Project UK Fisheries Improvements Stage 2

Pre-Assessment for UK *Nephrops* demersal trawl and creel fisheries in West of Scotland, Irish Sea and North Sea

Final report

May 2019

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Abbreviations

B	Biomass
CL	Carapace length
CW	Carapace width
CFP	Common Fisheries Policy
DCF	Data Collection Framework
ETP	Endangered, threatened & protected
EU	European Union
EC	European Commission
F	Fishing Mortality
FAO	Food and Agriculture Organisation of the United Nations
FCR	Fisheries Certification Requirements
FIP	Fisheries Improvement Project
FU	Functional Unit
ICES	International Council for Exploration of the Seas
IFCA	Inshore Fisheries & Conservation Authority
JNCC	Joint Nature Conservation Committee
JRC	European Commission Joint Research Centre
LTL	Low Trophic Level
LTMP	Long Term Management Plan
MLS	Minimum Landing Size
MCRS	Minimum Conservation Reference Size
MMO	Marine Management Organisation
MPA	Marine Protected Area
MSC	Marine Stewardship Council
MSFD	Marine Strategy Framework Directive
MSY	Maximum Sustainable Yield
PI	Performance Indicator
PO	Producer Organisation
PMF	Priority Marine Feature
PRI	Point of recruitment impairment
PSA	Productivity Susceptibility Analysis
PUKFI	Project UK Fisheries Improvements
RBF	Risk Based Framework
SAC	Special Area of Conservation
SG	Scoring Guidepost
SSB	Spawning Stock Biomass
STECF	Scientific, Technical and Economic Committee for Fisheries
TAC	Total allowable catch
UoA	Unit of Assessment
UoC	Unit of Certification
VME	Vulnerable marine ecosystem

1 Executive Summary

This report presents a pre-assessment, against the Marine Stewardship Council (MSC) standard, of Nephrops, *Nephrops norvegicus*, fisheries targeted by UK vessels using demersal trawl and creel. This work has been undertaken by Poseidon Aquatic Resource Management Limited (Poseidon) as part of Project UK Fisheries Improvements Stage 2 (PUKFI-2), including team members responsible for Principle 1: Julian Addison, Principle 2: Fiona Nimmo and Principle 3: Rod Cappell.

The UK Nephrops fisheries are undertaken across the North Sea (ICES Division 4), West of Scotland (6a) and Irish Sea (7a). Within these ICES Divisions, twelve Functional Units (FUs) are defined and assessed as distinct Nephrops stocks, which are treated as separate Units of Assessment (UoAs) within this pre-assessment.

The UK Nephrops fishery is currently the UK's second most valuable species, behind only mackerel in terms of first sales value. In 2017, over 30,600 tonnes were landed by UK vessels, with a first sales value of £99.2 million. Demersal trawl account for 95% of landings by weight, and creel 5%.

Nephrops distribution is limited by the extent of suitable muddy sediment in which the animals construct burrows. Nephrops burrowing behaviour is key to the formation of the marine habitat 'seapens and burrowing megafauna' which is listed as an Annex I sub feature in the Habitats Directive.

The pre-assessment evaluated scores of less than 60 in Principles 1 and 2, indicating that the UK Nephrops demersal trawl and creel fisheries would not currently meet the MSC standard.

In addition, a number of scores less than 80 were also identified in Principles 1 and 2, which would lower the overall average scores for these principles.

Principle 1: level 60 was not met for harvest strategy, and therefore it is expected that the fishery would currently fail.

Level 60 was not met for the following Performance Indicators (PIs):

- 1.2.1 Harvest strategy: for all FUs, related to the mis-match between the scale at which stocks are assessed and catch advice is provided (Functional Unit level) and the much wider scale at which Total Allowable Catches are set (e.g. North Sea).

Level 80 was not met for the following PIs:

- 1.1.1 Stock status: for 2 out of 12 FUs, based on the stocks not fluctuating around Maximum Sustainable Yield (MSY) and (for one FU) not being highly likely to be above the point of recruitment impairment (PRI) (10 FUs met level 80)
- 1.2.2 Harvest control rules (HCR) & tools: for all FUs, related to a lack of defined reference points and subsequent management action, meaning HCRs are understood, but not well-defined.
- 1.2.3 Information and monitoring: for 3 out of 12 FUs, based on less comprehensive information that does not allow the level of accuracy or coverage required to be consistent with the HCR (9 FUs met level 80)
- 1.2.4 Assessment of stock status: for 3 out of 12 FUs, due to harvest rate reference points not being estimated specifically for these UoAs (9 FUs met level 80)

Principle 2: level 60 was not met for outcome status of primary species within the demersal trawl fishery, and therefore it is expected that this UoA would currently fail. A number of PIs did not meet level 80 for the creel fishery and there is a strong possibility of an average of less than 80 for this UoA, leading to an overall fail.

Level 60 was not met for the following PIs for demersal trawl:

- 2.1.1: very low stock sizes of whiting, haddock and cod across the West of Scotland and Irish Sea.
- 2.1.2: on account of West of Scotland whiting catches being above levels that would allow stock recovery.
- 2.3.1: based on concern that this fishery may hinder recovery of invertebrate species designated as Scottish priority marine features.

- 2.4.1: for demersal trawl, current evidence does not provide the confidence that demersal trawl is unlikely to reduce the structure and function of encountered habitats, including vulnerable marine ecosystems.

Level 80 was not met for the following PIs:

- 2.2.1: for creel, on account of stock status of main species not being highly likely to be above biologically based limits.
- 2.2.2: for demersal trawl and creel as it is considered that current management does not prevent the UoAs from hindering recovery of secondary species.
- 2.3.1: for creel, related to evidence / data on the combined effects of MSC UoAs on harbour porpoise.
- 2.3.2 and 2.3.3: for demersal trawl and creel, based on a lack of management strategy specific to ETP species and a lack of information that would allow trends in ETP interactions to be identified.
- 2.4.2 and 2.4.3: for demersal trawl and creel, based on a lack of partial strategy and lack of quantitative evidence of compliance, specifically for vessels within Vessel Monitoring Systems (VMS).
- 2.5.1 and 2.5.2: for demersal trawl, based on concern that this fishery is not highly unlikely to disrupt ecosystem structure and function.

Principle 3: level 80 is not met for 3.2.3: compliance and enforcement related to effective monitoring of closed areas and implementation and enforcement of the Landing Objective.

Summary of pre-assessment scoring for UK Nephrops fishery

	Component	PI	Performance Indicator	Likely scoring level				
Principle 1 UoAs				**FU 5**	**FU 6**	**FU 10**	**FU 34**	**All other FUs**
1	Outcome	1.1.1	Stock status	≥80	60-79	≥80	60-79	≥80
		1.1.2	Stock rebuilding		≥80		≥80	
	Management	1.2.1	Harvest Strategy	<60	<60	<60	<60	<60
		1.2.2	Harvest control rules & tools	60-79	60-79	60-79	60-79	60-79
		1.2.3	Information and monitoring	60-79	≥80	60-79	60-79	≥80
		1.2.4	Assessment of stock status	60-79	≥80	60-79	60-79	≥80
Principle 2 UoAs				**Demersal trawl**			**Creel**	
				North Sea FU 5-10, 34	**West of S. FU 11-13**	**Irish Sea FU 14-15**	**All FUs**	
2	Primary Species	2.1.1	Outcome	60-79	<60	<60	≥80	
		2.1.2	Management	60-79	<60	60-79	≥80	
		2.1.3	Information	≥80	≥80	≥80	≥80	
	Secondary species	2.2.1	Outcome	≥80	≥80	≥80	60-79	
		2.2.2	Management	60-79	60-79	60-79	60-79	
		2.2.3	Information	≥80	≥80	≥80	≥80	
	ETP species	2.3.1	Outcome	<60			60-79	
		2.3.2	Management	60-79			60-79	
		2.3.3	Information	60-79			60-79	
	Habitats	2.4.1	Outcome	<60			≥80	
		2.4.2	Management	60-79			60-79	
		2.4.3	Information	60-79			60-79	
	Ecosystem	2.5.1	Outcome	60-79			≥80	
		2.5.2	Management	60-79			≥80	
		2.5.3	Information	≥80			≥80	
Principle 3 UoAs				**All FUs and all gear types**				
3	Governance & policy	3.1.1	Legal and customary framework	≥80				
		3.1.2	Consultation, roles and responsibilities	≥80				
		3.1.3	Long term objectives	≥80				
	Fishery specific management system	3.2.1	Fishery specific objectives	≥80				
		3.2.2	Decision making processes	≥80				
		3.2.3	Compliance and enforcement	60-79				
		3.2.4	Management performance evaluation	≥80				

2 Introduction

2.1 Aims/scope of pre-assessment

This report presents a Marine Stewardship Council (MSC) pre-assessment of the UK Nephrops, *Nephrops norvegicus,* demersal trawl and creel fisheries in the North Sea, West of Scotland and Irish Sea.

The principle aims of the pre-assessment are to:

- Review fishery-specific data;
- Define the appropriate Units of Assessment (UoAs);
- Review the performance of the fishery against the MSC certification requirements;
- Present pre-assessment scoring and supporting rationales.

This pre-assessment involves providing a provisional evaluation against MSC Performance Indicators (PIs) and Scoring Guideposts (SGs), to inform how the fishery fares against the MSC standard and whether each PI is likely to fall within the following categories: fail (i.e. score <60), pass with conditions (60-79) or pass without conditions (≥ 80). It should be noted that the pre-assessment does not attempt to duplicate a full assessment against the MSC standard, which requires precise scoring and defined public consultation phases.

The pre-assessment has been undertaken as part of Project UK Fisheries Improvements Stage 2 (PUKFI-2). This project is working towards an environmentally sustainable future for UK fisheries by running Fishery Improvement Projects (FIPs) on two UK fisheries that have been selected by the UK supply chain. They were selected due to their importance for the UK market. PUKFI-2 will do this through strategic use of the MSC process to develop credible FIPs, giving each fishery the tools to implement changes and to ensure their sustainable future. It will use the MSC Pre-Assessment process as a gap analysis to determine current status, identify improvements and inform development of an Action Plan designed to ultimately improve the sustainability of the fishery.

PUKFI-2 builds upon the foundation of PUKFI-1 and Project Inshore.

The overall aim of this Pre-Assessment is to feed in to the development of an Action Plan for the fishery, designed to raise the scores over a defined period to a point at which the fishery could enter MSC assessment.

2.2 Constraints to the pre-assessment of the fishery

While no site visit to the fishery has been undertaken, all key data sources were made available to allow appropriate assessment for this fishery.

It should be noted that the comparatively quick pre-assessment exercise does not go into the level of detailed and rigorous scrutiny, which is undertaken as part of a full MSC assessment. For this reason, it cannot be guaranteed that the outcome of a full assessment process can be predicted with absolute accuracy. There may still be some unforeseen additional issues that arise once a fuller public consultation exercise is undertaken as part of any full assessment.

2.3 Unit(s) of Assessment

The Units of Assessment (UoAs) for this pre-assessment are defined in Table 2.1.

Table 2.1: Units of Assessment

Species	Area		Gear
	ICES Division	Functional Unit	
Nephrops norvegicus	ICES Division 4, North Sea	5 Botney Gut - Silver Pit	Demersal trawl
		6 Farn Deeps	
		7 Fladen Ground	
		8 Firth of Forth	
		9 Moray Firth	
		10 Noup	
		34 Devil's Hole	

Species	Area		Gear
	ICES Division	Functional Unit	
	ICES Division 6a, West of Scotland	11 North Minch	
		12 South Minch	
		13 Firth of Clyde + Sound of Jura	
	ICES Division 7a, Irish Sea	14 Irish Sea East	
		15 Irish Sea West	
	ICES Division 4, North Sea	5 Botney Gut - Silver Pit	Creel
		6 Farn Deeps	
		7 Fladen Ground*	
		8 Firth of Forth	
		9 Moray Firth	
		10 Noup	
		34 Devil's Hole*	
	ICES Division 6a, West of Scotland	11 North Minch	
		12 South Minch	
		13 Firth of Clyde + Sound of Jura	
	ICES Division 7a, Irish Sea	14 Irish Sea East	
		15 Irish Sea West	

2.4 Total Allowable Catch (TAC) and Catch Data

Total Allowable Catch (TAC) rates are set for the International Council for the Exploration of the Sea (ICES) management divisions that overlap the UoAs under assessment. Three TAC areas overlap the UoAs as follows:

- ICES Divisions 4 North Sea and EU waters of 2a Norwegian Sea;
- ICES Divisions 6a West of Scotland, 6b Rockall and 5b Faroes; and
- ICES Division 7, including 7a Irish Sea.

TAC and catch data for these areas are provided in Table 2.2.

Table 2.2: TAC and catch data

Detail	Year	ICES Division relevant to TAC			Total
		North Sea, 4, & Norwegian Sea, 2a (EU waters)	West of Scotland, 6a, Rockall, 6b & Faroes, 5b	Irish Sea, 7a, and other 7 areas	
TAC	**2018**	24,518 tonnes	12,129 tonnes	29,091 tonnes	65,738 tonnes
UoA share of TAC	**2018**	21,237 tonnes	11,842 tonnes	9,543 tonnes	42,622 tonnes
UoC share of TAC	**2018**	21,237 tonnes	11,842 tonnes	9,543 tonnes	42,633 tonnes
Total green weight catch by UoC	**2017**	12,037 tonnes	11,900 tonnes	6,715 tonnes	30,652 tonnes
	2016	9,455 tonnes	14,650 tonnes	7,380 tonnes	31,486 tonnes

3 Description of the fishery

3.1 Scope of the fishery in relation to the MSC programme

3.1.1 MSC programme scope

The fishery under assessment is within scope of the MSC program as defined in FCR v2 Section 7.4.11 (i.e. the target species is not from the following taxa: amphibians, reptiles, birds or mammals; the fishery is not being conducted under a controversial unilateral exemption to an international agreement, nor does the fishery use destructive fishing practices such as poisons or explosives - such fisheries would automatically fail the MSC standard).

3.1.2 Introduced Species / Inseparable Stocks (IPI) / Enhanced Fishery / Low Trophic

These MSC policies do not apply in the case of this fishery and no adjustments to the standard assessment procedure will therefore be required to include these. The fishery does not target non-native or introduced species therefore the MSC Introduced Species Requirements do not apply. The species caught are easily recognizable and can separated and recorded accurately. And no fishery enhancement techniques (such as artificial reefs) are employed. Finally, the species is not classified as a Key low trophic species.

3.2 Overview of the fishery

3.2.1 Nephrops norvegicus

Nephrops, *Nephrops norvegicus* (also known as langoustine, Norway lobster or prawn), has been commercial targeted since the 1960s, and is currently the UK's second most valuable species, behind mackerel. In 2017, over 30,600 tonnes were landed by UK vessels, with a first sales value of £99.2 million.

Nephrops distribution is limited by the extent of suitable muddy sediment in which animals construct burrows. There are populations in the North Sea, West of Scotland and Irish Sea, in open waters and sea lochs at depths ranging from a few metres down to over 500 m on the shelf edge, west of the Hebrides.

Nephrops spend most of their time in burrows, only coming out to feed and look for a mate. Nephrops in different areas grow at different rates and mature at different sizes. This variation is related to the density of animals and sediment type. Nephrops mature at 3 years of age, and further biological attributes are summarised in Table 3.1.

When in their burrows, Nephrops are protected from trawls and therefore catch rates are linked to emergence patterns, with highest catches taken at dusk and dawn. As 'berried' females rarely come out of the burrow, they are naturally protected from trawlers, and males dominate trawl catches for most of the year, and are more heavily exploited than females (Marine Scotland, 2018).

Distinct Functional Units (FU) are defined for Nephrops stocks based on analysis of Vessel Monitoring System (VMS) data, together with habitat suitability. In the UK EEZ waters of the North Sea, West of Scotland and Irish Sea, there are 12 FUs that are included within the scope of this pre-assessment (Figure 3.1).

Table 3.1. Biological attributes of Nephrops norvegicus

Species	*Nephrops norvegicus*	Average age at maturity	3 yr
Reproductive strategy	Broadcast spawners	Average maximum age	6-10 yr
Length of larvae phase	1-2 months	Fecundity (No of eggs)	1000
Movement of adults	Mobile, not migratory	Average size at maturity	3 cm
Sediment type	Demersal, muddy habitats	Average maximum size	6 cm
Depth	Subtidal, 20-800m	Trophic level	3.51

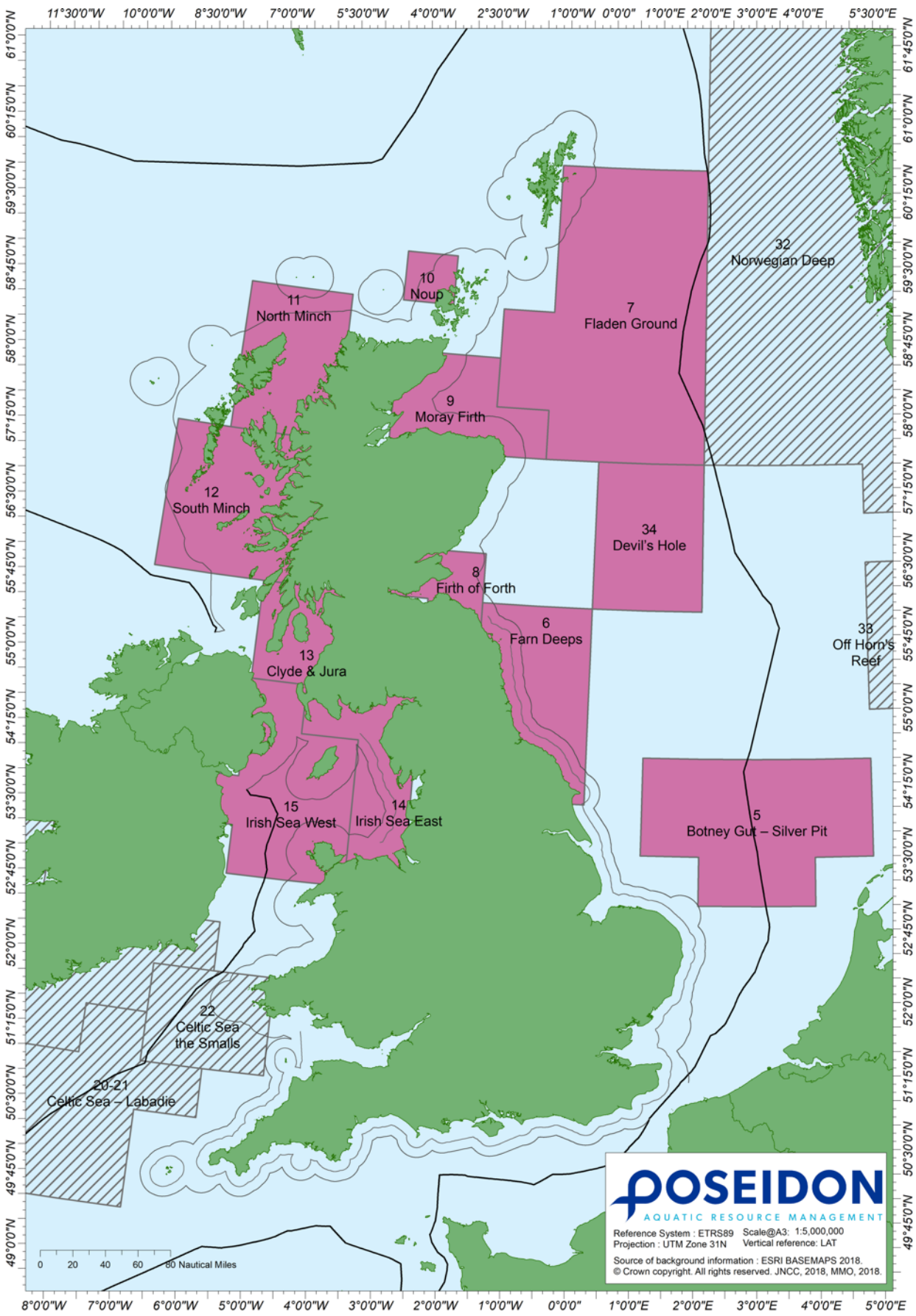


Figure 3.1. Nephrops Functional Units included within this pre-assessment (purple) and not included (grey).

3.2.2 Gear types

Nephrops are predominately landed by demersal trawl gear, which account for 95% of Nephrops landings by weight (Figure 3.2) and creels, which account for 5% of landings by weight.

Scottish registered vessels land the majority of Nephrops, accounting for 67% by weight, followed by Northern Irish registered vessels (27%) and English registered vessels (6%).

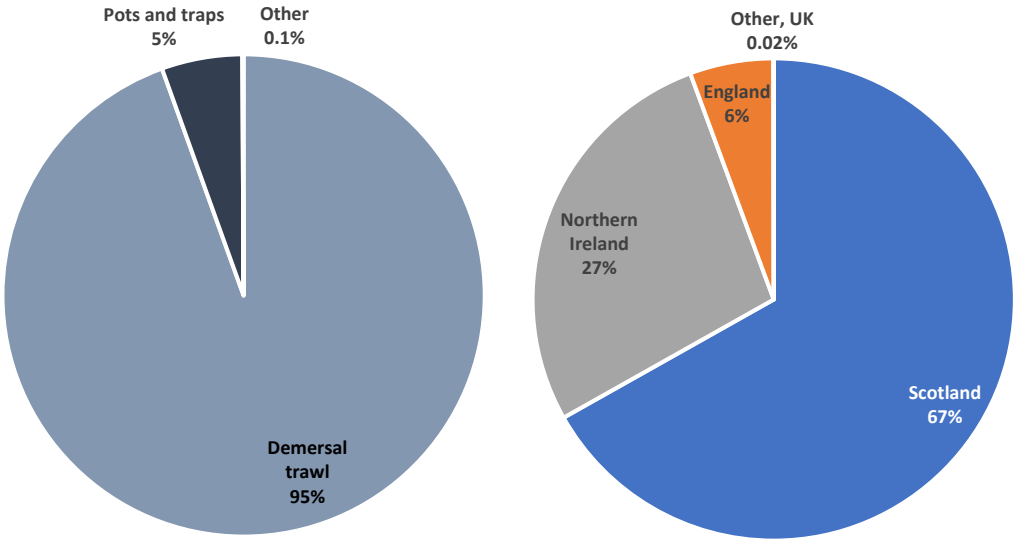


Figure 3.2. Proportion of Nephrops weight landed by gear type (left) and UK vessel nationality (right), based on five-year average from 2013 – 2017 (Data source: MMO, 2018).

Demersal trawl

The demersal or bottom otter trawl (single, twin and pair) is a towed fishing gear designed and rigged to have bottom contact during fishing. A demersal trawl is a cone-shaped net consisting of a body, closed by a cod end knot, and with lateral wings extending forward from the opening (Figure 3.3).

Based on EU gear classifications two distinct sets of otter trawl nets are in operation to target different sets of species. Mesh sizes of 100mm and greater (known as TR1) are typically used to target demersal whitefish including haddock, cod, sole, plaice and monkfish; while mesh sizes of 80-100mm (known as TR2) are typically used in the Nephrops trawl fishery.

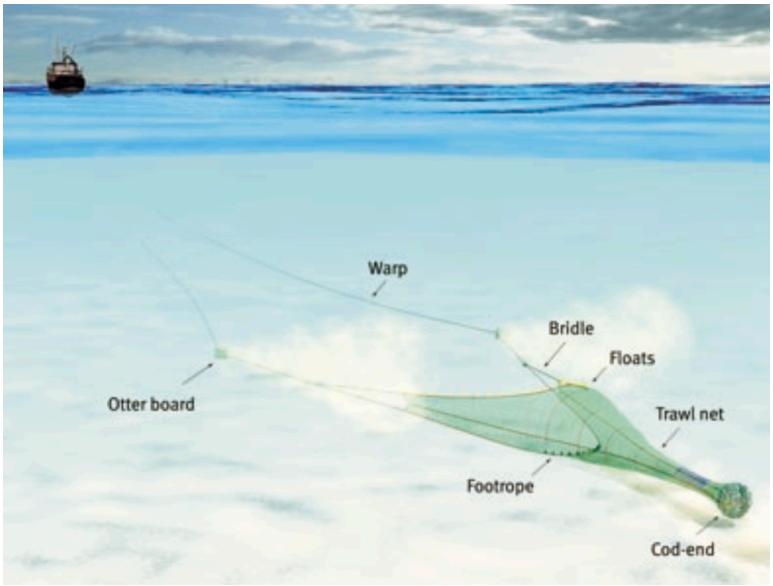


Figure 3.3. Typical demersal trawl gear (Galbraith & Rice, 2004)

Demersal otter twin trawl gear (Figure 3.4) is generally used to target species located immediately on the seabed, such as monkfish, flatfish and nephrops. By towing two nets side by side the effective swept area, and hence catch, is increased. As with the single demersal otter trawl above, otter boards (a in Figure 3.4) provide the horizontal spreading forces and floats and ground ropes the vertical forces. The obvious difference in rigging is the third wire or central warp (b), which runs from the vessel to the clump (c), a heavy weight which can consist of short lengths of chain cable shackled together or a custom-made device designed to roll rather than be dragged along the bottom (as shown in the inset).

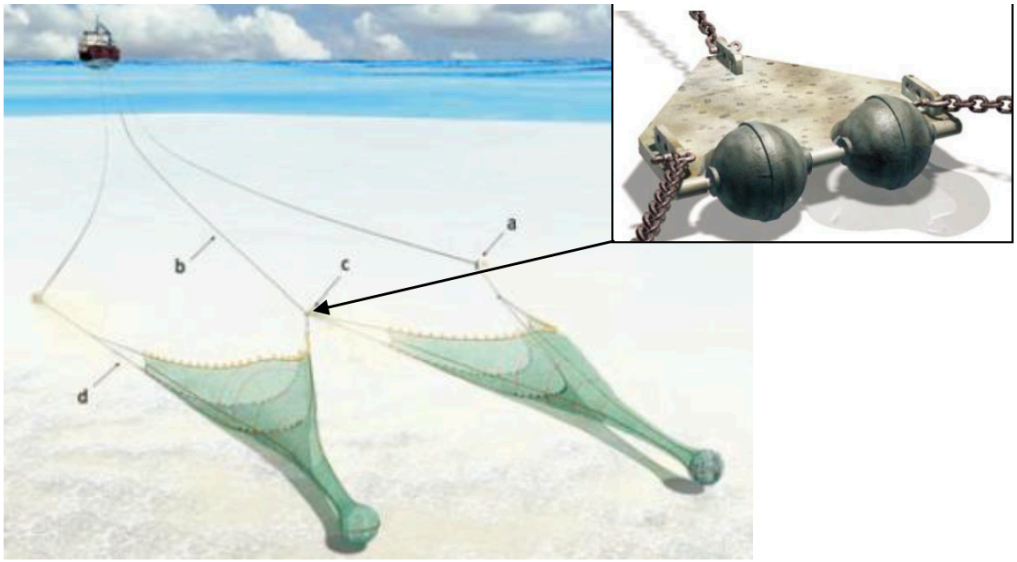


Figure 3.4. Typical demersal otter twin trawl gear and configuration (Galbraith & Rice, 2004)

Creel

Nephrops creels are generally of the basic D creel design (Figure 3.5) and of much lighter construction than that of a lobster or crab pot. A standard Nephrops creel has two entrances fitted with plastic rings, known as hard eyes, which provide an easy route for the Nephrops to enter the creel. As with any hard-eyed creel, if not hauled daily, many of the creatures will soon escape. These creels are generally set in deeper water on soft sea beds of mud and sand where the Nephrops live in burrows. In these areas, there is much less chance of the creels moving and getting abraded by contact with rocks and stones, therefore, there is need for only a lightweight rope to be wrapped around the frame of the creel to prevent damage (Seafish, 2018).

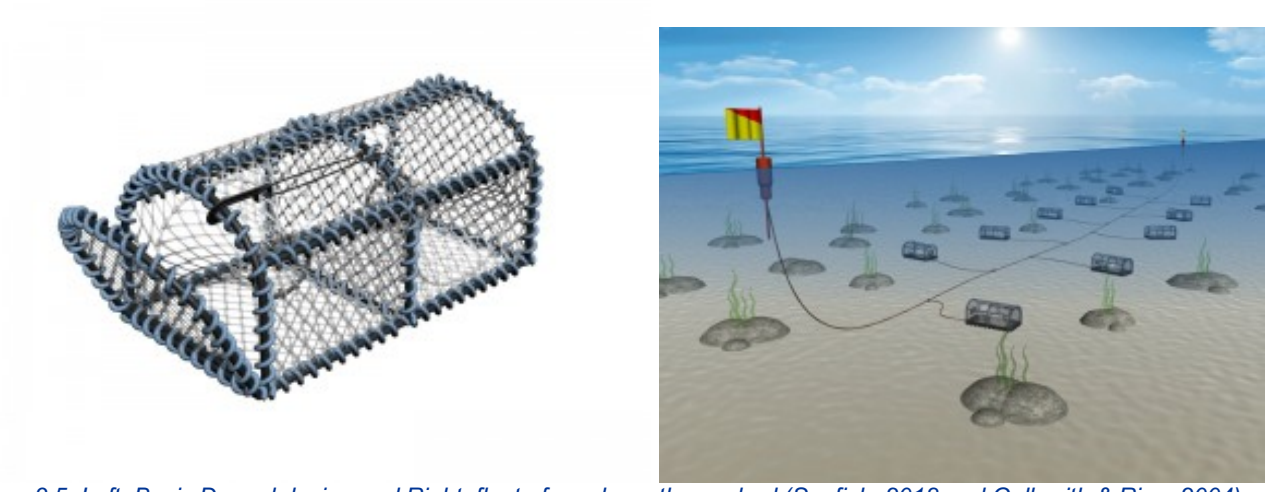


Figure 3.5. Left: Basic D creel design and Right: fleet of creels on the seabed (Seafish, 2018 and Galbraith & Rice, 2004)

Most skippers using Nephrops creels, even on the smaller vessels, use large fleets often around 100 creels. There will usually be some form of anchor or weight at each end of the fleet to help prevent the fleet being moved by strong tides and rough seas. They are baited with some form of fish often salted or frozen herring or mackerel is used. The gear will be hauled and shot on a daily basis (Seafish, 2018).

The mesh size of these creels will be chosen to allow the release of the very small Nephrops and any small fish. When the gear is hauled and the catch removed, the retained Nephrops are usually selected by size and placed in individual sections or 'tubes' in a box that is then immersed in a tank of sea water to keep them alive and in prime condition (Seafish, 2018).

3.2.3 Overview of landings

In 2017, 29,000 tonnes of Nephrops, with a first sales value of £89 million were landed by UK demersal trawlers (Figure 3.6). Landings have been high throughout the period, with a slight drop noted in 2015. Trends in first sale value, mirror those of landed weight.

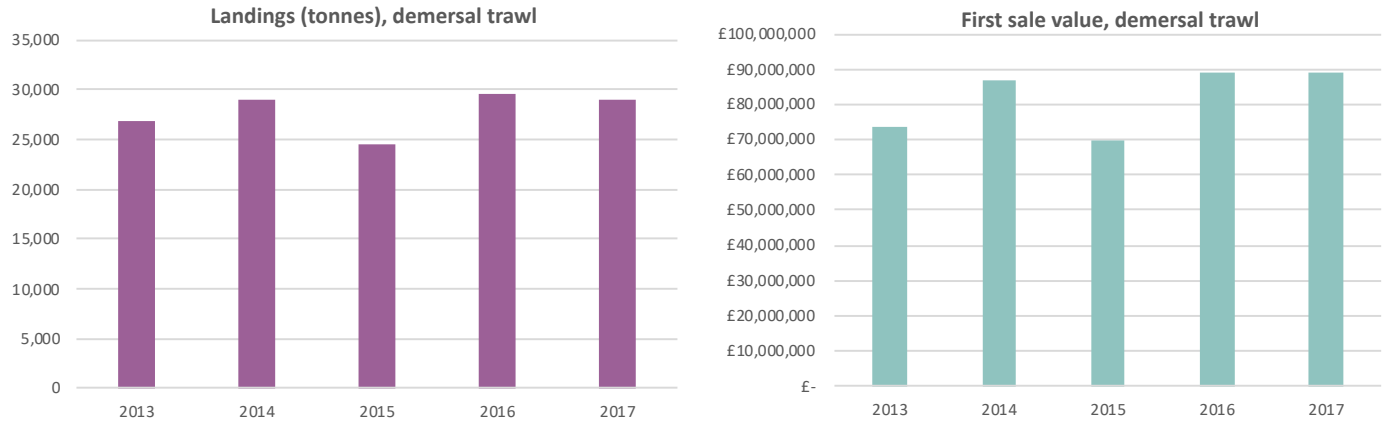


Figure 3.6. Nephrops weight (left) and first sale value (right) landed by UK vessels by demersal trawl from 2013 – 2017 (Data source: MMO, 2018)

In 2017, 1,500 tonnes of Nephrops, with a first sales value of just under £10 million were landed by UK vessels using creel (Figure 3.7). Landings have been high throughout the period, with a peak noted in 2016. First sales value dropped in 2017, which is linked to a 20% drop in price that was not seen within the demersal trawl fishery.

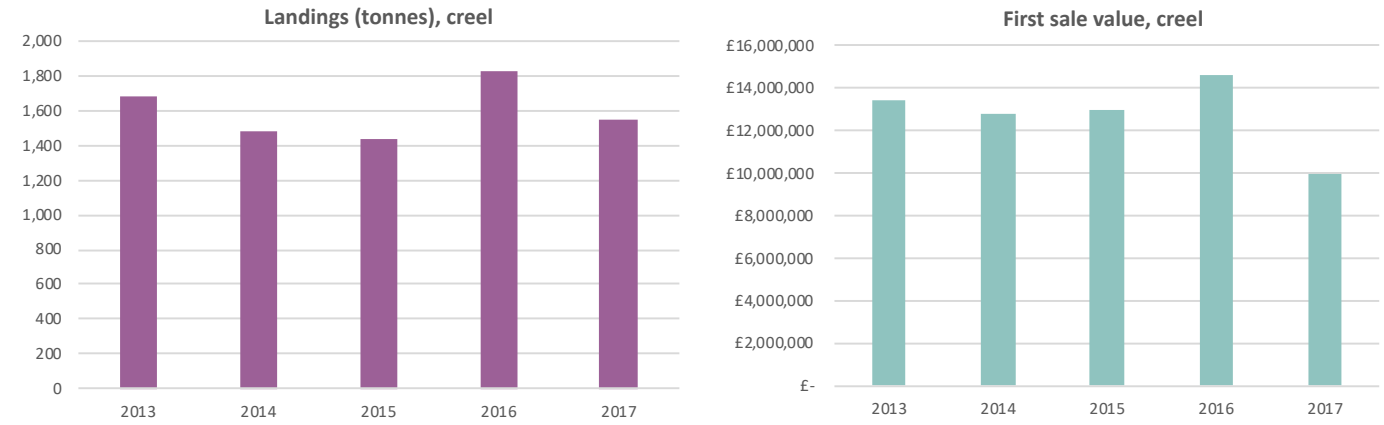


Figure 3.7. Nephrops weight (left) and first sale value (right) landed by UK vessels by creel from 2013 – 2017 (Data source: MMO, 2018)

Prices obtained for creel caught Nephrops are on average £8 per kg, which are significantly higher that of demersal trawl, £3 per kg (based on first sale average prices).

Nephrops landed by demersal trawl are principally taken from West of Scotland and North Sea by Scottish vessels, and from the Irish Sea by Northern Irish vessels (Figure 3.8). Vessels greater than 10m in length are responsible for the large majority of landings (93%).

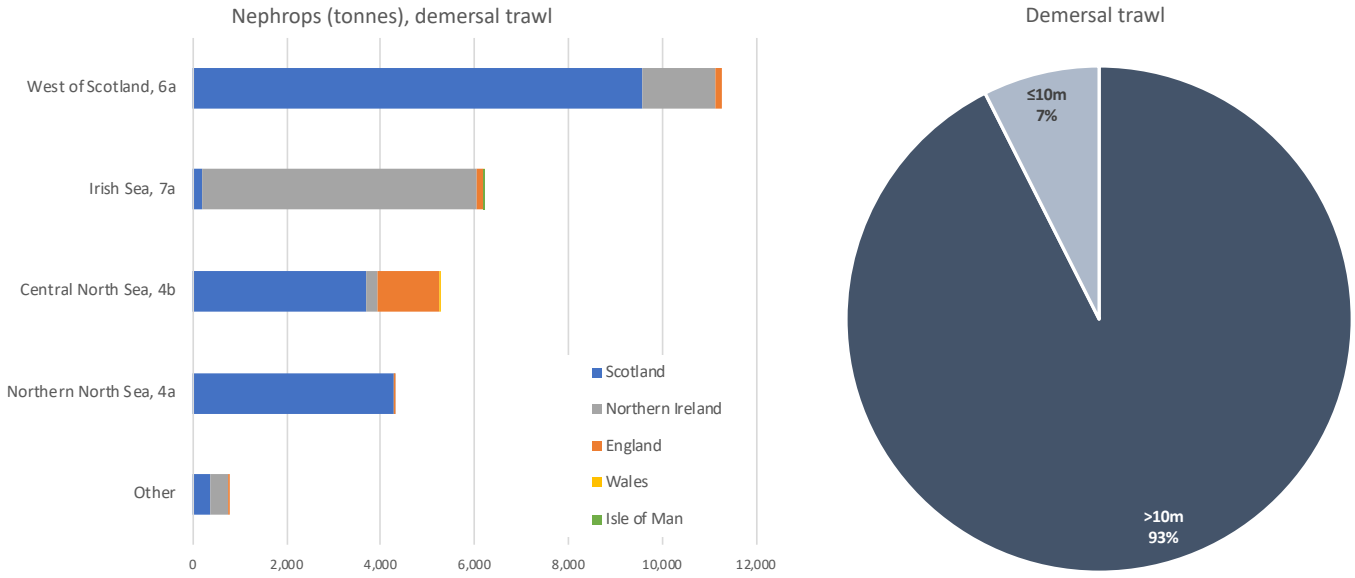


Figure 3.8. Nephrops live weight landed by UK vessels by demersal trawl indicating ICES Division and vessel nationality (Left) and proportion of catch by vessel length category (right) (Data source: MMO, 2018)

Nephrops landed by creel are almost entirely taken from West of Scotland by Scottish vessels (Figure 3.9). Vessels 10m in length and under are responsible for two-thirds of the landings (67%).

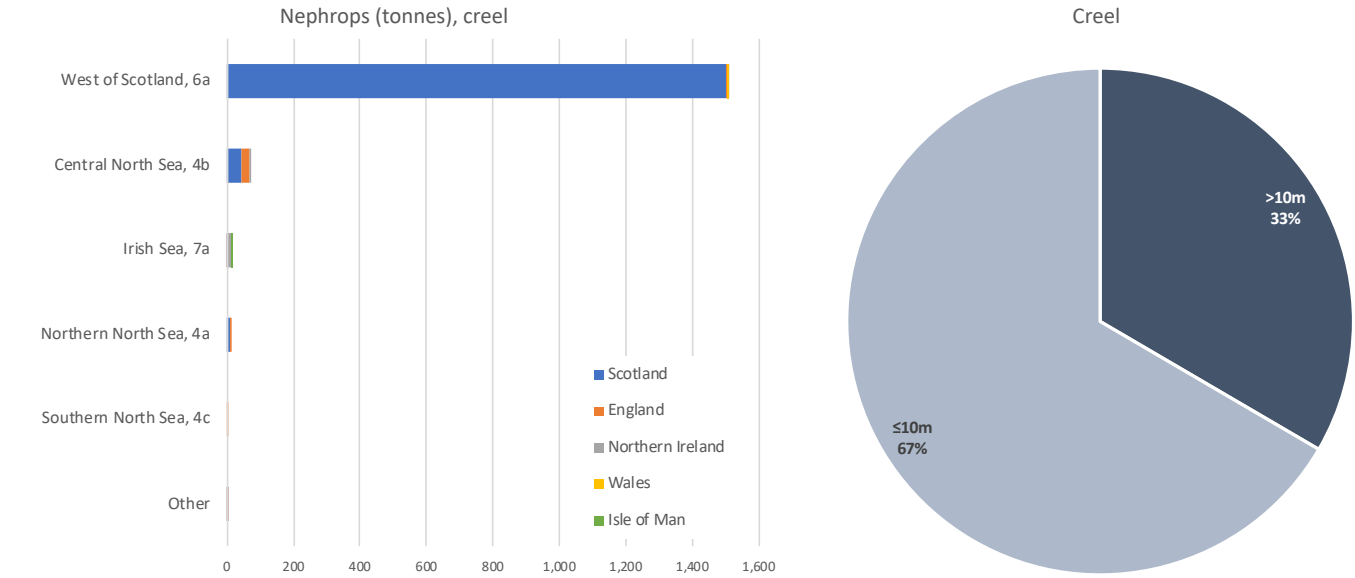


Figure 3.9. Nephrops live weight landed by UK vessels by creel indicating ICES Division and vessel nationality (Left) and proportion of catch by vessel length category (right) (Data source: MMO, 2018)

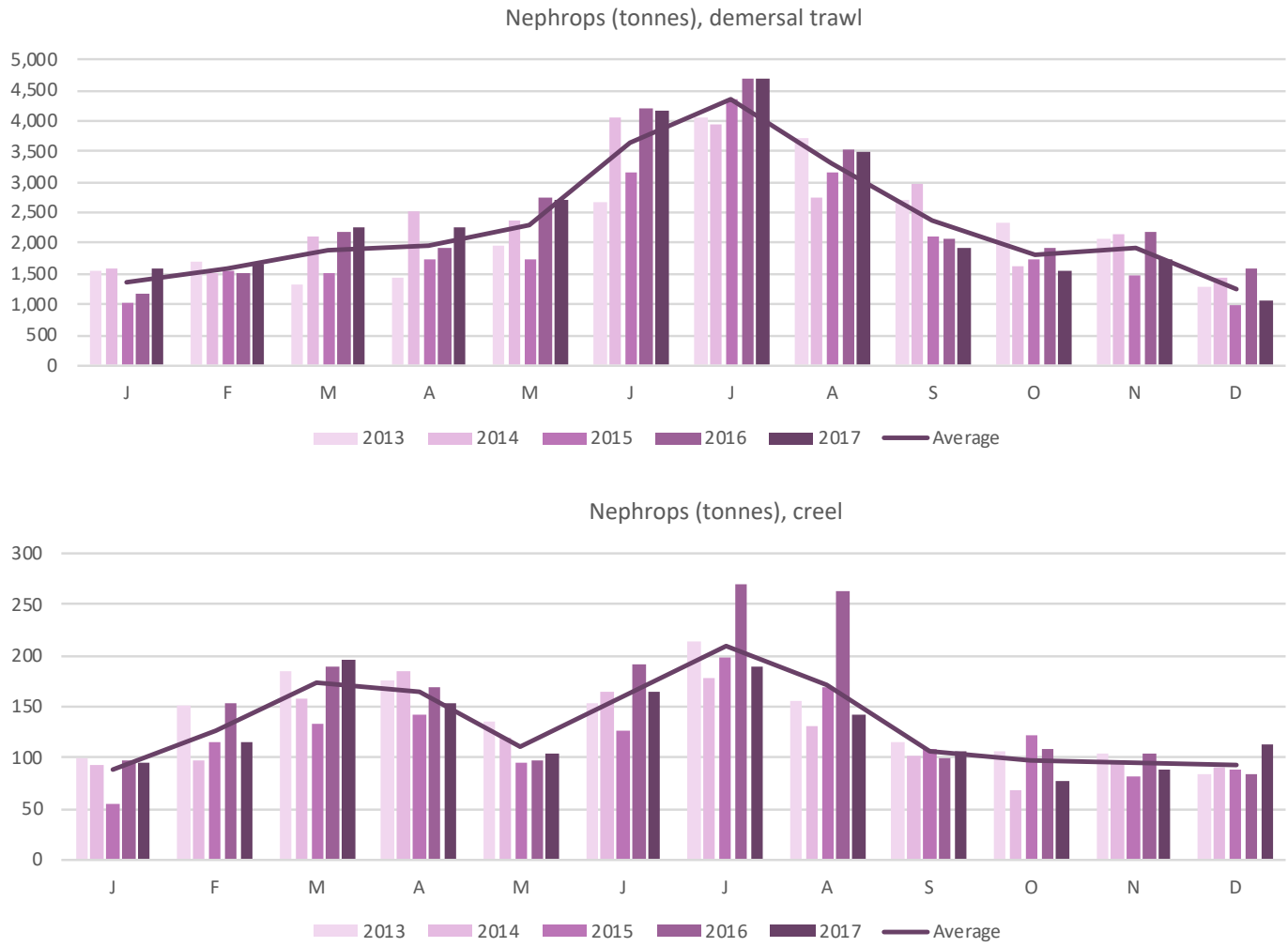


Figure 3.10. Seasonality in Nephrops landings by UK vessels from 2013 – 2017 using demersal trawl (top) and creel (bottom). (Data source: MMO, 2018)

Landings of Nephrops occur throughout the year (Figure 3.10). Landings by demersal trawl peak in the summer months, from June to July. Landings by creel are relatively more consistent throughout the year, with peaks noted in June to August and March to April.

The distribution of landings by demersal trawl and creel is mapped in Figure 3.11 which indicates the first sale value of Nephrops in 2017 by ICES rectangle. It is clear that demersal trawl activity occurs throughout the North Sea, West of Scotland and Irish Sea, while Nephrops creel activity is focused in the West of Scotland.

Specific hotspots for Nephrops landings are noted, that correspond with the Functional Unit areas presented in Figure 3.1.

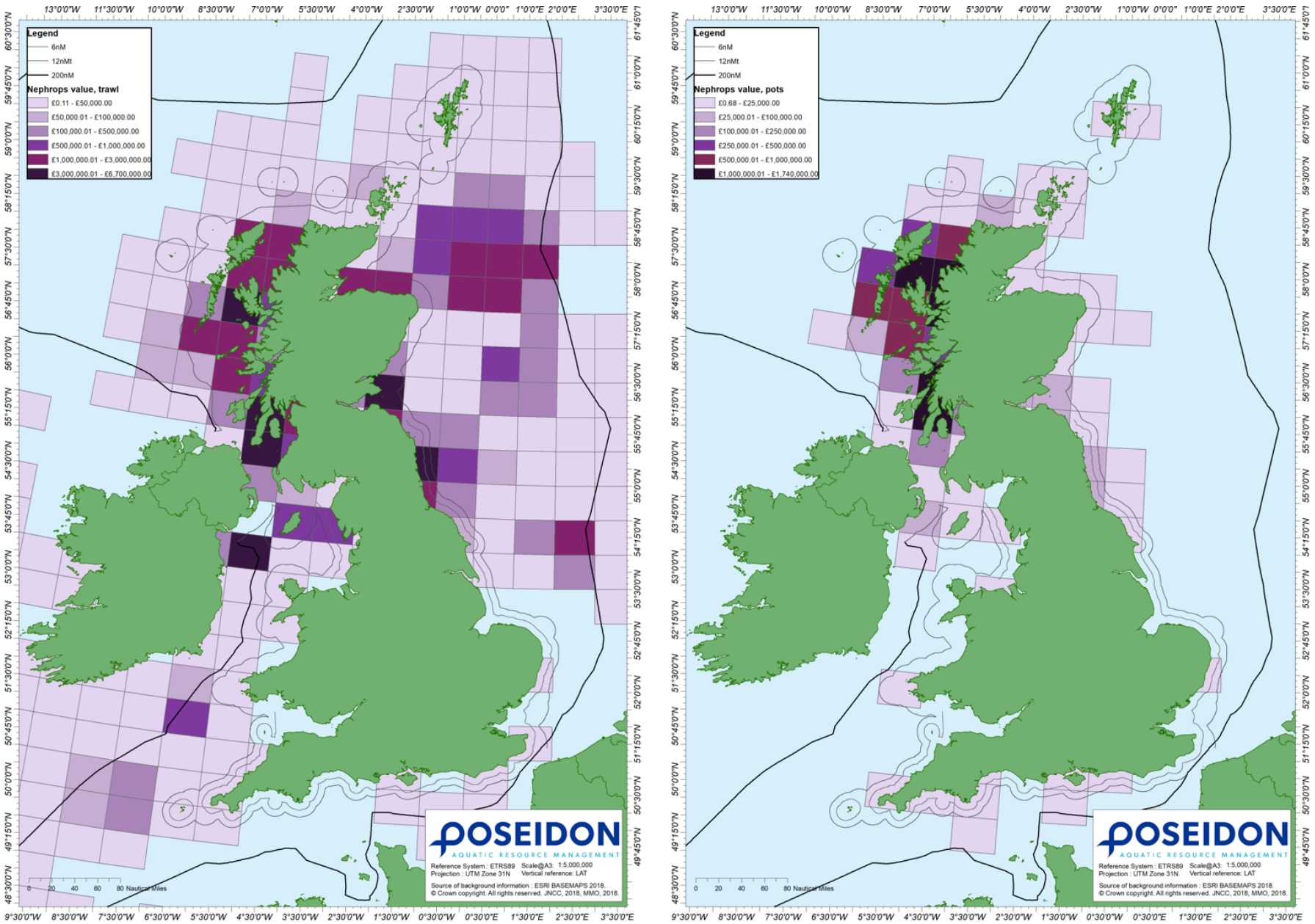


Figure 3.11. First sale value of Nephrops landed in 2017 by UK vessels using demersal trawl (left) and creel (right), indicating value by ICES rectangle (Data source: MMO, 2018)

3.3 Principle One: Target species background

3.3.1 Nephrops biology and life histories

The Norway lobster *Nephrops norvegicus*, also known as scampi, langoustine or Dublin Bay prawn, is distributed throughout the northeast Atlantic from Iceland and the north western coast of Norway in the north to the Atlantic coast of Morocco and is also found in the western and central Mediterranean, but is absent from the Baltic Sea (Holthuis, 1980). There are important commercial fisheries for Nephrops across its geographical range. Nephrops are found primarily in muddy sediments in which they build complex burrow systems. They are found in depths from 20 m to 800m and so can be found in isolated sea lochs on the west coast of Scotland but also on the edge of the continental slope. Commercially exploited populations of Nephrops often occur in discrete geographical areas characterised by muddy sediments, and these separated populations may therefore exhibit significant variations in population dynamics. Tagging studies do not show any significant migration of adult Nephrops (Chapman and Rice, 1971), although movements between populations could take place through passive dispersal of larvae by oceanic currents during the planktonic larva phase which lasts between 4 and 8 weeks. A study by Pampoulie *et al*. (2011) showed no genetic differences between Nephrops over a wide geographical area, but other genetics studies using a range of techniques showed significant genetic differentiation between populations of Nephrops but without a clear geographical pattern (Maltagliati *et al.*, 1998; Stamatis *et al*., 2004, 2006). Without any clear evidence of links between populations, it seems reasonable to assume that the populations of Nephrops in each Unit of Certification can be considered as a single stock.

In relation to the fisheries for Nephrops, the key behavioural characteristic is the pattern of emergence from the burrows (Bell, Redant and Tuck, 2006). Emergence behaviour is influenced by light intensity, season, sex and reproductive status of individual Nephrops, and tide strength (Chapman and Howard, 1979). Whilst incubating their eggs, the females rarely come out of the burrows, and so are not vulnerable to trawling (Chapman, 1980). The incubating females remain in their burrows throughout the winter and emerge in spring and summer to moult and mate. Incubating females will emerge from their burrows in response to bait and so can be captured in creel fisheries. Juvenile Nephrops tend to remain in the burrows most of the time. The size and sex composition of the Nephrops caught in trawls is strongly dependent on the time of day, the season and the state of the tide, and can vary from stock to stock. For example, some Nephrops fisheries occur throughout the year and therefore consist of both males and females, whereas other fisheries are based primarily on male-dominated winter fishing.

Nephrops are omnivorous feeding primarily on crustaceans, molluscs and to a lesser extent polychaetes and echinoderms (Parslow-Williams et al., 2002). They emerge from their burrows to eat but may also act as suspension feeders (Lars-Ove et al., 1993). Growth and fecundity are known to vary geographically and have been shown to be negatively correlated with burrow density (Tuck et al., 1997). Growth rate appears to be density-dependent and is also likely to be related to food availability.

Nephrops may act as a prey species for various groundfish species such as cod, but it cannot be considered to be a key low trophic level (LTL) species in the North Sea, Irish Sea and West of Scotland ecosystems, as it does not meet all the criteria set out in paragraphs SA2.2.8-SA2.2.10 of the MSC Fisheries Certification Requirements v2.0 (MSC, 2014). In particular, Nephrops does not form dense schools and is unlikely to play an important role in energy transfer in the ecosystem as predators of Nephrops will consume other prey species.

Nephrops stock dynamics can be influenced by the distribution of suitable habitat. The patchiness and varied density of Nephrops populations have been correlated primarily with the heterogeneous nature of the sediment and the production of pelagic larvae, whose dispersal is dependent on sea currents (Hill, 1990). Stock dynamics may also be influenced by fishing, abundance of predators such as cod (Brander and Bennett, 1986) and severe oxygen depletion which forces Nephrops out of their burrows and increases both fishing and natural mortality (Bagge et al., 1990).

3.3.2 Harvest strategy

General harvest strategy

Landings of Nephrops in 11 of the 12 UoCs are primarily by UK vessels. A small proportion of landings in South Minch (FU12) are by Irish vessels and about 10% of landings in Irish Sea East (FU14) are by Irish vessels. In the North Sea, in the Farn Deeps (FU6), there are occasional landings by vessels from Belgium, Denmark and the Netherlands, and in the Fladen (FU7) there are occasional landings by Danish vessels. However in the Botney Gut (FU5) the landings are shared between UK, Dutch, German and Belgian vessels. As all the vessels fishing for Nephrops in the UoCs are from Member States of the European Union, the overarching legislation

governing their fishing activities is the EU's Common Fisheries Policy (CFP) which was revised under EU Regulation No. 1380/2013 and came into effect on 1 January 2014. One of the key objectives of the CFP is that:

"The CFP shall apply the precautionary approach to fisheries management, and shall aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield."

Implementation of the CFP at a national level is carried out through the individual Member States. Under the Marine Strategy Framework Directive (MSFD), Member States are required to ensure the good environmental status of the marine environment.

Under the Marine and Coastal Access Act 2009, the UK legislation sets out a general objective with respect to sustainable development. Other recent policy documents which underpin the harvest strategy for Nephrops fisheries include the Prime Minister's Strategy Unit report "Net Benefits" and the joint Fisheries Administrations' response "Securing the Benefits". Long term objectives set out in "Securing the Benefits" include securing the management of fish stocks as an important renewable resource, harvested to optimise long term economic returns, and ensuring that stocks are fished at biologically sustainable levels and discards are minimised. Most recently, the UK Government's Fisheries White Paper: Sustainable fisheries for future generations (Defra, 2018) states that approaches to fisheries management (effort control and quota management) will be reviewed, that harvest rates will be set in order to restore and maintain fish stocks at least to levels that can produce maximum sustainable yield (MSY), and that an ecosystem approach to fisheries management will be pursued.

UK fisheries management and quota allocation is devolved to the four UK Fisheries Administrations: Marine Scotland, Defra, Welsh Government and Department of Agriculture, Environment and Rural Affairs (DAERA) via a 2016 Concordat on Fisheries Management in the UK.

The UK Government is the allocating authority for UK fish quotas and apportions quota to the UK Fisheries Administrations, which is subsequently allocated to fishermen. The Scottish Government issues allocations to Fish Producer Organisations (POs) or manage landings directly via catch limits for vessels that are not PO members (e.g. non-sector and 10m & under vessels).

The Scottish National Marine Plan (NMP), published in 2015, covers marine planning matters in Scotland's inshore waters, governed by the Marine (Scotland) Act 2010 and offshore waters, governed by the Marine and Coastal Access Act 2009.

Fisheries objectives of the NMP include:

- Fish stocks are harvested sustainably (both environmentally and economically) leading to exploitation of Scotland's commercial fish stocks at MSY and with increased long-term stability;
- Discarding is tackled through the avoidance of unwanted catches and the implementation of the EU's landing obligation;
- Management of removals rather than landings, where necessary, through fully documented fisheries.

Fisheries marine planning policies outlined in the NMP include the aim to ensure that, while taking account of the EU's CFP, Habitats Directive, Birds Directive and MSFD:

- An ecosystem-based approach to the management of fishing which ensures sustainable and resilient fish stocks and avoids damage to fragile habitats.
- Protection for vulnerable stocks (in particular for juvenile and spawning stocks through continuation of sea area closures where appropriate).
- Delivery of Scotland's international commitments in fisheries, including the ban on discards.

Nephrops fisheries in the North Sea are included within the recently-developed EU legislation establishing a multiannual plan for demersal stocks and fisheries in the North Sea (NSMAP) including the implementation of the landing obligation. NSMAP was published in July 2018 (EU, 2018) and the plan will be in place for 2019. Further details on the NSMAP are included in this Chapter and in Box 1. The most recent ICES advice for these stocks has been provided within the framework of the plan.

The harvest strategy consists of a number of elements that work together to ensure that the Nephrops stock is harvested sustainably. There are a series of regulations designed to control the level of exploitation, there is a comprehensive monitoring programme in place using both fishery-dependent and fishery-independent

approaches and a control and enforcement regime. A key element of the harvest strategy and the harvest control rule is an annual TAC based on a fishery-independent estimate of stock biomass. The TAC is designed to ensure that landings do not exceed the level consistent with fishing at Fmsy. Further details of this approach are given below.

Regulations

The Nephrops fishery is regulated through controls on fishing effort, the setting of an annual TAC and through technical conservation measures. There is a minimum landing size (MLS), now termed minimum conservation reference size (MCRS), and mesh size regulations and gear restrictions designed to minimise bycatch of cod and other commercially-exploited species. In the North Sea the MCRS is 25mm carapace length (equivalent to 87mm total length) for whole Nephrops and 46mm for Nephrops tails. In the West of Scotland and the Irish Sea, the MCRS is 20mm carapace length (equivalent to 70mm total length) for whole Nephrops and 37mm for Nephrops tails.

The technical regulations for the North Sea have been revised as of January 1st, 2017. This means that there is no longer a restriction on days at sea.

The EU Landing Obligation requires target species to be landed, and therefore prohibits the discarding of quota species. From 2016, fisheries catching Nephrops in the West of Scotland and the Irish Sea are covered by the EU Landing Obligation (EU, 2015). Creel fisheries are exempted from the landings obligation because Nephrops discarded from creels are expected to survive, and there is a *de minimis* exemption consisting of a 6% discard rate by weight for the trawl fishery in 2018 (reduced from 7% in 2016 and 2017). In 2017 the Landing Obligation was applied to all catches of Nephrops in the North Sea with several exemptions. However observations from most of the Nephrops fisheries in the North Sea suggest that discarding of individuals above the MCRS continues and has not changed markedly since the implementation of the Landing Obligation.

Monitoring

There is a comprehensive range of information available that is suitable for monitoring stock abundance and removals by the Nephrops fishery. In the trawl fishery, fishing activity is monitored through a vessel monitoring system (VMS) for the >12m sector of the fleet providing information on fishing position of all >12m vessels. This VMS data is correlated with electronic logbook data, to provide spatial distribution of fishing activity / intensity for the >15m vessels by the MMO for UK vessels and >12m vessels by ICES for all EU Member States (including UK in data up to 2017).

Defra and Marine Scotland have announced that inshore VMS (i-VMS) will be introduced for English vessels <12m in 2019, and for Scottish vessels <12m in 2020. Vessel tracking for the inshore fleet is noted as a commitment within the Scottish Inshore Fisheries Strategy.

In relation to landings, all vessels over 10m must complete log books recording daily landings and fishing effort and must complete landings declarations. Those vessels over 15m must record and submit their log books electronically. Creeling vessels in Scotland must return weekly log sheets on Nephrops catches. All vessels (both >10m and <10m) must complete sales notes under the Registration of Buyers and Sellers (RBS) legislation. Cross-checks of sales notes at landing ports with log book records allows verification of log book records. There is an observer programme in the Nephrops fishery which carries out on-board sampling of total catches and discards of all species caught in the Nephrops trawl, and size composition of landings is measured at landing points. A fishery-independent estimate of stock biomass is provided by burrow count surveys using underwater TV. In all but three of the UoCs, these underwater TV surveys are carried out on an annual basis.

There is also a rigorous control and enforcement regime carried out by the Marine Management Organisation (MMO) in England and Marine Scotland Compliance in Scotland. This enforcement includes inspections at sea and port inspections to monitor compliance with technical conservation measures and verification of log books and sales notes.

Box 1: North Sea Multiannual Plan (NSMAP) for demersal stocks and fisheries.

On 3 August 2016 the Commission proposed a multi-annual plan for demersal fish stocks in the North Sea. Complex consultations and negotiations on this proposal resulted in the new regulation for the North Sea multiannual plan (NSMAP) for demersal stocks being established on 4 July 2018:

Regulation (EU) 2018/973 of the European Parliament and of the Council of 4 July 2018 establishing a multiannual plan for demersal stocks in the North Sea and the fisheries exploiting those stocks, specifying details of the implementation of the landing obligation in the North Sea and repealing Council Regulations (EC) No 676/2007 and (EC) No 1342/2008.

Of specific relevance to nephrops, the NSMAP (2018/973) includes:

Paragraph 18: For stocks for which targets relating to MSY are available, and for the purpose of the application of safeguard measures, it is necessary to establish conservation reference points expressed as trigger abundance levels for Norway lobster.

Paragraph 19: Appropriate safeguard measures should be provided for in case the stock size falls below those levels. Safeguard measures should include the reduction of fishing opportunities and specific conservation measures when scientific advice states that remedial measures are needed.

Paragraph 20: It should be possible to set the TAC for Norway lobster in ICES division 2a and subarea 4 as the sum of the catch limits established for each functional unit and of the statistical rectangles outside the functional units within that TAC area. However, this should not preclude the adoption of measures to protect specific functional units.

Article 6: requires that conservation reference points, to safeguard the full reproductive capacity of the stocks, shall be requested from ICES for: a. MSY $B_{trigger}$ and b. B_{lim}

Article 7: requires that safeguards are taken as follows:

1. When scientific advice shows that the abundance of nephrops stocks are below MSY $B_{trigger}$ all appropriate remedial measures shall be adopted to ensure rapid return of the functional unit concerned to levels above those capable of producing MSY. In particular, fishing opportunities shall be fixed at levels consistent with a fishing mortality that is reduced below the upper range of F_{MSY}, taking into account the decrease in biomass.
2. When scientific advice shows that the abundance of nephrops stocks are below B_{lim} further remedial measures shall be taken to ensure rapid return of the functional unit concerned to levels above those capable of producing MSY. In particular, those remedial measures may include suspending the targeted fishery for the functional unit concerned and the adequate reduction of fishing opportunities
3. Remedial measures may include:
   (a) emergency measures in accordance with Articles 12 and 13 of Regulation (EU) No 1380/2013. In the case of a serious threat to marine biological resources, Article 12 (1380/2013) provides for the Commission to immediately implement measures to alleviate that threat for a maximum of 6 months and Article 13 provides for a Member State to adopt emergency measures to alleviate that threat for a maximum of 3 months.
   (b) measures in Article 8 and 9 of the NSMAP (2018/973) including: specific conservation measures and technical measures such as: selectivity devices, use of fishing gear (immersion time, depth etc), prohibition or limitation in specific areas, for specific gears and at specific times, minimum conservation reference sizes and other characteristics linked to selectivity.
4. The choice of measures shall be made taking into account the nature, seriousness, duration and repetition of the situation where the functional unit abundance is below B_{lim} and/or MSY $B_{trigger}$.

Box 2: Geographic scale of nephrops Total Allowable Catches (TACs)

ICES provide catch advice for nephrops at a functional unit (FU) level, which is appropriate and relevant for each stock.

TACs are set at a wider scale, e.g. for EU waters of North Sea and Norwegian Sea, which includes nine FUs. This scale of management is not considered appropriate to the stock, which is at FU level. ICES advise that management should be implemented at FU level.

An option to achieve this is to set one TAC for each FU. However, this option is not workable for the industry, due to the established protocols for allocation of quota at the current scale.

Exploring the option of setting TACs at FU level is therefore not feasible and will not be investigated further. Moving forward, focus is placed on management measures that are implemented at FU level and are responsive to the state of the stock and exploitation rate. This is consistent with the NSMAP, as outlined in Box 1.

It is recognised that measures alternative to FU TACs are successful in managing exploitation at a FU level and have demonstrated success in safeguarding and rebuilding the stock. A good example of this is the emergency measures introduced by Defra for the Farne Deep FU 6. In 2015, the North Sea Advisory Council recommended an “of which no more than” provision to set an upper limit on removals from the Farne Deeps FU. However, this provision was not set by the EU. Instead, after a consultation within the UK, Defra introduced a combined package of measure from 31 March 2016, including increasing minimum mesh size and other technical gear restrictions designed to collectively reduce fishing mortality. Subsequently the stock has shown signs of recovery with stock size abundance above MSY $B_{trigger}$ and fishing mortality at /just below F_{MSY}.

3.3.3 Nephrops Stock Assessment and Status of Stocks

Introduction

Stock assessment of the Nephrops fisheries is undertaken under the auspices of the International Council for the Exploration of the Sea (ICES) Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) for the North Sea stocks and by the Working Group for the Celtic Seas Ecoregion (WGCSE) for the West of Scotland and Irish Sea stocks. Data collection and assessment of Nephrops stocks are based around Functional Units (FUs) which are geographical areas defined by groupings of ICES statistical rectangles and which correspond to discrete areas of muddy sediment in which the highest densities of Nephrops are found. There are currently 34 FUs for Nephrops, although new FUs may be added to this list as minor landings from areas outside the FUs increase to become important commercially exploitable populations.

WGNSSK and WGCSE members come from a wide range of countries and have expertise on species other than Nephrops and thus the stock assessments of Nephrops are essentially fully peer–reviewed during the course of the WG meetings. Additional peer review of the WG report then occurs through a group of independent experts (ICES Review Group). The annual stock assessments then form the basis of ICES fisheries advice formulated through the ICES Advice Drafting Group and approved by the Advisory Committee on Management (ACOM). The assessment methodology will also be "benchmarked" through regular Benchmark Workshops. The aim of benchmarking is to reach a consensus agreement on an assessment methodology that is to be used in future assessments and to be laid down in a stock annex. The process is reviewed by independent experts and is open to stakeholders and includes all aspects of the assessment process: ecosystem and fisheries data, stock distribution, the assessment model, forecast method and reference points. Although it is a single species assessment, the benchmarking aims to integrate ecosystem information into the assessment. ICES Expert Groups will themselves develop new assessment approaches, but benchmark workshops are intended to formalize the process by which changes in methodology are agreed in order to assure quality, consistency and documentation. Benchmark meetings have taken place in 2009, 2013, 2015 and 2016 covering the different Nephrops assessments in the various UoCs covered in this report (ICES, 2009, 2013, 2015, 2016a).

Data available and stock assessment methodology

For the Nephrops fisheries in the West of Scotland, Irish Sea and North Sea long term data are available for most stocks on overall international landings, fishing effort from log books and size distributions of both landings and discards (from for example Scottish catch sampling) allowing the evaluation of long term trends in key stock indicators such as landings per unit effort (LPUE), mean size and harvest rate. Biological data including growth parameters, size at maturity, discard survival rate (Wileman *et al*., 1999) and assumptions about natural mortality rates for males and females are used as input parameters for analytical assessments, although there is considerable uncertainty in particular surrounding estimates of growth rates and discard survival. Full details of all data used in the assessments can be found in the most recent ICES Working Group reports (ICES, 2017a, 2018a). With the landing obligation has come renewed research focus on survivability of trawl-caught Nephrops. Until now the assessments have assumed survival rates of discarded Nephrops to be 25% in the West of Scotland and North Sea and 10% in the Irish Sea. However recent work in Sweden provided an overall estimate of Nephrops survival of 55% following discarding but demonstrated that survival rates varied amongst gear types and higher survival rates were observed in the winter than the summer (Valentinsson and Nilsson, 2015). However this estimate does not include any unknown post-discard predation mortality, which was incorporated into the previous lower survival estimates. Similar estimates of survival rates have been presented at the North Sea Advisory Council (van der Reijden and Molenaar, 2015). In the Swedish creel fisheries survival was estimated at 95% in the summer and 98% in the winter.

Underwater TV surveys

The key uncertainty underlying traditional stock assessments based on fisheries data is that adult Nephrops exhibit diurnal, seasonal and sex-related variations in emergence behaviour (Chapman and Howard, 1979) and so conventional fisheries data may provide a poor indicator of stock status. Pioneered in Scotland in the early 1990s, a fishery-independent method of estimating Nephrops stock abundance has been developed using underwater TV surveys of Nephrops burrow complexes. As the method counts burrows and not adult Nephrops, this approach is not reliant on Nephrops emerging from their burrows and so can be undertaken at any time. The method involves towing a TV camera mounted on a sledge over Nephrops grounds as defined by patches of muddy sediment and counting the number of Nephrops burrow complexes within a known area. All Nephrops burrow openings identified in view of the camera are allocated to a burrow complex, and the numbers of burrow complexes that cross a defined line on the TV screen are counted. Assuming a 1:1 rate of occupancy, the

average population density can be estimated which is then raised to the known area of suitable sediment to give a measure of population size. However, population density will be overestimated if the counts include all burrow complexes that extend beyond the edges of the field of view (the edge effect).

The TV burrow count surveys provide a fishery-independent estimate of stock biomass, but there are a number of inherent uncertainties in the methodology. These uncertainties include recognition of burrows created by Nephrops rather than other burrowing animals, burrow occupancy, burrow and animal size, variation between counters, "edge effects", survey design (randomised fixed grid or random stratified sampling) and the level of sampling effort required to obtain a precise measure of burrow density. These uncertainties in the methodology have been investigated in depth through a series of ICES workshops and Study Groups (e.g. ICES, 2007: 2008; 2009; 2010b; 2012; 2016b) and peer reviewed publications (e.g. Campbell et al., 2009; Morello et al., 2007). Whilst there are undoubtedly various uncertainties in this methodology, all forms of stock surveys have inherent uncertainties and in contrast to many methods of estimating abundance, it is possible to systematically investigate biases in Nephrops TV surveys (Campbell et al., 2009). Standard TV survey methodology is now agreed and continuously reviewed under the auspices of the ICES Working Group on Nephrops Surveys (WGNEPS).

The TV survey provides an estimate of stock abundance. Data on total catches defined as landings including dead and surviving discards, along with an assumption of a discard survival rate permits a calculation of total removals from the fishery. The ratio of total removals to stock abundance provides an estimate of observed harvest ratio.

Reference points / biological limits

In previous years there have been no explicitly defined reference points against which to assess the status of Nephrops stocks. As there are no age-based analytical assessments for Nephrops, it is difficult to estimate MSY and associated appropriate reference points. Techniques for estimating proxies for Fmsy for Nephrops were considered in detail at the ICES WGNSSK meeting in 2010 (ICES, 2010a). Three candidates for Fmsy were considered: $F_{0.1}$, $F_{35\%SPR}$ and Fmax. $F_{0.1}$ represents the fishing mortality rate at which the marginal yield-per-recruit is only 10% of the marginal yield-per-recruit on the unexploited stock, $F_{35\%SPR}$ represents the fishing mortality rate that corresponds to 35% of the unfished spawning stock biomass per recruit and Fmax is the fishing mortality rate that maximises yield-per-recruit. The Working Group selected preliminary stock-specific Fmsy proxies according to the perception of stock resilience, factors affecting recruitment, population density (average number of burrows per m^2), knowledge of biological parameters, and the nature of the fishery including the relative exploitation of the sexes and the historical harvest rate vs. stock status (Table 3.2).

Table 3.2. Decision-making framework for selection of stock-specific Fmsy proxies. (Source: ICES, 2010a)

		Burrow density (average burrows m^{-2})		
		Low	Medium	High
		< 0.3	0.3–0.8	>0.8
Observed harvest rate or landings compared to stock status (historical performance)	$>F_{max}$	$F_{35\%SPR}$	F_{max}	F_{max}
	F_{max}–$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$	F_{max}
	$< F_{0.1}$	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Unknown	$F_{0.1}$	$F_{35\%SPR}$	$F_{35\%SPR}$
Stock size estimates	Variable	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Stable	$F_{0.1}$	$F_{35\%SPR}$	F_{max}
Knowledge of biological parameters	Poor	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Good	$F_{35\%SPR}$	$F_{35\%SPR}$	F_{max}
Fishery history	Stable spatially and temporally	$F_{35\%SPR}$	$F_{35\%SPR}$	F_{max}
	Sporadic	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Developing	$F_{0.1}$	$F_{35\%SPR}$	$F_{35\%SPR}$

Having developed a decision-making framework for selecting stock-specific Fmsy proxies, the next stage is to calculate values for those proxies for the stock using data from the fishery on size at length in a cohort analysis approach using either an age structured model or a length structured model. As the exploitation rates in many stocks vary significantly between the sexes because of differences in emergence patterns, the Fmsy proxies were determined for males, females and combined sexes. The use of a yield-per-recruit cohort model then allows the calculation of harvest ratios which are equivalent to the various potential proxies for Fmsy. The

cohort model predicts the population size of animals >17mm CL at the Fmsy proxy, which is compared with projected landings to provide a "target" harvest rate. The projected landings are the projected catch at size using the Fmsy proxy value of F and applying the appropriate selectivity dependent on mesh size used in the fishery.

The model assumes that 25% of discards survive and are not therefore counted as "removals", i.e. the same assumption is used in the calculation of harvest ratio as that calculated from observed landings and biomass estimates from the TV survey.

The calculated harvest ratio reference point can then be used in conjunction with the biomass estimate from the TV surveys in two ways. Firstly, comparison of the observed harvest ratio with the harvest ratio reference point allows an evaluation of stock status against a defined reference point. Secondly, the harvest ratio reference point can be used with the stock biomass estimate to set a TAC for the fishery next year.

The current assessment approach is an improvement on previous standard assessment methodologies for three reasons. Firstly, the use of a harvest ratio as a reference point is more widely understood instead of an exploitation rate or F-value, and the observed value of the harvest ratio can be estimated simply from the landings data and biomass estimate from the TV survey and then directly compared with the reference value calculated from the yield-per-recruit model. Secondly, the reference harvest ratio is calculated based on the population of Nephrops of 17 mm CL and above, which allows a direct comparison with the TV survey, which also provides a biomass estimate of Nephrops of the same size range. This overcomes a previous criticism of the assessment approach (ICES, 2007) that the TV survey was measuring abundance of smaller Nephrops that were not seen in trawl catches and therefore the fishery dependent and fishery-independent estimates of biomass were not calculating the same metric. Thirdly this approach has the benefit that it can be applied to a biomass estimate from a single year's TV survey, without requiring a time series of biomass estimates. Previously, Nephrops assessments had focussed on long-term trends in a series of stock indicators.

Estimates of Fmsy for all UoCs

For the various Nephrops fisheries in the West of Scotland, Irish Sea and North Sea, the harvest ratios which are equivalent to the various Fmsy proxies were calculated from average length frequency data from the fishery from 2008 to 2010. Based on information on estimated burrow density, stock size estimates, history of the fishery and knowledge of biological parameters, ICES used the decision-making framework described in Table 3.2 above to determine the most appropriate Fmsy for each fishery (Table 3.3). It should be noted that the methodology of calculating a harvest ratio reference point equivalent to a proxy Fmsy is still under development and the methodology was reviewed at the ICES WKNEPH 2016 Benchmark Workshop on Nephrops Stocks, attended by both ICES Expert Group members and invited outside experts. However no further developments on the approach were reported at this meeting and so current estimates of Fmsy proxies for the various stocks are still in use when providing catch advice for 2019.

In addition to the harvest ratio reference points described in Table 3.3, values of MSYBtrigger were defined for each fishery based primarily upon the long term trends in stock abundance observed from the TV surveys (Table 3.3). No limit reference points (e.g. Blim) have been defined for Nephrops fisheries. For those fisheries where there is no long time trend of biomass estimates from the TV survey, no biomass reference points have been defined.

Harvest Control Rules

A key element of the harvest strategy is that the stock should be maintained above MSYBtrigger. ICES does not define values for Bmsy because it considers that Bmsy is a notional value around which the stock fluctuates when fishing at Fmsy. However ICES defines MSYBtrigger as the lower bound of the fluctuation of spawning-stock biomass (or stock abundance for Nephrops) around Bmsy. Maintaining stock abundance of Nephrops above MSYBtrigger by fishing at Fmsy should in the long term ensure that stock abundance will fluctuate around Bmsy. The harvest control rule is that the annual TAC should be set based upon the current estimate of stock abundance and the harvest ratio reference point (equivalent to the Fmsy proxy defined for each Functional Unit) and the TAC is therefore calculated as the maximum catch that would be consistent with fishing at Fmsy. As stock status changes from year-to-year, the annual TAC reflects any change in stock status. Up until 2018, the TAC has been calculated in the same way irrespective of whether the estimate of stock abundance is above or below MSYBtrigger. With the publication of NSMAP which is due to come into force for 2019, there will be additional requirements to be met in the setting of TACs for Nephrops. In particular, Article 6 of NSMAP states that ICES should be requested to provide values of both MSYBtrigger and Blim for all stocks, and Article 7 requires that (a) remedial measures should be introduced and fishing opportunities shall be fixed at levels consistent with a fishing mortality that is reduced below Fmsy when the abundance of Nephrops drops below

MSYBtrigger, and (b) that remedial measures, which may include closure of the fishery, must be taken if Nephrops abundance drops below Blim. Article 7 therefore conforms to the ICES advice rule, which indicates that when the spawning biomass or abundance is in a poor state, F is to be reduced to a value that does not exceed an upper limit equal to the Fmsy point value multiplied by the spawning biomass or abundance in the total allowable catch (TAC) year divided by MSY Btrigger. Remedial measures may include gear restrictions, changes in minimum conservation reference size, improved gear selectivity and closed areas and seasons, As noted above, whilst there are values defined for MSYBtrigger for most Nephrops stocks, ICES has not currently defined values of Blim, and therefore further work needs to be undertaken on reference points before all requirements for Harvest Control Rules defined by NSMAP are met. Proposed changes to the definition of reference points for Nephrops in the North Sea are outlined in section 3.3.5.

Table 3.3. Table of Fmsy proxies and MSY Btrigger reference points and values for all Nephrops Functional Units. (Source: ICES Advice for Greater North Sea and Celtic Seas Ecoregions)

Stock	Fmsy proxy	Fmsy proxy value (harvest rate)	MSYBtrigger	MSYBtrigger value (numbers)
West coast of Scotland				
North Minch (FU 11)	$F_{35\%SPR}$ for combined sexes	10.8%	Lowest observed abundance estimate from UWTV survey	540 million
South Minch (FU 12)	$F_{35\%SPR}$ for combined sexes	11.7%	Lowest observed abundance estimate from UWTV survey	1020 million
Firth of Clyde (FU 13)	F_{max} for combined sexes	15.1%	Lowest observed abundance estimate	580 million
Jura (FU 13)	$F_{35\%SPR}$ for combined sexes	12.0%	Lowest observed abundance estimate	160 million
Irish Sea				
Irish Sea East (FU 14)	$F_{0.1}$ for combined sexes	11.0%	Lowest observed abundance estimate from UWTV survey	350 million
Irish Sea West (FU 15)	F_{max} for combined sexes	18.2%	Minimum abundance observed based on a scaled trawl survey index	3 billion
North Sea				
Botney Gut (FU 5)	Lower level of range of harvest rate observed in North Sea stocks	7.5%	Not defined	N/A
Farn Deeps (FU 6)	$F_{35\%SPR}$ males	8.12%	UWTV survey index at start of current decline (2007)	858 million
Fladen (FU 7)	$F_{0.1}$ for combined sexes	7.5%	Lowest observed abundance estimate from UWTV survey	2767 million
Firth of Forth (FU 8)	F_{max} for combined sexes	16.3%	Lowest observed abundance estimate from UWTV survey	292 million
Moray Firth (FU 9)	$F_{35\%SPR}$ for combined sexes	11.8%	Lowest observed abundance estimate from UWTV survey	262 million
Noup (FU 10)	Lower level of range observed in North Sea stocks	7.5%	Not defined	N/A
Devil's Hole (FU 34)	Lower level of range observed in North Sea stocks	7.5%	Not defined	N/A

3.3.4 Current stock status of Nephrops in West of Scotland, Irish Sea and North Sea

For each Functional Unit, ICES provides a detailed stock assessment which is based upon landings data (by country and by gear), estimates of stock abundance from TV surveys and assessment of stock status in relation to MSYBtrigger, observed harvest rates (calculated as landings and dead discards in numbers divided by total abundance), comparisons of observed harvest rates with the harvest rate equivalent to Fmsy, and information on discard rates. Trends in LPUE, size structure, mean size and sex ration of catch are also available for most FUs. Full descriptions of the stock assessments can be found in the most recent ICES Working Group reports (ICES, 2017a, 2018a).

West of Scotland UoCs

North Minch (FU11)

Landings in FU11 have been stable over the last thirty years fluctuating between 2500 and 4000 tonnes. In 2016, 86% and 14% of the landings were from the trawl and creel fleets respectively. The average observed discard rate by numbers over the last three years was 11%. Over the last 20 years, the harvest rate has fluctuated around the Fmsy proxy of 11.8%, and stock abundance estimated from the TV survey has been well above MSYBtrigger in recent years (Figure 3.12, Table 3.4).

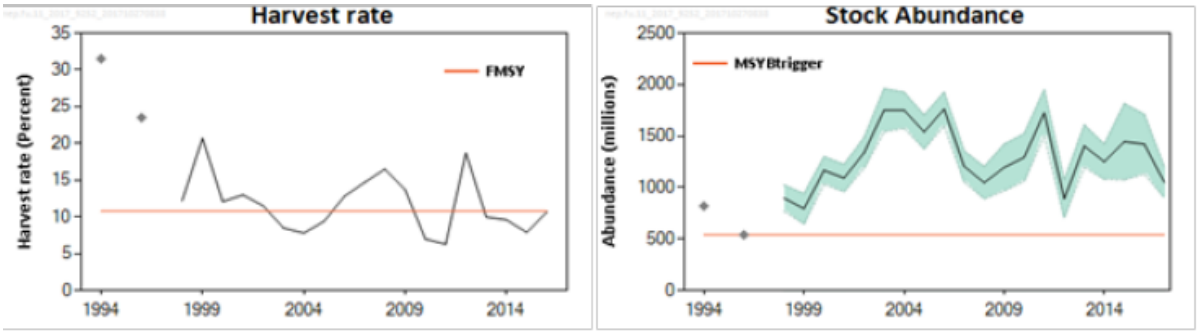


Figure 3.12. Summary of the stock assessment of Nephrops in North Minch (FU11). Trends in harvest rate and stock abundance estimated from TV survey with 95% confidence intervals. (Source: ICES, 2017b)

Table 3.4. State of the Nephrops stock and fishery in North Minch (FU11) relative to reference points. (Source: ICES, 2017b).

		Fishing pressure				Stock size			
		2014	2015	2016		2015	2016	2017	
Maximum Sustainable Yield	F_{MSY}	✓	✓	✓	Below	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	✓	✓	✓	Below possible reference points	B_{pa}, B_{lim}	✓	✓	✓ Above possible reference points
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	– Not applicable

South Minch (FU12)

Landings in FU12 have been stable over the last thirty years fluctuating between 3500 and 5500 tonnes. In 2016, 80% and 19% of the landings were from the directed trawl and creel fleets respectively, with 1% landed by the mixed Nephrops/demersal fleet. The average observed discard rate by numbers over the last three years was 12.7%. Over the last 20 years, the harvest rate has fluctuated but is currently below the Fmsy proxy of 11.8%, and stock abundance estimated from the TV survey has fluctuated above MSYBtrigger in the last 10 years (Figure 3.13, Table 3.5).

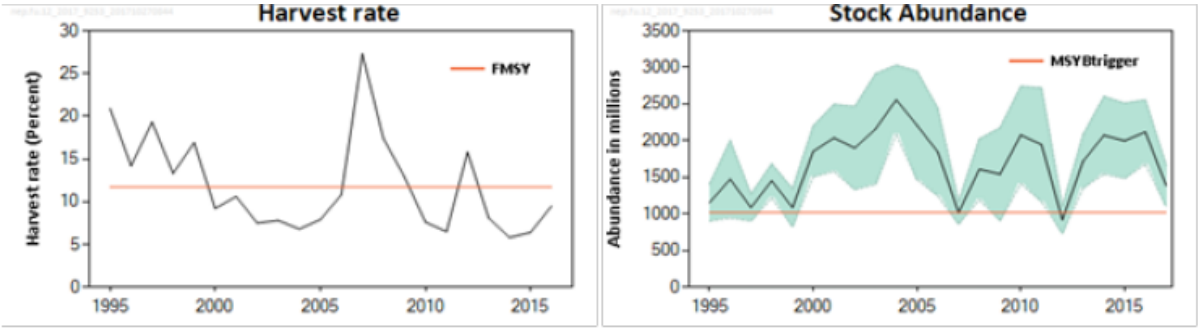


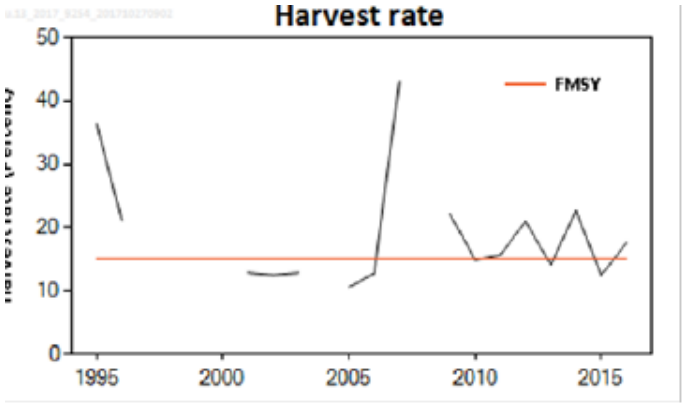
Figure 3.13. Summary of the stock assessment of Nephrops in South Minch (FU12). Trends in harvest rate and stock abundance estimated from TV survey with 95% confidence intervals. (Source: ICES, 2017c)

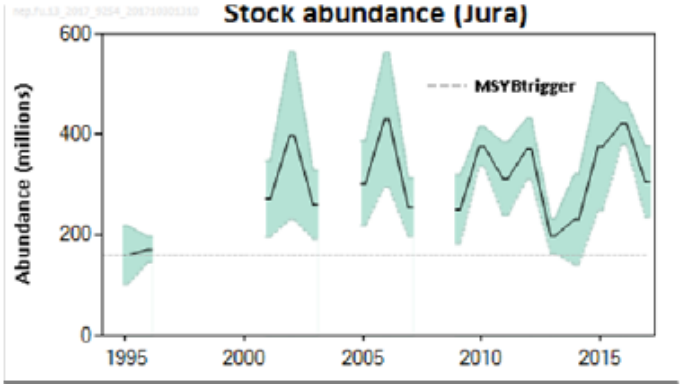
Table 3.5. State of the Nephrops stock and fishery in South Minch (FU12) relative to reference points. (Source: ICES, 2017c).

	Fishing pressure				Stock size			
		2014	2015	2016		2015	2016	2017
Maximum Sustainable Yield	F_{MSY}	✓	✓	✓ Below	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	✓	✓	✓ Below potential reference points	B_{pa}, B_{lim}	✓	✓	✓ Above potential reference points
Management plan	F_{MGT}	–	–	– Not applicable	B_{MGT}	–	–	– Not applicable

Firth of Clyde / Jura (FU13)

Landings in FU13 increased in the late 2000s and have been fluctuating between 4800 and 6700 tonnes in the Firth of Clyde and Jura areas combined. In 2016, 96% and 4% of the landings were from the trawl and creel fleets respectively. The average observed discard rate by numbers over the last three years was 18.6%. Stock abundance estimated from the TV survey has been well above MSYBtrigger in both the Firth of Clyde and Jura over the last 20 years, and the combined harvest rate, which is considered to be more representative of the Firth of Clyde fishery, has fluctuated around the Fmsy proxy for the Firth of Clyde of 15.1% (Figure 3.14, Table 3.6).





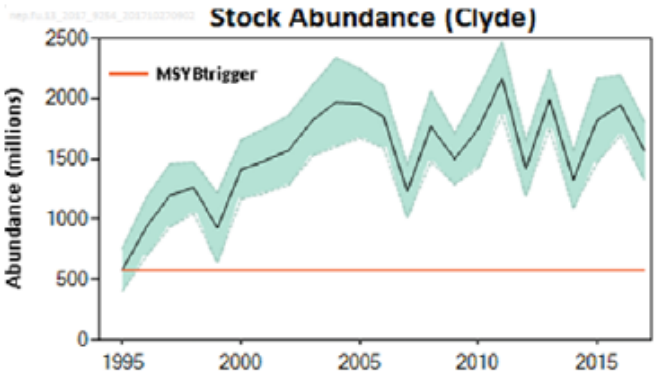


Figure 3.14. Summary of the stock assessment of Nephrops in Firth of Clyde / Jura (FU13). Trends in harvest rate (combined for both areas) and stock abundance estimated from TV survey for the Jura and Firth of Clyde with 95% confidence intervals. (Source: ICES, 2017d)

Table 3.6. State of the Nephrops stock and fishery in Firth of Clyde (top) and Jura (bottom) relative to reference points. As the combined harvest rate is considered more representative of the Firth of Clyde, the state of the stock in Jura relative to Fmsy is not defined (Source: ICES, 2017d).

	Fishing pressure				Stock size			
		2014	2015	2016		2015	2016	2017
Maximum Sustainable Yield	F_{MSY}	✗	✓	✗ Above	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	?	✓	? Undefined	B_{pa}, B_{lim}	✓	✓	✓ Above potential reference points
Management plan	F_{MGT}	–	–	– Not applicable	B_{MGT}	–	–	– Not applicable

	Fishing pressure				Stock size			
		2014	2015	2016		2015	2016	2017
Maximum Sustainable Yield	F_{MSY}	?	?	? Undefined	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	?	?	? Undefined	B_{pa}, B_{lim}	✓	✓	✓ Above potential reference points
Management plan	F_{MGT}	–	–	– Not applicable	B_{MGT}	–	–	– Not applicable

Irish Sea UoCs

Irish Sea East (FU14)

Landings in FU14 had fluctuated from 2004 to 2014 between 470 and 960 tonnes, but then declined significantly in 2015 and 2016. In 2016, virtually 100% of the landings were taken in the directed trawl fishery. The average observed discard rate by numbers over the last three years was 11.6%. The harvest rate has been below the Fmsy proxy of 11.0% in all recent years, and stock abundance estimated from the TV survey has been well above MSYBtrigger in all years (Figure 3.15, Table 3.7).

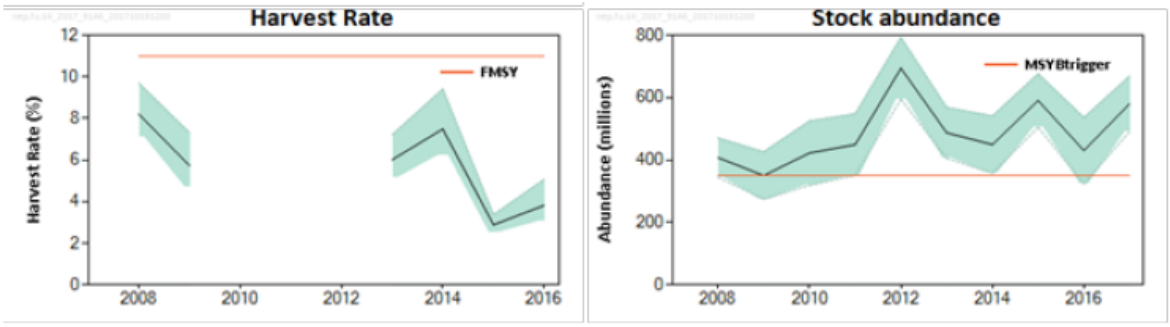


Figure 3.15. Summary of the stock assessment of Nephrops in Irish Sea East (FU14). Trends in harvest rate and stock abundance estimated from TV survey with 95% confidence intervals. (Source: ICES, 2017e)

Table 3.7. State of the Nephrops stock and fishery in Irish Sea East (FU14) relative to reference points. (Source: ICES, 2017e).

		Fishing pressure				Stock size			
		2014	2015	2016		2015	2016	2017	
Maximum sustainable yield	F_{MSY}	✓	✓	✓	Below	MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Below possible reference points	B_{pa}, B_{lim}	✓	✓	✓	Above possible reference points
Management plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	-	-	-	Not applicable

Irish Sea West (FU15)

Landings in FU15 have been stable since 1990 fluctuating between 6500 and 10500 tonnes. In 2016, virtually 100% of the landings were taken in the directed trawl fishery. The average observed discard rate by numbers over the last three years was 28.4%. The harvest rate has been fluctuating in recent years around the Fmsy proxy of 18.2%, and stock abundance estimated from the TV survey has been well above MSYBtrigger in all years (Figure 3.16, Table 3.8).

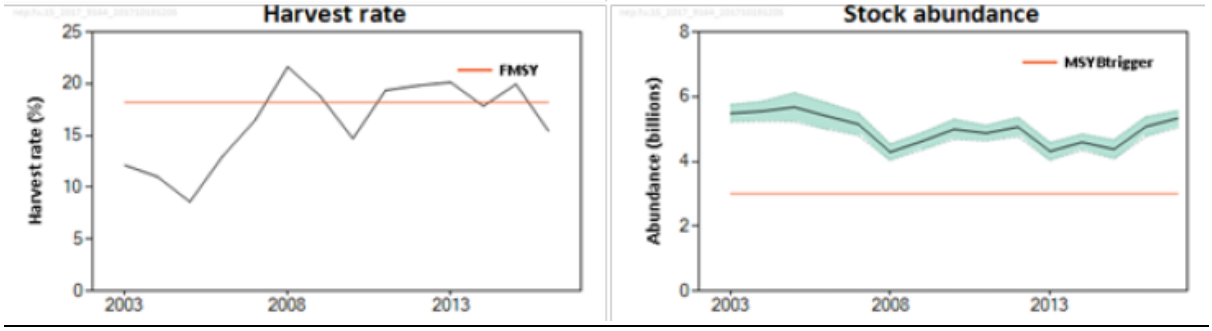


Figure 3.16. Summary of the stock assessment of Nephrops in Irish Sea West (FU15). Trends in harvest rate and stock abundance estimated from TV survey with 95% confidence intervals. (Source: ICES, 2017f)

Table 3.8. State of the Nephrops stock and fishery in Irish Sea West (FU15) relative to reference points. (Source: ICES, 2017f).

		Fishing pressure				Stock size			
		2014	2015	2016		2015	2016	2017	
Maximum sustainable yield	F_{MSY}	✓	✗	✓	Below	MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	?	✓	Below possible reference points	B_{pa}, B_{lim}	✓	✓	✓	Above possible reference points
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	–	Not applicable

North Sea UoCs

Botney Gut (FU5)

From 1997 to 2014 landings in FU5 fluctuated between 700 and 1450 tonnes, but have increased significantly in 2015 to 2017. In 2017, the directed trawl fishery and the mixed Nephrops/demersal fishery accounted for 77% and 22% of the landings respectively. The average observed discard rate by numbers over the last three years was 46.8%, but no data are available from previous years. For this stock there is no assessment of the stock and exploitation status relative to MSY reference points because reference points are not defined. An underwater TV survey was last undertaken for this stock in 2012, providing an estimate of burrow density, but there is no time series of surveys from which to assess stock status against a biomass reference point. Landings per unit effort (LPUE) recorded by vessels fishing in the area suggest that stock biomass has been stable over the period 2006 to 2017 (Figure 3.17). A harvest rate of 7.5% is considered as a reasonable Fmsy proxy for this stock based on the lower range of Fmsy proxy values estimated for other North Sea stocks.

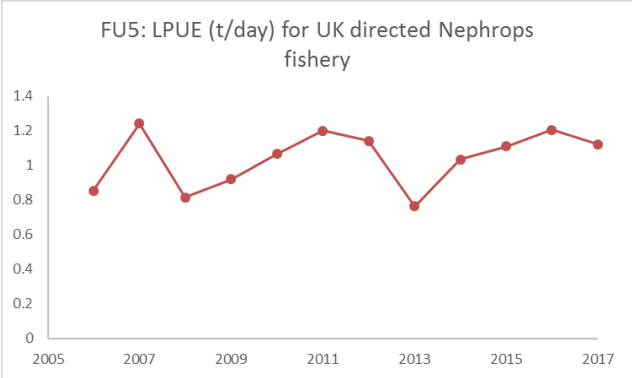


Figure 3.17. Landings per unit effort (LPUE) for Nephrops vessels in Botney Gut (FU5). Source: ICES, 2018b.

Farn Deeps (FU6)

Landings in FU6 have fluctuated significantly over the last 20 years reaching a peak of nearby 5000 tonnes in 2006, but have declined below historical levels in the last three years. In 2017, the directed trawl fishery and the mixed Nephrops / demersal fishery accounted for 76% and 22% of the landings respectively. The average observed discard rate by numbers over the last three years was 25.5%. The harvest rate has been well above the Fmsy proxy of 8.12% in all recent years until 2017 when it dropped to 7.8%. Stock abundance estimated from the TV survey has been below MSYBtrigger in recent years but recovered in 2017 to be just above MSYBtrigger (Figure 3.18,

Table 3.9).

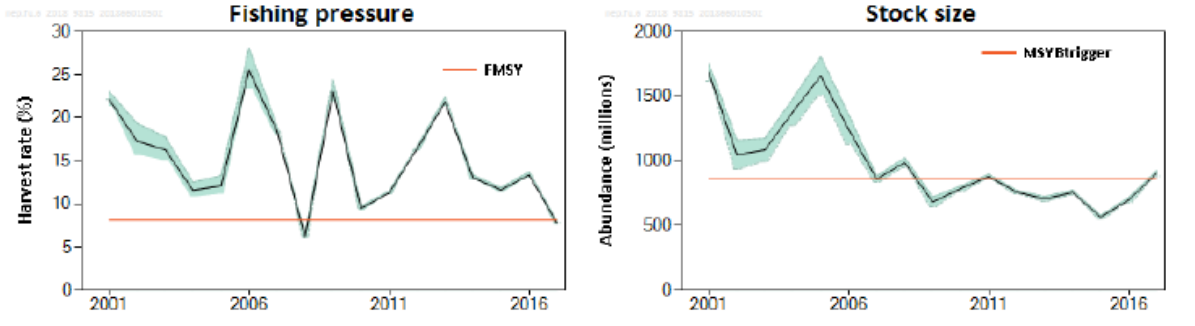


Figure 3.18. Summary of the stock assessment of Nephrops in Farn Deeps (FU6). Trends in harvest rate and stock abundance estimated from TV survey with 95% confidence intervals. (Source: ICES, 2018c)

Table 3.9.State of the Nephrops stock and fishery in Farn Deeps (FU6) relative to reference points. (Source: ICES, 2018c).

	Fishing pressure				Stock size			
		2015	2016	2017		2015	2016	2017
Maximum sustainable yield	F_{MSY}	✗	✗	✓ Below	MSY $B_{trigger}$	✗	✗	✓ Above trigger
Precautionary approach	F_{pa},F_{lim}	?	?	? Undefined	B_{pa},B_{lim}	?	?	? Undefined
Management plan	F_{MGT}	✗	✗	✓ Within range	B_{MGT}	✗	✗	✓ Above

Fladen (FU7)

Landings in FU7 increased continuously from the early 1990s until 2010 with peak landings in 2009 of over 13000 tonnes. Since 2010 landings declined markedly reaching a low of 1800 tonnes in 2015, but have since increased in 2017 to over 5000 tonnes. In 2017, the directed trawl fishery accounted for only 10% of the landings with the remaining 90% taken in the mixed Nephrops/demersal fishery. The average observed discard rate by numbers since 2000 was 7.1%. The harvest rate increased from 2003 to 2009 at which point it was well above the Fmsy proxy of 7.5% but has since declined to be significantly below Fmsy since 2010. Stock abundance estimated from the TV survey was significantly above MSYBtrigger during the 2000s, but then declined to the lowest observed abundance in the time series in 2015 just below MSYBtrigger (Figure 3.19, Table 3.10). However the stock has increased significantly in 2016 and 2017 to be well above MSYBtrigger, and the observation of high numbers of small burrows in the TV survey and decreases in the mean size of Nephrops in the catches suggest that this increase is due to a strong recruitment in recent years.

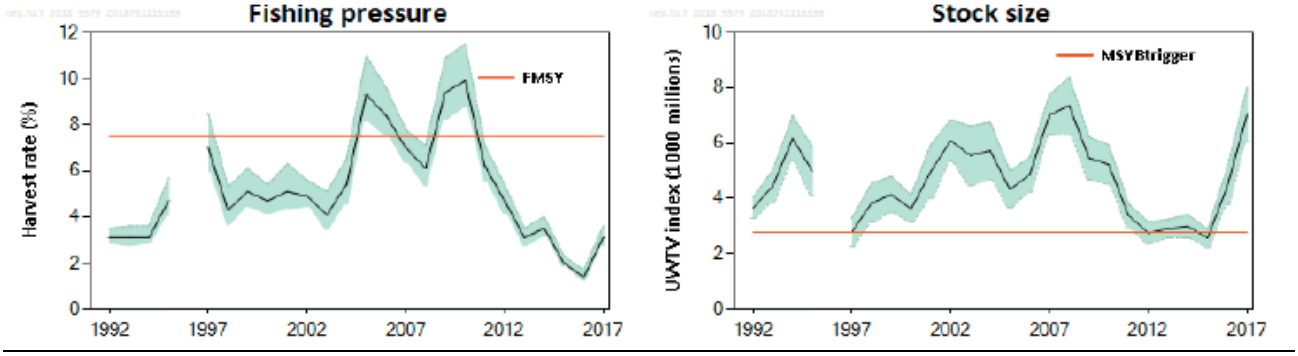


Figure 3.19. Summary of the stock assessment of Nephrops in Fladen (FU7). Trends in harvest rate and stock abundance estimated from TV survey with 95% confidence intervals. (Source: ICES, 2018d)

Table 3.10. State of the Nephrops stock and fishery in Fladen (FU7) relative to reference points. (Source: ICES, 2018d).

	Fishing pressure				Stock size			
		2015	2016	2017		2015	2016	2017
Maximum Sustainable Yield	F_{MSY}	✓	✓	✓ Below	MSY $B_{Trigger}$	✗	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	✓	✓	✓ Below possible reference points	B_{pa}, B_{lim}	?	✓	✓ Above possible reference points
Management plan	F_{MGT}	✓	✓	✓ Below	B_{MGT}	✗	✓	✓ Above

Firth of Forth (FU8)

Landings in FU8 have fluctuated since 2004 between 1500 and 2700 tonnes. In 2017, the directed trawl fishery and the mixed Nephrops/demersal fishery accounted for 85% and 15% of the landings respectively, with a few per cent landed in the creel fishery in recent years. The average observed discard rate by numbers over the last three years was 20.3%. The harvest rate has been above the Fmsy proxy of 16.3% from 2004 to 2014, but from

2015 to 2017 it was either just below or just above Fmsy. Stock abundance estimated from the TV survey has been well above MSYBtrigger in all recent years (Figure 3.20, Table 3.11).

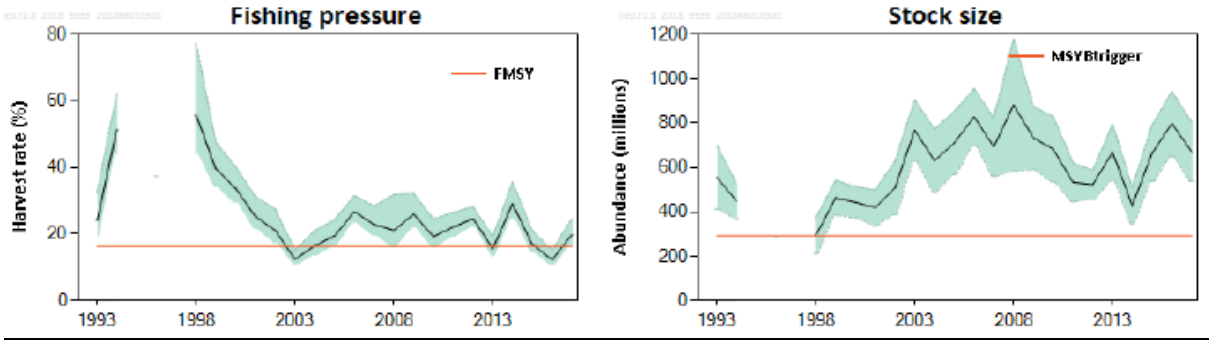


Figure 3.20. Summary of the stock assessment of Nephrops in Firth of Forth (FU8). Trends in harvest rate and stock abundance estimated from TV survey with 95% confidence intervals. (Source: ICES, 2018e)

Table 3.11. State of the Nephrops stock and fishery in Firth of Forth (FU8) relative to reference points. (Source: ICES, 2018e).

	Fishing pressure					Stock size				
		2015	2016	2017			2015	2016	2017	
Maximum sustainable yield	F_{MSY}	✗	✓	✗	Above	MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa},F_{lim}	?	✓	?	Undefined	B_{pa},B_{lim}	?	?	?	Undefined
Management plan	F_{MGT}	✗	✓	✗	Above	B_{MGT}	✓	✓	✓	Above

Moray Firth (FU9)

Landings in FU9 have declined since 2007 and have since fluctuated between 600 and 1400 tonnes. In 2017, the directed trawl fishery and the mixed Nephrops/demersal fishery accounted for 55% and 45% of the landings respectively. The average observed discard rate by numbers over the last three years was 11.9%. The harvest rate has fluctuated around the Fmsy proxy of 11.8% in recent years and stock abundance estimated from the TV survey has been above MSYBtrigger throughout the time series of data (Figure 3.21, Table 3.12).

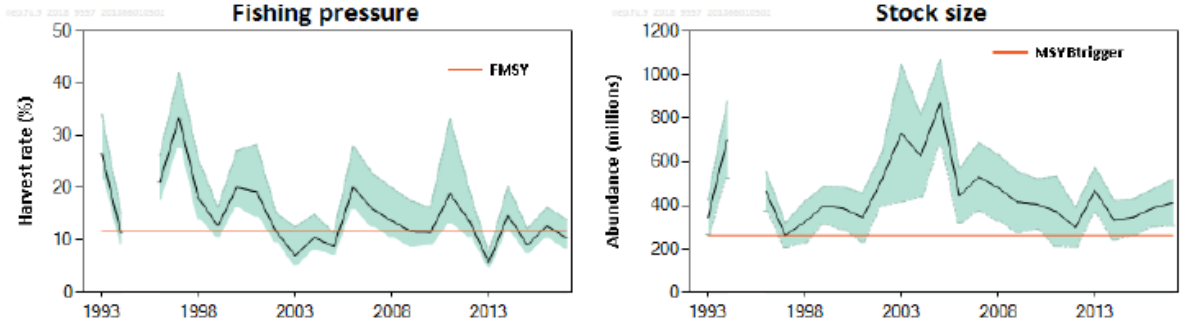


Figure 3.21. Summary of the stock assessment of Nephrops in Moray Firth (FU9). Trends in harvest rate and stock abundance estimated from TV survey with 95% confidence intervals. (Source: ICES, 2018f)

Table 3.12. State of the Nephrops stock and fishery in Moray Firth (FU9) relative to reference points. (Source: ICES, 2018f).

	Fishing pressure					Stock size				
		2015	2016	2017			2015	2016	2017	
Maximum sustainable yield	F_{MSY}	✓	✗	✓	Below	MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa},F_{lim}	✓	?	✓	Below possible reference points	B_{pa},B_{lim}	✓	✓	✓	Undefined
Management plan	F_{MGT}	✓	✗	✓	Within range	B_{MGT}	✓	✓	✓	Not applicable

Noup (FU10)

Landings in FU10 have declined significantly in recent years. In the 1990s and 2000s landings ranged from 130 to 500 tonnes, but in recent years recorded landings have ranged from 9 to 23 tonnes. The fishery is fished only sporadically by vessels targeting whitefish, and landings from the Noup contribute to less than 1% of the total North Sea Nephrops landings. In 2017, the directed trawl fishery and the mixed Nephrops/demersal fishery accounted for 6% and 94% of the landings respectively. There is no information available on discard rates in this fishery, but discard rates are assumed to be similar to those estimated for Moray Firth (FU9), i.e. 11.9%. For this stock there is no assessment of the stock and exploitation status relative to MSY reference points because reference points are not defined. An underwater TV survey is undertaken occasionally with the last survey undertaken in 2014 (Figure 3.22), providing an estimate of burrow density, but there is no time series of surveys from which to assess stock status against a biomass reference point. Landings per unit effort (LPUE) recorded by vessels fishing in the area are not available. A harvest rate of 7.5% is considered as a reasonable Fmsy proxy for this stock based on the lower range of Fmsy proxy values estimated for other North Sea stocks.

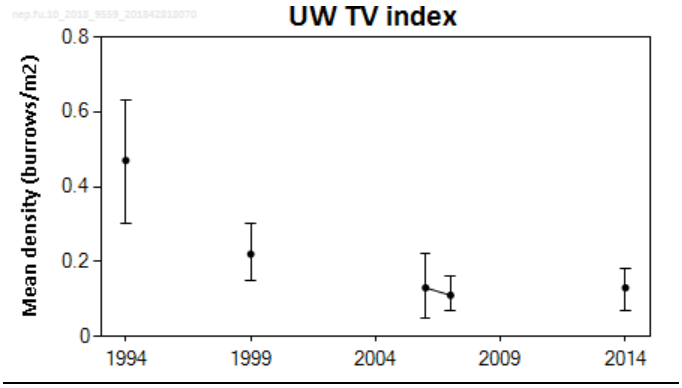


Figure 3.22. Noup (FU10). Mean burrow density of Nephrops from underwater TV surveys. Source: ICES, 2018g.

Devil's Hole (FU34)

Landings in FU34 have fluctuated significantly from 120 to 1300 tonnes in recent years. In 2017, the directed trawl fishery and the mixed Nephrops/demersal fishery accounted for 13% and 87% of the landings respectively. The discard rate by number was estimated to be 12.9% from 2008-2011, but more recent data do not appear to be available. For this stock there is no assessment of the stock and exploitation status relative to MSY reference points because reference points are not defined. An underwater TV survey is undertaken occasionally with the last survey undertaken in 2017 (Figure 3.23), providing an estimate of burrow density, but there is no time series of estimates of stock abundance from the surveys from which to assess stock status against a biomass reference point. A harvest rate of 7.5% is considered as a reasonable Fmsy proxy for this stock based on the lower range of Fmsy proxy values estimated for other North Sea stocks.

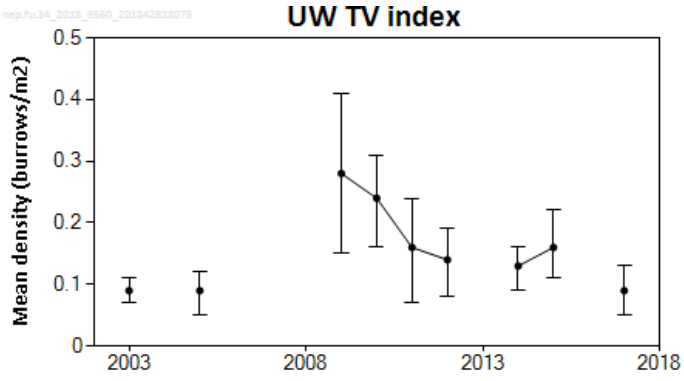


Figure 3.23. Devil's Hole (FU34). Mean burrow density of Nephrops from underwater TV surveys. Source: ICES, 2018h.

3.3.5 Management advice based on current stock assessment

The most recently published advice for North Sea stocks is for 2019, but that for the West of Scotland and the Irish Sea is for 2018 because the final report of the WGCSE meeting in 2018, which undertook the stock assessments for the west of Scotland and Irish Sea stocks, is not yet available.

The most recent stock assessments for Nephrops fisheries in the West of Scotland, Irish Sea and North Sea presented in the reports of WGNSSK and WGCSE provide the basis for the annual ICES Advice on maximum catches in the forthcoming year for each individual stock. For each stock, ICES takes an estimate of stock abundance from the most recent TV survey, and the harvest rate for the fishery equivalent to the Fmsy proxy, and calculates the maximum catch that would be consistent with fishing at Fmsy. The advice assumes that discard rates and fishery selection patterns will remain the same as those observed in the previous three years. Evidence from many Nephrops fisheries suggests that discarding patterns have not changed significantly since the implementation of the Landing Obligation and therefore the assumption that discard rates will remain the same in the forthcoming year seems reasonable. Assuming that discards remain at the same level will of course mean that maximum landings consistent with fishing at Fmsy will be significantly lower than maximum catches.

For the North Sea stocks, the EU North Sea multi-annual plan (NSMAP; EU, 2018) contains a common set of harvest control rules for all 'category 1 and 2 stocks' (those where MSY reference point advice exists), directly based upon the ICES MSY framework. The plan will be implemented as from 2019, and then the Fmsy (proxy) management already being used for *Nephrops* will be formalised. The ICES advice for 2019 for North Sea stocks is based on the NSMAP and is therefore given in a slightly different format to the advice for the West of Scotland and Irish Sea stocks. The advice is more precautionary than that using solely the catches based upon fishing at Fmsy in that under NSMAP, a range of catches is provided with an upper limit on catches based upon fishing at Fmsy and a lower limit based upon an exploitation rate which results in no more than a 5% reduction in long term yield in comparison with fishing at Fmsy.

As noted above in section 3.3.3, NSMAP requires that values for MSYBtrigger and Blim are provided by ICES and that the Harvest Control Rules must include a reduction in fishing mortality below Fmsy when the stock is below MSYBtrigger and that there must be remedial measures taken, which may include closure of the fishery, when the stock declines below Blim. At present ICES has defined only one biomass/abundance reference point, MSYBtrigger, and therefore the requirements of NSMAP have yet to be met by ICES for Nephrops stocks, and in consequence the Harvest Control Rules are not as comprehensive as required under NSMAP. In response, the North Sea Advisory Council (NSAC) has proposed the use of two reference points, one above the current MSYBtrigger value which acts as a threshold for remedial action, and the redefinition of the current MSYBtrigger as Blim. The ICES Working Group on Nephrops Surveys (WGNEPS) has proposed a method for calculating the new higher biomass/abundance reference point and concluded that it is possible to set such points for all North Sea Nephrops stocks. These proposals have also been considered by the Commission, but as yet these new reference points remain as proposals and have not been formally implemented.

For those FUs where there are no fishery-specific defined reference points, Botney Gut, the Noup and Devil's Hole, ICES catch advice uses a precautionary approach based upon observed burrow density from the most recent survey, and ensuring that the harvest rate remains below the precautionary Fmsy rate of 7.5%, which is the lower bound of Fmsy proxy rates estimated for North Sea stocks for which there is a long time series of data.

For all Nephrops fisheries in the West of Scotland, Irish Sea and North Sea, the ICES advice states – "To ensure that the stock in the Functional Unit (FU) is exploited sustainably, management should be implemented at the functional unit level." However in practice this does not occur. TACs are set at the regional level, e.g. at the North Sea scale rather than at the functional unit level. As the geographical scale at which TACs are allocated is very much larger than the scale at which the stock assessments are undertaken and the advice is set, this mismatch could lead to uneven exploitation patterns across the various FUs resulting potentially in over-exploitation within an individual FU even though annual TACs had not been exceeded.

Within the North Sea ecoregion, in both the Farn Deeps (FU6) and Devil's Hole (FU34) recent observed catches have increased substantially to levels well above ICES advice, which highlights the issue that current management arrangements of setting TACs at the scale of the whole North Sea are not sufficient to contain the fishery within the sustainable limits determined by ICES.

This mismatch between the geographical scale at which ICES advises on TACs and the scale at which TACs are set by the EU is an issue which has been discussed between the Commission and stakeholders for many years. The Commission has considered proposals to accept ICES advice and set TACs at the Functional Unit level, but the proposals have not yet been accepted. Nevertheless NSMAP states that:

"It should be possible to set the TAC for Norway lobster in ICES division 2a and subarea 4 as the sum of the catch limits established for each functional unit and of the statistical rectangles outside the functional units within that TAC area. However, this should not preclude the adoption of measures to protect specific functional units."

There is therefore scope within NSMAP to control exploitation rates in specific Functional Units by means other than setting a TAC at the Functional Unit level.

The NSAC has proposed a Long Term Management Plan (LTMP) which includes the following components:

- *maintain the abundance of each Functional Unit at a sustainable level, above Bbuffer (a proposed new reference point above MSYBtrigger)*
- *exploit Nephrops in the North Sea at a rate that is sustainable and consistent with Fmsy through the setting of Fmsy targets for each of the FUs*

The NSAC approach is not to set TACs at the individual FU level, but to develop Fishery Plans for each FU. As noted above, there has been particular concern about the Farn Deeps FU where total catches have exceeded the TAC in some recent years. The NSAC has therefore proposed a Fishery Plan which includes the following:

'Set an overall TAC at North Sea level but allocate that part of the quota pertaining to the Farn Deeps through an "…of which no more than …" provision. The latter measure effectively imposes a restriction on landings from the Farn Deeps.'

In summary, whilst it would be preferable to set the TACs at FU level as proposed by ICES, the assessment team notes that it may be possible to achieve a similar outcome through alternative harvest strategies. Nevertheless any harvest strategy which resulted in TACs for individual FUs being exceeded on a regular basis would not meet the minimum MSC requirements.

Full tables of the history of ICES catch advice and the corresponding observed landings and catches for each of the Functional Units can be found in the respective ICES advice documents.

3.4 Principle Two: Ecosystem background

3.4.1 Catch profiles

The catch profiles consist of the sum of the landings and sum of discards in 2016 for the UoAs under assessment. Data is sourced from the EU Data Collection Framework (EU DCF), with the most recent annual data available for 2016. Unlike the MMO iFISH dataset, the EU DCF provides data on discards and is therefore representative of the total catch for the UoAs under assessment. The coverage, frequency, extent and original source (e.g. via observers) of discard data is unknown.

Catch profile for demersal trawl targeting nephrops (using TR2) is provided in Table 3.13 based on an annual dataset for 2016. Landing statistics for creels/ pots is provided in Table 3.14 for 2017 for UK vessels where landings of nephrops equate to >£10,000 in first sales value per ICES rectangle. MMO data does not distinguish between pot / creel type and therefore pots targeting a range of shellfish species, including brown crab and lobster, is included within the dataset. This is a weakness of the quantitative data available to inform the species profile within nephrops targeted creel fisheries. This highlights the need for more appropriate data to accurately and quantitatively determine the catch profile of the nephrops creel fishery. Quantitative data is required to ensure appropriate allocation of main and minor categories to the non-target species associated with the fishery. Discards recorded from 2003 to 2016 for UK vessels operating creels/ pots are presented in Table 3.15.

The criteria for allocation of species between minor and main follows the methodology in CR2.0 GSA3.4.2.2. Information on productivity of each species was obtained from www.fishbase.org, and included size, fecundity, growth rates and trophic level. Assigning the level of resilience (as low or high) followed procedures for scoring productivity in PSA (see CR2.0 SA3.4.2.2 and Annex PF Risk Based Framework), as follows:

- A higher risk productivity score (of ≥ 2) indicated the species' resilience as "low", and
- A lower risk productivity score (of < 2) indicated the species' resilience as "high".

In cases where information on productivity was missing or could not be found, a higher risk score was allocated. As required by the MSC standard, in determining whether the species is categorized as main or minor, a 2% threshold on the proportion of catch by weight was applied for low resilient species and 5% for high resilient species. Landings greater than this threshold would indicate that the species was 'main'.

Table 3.13: Demersal trawl catch profile for TR2 in 2016 for UK vessels. Category indicates whether the species is addressed as primary or secondary. Type indicates whether the species is main or minor based on the proportion of the catch. (Data source, EU DCF, 2018).

Common name	Species	Species group	Resilience	Category	Landings	Discards	Total catch	Proportion	Type
Nephrops	*Nephrops norvegicus*	Crustacean	Low	Target species	22,213	2,029	24,242	47.37%	Target species
Whiting	*Merlangius merlangus*	Fish	High	Primary	871	5,267	6,139	11.99%	Main
Haddock	*Melanogrammus aeglefinus*	Fish	High	Primary	385	2,444	2,828	5.53%	Main
Small-spotted catshark	*Scyliorhinus canicula*	Elasmobranch	Low	Secondary	461	2,090	2,551	4.98%	Main
Atlantic cod	*Gadus morhua*	Fish	High	Primary	165	1,907	2,072	4.05%	Main
European plaice	*Pleuronectes platessa*	Fish	High	Primary	645	1,348	1,993	3.89%	Minor
Saithe(=Pollock)	*Pollachius virens*	Fish	High	Primary	6	1,341	1,347	2.63%	Minor
Common dab	*Limanda limanda*	Fish	High	Primary	44	920	964	1.88%	Minor
Anglerfishes nei	*Lophiidae*	Fish	Low	Secondary	442	302	744	1.45%	Minor
Surmullet	*Mullus surmuletus*	Fish	High	Secondary	473	181	654	1.28%	Minor
European hake	*Merluccius merluccius*	Fish	High	Primary	21	619	639	1.25%	Minor
Jack and horse mackerels	*Trachurus spp*	Fish	High	Primary	82	496	577	1.13%	Minor
Thornback ray	*Raja clavata*	Elasmobranch	Low	Secondary	261	297	559	1.09%	Minor
Lemon sole	*Microstomus kitt*	Fish	High	Primary	92	377	470	0.92%	Minor
Cuckoo ray	*Raja naevus*	Elasmobranch	Low	Secondary	3	463	466	0.91%	Minor

Common name	Species	Species group	Resilience	Category	Landings	Discards	Total catch	Proportion	Type
Tub gurnard	*Chelidonichthys lucerna*	Fish	High	Secondary	398	12	411	0.80%	Minor
Common squids nei	*Loligo spp*	Cephalopod	High	Secondary	403	0	403	0.79%	Minor
Queen scallop	*Aequipecten opercularis*	Mollusc	Low	Secondary	395	0	395	0.77%	Minor
Witch flounder	*Glyptocephalus cynoglossus*	Fish	High	Secondary	82	299	381	0.75%	Minor
Grey gurnard	*Eutrigla gurnardus*	Fish	High	Secondary	25	322	347	0.68%	Minor
Norway pout	*Trisopterus esmarkii*	Fish	High	Secondary	0	266	266	0.52%	Minor
Pouting(=Bib)	*Trisopterus luscus*	Fish	High	Secondary	167	67	234	0.46%	Minor
Spotted ray	*Raja montagui*	Elasmobranch	Low	Secondary	7	226	233	0.46%	Minor
European seabass	*Dicentrarchus labrax*	Fish	High	Secondary	29	150	180	0.35%	Minor
Ling	*Molva molva*	Fish	High	Primary	24	155	179	0.35%	Minor
European flounder	*Platichthys flesus*	Fish	High	Primary	23	143	167	0.33%	Minor
Common sole	*Solea solea*	Fish	High	Primary	157	9	166	0.32%	Minor
Red gurnard	*Aspitrigla cuculus*	Fish	High	Secondary	140	22	161	0.32%	Minor
European lobster	*Homarus gammarus*	Crustacean	Low	Secondary	4	149	153	0.30%	Minor
Atlantic mackerel	*Scomber scombrus*	Fish	High	Primary	134	2	136	0.27%	Minor
Gurnards, searobins nei	*Triglidae*	Fish	High	Secondary	119	0	119	0.23%	Minor
Atlantic herring	*Clupea harengus*	Fish	High	Primary	13	102	115	0.22%	Minor
Black seabream	*Spondyliosoma cantharus*	Fish	High	Secondary	100	0	100	0.20%	Minor
Pollack	*Pollachius pollachius*	Fish	High	Primary	8	74	82	0.16%	Negligible
Megrims nei	*Lepidorhombus spp*	Fish	High	Primary	19	56	75	0.15%	Negligible
Turbot	*Psetta maxima*	Fish	High	Primary	68	3	71	0.14%	Negligible
Edible crab	*Cancer pagurus*	Crustacean	Low	Secondary	17	46	63	0.12%	Negligible
Brill	*Scophthalmus rhombus*	Fish	High	Secondary	56	4	60	0.12%	Negligible
Long rough dab	*Hippoglossoides platessoides*	Fish	High	Secondary	0	54	54	0.11%	Negligible
Smooth-hound	*Mustelus mustelus*	Elasmobranch	Low	Secondary	38	14	53	0.10%	Negligible
Greater forkbeard	*Phycis blennoides*	Fish	High	Secondary	0	51	51	0.10%	Negligible
Cuttlefish, bobtail squids nei	*Sepiidae, Sepiolidae*	Cephalopod	High	Secondary	50		50	0.10%	Negligible
Starry smooth-hound	*Mustelus asterias*	Elasmobranch	Low	Secondary	6	38	44	0.09%	Negligible
Great Atlantic scallop	*Pecten maximus*	Mollusc	Low	Secondary	25	1	27	0.05%	Negligible
Dragonet	*Callionymus lyra*	Fish	High	Secondary	0	18	18	0.04%	Negligible
Various squids nei	*Loliginidae, Ommastrephidae*	Cephalopod	Low	Secondary	17		17	0.03%	Negligible
Blonde ray	*Raja brachyura*	Elasmobranch	Low	Secondary	10	6	16	0.03%	Negligible
Atlantic halibut	*Hippoglossus hippoglossus*	Fish	Low	Secondary	13	0	13	0.02%	Negligible
Mullets nei	*Mugilidae*	Fish	High	Secondary	11		11	0.02%	Negligible
Poor cod	*Trisopterus minutus*	Fish	High	Secondary	0	8	8	0.02%	Negligible
Greater weever	*Trachinus draco*	Fish	High	Secondary	7		7	0.01%	Negligible
Catsharks, etc. nei	*Scyliorhinidae*	Elasmobranch	Low	Secondary	7		7	0.01%	Negligible
Undulate ray	*Raja undulata*	Elasmobranch	Low	Secondary	0	6	6	0.01%	Negligible
John dory	*Zeus faber*	Fish	High	Secondary	5	1	5	0.01%	Negligible

Common name	Species	Species group	Resilience	Category	Landings	Discards	Total catch	Proportion	Type
Octopuses, etc. nei	*Octopodidae*	Cephalopod	Low	Secondary	5	0	5	0.01%	Negligible
Whelk	*Buccinum undatum*	Mollusc	High	Secondary	4		4	0.01%	Negligible
Hooknose	*Agonus cataphractus*	Fish	High	Secondary	0	4	4	0.01%	Negligible
Atlantic horse mackerel	*Trachurus trachurus*	Fish	High	Primary	0	4	4	0.01%	Negligible
Fourbeard rockling	*Enchelyopus cimbrius*	Fish	High	Secondary	0	4	4	0.01%	Negligible
Starry ray	*Raja radiata*	Elasmobranch	Low	Secondary	0	4	4	0.01%	Negligible
European conger	*Conger conger*	Fish	High	Secondary	3	0	3	0.01%	Negligible

Table 3.14: Creel landings in 2017 for UK vessels where landings of Nephrops equate to >£10,000 in first sales value per ICES rectangle. Category indicates whether the species is addressed as primary or secondary. Type indicates whether the species is main or minor based on the proportion of the catch. (Data source, MMO, 2018).

Common name	Species	Species group	Resilience	Category	Landings	Proportion	Type
Brown crab	*Cancer pagurus*	Crustacean	Low	Secondary	6,668	60.62%	Main
Nephrops	*Nephrops norvegicus*	Crustacean	Low	Target species	1,537	13.97%	Target species
Crabs - Velvet (Swim)	*Necora puber*	Crustacean	High	Secondary	1,020	9.27%	Main
European lobster	*Homarus gammarus*	Crustacean	Low	Secondary	860	7.82%	Main
Whelk	*Buccinum undatum*	Mollusc	High	Secondary	717	6.52%	Main
Green Crab	*Carcinus maenas*	Crustacean	High	Secondary	126	1.15%	Minor
Ballan Wrasse	*Labrus bergylta*	Fish	High	Secondary	30	0.27%	Minor
Atlantic mackerel	*Scomber scombrus*	Fish	High	Primary	9	0.08%	Negligible
Atlantic cod	*Gadus morhua*	Fish	High	Primary	6	0.05%	Negligible
Goldsinny-wrasse	*Ctenolabrus suillus*	Fish	High	Secondary	5	0.05%	Negligible
Razor Clam	*Ensis directus*	Mollusc	High	Secondary	4	0.04%	Negligible
Great Atlantic scallop	*Pecten maximus*	Mollusc	Low	Secondary	4	0.04%	Negligible
Corkwing Wrasse	*Symphodus melops*	Fish	High	Secondary	3	0.02%	Negligible
Brown Shrimps	*Crangon crangon*	Crustacean	Low	Secondary	2	0.02%	Negligible
Sea Trout	*Salmo trutta*	Fish	High	Secondary	1	0.01%	Negligible
Lobster - Squat	*Pleuroncodes monodon*	Crustacean	Low	Secondary	1	0.01%	Negligible
Whiting	*Merlangius merlangus*	Fish	High	Primary	1	0.01%	Negligible
Pollack	*Pollachius pollachius*	Fish	High	Primary	1	0.00%	Negligible

Table 3.15: Creel discards from 2003 to 2016 inclusive for UK vessels. Type indicates whether the species is main or minor or negligible based on the proportion of the catch. (Data source, EU DCF, 2018).

Species	Discards	Discard as % of catch	Type
Edible crab	119.01	0.03%	Negligible, species included within landings profile
Cod	0.38	0.00%	Negligible, species included within landings profile
Haddock	0.10	0.00%	Negligible
Lemon sole	0.05	0.00%	Negligible
Total landings & discards (of all species)	**419,813**		

3.4.2 Primary and secondary species

Outcome status

Based on the catch profiles, a summary of the main and minor elements within primary and secondary components for demersal trawl is provided in Table 3.16 and for creels in Table 3.17, this includes:

- Demersal trawl: 3 main primary species, 11 minor primary species; 1 main secondary species and 10 minor secondary species.
- Creel: no main and no minor primary species; 4 main secondary species and 17 minor secondary species.

Table 3.16: Summary of main and minor elements within Primary and Secondary components for demersal trawl

Component	Main	Minor	
Primary	Whiting	European plaice	European hake
		Saithe	Horse mackerel
	Haddock	Common dab	Lemon sole
		Ling	Flounder
	Atlantic cod	Sole	Mackerel
		Herring	
Secondary	Lesser spotted dogfish	Anglerfish	Common squid
		Surmullet	Queen scallop
		Thornback ray	Witch flounder
		Cuckoo ray	Grey gurnard
		Tub gurnard	Norway pout
		Pouting	Spotted ray
		Seabass	Red gurnard
		Lobster	Gurnard
		Black seabream	

Table 3.17: Summary of main and minor elements within Primary and Secondary components for creel

Component	Main	Minor
Primary	None	None
Secondary	Brown crab	Green crab
	Velvet swimmer crab	
	European lobster	Ballan wrasse
	Whelk	

A description of the status of main species elements is provided below.

Finfish and elasmobranchs

ICES has issued scientific advice for zero catch in 2019 for five stocks, three of which are main primary species associated with the nephrops trawl fishery: West of Scotland cod and whiting and Irish Sea whiting. The Table below outlines ICES advice and European Commission proposal for 2019 fishing opportunities. Further details on fishing mortality rates relative to reference points are provided below.

Table 3.18. Summary of ICES advice and EC proposal for 2019 fishing opportunities (pm: pro memoria, indicated EC proposal is yet to be determined).

	West of Scotland	Irish Sea	North Sea
Whiting	ICES advice: **zero TAC** EC proposal: 1,238 tonnes (exclusively for bycatches)	ICES advice: **zero TAC** EC proposal: 612 tonnes (exclusively for bycatches)	ICES advice: 24,195 tonnes EC proposal: *pm*
Haddock	ICES advice: 33,956 tonnes (for WoS, North Sea & Skagerrak) EC proposal: *pm*	ICES advice: 3,739 tonnes EC proposal: 3,739 tonnes	ICES advice: 33,956 tonnes (for WoS, North Sea & Skagerrak) EC proposal: *pm*
Cod	ICES advice: **zero TAC** EC proposal: 1,396 tonnes (exclusively for bycatches)	ICES advice: 807 tonnes EC proposal: 807 tonnes (exclusively for bycatches)	ICES advice: 28,204 tonnes (for North Sea, eastern English Channel and Skagerrak). EC proposal: *pm*

Whiting, *Merlangius merlangus*: Three whiting stocks overlap with the Nephrops FU's under assessment, these are: 6a West of Scotland, 4 & 7d North Sea and eastern English Channel and 7a Irish Sea.

The spawning stock size of whiting in 6a West of Scotland is below MSY $B_{trigger}$, below B_{pa} and below B_{lim}; it has been below the point of recruitment impairment (PRI) (i.e. below B_{lim}) since 1998.

Management has reduced the level of fishing mortality, which is currently below F_{MSY}, and SSB has been increasing since 2015. In the Nephrops fishery, the introduction of large square mesh panels are likely to have contributed to the observed reductions in fishing mortality (ICES, 2018).

However, the continued high discards and low TAC does not yet provide the confidence that the UoA is expected to not hinder recovery and rebuilding of this stock. Furthermore, the landing obligations will apply to fleets fishing in Division 6.a in 2019 and this stock could become a major 'choke' species for the Division 6.a Nephrops fishery in the context of the landing obligation (ICES, 2018).

Furthermore, ICES advise zero catch of this stock. TAC in 2018 was 213 tonnes and the 2019 Commission Proposal recommends a by-catch exclusive TAC of 1,238 tonnes.

ICES catch scenario based on total catch in 2018 of 1283 tonnes and SSB (2019) of 26,646 tonnes, shows that in 2019 a zero catch results in SSB (2020) = 24,239 tonnes, the alternative scenario of F at F2018 rate, (equating to total catch of 1171 tonnes in 2019), results in SSB (2020) = 22,939 tonnes. Both 2019 scenarios (zero catch and catch of 1171 tonnes) result in SSB (2020) being lower than SSB (2019). It is therefore considered that any level of fishing is hindering the stock.

This is corroborated by a recent study on West of Scotland demersal fisheries (Baudron *et al.,* 2019), which explored Ecosystem Based Fisheries Management via a food web ecosystem model to simulate the outcomes of applying the traditional single stock fishing mortalities, and management scenarios which explored F ranges in accordance with the CFP. Through exploring fishing mortality ranges for whiting in the West of Scotland Baudron *et al.* (2019) found that "a drastic reduction of juvenile whiting bycatch is necessary for the whiting stock to recover".

The spawning stock size of whiting in 7a Irish Sea is extremely low. SSB has been declining since the start of the time-series (1980) and has been well below B_{lim} and PRI since the mid-1990s. Recruitment has been low since the early 1990s. Large variations in fishing pressure has been estimated in recent years and F has been above F_{lim} for the entire time-series.

The majority of whiting caught are discards in the Nephrops fishery and are below the minimum landings size. Despite the introduction of several technical measures to reduce fin fish catch and discards in the Nephrops fishery, the total discards estimate remain high. Given the continued high discards and low TAC this stock could become a major 'choke' species for the Division 7.a Nephrops fishery in the context of the landing obligation (ICES, 2018).

ICES advise zero catch of this stock. TAC in 2018 was 80 tonnes and the 2019 Commission Proposal recommends a by-catch exclusive TAC of 612 tonnes.

ICES catch scenario based on a total catch in 2018 of 1461 tonnes and SSB (2019) 1757 tonnes, shows that in 2019 a zero catch results in SSB (2020) = 2989 tonnes, the alternative scenario of F at F2018 rate (equating to total catch of 1385 tonnes in 2019), results in SSB (2020) = 1649 tonnes. Fishing at Flim in 2019 (total catch of 928 tonnes) results in SSB (2020) = 2073 tonnes.

If total catch equated to the TAC proposal of 612 tonnes, then fishery removals would not be hindering recovery – this is based on ICES catch scenarios and predictions for SSB (2020).

There are measures in place that are expected to maintain or not hinder rebuilding of whiting in the Irish Sea. However, these are considered likely to work, but are not being implemented successfully, based on levels of total catch, including wanted and unwanted/discarded catches.

The spawning stock size of whiting in 4 & 7d North Sea and eastern English Channel has been above MSY $B_{trigger}$ since 2017 and above B_{lim} for the entire time series (since 1978) (ICES, 2018). This stock is therefore highly likely to be above PRI, and fluctuating around MSY $B_{trigger}$, but below the level that equates to 2 times MSY $B_{trigger}$ and therefore not considered to be fluctuating around MSY.

Haddock, *Melanogrammus aeglefinus:* Two haddock stocks overlap with the Nephrops FU's under assessment, these are: 4, 6a & 20 North Sea, West of Scotland and Skagerrak and 7a Irish Sea.

The spawning stock size of haddock in 4, 6a & 20 North Sea and West of Scotland has been above B_{lim} since 2001 and above MSY $B_{trigger}$ for most of the years since 2002. Since 2002 the stock has occasionally been above 2 times MSY $B_{trigger}$, but it has not been at or above this level since approximately 2013, so therefore is not currently around the biomass level that would support MSY. The stock is therefore highly likely to be above PRI, but not fluctuating around MSY.

The spawning stock size of haddock 7a Irish Sea is currently estimated at the highest level in the time-series (since 1993), has grown significantly since 2013 and is well above MSY $B_{trigger}$ (ICES, 2018) and well above 2 times MSY $B_{trigger}$, so the stock is considered to be above MSY. Fishing mortality (F) has been below F_{MSY} since 2012.

Atlantic cod, *Gadus morhua*: Three cod stocks overlap with the Nephrops FU's under assessment, these are: 6a West of Scotland, 4, 7d & 20 North Sea, eastern English Channel and Skagerrak, 6a West of Scotland and 7a Irish Sea.

The spawning stock size of cod in 4, 7d & 20 North Sea, eastern English Channel and Skagerrak has increased from the historical low in 2006, but is still below MSY $B_{trigger}$. The stock size is just above the PRI (i.e., B_{lim}) and considered by ICES to be at increased risk. Fishing mortality has declined since 2000, but remains above F_{MSY}. It is therefore likely that the stock is above PRI.

The spawning stock size of cod in 6a West of Scotland has been below B_{lim} since 1997 and well below this level since 2006. Recruitment has been low since 2001. There has been no evidence of stock growth, in terms of SSB size, since 2006. The stock is considered by ICES to be of reduced reproductive capacity. Fishing mortality is high and has been above F_{lim} for most of the time-series, is currently above F_{lim} and is considered to be harvested unsustainably. In addition, ICES notes that the total catches of cod from pots and traps are unknown (ICES, 2018).

ICES advise zero catch of this West of Scotland cod stock in 2019 (ICES, 2017). The latest advice available is June 2017, which provides catch scenarios for 2018 to predict SSB in 2019. In order to determine whether catches of 1,396 tonnes would hinder stock recover, updated advice is required, which will present the scenario for SSB in 2020, based on 2019 catch rates.

If the 2017 catch scenario is followed, then F_{pa} results in a total catch in 2018 of 1464 tonnes, which allows for growth in SSB from 2018 (2,835 tonnes) to 2019 (3,365 tonnes). If predictions are accurate and parameters remain the same, then it could be expected that the proposal of 1,396 tonnes in 2019 would not hinder stock recovery. However, updated ICES advice is required to confirm this.

The spawning stock size of cod in 7a Irish Sea showed significant decline in early 1990s and dropped below B_{lim} in 1993, with further decline to lowest levels in 2009. Since then growth has been seen in SSB, which since 2016 has been above B_{lim}, but remains below MSY $B_{trigger}$ and B_{pa}. ICES currently consider the stock size to be of increased risk. Recruitment remains low and was estimated at its lowest in 2016. Fishing pressure has declined from very high levels and has been below F_{MSY} since 2013, and was very low in 2016 and 2017. Overall, with low fishing mortality and growth in SSB, it is likely that the stock is above PRI, but not highly likely.

Lesser spotted dogfish, *Scyliorhinus canicular*: the stock boundaries of the lesser spotted dogfish have not been scientifically defined. This species is considered to form local populations at levels equivalent to ICES divisions, based on the limited movements and limited migrations of the species, together with its oviparous (egg laying) nature and associated spawning preferences (shallow sublittoral habitats). This has been informed by the EU-funded Development of Elasmobranch Assessments project (DELASS). Survey trends show stable or increasing populations around the UoA areas under assessment. The IUCN consider this species to be of least concern (Ellis et al, 2009). Overall, it is highly likely to be above biologically based limits.

Shellfish

The following shellfish species have some management measures in place, such as a Minimum Landing Size (MLS), intended to safeguard juvenile animals. However, they do not have measures or tools intended to reach stock management objectives, such as control in effort or output controls that limit fishing mortality. As such these species are considered within the P2 secondary component.

Brown crab, *Cancer pagurus*: Marine Scotland Science define 12 stock assessment areas for brown crab, lobster and velvet crab around Scotland. For brown crab assessments were carried out for ten of these areas based in 2013-2015 data (Mesquita et al, 2017). The Length Cohort Analysis (LCA) assessments evaluate size-based indicators relative to reference points allowing inferences to be made on stock status in terms of exploitation level. In the most recent assessments, nine of the ten assessed areas were fished at a rate above F_{MSY}.

Crabs - Velvet (Swim), *Necora puber*: Assessments were carried out for six of the 12 stock assessment areas around Scotland (Mesquita et al, 2017). The LCA assessments evaluate size-based indicators relative to reference points allowing inferences to be made on stock status in terms of exploitation level. In the most recent assessments, all of the six assessed areas were fished above F_{MSY} to some extent.

European lobster, *Homarus gammarus*: Assessments were carried out for eight of the 12 stock assessment areas around Scotland (Mesquita et al, 2017). The LCA assessments evaluate size-based indicators relative to reference points allowing inferences to be made on stock status in terms of exploitation level. In the most recent assessments, lobsters in all of the eight areas were fished above F_{MSY} to some extent, particularly males.

Overall, in most areas around Scotland, the crab and lobster stocks are being fished at levels which result in yield per recruit values not far below the maximum; fishing mortality is generally above F_{MSY}, and in some cases substantially above this level. The Marine Scotland Science assessment concludes that for those stocks substantially above F_{MSY}, it is likely that they are recruitment overfished as well as growth overfished (Mesquita et al, 2017). For lobster, it is noted that stocks have not showed signals of systematic changes in sex ratio which has been associated with recruitment overfishing in other lobster species.

While stock status for crab and lobster species are unlikely to be above biologically based limits, as informed by the Marine Scotland Science stock assessment (Mesquita et al, 2017), there are measures in place designed to safeguard juvenile animals which are expected to ensure that the Nephrops UoAs do not hinder recovery and rebuilding of these species, including:

- MLS and high survivability of returned animals;
- Targeted fishing grounds of soft seabed of mud and sand, where Nephrops inhabit;
- Size of mesh and hard-eye (entrance to creel) sized appropriately for target species.

Whelk, *Buccinum undatum*: Whelks are targeted by a different design of trap in the form of a cylindrical plastic container, compared to creels used to target Nephrops, crab and lobster. They are likely to be included within

the landings dataset related to Nephrops due to statistics amalgamating different pot and creel gear types into one single category. While whelk are commonly distributed throughout all British coasts, their stock status is not well understood. However, measures, including MLS and technical gear type design are expected to ensure that Nephrops UoAs do not impact whelk stocks.

Management

Finfish: Whiting, haddock and cod are subject to EU Total Allowable Catch (TAC) regulations and national quotas. In addition under the Eu Landing Obligation, vessels using gear of 80-99mm have been required to land all catches of cod and haddock (as well as other species) since 2018, and from 2019 all quota species will be required to be landed (i.e. including whiting). Minimum Conservation Reference Sizes (MCRS) are in place that define when a quota species that must be landed cannot be sold for human consumption.

EU Regulation no 227/2013 sets out technical measures for protection of juvenile marine organisms and includes various measures relevant to the UoAs under assessment, such as gear specifications – including use of sort grids and/or square mesh panels.

As part of the Cod Recovery Plan, a further range of management measures were introduced to limit the catches of cod, including:

- Conservation Credits Scheme
- Real Time Closures (RTCs) and seasonal closures
- Vessels using TR2 trawl nets (*Nephrops*) are required to insert a 110mm Square Mesh Panel (SMP), when in the North Sea, and 120mm SMP in the West of Scotland.

Shellfish: crab and lobster fisheries are not subject to EU TAC regulations or national quotas, although there are EU measures to restrict fishing effort. Under EU Regulations, the annual fishing effort of UK vessels over 15 m participating in the brown crab fishery is restricted to 702,292 KW days in ICES Areas 5 and 6, and 543,366 KW days in ICES Area 7 (EC, 2004).

UK vessels fishing for brown crab, velvet crab, spider crab, green crab, lobster or crawfish must have a licence with a shellfish entitlement. The quantities that are permitted to be landed are not restricted.

Minimum landing size (MLS) regulations designed to protect juvenile animals apply to the main commercial crab and lobster species as follows:

- Brown crab: 140-160mm CW dependant on location.
- Lobster: 90mm CL, and maximum landing size of 145mm in Orkney and Shetland and 155mm elsewhere
- Velvet crab: 70mm CW, and prohibition of landing berried velvet crab.
- Whelk: 45mm, and 75mm in Shetland.

Information

Quantitative information is available on the catch composition and status of species associated with the UoAs under assessment including:

- MMO iFISH database with landing statistics data for UK registered vessels for 2013 to 2017 with attributes for: landing year; landing month; vessel length category; country code; ICES rectangle; vessel/gear type; species; live weight (tonnes); and value. Including gear categories for ‘demersal trawl/seine’ and ‘pot and traps’.
- EU DCF database with landing and discard statistics for UK registered vessels for 2003 to 2016 with attributes for: country, regulated area, regulated gear, species, discards, landings, vessel length category, year for trawl TR2 and pots.
- Shellfish stock assessments based on 2012-2015 data, by Marine Scotland Science (Mesquita et al, 2017).
- Finfish stock assessments undertaken annually by ICES.
- Other sources including Fishbase, Marlin and IUCN assessments.

3.4.3 ETP

A list of potential ETP species is provided in Table 3.19. This has been compiled based on a review of the following relevant designations and protective instruments:

- Convention on International Trade in Endangered Species (CITES): Appendix I.
- ASCOBANS: Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) provides management advice for cetaceans across its geographic remit. Specifically it provides a limit for unacceptable anthropogenic interaction with harbour porpoise populations (>1.7% removal of population).
- IUCN: The IUCN Red List is a critical indicator of the health of species and provides an assessment for population status within the categories of: Least Concern, Near Threatened, Vulnerable, Endangered, or Critically Endangered.
- Council Regulations 39 & 40 /2013: Under Article 12 paragraph 1 it is prohibited for EU vessels to fish for, to retain on board, to tranship or to land a range of species. The regulation states that when accidentally caught, species referred to in paragraph 1 shall not be harmed and shall be promptly released. This regulation also stipulates 0 tonnes TAC for certain species.
- Habitats Directive: Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora lists a range of habitats (Annex I) and animal and plant species (Annex II) whose conservation requires the designation of Special Areas of Conservation.
- Wildlife and Countryside Act 198113: The Wildlife and Countryside Act 1981 consolidates and amends existing British legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and Council Directive 79/409/EEC on the conservation of wild birds (Birds Directive) in Great Britain.
- Birds Directive: Council Directive 2009/147/EC provides a framework for the conservation and management of, and human interactions with, wild birds in Europe, including designation of and management within Special Protected Areas.
- In Scottish waters, Priority Marine Features (PMFs) have policy protection through General Policy 9 of the National Marine Plan, and domestic Marine Protected Areas (MPAs) have been established to provide protection for some PMFs, both of which arise from legislation in the form of the Marine (Scotland) Act 2010 (and Marine and Coastal Access Act 2009).

Species listed as a PMF are included in Table 3.19 below, including a qualifier as to when the species is considered an ETP species and when it is considered to be a habitat-forming species, thereby classified as a Vulnerable Marine Ecosystem (VME) under the Habitats component. A fuller description and list of VMEs is provided within Section 3.4.4.

A range of finfish species are listed as PMFs, including: cod, horse mackerel, saithe, whiting etc. Given the fisheries management in place for these species, together with the fact that many are commercially targeted, it is considered appropriate to assess these finfish species under component 2.1: primary species or 2.2: secondary species.

The potential for interaction between the ETP species and the UoA is highlighted in Table 3.19.

Table 3.19. Potential ETP species [IUCN categories: LC Least Concern, NT Near Threatened, VU Vulnerable, EN Endangered, CE Critically Endangered]

Species	Scientific name	Cites App I	ASCOBANS	IUCN status	Council Regs. 39 & 40/2013	EU 92/43/1992 Habitats Directive	Wildlife and Countryside Act 1981	EU 2009/147/EC Birds Directive	Priority Marine Feature (Scottish Waters)	Assigned component for this pre-assessment		Potential for interaction with UoA	
										ETP species	VME habitat	Trawl	Creel
Mammals													
Harbour porpoise	*Phocoena phocoena*		Y	LC		Annex II			Mobile species	Y			
Bottlenose dolphin	*Tursiops truncatus*		Y	LC		Annex II			Mobile species	Y			
All cetaceans			Y			Annex IV	Schedule 5 S9.5a		Mobile species	Y			
Harbour seal	*Phoca vitulina*			LC		Annex II			Mobile species	Y			
Grey seal	*Halichoerus grypus*			LC		Annex II			Mobile species	Y			
Otter	*Lutra lutra*	App I		NT		Annex II	Schedule 5 S9.5a		Mobile species	Y			
Fish and elasmobranchs													
Angel shark	*Squatina squatina*			CE	Prohibited species all waters					Y			
Common skate	*Dipturus batis*			CE	Prohibited species ICES 3-10				Mobile species	Y			
White skate	*Rostroraja alba*			EN	Prohibited species ICES 6-10					Y			
Undulate ray	*Raja undulata*			EN	Prohibited species ICES 6-10					Y			
Guitarfish	*Rhinobatidae spp*			EN/NT/VU	Prohibited species all waters					Y			
Porbeagle	*Lamna nasus*			VU	Prohibited species all waters								
Spurdog	*Squalus acanthias*			VU	0t TAC					Y			

Species	Scientific name	Cites App I	ASCOBANS	IUCN status	Council Regs. 39 & 40/2013	EU 92/43/1992 Habitats Directive	Wildlife and Countryside Act 1981	EU 2009/147/EC Birds Directive	Priority Marine Feature (Scottish Waters)	Assigned component for this pre-assessment		Potential for interaction with UoA	
										ETP species	VME habitat	Trawl	Creel
White shark	*Carcharodon carcharias*			VU	Prohibited species all waters					Y			
Giant manta ray	*Manta birostris*			VU	Prohibited species all waters					Y			
Basking shark	*Cetorhinus maximus*			VU	Prohibited species all waters				Mobile species	Y			
Sturgeon	*Acipenser sturio*	App I		CE		Priority species	Schedule 5			Y			
Allis shad	*Alosa alosa*			LC		Annex II	Schedule 5 S9.1, 9.4a			Y			
Twaite shad	*Alosa fallax*			LC		Annex II	Schedule 5 S9.4a			Y			
Atlantic salmon	*Salmo salar*			LC		FW Phase			Mobile species	Y			
Sea lamprey	*Petromyzon marinus*			LC		Annex II			Mobile species	Y			
Sandy ray	*Leucoraja circularis*			EN					Mobile species	Y			
Leafscale gulper shark	*Centrophorus squamosus*			VU					Mobile species	Y			
Porbeagle shark	*Lamna nasus*			VU	Prohibited species all waters				Mobile species	Y			
Portuguese dogfish	*Centroscymnus coelolepis*			NT					Mobile species	Y			
Spiny dogfish	*Squalus acanthias*			VU					Mobile species	Y			
Sea horses	*Hippocampus spp*			VU		Annex II	Schedule 5 S9.2			Y			
Invertebrates													
Blue mussel beds	*Mytilus edulis* beds								Sea bed habitat		Y		
Flame shell beds	*Limaria hians* beds								Sea bed habitat		Y		
Horse mussel beds	*Modiolus modiolus* beds					1170 Reefs					Y		

Species	Scientific name	Cites App I	ASCOBANS	IUCN status	Council Regs. 39 & 40/2013	EU 92/43/1992 Habitats Directive	Wildlife and Countryside Act 1981	EU 2009/147/EC Birds Directive	Priority Marine Feature (Scottish Waters)	Assigned component for this pre-assessment		Potential for interaction with UoA	
										ETP species	VME habitat	Trawl	Creel
Native oyster beds	*Ostrea edulis* beds								Sea bed habitat		Y		
Pink sea-fan	*Eunicella verrucosa*			VU			Schedule 5 S9.2, 9.5a			Y			
Burrowing sea anemone	*Arachnanthus sarsi*								Low mobility species	Y			
Pink sea fingers	*Alcyonium hibernicum*								Low mobility species	Y			
White cluster anemone	*Parazoanthus anguicomus*								Low mobility species	Y			
Northern feather star	*Leptometra celtica*								Low mobility species	Y			
Heart cockle	*Glossus humanus*								Low mobility species	Y			
Ocean quahog	*Arctica islandica*								Low mobility species	Y			
Fan mussel	*Atrina fragilis*						Schedule 5 S9.2, 9.5a		Low mobility species	Y			
Reptiles													
Marine turtles	*Cheloniidae spp*					Annex II	Schedule 5 S9.2, 9.5a			Y			
Leatherback turtle	*Dermochelys coriacea*	App I		VU			Schedule 5 S9.1, 9.5a			Y			
Birds													
Bird spp								Annex I, III, IV		Y			

Some information on the interaction of ETP species and nephrops trawling is available. For Scottish PMF invertebrate species, the Marine Scotland National Marine Plan interactive (NMPi) mapping tool allows the distribution of PMFs to be mapped, for example see Figure 3.24.

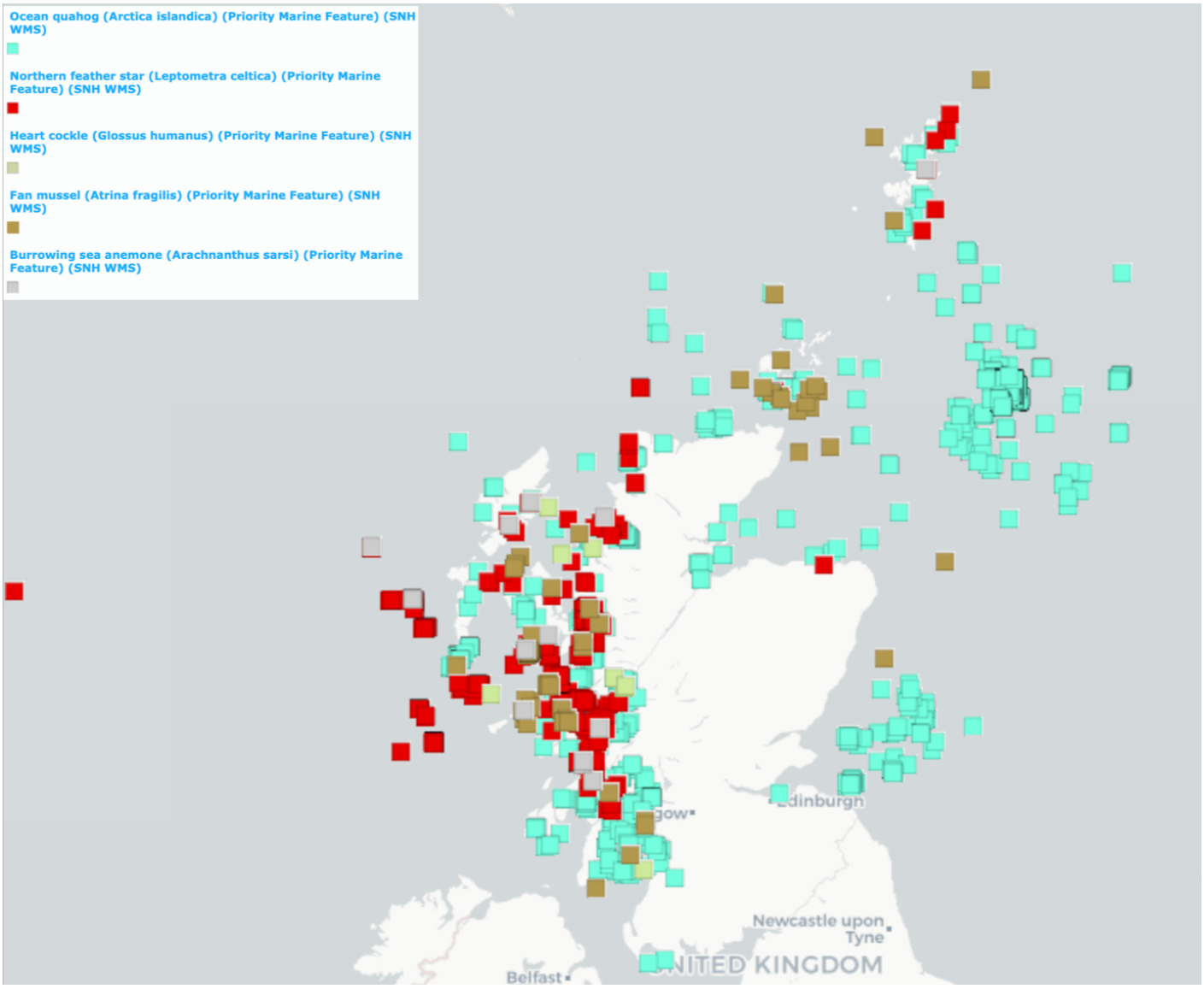


Figure 3.24. Distribution of invertebrate species identified as Scottish Priority Marine Features [Source: Marine Scotland National Marine Plan interactive, 2018].

3.4.4 Habitats

The MSC methodology requires species / features to be assessed as separate elements. Within the default assessment tree habitats elements are assessed as one of the following:

- Commonly encountered habitats;
- Vulnerable marine ecosystems (VME);
- Minor habitats.

Commonly encountered habitats

Commonly encountered habitats are those with which the gear regularly comes into contact; such habitats are considered separately from vulnerable marine ecosystems (VMEs) for the purpose of this assessment.

Nephrops distribution is limited by the extent of suitable muddy substrates in which they construct burrows. Commonly encountered habitats when targeting Nephrops include: sandy mud, mud and soft substrate. The North Sea, West of Scotland and Irish Sea are characterized by a mix of mud, sandy-mud, sand and coarse sediments (Figure 3.29). The areas targeted by Nephrops trawls creels within Functional Units is well understood and has been mapped based on analysis of habitat preference and VMS data (Figure 3.30).

The habitat of Nephrops norvegicus is characterized by fine sand and mud, where sea-pen (*Virgularia mirabilis, Pennatula phosphorea,* and *Funiculina quadrangularis*) and burrowing megafauna communities can be found (OSPAR 2010). Based on an assessment against the Texel-Faial criteria (selection criteria for habitats are: global importance, regional importance, rarity, sensitivity, ecological significance, status of decline) carried out by OSPAR such communities are ecologically significant, but were not classified as rare or regionally important. Moreover, seapen- and burrowing megafauna communities are on the OSPAR List of threatened and/or declining species and habitats for region II (Greater North Sea) and III (Celtic Seas).

Vulnerable marine ecosystems

For the purposes of this assessment VMEs are proposed to include sub features listed in the Habitats Directive and habitats identified as Priority Marine Features that are sensitive to fishing gear interactions.

The **Habitats Directive** requires the maintenance and/or restoration of natural habitats and species of European interest at favourable conservation status across their biogeographical range. The specific 'marine' habitats defined in Annex I of the Habitats Directive include:

- Sandbanks which are slightly covered by sea water all the time,
- Estuaries
- Mudflats and sandflats not covered by seawater at low-tide,
- Large shallow inlets and bays
- Lagoons
- Reefs
- Submerged or partly submerged sea caves

Sub features include:

- Zostera Biotopes
- Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks
- Sea Pens and Burrowing Megafauna
- Subtidal Brittlestar Beds
- Maerl
- Intertidal Reef Biotopes
- Infralittoral Reef Biotopes with Kelp Species
- Circalittoral Faunal Turfs

A network of Special Areas of Conservation (SACs) and Marine Protected Areas (MPAs) (Figure 3.25) are designated and managed to protect valuable marine and coastal habitats by managing human activities in these areas. Management measures relevant to mobile bottom-contact gears within MPAs are well developed and enacted through Fisheries Orders and Marine Conservation Orders.

Measures variously prohibit fishing from either the entire designated site, or from features of importance within the site. Restrictions are provided via closed areas, curfews, seasonal closures and limits based on vessel size.

In 2014, Marine Scotland, Scottish Natural Heritage (SNH) and the Joint Nature Conservation Committee (JNCC) identified 81 Priority Marine Features (PMFs) in Scottish territorial waters. This list of PMFs and the existing designations in place to protect them are outlined in Table 3.20.

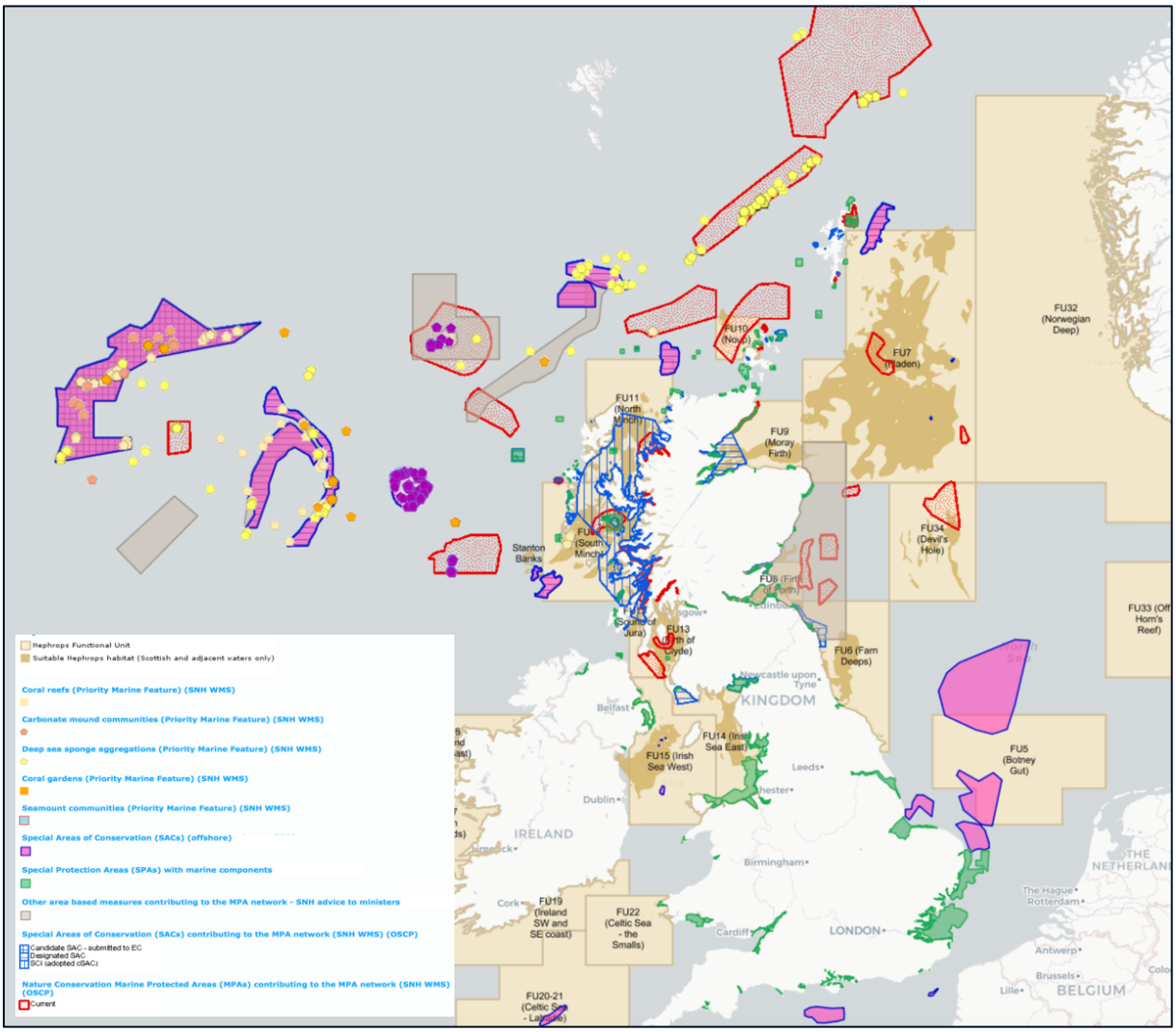


Figure 3.25. Marine protected areas [Source: Marine Scotland National Marine Plan interactive, 2018].

Of these PMFs, 11 habitat features have been identified as being particularly sensitive to impact from bottom contacting mobile fishing gears:

- Blue mussel beds
- Cold water coral reefs
- Fan mussel aggregations
- Flame shell beds
- Horse mussel beds
- Maerl beds
- Maerl or coarse shell gravel with burrowing sea cucumbers
- Native oysters
- Northern sea fan and sponge communities
- Seagrass beds
- Serpulid aggregations

In summer 2018, Marine Scotland consulted on improving protection given to PMFs outside the MPA network, including options for managing fisheries interactions with these 11 PMFs. A report assessing these management measures / approaches is due at the end of 2018.

As part of the consultation, SNH advised on areas for management consideration as presented in Figure 3.26. SNH consider that within these areas attention should be focused to ensure that any significant impact of bottom contact fishing gear on the national status of the 11 PMFs is avoided.

However, management will be focused on finer scale zones around features and not necessarily lead to the entirety of areas for management being closed. Zones would be drawn using activity data, environmental factors, and where necessary geographic points of interest, with the precautionary principle applied by zoning off PMFs even when not subject to current fishing pressure.

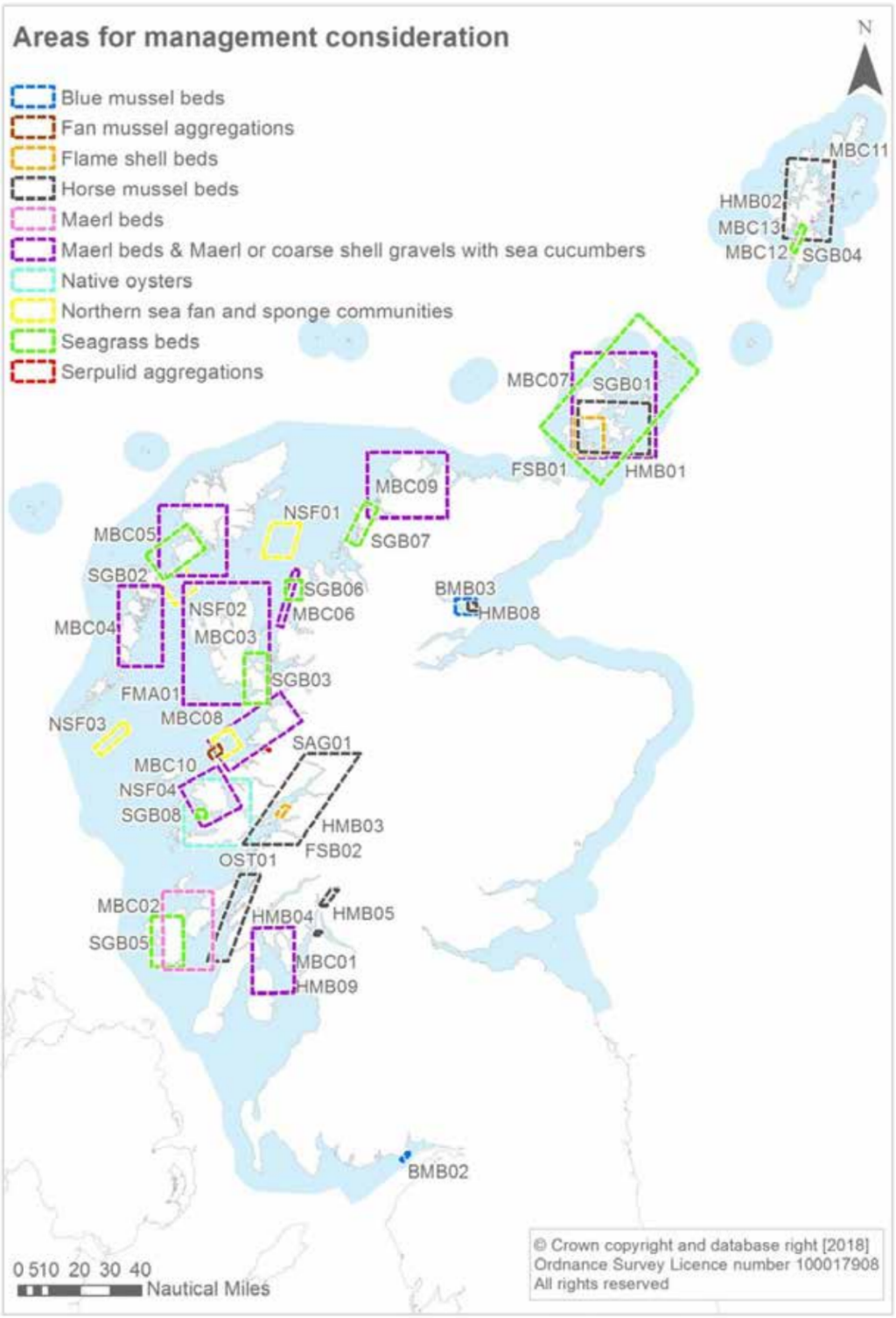


Figure 3.26 Areas for management consideration (Marine Scotland, 2018)

Table 3.20 Recommended PMFs and existing designations (SNH, 2013).

Priority Marine Feature (PMF)	Scottish marine area important for PMF	Habitats Directive	Wildlife & Countryside Act	CITES	OSPAR threatened and/or declining habitats and species	BAP priority habitat/ species	IUCN Global Red list status	MPA search feature (offshore/territorial)	Proposed MPA protected feature (offshore/territorial)
Blue mussel beds	Territorial waters	Annex I			Regions II,III (LS.LBR.LMus.Myt.Sa & LS.LBR.LMus.Myt.Mx only)	√ (except IR.LIR.IFaVS.MytRS)		Territorial waters	
Burrowed mud	Both				Regions I, II, III, IV (habitat components only)	√ (except *Maera loveni*)		Both (not *Maera loveni*)	Both (not *Maera loveni*)
Carbonate mound communities	Offshore waters				Region V	√ (related to Carbonate Mounds)		Offshore waters	
Cold-water coral reefs	Both	Annex I		Appendix II	All regions where they occur	√			
Coral gardens	Offshore waters	Annex I			All regions where they occur			Offshore waters	Offshore waters
Deep sea sponge aggregations	Offshore waters	Annex I			All regions where they occur	√		Offshore waters	Offshore waters
Flame shell beds	Territorial waters					√		Territorial waters	Territorial waters
Horse mussel beds	Territorial waters	Annex I			All regions where they occur	√		Territorial waters	Territorial waters
Inshore deep mud with burrowing heart urchins	Territorial waters					√		Territorial waters	
Intertidal mudflats	Territorial waters	Annex I			All regions where they occur	√			
Kelp and seaweed communities on sublittoral sediment	Territorial waters					√ (Subtype SS.SMp.KSwSS.LsacR .CbPb only)		Territorial waters	Territorial waters
Low or variable salinity habitats	Territorial waters	Annex I (habitat components only)	Schedule 8 (*Lamprothamnium papulosum* only)			√ (except IR.LIR.IFaVS and *Hydrobia acuta neglecta)*		Territorial waters	
Maerl beds	Territorial waters	Annex I			Region III	√		Territorial waters	Territorial waters
Maerl or coarse shell gravel with burrowing sea cucumbers	Territorial waters	Annex I				√		Territorial waters	Territorial waters
Native oysters	Territorial waters				All regions where they occur (habitat), Region II (species)	√		Territorial waters	Territorial waters
Northern sea fan and sponge communities	Territorial waters	Annex I (habitat components only)				√		Both (habitat components in territorial waters only)	Territorial waters
Offshore deep sea muds	Offshore waters					√		Offshore waters	Offshore waters
Offshore subtidal sands and gravels	Offshore waters	Annex I (if in <20m of water)				√		Offshore waters	Offshore waters
Seagrass beds	Territorial waters	Annex I			All regions where they occur (LS.LMp.LSgr.Znol and SS.SMp.SSgr.Zmar only)	√		Territorial waters	Territorial waters
Sea loch egg wrack beds	Territorial waters	Annex I				√		Territorial waters	
Seamount communities	Offshore waters				All regions where they occur	√		Offshore waters	Offshore waters
Serpulid aggregations	Territorial waters	Annex I				√			
Submarine structures made by leaking gases	Both	Annex I							
Tide-swept algal communities	Territorial waters	Annex I				√		Territorial waters	
Tide-swept coarse sands with burrowing bivalves	Territorial waters	Annex I				√		Territorial waters	Territorial waters
Burrowing sea anemone	Territorial waters					√		Territorial waters (aggregations)	Insufficient information to identify MPA proposal
Pink sea fingers*	Territorial waters								
White cluster anemone*	Territorial waters								Territorial waters
Northern feather star*	Both							Both (aggregations on mixed substrata)	Territorial waters (aggregations on mixed substrata)
Fan mussel	Both		Schedule 5			√		Both (aggregations)	Territorial waters (aggregations)
Heart cockle*	Territorial waters							Territorial waters (aggregations)	Insufficient information to identify MPA proposal
Ocean quahog	Both				Region II			Both (aggregations)	Offshore waters (aggregations); Territorial waters (species)
European spiny lobster	Territorial waters					√		Territorial waters	Insufficient information to identify MPA proposal
Eel (marine part of life cycle)	Territorial waters			Appendix II	All regions where it occurs	√	Critically Endangered		
Atlantic salmon (marine part of life cycle)	Territorial waters	Annex II (freshwater only) and Annex V			All regions where it occurs	√	Lower risk - least concern		
European river lamprey (marine part of life cycle)	Territorial waters	Annex II (freshwater only) and Annex V				√	Lower risk - least concern		
Sea lamprey (marine part of life cycle)	Territorial waters	Annex II (freshwater only)			All regions where it occurs	√	Lower risk - least concern		
Sea trout (marine part of life cycle)	Territorial waters					√	Lower risk - least concern		
Sparling (marine part of life cycle)	Territorial waters					√	Lower risk - least concern		
Anglerfish	Both					√			

Priority Marine Feature (PMF)	Scottish marine area important for PMF	Habitats Directive	Wildlife & Countryside Act	CITES	OSPAR threatened and/or declining habitats and species	BAP priority habitat/ species	IUCN Global Red list status	MPA search feature (offshore/territorial)	Proposed MPA protected feature (offshore/territorial)
Atlantic halibut	Offshore waters					√	Endangered		
Atlantic herring	Both					√	Lower risk - least concern		
Atlantic mackerel	Both					√			
Black scabbardfish	Offshore waters					√			
Blue ling	Offshore waters					√		Offshore waters	
Blue whiting	Offshore waters					√			
Cod	Both				Regions II, III	√	Vulnerable		
Greenland halibut	Offshore waters					√			
Horse mackerel	Offshore waters					√			
Ling	Both					√			
Norway pout*	Both								
Orange roughy	Offshore waters				All regions where it occurs	√		Offshore waters	Offshore waters
Round-nose grenadier	Offshore waters					√			
Saithe*	Both								
Sandeels	Both (only *Ammodytes marinus* occurs offshore)					√ (*Ammodytes marinus* only)		Both (only *Ammodytes marinus* occurs offshore)	Both (only *Ammodytes marinus* occurs offshore)
Sand goby*	Territorial waters								
Whiting	Both					√			
Basking shark	Both		Schedule 5	Appendix II	All regions where it occurs	√	Vulnerable	Territorial waters	Territorial waters (search location identified)
Common skate	Both				All regions where it occurs	√	Critically Endangered	Territorial waters	Territorial waters
Leafscale gulper shark	Offshore waters				All regions where it occurs	√	Vulnerable		
Porbeagle shark	Offshore waters			Appendix III (Appendix II from 14 Sept 2014)	All regions where it occurs	√	Vulnerable		
Portuguese dogfish	Offshore waters				All regions where it occurs	√	Near threatened		
Sandy ray	Offshore waters					√	Vulnerable		
Spiny dogfish	Both				All regions where it occurs	√	Vulnerable		
Atlantic white-sided dolphin	Offshore waters	Annex IV	Schedule 5	Appendix II		√	Lower risk - least concern		
Bottlenose dolphin	Both	Annex II and Annex IV	Schedule 5	Appendix II		√	Lower risk - least concern		
Fin whale	Offshore waters	Annex IV	Schedule 5	Appendix I		√	Endangered		
Harbour porpoise	Both	Annex II and Annex IV	Schedule 5	Appendix II	Regions II, III	√	Lower risk - least concern		
Killer whale	Both	Annex IV	Schedule 5	Appendix II		√	Data Deficient		
Long-finned pilot whale	Offshore waters	Annex IV	Schedule 5	Appendix II		√	Data Deficient		
Minke whale	Both	Annex IV	Schedule 5	Appendix I		√	Lower risk - least concern	Territorial waters	Territorial waters (search location identified)
Northern bottlenose whale	Offshore waters	Annex IV	Schedule 5	Appendix I		√	Data Deficient		
Risso's dolphin	Both	Annex IV	Schedule 5	Appendix II		√	Lower risk - least concern	Territorial waters	Territorial waters (search location identified)
Short-beaked common dolphin	Both	Annex IV	Schedule 5	Appendix II		√	Lower risk - least concern		
Sowerby's beaked whale	Offshore waters	Annex IV	Schedule 5	Appendix II		√	Data Deficient		
Sperm whale	Offshore waters	Annex IV	Schedule 5	Appendix I		√	Vulnerable		
White-beaked dolphin	Both	Annex IV	Schedule 5	Appendix II		√	Lower risk - least concern	Territorial waters	Territorial waters (search location identified)
Harbour / common seal	Both	Annex II and Annex V				√	Lower risk - least concern		
Grey seal	Both	Annex II and Annex V					Lower risk - least concern		
Otter	Territorial waters	Annex II and Annex IV	Schedule 5	Appendix I		√	Near threatened		

*This table covers only the main lists used during the process to identify PMFs in Scotland's seas. Species with an asterisk which do not correlate with any of the reporting categories provided in this table have originated from other lists, for example sand goby is on Appendix 3 of the BERN Convention, while Norway pout is included on the Scottish Biodiversity List.

Burrowed mud

Burrowed mud is a Priority Marine Feature and an OSPAR threatened and declining habitat ('sea-pen and burrowing megafauna communities'). It is therefore considered to be a VME, for the purposes of this MSC pre-assessment.

In areas where this habitat is undisturbed it is extensively burrowed by several species including Nephrops. It also supports a number of characteristic and important species such as the fireworks anemone (*Pachycerianthus multiplicatus*) and the tall sea pen (*Funiculina quadrangularis*). This habitat type is concentrated within Scottish waters, with 95% of UK records of inshore and deep burrowed mud are from the northern North Sea and the sea lochs of western Scotland and the Hebrides and are of international importance (Marine Scotland, 2018).

The Marine Scotland NMPi information database defines 6 layers of burrowed mud habitat, that represent a range of important communities and species (mapped in Figure 3.28):

1. Seapens and burrowing megafauna in circalittoral fine mud. Extensively distributed throughout the sea lochs of the west coast, Hebrides and voes of Shetland it occurs at depths of between 10-100m. It supports a diverse burrowing fauna and in particular various seapens in the deeper, sheltered areas. The majority of the UK records are from Scotland.
2. Burrowing megafauna and *Maxmuelleria lankesteri* in circalittoral mud. Found at depths of 10-100m in sheltered and extremely sheltered conditions in sea lochs on the west coast of Scotland and the Outer Hebrides. The great majority of UK records are from Scotland.
3. Tall seapen - *Funiculina quadrangularis.* Found in deep sheltered waters up to 200m depth it has also been recorded from as shallow as 20m in some sea lochs. In the UK it is almost entirely restricted to western Scotland and the Hebrides; Scottish populations are considered of global importance.
4. Fireworks anemone - *Pachycerianthus multiplicatus.* A large burrowing sea anemone that lives in a long thick tube buried in mud or muddy sand at depths of 10-130m in very sheltered areas. It is restricted to a number of sea lochs on the west coast of Scotland. It is nationally scarce in the UK, Scottish populations represent 95% of all records and are of international and possibly global importance.
5. Mud burrowing amphipod - *Maera loveni.* A mud-dwelling infaunal amphipod, which lives in depths of 20-400 m. It is a northern cold water species that has reached its southern limit in Scotland where it is sparsely distributed around the coast. 95% of British records are from sea lochs and the northern North Sea.
6. Other burrowed mud habitats.

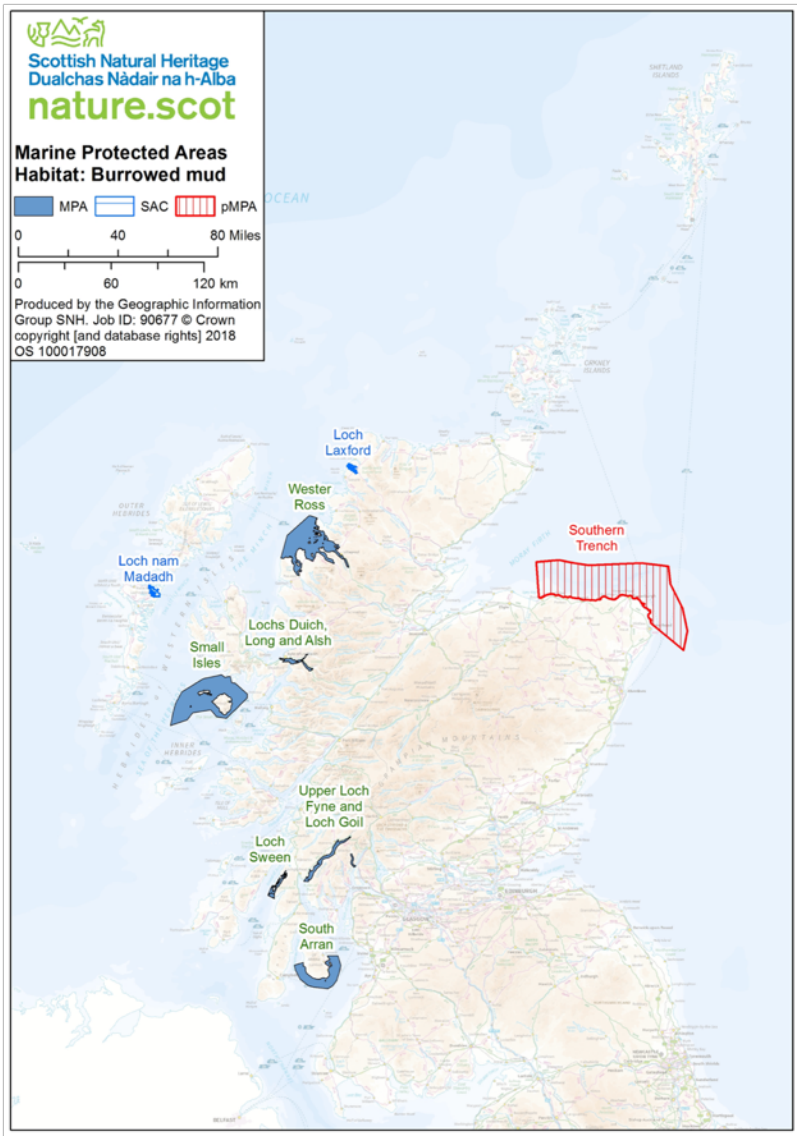


Figure 3.27 Marine Protected Areas for habitat: Burrowed mud (SNH, 2018)

Burrowed mud is protected in eight locations around Scotland, which are designated as MPAs (Figure 3.27).

More information on the sites and how they are managed can be found at SNH's **Sitelink** and on the **Marine Scotland** web pages for some sites. For a number of sites detailed survey and monitoring reports also exist (SNH, 2018).

Considering the MSC definitions for commonly encountered habitats and VMEs, the team believe it is appropriate that:

- Specific aspects or features of burrowed mud are treated as VMEs, such as those areas that are designated and where fishing is prohibited to protect those features; and
- The remainder burrowed mud habitat is treated as commonly encountered habitat.

Figure 3.28 Burrowed mud Priority Marine Features as mapped in Marine Scotland NMPi (Marine Scotland, 2019)

Habitat impact

Demersal trawl: Seapens are sensitive to mechanical damage by Nephrops trawling, in particular *F. quadrangularis* is likely to be the most vulnerable to trawl damage because of its brittle stalk and inability to retract into the sediment. However, experimental studies show that all three sea-pen species can re-anchor themselves in the sediment if dislodged by fishing gear. The ability of *Virgularia mirabilis* to withdraw rapidly into the sediment provides protection from this form of disturbance, and there is no strong evidence that populations of this species have been damaged by trawling. In addition pennatulaceans are mainly restricted to waters deeper than 500 m depth, in fact the average depth where these anthozoans are found is 800 m (Ólafsdóttir et al. 2014).

In the absence of significant populations of seapens, burrowing megafauna including burrowing crustaceans, small polychaetes and bivalves will be found in Nephrops habitats (Ball et al., 2000). The effects of trawling on these other burrowing megafauna are less clear, but it could be expected that deep- burrowing species would be much less affected by this form of disturbance.

Studies on the impact of Nephrops trawling indicate that fishing intensity is the major factor controlling long-term negative trends in the benthos (Ball et al. 2000).

Overall, there is currently insufficient evidence to consider it unlikely that the fishery would reduce any habitat structure and function to a point where there would be serious or irreversible harm, specifically for VME habitats and also in relation to historical extent. There is insufficient evidence to confirm that the VME habitats would be able to recover to at least 80% of unimpacted structure, biological diversity and function within 5-20 years if fishing were to cease entirely.

Creels: Eno et al. (2001) examined the effects of fishing with crustacean pots and creels on benthic species in Great Britain through qualitative and quantitative experiments. This study found that the habitats and their communities appeared relatively unaffected by potting. The slow-growing, long-lived, pink sea fan *Eunicella verrucosa* were frequently observed to flex under the weight of pots as they passed and then returned back to an upright position. Quantitative studies, undertaken in south England and west Wales, were based on surveys carried out along transect lines before and after a month of pot fishing for crabs and lobsters. The results suggest that four weeks of fairly intense fishing did not have immediate detrimental effects on the abundance of the species selected for study, although some individual ross coral colonies *Pentapora foliacea* were damaged.

The observations of pots and creels being dropped and hauled show clearly that these fisheries have little or no immediate effect on several species that had previously been thought to be sensitive. Other than damage sustained by large individual ross corals *P. foliacea*, Eno et al (2001) found the short-term effects of crab and lobster potting on sensitive benthic species in west Wales and Lyme Bay not to be detrimental.

Management

A network of Special Areas of Conservation (SACs) and Marine Protected Areas (MPAs) are designated and managed to protect valuable marine and coastal habitats by managing human activities in these areas. Of particular note is the East Mingulay SAC where coral reefs for, the qualifying feature of the designation that overlaps with areas identified as Nephrops grounds.

The reef areas to the east of Mingulay in the Outer Hebrides are found within a wide trench in the seabed at depths of about 100 to 250 metres. Nine reef areas have been identified, formed by characteristic mounds on the seabed up to 150 metres high. An area of approximately 26 square kilometres supports reef habitat, including both biogenic and non-biogenic (rocky) reefs. The biogenic reefs, covering an area of about 5.4 square kilometres, are formed of the cold-water coral, *Lophelia pertusa*. Demersal trawl is prohibited from the whole East Mingulay SAC site, creel fishing is prohibited from parts of the site.

The process of establishing management measures relevant to mobile bottom-contact gears within MPAs and SACs is well established. Measures variously prohibit fishing from either the entire designated site, or from features of importance within the site. Restrictions are provided via closed areas, curfews, seasonal closures and limits based on vessel size.

However, it is noted, that management proposals within offshore SACs and MPAs require consultation, negotiation and agreement across Member States. Development of proposals for offshore management began via workshops held in 2013, 2014 and 2015, followed by consultations on proposals in 2016. As yet, management within offshore MPAs is yet to be formally negotiated.

It is noted that nephrops fisheries are undertaken within MPAs and SACs, including the Noup Functional Unit, and trawl activity within the Minch, Fladen, Small Isles, Clyde Sea Sill and Moray Firth SACs.

The status of developing management proposals and implementation of management measures within these MPAs and SACs is unclear.

Information

Quantitative data and evidence are available on the benthic marine environment, extent of interaction with the UoAs under assessment and protected areas including:

- EUINS and priority marine habitat mapping;
- VMS and landing statistics by ICES rectangle indicating location of fishing grounds;
- Network of marine protected areas and associated management.

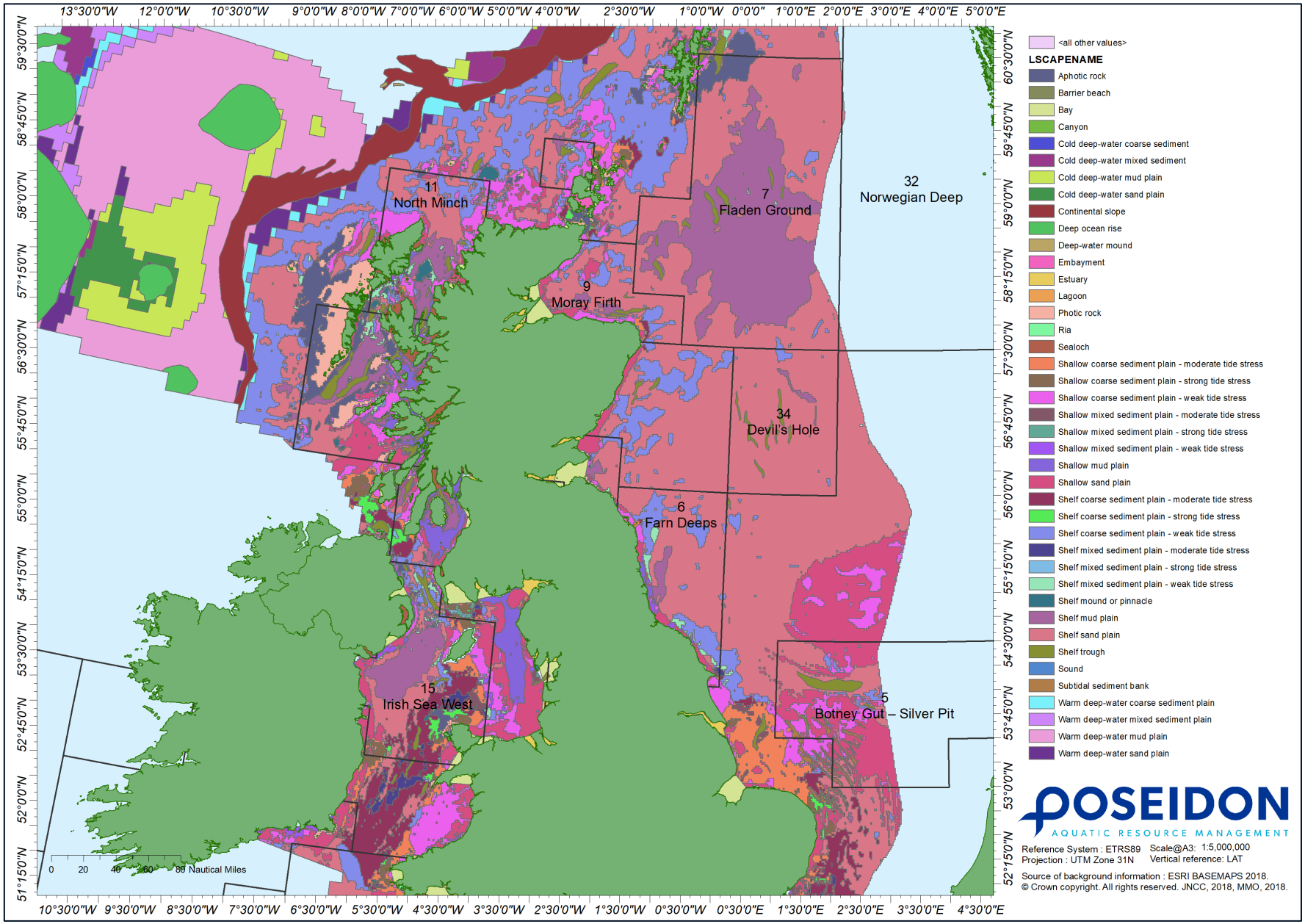


Figure 3.29. European Nature Information System (EUNIS) habitat classification for the UK EEZ.

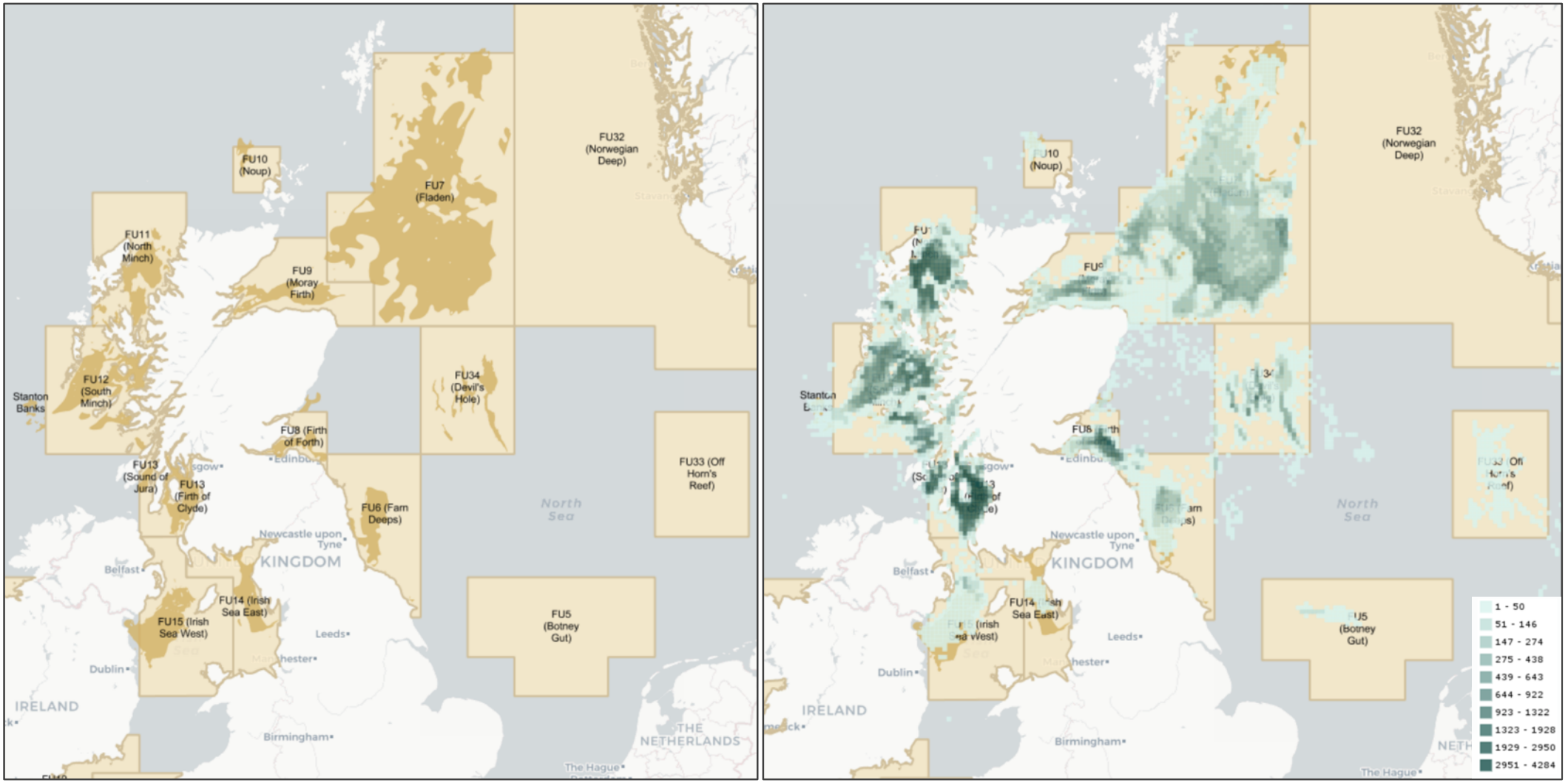


Figure 3.30. Left: Nephrops Functional Units (FUs) and suitable habitat for Nephrops (based on analysis of VMS data and habitat mapping). Right: Effort of >15m vessels landing >75% Nephrops from 2007-2012 (count of VMS pings). [Source: Marine Scotland National Marine Plan interactive, 2018].

3.4.5 Ecosystem

There is a good level of information on the trophic position and role of various life history stages of most demersal species, including Nephrops, within the North Sea food web. Many studies have been completed that examined the fish community structure in the North Sea, West of Scotland and Irish Sea.

These studies confirm that Nephrops is low trophic level species and are common prey for numerous marine species, such as cod, rays or dogfish.

Measures in place, such as the closed areas, the cod recovery plan, the enforcement effort, the collaboration between UK and EU fisheries agencies, the establishment of an MPA network, the assigned quota, and the use of selective gears contribute to minimize impacts of the fishery.

Data continue to be collected through various organizations. ICES provide an annual overview of the state of the North Sea Ecosystem. The research conducted with these data contributes to the detection of any change or increase in risk level to the main ecosystem components.

3.5 Principle Three: Management system background

Nephrops fisheries are currently EU management stocks under the CFP and are considered fisheries under a single jurisdiction as all Member States operate under the CFP. With the UK leaving the EU in March 2019, a transitional phase is proposed whereby management under the CFP will continue. In 2020 the UK will begin negotiating as an independent coastal state for fishing opportunities from 2021. It is at this point (2021 onwards) that the fisheries will either be managed by the UK as a single jurisdiction if entirely within its EEZ or as a shared stock (with the EU).

Nephrops fisheries in UK EEZ waters of the North Sea, West of Scotland and the Irish Sea are within the UK EEZ except for the Irish Sea fisheries that do extend into Isle of Man and Republic of Ireland waters. Some fishing by *Nephrops* vessels from Northern Ireland extends into Republic of Ireland waters, which is permitted under a Voisinage agreement that provides reciprocal entitlement for Northern Ireland and ROI vessels to fish in each other's waters.

Table 3.21. Summary of jurisdiction related to Nephrops fisheries

Species	Area	Jurisdiction
Norway Lobster, *Nephrops norvegicus*	Irish Sea	EU managed stocks (single jurisdiction under CFP) 2021 onwards: Some FU are shared stocks and some single jurisdiction
	North Sea	EU managed stocks (single jurisdiction under CFP) 2021 onwards: Some FU are shared stocks and some single jurisdiction
	West of Scotland	EU managed stocks (single jurisdiction under CFP) 2021 onwards: Single jurisdiction - Scotland

*UK waters of ICES Area 4.

3.5.1 EU management

The UK is required to manage its fisheries in line with the EU's Common Fisheries Policy (CFP) and this will be the case throughout the transition period post-Brexit to 2021. Following this transition period, the UK will become an independent coastal state.

For this pre-assessment, the current regime under the CFP is considered and it is recommended that the PA and resulting action plan be reviewed in 2021 when the new regime is in place.

The latest iteration of the CFP is EU Reg. 1380/2013, which includes objectives of stocks being at Maximum Sustainable Yield (MSY) by 2015 or no later than 2020; long-term management planning and increased regionalisation. It also requires that the precautionary approach, an ecosystem approach and that the best available scientific advice is used in decision-making.

For *Nephrops* fisheries targeted by the UK fleet there is currently no EU long-term management plan (LTMP) under the CFP and there is no regional or UK-wide management plan for the species or the

sector. However, an LTMP for demersal stocks in the North Sea including *Nephrops* is to be in place from 2019.

The European Commission is preparing a LTMP for Western Waters (ICES Areas 5 to 10), which is to include *Nephrops* in functional units 11 (North Minch) through to 22 (Celtic Sea and Bristol Channel). In March 2018 ICES responded to a request from the EC to provide Fmsy ranges for the species under the Western LTMP[1] as part of its development process, but the LTMP is not yet in place.

Nephrops fisheries are subject to an EU Total Allowable Catch (TAC) and technical measures as described below. The legislation that sets out the control system for ensuring compliance with the rules of the common fisheries policy is Council Regulation (EU) 1224/2009.

Total Allowable Catch

The European Commission requests independent scientific advice from ICES on the appropriate TAC in relation to MSY-related reference points. ICES provides that advice through stock assessment and review in expert working groups involving fisheries scientists from many members states (see section 3.3 for further details). The EC then considers the resulting advice when making a proposal for the following year's fishing opportunities.

Putting the proposal into legislation requires a trilogue process between the three EU institutions: the Commission, the Council of Ministers and the Parliament. This is further discussed in section 3.5.7.

As described in section 3.3, the *Nephrops* fisheries are assessed in relation to functional units (FU), but TACs are applied on the basis of Management Areas that are defined by ICES divisions and sub-areas. The Irish Sea, West of Scotland and North Sea management areas each contain more than one FU, which creates a misalignment between scientific advice and management. ICES states the following in its advice on *Nephrops* fisheries:

"Functional Units are defined by groupings of statistical rectangles according to the present knowledge of the distribution of Nephrops stocks. Management Areas are defined using, as far as possible, existing ICES Subarea and Division boundaries. ICES provides catch advice by Functional Units. However, under the existing quota system, a TAC is often set for an area that is larger than the Management Area that is considered appropriate. Therefore, the present TAC areas do not allow management of the stocks in individual Functional Units in a way that takes the different levels of exploitation into account. While for some Management Areas it may be advisable to reduce exploitation, it may be admissible to increase catches in other Management Areas included within the same TAC area. If the sum of the recommended catches for the separate areas is taken as the basis for setting the TAC for the whole area, this could lead to unsustainable increases in exploitation in individual Management Areas within the TAC area."

3.5.1 UK management

The UK is leaving the EU's CFP, but it will continue to have international commitments requiring it to manage fish stocks sustainably, including the UN Law of the Sea (UNCLOS) commitment to maintaining or achieving exploitation levels in line with MSY and effective co-operation with other countries on shared stocks. The UK government's Fisheries white paper (see **Box 3**) reiterates these commitments and sets out its intentions for UK fisheries management in the future.

[1] http://ices.dk/sites/pub/Publication%20Reports/Advice/2018/Special_requests/eu.2018.04.pdf

Box 3: The Fisheries White Paper: Sustainable fisheries for future generations (Defra, 2018)

The Fisheries White Paper: Sustainable fisheries for future generations, published in July 2018, is a UK Government policy document setting out a range of fisheries policy matters and proposed new approaches to fisheries management. Below are some key aspects from the White Paper that are relevant to the UK *Nephrops* sector.

Management: Defra will review how fishing opportunities are managed in England, including use of effort systems, quota or a combination of the two approaches. It is recognised that commercial fishing opportunities are "currently regulated mainly by quota, which is the system supported by most fisheries scientists, industry representatives and other stakeholders around the world".

Maximum Sustainable Yield: the UK Government will continue to work under the principle of maximum sustainable yield and is committed to reaching 2020 targets to effectively regulate harvesting and end overfishing. In addition the UK Government supports the setting of harvest rates that restore and maintain fish stocks at least to levels that can produce MSY. This will mean agreeing catch rates that are based on the best available science, or other precautionary management measures that conserve those stocks.

Environmental management: the UK Government will pursue an ecosystem approach to fisheries management that aims for more sustainable management and accounts for, and seeks to minimise, impacts on non-commercial species and the marine environment generally.

The UK Government seeks a proportionate approach to regulation which makes sure that those who are compliant are able to fish and those that are not cannot; and that those who have the highest impact on stocks and ecosystems will be subject to the tightest requirements.

An agreed proportion of the EU TAC for each year is allocated to each member state with a fishing interest in that stock. The UK Government is the allocating authority for UK Fish Quotas which are allocated annually. The UK Government apportions the fish quotas amongst the four UK Fisheries Administrations (i.e. Northern Ireland, Scotland, England and Wales) pro-rata to the Fixed Quota Allocation (FQA) units associated with the licences administered by each Administration.

Each of the four devolved Fisheries Administrations allocates quota to its fishermen. In the UK most of the quota is allocated to Fish Producer Organisations (POs). POs are quota management and marketing organisations made up of member fishing vessels and they manage their members' quotas on their behalf.

There is also a proportion of non-sector' quota that is retained by the fisheries administration to manage catches by the under 10m fleet, such as in the Scottish creel fishery that requires weekly returns to be submitted by inshore fishermen and allows the administrations to ensure the quota allocation is not exceeded. The table below shows the quota uptake in the three areas for 2017 and illustrates that the landings do not exceed the quota.

Table 3.22 UK Nephrops quota uptake in 2017. (Source: MMO)

Area	Fleet	Landings as % of quota
North Sea	UK fleet total	74%
	Non-sector	67%
	Under 10m pool	64%
West of Scotland	UK fleet total	66%
	Non-sector	43%
	Under 10m pool	83%
Area 7	UK fleet total	70%
	Non-sector	16%
	Under 10m pool	50%

Fishermen with vessels over 10m in length are required to complete daily logbooks and landing declarations (since 2012 for over 15m vessels these are now completed and submitted electronically) that report the volume of catches in each area fished. Since 2005 the Registration of Buyers and Sellers has required all UK vessels, including those under 10m in length to provide sales notes. Sales notes are required within 48 hours of sale. A UK Electronic Reporting System hub has been set up to receive and verify these various electronic submissions.

Technical measures

Under the CFP, the EU requires member states to apply technical measures that specify how when and where a vessel may fish. Vessels targeting *Nephrops* fisheries are subject to these measures, which include:

- Minimum landing sizes and minimum conservation sizes
- Specifications for design and use of gears
- Minimum mesh sizes for nets
- Requirement of selective gears to reduce unwanted catches;
- Closed areas and seasons;
- Limitations on by-catches (catches of unwanted or non-target species)
- Measures to minimize the impact of fishing on the marine ecosystem and environment.

With the introduction of the landing obligation where all quota species should be landed irrespective of size (see below), minimum landing sizes are now termed Minimum Conservation Reference Sizes. For Nephrops, which can be landed whole or tailed at sea, the following apply: Source: MMO[2]

Norway lobster	Nephrops norvegicus	Whole area, except Region 3 and ICES VIa, VIIa: total length 87 mm, carapace length 25 mm, tail 46mm ICES VIa, VIIa; Region 3: total length 70 mm, carapace length 20 mm, tail 37mm
Norway lobster tails	Nephrops norvegicus	Whole area, except Region 3 and ICES VIa, VIIa: 46 mm ICES VIa, VIIa; Regione 3: 37 mm

Com Reg. 2012/298 is the main regulation that sets out the various technical measures (area closures, gear specifications and by-catch limits) to be applied to protect juvenile marine organisms. Additional technical measures were introduced as part of cod recovery plans in the North Sea and Irish Sea where *Nephrops* fisheries are required to use highly selective gear to minimise by-catch of cod.

With the introduction of the Landing Obligation (a ban on discarding quota species to be fully implemented from 2019), a number of regional discard plans were introduced as EU delegated regulations that set out the requirements for vessels operating in demersal fisheries in North Western Waters (which includes the Irish Sea and West of Scotland) and the North Sea. These plans establish a number of *de minimis* exemptions (e.g. 6% of nephrops can still be discarded in Area VII as increased selectivity is difficult to achieve) and survivability exemptions (e.g. *Nephrops* caught in creels can be discarded as a high proportion are expected to survive).

3.5.2 National management

At present UK fisheries legislation (set out in the UK government's Blue Book[3]) is defined by CFP requirements and associated EU regulation.

In the UK, management of fisheries is devolved to the national administrations of England, Northern Ireland, Scotland and Wales. Each national administration requires fishing vessels to hold a UK license and abide by UK and national fisheries legislation.

3.5.3 Regional management

Inshore *Nephrops* fisheries may be subject to more localised management in Scotland and England (Inshore Fisheries and Conservation Authorities). These are described further below. In Northern Ireland and Wales there is not a further level of formal management below national legislation, but localised management can be introduced through fishery orders.

[2] MMO https://www.gov.uk/government/publications/minimum-conservation-reference-sizes-mcrs/minimum-conservation-reference-sizes-mcrs-in-uk-waters

[3] See: https://www.gov.uk/government/publications/fishing-regulations-the-blue-book

Scotland

Scotland introduced Regional Inshore Fisheries Groups (RIFGs) as non-statutory bodies in 2016 with the aim of improving fisheries management in the 0-6 mile zone of Scottish waters. The groups are open to all licensed fishermen and involve a management committee of fishermen's representatives and an independent chair. The RIFGs have development management plans to improve inshore fisheries management in the areas. However, they are not management bodies, but the groups can make recommendations to Marine Scotland, which may then introduce secondary legislation on the basis of those recommendations and wider consultation.

The RIFG network includes:

- North & East Coast RIFG
- West Coast RIFG
- Outer Hebrides RIFG
- Orkney Management Group
- Shetland Shellfish Management Organisation

The intention is for these RIFGs to integrate with the regional marine planning partnerships around the Scottish coast to better ensure that fisheries sector can effectively participate in the marine planning process. The importance of *Nephrops* creel fisheries in Scotland's inshore waters means that many RIFG plans include additional measures to manage these fisheries over and above the national legislation. For example, the Outer Hebrides RIFG has proposed a pot limitation scheme in the Minches in response to reduced CPUE identified in the area. This would be introduced by Marine Scotland through secondary legislation.

England

England's inshore waters out to 6 nmiles are managed by ten Inshore Fisheries and Conservation Authorities (IFCAs). These bodies work with MMO to manage fisheries that may extend beyond the 0-6 mile zone and may introduce either IFCA or MMO byelaws to regulate fishing. This may be through introducing permitting schemes and pot limits or through defining the types of fishing activities that are allowed within closed areas, usually to protect certain species or habitat features. Emergency byelaws can be introduced in a matter of weeks to address an issue of concern and within 12 months the byelaw is either made permanent or removed.

3.5.4 Closed areas

National or regional regulations may specify area closures that are associated with European marine sites (Natura 2000 sites) or Marine Conservation Zones (MCZs) if sites have interest features that are considered vulnerable to bottom gear. These area closures are specifically to address environmental objectives they relate to preventing benthic impact on habitat features by fishing.

3.5.5 Objectives

Long term objectives

Long term fisheries and environmental objectives are set out in the CFP, which align with international commitments for fisheries at or above MSY by 2015 or 2020 by the latest. The EU also has a range of environmental legislation and directives to protect species and habitats, e.g. the Birds Directive and the Habitats Directive that require member states to establish a network of European Marine Sites and apply appropriate manage of activities in those sites.

The UK, both independently and as part of the EU, has international commitments under the United Nations Convention on the Law of the Sea (1982) that sets out the legal framework within which all activities in the oceans and seas must be carried out. Contracting states must cooperate with other states where the same stock or stocks straddle two or more EEZs, the EEZ and the high seas, or where the stock is a highly migratory species, which is the case for virtually all stocks fished by the UK.

The UK is also committed to the UN's Sustainable Development Goals, including goal 14 'life below water' to conserve and sustainably use the oceans, seas and marine resource[4]. Goal 14 includes a number of environmental and resource management targets up to 2030, including:

- By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.

The UK government's Fisheries white paper confirms that the UK will continue its international commitments after leaving the EU:

"We remain fully committed to meeting our obligations under UNCLOS, UNFSA, FAO and relevant RFMOs, multilateral environmental agreements, such as the Convention on Biological Diversity (CBD) and Convention on International Trade in Endangered Species (CITES), and the World Trade Organisation (WTO)"[5]

The UK government has also set out a 25 Year Environment Plan[6] with a number of marine targets, relevant to England, including:

- reversing the loss of marine biodiversity and, where practicable, restoring it
- increasing the proportion of protected and well-managed seas, and better managing existing protected sites
- making sure populations of key species are sustainable with appropriate age structures
- ensuring seafloor habitats are productive and sufficiently extensive to support healthy, sustainable ecosystem.

The plan proposes to work with all UK administrations and other countries that are neighbours of our seas through OSPAR in delivering these targets for the marine environment.

The Scottish National Marine Plan (NMP), published in 2015, covers marine planning matters in Scotland's inshore waters, governed by the Marine (Scotland) Act 2010 and offshore waters, governed by the Marine and Coastal Access Act 2009.

Fisheries objectives of the NMP include:

- Fish stocks are harvested sustainably (both environmentally and economically) leading to exploitation of Scotland's commercial fish stocks at MSY and with increased long-term stability;
- Discarding is tackled through the avoidance of unwanted catches and the implementation of the EU's landing obligation;
- Management of removals rather than landings, where necessary, through fully documented fisheries.
- Fisheries marine planning policies outlined in the NMP include the aim to ensure that, while taking account of the EU's CFP, Habitats Directive, Birds Directive and MSFD:
- An ecosystem-based approach to the management of fishing which ensures sustainable and resilient fish stocks and avoids damage to fragile habitats.
- Protection for vulnerable stocks (in particular for juvenile and spawning stocks through continuation of sea area closures where appropriate).
- Delivery of Scotland's international commitments in fisheries, including the ban on discards.

[4] https://www.un.org/sustainabledevelopment/oceans/
[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/722074/fisheries-wp-consult-document.pdf
[6] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

Fishery-specific objectives and management plans

There are no fishery-specific management plans in place to date, although the LTMP for North Sea demersal stocks is to be in place from 2019 and the North Western Waters LTMP is in development.

The fishery-specific objectives for the *Nephrops* fisheries are defined by the CFP regulation, which states that "For stocks for which no multiannual plan has been established, exploitation rates delivering maximum sustainable yield should be ensured by setting catch or fishing effort limits. If available data is insufficient, fisheries should be managed by using approximative parameters."

The objectives for the *Nephrops* fishery are therefore to ensure fishing mortality allows for the biomass of stocks to be at or above MSY. Further details on the North Sea multiannual plan are provided in Box 1.

3.5.6 Consultation, roles and responsibilities

Management

As described above, management of the UK *Nephrops* fishery occurs at EU, UK, devolved nation and more local levels. Defra engages with the EU and manages certain aspects of fisheries management such as licensing at a UK level, while the devolved management authorities (MMO, Marine Scotland, DEARA in Northern Ireland and the Welsh Government) implement the CFP regulations and any national legislation.

Enforcement

Control of Sea fisheries is through a range of organisations around the UK coast such as the Royal Navy (mostly for offshore activities), the MMO, Marine Scotland Compliance, DAERA and the Welsh Government. In England the IFCAs also operate their own inshore control activities.

Science

Each devolved administration is informed by government scientific bodies such as Cefas, Marine Scotland Science, AFBI and the Science Advisory Council as well as through commissioning independent research.

These fisheries scientists participate in ICES stock assessment and various ICES Working Groups, including the *Nephrops* survey working group, WGNEPS. UK scientists have a wealth of experience in the development of *Nephrops* survey techniques such as TV survey of burrow mounds.

Stakeholders

The majority of owners of Nephrops trawlers are members of Producer Organisations that manage their quota and also to some extent represent their interests. There are also national fishermen's bodies: The National Federation of Fishermen's Organisations in England (and a Northern Irish PO), the Scottish Fishermen's Federations and the Welsh Fishermen's Association. Fishermen may also be members of more localised fishermen's associations or groups and, as mentioned above, the RIFGs in Scotland are open to all licensed fishermen. Some fishermen do, however, choose to not be members of any industry groups and operate independently fishing against either their own quota held as part of the non-sector allocation or against the under 10m pool quota.

3.5.7 Decision-making process

Management authorities at EU, UK or national level are required to undertake appropriate consultation processes, including public consultation, when developing policy. The EU-level management of *Nephrops* fisheries is informed by scientific advice from ICES and the Scientific, Technical and Economic Committee on Fisheries (STECF) as well as the regional advisory councils that are made up of 60% industry groups and 40% other interest groups such as environmental NGOs. UK industry representatives are prominent members of the North Sea Advisory Councils and North Western Waters Advisory Councils that would consider matters related to the *Nephrops* fisheries in these regions. The EC requests recommendations from the Advisory Councils, who may also propose management changes directly to the EC.

ICES provides stock assessment and TAC advice on an annual basis (reiterating the disparity between FUs and TAC management area) to the European Commission, which then proposes fishing opportunities expected to be in line with this advice. These proposals are then debated and can be

amended by the Council of Ministers and the European Parliament through a Trilogue process. The trend is increasingly towards following the scientific advice, but some divergence can occur if Ministers agree that socio-economic require it, e.g. a smaller reduction in TAC. Recent years have seen the TAC set above ICES advice in the *Nephrops* fisheries. In 2017 the Area VII final TAC was set 20% above the Commission proposal, which was the same as ICES advice, but the TAC was aligned for 2018. For Area VI the TAC set is 6% above ICES advice to limit the impact of the substantial reduction proposed from the previous year (fishfix.eu, 2018[7]).

3.5.8 Monitoring compliance and enforcement

All UK vessels over 12m in length are required to have a Vessel Monitoring System (VMS) to establish their location and an increasing number of smaller vessels are being fitted with inshore VMS. These systems both inform fisheries management and support environmental management through closed areas.

The control authorities described in section 3.5.6 remotely monitor VMS, logbooks and sales notes as well as conducting at sea and in port inspections of vessels to check compliance with technical measures such as minimum sizes and gear.

The European Court of Auditors report (2017)[8] identified that the EU's fisheries control system has improved since an earlier critical report of 2007, but further improvements were recommended. Scotland was one of the areas visited to inform the report and overall the control system was found to be effective, albeit with some data errors identified in the electronic system.

3.5.9 Management Performance Evaluation

The EU fisheries management framework is reviewed every ten years as part of regular reform of the CFP, the latest being in the lead up to the 2013 reform. Independent evaluations of various aspects of the CFP regulation are undertaken regularly where EU funding is applied and the Advisory Councils can be considered external evaluation of regulations and policy.

The UK internally evaluates management performance regularly through Defra internal evaluation processes and UK government auditing. A similar process applies to the devolved administrations. The decision to leave the EU has prompted extensive evaluation of the UK's fisheries management arrangements by both internal and external groups. The Fisheries White Paper published in July 2018 sets out the government's intent for future fisheries management and this includes an intention to evaluate new proposals.

[7] http://fishfix.eu/projects.html
[8] https://www.eca.europa.eu/Lists/ECADocuments/SR17_8/SR_FISHERIES_CONTROL_EN.pdf

4 Evaluation Procedure

4.1 Assessment methodologies used

The methodology and standard of the MSC Fisheries Certification Requirements (& Guidance) v2.0, 1 October, 2014, was followed during this pre-assessment. No revisions of the default assessment tree are required.

The setup of the report follows the “MSC Pre-Assessment Reporting Template v2.1, 9 October 2017”.

4.2 Summary of site visits and meetings held during pre-assessment

This pre-assessment has been entirely informed through a desk-based exercise of evidence base review and data analysis. No face to face meetings or field activities were undertaken.

This work is part of a Fisheries Improvement Plan (FIP) with planned Steering Group meetings to inform, develop and steer Action Plans. The first Steering Group meeting is scheduled for 14 November 2018 with the following members:

- AFBI
- ANIFPO
- Associated Seafoods Ltd.
- BIM
- CIFA
- CO-OP
- DAERA
- DEFRA
- DFAM
- Fife PO
- IFG
- IoM
- Lidl
- Macduff
- Marine Conservation Society/National Trust
- Marine Scotland
- Marine Scotland Science
- Marks and Spencer
- Morrisons
- NI gear trials
- NIFPO
- Sainsbury’s
- ScotLINK
- Seachill
- Seafish
- SFF
- SFO
- SNH
- SSA
- SWFPA
- Tesco
- Waitrose
- Whitby Seafoods/Kilkeel Seafoods
- WoSPO/SAFPO
- WWF
- Young’s

4.3 Stakeholders to be consulted during a full assessment

In addition to the Steering Group members identified above, it is recommended that the following stakeholders be consulted during a future full assessment:

- National Government: Marine Scotland / MMO
- Regional fisheries governance and groups: IFCAs, Inshore Fisheries Groups
- Enforcement Officers: Marine Scotland Compliance, MMO
- Vessel Skippers: Relevant Fishermen’s Associations

- Fishery Scientists: Marine Scotland Science, ICES
- Environmental scientists: Scottish Natural Heritage
- Relevant NGOs: WWF, North Sea Foundation

4.4 Harmonisation with any overlapping MSC certified fisheries

There are no current overlapping MSC certified Nephrops fisheries.

5 Traceability (issues relevant to Chain of Custody certification)

5.1 Eligibility of fishery products to enter further Chains of Custody

As with all MSC assessments it is noted that there is a risk that catches of target species landed into ports and facilities covered by the MSC assessment, but by non-member vessels (i.e. outside of the UoC) could be sold as MSC certified product. Additionally, the same target species but caught from another adjacent stock area (once these have been defined) (and therefore not covered this assessment) maybe landed into the same ports and facilities as target species covered by the assessment. In both cases systems, will need to be in place to avoid the inclusion of non-MSC product in the Chain of Custody.

6 Preliminary evaluation of the fishery

6.1 Applicability of the default assessment tree

6.1.1 Expectations regarding use of the Risk-Based Framework (RBF)

Principle 1

For 9 out of the 12 UoCs, there are clearly defined reference points for stock abundance (MSYBtrigger) and exploitation rate (harvest rate equivalent to Fmsy proxy), and therefore there is no requirement to use the RBF for these UoCs. For the remaining UoCs covering the fisheries in Botney Gut, the Noup and Devil's Hole, a precautionary harvest rate reference point equivalent to the lower limit of the range estimated for other North Sea stocks has been defined. Whilst there are no biomass/abundance reference points defined for these UoCs, and the harvest rate reference points are not estimated specifically for the UoC, these harvest rate reference points are used to evaluate stock status and set precautionary TACs. There is no requirement therefore to use the RBF for these three UoCs.

The Risk-Based Framework (RBF) is not required for Principle 1.

Principle 2

Due to the lack of stock status reference points Performance Indicator (PI) 2.2.1 would be expected to use RBF for some of the species identified. The information available in the pre-assessment indicates that this would not be necessary for main secondary species, so this would not be required to score at the SG80 level.

6.2 Evaluation of the fishery

The MSC pre-assessment process involves a provisional evaluation against MSC Performance Indicators (PIs) and Scoring Guideposts (SGs), to inform how the fishery fares against the MSC standard and whether each PI is likely to fall within the following categories:

Table 6.1. Key to likely scoring level

Definition of scoring ranges for PI outcome estimates	Shading to be used
Information suggests fishery is not likely to meet the SG60 scoring issues.	Fail (<60)
Information suggests fishery will reach SG60 but may not meet all of the scoring issues at SG80. A condition may therefore be needed.	Pass with Condition (60-79)
Information suggests fishery is likely to exceed SG80 resulting in an unconditional pass for this PI. Fishery may meet one or more scoring issues at SG100 level.	Pass (≥80)

6.3 Summary of likely PI scoring levels

A summary of the likely PI scoring levels is provided in Table 6.2.

Table 6.2: Simplified scoring sheet

Principle	Component	PI	Performance Indicator	RBF	Likely scoring level				
Principle 1 UoAs					**FU 5**	**FU 6**	**FU 10**	**FU 34**	**All other FUs**
1	Outcome	1.1.1	Stock status	No	≥80	60-79	≥80	60-79	≥80
		1.1.2	Stock rebuilding			≥80		≥80	
	Management	1.2.1	Harvest Strategy		<60	<60	<60	<60	<60
		1.2.2	Harvest control rules & tools		60-79	60-79	60-79	60-79	60-79
		1.2.3	Information and monitoring		60-79	≥80	60-79	60-79	≥80
		1.2.4	Assessment of stock status		60-79	≥80	60-79	60-79	≥80
									Number of PIs less than 60: 1
Principle 2 UoAs					**Demersal trawl**			**Creel**	
					North Sea FU 5-10, 34	**West of S FU 11-13**	**Irish Sea FU 14-15**	**All FUs**	
2	Primary Species	2.1.1	Outcome	No	60-79	<60	<60	≥80	
		2.1.2	Management		60-79	<60	60-79	≥80	
		2.1.3	Information		≥80	≥80	≥80	≥80	
	Secondary species	2.2.1	Outcome	Yes, minor	≥80	≥80	≥80	60-79	
		2.2.2	Management		60-79	60-79	60-79	60-79	
		2.2.3	Information		≥80	≥80	≥80	≥80	
	ETP species	2.3.1	Outcome	No	<60			60-79	
		2.3.2	Management		60-79			60-79	
		2.3.3	Information		60-79			60-79	
	Habitats	2.4.1	Outcome	No	<60			≥80	
		2.4.2	Management		60-79			60-79	
		2.4.3	Information		60-79			60-79	
	Ecosystem	2.5.1	Outcome	No	60-79			≥80	
		2.5.2	Management		60-79			≥80	
		2.5.3	Information		≥80			≥80	
									Number of PIs less than 60: Trawl: 4, Creel: 0
Principle 3 UoAs					**All FUs and all gear types**				
3	Governance & policy	3.1.1	Legal and customary framework		≥80				
		3.1.2	Consultation, roles and responsibilities		≥80				
		3.1.3	Long term objectives		≥80				
	Fishery specific management system	3.2.1	Fishery specific objectives		≥80				
		3.2.2	Decision making processes		≥80				
		3.2.3	Compliance and enforcement		60-79				
		3.2.4	Management performance evaluation		≥80				
									Number of PIs less than 60: 0

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Annex 1: Pre-assessment full scoring tables

Principle 1

Evaluation Table for PI 1.1.1 – Stock status

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Stock status relative to recruitment impairment**			
	Guidepost	It is **likely** that the stock is above the point where recruitment would be impaired (PRI).	It is **highly likely** that the stock is above the PRI.	There is a **high degree of certainty** that the stock is above the PRI.
	Met?	Y (all UoCs)	Y (all UoCs except FU34) N (FU34)	Y (all UoCs except FU34) N (FU34)
b	**Stock status in relation to achievement of MSY**			
	Guidepost		The stock is at or fluctuating around a level consistent with MSY.	There is a **high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		Y (all FUs except FUs 6 & 34) N (FUs 6 & 34)	Y (FUs 8,9,11,12,13,14 & 15) N (FUs 5,6,7,10,34)
Overall PI justification		**Stock status relative to recruitment impairment** West of Scotland and Irish Sea UoCs. Although there is no formally defined biomass limit reference point for any of the UoCs, the stock is well above MSYBtrigger for all of the UoCs, and therefore it can be concluded that there is a high degree of certainty that the stock is above the PRI. North Sea UoCs. For FUs 6, 7, 8 and 9, the stock is above MSYBtrigger in 2017, and therefore it can be concluded that there is a high degree of certainty that the stock is above the PRI. For FU5, there is no defined value of MSYBtrigger, but the most recent TV survey estimated a burrow density of 0.7 Nephrops m^{-2}, and in conjunction with average annual landings over the last ten years, this represents a harvest rate of 6.3%, well below the harvest rate reference point of 7.5%. In addition, LPUE has remained stable since 2006. There is a high degree of certainty that the stock is above the PRI. For FU10 the most recent TV survey estimated a burrow density of 0.13 Nephrops m^{-2}, and in conjunction with average annual landings over the last ten years, this represents a harvest rate of 3.5%, well below the harvest rate reference point of 7.5%. There is a high degree of certainty that the stock is above the PRI. For FU34 the most recent TV survey estimated a burrow density of 0.09 Nephrops m^{-2}, and in conjunction with average annual landings over the last ten years, this represents a harvest rate of 14.5%, well above the harvest rate reference point of 7.5%. There is no sign of recruitment failure in the stock and TACs have been reduced to ensure that the harvest rate is reduced below the Fmsy proxy, and therefore it is likely that the stock is above the PRI. However the recent observed high harvest rates caused primarily by TACs being exceeded means that the SG80 is not met for this UoC.		

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue	SG 60	SG 80	SG 100
	Stock status in relation to achievement of MSY West of Scotland and Irish Sea stocks. For all UoCs the stock has been well above MSYBtrigger for all recent years and therefore the SG100 is met. North Sea stocks. For FU6 the stock is above MSYBtrigger in 2017, but has recently been below the reference point in all recent years and so it cannot be concluded that the stock is at or fluctuating at a level consistent with MSY. For FU7, the stock is significantly above MSYBtrigger, but was below that reference point in 2015, so the UoC scores 80. For FUs 8 and 9, the stock has been well above MSYBtrigger for all recent years and therefore the SG100 is met. For FUs 5 and 10, the average harvest rate over the last ten years has been well below the harvest rate reference point of 7.5%, and so the stock can be considered to be fluctuating around a level consistent with MSY. With the assumptions required to estimate harvest rate, there is not a high degree of certainty that the stock is at or above MSY. For FU34, the estimated average harvest rate has been well above the precautionary harvest rate reference point for the last ten years and it cannot be concluded that the stock is fluctuating around a level consistent with MSY.		
References	ICES 2017a; 2018a.		
RBF Required? (✓/✗)	No	**Likely PI Scoring Level (<60, 60-79, ≥ 80)**	60-79 FUs 6 & 34 ≥ 80 All FUs except FUs 6 & 34)

Stock Status relative to Reference Points			
	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Reference point used in scoring stock relative to PRI (SIa)	No explicit biomass limit reference point defined	N/A	N/A
Reference point used in scoring stock relative to MSY (SIb)	MSYBtrigger Harvest ratio equivalent to Fmsy proxy	North Minch (FU11): MSYBtrigger 540 million Harvest rate 10.8% South Minch (FU12): MSYBtrigger 1020 million Harvest rate 11.7% Clyde / Jura (FU13): MSYBtrigger 580 / 160 million Harvest rate 15.1%/12.0% Irish Sea East (FU14): MSYBtrigger 350 million Harvest rate 11.0% Irish Sea West (FU15): MSYBtrigger 3 billion Harvest rate 18.2% Botney Gut (FU5): MSYBtrigger not defined Harvest rate 7.5% Farn Deeps (FU6): MSYBtrigger 858 million Harvest rate 8.12% Fladen (FU7): MSYBtrigger 2767 million	North Minch (FU11): Stock = 1.89 x MSYBtrigger Harvest rate = 0.99 x Fmsy South Minch (FU12): Stock = 1.36 x MSYBtrigger Harvest rate = 0.81 x Fmsy Clyde / Jura (FU13): Stock = 2.7 x MSYBtrigger (Clyde) = 1.91 x MSYBtrigger (Jura) Harvest rate = 1.17 x Fmsy Irish Sea East (FU14): Stock = 1.66 x MSYBtrigger Harvest rate = 0.43 x Fmsy Irish Sea West (FU15): Stock = 1.78 x MSYBtrigger Harvest rate = 0.97 x Fmsy Botney Gut (FU5): Stock N/A Harvest rate = 0.84 x Fmsy Farn Deeps (FU6): Stock = 1.05 x MSYBtrigger Harvest rate = 0.96 x Fmsy Fladen (FU7): Stock = 2.54 x MSYBtrigger

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue	SG 60	SG 80	SG 100
		Harvest rate 7.5% Firth of Forth (FU8): MSYBtrigger 292 million Harvest rate 16.3% Moray Firth (FU9): MSYBtrigger 262 million Harvest rate 11.8% Noup (FU10): MSYBtrigger not defined Harvest rate 7.5% Devil's Hole (FU34): MSYBtrigger not defined Harvest rate 7.5%	Harvest rate = 0.41 x Fmsy Firth of Forth (FU8): Stock = 2.29 x MSYBtrigger Harvest rate = 1.21 x Fmsy Moray Firth (FU9): Stock = 1.57 x MSYBtrigger Harvest rate = 0.89 x Fmsy Noup (FU10): Stock N/A Harvest rate = 0.16 x Fmsy (based on 2015-2017 landings) Devil's Hole (FU34): Stock N/A Harvest rate = 1.80 x Fmsy (based on 2015-2107 landings)

Evaluation Table for PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	**Rebuilding timeframes**			
	Guidepost	A rebuilding timeframe is specified for the stock that is **the shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	Y		N
b	**Rebuilding evaluation**			
	Guidepost	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is **strong** evidence that the rebuilding strategies are rebuilding stocks, **or it is highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	Y	Y	N
Overall PI justification		FUs 6 and 34 only. The rebuilding strategy is to set TACs based on a harvest rate equivalent to fishing at Fmsy, and therefore the stock should be rebuilt to MSY within two generations. The stock could be rebuilt at a faster rate if the TAC was set at a lower level than that equivalent to Fmsy. The SG100 is not met therefore for scoring issue (a). There are monitoring strategies in place in both UoCs to determine whether the stock is being rebuilt. There is evidence that the stock in FU6 is already being rebuilt as it has recently increased to above MSYBtrigger, and for both UoCs the strategy of setting the TACs based upon a precautionary Fmsy proxy should ensure that the stock is rebuilt within two generation times. In both UoCs there has been recent evidence of the TACs being exceeded, and therefore it is not **highly likely** that the rebuilding will be achieved within two generations unless there is strict compliance with the TACs.		
References		ICES 2017a; 2018a.		
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80 for FUs 6 and 34**

Evaluation Table for PI 1.2.1 – Harvest strategy

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Harvest strategy design**			
	Guidepost	The harvest strategy is **expected** to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	N	N	N
b	**Harvest strategy evaluation**			
	Guidepost	The harvest strategy is **likely** to work based on prior experience or plausible argument.	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been **fully evaluated** and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Y	N	N
c	**Harvest strategy monitoring**			
	Guidepost	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
d	**Harvest strategy review**			
	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			N
e	**Shark finning**			
	Guidepost	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
f	**Review of alternative measures**			
	Guidepost	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	Y	N	N
Overall PI justification		The harvest strategy is composed of a number of elements which work together to control the exploitation rate on the Nephrops stock. There is an annual TAC, controls on fishing effort, a minimum landing size, mesh size regulations and gear restrictions (square mesh panel) designed to minimise bycatch of cod and other commercially-exploited species and a comprehensive monitoring programme. The key element of the harvest strategy and the harvest control rule is an annual TAC based on a fishery-independent estimate of stock abundance and a target harvest ratio equivalent to a proxy for Fmsy. The TAC is adjusted		

PI 1.2.1	There is a robust and precautionary harvest strategy in place
	annually based upon the annual estimate of stock abundance from the TV survey (or based on information on annual landings and burrow density for those stocks where TV surveys are not conducted annually). In principle, the harvest strategy is therefore responsive to changes in the state of the stock, and is designed to ensure that landings do not exceed the level consistent with fishing at Fmsy and that the stock therefore fluctuates around its target reference point which is well above the level at which recruitment would be impaired. However there is a serious flaw in the overall harvest strategy in that there is a mis-match between the scale at which stocks are assessed and catch advice is provided (Functional Unit level) and the much wider scale at which TACs are set (e.g. North Sea). This mismatch could lead to uneven exploitation patterns across the various FUs resulting potentially in over-exploitation within an individual FU even though annual TACs had not been exceeded. The harvest strategy cannot therefore be expected to achieve stock management objectives reflected in PI 1.1.1, and therefore the SG60 is not met currently for scoring issue (a). The assessment team notes however that it is possible to achieve the stock management objectives through alternative harvest strategies to setting TACs at the FU level. Alternatives have been proposed through, for example, the NSAC Long Term Management Plan and the example Fishing Plan for the Farn Deeps FU. Nevertheless, the assessment team emphasizes that any harvest strategy which resulted in TACs for individual FUs being exceeded on a regular basis would not meet the minimum MSC requirements. Assuming that there is little movement of fishing effort between UoCs and therefore the harvest strategy is likely to work for most UoCs, there is some justification for the fishery meeting SG60b. Whilst for most of the UoCs, the harvest strategy appears to be maintaining stocks at target levels, there is evidence for Farn Deeps (FU6) and Devil's Hole (FU34) that TACs have been exceeded and the stocks are below levels expected if the harvest strategy was working. The harvest strategy has not been fully evaluated through, for example, a management strategy evaluation (MSE). There is a comprehensive monitoring programme in place including vessel log books, VMS, catch sampling, fishery-independent TV surveys and monitoring of landings. The harvest strategy has been regularly reviewed through review of the EU CFP, review of the TV survey methodology through WGNEP, regular ICES benchmarking workshops and the development of the multi-annual plan for the North Sea (NSMAP). However ICES has continued to state that management should be implemented at the Functional Unit level and that advice has not been implemented and there are elements of NSMAP (particularly in relation to Harvest Control Rules) that have not been implemented. SG100d is not met. There have been regular reviews of the potential effectiveness of measures such as gear design and selectivity to minimise unwanted mortality but discard rates are still high in a number of UoCs and there is evidence that there is still discarding of Nephrops above the MCRS despite the implementation of the Landing Obligation. There is therefore evidence that appropriate measures to reduce unwanted catch are not being implemented.
References	EU, 2018; ICES 2016b; 2017a; 2018a; 2018c; 2018h.

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**<60 (all UoCs)**

Evaluation Table for PI 1.2.2 – Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**HCRs design and application**			
	Guidepost	**Generally understood** HCRs are in place **or available** that are **expected** to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	**Well defined** HCRs are **in place** that **ensure** that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock **fluctuating around** a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock **fluctuating at or above** a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, **most** of the time.
	Met?	Y (all UoCs)	N (all UoCs)	
b	**HCRs robustness to uncertainty**			
	Guidepost		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a **wide** range of uncertainties including the ecological role of the stock, and there is **evidence** that the HCRs are robust to the main uncertainties.
	Met?		N	N
c	**HCRs evaluation**			
	Guidepost	There is **some evidence** that tools used **or available** to implement HCRs are appropriate and effective in controlling exploitation.	**Available evidence indicates** that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	**Evidence clearly shows** that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	Y	N	N
Overall PI justification		For the West of Scotland and Irish Sea UoCs and most of the North Sea UoCs, the key harvest control rule is that the TAC is adjusted annually based on the stock abundance estimate derived from the annual underwater TV surveys and the target harvest ratio equivalent to the Fmsy proxy estimated from the yield-per-recruit model. By maintaining the TAC at a level equivalent to fishing at Fmsy, the harvest control rule is designed to ensure that the stock fluctuates around Bmsy which is well above the level at which recruitment would be impaired. However ICES advice has not previously been based upon a reduction in exploitation rate should abundance drop below $MSYB_{trigger}$ and for all Nephrops stocks there is no formally defined limit reference point such as Blim. For North Sea stocks, the most recent ICES advice is framed in terms of the EU multi-annual plan for North Sea stocks (NSMAP), in which a range of catches is provided with an upper limit on catches based upon fishing at Fmsy and a lower limit based upon an exploitation rate which results in no more than a 5% reduction in long term yield in comparison with fishing at Fmsy. NSMAP requires that fishing mortality should be reduced below F_{MSY} if the stock falls below MSYBtrigger, and that major action, such as closing the fishery, should be taken if the stock drops below Blim. Although NSMAP will be implemented for North Sea stocks from 2019, in the absence of defined values for Blim, the HCR does not ensure that the exploitation rate is reduced as the PRI is approached. There is no similar long term management plan in place for West of Scotland and Irish Sea stocks similar to that for the North Sea stocks, and therefore the assessment team concluded that for all stocks for which there is an underwater TV survey and a target harvest ratio, the HCRs were generally understood, but cannot be considered currently to be well-defined. SG60a is met, but SG80a is not met The assessment team note however that there are current proposals to define two abundance reference points, one above the current MSYBtrigger value which acts as a threshold for remedial action, and the redefinition of the current MSYBtrigger as Blim. The Harvest Control Rule would then set TACs based on different exploitation rates dependent on the current stock status in relation		

PI 1.2.2	There are well defined and effective harvest control rules (HCRs) in place
	to the two abundance reference points. On implementation of such additional reference points and revised HCRs, the SG80a would be net. For those UoCs where there is no defined MSYBtrigger and no fishery-specific harvest ratio reference point, the HCRs can be considered to be precautionary and generally understood and should reduce the exploitation rate if the stock declines. The HCRs are therefore generally understood, but not well-defined. The HCRs are likely to be robust to some uncertainties. The estimate of stock from the TV surveys incorporates a bias correction factor, which takes account of uncertainties such as "edge effects" within the burrow counting methodology. The selection of the F_{MSY} proxy for all of the UoCs employs a highly precautionary approach. However the main uncertainty underlying the HCR is that the setting of the TAC for the whole region (e.g. North Sea) generates a significant risk that the HCR could result in the over-exploitation of individual FUs within the constraint of the overall TAC. In most UoCs the tools used to implement the HCRs (primarily TACs) have been successful in controlling exploitation rates. Even in those UoCs where the TAC has been exceeded in recent times, the TACs have been reduced significantly to ensure that the exploitation rate is reduced in future years. However overall TACs have not always been set in line with ICES advice. The Area VII TAC was set 20% above the ICES advice in 2017, and the North Sea TAC was set 6% above scientific advice in 2018. With TACs being exceeded in two UoCs in recent years, the opportunity for such events to occur in the future and overall TACs being set above scientific advice, there is not sufficient evidence to indicate that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.
References	EU, 2018; ICES 2017a; 2018a; 2018c; 2018h.

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**60-79 (all UoCs)**

Evaluation Table for PI 1.2.3 – Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	**Range of information**			
	Guidepost	**Some** relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	**Sufficient** relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Y	Y (all UoCs)	Y (all UoCs except FUs 5, 10 and 34) N (FUs 5, 10 and 34)
b	**Monitoring**			
	Guidepost	Stock abundance and UoA removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule**, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent **uncertainties** in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Y (all UoCs)	Y (all UoCs except FUs 5, 10 and 34) N (FUs 5, 10 and 34)	N (all UoCs)
c	**Comprehensiveness of information**			
	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		Y	
Overall PI justification		For West of Scotland, Irish Sea and most North Sea stocks, there is a comprehensive range of information on stock structure and stock productivity from both fishery-dependent (log books, catch sampling etc.) and fishery-independent (TV surveys) sources, the fleet composition is well known, and fishing activity is comprehensively monitored through VMS records. Biological parameters are available for stock assessment models and there has been recent work on *Nephrops* discard survival rate. Fishery removals are documented through EU logbooks and cross-checked with landings returns. In addition to information on the *Nephrops* stock and fishery, there is detailed information available on sediment types which permits evaluation of the extent of fishing activity and burrow density in relation to habitat type. In some areas, information on grain size of the various habitats may provide additional information on Nephrops size and abundance. Groundfish predator abundance is available for all areas. SG100 is met. For FUs 5, 10 and 34, the information is less comprehensive, but nevertheless sufficient to support the harvest control rule. For West of Scotland, Irish Sea and most North Sea stocks, estimates of stock abundance are available from annual TV surveys, annual trends in LPUE data are also available, and fishery removals are well-documented through EU log books and landings returns and are closely monitored to ensure that annual TACs are not exceeded. SG80 is met therefore. Whilst the uncertainties in the data are generally understood, it is not clear that there is a good understanding of the robustness of the assessment and management to these uncertainties and so SG100 is not met. For FUs 5, 10 and 34, there is no annual monitoring of stock abundance, and so SG80 is not met.		

PI 1.2.3	Relevant information is collected to support the harvest strategy	
	Fishery removals from the trawl and creel sectors of the *Nephrops* fishing fleet are well documented, and any landings of *Nephrops* using other gear should be recorded on EU logbooks. It is unlikely that any catches of Nephrops in the recreational fishery would be significant, but evidence of the potential level of catches would be needed to meet SG80c.	
References	ICES 2017a; 2018a; 2018b; 2018g; 2018h.	
	Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80** (all UoCs except FUs 5, 10 and 34) 60-79 (FUs 5, 10 and 34)

Evaluation Table for PI 1.2.4 – Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	**Appropriateness of assessment to stock under consideration**			
	Guidepost		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		Y (all FUs)	Y (all FUs except FUs 5,10 and 34) N (FUs 5,10 & 34)
b	**Assessment approach**			
	Guidepost	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	Y (All FUs)	Y (all FUs except FUs 5,10 and 34) N (FUs 5,10 & 34)	
c	**Uncertainty in the assessment**			
	Guidepost	The assessment **identifies major sources** of uncertainty.	The assessment **takes uncertainty into account**.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	Y (All FUs)	Y (All FUs)	N (All FUs)
d	**Evaluation of assessment**			
	Guidepost			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			N (All FUs)
e	**Peer review of assessment**			
	Guidepost		The assessment of stock status is subject to peer review.	The assessment has been **internally and externally** peer reviewed.
	Met?		Y (all FUs)	Y (all FUs)
Overall PI justification		The stock assessment method of estimating abundance of Nephrops from TV surveys takes into account the key features of Nephrops biology as it counts Nephrops burrow complexes and not individual animals and therefore provides an index of abundance which is not influenced by patterns of emergence behaviour. This approach is coupled with the use of a length-based yield-per-recruit stock assessment model to determine Fmsy proxies, which is appropriate for a species such as Nephrops which cannot be aged. The observed stock biomass and the target harvest ratio are used within the harvest control rule to set a TAC for the upcoming year. LPUE data are used as additional indicators of stock status. SG100a is met for all FUs except FUs 5, 10 & 34 where only occasional TV surveys are undertaken and harvest rate reference points are not estimated specifically for the UoA. Harvest ratio reference points equivalent to a proxy for Fmsy can be estimated specifically for Nephrops stocks, and a biomass reference point (MSYBtrigger) has been estimated from the time series of TV surveys. The assessment compares observed harvest rates and abundance estimates from TV surveys with these reference points. For all FUs other than FUs 5, 10 and 34, SG80b is met. For FUs 5, 10 & 34, the harvest rate reference points are		

PI 1.2.4	There is an adequate assessment of the stock status
	not specific to the stock. MSYBtrigger has not been defined for these stocks. SG60b is met, but SG80b is not met. Uncertainties in the biomass estimates derived from the UWTV burrow count surveys are taken into account by applying a cumulative bias correction factor and biomass estimates are presented with 95% confidence intervals. The uncertainties underlying the calculation of the target harvest ratio using a length-based cohort analysis approach are well understood. The assessment takes into account uncertainty (SG80c is met), but stock status is not evaluated relative to reference points in a probabilistic way, so SG100c is not met. Although the current method of stock assessment has been shown to be more robust than previous methods using age-based virtual population analysis (VPA) and multiple-indicator approaches, which were explored and discarded, the method of calculating a harvest ratio reference point equivalent to a proxy Fmsy is still under development by ICES and cannot therefore be considered to be tested and shown to be robust. SG100d is not met. The annual stock assessments are peer-reviewed within the relevant ICES Working Group meetings, by the ICES Review Group, STECF, and through regular ICES benchmark workshops. The TV survey methodology is constantly reviewed by ICES WGNEP. SG100e is met.
References	Campbell *et al*., 2009; Chapman and Howard, 1979; ICES, 2010a; 2016a; 2017a; 2018a.

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80** **(all FUs except FUs 5,10 and 34)** **60-79** **(FUs 5,10 & 34)**

Principle 2

DT: Demersal trawl; CR: Creel

Evaluation Table for PI 2.1.1 – Primary species outcome

PI 2.1.1		The UoA aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Main primary species stock status**			
	Guidepost	Main primary species are **likely** to be above the PRI OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.
	Met?	DT: 3N, 5Y CR: Y	DT: 5N, 3Y CR: Y	N
b	**Minor primary species stock status**			
	Guidepost			Minor primary species are highly likely to be above the PRI OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species
	Met?			N
Overall PI justification		**Demersal trawl:** the catch statistics indicate 3 main primary species: whiting, haddock and cod, all across a number of stocks, which in total equate to 8 elements. Eleven minor primary species are also identified. For the purpose of this pre-assessment, species catch of <0.2% weight is considered negligible. Based on analysis of ICES stock assessment undertaken in 2018 and informing TAC advice for 2019, 3 elements fail to meet SG60 based on the extremely low spawning stock sizes, together with rate of fishing mortality and lack of evidence that the Nephrops trawl fishery is not hindering recovery and rebuilding of the species. The elements that do not meet SG60 are: • Whiting in 6a West of Scotland • Whiting in 7a Irish Sea • Cod in 6a West of Scotland The two further cod stocks meet SG60, but not SG80 based on SSB being close to Blim values. Two haddock stocks (4, 6a and 7a) and one whiting stock (4) meet SG80. Overall demersal trawl fails to reach SG60, although it should be noted that those Nephrops functional units within North Sea would reach >SG60.		

<table>
<tr><td>PI 2.1.1</td><td colspan="3">The UoA aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.</td></tr>
<tr><td></td><td colspan="3">Summary of whiting, haddock and cod status in the North Sea, West of Scotland and Irish Sea is provided below.
<table><tr><td>Species</td><td>North Sea
FUs: 5-10, 34</td><td>West of Scotland
FUs: 11-13</td><td>Irish Sea
FUs: 14-15</td></tr><tr><td>Whiting</td><td>³80</td><td><60</td><td><60</td></tr><tr><td>Haddock</td><td>³80</td><td>³80</td><td>³80</td></tr><tr><td>Cod</td><td>60-79</td><td><60</td><td>60-79</td></tr></table>
Creel: the catch statistics indicate no primary main or minor species.
A number of other shellfish species form part of the catch, which do have some management measures in place, such as a Minimum Landing Size (MLS), intended to safeguard juvenile animals. However, they do not have measures or tools intended to reach stock management objectives, such as control in effort or output controls that limit fishing mortality. As such these species are considered within the P2 secondary component.</td></tr>
<tr><td>References</td><td colspan="3">ICES, 2018, stock assessments
Marine Scotland Science, 2017, Shellfish Stock Assessment
Ellis et al, 2009. IUCN, Scyliorhinus canicula</td></tr>
<tr><td>RBF Required? (✓/✗/)</td><td>No</td><td>Likely PI Scoring Level (<60, 60-79, ≥ 80)</td><td>DT: FUs 5-10, 34: 60-79
DT: FUs 11-15: <60
CR: ≥ 80</td></tr>
</table>

Evaluation Table for PI 2.1.2 – Primary species management strategy

PI 2.1.2		There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guidepost	There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to above the point where recruitment would be impaired.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the point where recruitment would be impaired.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	DT: N CR: Y	DT: N CR: Y	N
b	**Management strategy evaluation**			
	Guidepost	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	DT: N CR: Y	DT: N CR: Y	N
c	**Management strategy implementation**			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).
	Met?		DT: Y CR: Y	N
d	**Shark finning**			
	Guidepost	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
e	**Review of alternative measures**			
	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.
	Met?	DT: Y CR: Not relevant	DT: N CR: Not relevant	DT: N CR: Not relevant
Overall PI justification		Demersal trawl: There are a range of measures in place for managing the main primary species landed in conjunction with the Nephrops trawl fishery. These include: TACs and quota system and technical measures including use of sorting grid and square mesh panels.		

PI 2.1.2	**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**
	However, stock assessments for three of the main species elements indicate that spawning stock sizes remain very low, with no evidence of rebuilding. Furthermore, Nephrops trawl are indicated as being a key fishery responsible for bycatch of these species. ICES has issued scientific advice for zero catch in 2019 for five stocks, three of which are main primary species associated with the nephrops trawl fishery: West of Scotland cod and whiting and Irish Sea whiting. Cod West of Scotland: F is currently high and above F_{lim} and ICES advise zero catch of this stock in 2019 (ICES, 2017). The latest advice available is June 2017, which provides catch scenarios for 2018 to predict SSB in 2019. In order to determine whether catches of 1,396 tonnes would hinder stock recover, updated advice is required, which will present the scenario for SSB in 2020, based on 2019 catch rates. If the 2017 catch scenario is followed, then F_{pa} results in a total catch in 2018 of 1464 tonnes, which allows for growth in SSB from 2018 (2,835 tonnes) to 2019 (3,365 tonnes). If predictions are accurate and parameters remain the same, then it could be expected that the proposal of 1,396 tonnes in 2019 would not hinder stock recovery. However, updated ICES advice is required to confirm this. Whiting West of Scotland. F is currently below F_{MSY}, however, ICES advise zero catch of this stock. TAC in 2018 was 213 tonnes and the 2019 Commission Proposal recommends a by-catch exclusive TAC of 1,238 tonnes. ICES catch scenario based on total catch in 2018 of 1283 tonnes and SSB (2019) of 26,646 tonnes, shows that in 2019 a zero catch results in SSB (2020) = 24,239 tonnes, the alternative scenario of F at F2018 rate, (equating to total catch of 1171 tonnes in 2019), results in SSB (2020) = 22,939 tonnes. Both 2019 scenarios (zero catch and catch of 1171 tonnes) result in SSB (2020) being lower than SSB (2019). **It is therefore considered that any level of fishing is hindering the stock recovery, as such SG60 is not met.** This is corroborated by a recent study on West of Scotland demersal fisheries (Baudron *et al.,* 2019), which explored Ecosystem Based Fisheries Management via a food web ecosystem model to simulate the outcomes of applying the traditional single stock fishing mortalities, and management scenarios which explored F ranges in accordance with the CFP. Through exploring fishing mortality ranges for whiting in the West of Scotland Baudron *et al.* (2019) found that "a drastic reduction of juvenile whiting bycatch is necessary for the whiting stock to recover". Whiting Irish Sea: F is currently above F_{lim} and ICES advise zero catch of this stock. TAC in 2018 was 80 tonnes and the 2019 Commission Proposal recommends a by-catch exclusive TAC of 612 tonnes. ICES catch scenario based on a total catch in 2018 of 1461 tonnes and SSB (2019) 1757 tonnes, shows that in 2019 a zero catch results in SSB (2020) = 2989 tonnes, the alternative scenario of F at F2018 rate (equating to total catch of 1385 tonnes in 2019), results in SSB (2020) = 1649 tonnes. Fishing at F_{lim} in 2019 (total catch of 928 tonnes) results in SSB (2020) = 2073 tonnes. If total catch equated to the TAC proposal of 612 tonnes, then fishery removals would not be hindering recovery – this is based on ICES catch scenarios and predictions for SSB (2020). There are measures in place that are expected to maintain or not hinder rebuilding of whiting in the Irish Sea. These are considered likely to work, but are not being implemented successfully, based on levels of total catch, including wanted and unwanted/discarded catches. Overall, it is considered that management measures are likely to work for West of Scotland cod and Irish Sea whiting, however evidence shows that this has not yet been reflected within stock sizes. Management measures are not, however expected to be likely to work for West of Scotland whiting, on account of the level of TAC (EC proposal for 1,238 tonnes, when ICES advise zero TAC), together with the modelling undertaken on whiting in the West of Scotland by Baudron *et al.* (2019) that found "a drastic reduction of juvenile whiting bycatch is necessary for the whiting stock to recover". There is evidence of the successful implementation of the management measures, and a review of the effectiveness in the form of annual stock assessments, which lead to the introduction of square mesh panels etc. However, more effort could be placed on regular

PI 2.1.2	**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
	review of the effectiveness of these measures, which are clearly not having the desired effect based on current SSB levels. Creel: There are no main or minor primary species for creel UoA and therefore SG80 for all issues is met.		
References			
		Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: FUs 5-10, 14, 15, 34: 60-79** **DT: FUs 11-13: <60** **CR: ≥ 80**

Evaluation Table for PI 2.1.3 – Primary species information

PI 2.1.3		**Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impact on main primary species**			
	Guidepost	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. OR **If RBF is used to score PI 2.1.1 for the UoA**: Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. OR **If RBF is used to score PI 2.1.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
	Met?	Y	Y	?
b	**Information adequacy for assessment of impact on minor primary species**			
	Guidepost			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			Y
c	**Information adequacy for management strategy**			
	Guidepost	Information is adequate to support **measures** to manage **main** primary species.	Information is adequate to support a **partial strategy** to manage **main** Primary species.	Information is adequate to support a **strategy** to manage **all** primary species, and evaluate with a **high degree of certainty** whether the strategy is achieving its objective.
	Met?	Y	Y	N

PI 2.1.3	**Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species**
Overall PI justification	Quantitative information is available on the catch composition and status of species associated with the UoAs under assessment including: • MMO iFISH database with landing statistics data for UK registered vessels for 2013 to 2017 with attributes for: landing year; landing month; vessel length category; country code; ICES rectangle; vessel/gear type; species; live weight (tonnes); and value. Including gear categories for 'demersal trawl/seine' and 'pot and traps'. • EU DCF database with landing and discard statistics for UK registered vessels for 2003 to 2016 with attributes for: country, regulated area, regulated gear, species, discards, landings, vessel length category, year for trawl TR2 and pots. • Finfish stock assessments undertaken annually by ICES.
References	MMO, 2018 EU DCF, 2018 ICES, 2018

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: ≥ 80** **CR: ≥ 80**

Evaluation Table for PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Main secondary species stock status**			
	Guidepost	Main Secondary species are **likely** to be within biologically based limits. OR If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that also have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are within biologically based limits.
	Met?	DT: 1Y CR: 4Y	DT: 1Y CR: 4N	N
b	**Minor secondary species stock status**			
	Guidepost			Minor secondary species are highly likely to be above biologically based limits. OR If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species
	Met?			N
Overall PI justification		**Demersal trawl:** the catch statistics indicate 1 main secondary species: Lesser spotted dogfish. Seventeen minor secondary species are also identified. For the purpose of this pre-assessment, species catch of <0.2% weight is considered negligible. While stock boundaries for lesser spotted dogfish are not defined, they are known to be one of the most abundant elasmobranch species within UK waters. They favor inshore areas based on spawning habitat preferences and are therefore somewhat limited in aerial overlap with the Nephrops trawl fishery. The IUCN status for lesser spotted dogfish is 'least concern'		

PI 2.2.1	**The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit.**		
	and it is therefore considered highly likely to be above biologically based limits for this species. The minor secondary species have not been investigated in detail, but will not cause a score to drop below SG80. **Creel:** the currently available catch statistics indicate 4 main secondary species associated with creel and pot fisheries: brown crab, velvet crab, lobster and whelk. Two minor secondary species are also identified: green crab and ballan wrasse. For the purpose of this pre-assessment, species catch of <0.2% weight is considered negligible. In most areas around Scotland, the brown crab, velvet crab and lobster stocks are being fished at levels which result in yield per recruit values not far below the maximum; fishing mortality is generally above F_{MSY}, and in some cases substantially above this level. The Marine Scotland Science stock assessment for these species concluded that for those stocks substantially above F_{MSY}, it is likely that they are recruitment overfished as well as growth overfished (Mesquita et al, 2017). For lobster, it is noted that stocks have not showed signals of systematic changes in sex ratio which has been associated with recruitment overfishing in other lobster species. While stock status for brown crab, velvet crab and lobster are unlikely to be above biologically based limits, as informed by the Marine Scotland Science stock assessment (Mesquita et al, 2017), there are measures in place designed to safeguard juvenile animals which are expected to ensure that the Nephrops UoAs do not hinder recovery and rebuilding of these species, including: • MLS and high survivability of returned animals; • Targeted fishing grounds of soft seabed of mud and sand, where Nephrops inhabit; • Size of mesh and hard-eye (entrance to creel) sized appropriately for target species; • Use of escape panels to allow juveniles to exit the creel. It is considered likely that these measures are sufficient to meet SG60 for SIa. Whelks are targeted by a different design of trap in the form of a cylindrical plastic container, compared to creels used to target Nephrops, crab and lobster. They are likely to be included within the landings dataset related to Nephrops due to statistics amalgamating different pot and creel gear types into one single category. While whelk are commonly distributed throughout all British coasts, their stock status is not well understood. However, measures, including MLS and technical gear type design are expected to ensure that Nephrops UoAs do not impact whelk stocks and thereby SG60 is met.		
References	Mesquita et al, 2017 Ellis et al, 2009		
RBF Required? (✓/×/)	Potentially for minor species.	**Likely PI Scoring Level (<60, 60-79, ≥ 80)**	**DT: ≥ 80** **CR: 60-79**

Evaluation Table for PI 2.2.2 – Secondary species management strategy

PI 2.2.2		There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guidepost	There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **strategy** in place for the UoA for managing main and minor secondary species.
	Met?	DT: Y CR: Y	DT: Y CR: N	N
b	**Management strategy evaluation**			
	Guidepost	The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.
	Met?	DT: Y CR: Y	DT: Y CR: N	N
c	**Management strategy implementation**			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).
	Met?		DT: Y CR: Y	N
d	**Shark finning**			
	Guidepost	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	DT: Y CR: Not relevant	DT: Y CR: Not relevant	DT: N CR: Not relevant
e	**Review of alternative measures to minimise mortality of unwanted catch** [Scoring issue need not be scored if are no unwanted catches of secondary species]			
	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N

PI 2.2.2	**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**
Overall PI justification	In addition to the rational provided in 2.1.2 for finfish, a number of measures are in place for shellfish species. Brown crab, velvet crab, lobster and whelk fisheries are not subject to EU TAC regulations or national quotas, although there are EU measures to restrict fishing effort. Under EU Regulations, the annual fishing effort of UK vessels over 15 m participating in the brown crab fishery is restricted to 702,292 KW days in ICES Areas 5 and 6, and 543,366 KW days in ICES Area 7 (EC, 2004). UK vessels fishing for brown crab, velvet crab, spider crab, green crab, lobster or crawfish must have a licence with a shellfish entitlement. The quantities that are permitted to be landed are not restricted. Minimum landing size (MLS) regulations designed to protect juvenile animals apply to the main commercial crab and lobster species as follows: • Brown crab: 140-160mm CW dependant on location. • Lobster: 90mm CL, and maximum landing size of 145mm in Orkney and Shetland and 155mm elsewhere • Velvet crab: 70mm CW, and prohibition of landing berried velvet crab. • Whelk: 45mm, and 75mm in Shetland. These measures are not considered to be adequate to form a partial strategy, as there is no control over effort or total removals of stock. Furthermore, there are no management actions related to specific reference points for the stocks of brown crab, lobster, velvet crab or whelk. Overall, SIa and Sib are not met.
References	EC, 2004 Mesquita et al, 2017

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: 60-79** **CR: 60-79**

Evaluation Table for PI 2.2.3 – Secondary species information

PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impacts on main secondary species**			
	Guidepost	Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and **adequate to assess** the impact of the UoA on main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status.
	Met?	Y	Y	N
b	**Information adequacy for assessment of impacts on minor secondary species**			
	Guidepost			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
	Met?			Y
c	**Information adequacy for management strategy**			
	Guidepost	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species.	Information is adequate to support a **strategy** to manage **all** secondary species, and **evaluate** with a **high degree of certainty** whether the strategy is **achieving its objective**.
	Met?	Y	Y	N
Overall PI justification		Quantitative information is available on the catch composition and status of species associated with the UoAs under assessment including: • MMO iFISH database with landing statistics data for UK registered vessels for 2013 to 2017 with attributes for: landing year; landing month; vessel length category; country code; ICES rectangle; vessel/gear type; species; live weight (tonnes); and value. Including gear categories for 'demersal trawl/seine' and 'pot and traps'. • EU DCF database with landing and discard statistics for UK registered vessels for 2003 to 2016 with attributes for: country, regulated area, regulated gear, species, discards, landings, vessel length category, year for trawl TR2 and pots. • Shellfish stock assessments based on 2012-2015 data, by Marine Scotland Science (Mesquita et al, 2017). • Finfish stock assessments undertaken annually by ICES. • Other sources including Fishbase, Marlin and IUCN assessments. While it is considered likely that all issues will meet SG80, there is potential for a recommendation related to landings data. Landing statistics for creel targeted fisheries do		

PI 2.2.3	**Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.**
	not distinguish between pot types i.e., Nephrops creel, crab and lobster creel or whelk pot. As such, the current landing statistics are likely to over-estimate the level of catch of other species when creels specifically target Nephrops. This is based on the difference in habitat preferences for Nephrops (muddy, soft sediment) compared to crab and lobster (coarse mixed sediment and rock).
References	MMO, 2018 EU DCF, 2018 ICES, 2018 Ellis et al, 2009 Fishbase MarLin

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: ≥ 80** **CR: ≥ 80**

Evaluation Table for PI 2.3.1 – ETP species outcome

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Effects of the UoA on population/stock within national or international limits, where applicable** [Scoring issue need not be scored if there are no national or international requirements that set limits for ETP species].			
	Guidepost	Where national and/or international requirements set limits for ETP species, the effects of the UoA on the population/stock are known and **likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, the **combined effects of the MSC UoAs** on the population/stock are known and **highly likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** are within these limits.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
b	**Direct effects**			
	Guidepost	Known direct effects of the UoA are likely to not **hinder recovery** of ETP species.	Known direct effects of the UoA are **highly likely** to not **hinder recovery** of ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species.
	Met?	DT: N CR: Y	DT: N CR: Y	DT: N CR: N
c	**Indirect effects**			
	Guidepost		Indirect effects have been considered and are thought to be **highly likely** to not create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.
	Met?		DT: N CR: N	DT: N CR: N
Overall PI justification		SI(a): ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas) sets limits on the acceptable level of human interaction with cetaceans, specifically harbour porpoise where a maximum limit of 1.7% of best estimate of population size is in place. Potential interaction between harbour porpoise and Nephrops trawl might arise if a harbour porpoise is unintentionally caught within the trawl net; interaction with creel is possible via entanglement with the rope connecting the fleet of creels to a surface buoy. Both forms of interaction are considered to be rare and therefore likely to be within national limits. Further work would be required to determine the combined effects of MSC UoAs on harbour porpoise stocks and therefore SG80 is not met. SI(b): A number of ray species are included within the catch statistics for Nephrops trawl including: thornback ray, cuckoo ray, spotted ray, blonde ray and starry ray. None of the ETP ray species, common skate, white skate and undulate ray, appear in the catch statistics. It is therefore considered likely that the Nephrops trawl does not hinder recover of these ray species. The available evidence in the form of catch statistics, which include landings and some discards data, are not sufficient to allow determination of the direct effect on all ETP species, particularly invertebrates Priority Marine Features (PMF) in Scottish waters, that are vulnerable to trawl activity, as well as other cetacean species. The potential for overlap of the nephrops trawl fishery across PMF invertebrate species is not clearly understood. It is therefore unknown whether direct effects are likely to hinder recovery and the PI cannot be scored without further information on the overlap with and risk posed to the PMF invertebrate species.		

PI 2.3.1	**The UoA meets national and international requirements for the protection of ETP species** **The UoA does not hinder recovery of ETP species**		
	For the creel fishery, entanglement of cetaceans is known to occur with the rope attaching the fleet of creels on the seabed and the surface marker buoy. Northridge et al (2010) report that 11-12 baleen whales strand every year and approximately half have died due to entanglement. This includes entanglement with all types of pot and creel fisheries. Estimations of minke whale population sizes are: *c.* 8,500 in the North Sea, Celtic Sea and Skagerrak (Hammond *et al*. 1995), and 112,000 estimated in the north-east Atlantic stock, seasonally inhabiting the North, Norwegian and Barents Seas (Schweder *et al*., 1997). Based on these population sizes and estimated entanglement of 6 baleen whales per year, it is likely that the creel UoA is not hindering recovery of minke whales. SI(c): It is likely that indirect effects are unlikely to create unacceptable impacts to ETP species, including removal of nephrops as prey item. However, evidence is not available to support this to highly unlikely classification, which is required at SG80. It is recognized that nephrops are important in forming and shaping habitat features that support a range of species, including Scottish PMFs. Overall, the indirect effects of the trawl and creel gear on ETP species is not well understood. As such SG80 is not met.		
References	Northridge et al (2010)		
RBF Required? (✓/✗)		**Likely PI Scoring Level (<60, 60-79, ≥ 80)**	**DT: <60** **CR: 60-79**

Evaluation Table for PI 2.3.2 – ETP species management strategy

PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** **meet national and international requirements;** **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place (national and international requirements)** [Scoring issue need not be scored if there are no requirements for protection or rebuilding provided through national ETP legislation or international agreements].			
	Guidepost	There are **measures** in place that minimise the UoA-related mortality of ETP species, and are expected to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **comprehensive strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
b	**Management strategy in place (alternative)** [Scoring issue need not be scored if there are requirements for protection or rebuilding provided through national ETP legislation or international agreements].			
	Guidepost	There are **measures** in place that are expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **strategy** in place that is expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **comprehensive strategy** in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
c	**Management strategy evaluation**			
	Guidepost	The measures are **considered likely** to work, based on **plausible argument** (e.g., general experience, theory or comparison with similar fisheries/species).	There is an **objective basis for confidence** that the measures/strategy will work, based on **information** directly about the fishery and/or the species involved.	The strategy/comprehensive strategy is mainly based on information directly about the fishery and/or species involved, and a **quantitative analysis** supports **high confidence** that the strategy will work.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
d	**Management strategy implementation**			
	Guidepost		There is some **evidence** that the measures/strategy is being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a) or (b).
	Met?		DT: N CR: N	DT: N CR: N
	Review of alternative measures to minimize mortality of ETP species			

PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** **meet national and international requirements;** **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**		
e	**Guidepost**	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
Overall PI justification		Although the Management Strategy PIs across Principle 2 typically require a 'Partial strategy' at the SG80 level, for the ETP management PI (2.3.2) there is a requirement at the SG80 level for a 'strategy'. For ETP, management strategies should be designed to manage the impact of the fishery on the ETP component specifically. Recent UK pre-assessments (including Project Inshore and PUKFI-1) concluded that there are measures in place to manage ETP interactions (i.e. scoring at the SG60 level) but that no ETP management strategies (using the MSC definition) were in place for any fisheries. Management measures include designation of SACs for species qualifying features and subsequent management including closed area. For MPAs and SACs the structure and process is in place for identifying features requiring protecting, designating MPAs or SACs, assessing risks to the protected features and introducing appropriate management measures. It is therefore considered that SG60 is met for SI (b) and SI (c). However, it is recognized that some areas recommended for MPA designation, are yet to be designated, and that many sites do not yet have specific management developed or implemented. Despite the structure for the management being in place, measures have not yet been implemented and therefore SG80 SI(d) is not met. The review of selection grids in the Nephrops trawl fishery and gear modifications within creel fisheries, to minimize entanglement, is considered appropriate to meet SG60 for SIe. However, no regular review of the potential effectiveness and practicality of alternative measures to minimise UoA related mortality of ETP species is understood to take place.		
References				
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: 60-79** **CR: 60-79**

Evaluation Table for PI 2.3.3 – ETP species information

PI 2.3.3		**Relevant information is collected to support the management of UoA impacts on ETP species, including: Information for the development of the management strategy; Information to assess the effectiveness of the management strategy; and Information to determine the outcome status of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impacts**			
	Guidepost	Qualitative information is **adequate to estimate** the UoA related mortality on ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Qualitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species.	Quantitative information is available to assess with a high degree of certainty the **magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status** of ETP species.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
b	**Information adequacy for management strategy**			
	Guidepost	Information is adequate to support **measures** to manage the impacts on ETP species.	Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species.	Information is adequate to support a **comprehensive strategy** to manage impacts, minimize mortality and injury of ETP species, and evaluate with a **high degree of certainty** whether a strategy is achieving its objectives.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
Overall PI justification		For most ETP species there is a reasonable level of information – with species distribution, some trend information coupled with good information on fleet activity and good understanding of the potential interaction with the fleets under assessment. Although not specifically focused on the UoA it is still relevant to point to the work that has been undertaken across all fleets at a European level to improve understanding of ETP interactions – such as EU Regulation 812/2004 laying down measures concerning incidental catches of cetaceans in fisheries, which stipulates the level of monitoring required. Given the definition of certain ray species as ETP as a result of the prohibition under Council Regulation (EU) 2016/72, it will be important to address the UoA related mortality to these. However, while discard data is available, this is not considered adequate to assess the UoA related mortality to all ETP species, specifically recognizing the species ID of rays and the lack of interaction data associated with creels.		
References				
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: 60-79** **CR: 60-79**

Evaluation Table for PI 2.4.1 – Habitats outcome

PI 2.4.1		**The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Commonly encountered habitat status**			
	Guidepost	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	DT: Y CR: Y	DT: N CR: Y	DT: N CR: N
b	**VME habitat status** [Scoring issue need not be scored if there are no VMEs].			
	Guidepost	The UoA is **unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.
	Met?	DT: N CR: Y	DT: N CR: Y	DT: N CR: N
c	**Minor habitat status**			
	Guidepost			There is **evidence** that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.
	Met?			DT: N CR: N
Overall PI justification		**Demersal trawl** **<u>Commonly encountered habitats:</u>** soft muddy sediment, including fine mud, mud and muddy sand, commonly at depths 200-800m, but also <200m, including <20m in sea lochs. **<u>VMEs:</u>** VMEs within the UoA includes biogenic reefs (e.g. horse mussel), maerl beds, seagrass beds, sea pens etc, including habitats identified as Scottish Priority Marine Features (PMFs). **<u>Minor habitats:</u>** Relate to other habitats that are not VMEs and are not commonly encountered. Being a burrowing species living in or immediately on top of the seabed, trawls gears targeting Nephrops can reasonably expected to have an impact on benthic habitats, as the gear must establish close contact with the seabed in order to work efficiently. The greatest physical impact results from contact with the seabed that is made by trawl doors as well as the center weight or roller (if in twin rig arrangement); as these are pulled across the seabed they leave behind them a furrow (Hopkins, 2003) which may be detected for some time afterwards. The impact of demersal otter trawling on benthic habitats is well documented (e.g., Jennings et al 2001, Trimmer et al 2005, Hiddink et al 2006, Hopkins 2003). Effects on habitat include the removal of major physical features, reduction of structural biota, reduction in habitat complexity, changes in sea floor structure and changes to benthic communities. Each pass of the trawling gear re-suspends sediment which then may settle on and smother sessile fauna.		

PI 2.4.1	**The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.**
	Trawling tends to reduce the seabed to a flat homogenous plain. By directly or indirectly removing and flattening any relief, the seabed may lose much or its entire three-dimensional structure. Benthic communities of larger slow growing and long-lived species are removed and replaced by less diverse communities of smaller, short lived and fast-growing species. Hiddink et al. (2006) suggest that negative impacts of trawling are greatest in those areas where seabed habitats are not subject to high levels of natural disturbance. Benthic macrofauna are most affected by trawling activity; whereas burrowing and other smaller seabed infauna are less vulnerable (Bergmann & Santbrink, 2000; Dinmore et al 2004). Where trawling does not cause direct mortality to species or individual specimens, indirect consequences may arise whereby fauna is damaged or injured, making it more susceptible to being preyed upon by scavenging fauna (Kaiser & Spencer, 1994; Kenchington et al 2006). Repeated trawling of the seabed may also modify benthic production processes (Humborstad, 2004). It is known that demersal otter trawling has a significant initial effect on muddy-sand and mud habitats, but on the latter these effects have been shown to be short-lived with an apparent long-term, positive, post-trawl, disturbance response (Kaiser et al, 2006). This positive response may represent an increase in the abundance of smaller-bodied fauna, but a possible overall decrease in biomass (Jennings et al. 2001 Duplisea et al. 2002). The rates of recovery for benthic communities following intensive trawling disturbance may range from weeks to years, with rates of recovery depending on rates of immigration, recruitment and growth (Schratzberger and Jennings, 2002). Slow-growing large-biomass biota such as sponges and soft corals are known to take much longer to recover (up to 8 yr.) than biota with shorter life-spans such as polychaetes (<1 yr) (Kaiser et al., 2006). In relation to nephrops trawling, SNH advice states that “bottom trawling for nephrops is likely to cause severe physical disturbance and a decline in species richness within this habitat, with large slow growing species such as seapens particularly at risk.” Stakeholder concern has been raised in relation to nephrops trawl interaction with PMF habitats, including fan mussel aggregations, northern sea fan and sponge communities and horse mussel beds. While MPAs have been designated to protect PMF features, not all have management implemented and the extent of interaction between nephrops trawl and VMEs is unknown. Furthermore, issues have been raised related to the historical extent of VMEs, specifically fan mussel aggregations, which are a PMF habitat. When determining the point of serious or irreversible harm to VMEs, the MSC standard requires pre-existing historical extent to be considered. Specifically, under GSA3.13.4: “For VMEs the pre-existing historical extent of the habitat should be considered in the calculation of the current state of the VME in relation to unimpacted levels if the historical extent is known and if recovery in those areas of historical extent would be possible. If the habitat has been altered completely so that the pre-existing state does not exist, recovery of that state is not expected; however if recovery of the pre-existing state is possible, this should be considered. “ Further information on the historical extent of VMEs and an understanding of whether recovery in those areas would be possible is necessary to determine if this should be considered. Stakeholder comments note that fan mussel aggregations have been known to have once occurred in extensive beds, and that only one fan mussel aggregation now remains. Overall there is currently insufficient evidence to consider it unlikely that the fishery would reduce any habitat structure and function to a point where there would be serious or irreversible harm, specifically for VME habitats and also in relation to historical extent. As such SG60 for SI(b) is not meet. **Creel** In general, pots are often advocated on an environmental basis for having a lesser impact on habitat than mobile fishing gear such as trawls and dredges (Rogers et al., 1998; Hamilton, 2000; Barnette, 2001). Static gears in general have smaller and more localised impacts.

PI 2.4.1	**The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.**		
	Eno et al. (2001) examined the effects of fishing with crustacean pots and creels on benthic species in Great Britain through qualitative and quantitative experiments. This study found that the habitats and their communities appeared relatively unaffected by potting. The slow-growing, long-lived, pink sea fan *Eunicella verrucosa* were frequently observed to flex under the weight of pots as they passed and then returned back to an upright position. Quantitative studies, undertaken in south England and west Wales, were based on surveys carried out along transect lines before and after a month of pot fishing for crabs and lobsters. The results suggest that four weeks of fairly intense fishing did not have immediate detrimental effects on the abundance of the species selected for study, although some individual ross coral colonies *Pentapora foliacea* were damaged. The observations of pots and creels being dropped and hauled show clearly that these fisheries have little or no immediate effect on several species that had previously been thought to be sensitive. Other than damage sustained by large individual ross corals *P. foliacea,* Eno et al (2001) found the short-term effects of crab and lobster potting on sensitive benthic species in west Wales and Lyme Bay not to be detrimental.		
References	Barnette, 2001 Bergmann & Santbrink, 2000; Dinmore et al 2004 Duplisea et al. 2002 Eno et al. (2001) Hamilton, 2000; Hiddink et al 2006, Hopkins 2003 Humborstad, 2004 Jennings et al 2001, Kaiser & Spencer, 1994; Rogers et al., 1998; Schratzberger and Jennings, 2002 Trimmer et al 2005,		
RBF Required? (✓/✗/)		**Likely PI Scoring Level (<60, 60-79, ≥ 80)**	**DT: <60** **CR: ≥ 80**

Evaluation Table for PI 2.4.2 – Habitats management strategy

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guidepost	There are **measures** in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a **partial strategy** in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a **strategy** in place for managing the impact of all MSC UoAs/non-MSC fisheries on habitats.
	Met?	DT: Y CR: Y	DT: N CR: Y	DT: N CR: N
b	**Management strategy evaluation**			
	Guidepost	The measures are **considered likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on **information directly about the UoA and/or habitats** involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on **information directly about the UoA and/or habitats** involved.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
c	**Management strategy implementation**			
	Guidepost		There is **some quantitative evidence** that the measures/partial strategy is being implemented successfully.	There is **clear quantitative evidence** that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).
	Met?		DT: N CR: N	DT: N CR: N
d	**Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs** [Scoring issue need not be scored if there are no VMEs].			
	Guidepost	There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs.	There is **some quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is **clear quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
Overall PI justification		A network of Special Areas of Conservation (SACs) and Marine Protected Areas (MPAs) are designated and managed to protect valuable marine and coastal habitats by managing human activities in these areas. Of particular note is the East Mingulay SAC where coral reefs form the qualifying feature of the designation that overlaps with areas identified as Nephrops grounds. The biogenic reefs, covering an area of about 5.4 square kilometres, are formed of the cold-water coral, *Lophelia pertusa*. Where management measures relevant to mobile bottom-contact gears are in place within MPAs, they are well developed and enacted through Fisheries Orders and Marine Conservation Orders. Measures variously prohibit fishing from either the entire designated site, or from features of importance within the site. Restrictions are provided via closed areas, curfews, seasonal closures and limits based on vessel size.		

PI 2.4.2	**There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.**
	However, stakeholder concern has raised issues related to the lack of management within MPAs with PMF habitats, including the Small Isles MPA. Further concern is noted for PMF habitats identified that are outside MPAs, including northern sea fan aggregations, in the West Mull Sea Lochs, and Sound of Arisaig. a. Overall it is considered that the network of designated areas, including MPAs and SACs form measures, that if applied correctly would be expected to meet SG80. However, these do not form a partial strategy, as they do not form a cohesive arrangement and do not have an awareness of the need to change measures should they cease to be effective. b. While measures are considered likely to work, management has not been consistently applied across MPA sites with PMF habitats sensitive to bottom-contact gears. Furthermore, measures do not extend outside MPAs, where PMF habitats are known to exist. There is not an objective basis for confidence that management within designated sites, including closed areas, will work to protect habitats and habitat forming species. c. & d. There is not quantitative evidence to confirm that management measures are being implemented. Vessels >12m are fitted with VMS, but vessels <12m are not currently monitored (although inshore-VMS is expected in 2019-2020). Moreover, VMS may not accurately allow determination of whether a vessel is actively fishing or not, which is important for enforcing closed areas, where steaming through the area remains acceptable.
References	

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: 60-79** **CR: 60-79**

Evaluation Table for PI 2.4.3 – Habitats information

PI 2.4.3		**Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information quality**			
	Guidepost	The types and distribution of the main habitats are **broadly understood**. OR **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. OR **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	DT: Y CR: Y	DT: Y CR: Y	DT: N CR: N
	Information adequacy for assessment of impacts			

PI 2.4.3		**Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.**		
b	**Guidepost**	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	The physical impacts of the gear on all habitats have been quantified fully.
	Met?	DT: Y CR: Y	DT: N CR: N	DT: N CR: N
c	**Monitoring**			
	Guidepost		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in habitat distributions over time are measured.
	Met?		DT: Y CR: Y	DT: N CR: N
Overall PI justification		There is a high degree of knowledge in relation to habitat distribution within UK inshore and offshore waters - including vulnerable habitats and Scottish PMFs. Quantitative data and evidence are available on the benthic marine environment, extent of interaction with the UoAs under assessment and protected areas including: • EUINS and priority marine habitat mapping; • VMS and landing statistics by ICES rectangle indicating location of fishing grounds; • Network of marine protected areas and associated management However, reliable information on the spatial extent of interaction and the location of use of the fishing gear is not available for <12m vessels. As such, SI(b) does not meet SG80.		
References				
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: 60-79** **CR: 60-79**

Evaluation Table for PI 2.5.1 – Ecosystem outcome

PI 2.5.1		The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Ecosystem status**			
	Guidepost	The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Y	DT: N CR: Y	N
Overall PI justification		Nephrops is a low trophic level species and is common prey for numerous marine species. Nephrops is preyed upon by numerous species of fish and elasmobranch. Specific research on rate of Nephrops consumption includes: • Research in Scotland showed that 80% of cod had Nephrops norvegicus amongst their stomach contents (Björnsson, B. and Dombaxeb, 2004). • Nephrops was also found in 52% of the thornback ray *Raja clavata* that were sampled (Björnsson, B. and Dombaxeb, 2004). • In the Clyde, Nephrops was found in 51% of the lesser spotted dogfish *Scyliorhinus canicula* that were sampled (Gordon & De Silva, 1980). Gordon et al. studied the effects of otter trawling on benthic habitat and communities on Western Bank. Although not specific to this UoC, results indicated very limited immediate impacts on the benthic community. The structure of the colonial epifaunal assemblage was not affected by repeated trawling over three years. However, the total biomass of colonial epifauna was significantly reduced. Overall, for demersal trawl, it is expected that SG60 is met, but further information is required to demonstrate that serious harm to ecosystem function is highly unlikely to occur. Overall, for the creel fishery, it is considered highly unlikely that biodiversity, community structure and productivity are adversely impacted , however, targeted evidence of this is not available.		
References		Björnsson, B. and Dombaxeb, 2004 Gordon, J.D.M. and de Silva, 1980 Parslow-Williams et al., 2002.		
RBF Required? (✓/✗)			**Likely PI Scoring Level (<60, 60-79, ≥ 80)**	**DT: 60-79** **CR: ≥ 80**

Evaluation Table for PI 2.5.2 – Ecosystem management strategy

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guidepost	There are **measures** in place, if necessary which take into account the **potential impacts** of the fishery on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a **plan**, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place.
	Met?	Y	DT: N CR: Y	N
b	**Management strategy evaluation**			
	Guidepost	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ ecosystems).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or ecosystem involved
	Met?	Y	Y	N
c	**Management strategy implementation**			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is **clear evidence** that the partial strategy/strategy is being **implemented successfully and is achieving its objective as set out in scoring issue (a)**.
	Met?		Y	N
Overall PI justification		There is an increasing focus on ecosystem management at the EU CFP and ICES advisory level. Recent evidence for this includes the issuing of ICES mixed fisheries advice, North Sea mixed demersal multiannual plan and proposals for western waters multiannual management plan. In addition, there is considerable focus at an EU level of the marine ecosystem. For example, the EU Marine Strategy Framework Directive requires member states to assess the current state of their seas against agreed targets for 'good environmental status', including healthy fish stocks, and to establish both a programme of measures to meet these targets and a monitoring programme to measure progress. A number of measures exist that manage the interaction of the nephrops fisheries, including: • Closed areas within the Marine Protected Areas network. • Technical gear restrictions • TACs and quotas • Minimum landing sizes For creel fisheries, this is expected to restrain ecosystem impacts so as to achieve SG80 for 2.5.1. However, these measures are unlikely to qualify as a partial strategy in relation to the demersal trawl fishery and are not expected to restrain impacts across the wider ecosystem. Not all measures take appropriate account of ICES catch advice, particularly for whiting in West of Scotland where catch scenarios demonstrate that any level of catch will hinder recovery, which could subsequently have wider impacts on community structure.		

PI 2.5.2	There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.	
References		
	Likely PI Scoring Level (<60, 60-79, ≥ 80)	DT: 60-79 CR: ≥ 80

Evaluation Table for PI 2.5.3 – Ecosystem information

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information quality**			
	Guidepost	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
	Met?	Y	Y	
b	**Investigation of UoA impacts**			
	Guidepost	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but **have not been investigated** in detail.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and **some have been investigated in detail**.	Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
	Met?	Y	Y	N
c	**Understanding of component functions**			
	Guidepost		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known**.	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		Y	N
d	**Information relevance**			
	Guidepost		Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred.	Adequate information is available on the impacts of the UoA on the components **and elements** to allow the main consequences for the ecosystem to be inferred.
	Met?		Y	N
e	**Monitoring**			
	Guidepost		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		Y	N
Overall PI justification		The North Sea, West of Scotland and Irish Sea are well-studied ecosystems. Good quality information is available for key elements e.g., productivity modelling, trophic work, habitat mapping & fish stock assessment. The impacts of fisheries on these elements is adequately understood e.g., habitat damage, biomass removal, species size & maturation studies, etc. And the nature of impacted communities is understood, e.g. target and bycatch spp. (composition, volume & function), ETP e.g. skates / rays / birds are known. Consequences can be inferred from gear studies, impact assessments (and key elements in some cases), but not many specific studies. Some spatial data, seabird and cetacean surveys, hydrographic and oceanographic studies. Biodiversity assessments can show ecological risks. Information covers both fisheries-dependent and fisheries-independent variables.		
References				
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**DT: ≥ 80** **CR: ≥ 80**

Principle 3

Evaluation Table for PI 3.1.1 – Legal and/or customary framework

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it: Is capable of delivering sustainability in the UoA(s); and Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and Incorporates an appropriate dispute resolution framework.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Compatibility of laws or standards with effective management**			
	Guidepost	There is an effective national legal system **and a framework for cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and **organised and effective cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Y	Y	N
b	**Resolution of disputes**			
	Guidepost	The management system incorporates or is subject by law to a **mechanism** for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes which is **considered to be effective** in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the fishery and has been **tested and proven to be effective**.
	Met?	Y	Y	N
c	**Respect for rights**			
	Guidepost	The management system has a mechanism to **generally respect** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **observe** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Y	Y	Y
Overall PI justification		Note: it is not appropriate to score the same issue twice. P3 considers the management systems in place, while P1 deals with the specific management arrangements. The fundamental issue of management units and assessment units is addressed under P1. a. The CFP (EU Reg. 1380/2013) is the principal legislative instrument for fisheries management in the EU. The CFP commits the EU and Member States to obligations and commitments (e.g. Convention on Biological Diversity) and through European Directives, (e.g. 2008/56/EC Marine Strategy Framework Directive, 2009/147/EC Birds Directive, 92/43/ECC Habitats Directive). Fisheries rules and control systems are agreed at an EU level, then implemented by the member states through their national authorities and inspectors. Member States also adopt their own national legislation on nature conservation and Good Environmental Status (GES) Directives related to the EU directives. In summary, there are effective national legal systems and organised and effective co-operation with other parties where necessary. The binding procedures to deliver P1 outcomes are lacking (which can contribute to the situation highlighted under P1 of a mis-alignment between scientific assessment and management) and so SG 100 is not met.		

PI 3.1.1	**The management system exists within an appropriate legal and/or customary framework which ensures that it:** **Is capable of delivering sustainability in the UoA(s); and** **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** **Incorporates an appropriate dispute resolution framework.**
	b. The EU legal system provides for resolution of disputes between actors from the same or different EU member state. No evidence identified showing it has been tested and proven. c. Under the CFP, the EU management system creates, respects, and ensures legal rights, which are expressly created or established for the practices of people dependent on fishing for their food or livelihood. This equates to a formal commitment.
References	EU Reg. 1380/2013 Common Fisheries Policy 2008/56/EC Marine Strategy Framework Directive 2009/147/EC Birds Directive, 92/43/ECC Habitats Directive

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80**

Evaluation Table for PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Roles and responsibilities**			
	Guidepost	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **generally understood**.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for key areas** of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for all areas** of responsibility and interaction.
	Met?	Y	Y	N
b	**Consultation processes**			
	Guidepost	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information and **explains how it is used or not used**.
	Met?	Y	Y	N
c	**Participation**			
	Guidepost		The consultation process **provides opportunity** for all interested and affected parties to be involved.	The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement.
	Met?		Y	Y
Overall PI justification		The main report describes the roles and responsibilities in fisheries management. Organisations and their roles are well defined at EU, UK and national levels for key areas of responsibility and interaction (SG80). There are defined consultation processes at each level providing opportunity for interested and affected parties to be involved. For example the Advisory Councils operate on a 60/40 membership arrangement between industry and other groups to allow for involvement of those other groups. This facilitates their effective engagement (SG100). These regularly seek and accept relevant information (SG80), but do not always explain how it is used or not used (SG100).		
References				
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80**

Evaluation Table for PI 3.1.3 – Long term objectives

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC fisheries standard, and incorporates the precautionary approach.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Objectives**			
	Guidepost	Long-term objectives to guide decision-making, consistent with the MSC fisheries standard and the precautionary approach, are **implicit** within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach are **explicit** within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach, are **explicit** within **and required by** management policy.
	Met?	Y	Y	Y
Overall PI justification		The precautionary approach is explicit within the CFP and EU Member States policies align with this, which is required under the CFP (SG100).		
References		EU Reg. 1380/2013 Common Fisheries Policy		
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80**

Evaluation Table for PI 3.2.1 Fishery-specific objectives

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Objectives**			
	Guidepost	**Objectives**, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery-specific management system.	**Short and long-term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.	**Well defined and measurable short and long-term objectives**, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-specific management system.
	Met?	Y	Y	Partial
Overall PI justification		Note: [SA4.7.1.1] The objectives shall be assessed under this PI and the strategies that implement the objectives shall be assessed under P1 and P2. Short and long-term objectives that are consistent with P1 and P2 outcomes are explicit within the management system. This is the case for P1 objectives that apply an annual TAC (short-term) in relation to MSY-based reference points, intending to ensure the resource is at or above MSY over the long term. P2-related objectives of reducing by-catch (through technical measures and spatial management) are also explicit under the management system (such as the regional discard plans to implement the landing obligation), but these are less well defined.		
References		ICES stock assessments for Nephrops in Areas IV, VI and VII (www.ices.dk) EU Reg. 1380/2013 Common Fisheries Policy Regional discard plans for demersal fisheries in North Western Waters and the North Sea as set out in EU Delegated Regulations: https://ec.europa.eu/fisheries/cfp/fishing_rules/discards_en		
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80**

Evaluation Table for PI 3.2.2 – Decision-making processes

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Decision-making processes**			
	Guidepost	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Y	Y	
b	**Responsiveness of decision-making processes**			
	Guidepost	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Y	Y	N
c	**Use of precautionary approach**			
	Guidepost		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Y	
d	**Accountability and transparency of management system and decision-making process**			
	Guidepost	Some information on the fishery's performance and management action is generally available on request to stakeholders.	**Information on the fishery's performance and management action is available on request**, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders **provides comprehensive information on the fishery's performance and management actions** and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Y	Y	Y
e	**Approach to disputes**			
	Guidepost	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Y	Y	N

PI 3.2.2	**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.**
Overall PI justification	a. As described in the main report, there are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives. b. Those decision-making processes do respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner: the processes are documented and result in annual TACs and any necessary additional measures (e.g. cod recovery measures). Those decisions also take account of the wider implications (e.g. Council of Ministers will cite socio-economic reasons to less TAC reductions). At a UK level, the introduction of Marine Conservation Zones (MCZ) that may restrict fishing on some *Nephrops* grounds are required to consider socio-economic impacts. c. Decision-making processes use the precautionary approach and based on best available information. d. Information on the fishery's performance and management is available. At an EU level ICES advice, STECF reports and Trilogue outcomes are published. For the UK, statistics on quota uptake and landings (on MMO website) and economic performance (the Seafish fleet economic report) and all actions taken by management authorities are published. e. While no specific examples from the Nephrops fishery is known, the EU and UK systems both commit to compliance with judicial decisions.
References	ICES stock assessments **www.ices.dk** STECF reports **https://stecf.jrc.ec.europa.eu/reports** MMO Statistics **https://www.gov.uk/government/organisations/marine-management-organisation/about/statistics** Seafish economic report **http://www.seafish.org/research-economics/industry-economics/seafish-fleet-economic-performance-data**

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80**

Evaluation Table for PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.		
Scoring Issue		SG 60	SG 80	SG 100
a	**MCS implementation**			
	Guidepost	Monitoring, control and surveillance **mechanisms** exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Y	N	N
b	**Sanctions**			
	Guidepost	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	Y	Y	N
c	**Compliance**			
	Guidepost	Fishers are **generally thought** to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	**Some evidence exists** to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a **high degree of confidence** that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Y	Y	N
d	**Systematic non-compliance**			
	Guidepost		There is no evidence of systematic non-compliance.	
	Met?		Y	
Overall PI justification		Monitoring, control and surveillance mechanisms are in place for management of vessels in the *Nephrops* fisheries at EU, UK and national levels and there is reasonable expectation that they are effective. SG60 is met. Vessels over 12m in length are required to have a functioning VMS system, which enables control authorities to monitor position of vessels in relation to closed areas such as MPAs. However, vessels under 12m do not currently require VMS (although inshore VMS, i-VMS, is anticipated for all UK vessels by 2020). Furthermore, VMS does not provide an accurate determination of whether a vessel is actively fishing, thereby making it challenging to monitor whether a vessel is fishing within an MPA / closed area, or transiting through the area. As such SG80 is not met. In addition, there are questions over the ability to effectively enforce the Landing Obligation from 2019 when it will apply to all quota species. As Defra noted in August, 2018: “Defra is working with the MMO and the fishing industry to identify ways to limit the risk of ‘choke’ species closing fisheries in 2019. A choke species is one for which there is not enough quota; when this runs out it may restrict opportunities to carry on fishing for other key species for which more quota is available. The UK is also working with the European Commission and other Member States to develop other ways of limiting choke for the highest risk fisheries. These are likely to be agreed at December Council when the annual Total Allowable Catch and Quota Regulation is finalised.” Marine Scotland Compliance is also developing the control protocols required: “Marine Scotland’s marine patrol vessels and surveillance aircraft will be used to detect, as well as		

PI 3.2.3	**Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.**
	deter, discarding. We will use the intelligence and evidence gathered by these vessels and aircraft to ascertain species and the size of fish being landed, which will identify any vessels which continue to discard. We will also use enhanced profiling of catches to identify any irregularities. Marine Scotland will continue to develop other tools to aid control and enforcement through its involvement in European Union discussions with other Member States, and work to deliver a consistent and fair approach to enforcement across the Member States. Marine Scotland will be pragmatic in its enforcement, recognising that there needs to be a period of learning and adjustment when the ban takes effect. Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence. Some evidence exists to demonstrate fishers comply with the management system as control agency reports suggest non-compliance is limited. Evidence of compliance with the landing obligation should be sought from 2019 onwards. There is no evidence of systematic non-compliance.
References	MMO https://www.gov.uk/government/news/forthcoming-changes-to-fisheries-rules-highlighted MMO Compliance and Enforcement Strategy https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/317543/compliance_enforcement.pdf Marine Scotland Compliance https://www.gov.scot/Topics/marine/Sea-Fisheries/discards/demersal

Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 60-79**

Evaluation Table for PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4		**There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives.** **There is effective and timely review of the fishery-specific management system.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Evaluation coverage**			
	Guidepost	There are mechanisms in place to evaluate **some** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **key** parts of the fishery-specific management system	There are mechanisms in place to evaluate **all** parts of the fishery-specific management system.
	Met?	Y	Y	N
b	**Internal and/or external review**			
	Guidepost	The fishery-specific management system is subject to **occasional internal** review.	The fishery-specific management system is subject to **regular internal** and **occasional external** review.	The fishery-specific management system is subject to **regular internal** and **external** review.
	Met?	Y	Y	N
Overall PI justification		There are mechanisms in place to review key parts of the management system. The CFP itself is subject to review and reform over a 10-year cycle. Regulatory decisions by the EC (e.g. annual fishing opportunities) are subject to scrutiny by the Council of Ministers, the European Parliament. Management performance at EU level is also subject to evaluation by EU Council of Auditors and independent evaluations as required under the EU Better Regulations guidelines. The ICES stock assessments are also subject to a robust peer review process. At a UK level, fisheries policy is also subject to regular review, which were ongoing prior to the more extensive review triggered by Brexit. At a national level, IFCAs is England are subject to a formal evaluation cycle led by Defra. In Scotland, RIFGs and other groups such as the MASTS Fisheries Science Forum. regularly review the management in place and science being undertaken to inform that management. Northern Ireland and Wales each have Industry Advisory Committees co-ordinated by Seafish (SNIAC and SWAC) that bring together industry, scientists and managers, giving in a less formal but regular review of management performance. Seafish also co-ordinates multi-stakeholder groups in other regions of the UK Action Groups on key subjects such as the Landing Obligation. UK Management Agencies often participate in and are informed by these groups.		
References		EU Better Regulation Guidelines https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en Seafish Northern Ireland Advisory Committee http://www.seafish.org/industry-support/regional-teams/seafish-northern-ireland/seafish-northern-ireland-advisory-committee-sniac- Seafish Wales Advisory Committee http://www.seafish.org/industry-support/regional-teams/seafish-wales/seafish-wales-advisory-committee-swac- Seafish Discard Action Group http://www.seafish.org/responsible-sourcing/discussion-forums/the-discard-action-group Scottish MASTS Fisheries Scientific Forum https://www.masts.ac.uk/research/research-forums/fisheries-science-forum/		
			Likely PI Scoring Level (<60, 60-79, ≥ 80)	**≥ 80**

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