8. Fish and Shellfish

8.1. Study Area Definition

This chapter of the Scoping Report describes the potential impacts arising from the construction, operation and maintenance, and decommissioning of the Eastern Green Link 3 (EGL 3) hereafter referred to as 'the Project' on fish and shellfish. Fish and shellfish receptors include marine species, diadromous species (species which migrate between freshwater and marine environments), elasmobranchs (sharks, rays and skates), and shellfish (crustaceans and molluscs).

The Scoping Boundary for the Project extends from MHWS in England to MHWS in Scotland. It is nominally 1 km wide, 500 m either side of the centreline, but however, it widens in areas where there is still optionality in the design e.g., to allow for micro-routeing around potential seabed features. It is anticipated that the Marine Licence application boundary will ultimately be 500 m following refinement and rationalisation as the MEA and design process evolves.

There are two proposed Landfalls in England being considered at this stage of the environmental assessment process; Anderby Creek and Theddlethorpe. These options will be subject to further technical feasibility work and stakeholder consultation and will be refined to one preferred option for inclusion in the subsequent Marine Licence application for the Project.

The Study Area for this receptor includes the Scoping boundary plus an additional 15 km each side. This is a precautionary maximum zone of influence that encompasses the potential impact pathways from underwater noise and increased suspended sediment concentrations. It will be reviewed and refined for the Marine Environmental Assessment (MEA) based on maximum tidal excursions and if appropriate sediment dispersion modelling. The zone of influence will be influenced by the conclusions of Chapter 6 – Marine Physical Processes, and this chapter should be read in conjunction with these findings.

Kilometre Points (KPs) are used throughout this Chapter to provide context as to where within the Study Area a feature lies. KP 0 is defined at the Anderby Creek Landfall. As there are still alternative Landfalls being considered, KPs have been created along the longest route from the proposed English Landfall at Anderby Creek, around the Holderness Offshore Marine Conservation Zone (MCZ) to the proposed Scottish Landfall at Sandford Bay. The KPs for this route are referenced as KP0 – KP575.3. Alternative options, which branch off this longest route, are routed from the proposed English Landfall at Theddlethorpe to the point where it converges with the longest route (referenced as T_KP0 to T_KP18); and through Holderness Offshore MCZ, which is referenced as KP0 to H_KP40.

8.2. Data Sources

Data sourced for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the MEA are described in the following sub-sections.

8.2.1. Site-specific Survey Data

Extensive contemporary and historic information is available regarding fish and shellfish ecology of the North Sea. Following a detailed review to inform the scope of the data and assessment, as presented, no site-specific surveys are planned for this topic, however data from the benthic survey may provide useful data for the assessment.

8.2.2. Publicly Available Data

Desk based review of publicly available data sources (literature and GIS mapping files) will be used to describe the baseline environment. Table 8-1 lists the key data sources which will be used in the assessment.

Table 8-1: Key publicly available data sources for fish and shellfish

Data Source	Description	Coverage	
		English Study Area	Scottish Study Area
Environment Agency	Transitional and Coastal Waters (TraC) Fish Monitoring Programme	✓	✓
Department of Energy & Climate Change (DECC, 2022)	Offshore Energy Strategic Environmental Assessment 4	✓	✓
Coull *et al* (1998), Ellis *et al* (2012)	Fish Sensitivity Maps showing spawning and nursery grounds of selected fish species in UK waters	✓	✓

Data Source	Description	Coverage	
		English Study Area	Scottish Study Area
International Council for the Exploration of the Sea (ICES)	International Herring Larvae Surveys and International research reports and publications ICES Scientific Reports	✓	✓
Marine Space (2013)	Environmental Effect Pathways between Marine Aggregate Application Areas and Atlantic Herring Potential Spawning Habitat: Regional Cumulative Impact Assessments. Version 1.0. A report for the British Marine Aggregates Producers Association	✓	
Inshore Fishing and Conservation Authority	Website with Information about fishing and the species in the different regional Inshore Fishing and Conservation Authorities	✓	
FishBase	Species reference website www.fishbase.org	✓	✓
EMODnet	Interactive reference website which shows fish abundance and distribution. http://www.emodnet.eu/biology	✓	✓
Marine Management Organisation (MMO 2022)	UK Sea Fisheries annual statistics report 2021 and accompanying datasets which includes species catch list for the relevant ICES rectangles. https://assets.publishing.service.gov.uk/media/6512f96df6746b0012a4ba77/UK_Sea_Fisheries_Statistics_2022_.pdf	✓	✓
NatureScot	An executive non-departmental public body of the Scottish government responsible for the country's natural heritage. https://www.nature.scot/		✓
Marine Scotland	Scottish Government's Marine Directorate is responsible for managing Scotland's seas and freshwater fisheries https://marine.gov.scot/		✓
International Convention for the Conservation of Nature (IUCN)	The IUCN Red List of Threatened Species (https://www.iucnredlist.org/)	✓	✓
Brown & May Marine Ltd (2023)	Eastern Green Link Three and Four Transmission Reinforcement Cable Projects: Fishing Activity Report	✓	✓
Environment Agency	Ecology and Fish Data Explorer. Freshwater fish survey data, used to check presence or absence of migratory fish in catchments and estuaries EA Ecology & Fish Data Explorer	✓	
Scottish Environment Protection Agency (SEPA)	Scotland's principal environmental regulator		✓
Joint Nature Conservation Committee (JNCC)	Species specific data, of native species of conservation interest UK BAP List of UK Priority Species | JNCC Resource Hub	✓	✓
British Geological Society (BGS)	Marine Sediment Particle Size dataset sourced from the BGS GeoIndex Offshore portal GeoIndex Offshore | BGS	✓	✓

8.2.3. Additional Studies

8.2.3.1. Commercial Fishing Activity Study

A fishing activity study was undertaken by Brown & May Marine Ltd in March 2023 to understand the spatial and temporal distribution of fishing activity within the Study Area. This is described in further detail in Chapter 12 - Commercial Fisheries. Landing data from this study which outlines target species and location of key fisheries areas will be used to inform the baseline for fish and shellfish.

8.2.3.2. Herring and Sandeel Assessment

Atlantic herring (*Clupea harengus*) and Sandeel (*Ammodytes spp.*) have specific habitat preferences that limit the spatial extent of spawning. As primary prey species for higher trophic levels, it is important to understand whether there is primary habitat within the Study Area which could be utilised by the species for activities such as spawning, feeding or resting. The assessment will be based on a review of particle size analysis to be carried out on sediment samples obtained through grab sampling and vibrocoring in the Study Area. This will be supplemented with a desk-based literature review, e.g., a minimum of 10 years' worth of International Herring Larvae Surveys (IHLS) data. The assessment will follow the MEA methodology in conjunction with the approaches developed by MarineSpace et al. (2013), Latto et al (2013) and the upcoming Sandeel and Herring report by MarineSpace, to assess effects on sandeel and Atlantic herring.

8.2.3.3. Fisheries Liaison and Mitigation Action Plan (FLMAP)

A Fisheries Liaison and Mitigation Action Plan will be written which will outline how the Applicants will interact with all the legitimate sea users prior to and during any works on the Project. This will be written by Brown & May Marine Ltd who are the Fisheries Liaison Officer (FLO) for the Project.

8.3. Consultation

Consultation will be undertaken with fisheries stakeholders to supplement the desk-top review and studies. The following bodies are being consulted, as a minimum, to ensure that the most up-to-date information is collated:

Table 8-2: List of consultees

England	Scotland
MMO	MD-LOT
Centre for Environment, Fisheries and Aquaculture Science (Cefas)	Scottish Environment Protection Agency (SEPA)
Environment Agency	Scottish Fishermen's Federation (SFF)
Inshore Fisheries and Conservation Authority (IFCA) - Eastern, North-Eastern and Northumberland.	Scottish Pelagic Fishermen's Association
National Federation of Fishermen's Organisation (NFFO)	Scottish White Fish Producers Association
Fisheries Associations and Individual Fishers (as identified in Chapter 12)	Fisheries Associations and Individual Fishers (as identified in Chapter 12)

8.4. Baseline Characterisation

This section has been split into the following sub-sections:

- General species information
- English baseline characterisation
- Scottish baseline characterisation

The baseline characterisation sections include information on spawning and nursery grounds, designated sites, and protected species specific to the country Study Areas.

8.4.1. General Species Information

8.4.1.1. Overview

There have been over 330 species of fish recorded in UK waters, with the North Sea supporting a wide variety of both pelagic (species that live within the water column) and demersal (species that live or feed on the seabed) species (DECC, 2020). The species most likely to be affected by the Project are those with demersal life stages, and those sensitive to underwater noise changes e.g., hearing specialists such as clupeoids (e.g., Atlantic herring, shad, sprat).

8.4.1.2. Sensitive Demersal and Pelagic Species

The North Sea is home to important fishing grounds used not only by the local English and Scottish fleet but also by international vessels from Belgium, the Netherlands, Denmark, France, Ireland, Spain and Germany. To enable accurate monitoring the sea is divided into rectangles by the International Council for the Exploration of the Sea (ICES). Each ICES rectangle is approximately 30 NM

squared and is 30 min latitude and 1° longitude in size (ICES, 2022). The Project lies within 12 of these rectangles we have therefore only analysed the distribution data for these particular rectangles within this scoping report rather than the North Sea as a whole.

Sandeel (*Ammodytes spp.*)

Sandeel have been recorded within the Study Area and are significant due to their importance as prey species for a number of bird, fish and marine mammal species. Sandeel hibernate in specific types of seabed during the autumn and winter, particularly coarse sand or fine gravel where they bury themselves in up to 50 cm of sediment (MarLIN, 2023). They briefly emerge from hibernation between December and January to spawn. During the spring and summer, they feed in the water column during the day and then bury themselves in the seabed at night. Their lifecycle makes them sensitive to seabed disturbance, especially during hibernation season. Studies have found that sandeel are largely resident and do not disperse over distances greater than 30 km (RSPB, 2017), and that they do not migrate between grounds suggesting that they are not successful re-colonisers (Jensen et al. 2011). Sandeel are not however considered to be sensitive to increased suspended sediment concentrations and deposition.

The sandeel's environment is under threat for a number of reasons. Temperature variations can impact their metabolic rate and therefore affect reproduction and increase their mortality rate. Physical disturbances to their habitat or removal of sediment brought about by development on or nearby their habitat, and activities which can disrupt local water currents all can affect them and at the moment there is little data available on how sandeel recover from these threats.

The sandeel species Raitt's sandeel (*Ammodytes marinus*) are listed as a principal species of importance in England under Section 41 of the National Environment and Rural Communities Act (2006), meaning that they are of principal importance for the purpose of conserving or enhancing biodiversity (Defra, 2022). Sandeel are also noted in UK Biodiversity Action Plan (BAP) priority marine species of principal importance, requiring conservation due to their ecological importance as a prey species and their marked decline within the UK (a decline of 50% or more over the past 25 years or deterioration or loss of habitat) (BRIG, 2007).

Within Scottish waters there are five known species of sandeel with the most common species being Raitts sandeel (*Ammodytes marinus)* which can be found in depths over 20 m and the lesser sandeel (*Ammodytes tobianus*) who prefers shallower intertidal waters. Sandeel are a priority marine feature in Scotland and have been included as a protected feature within the Turbot Bank MPA. In Scottish waters they are considered to be threatened and/or declining (NatureScot, 2023). The Scoping Boundary lies approximately 18.8 km from Turbot Bank MPA.

The proposed submarine cable corridor crosses several known sandeel spawning grounds which are illustrated in Figure 8-1, Drawing C01494-EGL3-FISH-004.

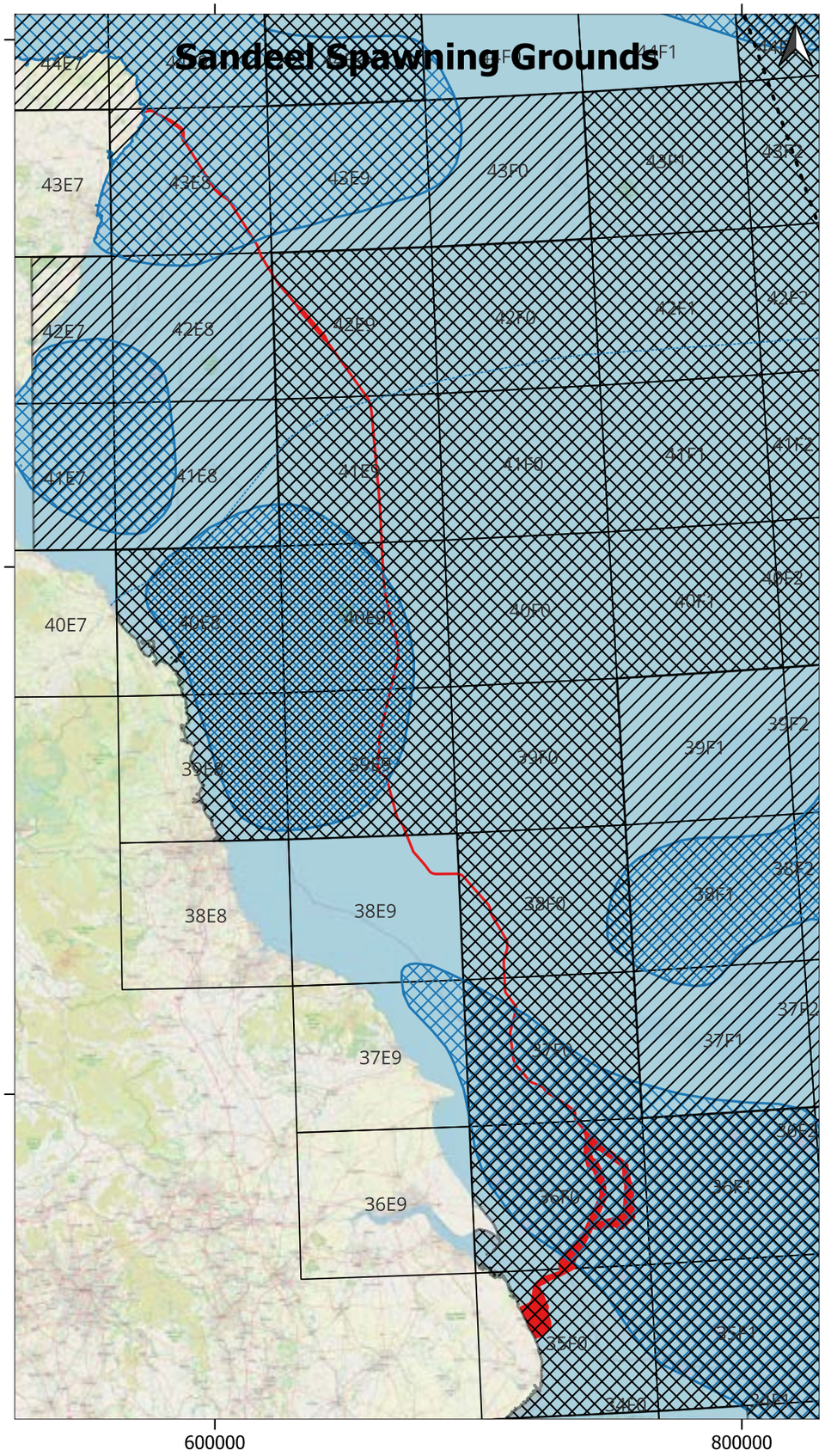
Atlantic herring (*Clupea harengus*)

Atlantic herring is a pelagic species which spawns on the seabed. As benthic spawners, the species has a specific habitat preference of gravel and partly sandy gravel (MarineSpace, 2013) which limits the spatial extent of their spawning grounds. As a result, they are particularly sensitive to any seabed disturbance. A programme of annual surveys has taken place since 1967 by the International Herring Larvae Survey (IHLS) monitoring the abundance of herring larvae (ICES, 2023). Atlantic herring numbers fluctuate annually, with Atlantic herring often abandoning and then returning to suitable areas. As a result, all suitable areas of spawning habitat are necessary to maintain a resilient population.

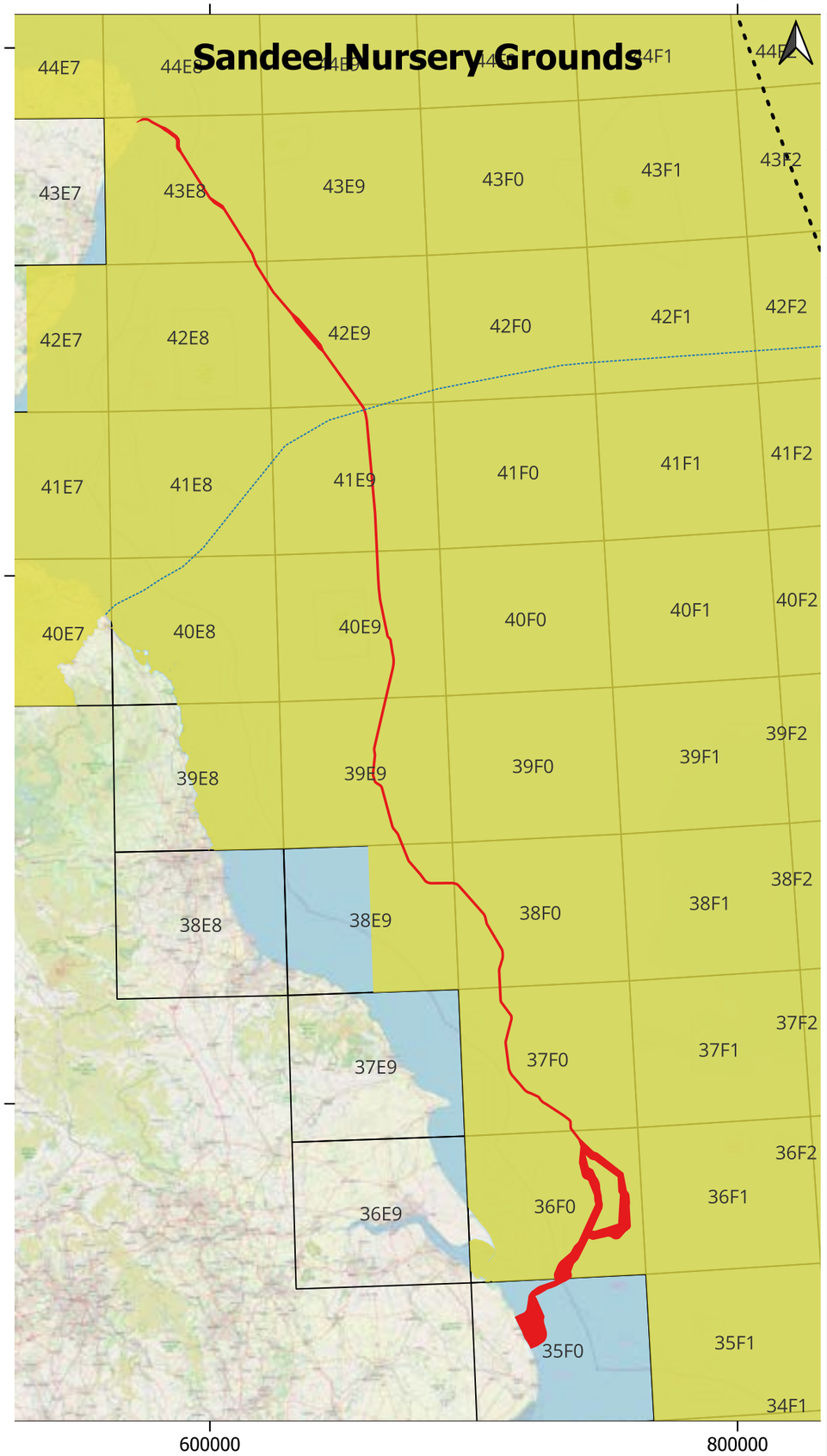
There are four main autumn/winter-spawning populations of herring located across the North Sea alongside several discrete spring-spawning stocks. The autumn-spawning grounds include the Orkney-Shetland population, the Buchan population, the Banks (or Dogger) population and the Downs / Southern Bight population (Ellis et al., 2012) and are characterised by different growth rates, recruitment patterns and migration routes. The English Study Area crosses the Banks spawning grounds and the Scottish Study Area crosses the Buchan spawning grounds.

Figures 8-2, Drawing C01494-EGL3-FISH-003, illustrates the spawning and nursery grounds for Atlantic herring.

Sandeel Spawning Grounds



Sandeel Nursery Grounds



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Sandeel Spawning and Nursery Grounds

C01494a-EGL3-FISH-004-D

- Scottish Adjacent Waters
- Exclusive Economic Zone Limit
- EGL 3 Scoping Boundary
- ICES Statistical Rectangles

Sandeel Spawning Ground (Coull et al 1998)

- Sandeel

Sandeel Spawning Ground Intensity (Ellis et al 2010)

- High
- Low

Sandeel Nursery Ground Intensity (Ellis et al 2010)

- High
- Low

0 10 20 NM

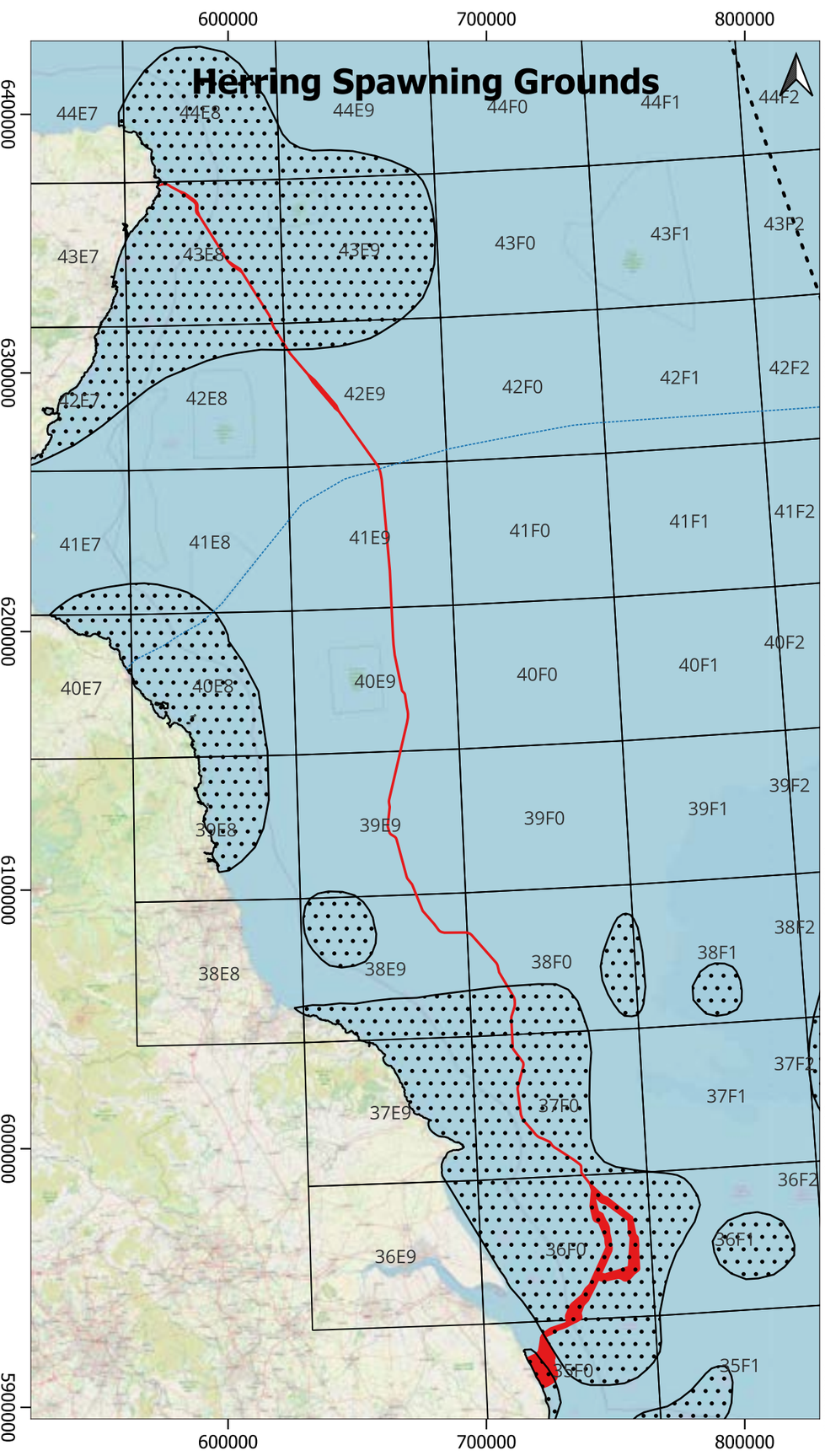
0 25 50 KM

Date	17/10/2023
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:2,000,000
Created	EP
Reviewed	DS
Authorised	AF

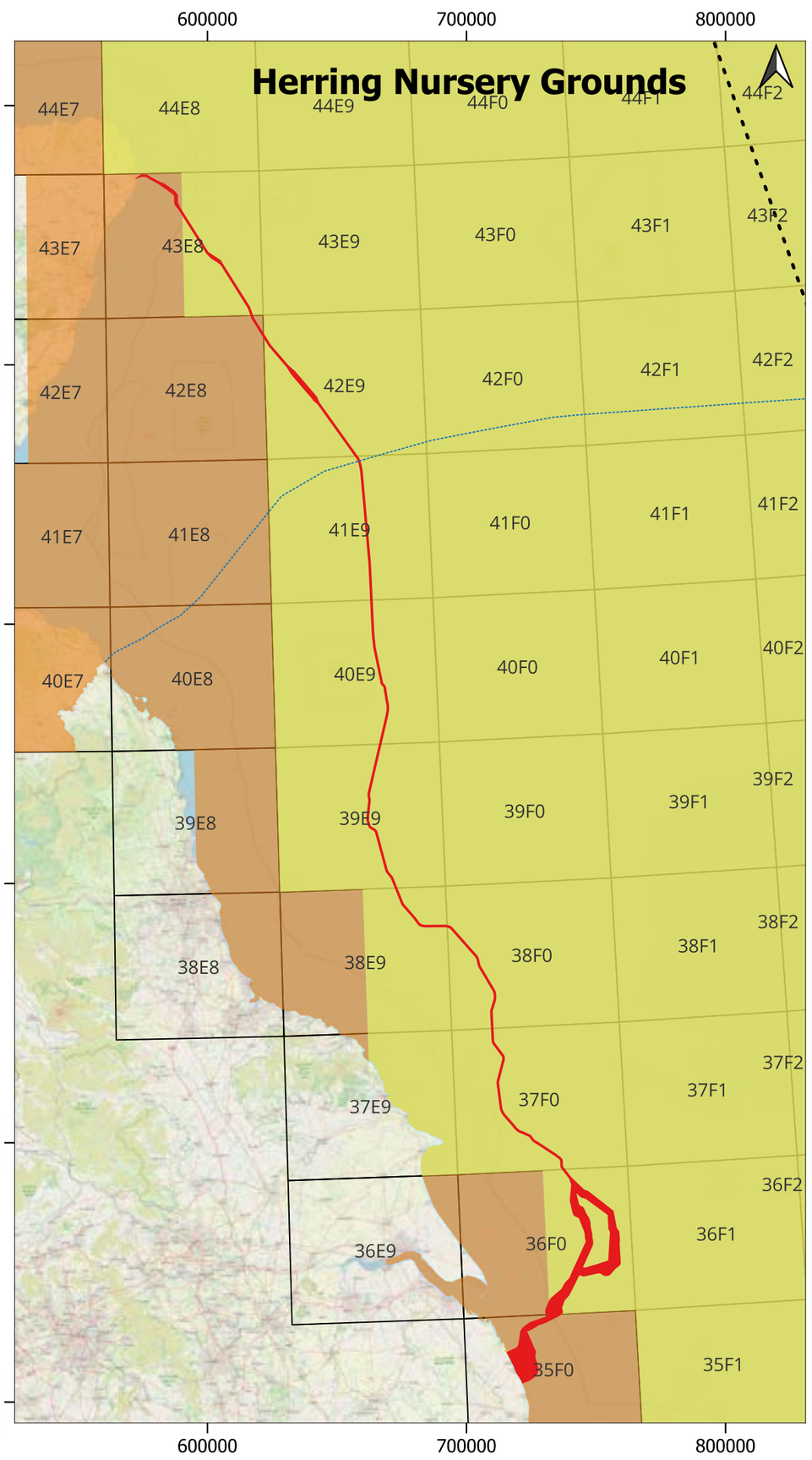
Document Path: Z:\GIS\GIS_PROJECTS\C01494_EGL3&4\Project\QGS\EGL3\07_FISH\C01494_EGL3_FISH_004.qgz

Export Date: 17/10/2023

Herring Spawning Grounds



Herring Nursery Grounds



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Herring Spawning and Nursery Grounds

C01494a-EGL3-FISH-003-D

Scottish Adjacent Waters

Exclusive Economic Zone Limit

EGL 3 Scoping Boundary

ICES Statistical Rectangles

Herring Spawning Ground Intensity
(Coull et al 1998)

High

Low

Undetermined

Herring Nursery Ground Intensity
(Ellis et al 2010)

High

Low

0 10 20 NM

0 25 50 KM

Date	17/10/2023
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:2,000,000
Created	EP
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8.4.1.3. Diadromous and Catadromous Fish

Diadromous fish migrate between salt water and fresh water, normally at the time of spawning. Catadromous fish migrate between freshwater and salt water to spawn. The English Study Area lies within the Humber Estuary SAC, close the mouth of the Rivers Ouse' Hull and Trent and as such several species of diadromous and catadromous fish are found within the Study Area. Some of these fish are on the protected species list presented in Table 8-3, including twaite and allis shad (*Alosa fallax, Alosa alosa),* Sea lamprey (*Petromyzon marinus*) and river lamprey (*Lampetra fluviatilistwaite*). The sea and river lamprey are both qualifying features of the Humber Estuary SAC which is 4.26 km from the Scoping Boundary. Allis and twaite shad are known to have spawning migrations between April and May and, although rare in the region, have been recorded in MMO annual catch statistics.

Smelt (*Osmerus eperlanus*)

Once widespread in the UK, the species is now in decline and subject to protection at certain key locations. The Northeast of Farnes Deep Highly Protected Marine Area (HPMA) provides a critical habitat for this species where it can complete some of its life cycle (gov.uk, 2023). The Scoping Boundary lies approximately 4.9 km from the HPMA.

Smelt have been seen to congregate in shoals in lower estuaries as they migrate into freshwater where they spawn in spring. The species lay their eggs onto the seabed where they adhere to gravel and stones. Smelt are known to congregate near river mouths during winter and then ascend the river between February and April for spawning before returning to the sea (MarLIN, 2023).

8.4.1.4. Elasmobranchs (Sharks, Rays and Skates)

Elasmobranchs are amongst the most vulnerable marine fish, due to their slow growth rates, late maturity, low fecundity and reproductive productivity which limits their ability for population recovery should it decline. All sharks and rays are on the OSPAR list of threated or declining species. There are a number of elasmobranchs which are regularly caught by commercial fisheries in the Study Area. These include thornback ray (*Raja clavata*), lesser spotted dogfish (*Scyliorhinus canicula*), smooth hound (*Mustelus mustelus*), and common skate (*Dipturus batis*), as well as white skate (*Rostroraja alba*) which are on the IUCN Red list.

Thornback ray are known to use the English Study Area as spawning and nursery grounds with peak spawning between April and August (see Table 8-6). Common skate, spotted ray and tope are known to use the Scottish Study Area as spawning and nursery grounds with peak spawning between April and June (see Table 8-10).

The basking shark (*Cetorhinus maximus*) is the largest fish to visit UK waters measuring up to 12 m in length. Despite its size it feeds exclusively on plankton (MarLIN, 2023). There are regular sightings in the summer months from southern Cornwall to the Scottish Isles, however sightings of basking shark within the Study Area are rare with only four sightings in the last 10 years.

8.4.1.5. Shellfish (Crustaceans and Molluscs)

Shellfish is a collective term for crustaceans (e.g., shrimp, lobsters, crabs) and molluscs (e.g., cockles, mussels, oysters, whelk) – animals which have a shell or shell-like exterior. Shellfish waters are protected areas under The Water Environment (Water Framework Directive) (WFD) (England and Wales) Regulations 2017 (as amended) (gov.uk, 2017). The English Study Area does not go through any of these protected shellfish areas. Scottish waters also have a WFD, but they use the European Union Directive 2000/60/EC (Eur-Lex, 2023) to provide protection for shellfish. The Scottish Study Area does not go through any of these protected shellfish areas.

A variety of shellfish species are targeted in the waters within the Study Area by commercial fisheries. The top five shellfish species by catch value in 2022 were lobster (*Homarus gammarus*), crab (*Cancer pagurus*), nephrops (*Nephrops norvegicus*), scallop (*Aequipecten opercularis*), and whelk (*Buccinum undatum*) (MMO, 2023). Other species targeted include squid (*Alloteuthis subulata),* brown shrimp (*Crangon crangon*), and cockles (*Cerastoderma edule*).

Ocean Quahog (*Arctica islandica*)

The ocean quahog is found around all British and Irish coasts, as well as offshore. The growth rate of quahog is rapid in juveniles but very slow and indeterminate in adults. Individual growth rates are highly variable between different regions in the North Atlantic, within sites, between seasons and daily, depending on temperature, salinity, hydrography and food supply. They are the longest-unitary species with the oldest recorded specimen found being 507 years old (MarLIN, 2023).

The ocean quahog is a burrowing species which has been found in a range of sediments, from coarse clean sand to muddy sand in a range of depths typically from 4 m to 482 m deep. Ocean quahogs are thought to have a high sensitivity to physical loss of habitat, it is therefore important to conserve the extent and distribution of supporting habitats to provide the best chance of any potential settlement for new recruits and to retain existing individuals (JNCC, 2018). As such, the Ocean Quahog is a protected species in a number of sites which are within vicinity of or within the Study Area including Holderness Offshore MCZ.

8.4.1.6. Protected Species England and Scotland

Table 8-3 lists the protection afforded to species which have been identified within the Study Areas. Some fish species are protected by several national and international conventions including:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES. Whose aim is to protect endangered plant and animal species from illegal trade and over-exploitation.
- Convention for the Protection of the Marine Environment of the North-East Atlantic – OSPAR Convention. The OSPAR Convention aims to protect the marine environment of the North-East Atlantic.
- International Union for Conservation of Nature and Natural Resources- IUCN. The IUCN Red Data list catalogues and highlights those animals and plants at high risk of global extinction.
- The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended).
- Natural Environment and Rural Communities (NERC) Act.
- Wildlife and Countryside Act 1981 (as amended in 1985).

Table 8-3: Protected species observed in the English and Scottish Study Areas

Species	International			UK			England	Scotland	
	OSPAR	CITES	IUCN	Wildlife and Countryside Act[1]	Conservation of Offshore Habitats and Species Regulations	Features of Conservation Interest (FOCI)	Species of Principal Importance	Scottish Biodiversity list	Priority Marine Features
Pelagic species									
Herring (*Clupea harengus*)			Least concern				Y	Y	Y
Horse mackerel (*Trachurus trachurus*)			Least concern				Y		Y
Mackerel (*Scomber scombrus*)			Least Concern				Y		Y
Demersal species									
Atlantic cod (*Gadus morhua*)	Y		Vulnerable				Y	Y	Y
Atlantic halibut (*Hippoglossus hippoglossus*)			Endangered				Y		Y
Bass (*Dicentrarchus labrax)*			Least concern						
Haddock (*Melanogrammus aeglefinus)*			Vulnerable						
Ling (*Molva molva*)			Least concern				Y	Y	Y
Plaice (*Pleuronectes platessa*)			Least concern				Y	Y	
Saithe (*Pollachius virens*)									Y
Sole (*Solea solea*)			Data deficient				Y		
Whiting (*Merlangius merlangus*)			Least concern				Y	Y	Y
Elasmobranch species									
Basking shark (*Cetorhinus maximus*)	Y	Appendix II	Endangered	Schedule 5			Y	Y	Y
Blonde Ray (*Raja brachyura)*			Near Threatened					Y	
Common Skate (*Raja batis*)	Y		Critically endangered				Y	Y	Y
Flapper Skate (Dipturus intermedius)	Y		Critically endangered				Y	Y	Y

Species	International			UK			England	Scotland	
	OSPAR	CITES	IUCN	Wildlife and Countryside Act[1]	Conservation of Offshore Habitats and Species Regulations	Features of Conservation Interest (FOCI)	Species of Principal Importance	Scottish Biodiversity list	Priority Marine Features
Cuckoo Ray (*Leucoraja naevus*)			Least Concern						
Lesser spotted dogfish (*Scyliorhinus canicula*)			Least Concern						
Nurse hound (*Scyliorhinus stellaris*)			Near Threatened						
Smoothhound (*Mustelus asterias*)			Near Threatened						
Spotted ray (*Raja montagui*)	Y		Least Concern						
Starry Ray (*Amblyraja radiata*)			Least Concern						
Thornback Ray (*Raja clavata*)	Y		Near Threatened					Y	
White Skate (*Rostroraja alba*)	Y		Endangered				Y		
Diadromous species									
Allis shad (*Alosa alosa*)	Y		Least Concern	Schedule 5	Annex II & V		Y	Y	
River Lamprey (*Lampetra fluviatilis*)			Least Concern		Y		Y	Y	Y
Sea Lamprey (*Petromyzon marinus*)	Y						Y		Y
Smelt (*Osmerus eperlanus*)			Least Concern			Y	Y	Y	Y
Twaite shad (*Alosa fallax*)			Least Concern	Schedule 5	Annex II & V		Y	Y	
Shellfish Species									
Cuttlefish (*Sepia officinalis*)			Least Concern						
Ocean quahog (*Arctica islandica*)	Y					Y			Y

8.4.2. English Baseline Characterisation KP 0 to KP 431.4

The Scoping Boundary for the Project crosses 12 ICES rectangles, seven of which are within the English Study Area namely 35F0, 36F0, 37F0, 38E9, 38F0, 39E9, 40E9, and one which covers both the English and Scottish Study Areas 41E9. For the purpose of this Scoping Report 41E9 has been included within the data for the English baseline. Analysis of the fishing data from the ICES rectangles has been used as an indication of the commercial fish species caught in these regions.

8.4.2.1. Landing Information

Table 8-4 shows the top four pelagic species caught in 2022 by catch weight and catch value within the English Study Area, it should be noted that for pelagic species the order is the same for catch by weight and by value. Table 8-5 shows the top five species of shellfish species caught in 2022 by catch weight and catch value within the English Study Area and Table 8-6 shows the same for demersal species.

Table 8-4: Top four pelagic species caught in 2022 within the English Study Area by weight in tonnes and value (£s)

Most caught pelagic species by weight (t) and catch value (£s)
Herring
Mackerel
Horse mackerel
Shad

Source: MMO (2023)

Table 8-5: Top five shellfish species caught in 2022 within the English Study Area by weight in tonnes and value (£s)

Most caught demersal species by weight (t)	Most caught demersal species by value (£s)
Lobster	Crabs
Crabs	Scallops
Nephrops	Lobster
Scallops	Nephrops
Whelks	Whelks

Source: MMO (2023)

Table 8-6: Top five demersal species caught in 2022 within the English Study Area by weight in tonnes and value (£s)

Most caught demersal species by weight (t)	Most caught demersal species by value (£s)
Whiting	Whiting
Haddock	Monks & Anglers
Dabs	Halibut
Monks & Anglers	Haddock
Cod	Sole

Source: MMO (2023)

8.4.2.2. Spawning and Nursery Grounds within the English Study Area

Table 8-7 summarises the species which use the English Study Area as spawning and nursery grounds and the months within which this occurs. Spawning grounds are described as the location where eggs are laid, and nursery grounds are the location where juveniles of a species are common. Information is taken from the Cefas fisheries sensitivities maps (Coull et al., 1998; Ellis et al., 2012). It also shows the intensity of 0 Group Aggregations. 0 Group aggregation species are fish within the first year of their lives (Aires et al., 2014). There is one species noted within the English Study Area which only has evidence of 0 Group aggregations which is the Norway pout (*Trisopterus esmarkii)*; there is no evidence of spawning or nursey areas within the Study Area.

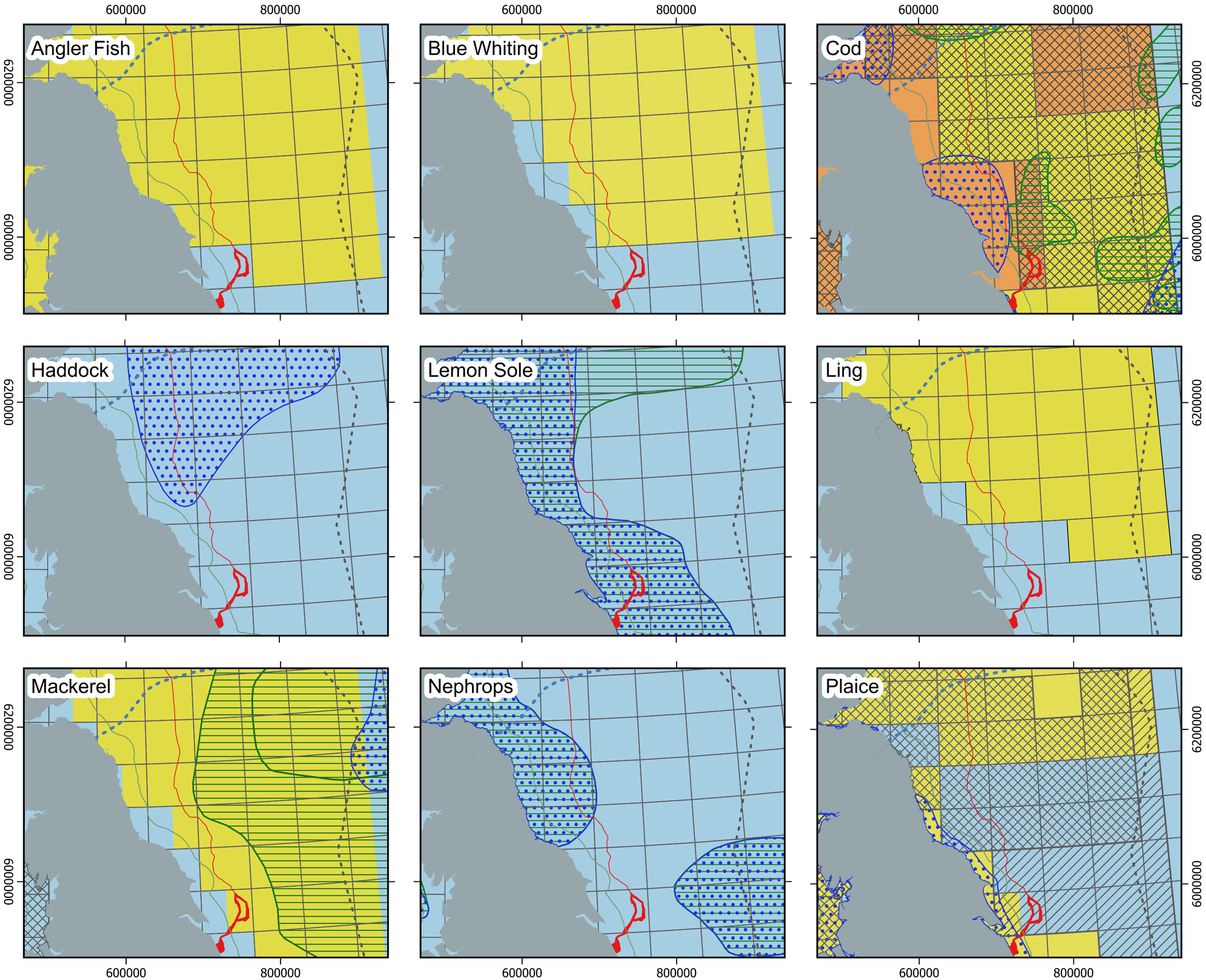
Where information is available in the form of mapped data this has been presented in Figure 8-3 (Drawing C01494-FISH-005) and Figure 8-4 (Drawing C01494-FISH-011).

Table 8-7: Spawning and Nursery grounds that overlap with the Study Area KP 0 to KP 431.4 in England

Species	Latin names	Spawning Zone	Intensity	Nursery Zone	Intensity	** Presence of Group 0 Aggregations	J	F	M	A	M	J	J	A	S	O	N	D
Anglerfish	*Lophius piscatorius*	n/a	n/a	Demersal	Low	Low												
Atlantic Cod	*Gadus morhua*	Pelagic	Low	Demersal	High	Low		*	*									
Atlantic Herring	*Clupea harengus*	Pelagic	High	Pelagic	High	Low/Medium												
Atlantic Mackerel	*Scomber scombrus*	Pelagic	Low	Pelagic	Low	Low						*	*					
Blue Whiting	*Micromesistius poutassou*	n/a	n/a	Pelagic	Low					*	*							
Common Sole	*Solea solea*	Pelagic/Demersal	Low	Demersal	Low	Low				*								
European Hake	*Merluccius merluccius*	n/a	n/a	Demersal	Low	Low		*	*									
European Plaice	*Pleuronectes platessa*	Pelagic/Demersal	High	Demersal	Low	Low	*	*										
European Sprat	*Sprattus sprattus*	Pelagic	Low	Pelagic	Low	Low/Medium												
Haddock	*Melanogrammus aeglefinus*	n/a	n/a	Demersal	Low	Medium/High		*	*	*								
Horse Mackerel	*Trachurus trachurus*	n/a	n/a	Pelagic	Low	Low					*	*						
Lemon Sole	*Microstomus kitt*	Demersal	Low	Demersal	Low													
Ling	*Molva molva*	n/a	n/a	Demersal	Low													
Nephrops	*Nephrops norvegicus*	Demersal	Low	Demersal	Low													
Norway Pout ***	*Trisopterus esmarkii*	n/a	n/a	n/a	n/a	Low	-	-	-	-	-	-	-	-	-	-	-	-
Sandeels	*Ammodytidae spp.*	Demersal	Low	Demersal	Low													
Spurdog	*Squalus acanthias*			Viviparous	Low													
Thornback ray	*Raja clavata*	Demersal	Low	Demersal	Low					*	*	*	*	*				
Whiting	*Merlangius merlangus*	Pelagic	Low	Pelagic	High	Low												

*Sources: Coull et al (1998), Ellis et al (2012), Aires (2014). * Peak Spawning. ** 0 Group fish defined as fish in the first year of their lives. *** Species only recorded as 0 Group fish within Study Area.*

	Spawning Only		Nursery Only		Both



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Fish nursery and spawning grounds with intensity of activity within the English Study Area - Map 1

C01494a-EGL3-FISH-005-D

- 12NM Limit
- Scottish Adjacent Waters
- Exclusive Economic Zone Limit
- EGL 3 Scoping Boundary
- ICES Statistical Rectangles

Spawning Grounds with Intensity (Ellis et al, 2012)
- Low
- High

Nursery Grounds with Intensity (Ellis et al, 2012)
- Low
- High

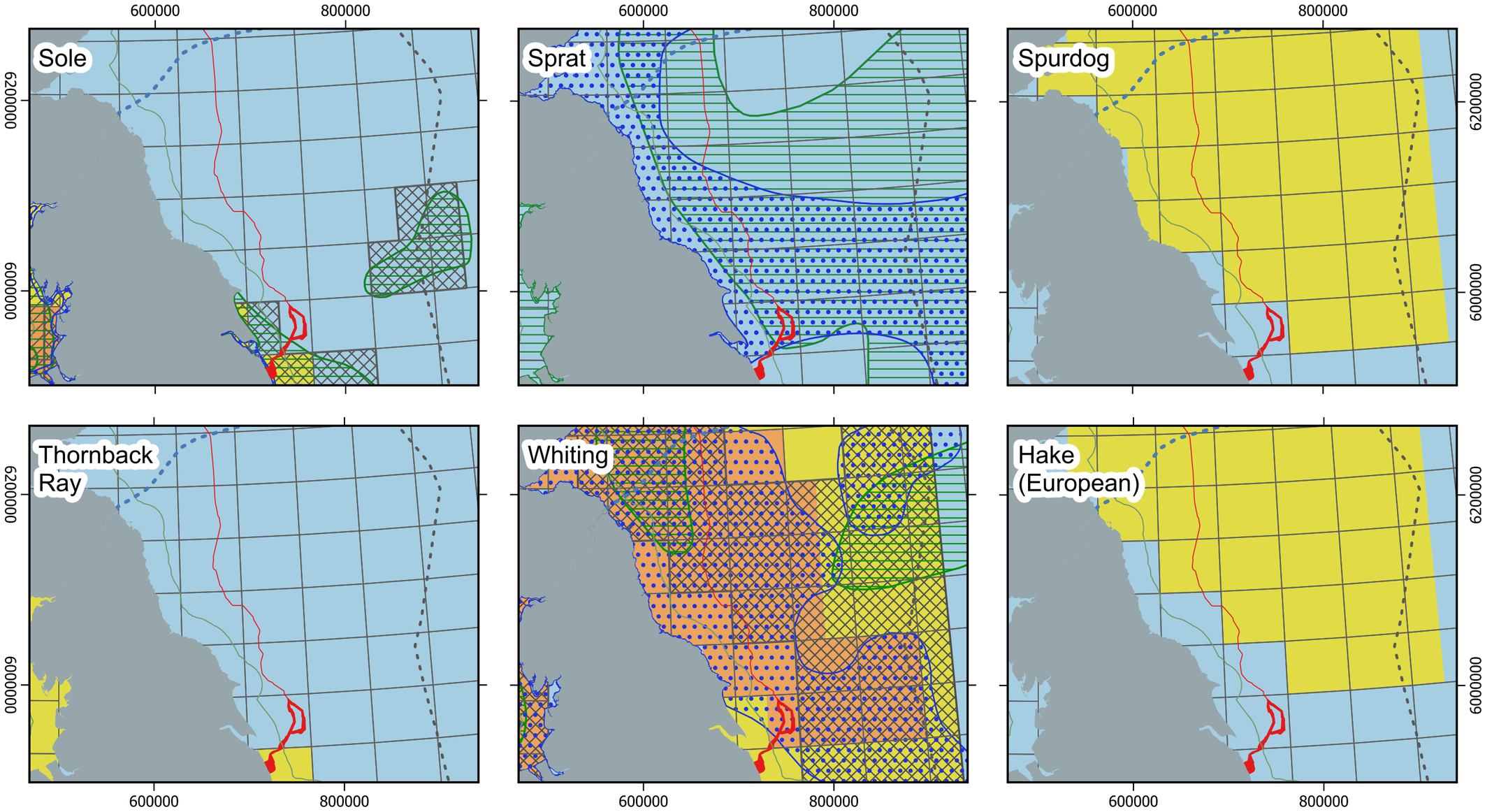
Spawning and Nursery Grounds (Coull et al, 1998)
- Spawning Grounds
- Nursery Grounds

0 20 40 km

0 20 40 NM

Date	14/11/2023
Coordinate System	ETRS89 / UTM zone 30N
Projection	Universal Transverse Mercator
Unit	meters
Scale at A3	1:4500000
Created	J Cunningham
Reviewed	D Summers/ S Pearce
Authorised	A Farley

Data Sources-UKHO-Contains public sector information licensed under the Open Government Licence v3.0. CEFAS-Spawning and Nursery Grounds Layers for Selected Fish in UK Waters in 2010/ 2012/ 1998 & Coull et al & Ellis et al (2012)-Contains public sector information licensed under the Open Government Licence v3.0. ICES-All public data are under the Creative Commons (CC BY 4.0) licence. Data correct at time of export. X:\GIS\GIS_PROJECTS\C01494_EGL3&4\Project\QGS\EGL3\07_FISH\C01494a_FISH_005.qgz



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Fish nursery and spawning grounds with intensity of activity within the English Study Area - Map 2

C01494a-EGL3-FISH-011-D

- 12NM Limit
- Scottish Adjacent Waters
- Exclusive Economic Zone Limit
- EGL 3 Scoping Boundary
- ICES Statistical Rectangles

Spawning Grounds with Intensity (Ellis et al, 2012)

- Low
- High

Nursery Grounds with Intensity (Ellis et al, 2012)

- Low
- High

Spawning & Nursery Grounds (Coull et al,1998)

- Spawning Grounds
- Nursery Grounds

0 20 40 KM

0 20 40 NM

Date	14/11/2023
Coordinate System	ETRS89 / UTM zone 30N
Projection	Universal Transverse Mercator
Unit	meters
Scale at A3	1:4500000
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8.4.2.3. Designated Sites England

Holderness Offshore MCZ

The Scoping Boundary crosses the Holderness Offshore MCZ. The MCZ covers an area of 1,176 km^2 and is located approximately 11 km offshore from the Holderness coast in the Southern North Sea region. It crosses the 12 NM territorial seas limit and overlaps with the Southern North Sea SAC (JNCC, 2019). The seabed of the Holderness Offshore MCZ is predominantly composed of sediment habitats ranging from subtidal sand to subtidal coarse sediment and contains part of a glacial tunnel valley. The varied nature of the seabed means it supports a wide range of species, both on and in the sediment, including multiple species of worms, mussel beds, sponges, starfish and crustaceans (such as crabs and shrimp). The site is also a spawning and nursery ground for a number of fish species, including lemon sole, plaice and European sprat. Ocean quahog has also been recorded within the site. The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

Humber Estuary SAC

The Scoping Boundary lies approximately 4.26 km from The Humber Estuary European Marine Site (EMS) which comprises of the Humber Estuary Special Area of Conservation (SAC), Humber Estuary Special Protection Area (SPA), Humber Estuary Ramsar Site and Humber Estuary Site of Special Scientific Interest (SSSI). The site extends for 366.57 km^2 and includes the second largest coastal plain estuary in the UK (JNCC, 2023). The estuary supports a full range of saline conditions from the open coast to the limit of saline intrusion on the tidal rivers of the Ouse and Trent. Significant, Annex II migratory fish species are present and include river lamprey and sea lamprey, which breed in the River Derwent, a tributary of the River Ouse and are protected species of the SAC. The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

As mentioned above the Humber Estuary SAC includes sea and river lamprey, Table 8-8 shows the seasonality of these species within the SAC.

Table 8-8: Seasonality of protected species in Humber Estuary SAC

Feature	Life stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
River Lamprey	Downstream Migration (Juveniles)	■	■	■	■	■	■	■	■				
River Lamprey	Spawning (Freshwater)			■	■								
River Lamprey	Upstream migration (Adults)	■	■	■				■	■	■	■	■	■
River Lamprey	Estuarine feeding	■	■	■	■	■	■	■	■	■	■	■	■
Sea Lamprey	Downstream Migration (Juveniles)	■	■	■	■						■	■	■
Sea Lamprey	Spawning (Freshwater)					■	■	■					
Sea Lamprey	Upstream migration (Adults)		■	■	■	■	■						

Source: Natural England (2018)

North East of Farnes Deep Highly Protected Marine Area (HPMA)

The Scoping Boundary lies approximately 4.9 km from the HPMA North East of Farnes Deep. The HPMA is located approximately 55 km offshore from the north Northumberland coast, in the northern North Sea. The habitats within the HPMA are relatively stable and support a diverse range of marine flora and fauna such as anemones, worms, molluscs, echinoderms and fish species. Also found here is the ocean quahog which is Feature of Conservation Importance (FOCI) and smelt (JNCC, 2023). The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

8.4.3. Scottish Baseline Characterisation KP 431.4 to KP 575.3

The Scoping Boundary within the Scottish Study Area crosses four ICES rectangles namely 42E8, 42E9, 43E8 and 44E8. Analysis of the fishing data from the ICES rectangles has been used as an indication of the commercial fish species caught in these regions.

8.4.3.1. Landing Information

Table 8-9 shows the top three pelagic species caught in 2022 by catch weight and catch value within the Scottish Study Area. It should be noted that for pelagic and shellfish species the order is the same for catch by weight and by value.

Table 8-10 shows the top five species of shellfish species caught in 2022 within the Scottish Study Area and Table 8-11 shows the same for demersal species by catch weight and catch value.

Table 8-9: Top three pelagic species caught in 2022 within the Scottish Study Area by weight in tonnes and value

Most caught pelagic species by weight (t) and catch value (£'s)
Herring
Mackerel
Horse mackerel

Source: MMO (2023)

Table 8-10: Top five shellfish species caught in 2022 within the Scottish Study Area by weight in tonnes and value

Most caught pelagic species by weight (t) and catch value (£'s)
Nephrops
Scallops
Crabs
Squid
Lobsters

Source: MMO (2023)

Table 8-11: Top five demersal species caught in 2022 within the Scottish Study Area by weight in tonnes and value

Most caught demersal species by weight (t)	Most caught demersal species by value (£'s)
Haddock	Haddock
Whiting	Monks & Anglers
Monks & Anglers	Whiting
Plaice	Cod
Hake	Plaice

Source: MMO (2023)

8.4.3.2. Spawning and Nursery Grounds Scotland

Table 8-12 summarises the species which use the Scottish Study Area as spawning and nursery grounds and the months within which this occurs. Also listed are the 0 Group Aggregation fish species which are noted to be within the Study Area.

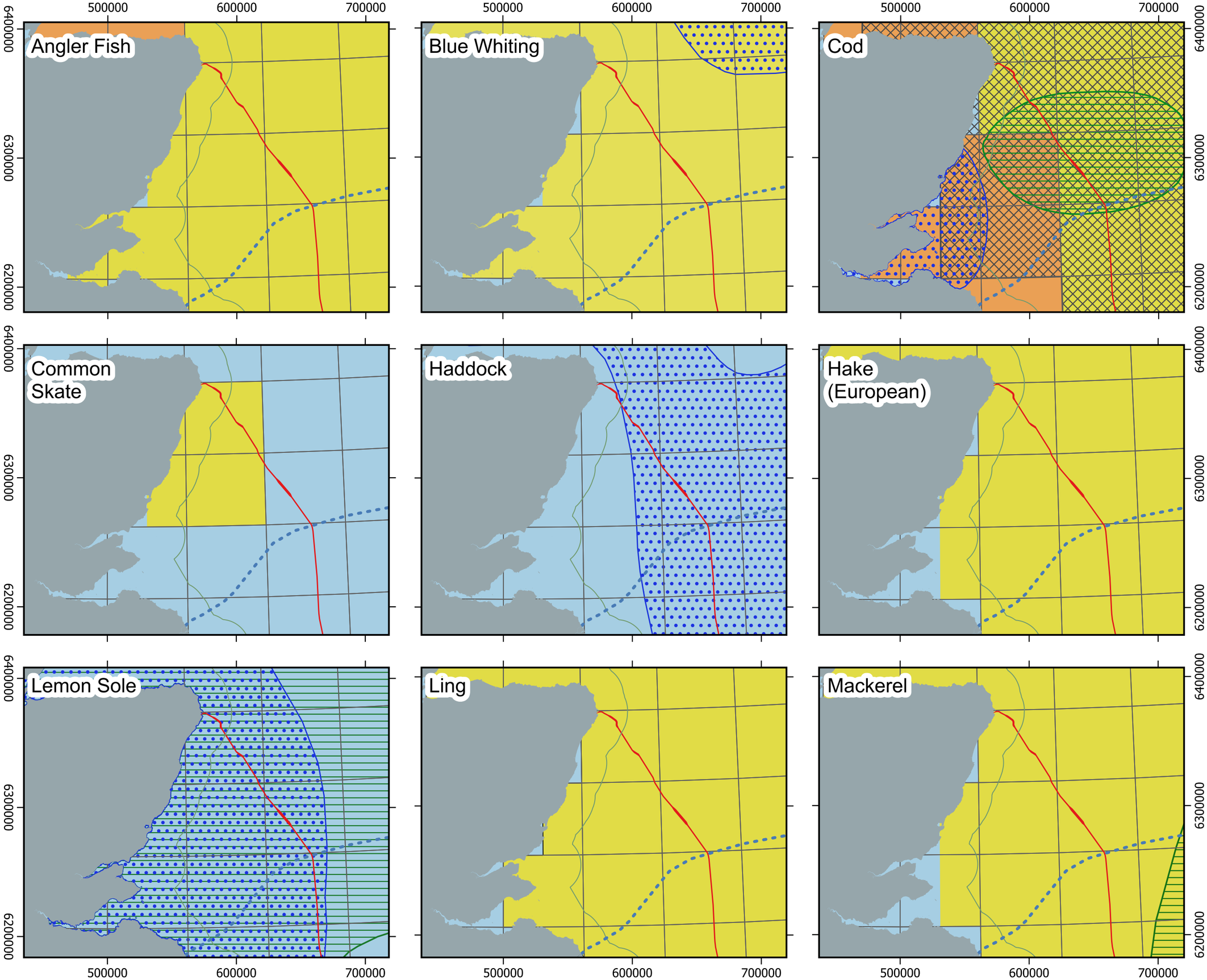
Where information is available in the form of mapped data this has been presented in Figure 8-5 (Drawing C01494-FISH-010) and Figure 8-6 (Drawing C01494-FISH-012).

Table 8-12: Spawning and Nursery grounds that overlap with the Study Area KP 431.4 to KP 575.3 in Scotland

Species	Latin names	Spawning Zone	Intensity	Nursery Zone	Intensity	** Presence of Group 0 Aggregations	J	F	M	A	M	J	J	A	S	O	N	D
Anglerfish	*Lophius piscatorius*	n/a	n/a	Demersal	Low	Low												
Atlantic Cod	*Gadus morhua*	Pelagic	Low	Demersal	High	Low												
Atlantic Herring	*Clupea harengus*	Pelagic	High	Pelagic	High	Low/Medium												
Atlantic Mackerel	*Scomber scombrus*	Pelagic	Low	Pelagic	Low	Low												
Blue Whiting	*Micromesistius poutassou*	n/a	n/a	Pelagic	Low					*	*							
Common Skate	*Dipturus batis-complex*	Demersal	Low	Demersal	Low		?	?	?	?	?	?	?	?	?	?	?	?
European Hake	*Merluccius merluccius*	n/a	n/a	Demersal	Low	Low		*	*									
European Plaice	*Pleuronectes platessa*	Pelagic/Demersal	Low	Demersal	Low	Low/medium												
European Sprat	*Sprattus sprattus*	Pelagic	Low	Pelagic	Low	Low												
Haddock	*Melanogrammus aeglefinus*	n/a	n/a	Demersal	Low	Medium/High		*	*	*								
Horse Mackerel	*Trachurus trachurus*	n/a	n/a	Pelagic	Low	Low												
Lemon Sole	*Microstomus kitt*	Demersal	Low	Demersal	Low													
Ling	*Molva molva*	n/a	n/a	Demersal	Low													
Nephrops	*Nephrops norvegicus*	Demersal	Low	Demersal	Low													
Norway Pout	*Trisopterus esmarkii*	Demersal	Low	Demersal	Low	Low/Medium												
Sandeels	*Ammodytidae spp.*	Demersal	High	Demersal	Low													
Spotted ray	*Raja montagui*	Demersal	Low	Demersal	Low						*	*	*					
Spurdog	*Squalus acanthias*	n/a	n/a	Viviparous	Low													
Tope Shark	*Galeorhinus galeus*	n/a	n/a	Viviparous	Low													
Whiting	*Merlangius merlangus*	Pelagic	Low	Pelagic	High	Low/Medium												

*Sources: Coull et al (1998), Ellis et al (2012), Aires (2014). * Peak Spawning. ** 0 Group fish defined as fish in the first year of their lives. ? Insufficient data available*

	Spawning Only		Nursery Only		Both



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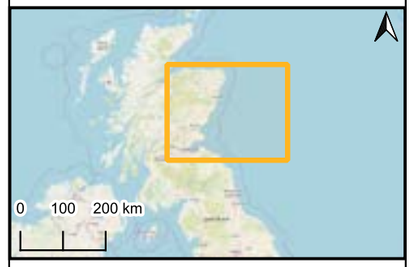
Fish nursery and spawning grounds with intensity of activity within the Scottish Study Area - Map 1

C01494a-EGL3-FISH-010-D



- 12NM Limit
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- EGL 3 Scoping Boundary
- ICES Statistical Rectangles

Spawning Grounds with Intensity (Ellis et al, 2012)
- Low
- High

Nursery Grounds with Intensity (Ellis et al, 2012)
- Low
- High

Spawning and Nursery Grounds (Coull et al, 1998)
- Spawning Grounds
- Nursery Grounds

0 20 40 km

0 20 40 NM

Date	14/11/2023
Coordinate System	ETRS89 / UTM zone 30N
Projection	Universal Transverse Mercator
Unit	meters
Scale at A3	1:2700000
Created	J Cunningham
Reviewed	D Summers/ S Pearce
Authorised	A Farley

Data Sources-UKHO-Contains public sector information licensed under the Open Government Licence v3.0. CEFAS-Spawning and Nursery Grounds Layers for Selected Fish in UK Waters in 2010 & Coull et al & Ellis et al (1998/2010/ 2012)-Contains public sector information licensed under the Open Government Licence v3.0. ICES-All public data are under the Creative Commons (CC BY 4.0) licence. Data correct at time of export.

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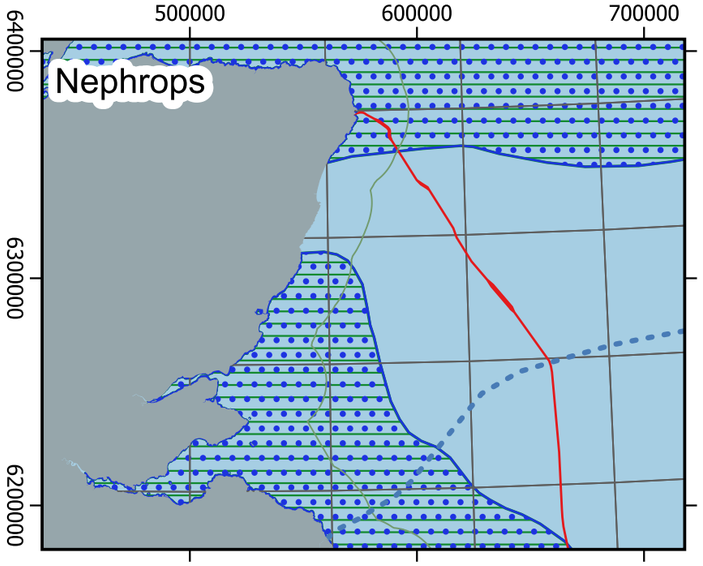

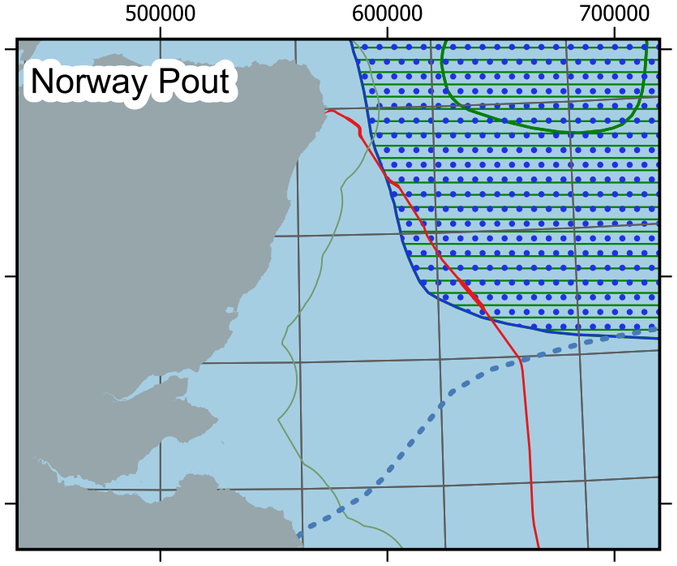

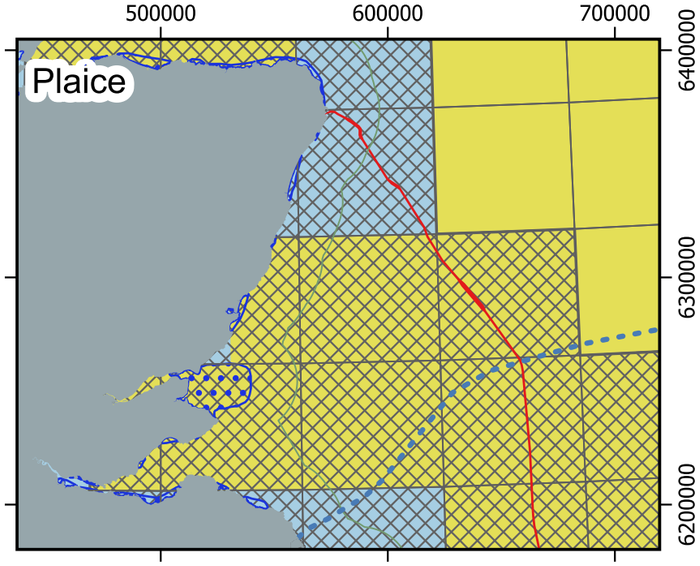

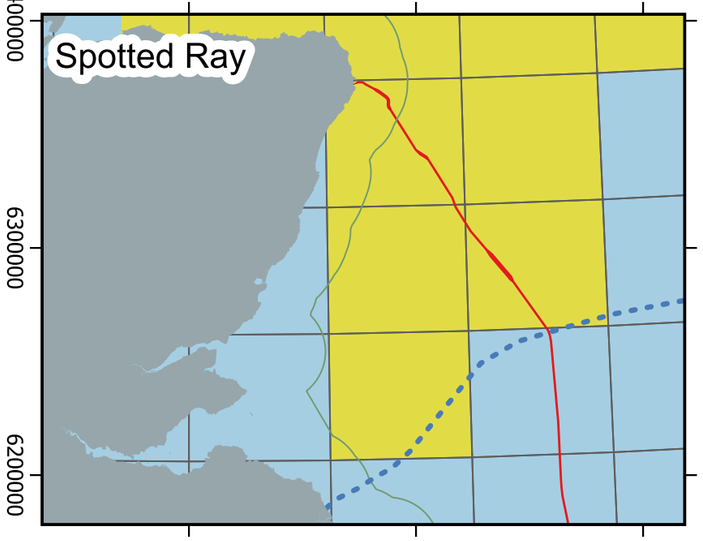

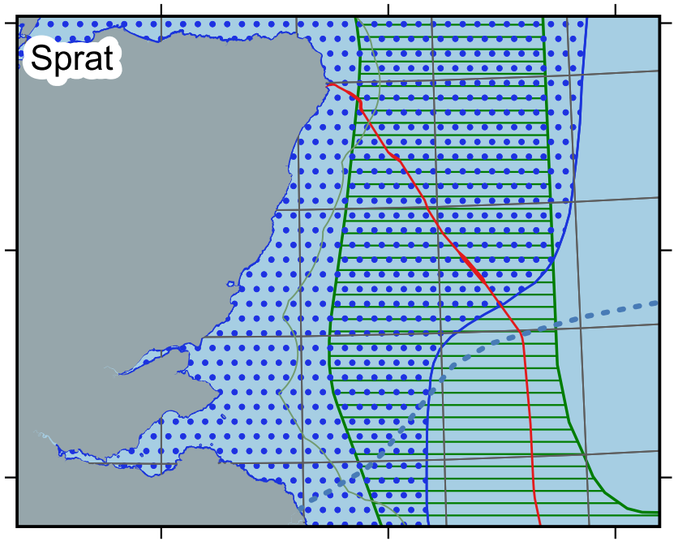

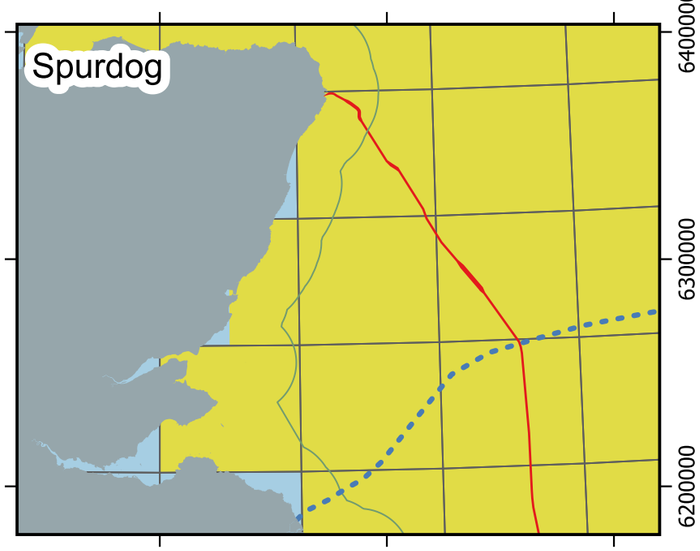

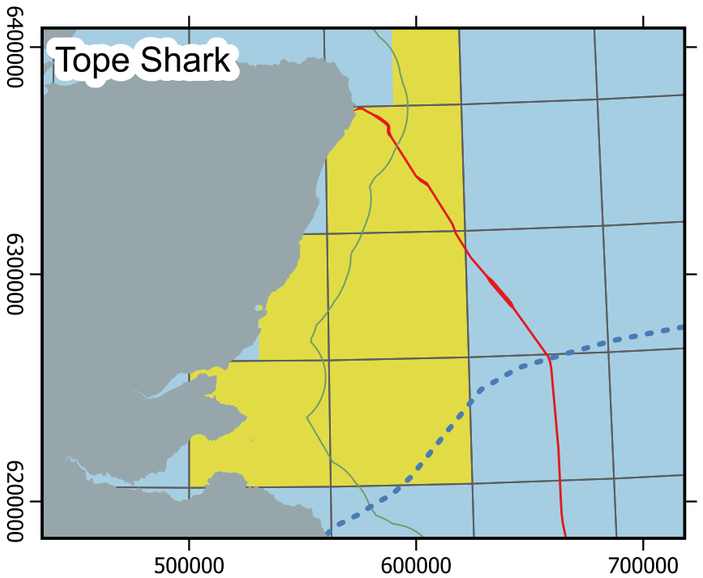

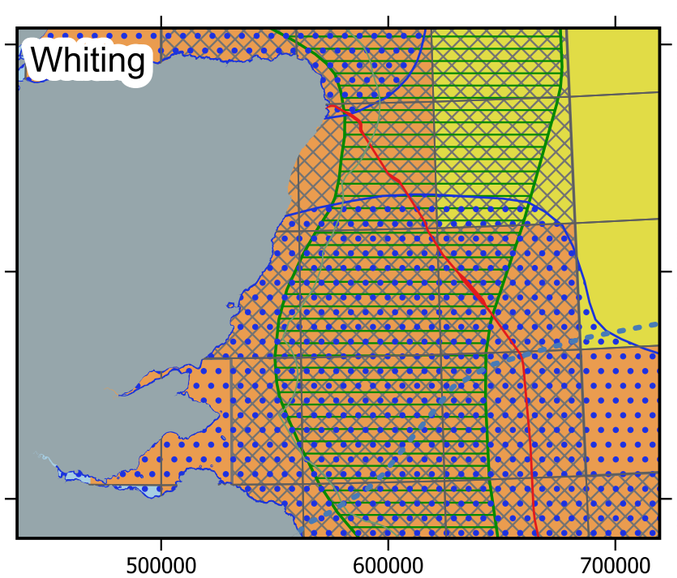

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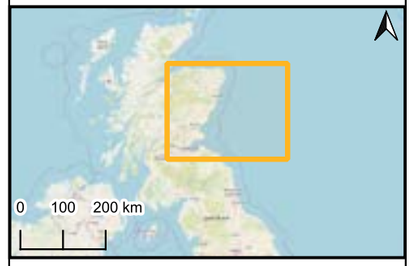
Fish nursery and spawning grounds with intensity of activity within the Scottish Study Area - Map 2

C01494a-EGL3-FISH-012-D



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Spawning Grounds with Intensity (Ellis et al, 2012)
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- High

Nursery Grounds with Intensity (Ellis et al, 2012)
- Low
- High

Spawning and Nursery Grounds (Coull et al, 1998)
- Spawning Grounds
- Nursery Grounds

0 20 40 km

0 20 40 NM

Date	14/11/2023
Coordinate System	ETRS89 / UTM zone 30N
Projection	Universal Transverse Mercator
Unit	meters
Scale at A3	1:2700000
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8.4.3.3. Protected Sites Scotland

Firth of Forth Banks Complex MPA

The Scoping Boundary lies approximately 18.2 km from the Firth of Forth Banks Complex MPA, which comprises of a group of three shelf banks and mounds, namely Scalp Bank, Berwick Bank, Montrose Bank & Wee Bankie shelf banks and mounds (JNCC, 2014). It is located in offshore waters of the Northern North Sea on the east coast of Scotland and is strongly influenced by water currents. These result in a 'mosaic' of habitats including various types of sand and gravels which overlie the shelf banks and mounds, supporting a diverse range of benthic species, including the ocean quahog, which is a Feature of Conservation Importance, and a protected species of the Firth of Forth Banks Complex MPA. The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

8.5. Proposed Assessment Methodology

The fish and shellfish MEA will follow the assessment approach set out in Chapter 4 of this Scoping Report, using the project-wide assessment matrix. The assessment of potential effects will be established using the standard Source-Pathway-Receptor approach.

Data derived from the site-specific survey will provide a more detailed site characterisation and fill key data gaps such as sediment particle size distributions (which informs the presence of species such as sandeel and herring), habitat biotopes and extent of shellfish beds (if present). A sandeel and Atlantic herring habitat assessment will be undertaken to inform the assessment of effects. In addition, the results from any assessment undertaken to inform the marine physical processes chapter will be used to establish the potential impacts on fish and shellfish.

Where impacts are not predicted to be significant, simple assessments, using an evidence-based approach that is proportionate to the anticipated level of significance will be undertaken. The potential for mortality, permanent and temporary injury and behavioural disturbance of noise sensitive fish and shellfish receptors based on impact thresholds reported in Popper et al. (2014) will be assessed.

Where significant effects are identified, mitigation measures will be proposed, and residual effects presented.

8.6. Scope of Assessment

A range of potential impacts on fish and shellfish have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Project. Table 8-13 describes the potential impacts identified and provides justification as to whether they will be scoped in or out of the MEA. A precautionary approach has been taken and where there is no strong evidence base, or the significance is uncertain at this stage the impact has been scoped 'in' to the MEA. Where there is a clear evidence base that the effect from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped 'out' of the MEA.

Table 8-13: Scoping assessment of impacts on fish and shellfish

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
Temporary habitat loss/seabed disturbance *(Abrasion/disturbance of the substrate on the surface of the seabed* *Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion)*	Boulder clearance, PLGR, pre-sweeping of sand waves. HDD duct excavation. Cable burial and trenching. Anchoring / jack-up foundations.	Shellfish and marine species with demersal life stage	**IN –** Any disturbance of the seabed has the potential to effect species which use the seabed for part/all of their lifecycle. Species most at risk are those that live in the upper layers of sediment (e.g., cockles), those that live on the seabed with limited mobility (e.g., ocean quahog, whelk, crab, lobster, hibernating sandeel) or those which lay their eggs on the seabed (demersal spawners) e.g., herring. The Project crosses many spawning and nursery grounds and whilst these cover large areas of the North Sea suitable habitats within these areas may be limited. Disturbance during the spawning season could have a direct impact on the spawning biomass for a specific year group. The assessment will focus on the effect on shellfish species due to their limited mobility and high commercial values and sandeel and herring as significant prey species.	**IN –** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works, or remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude that during installation. However, if the activity takes place during key spawning periods, impacts could potentially be significant.	**IN –** The significance of the effect during decommissioning is similar or of lower magnitude than installation. However, effects could potentially be significant if within a sensitive spawning ground.
		Species with fully pelagic lifecycle	**OUT –** Species which have a fully pelagic lifecycle will not be significantly affected by disturbance of the seabed and will therefore be scoped out of the assessment.		
Permanent habitat loss *(Physical change (to another seabed type or sediment type)* *Water flow (tidal current) changes including sediment transport considerations)*	Deposit of external cable protection.	Shellfish and marine species with demersal life stage	**IN –** The presence of the deposit of external cable protection has the potential to change the seabed type, changing the habitat for shellfish and marine species with demersal life stages. They also have the potential to alter sediment transport at a local level, creating scour pits or causing accretion. If the deposits are close to sensitive shellfish beds or within demersal spawning grounds, there is the potential that changes to the habitat could have a significant effect on shellfish or species with demersal life stages. The significance of the effect will vary according to local factors such as the position of the external cable protection in relation to the prevailing current, the mobility of the seabed, and the sensitivity of the habitat. Information from ecological and marine surveys will be used to avoid areas of significant importance where possible. However, as the locations where external cable protection will be used has not currently been identified, the impact pathway cannot be scoped out of the assessment.	**IN –** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works, or remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude that during installation. However, if the activity takes place during key spawning periods, impacts could potentially be significant.	**OUT –** No new seabed deposits will be made and no further permanent changes to the seabed.
		Pelagic Species	**OUT –** Species which have a fully pelagic lifecycle will not be significantly affected by localised seabed deposits and will therefore be scoped out of the assessment		

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*	Pre-sweeping	Shellfish and marine species with demersal life stage	**IN** - Pre-sweeping of sand waves involves the re-positioning of large quantities of sediment from the cable route to either immediate alongside the cable route, or to a separate disposal location. Depending on the technique used and the size of sand waves requiring pre-sweeping, the redeposition of sediment can cause smothering >10 cm deep over relatively wide areas of seabed (in the order of tens of thousands square metres). Effects could potentially be significant if the disposal site contains sensitive spawning grounds, ocean quahog aggregations or shellfish beds. Therefore, the impact pathway cannot be scoped out for this specific activity until further information is available on the areas that will require pre-sweeping.	**OUT –** Pre-sweeping is used during construction to ensure that the cables are buried below the base of mobile sediments. Generally during operation, remedial works are focused on protecting sections of cable that have become exposed due to sediment mobility, or to repair cables that have been damaged by a third party (e.g., fishing damage). Pre-sweeping would not be required during a cable repair for third-party damage as the cable would already be exposed on the seabed. Therefore, the only scenario pre-sweeping might be required is where the cable has been damaged during construction and develops a fault in an area where pre-sweeping was used during construction. In this scenario the significance of the effect will be of lower magnitude than during construction and has been scoped out of the assessment.	**IN –** Pre-sweeping or controlled flow excavation could be used during decommissioning to expose the buried cable. The significance of the effect during decommissioning is similar or of lower magnitude than construction. However, effects could potentially be significant if within a sensitive habitat.
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*	Seabed preparation (e.g., boulder clearance, PLGR). HDD duct excavation Cable burial and trenching. Anchoring / jack-up foundations. Deposit of external cable protection.	All species (except cockles)	**OUT -** The most significant contributor (relatively) will be from the sediment plume generated by cable trenching. During trenching the area affected depends on the trenching technique deployed e.g., ploughing will create a slightly larger footprint than jet trenching. However, in both cases the spatial extent of heavy smothering is extremely localised, restricted to less than a couple of metres either side of the trench (Gridlink, 2020, BERR, 2008) and significant effects are unlikely. Modelling undertaken for other cable projects (e.g., Viking Link reported in Intertek 2017, GridLink 2020, BERR 2008) indicates that approximately 90% of the suspended sediment is re-deposited within close proximity (<100m) and would be classed as heavy smothering. The remaining 10% is transported over a wide area, which depending on the strength of the prevailing currents could be as far as 10 – 15 km but will be deposited in thicknesses of less than 2 mm. With respect to changes in water clarity, the benchmark used by Natural England for the pressure is a change in one rank e.g., from clear to intermediate, on the Water Framework Directive scale for one year. While trenching is undertaken a sediment plume will be generated continuously, but it will move with the location of the cable spread. Sands and gravels do	**OUT** - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair work or remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude than during construction and the impact has therefore been scoped out of the assessment for the same reasons.	**OUT -** The significance of the effect during decommissioning is similar or of lower magnitude than construction and has therefore been scoped out of the assessment for the same reasons.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
			not form part of the sediment load and will settle out of suspension quickly. Modelling undertaken for other cable projects (e.g., Viking Link reported in Intertek 2017, GridLink 2020, BERR 2008), concludes that regardless of the position along a cable route, the sediment plume generated is aligned with the dominant tidal axis. Material is deposited primarily along the dominant tidal axis but with some lateral extension. Over most of the plume the increase in suspended sediment concentrations is generally lower than 30mg/l with natural conditions returning within a single tidal cycle following the cessation of activities, although if very fine chalk particles are present this could be extended to 4-5 days. Overall, the change in water clarity is not significant and generally in line with changes experienced during storm conditions when background concentrations can reach 1000mg/l (Gridlink, 2020). Sediment contamination in the North Sea is focused on areas of high anthropogenic activity e.g., around disposal sites, estuaries and where drilling activity has taken place. Sediments in areas where pre-sweeping is proposed will be tested to ensure compliance with Cefas Action Levels for disposal.		
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*	Seabed preparation (e.g., boulder clearance, PLGR). HDD duct excavation. Cable burial and trenching. Anchoring / jack-up foundations. Deposit of external cable protection.	Cockles	**IN –** Cockles are susceptible to smothering and changes in water quality. There is a cockle area in ICES rectangle 35F0 within The Wash which is in the Study Area. There could be some concerns amongst fisheries stakeholders that if contaminated sediments are suspended by cable trenching this could have a significant impact on sensitive cockle beds. Other recent projects where reported sediments have been contaminated with heavy metals, PCBs and PAHs were analysed against Cefas Guidelines which concluded that there were considered to be of no concern (NeuConnect, 2019). Indirect effects from the mobilisation of contaminants entering the food chain are not predicted to be significant. However, the impact pathway will not be scoped out for this specific activity until further information is available on seabed contamination levels within the Project.	**OUT -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works may be required. In these circumstances the significance of the effect will be of lower magnitude than during installation and has therefore been scoped out of the assessment.	**OUT -** The significance of the effect during decommissioning is similar or of lower magnitude than installation and has therefore been scoped out of the assessment.
Accidental spills	Presence of project vessels and equipment	All species	**OUT -** Project vessels and contractors will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 which relate to pollution from oil from equipment, fuel tanks etc and release of sewage (black and grey water). It is a legal requirement that all vessels have a SOPEP. Compliance with Regulations will be sufficient to minimise the risk to the environment.		

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
(Hydrocarbon & PAH contamination)					
Introduction or spread of marine invasive non-native species (MINNS)	Presence of project vessels and equipment. Deposit of external cable protection.	Shellfish	**OUT –** Although the introduction of project vessels, equipment, and external cable protection have the potential to introduce and spread MINNS, all relevant guidelines will be followed (GB Non-native Species Secretariat, 2015) including vessel cleaning facilities and the use of anti-fouling paint. Project vessels and contractors will comply with the International Convention for the Control and Management of Ships' Ballast water and Sediments. All seabed deposits will be inert with no biologically active material. Project vessels will complete a biosecurity risk assessment prior to arriving on site which will include factors such as origins of the vessels and ensuring that relevant equipment is cleaned before use. Compliance with Regulations will be sufficient to minimise the risk to the environment.		
Underwater noise changes	Presence of project vessels and equipment	All species	**OUT –** All of the operations involved in the preparation and construction of subsea cable generate underwater sound. The presence of vessels creates a continuous sound. The Project will be a one-off event set against a background of existing shipping noise. Any effects will be localised and short-term and are not predicted to be significant.	**OUT -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works may be required. In these circumstances the significance of the effect will be of lower magnitude than during construction and has therefore been scoped out of the assessment for the same reasons.	**OUT -** The significance of the effect during decommissioning is similar or of lower magnitude than construction and has therefore been scoped out of the assessment for the same reasons.
Collision risk	Presence of project vessels and equipment	Basking shark	**OUT –** There have only been a couple of sightings of basking shark within the waters of the Study Area during the last 20 years (NBN Atlas, 2023) This impact pathway has been scoped out due to the scarcity of the species within the Study Area.		
Electromagnetic changes / Barrier to species movement	Presence of cables	All species	N/A	**IN –** Some species of mollusc, crustacean, marine fish and elasmobranchs detect electric and magnetic fields. Bundling of the cables and cable burial reduces the EMF exposure. Given that calculations as to the field strength and burial depths have not been undertaken this impact pathway cannot be scoped out of the assessment at this stage.	N/A
Temperature increase	Presence of cables	Species with demersal life stage	N/A	**OUT –** During the operation of an HVDC cable heat losses occur because of the resistance in the cable/conductor. This can cause localised heating of the surrounding environment (i.e., sediment for buried cables, or water in the interstitial spaces of external cable protection). There are no specific regulatory limits applied to temperature changes in the seabed, although a 2°C changed between seabed surface and 0.2 m depth is used as a guideline in Germany.	N/A

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
				Conservative calculations undertaken for Viking Link (which crosses German waters) concluded that heating in excess of 2°C at 20 cm sediment depth will only occur if cables are bundled and buried to less than 0.75 m (National Grid and Energinet, 2017). As yet the cable burial risk assessment has not been carried out. However, evidence from similar projects show that risk of shipping and fishing interactions that a minimum burial depth of 1.5 – 2 m is required (NeuConnect, 2019, Gridlink, 2020) Any temperature changes will be localised to the immediate environment surrounding the cable and undetectable against natural temperature fluctuations in the surrounding sediments and water column. No significant effects are predicted. This pressure has therefore been scoped out of the assessment.	

8.7. References

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