Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

Volume 2, Chapter 7: Commercial Fisheries

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Table of Contents

List of Tables

List of Figures

Annexes

Annex	Heading
5.7.1	Commercial Fisheries Technical Report

Glossary

Term	Definition
Beam trawlers	A method of bottom trawling with a net that is held open by a beam, which is generally a heavy steel tube supported by steel trawl heads at each end. Tickler chains or chain mats, attached between the beam and the ground rope of the net, are used to disturb fish and crustaceans that rise up and fall back into the attached net.
Bycatch	Catch which is retained and sold but is not the target species for the fishery.
Code of Construction Practice (CoCP)	A document detailing the overarching principles of construction, contractor protocols, construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes
Commitment	A term used interchangeably with mitigation. Commitments are embedded mitigation measures. Commitments are either primary (design) or tertiary (Inherent) and embedded within the assessment at the relevant point in the Environmental Impact Assessment (EIA) (e.g. at Scoping or Preliminary Environmental Information Report (PEIR)). The purpose of Commitments are to reduce and/or eliminate Likely Significant Effects (LSEs), in EIA terms.
Cooperative Maritime Etaploise (C.M.E.) Producer Organisation	A French producer organization representing 45% of French landings, representing 44 active vessels including their owners, skippers, crew and ancillary services.
Cumulative effects	The combined effect of Hornsea Four in combination with the effects from a number of different projects, on the same single receptor/resource.
Cumulative impact	Impacts that result from changes caused by other past, present or reasonably foreseeable actions together with Hornsea Four.
Danish Fishermen's Producer Organisation	A Danish producer organisation representing 95% of Danish vessels, equating to approximately 650 vessels including their owners, skippers, crew and ancillary services.
Demersal	Living on or near the seabed.
Demersal trawl	A fishing net used by towing the trawl along or close to the seabed.
Design Envelope	A description of the range of possible elements that make up the Hornsea Four design options under consideration, as set out in detail in the project description. This envelope is used to define Hornsea Four for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Regulations	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended).
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection

Term	Definition
	and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Impact Assessment (EIA) Report.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Market Observatory for Fisheries and Aquaculture Products	An online database that enables direct monitoring of the weight, value and price of fishery and aquaculture products, from the first sale to retail stage, for EU countries, Norway and Iceland.
European Union Data Collection Framework	An EU framework for the collection and management of fisheries data.
Export cable corridor (ECC)	The specific corridor of seabed (seaward of Mean High Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Four array area to the Creyke Beck National Grid substation, within which the export cables will be located.
First sale value	The value obtained for fish or shellfish when it is sold for the first time.
Fish stock	Any natural population of fish, which is an isolated and self-perpetuating group of the same species.
Fishery	A group of vessel voyages which target the same species or use the same gear.
Fishing ground	An area of water or seabed targeted by fishing activity.
Fishing mortality	Mortality due to fishing; death or removal of fish from a population due to fishing.
Fleet	A physical group of vessels sharing similar characteristics (e.g. nationality).
Fly shooting	A fishing net consisting of a conical net with two long wings with a bag where the fish collect. Drag lines extend from the wings, and are long so they can surround an area. A seine boat drags the net in a circle around the fish, the motion of the drag lines herds the fish into the central net.
From Nord	A French non-cooperative producer organization, legally in the form of an association, representing 40% of all French quotas (on average across all species) and specifically 61% of sole *Solea solea* quota.
Gear type	The method/equipment used for fishing.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current (HVDC)	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
Hornsea Four	The proposed Hornsea Project Four offshore wind farm project; the term covers all elements within the Development Consent Order (i.e. both the offshore and onshore components).
ICES statistical rectangles	Defined areas, 1 degree longitude x 0.5 degree latitude equalling approximately 30 x 30 nm used for fisheries statistics.
Industrial fishery	Highly mechanised commercial fishing operations whose ultimate products are principally fishmeal and fish oil.
Landings	Quantitative description of amount of fish returned to port for sale, in terms of value or weight.

Term	Definition
Marine Management Organisation	A UK government department that license regulate and plan commercial fisheries activities in the seas around England, with jurisdiction from 0 to 12 nm.
Maximum sustainable yield	Maximum sustainable yield (MSY) is the largest yield (catch, in tonnes) that can be taken from a specific fish stock over an indefinite period under constant environmental conditions. Fishing at MSY levels should ensure the capacity of the stock to continue to produce this level in the long term.
Metier	A homogenous subdivision, either of a fishery by vessel type or a fleet by voyage type.
Minimum Landing Size	Is a technical measure that limits the size of fish or shellfish species that can be legally landed and sold. The MLS varies per species. With the implementation of the Landings Obligation, the existing MLS are changed into minimum conservation reference sizes (MCRS), but they will remain largely the same.
Mitigation	A term used interchangeably with Commitment(s) by Hornsea Four. Mitigation measures (Commitments) are embedded within the assessment at the relevant point in the EIA (e.g. at Scoping or PEIR).
National Federation of Fishermen's Organisations	A UK organisation comprised of members from Producers' Organisations, fishermen's groups and individuals, representing fishermen in England, Wales, Northern Ireland and the Channel Islands.
North Eastern Inshore Fisheries and Conservation Authority	A UK authority that license, regulate and plan commercial fisheries activities in the seas around England, with jurisdiction from 0 to 6 nm.
Norwegian Directorate of Fisheries	A Norwegian government agency responsible for Norwegian fisheries.
Otter trawl	A net with large rectangular boards (otter boards) which are used to keep the mouth of the trawl net open. Otter boards are made of timber or steel and are positioned in such a way that the hydrodynamic forces, acting on them when the net is towed along the seabed, pushes them outwards and prevents the mouth of the net from closing.
Pelagic	Of or relating to the open sea.
Pelagic trawl	A net used to target fish species in the mid water column.
Rederscentrale	The only Belgian producer organization, an umbrella organization led by a Board of Directors, representing Belgian vessel owners and members.
Scallop dredge	A method to catch scallop using steel dredges with a leading bar fitted with a set of spring loaded, downward pointing teeth. Behind this toothed bar (sword), a matt of steel rings is fitted. A heavy net cover (back) is laced to the frame, sides and after end of the mat to form a bag.
Soak time	The duration of time that pots are left on the seabed in between hauls.
Spawning	The act of releasing or depositing eggs (fish).
Stock assessment	An assessment of the biological stock of a species and its status in relation to defined references points for biomass and fishing mortality.
String	A series of static fishing gear (pots) joined together to form a single deployable linear line of pots.
Total Allowable Catches	Total Allowable Catches (TACs) are catch limits, expressed in tonnes or numbers that are set for some commercial fish stocks.

Term	Definition
Vessel Monitoring System	A system used in commercial fishing to allow environmental and fisheries regulatory organizations to monitor, minimally, the position, time at a position, and course and speed of fishing vessels.
VisNed	(Cošperatie Kottervisserij Nederland u.a.) a Dutch umbrella organisation of producer organisations, representing 75% of the Dutch Demersal Fishing interest.
Year class	The individual animals of a single species of fish or shellfish that were born in any one-year.

Acronyms

Acronym	Definition
DCO	Development Consent Order
EIA	Environmental Impact Assessment
CEA	Cumulative Effects Assessment
DCF	Data Collection Framework
DFPO	Danish Fishermen's Producer Organisation
EC	European Council
EEC	European Economic Community
EEFPO	The East of England Fish Producers Organisation
EEZ	Exclusive Economic Zone
ES	Environmental Statement
EMF	Electromagnetic fields
EMS	European Marine Site
EU	European Union
EUMOFA	European Market Observatory for Fisheries and Aquaculture Products
FU	Functional Unit
ICES	International Council for the Exploration of the Sea
IFCA	Inshore Fisheries and Conservation Authorities
MMO	Marine Management Organisation
MSAR	Monthly Shellfish Activity Returns
NFFO	National Federation of Fishermen's Organisations
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
SoCC	Statement of Community Consultation
SoS	Secretary of State
Spp.	Species
TAC	Total Allowable Catches
TCE	The Crown Estate
UK	United Kingdom
VMS	Vessel Monitoring System

Units

Unit	Definition
£	Great British pounds
£/kg	Great British pounds per kilogram
€	Euro
kg	kilograms
km	kilometres
kW	Kilowatt (power)
m	metres
mm	millimetres
nm	Nautical Mile

7.1 Introduction

7.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the results of the Environmental Impact Assessment (EIA) for the potential impacts of the Hornsea Project Four offshore wind farm (hereafter Hornsea Four) on commercial fisheries. Specifically, this chapter considers the potential impact of Hornsea Four seaward of Mean High Water Springs (MHWS) during its construction, operation and maintenance, and decommissioning phases.

7.1.1.2 Orsted Hornsea Project Four Limited (the Applicant) is proposing to develop Hornsea Four. Hornsea Four will be located approximately 65 km from the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone please see **Volume 1, Chapter 1: Introduction** for further details on the Hornsea Zone). Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network (please see **Volume 1, Chapter 4: Project Description** for full details on the Project Design).

7.1.1.3 For the purpose of this chapter 'commercial fishing' is defined as any form of fishing activity legally undertaken for taxable profit. Recreational fishing is addressed in **Volume 2, Chapter 12: Infrastructure and Other Users**. Navigational aspects related to fishing vessels are assessed in **Volume 2, Chapter 8: Shipping and Navigation**.

7.1.1.4 This chapter summarises information contained within **Volume 5, Annex 7.1: Commercial Fisheries Technical Report**.

7.2 Purpose

7.2.1.1 The primary purpose of the Environmental Statement (ES) is to support the Development Consent Order (DCO) application for Hornsea Four under the Planning Act 2008 (the 2008 Act). This PEIR constitutes the Preliminary Environmental Information for Hornsea Four and sets out the findings of the EIA to date to support pre-application consultation activities required under the 2008 Act. The EIA will be finalised following completion of pre-application consultation and the Final ES will accompany the application to the Planning Inspectorate (PINS) for Development Consent.

7.2.1.2 This PEIR chapter:

- Presents the existing environmental baseline established from desk studies, and consultation;
- Presents the potential environmental effects on commercial fisheries arising from Hornsea Four, based on the information gathered and the analysis and assessments undertaken to date;
- Identify any assumptions and limitations encountered in compiling the environmental information; and
- Highlight any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

7.3 Planning and Policy Context

7.3.1.1 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to commercial fisheries, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a) and the NPS for Renewable Energy Infrastructure (EN-3, DECC, 2011b).

7.3.1.2 NPS EN-3 includes guidance on what matters are to be considered in the assessment. These are summarised in **Table 7.1** below.

Table 7.1: Summary of NPS EN-3 provisions relevant to commercial fisheries.

Summary of NPS EN-3 provisions	How and where considered in the PEIR
Consultation	
"Early consultation should be undertaken with statutory advisors and with representatives of the fishing industry which could include discussions of impact assessment methodologies. Where any part of a proposal involves a grid connection to shore, appropriate inshore fisheries groups should also be consulted" (paragraph 2.6.127 of NPS EN-3)	Engagement with the local and regional industry over the period September 2010 to present (see **Section 7.4**).
"Where a number of offshore wind farms have been proposed within an identified zone, it may be beneficial to undertake such consultation at a zonal, rather than a site-specific, level" (paragraph 2.6.128 of NPS EN-3)	Consultation has been undertaken both at a zonal and at a project-specific level (see **Section 7.4**).
"The assessment by the applicant should include detailed surveys of the effects on fish stocks of commercial interest and any potential reduction in such stocks, as well as any likely constraints on fishing activity within the project's boundaries" (paragraph 2.6.129 of NPS EN-3)	Site-specific surveys are detailed in **Volume 2, Chapter 3: Fish and Shellfish Ecology**. In addition, consultation with the fishing industry has identified key concerns as well as available data and potential impacts, which have all been considered in the assessment (see **Section 7.4**).
Baseline data	
"Robust baseline data should have been collected and studies conducted as part of the assessment" (paragraph 2.6.129 of NPS EN-3)	Robust baseline datasets analysed include EU and UK statistics and surveillance data, industry consultation and published reports (see **Section 7.7.1**).
Safety zones	
"Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on commercial fishing" (paragraph 2.6.130 of NPS EN-3)	The need for safety zones has been considered by the navigational risk assessment (NRA) completed for Hornsea Four. The risk assessment results have been taken into account within the Commercial Fisheries assessment (see **Section 7.11**). Consultation has also been undertaken with the Maritime and Coastguard Agency (MCA) (see **Volume 2, Chapter 8: Shipping and Navigation**). It is assumed there would be safety zones of 500 m around infrastructure under construction, decommissioning and major maintenance works.
"Where the precise extents of potential safety zones are unknown, a realistic worst case scenario should be assessed. Applicants should consult the MCA" (paragraph 2.6.131 of NPS EN-3)	

Summary of NPS EN-3 provisions	How and where considered in the PEIR
Fish stocks	
"The assessment by the applicant should include detailed surveys of the effects on fish stocks of commercial interest and the potential reduction or increase in such stocks that will result from the presence of the wind farm development and of any safety zones" (paragraph 2.6.131 of NPS EN-3)	The Hornsea Four assessment has considered the effects on commercial fish stocks (see **Section 7.11**, and **Volume 2, Chapter 3: Fish and Shellfish Ecology**).

7.3.1.3 NPS EN-3 also highlights several factors relating to the determination of an application and in relation to mitigation. These are summarised in **Table 7.2** below.

Table 7.2: Summary of EN-3 policy on decision making relevant to commercial fisheries.

Summary of NPS EN-3 policy on decision making (and mitigation)	How and where considered in the PEIR
Commercial fisheries	
"The Secretary of State should be satisfied that the site selection process has been undertaken in a way that reasonably minimises adverse effects on fish stocks, including during peak spawning periods and the activity of fishing itself" (paragraph 2.6.132 of NPS EN-3)	The effects arising from the proposed development have been and will be discussed with statutory bodies during pre and post application consultation. Hornsea Four, is, and will continue to, take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Commitments related to commercial fisheries and adopted as part of Hornsea Four are provided in **Section 7.8.2**.
"The Secretary of State should consider the extent to which the proposed development occupies any recognised important fishing grounds and whether the project would prevent or significantly impede protection of sustainable Commercial Fisheries or fishing activities" (paragraph 2.6.132 of NPS EN-3)	The extent to which Hornsea Four impacts on recognised fishing grounds has been considered and consultation with fishing stakeholders in order to fully understand any potential impacts has been undertaken (see **Section 7.4**). The results of the commercial fisheries assessment are presented in **Section 7.11**.
"The Secretary of State should be satisfied that the applicant has sought to design the proposal having consulted representatives of the fishing industry with the intention of minimising the loss of fishing opportunity taking into account effects on other marine interests" (paragraph 2.6.133 of NPS EN-3)	
Mitigation for commercial fisheries	
"Any mitigation proposals should result from the applicant having detailed consultation with relevant representatives of the fishing industry" (paragraph 2.6.134 of NPS EN-3)	Hornsea Four consultation with UK and overseas stakeholders from the fishing community is on-going (see **Section 7.4**).
"Mitigation should be designed to enhance where reasonably possible any potential medium and long-term positive benefits to the fishing industry and Commercial fish stocks" (paragraph 2.6.135 of NPS EN-3)	A range of commitments are presented within **Section 7.8.2**.

7.3.2 Other relevant policies

7.3.2.1 The UK Marine Policy Statement (MPS; HM Government, 2011) explicitly expresses support for the fishing sector, and with regard to displacement, advocates "*seeking solutions such as co-location of activity wherever possible*". Specifically, paragraphs 3.8.1, 3.8.2, and 2.3.1.5 stipulate that the process of marine planning should "enable the co- existence of compatible activities wherever possible" and supports the reduction of real and potential conflict as well as maximising compatibility and encouraging co-existence of activities (Defra, 2014).

7.3.2.2 The East Inshore and East Offshore Marine Plans (Defra, 2014) support maximising possibilities for the co-location of fisheries with other sectors (GOV2 under objective 10), together with a cross-sectoral policy on displacement (GOV3). A summary of East Inshore and East Offshore Marine Plans policies relevant to commercial fisheries is provided in **Table 7.3**.

Table 7.3: Summary of East Inshore and East Offshore Marine Plans policies relevant to commercial fisheries.

Summary of relevant East Inshore and East Offshore Marine Plan policies	How and where considered in the PEIR
Commercial fisheries	
Policy FISH1: *"Within areas of fishing activity, proposals should demonstrate in order of preference:* *a) that they will not prevent fishing activities on, or access to, fishing grounds;* *b) how, if there are adverse impacts on the ability to undertake fishing activities or access to fishing grounds, they will minimise them;* *c) how, if the adverse impacts cannot be minimised, they will be mitigated;* *d) the case for proceeding with their proposal if it is not possible to minimise or mitigate the adverse impacts."*	Hornsea Four, is, and will continue to, take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. A range of commitments are presented within **Section 7.8.2**.
Policy FISH2: *"Proposals should demonstrate, in order of preference:* *a) that they will not have an adverse impact upon spawning and nursery areas and any associated habitat;* *b) how, if there are adverse impacts upon the spawning and nursery areas and any associated habitat, they will minimise them;* *c) how, if the adverse impacts cannot be minimised they will be mitigated;* *d) the case for proceeding with their proposals if it is not possible to minimise or mitigate the adverse impacts"*	The Hornsea Four assessment has considered the effects on commercial fish stocks (see **Section 7.11**, and **Volume 2, Chapter 3: Fish and Shellfish Ecology**).
Coexistence and displacement	
Policy GOV2: *"Opportunities for co-existence should be maximised wherever possible."*	Hornsea Four, is, and will continue to, take steps to minimise the effects

Summary of relevant East Inshore and East Offshore Marine Plan policies	How and where considered in the PEIR
Policy GOV3: *"Proposals should demonstrate in order of preference: a) that they will avoid displacement of other existing or authorised (but yet to be implemented) activities; b) how, if there are adverse impacts resulting in displacement by the proposal, they will minimise them; c) how, if the adverse impacts resulting in displacement by the proposal, cannot be minimised, they will be mitigated against or; d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts of displacement."*	upon the fishing industry in the area through appropriate mitigation where required. A range of Commitments are presented within Section 7.8.2, and include commitment to developing a Fisheries Liaison and Coexistence Plan (Co95).

7.4 Consultation

7.4.1.1 Consultation is a key part of the Development Consent Order (DCO) application process. Consultation regarding commercial fisheries has been conducted through the scoping process and meetings with commercial fisheries organisations. An overview of the project consultation process are presented within **Volume 1, Chapter 6: Consultation**.

7.4.1.2 The key issues raised during consultation specific to commercial fisheries are outlined below in **Table 7.4**, together with how these issues have been considered in the production of this PEIR.

Table 7.4: Consultation Responses.

Consultee	Date, Document, Forum	Comment	Where addressed in the PEIR
PINS	26 November 2018, Scoping Opinion	Displacement or disruption of commercially important fish and shellfish resources (during construction, operation and decommissioning). The primary justification provided in the Scoping Report for scoping this matter out is a cross-reference to the conclusions drawn in the Fish and Shellfish Ecology chapter regarding a similar matter. As the latter refers to the array area and the operational phase only, the justification is incomplete. In light of this the Inspectorate has insufficient information to enable this matter to be scoped out of the assessment and does not agree to do so.	This impact is scoped in and addressed within the impact assessment **Section 7.11**.
PINS	26 November 2018, Scoping Opinion	Additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas (during construction, operation and decommissioning). The Inspectorate agrees that this potential effect can be scoped out of the impact assessment having regard to the magnitude of the impact.	It is confirmed that this impact is scoped out of the impact assessment.
PINS	26 November 2018,	Increased vessel traffic within fishing grounds leading to interference with fishing activity (during construction, operation and decommissioning). It is not evident how	This impact is scoped in and addressed within the impact assessment Section 7.11.

Consultee	Date, Document, Forum	Comment	Where addressed in the PEIR
	Scoping Opinion	information on the anticipated number of vessel movements that will be associated with the construction, operation and decommissioning of the Proposed Development has been taken into account. Additionally, the datasets used in the Scoping Report do not capture the fishing activity undertaken in inshore areas by vessels smaller than 15 m, which are likely to be more vulnerable to interference with their fishing activity. Insufficient information is therefore provided to scope this matter out of the assessment, and the Inspectorate advises that it must be assessed in the ES where significant effects are likely to occur.	
PINS	26 November 2018, Scoping Opinion	Baseline data: The Scoping Report states that baseline data "*may be supplemented by the results of vessel-based fishing activity reconnaissance survey work*". It is unclear on what basis this additional survey work would or would not be undertaken. The ES should clearly explain what data has been used to inform the assessment and how it has been applied.	Sources of commercial fisheries data is provided in **Table 7.5** and a list site specific survey data is provided in **Table 7.6**.
National Federation of Fishermen's Organisations (NFFO) and Holderness Fishing Industry Group (HFIG)	10 July 2018, Meeting	Hornsea Project One Offshore Wind Farm (hereafter Hornsea Project One), Hornsea Project Two Offshore Wind Farm (hereafter Hornsea Project Two) & Hornsea Four project update meeting - Hornsea Four update meeting 1.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment **Section 7.11**.
NFFO and HFIG	19 September 2018, Meeting	Hornsea Project One, Hornsea Project Two & Hornsea Four project update meeting – Hornsea Four update meeting 2: Concern raised regarding cumulative impact of Hornsea Project One and Hornsea Project Two.	Assessed in cumulative effects assessment **Section 7.12**.
NFFO and HFIG	24 January 2019, Meeting	Hornsea Project One, Hornsea Project Two & Hornsea Four project update meeting – Hornsea Four update meeting 3: Discussion around construction timings and specific locations of construction activities for Hornsea One and Two and forthcoming Hornsea Four surveys.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment **Section 7.11**.
NFFO and HFIG	16 April 2019, Meeting	Hornsea Four update meeting 4: Discussion around phasing of gear clearance to facilitate Hornsea Four surveys.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment **Section 7.11**.
NFFO and HFIG	02 May 2019, Meeting	Hornsea Project One, Hornsea Project Two & Hornsea Four project update - Hornsea Four update 5: Discussion of timings of gear clearance and key areas of commercial fisheries activity.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment **Section 7.11**.

Consultee	Date, Document, Forum	Comment	Where addressed in the PEIR
North East Inshore Fisheries and Conservation Authority	01 July 2019, Email	Provision of surveillance data related to commercial fisheries.	Surveillance sightings data is provided within Volume 5, Annex 7.1: Commercial Fisheries Technical Report.
Rederscentrale	July 2019, Email	Presentation on Hornsea Four and Belgian commercial fisheries activity.	Country specific commercial fisheries activity assessments are provided within Volume 5, Annex 7.1: Commercial Fisheries Technical Report. The baseline (Section 7.7) and impact assessment (Section 7.11) analyse and assess on a fleet by fleet / fishery by fishery basis.
From Nord	July 2019, Email	Presentation on Hornsea Four and French commercial fisheries activity. Confirmation that French vessels are active across the area, as per baseline presented, and that further consultation should be directed via CRPMEM Nord.	
Cooperative Maritime Etaploise (C.M.E.) Producer Organisation	July 2019, Email	Presentation on Hornsea Four and French commercial fisheries activity. Confirmation that French vessels are active across the area, as per baseline presented, and that further consultation should be directed via CRPMEM Nord.	
VisNed	July 2019, Email and phone meeting	Presentation on Hornsea Four and Dutch commercial fisheries activity. Confirmation that baseline data is representative of the Dutch fleet; that vessels are likely to operate across the offshore export cable where appropriate burial is achieved.	
Danish Fishermen's Producer Organisation	July 2019, Email	Presentation on Hornsea Four and Danish commercial fisheries activity.	
Swedish Pelagic Federation Producers Organisation	July 2019, Email	Presentation on Hornsea Four and Swedish commercial fisheries activity.	
Danish Pelagic Producers Organisation	July 2019, Email	Presentation on Hornsea Four and Danish commercial fisheries activity.	
Erzeugergemeinschaft der Nord- und Osteefischer GmbH	July 2019, Email and phone meeting	Presentation on Hornsea Four and German commercial fisheries activity. Confirmation that baseline data is representative of the German fleet; and that pelagic vessels operating across the area will maintain the opportunity to catch pelagic shoaling species outside the array area.	

7.5 Study area

7.5.1.1 Hornsea Four is within the southwest portion of the International Council for the Exploration of the Sea (ICES) Division 4b (Central North Sea). Hornsea Four array area lies outside the 12 nautical miles (nm) territorial waters limit within the UK Exclusive Economic Zone (EEZ). For the purpose of recording fisheries landings, ICES Division 4b is divided into statistical rectangles, which are consistent across all Member States operating in the North Sea.

7.5.1.2 From a commercial fisheries perspective, the study areas are defined by the ICES statistical rectangles that Hornsea Four overlaps (**Figure 7.1**). Linking the study areas to ICES statistical rectangles supports analysis of landings data that is collated for each statistical rectangle. The commercial fisheries study areas are defined as follows:

- Hornsea Four array commercial fisheries study area: ICES rectangles 37F0, 37F1, and 36F1;
- Hornsea Four offshore ECC commercial fisheries study area: ICES rectangles 37E9 to 37F1 and 36F0 to 36F1; and
- Hornsea Four commercial fisheries study area: ICES rectangles 37E9 to 37F1 and 36F0 to 36F1 i.e., covers all aspects of Hornsea Four (and mirrors the offshore ECC commercial fisheries study area). The Hornsea Four array area and offshore ECC occupy only a portion of these ICES rectangles (8.83%).

7.5.1.3 Given the range of commercial fisheries stakeholders considered in this chapter, and the scale of geographic coverage of their activities, the commercial fisheries study area for the cumulative effects assessment (CEA) is defined as the North Sea (ICES Divisions 4a, 4b and 4c).

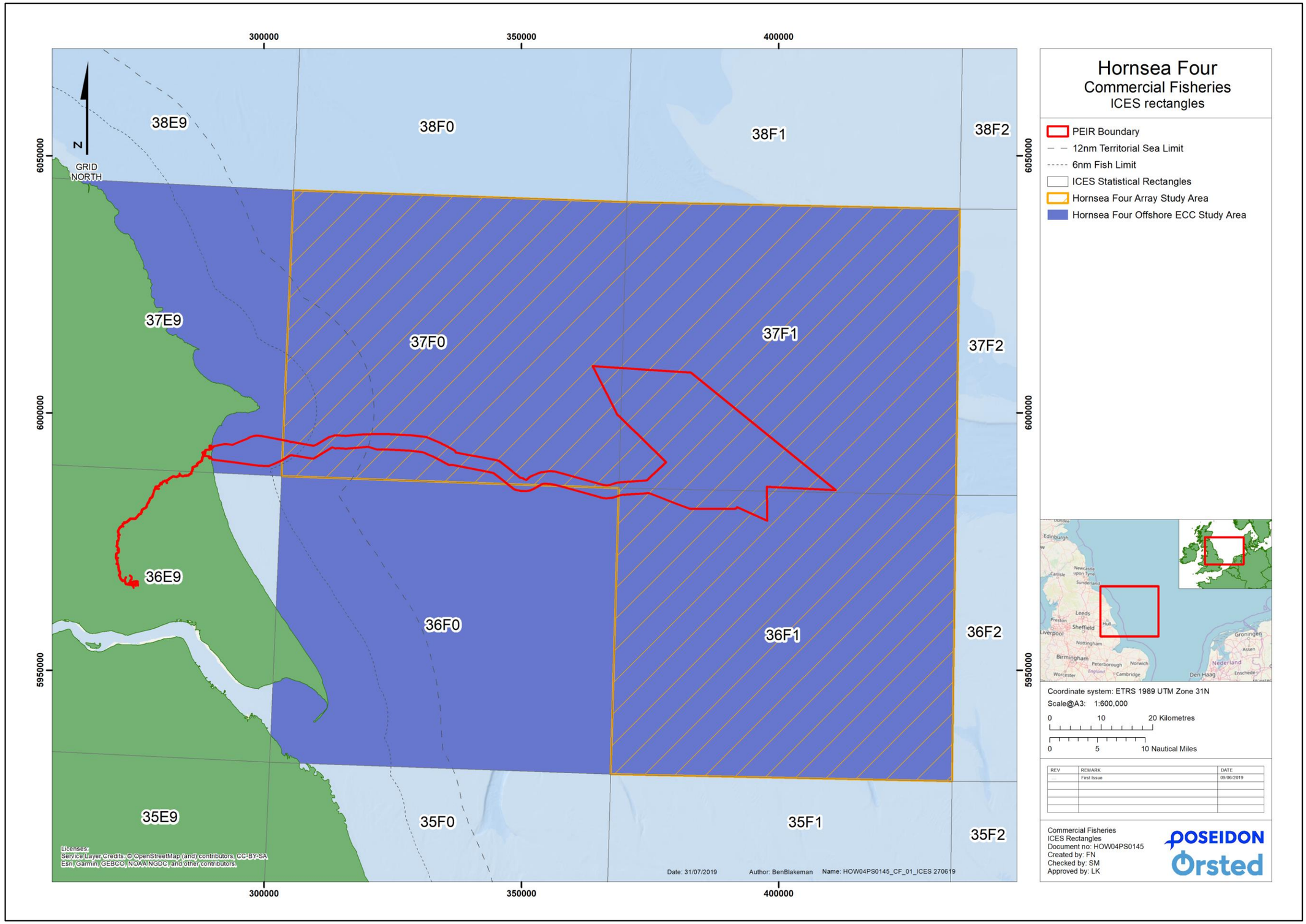

Figure 7.1: Commercial Fisheries ICES statistical rectangles and the Hornsea Four PEIR boundary (not to scale).

7.6 Methodology to inform baseline

7.6.1 Desktop Study

7.6.1.1 A desk study was undertaken to obtain information on commercial fisheries. Data were acquired within the Hornsea Four commercial fisheries study area from 2012 to 2017 through a detailed desktop review of existing studies and datasets. Data for 2018 was not available to inform the assessment.

7.6.1.2 The following sources of information in Table 7.5 were analysed. In addition, consultation with UK inshore and offshore fisheries and European offshore fisheries has been pertinent in both ground-truthing the data and understanding temporal and spatial patterns of fishing activity.

Table 7.5: Key Sources of commercial fisheries data.

Source	Summary	Coverage of Hornsea Four development area
Marine Management Organisation (MMO)	UK: Landings statistics data for UK-registered vessels, with data query attributes for: landing year; landing month; vessel length category; ICES rectangle; vessel/gear type; port of landing; species; live weight (tonnes); and, value for period 2013-2017.	Full coverage of the Hornsea Four array area and offshore ECC.
MMO	UK: VMS data for UK-registered vessels with data query attributes for time fishing and value of catch at a resolution of 200th of an ICES rectangle, amalgamated for all mobile gear vessels and all static gear vessels for period 2013-2016	Full coverage of the Hornsea Four array area and offshore ECC.
European Union Data Collection Framework	All Europe: Landings statistics for Belgian, Danish, Dutch, French, German, Swedish and UK registered vessels with data query attributes for: landing year; landing quarter; ICES rectangle; vessel length; gear type; species; and, landed weight (tonnes) for period 2012-2016.	Full coverage of the Hornsea Four array area and offshore ECC.
European Market Observatory for Fisheries and Aquaculture Products	All Europe: Price data for species landed by Belgian, Danish, Dutch, French, German, and Swedish registered vessels with data query attributes for: landing year; species; and, price (Euros per kilogram) for period 2012-2016.	Full coverage of the Hornsea Four array area and offshore ECC.
International Council for the Exploration of the Sea	All Europe: VMS data for Belgian, Danish, Dutch, French, German, and Norwegian registered vessels with data query attributes for time fishing at a resolution of 1/200th of an ICES rectangle amalgamated for all mobile vessels for period 2013-2017.	Full coverage of the Hornsea Four array area and offshore ECC.
The Crown Estate	All Europe: Commercial fishing activity density mapping across the former Hornsea Zone for beam trawl and demersal otter trawl, collated in 2010 and covering a period of approximately 20 years.	Full coverage of the Hornsea Four array area.

Source	Summary	Coverage of Hornsea Four development area
North Eastern Inshore Fisheries Conservation Authority (NE IFCA)	UK: Commercial fisheries surveillance data for activity out to 6 nm, and out to 12 nm in some instances, including mapping of sited fishing vessels deploying the following gears: potting, dredge, otter trawl, netting, lining..	Partial coverage of the offshore ECC.

Landing statistics

7.6.1.3 Landings data for all species are collected via the European Union (EU) logbooks scheme and recorded by ICES statistical rectangle and stored in the EU Data Collection Framework (DCF) database, accessible through the EU Joint Research Committee. Landings data have been collated for all EU Member States for all ICES statistical rectangles that overlap the Hornsea Four commercial fisheries study area.

7.6.1.4 Landing statistics were collated across five year (2012 to 2016 or 2013 to 2017, dependant on availability) and ten-year periods (2007 to 2016) to ensure reflection of long-term trends. Landing statistics include all landings by that country's nationally registered vessels into all ports. The following parameters were examined: year; season (quarter); gear type; ICES rectangle; species; effort (hours fished); and live weight (tonnes).

7.6.1.5 The EU DCF database does not provide first sales value or prices. The European Market Observatory for Fisheries and Aquaculture Products (EUMOFA) database was therefore assessed to provide first sale prices per country, species and year (i.e. an average price per year for each species and country from the EUMOFA database was correlated with the annual species landings per country in the EU DCF database in order to gain first sales values).

7.6.1.6 The EU DCF and EUMOFA databases included landings by UK, Belgian, Danish, Dutch, French, German and Swedish registered vessels. No landings statistics were obtained for Norwegian vessels, which are not included within the EU databases.

7.6.1.7 In addition to the EU DCF database, landing statistics for UK registered vessels were obtained from the Marine Management Organisation (MMO) with the following parameters: year; month; gear type; ICES rectangle; species; live weight (tonnes) and first sales value (£) across a five-year period (2013 to 2017).

Vessel Monitoring System data

7.6.1.8 All EU fishing vessels (i.e. fishing vessels flying the flag of an EU Member State), and third-party fishing vessels operating in EU waters, that are ≥ 12 m in length, are required to have a VMS on board. This reports the vessels' position to fisheries management authorities, in the case of EU fishing vessels, every two hours. Since 1 January 2012, this obligation has applied to vessels that are ≥ 12 m in length (before 1 January 2012 it applied to vessels ≥ 15 m in length, see Council Regulation (EC) No 1224/2009).

7.6.1.9 Through a European wide data call, ICES collated VMS data for vessels ≥ 12 m operating mobile gear that has contact with the seabed. This VMS data set includes vessel registered

to the following countries: Belgium, Denmark, France, Germany, the Netherlands, Norway, Ireland, Sweden and UK. Data is amalgamated for all countries and not available on a country-by-country basis; data has been analysed over a five-year period from 2013 to 2017.

7.6.1.10 Further annual VMS data are collated by the MMO for all vessels ≥ 15 m registered to the UK, including all gear types. VMS data for UK vessels 12-14.9 m in length are expected to be available at the end of 2019.

7.6.2 Site Specific Surveys

7.6.2.1 To inform the EIA, site-specific surveys were undertaken. A summary of surveys is outlined in **Table 7.6**.

Table 7.6: Summary of site-specific survey data.

Title, year and reference	Summary	Coverage of Hornsea Four development area
Commercial Fisheries Scouting Surveys, 26 July to 01 August 2018.	Static gear survey and gear observations out to 12 nm across the offshore ECC and within Hornsea Four array area, including location of gear and identification of gear marker type (drums, buoys, pellets and fenders).	Inshore section of the Hornsea Four offshore ECC
Seasonal otter trawl sampling, 2011. **Volume 5, Annex 3.1: Fish and Shellfish Ecology Technical Report**.	41 trawls undertaken across the former Hornsea Zone with a 4 km buffer to the north and south. The vessel used to conduct these surveys was a commercial fishing vessel fitted with a high-opening 5 m otter trawl and 40 mm cod-end allowing for both demersal and semi-pelagic species to be caught. A total of 41 trawls, of 30-minute duration, were completed.	Partial coverage of the Hornsea Four array area.
Epibenthic beam trawl sampling, 2012 and 2012. **Volume 5, Annex 3.1: Fish and Shellfish Ecology Technical Report**. **Volume 5, Annex 2.1: Benthic Ecology Technical Report**.	102 beam trawl samples were collected across the former Hornsea Zone to support the zonal characterisation and baseline characterisations for Hornsea Projects One and Two. The beam trawls, each lasting 10 minutes, were carried out using a standard Cefas 2 m 'Jennings' beam trawl fitted with a 5 mm cod-end.	Partial coverage of the Hornsea Four array area.
Marine traffic surveys of Hornsea Four array area and offshore HVAC booster station search area (summer and winter), 2018. **Volume 5, Annex 8.1: Navigational Risk Assessment**.	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three array area in accordance with MGN 543.	Full coverage of the Hornsea Four array area and partial coverage of the offshore ECC.

7.7 Baseline environment

7.7.1 Existing baseline

7.7.1.1 This section presents the existing baseline for commercial fisheries, using the most recent datasets available at the time of writing (2012-2016 for EU DCF data; 2013-2017 for MMO data; 2017 for ICES VMS data and 2012-2016 for NE IFCA data).

7.7.1.2 This section provides an overview of all landings from the Hornsea Four commercial fisheries study area (i.e., ICES rectangles 37E9, 36F0, 37F0, 36F1, 37F1), followed by analysis on a fishery by fishery basis, where details on the nationality of vessels, species caught, and location of fishing activity is provided.

7.7.1.3 This section should be read in conjunction with **Volume 5, Annex 7.1: Commercial Fisheries Technical Report**, which provides further detail on vessel and gear characteristics and profiles fisheries activity on a country basis.

Total landings and activity across Hornsea Four

7.7.1.4 Landings from the Hornsea Four commercial fisheries study area had an average annual value of €33.1 million for all EU member states (based on five-years' data from 2012 to 2016; EU DCF database, 2019; EU MOFA, 2019). The proportion of value by ICES rectangle is shown in **Figure 7.2** for vessel nationality and **Figure 7.3** for species composition.

7.7.1.5 Landings from the inshore and southern ICES rectangles (37E9, 36F0 and 36F1) are dominated by UK vessels targeting shellfish, namely lobster *Homarus gammarus*, brown crab *Cancer pagurus*, whelk *Buccinum undatum* and scallops *Pecten maximus*. Landings from the remaining ICES rectangles (37F0 and 37F1) are fished by a mix of UK and other EU countries, mainly targeting pelagic (herring *Clupea harengus*) and demersal species including sandeel *Ammodytes* spp, sole *Solea solea*, plaice *Pleuronectes platessa*, Norway lobster *Nephrops norvegicus* (hereby referred to as *Nephrops*) and whiting *Merlangius merlangus*.

7.7.1.6 The highest value (€11.2 million) and weight (17,300 tonnes) of landings is taken from 37F0 (**Figure 7.4**), where a range of fisheries occur (pelagic, demersal, shellfish), that are targeted by seven different countries. Other than UK vessels, landings by Dutch, Danish and French dominate, with smaller amounts landed by Belgian, German and Swedish fleets.

7.7.1.7 Shellfish landings of lobster, brown crab, scallop, whelk and *Nephrops* are almost exclusively taken by UK vessels (**Figure 7.5**). For pelagic species, the majority of herring (58% by value) are caught by Dutch vessels, with the remainder taken by five other countries. While mackerel landings are almost exclusively taken by the French pelagic fleet, as are whiting landings by the French demersal fleet. The Danish dominate landings of sandeel, with a small proportion landed by Swedish vessels. Sole and plaice are landed by a mixture of Dutch, Belgian and UK vessels.

7.7.1.8 Lobster is the most economically important species in the Hornsea Four commercial fisheries study area, with an average annual value of €8.6 million, followed by herring (€6.6 million), brown crab (€6.3 million), scallop (€3.4 million) and sandeel (€2 million).

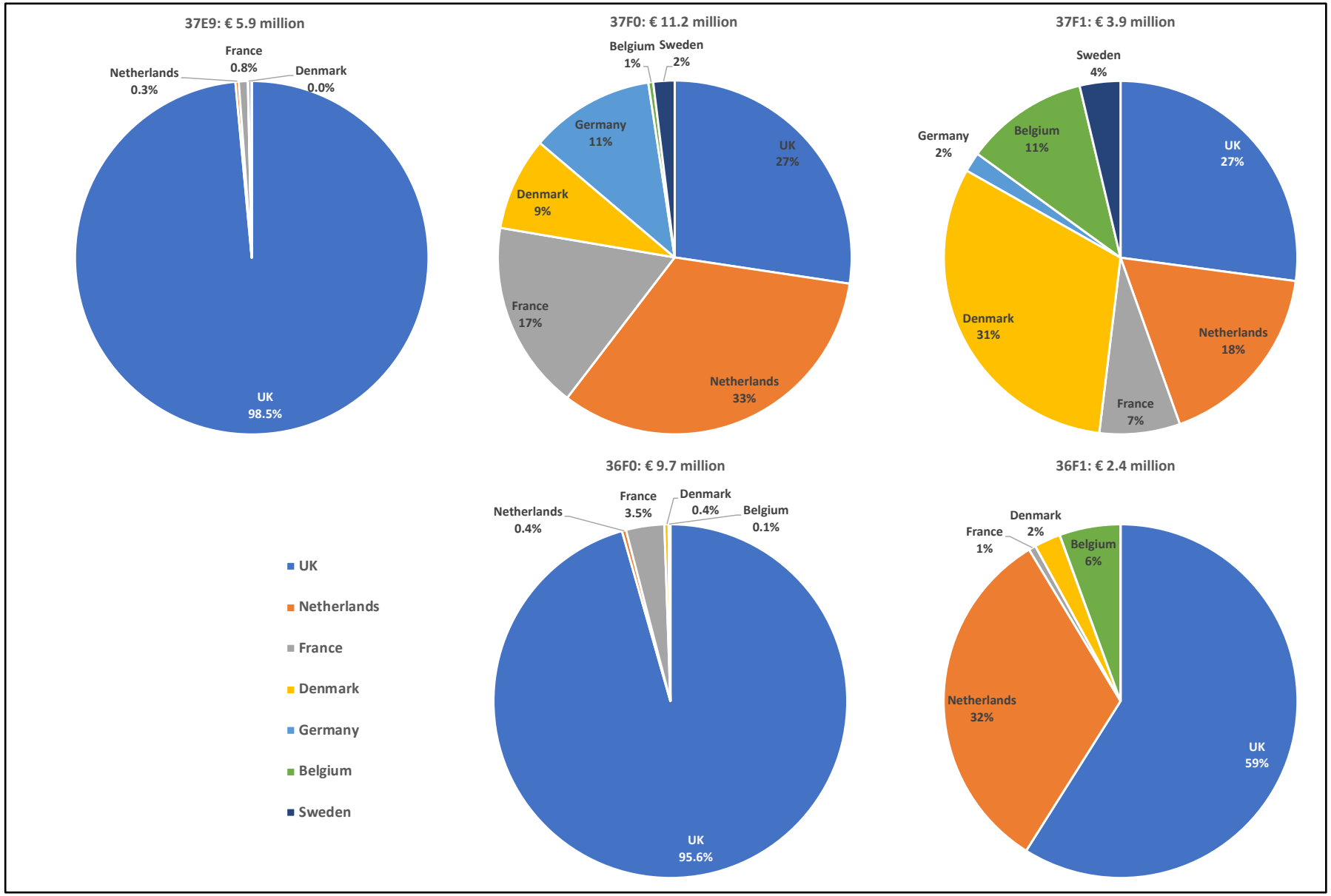

Figure 7.2: Average annual value by country and ICES rectangle (data 2012-2016, source DCF, 2019).

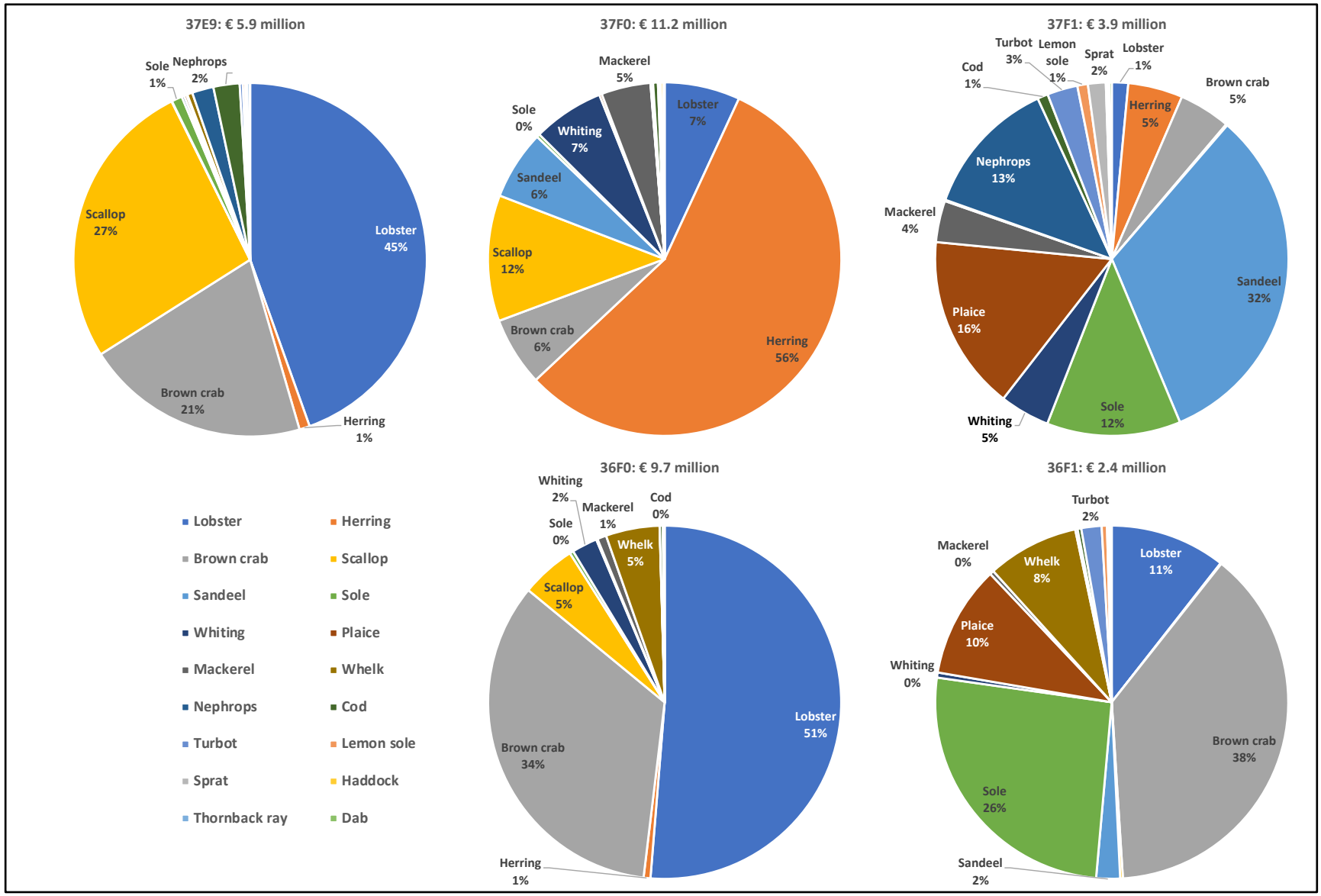

Figure 7.3: Average annual value by species and ICES rectangle (data 2012-2016, source DCF, 2019).

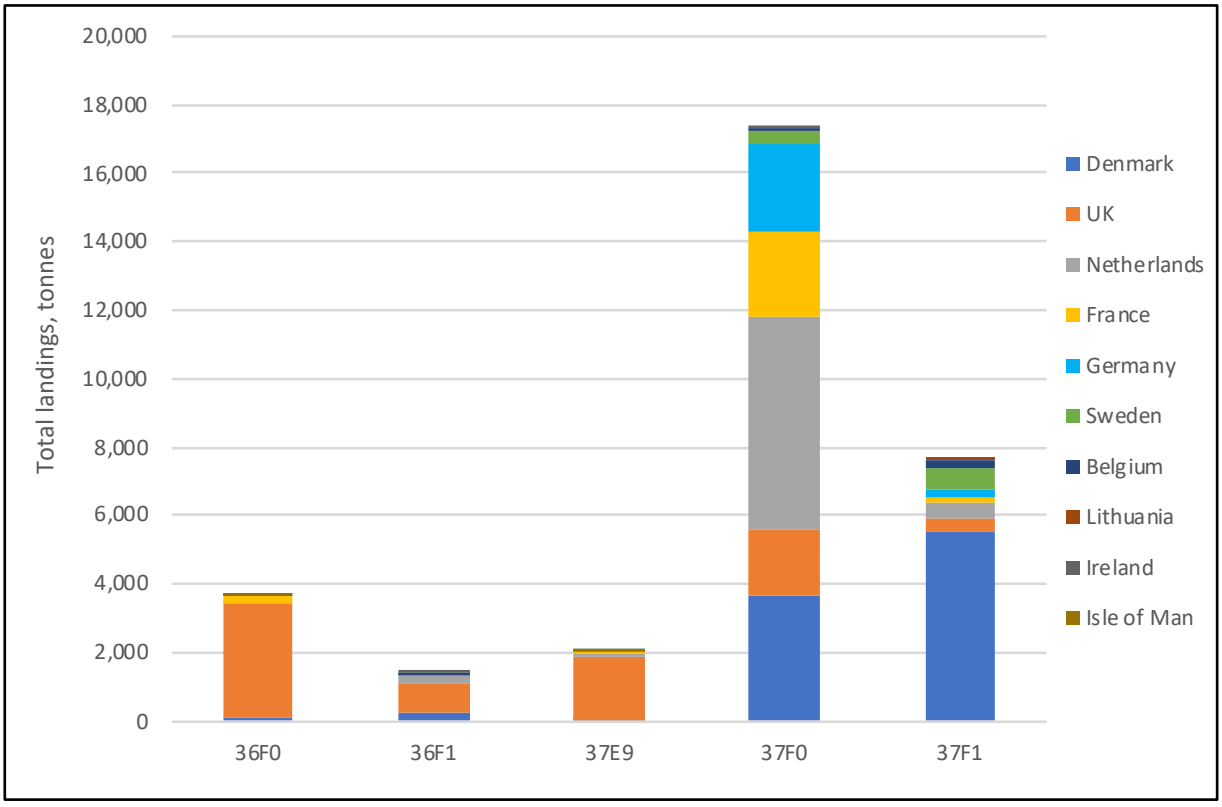

Figure 7.4: Average annual landings from Hornsea Four commercial fisheries study area by ICES rectangle and country (data 2012-2016, source DCF, 2019).

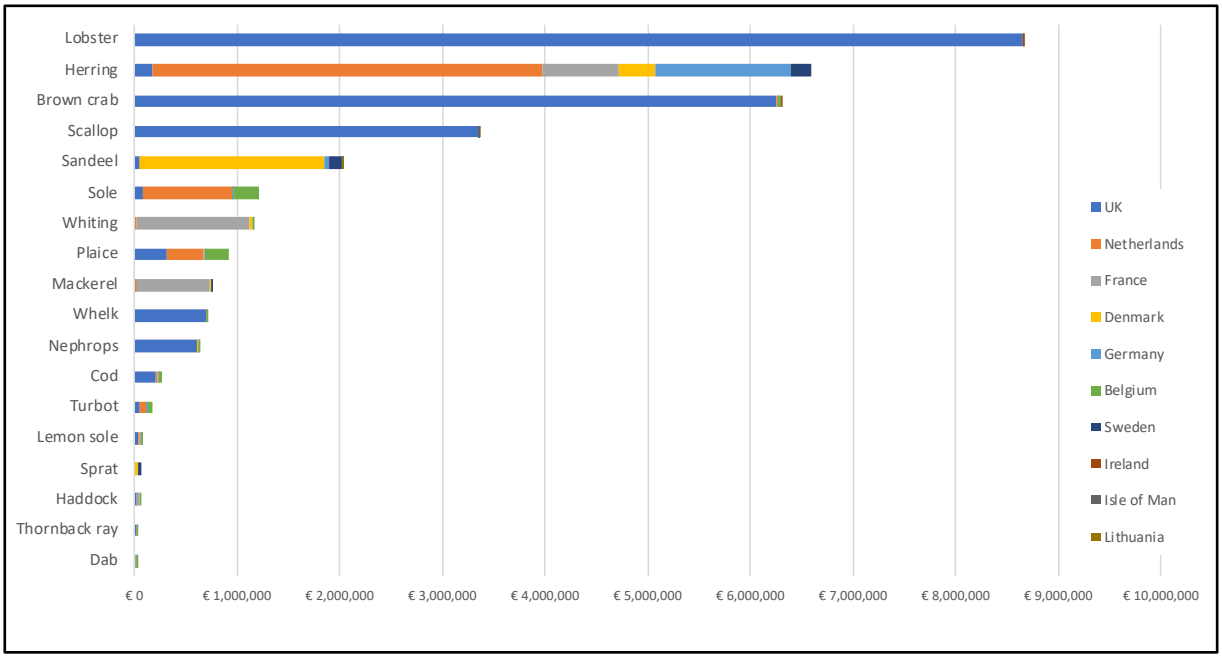

Figure 7.5: Average annual value from Hornsea Four commercial fisheries study area by species and country (data 2012-2016, source DCF, 2019).

Potting fishery

7.7.1.9 In the Hornsea Four commercial fisheries study area landings by vessels using pots are almost exclusively undertaken by the UK fleet (99.98%), with a negligible amount landed by Irish vessels (**Figure 7.6**). While lobsters are the most valuable species, they are landed in smaller quantities than brown crab (656 tonnes lobster annually, compared to 4,600 tonnes brown crab), indicating the potting fleet are dependent on both species. Increases in prices of both crab and lobster have made the fisheries more profitable in recent years (see **Volume 5, Annex 7.1: Commercial Fisheries Technical Report**). A small whelk fishery is also undertaken, using a different type of pot (normally a plastic container).

7.7.1.10 In terms of location, 37E9 and 36F0 are the most important, which is supported by VMS data for vessels ≥ 15 m in length (**Figure 7.7**). Total value of catches landed by the potting fleet have steadily increased over the time period analysed.

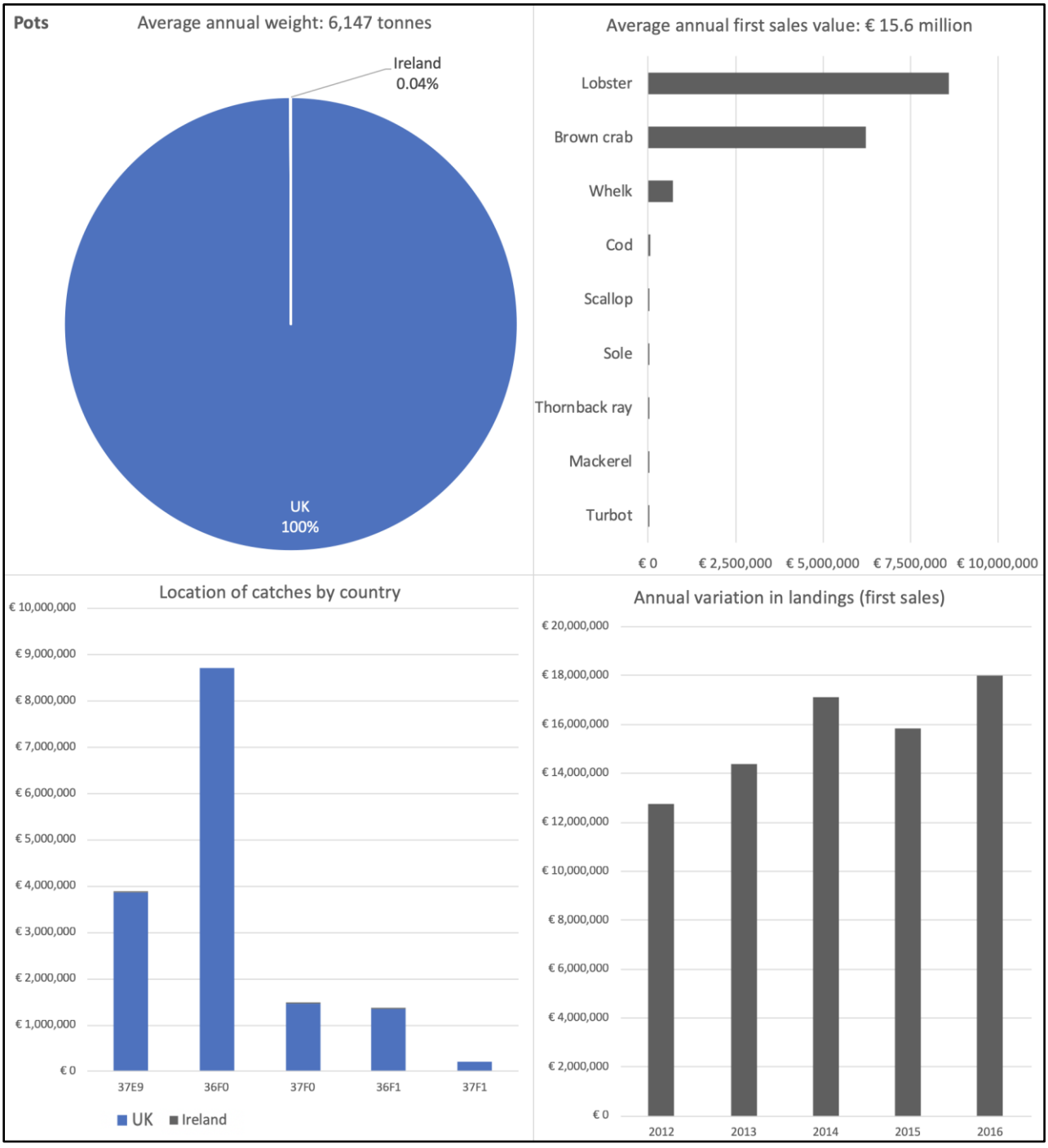

Figure 7.6: Pots landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source DCF, 2019).

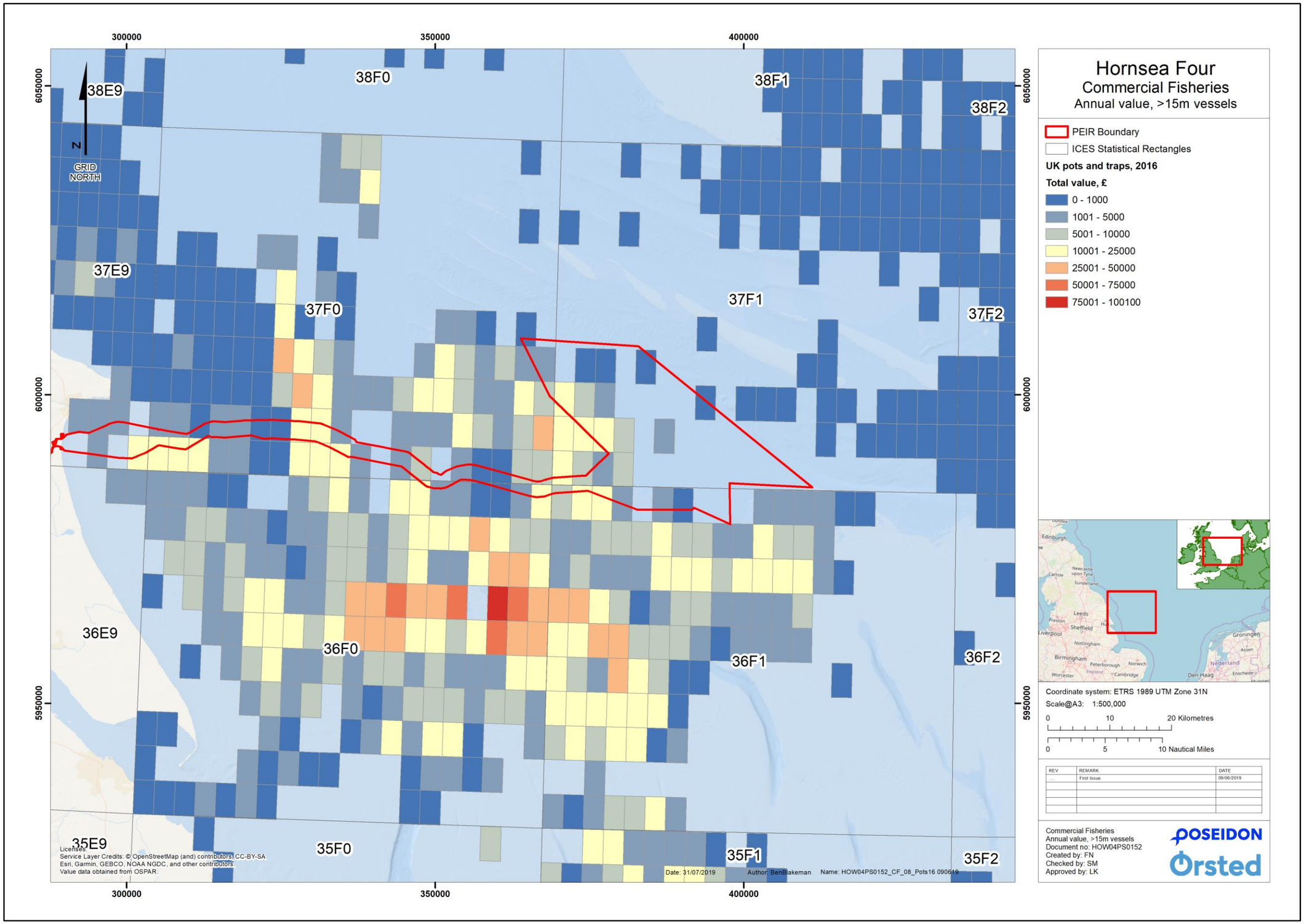

Figure 7.7: Pots landed value for UK ≥ 15m vessels (data: MMO, 2018) (not to scale).

Hornsea Four array area

7.7.1.11 The majority of the Hornsea Four array area is located in ICES rectangle 37F1, which has the lowest level of landings by potting vessels, corroborated by statistics and VMS data. Activity by UK potting vessels within the array area is limited. However, consultation indicates that construction activities related to other projects (including Hornsea Project One and Hornsea Project Two, as well as oil and gas exploration activity) has resulted in a higher proportion of potting than illustrated by 2016 VMS and landings data.

Hornsea Four offshore ECC

7.7.1.12 It is understood that extensive potting occurs in the inshore region of the Holderness coast, and along the entirety of the offshore ECC. VMS data indicates hot spots of activity in the north eastern portion of 36F0, with less activity overlapping the offshore ECC. However, this is due to the dataset representing ≥15 m vessels, which does not reflect the majority of vessels based in the Bridlington area, which are under 15 m. It is noted that other ICES VMS datasets presented within the report are for ≥12 m vessels; due to data availability, it is not possible to present MMO VMS to the same level of detail for potting vessels.

7.7.1.13 Extensive potting activity across the offshore ECC is evidenced by landings statistics and consultation with fisheries representatives (NFFO and HFIG) and directly with the fishing industry, based on one-to-one discussions related to survey work to inform the PEIR.

7.7.1.14 Surveillance data provided by the NE IFCA and mapped within **Volume 5, Annex 7.1: Commercial Fisheries Technical Report** corroborates that potting activity occurs across the inshore region of Holderness Coast, including across the offshore ECC. Activity appears greatest to the north of the offshore ECC, but this may be a factor of surveillance coverage across the NE IFCA area.

Dredge fishery

7.7.1.15 In the Hornsea Four commercial fisheries study area landings by vessels using mechanical dredge are almost exclusively undertaken by the UK fleet (99.9%), with a negligible amount landed by Isle of Man vessels (**Figure 7.8**).

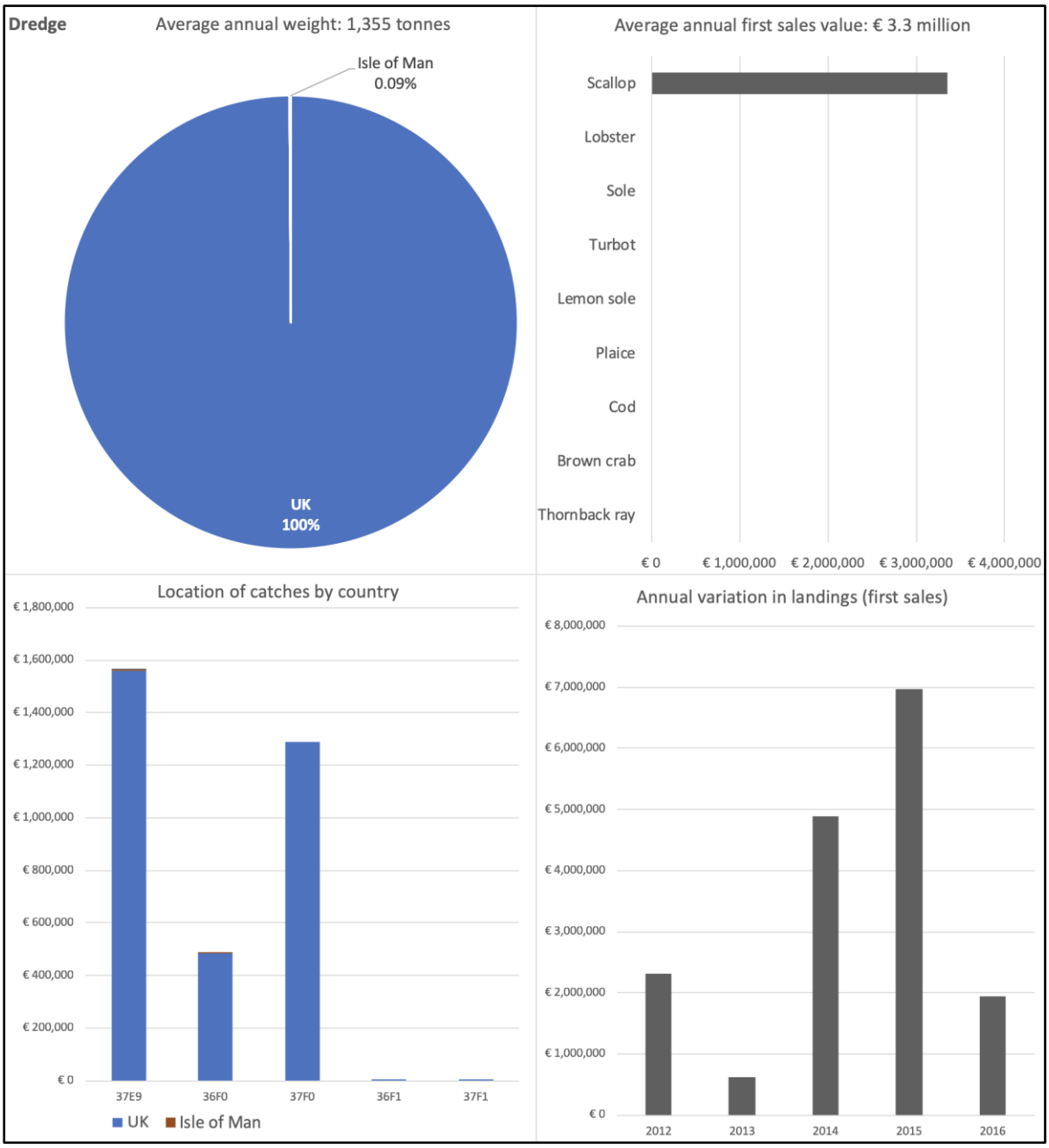

Figure 7.8: Dredge landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source DCF, 2019).

7.7.1.16 The dredge fishery targets scallops, with minimal landings of other commercial species. The fishery is predominately undertaken in the northern ICES rectangles 37E9 and 37F0, as well as 36F0, to a lesser extent. There is no fishery in the most offshore ICES rectangles 36F1 and 37F1, which is corroborated by VMS data for all EU and UK vessels ≥12 m in length (**Figure 7.8**).

7.7.1.17 Annual landings by the dredge scallop fishery are highly variable, reaching almost €7 million in 2015, compared to the €3.3 million annual average. This reflects the somewhat cyclable nature of scallop fisheries, where certain grounds are more productive in certain years and are therefore targeted on a cyclable basis.

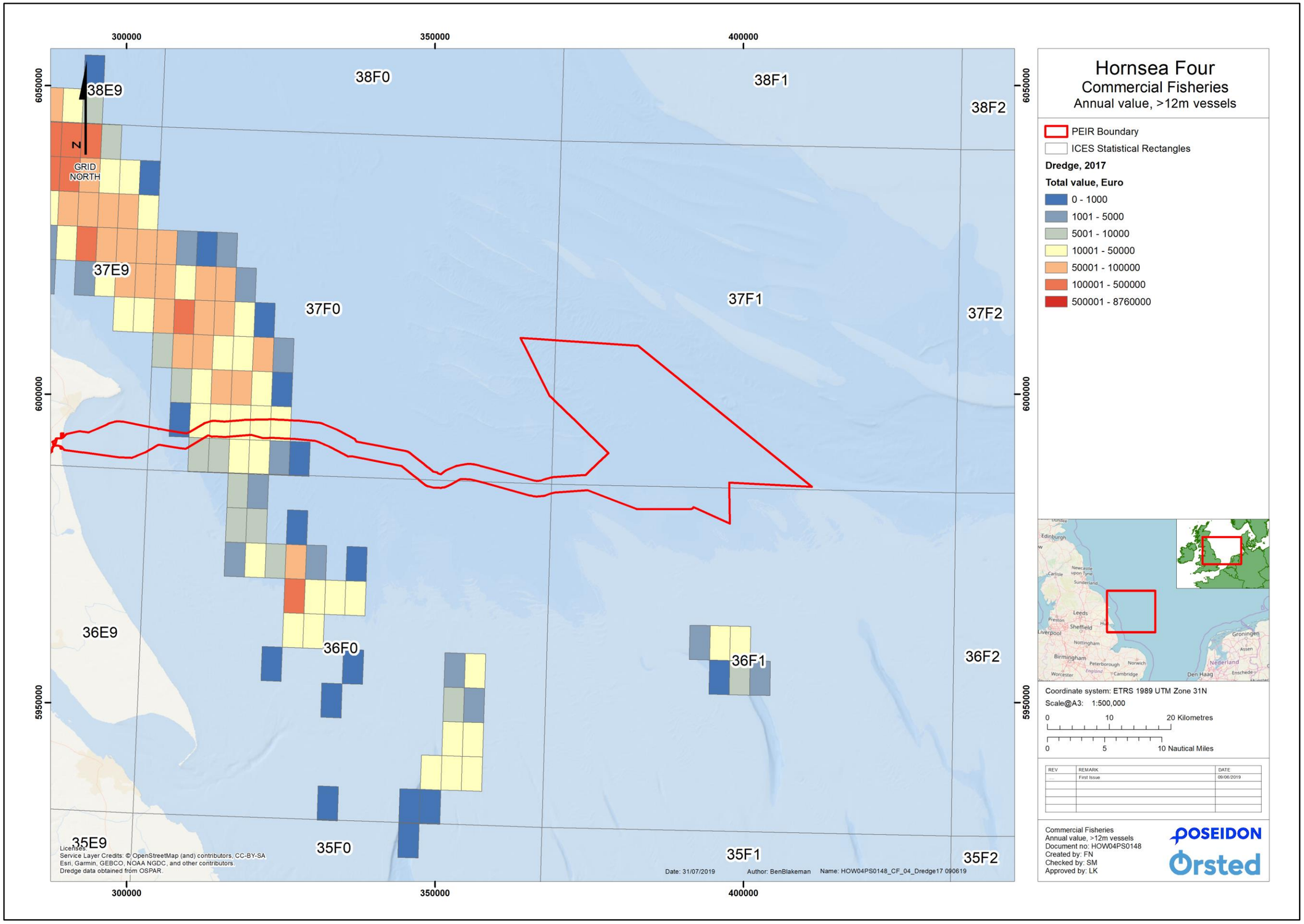

Figure 7.9: Dredge landed value for UK and EU ≥ 12 m vessels (data: ICES, 2019) (not to scale).

Hornsea Four array area

7.7.1.18 There is no scallop dredge activity within the Hornsea Four array area, as evidenced by landing statistics and VMS data.

Hornsea Four offshore ECC

7.7.1.19 The scallop dredge fishery targets grounds between 6 to 12 nm, running parallel to Holderness Coast. The fishery is principally undertaken north of the offshore ECC, but also runs through the section of offshore ECC between 6 to 12 nm.

Pelagic fishery

7.7.1.20 In the Hornsea Four commercial fisheries study area landings by vessels using pelagic trawl are taken by Dutch (45% by value), German (18%) and French and Danish (15% each) fleets.

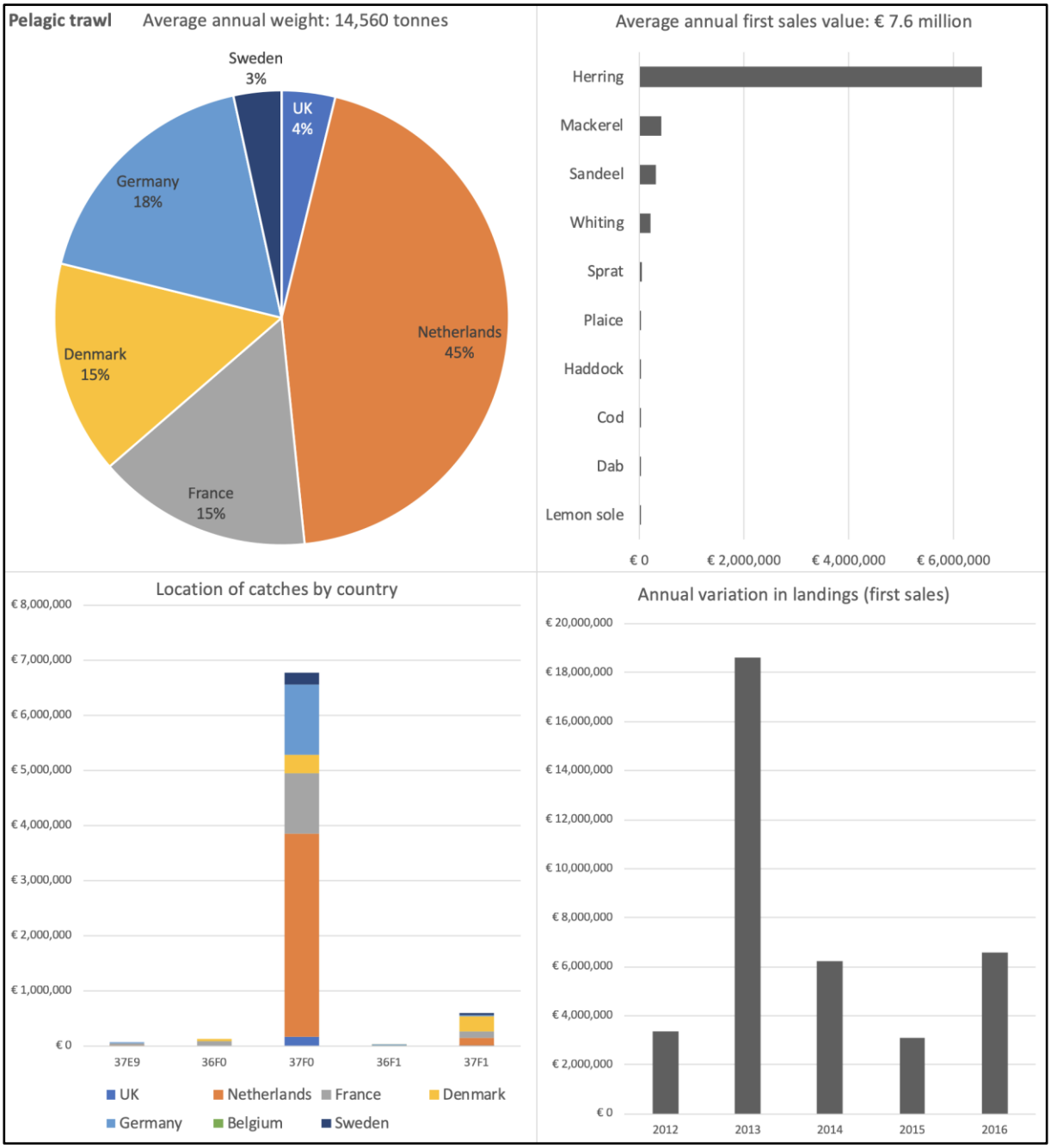

Figure 7.10: Pelagic trawl landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source DCF, 2019).

7.7.1.21 The target species is herring, worth €7.6 million in average annual first sales value, with additional small quantities of mackerel, sandeel and whiting associated with the catch. Almost all pelagic catches are taken from 37F0 and are highly variable year on year.

7.7.1.22 Pelagic trawls target highly mobile pelagic species, that move in shoals and are not associated with specific seabed habitats. Herring shoal and migrate across long distances to and from spawning grounds and are therefore available to catch across large areas. VMS data is not available for analysis of EU member states. The fishery is characterised by short, highly seasonal fishing events, with each trip landing between 1,000 – 1,500 tonnes, which can be taken in a single haul.

Hornsea Four array area

7.7.1.23 The majority of pelagic landings are consistently taken from 37F0. A small portion of Hornsea Four array area overlaps with 37F0. All pelagic trawl fleets are assumed to occasional fish within the array area, but not routinely target this area.

Hornsea Four offshore ECC

7.7.1.24 The Hornsea Four offshore ECC runs across the southern part of 37F0. All pelagic trawl fleets are assumed to occasional fish within the offshore ECC, but not routinely target this area.

Demersal fishery – beam trawl

7.7.1.25 In the Hornsea Four commercial fisheries study area landings by vessels using beam trawl are principally taken by Dutch (56% by value) and Belgian (40%) fleets (**Figure 7.11**). The target species are sole and plaice, worth €2 million in average annual first sales value. Landings are predominately taken from the offshore ICES rectangles 36F1 and 37F1, with 36F1 principally targeted by Dutch vessels.

7.7.1.26 The total landings value by beam trawl has dropped consistently across the years analysed and by 46% across the full five-year time series. This is likely to be due to changes in gear, with the Dutch fleet citing a move towards demersal seine over beam trawl, as well as fluctuations related to trends in Total Allowable Catches (TACs) for the key species.

7.7.1.27 VMS data (**Figure 7.12**) corroborates landings from 36F1 and 37F1, noting that the adjacent ICES rectangle (37F2) is more important to the beam trawl fleet, in terms of value landed.

Hornsea Four array area

7.7.1.28 Some activity by beam trawl vessels is noted within Hornsea Four array area, notably in the south portion of the array (**Figure 7.12**). The south east corner of 37F1 (outside the array area boundary) and adjacent ICES rectangle (37F2) are considerably more important in terms of value landed by beam trawl vessels. This is consistent for previous years analysed (2013 to 2016), as presented in **Volume 5, Annex 7.1: Commercial Fisheries Technical Report**.

Hornsea Four offshore ECC

7.7.1.29 There is limited effort of activity by beam trawl vessels across the offshore ECC. However, a pocket of activity is noted, approximately 10 nm east of Flamborough Head, which extends south and overlaps with a small section of the offshore ECC.

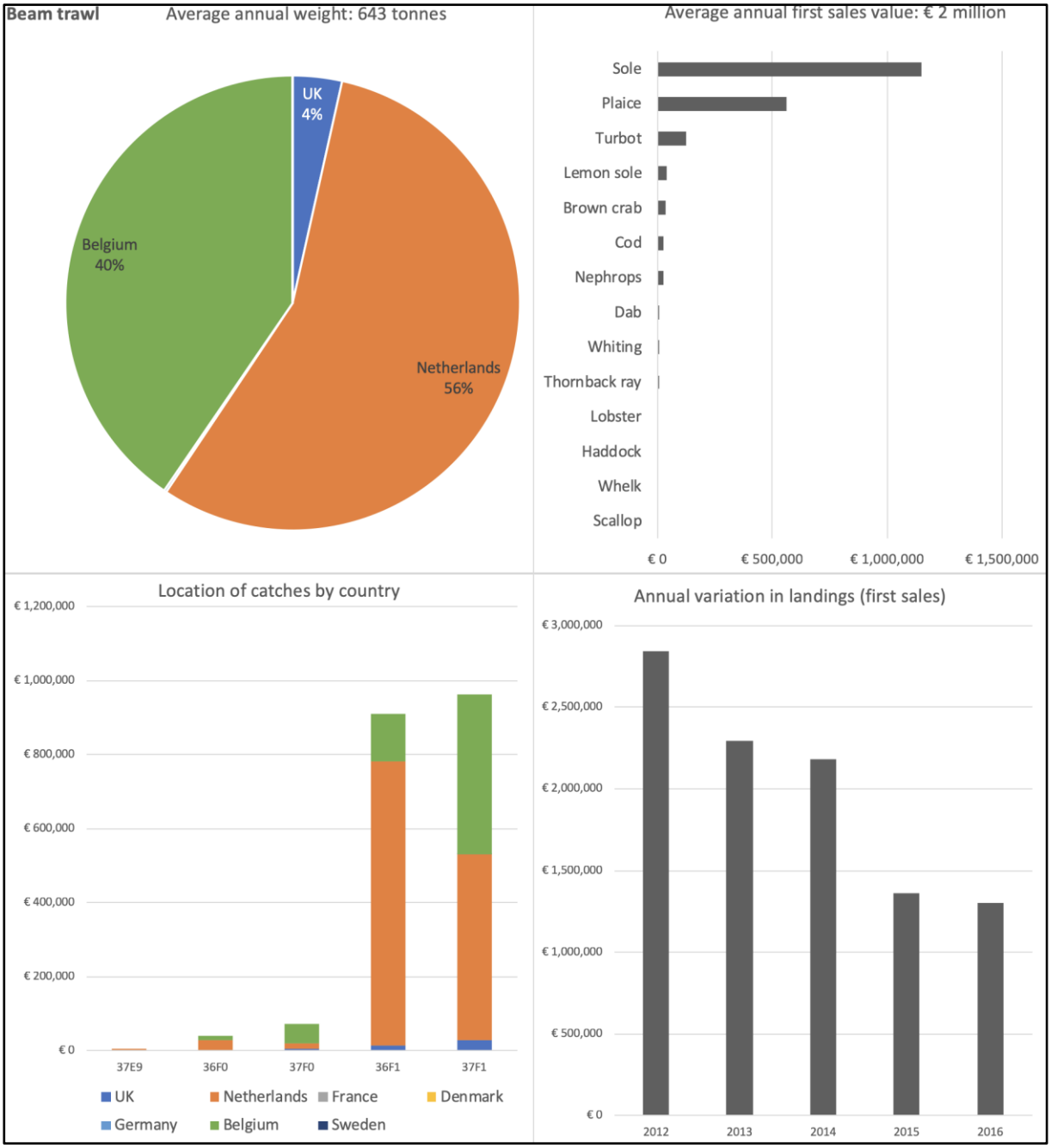

Figure 7.11: Beam trawl landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source DCF, 2019).

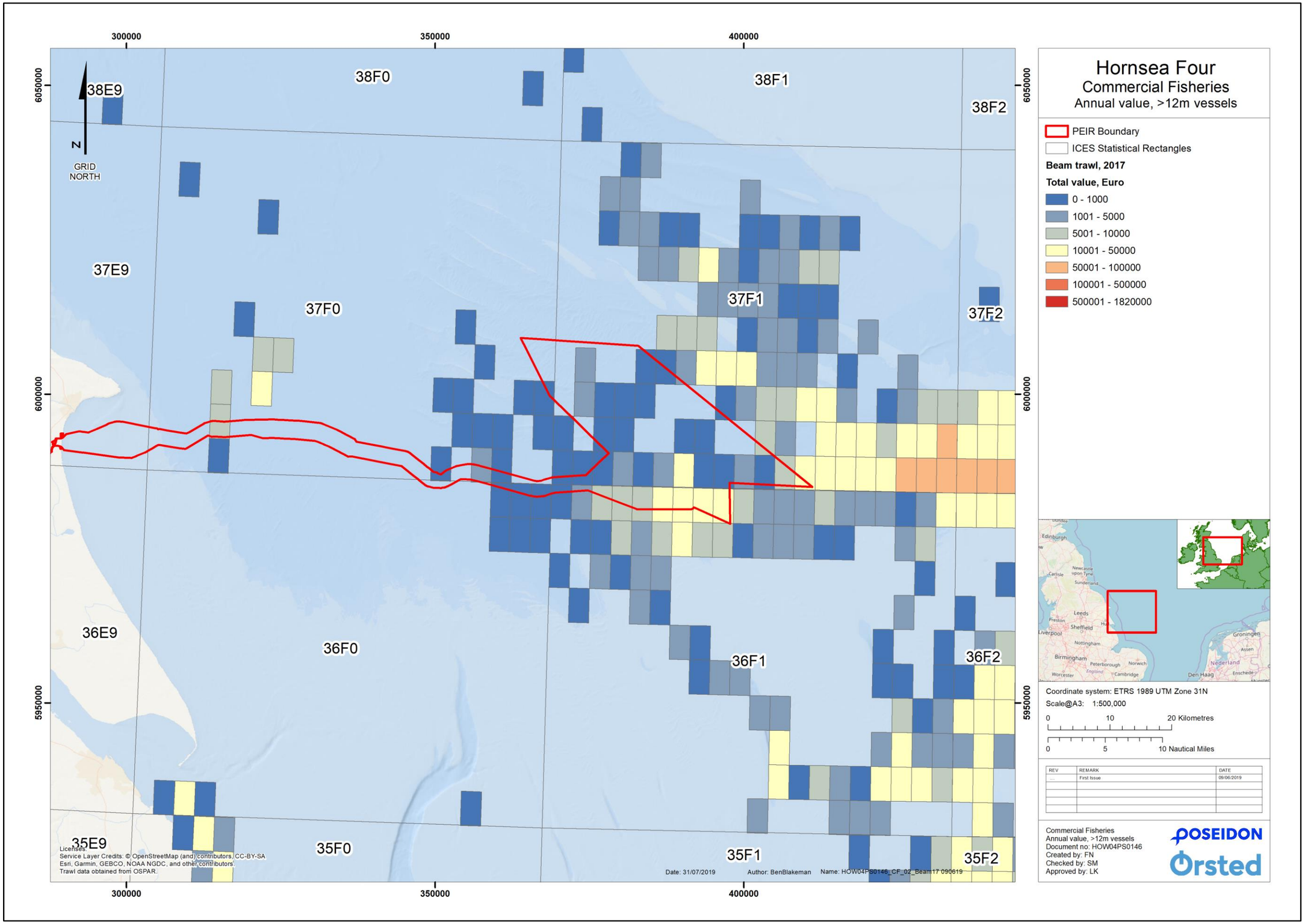

Figure 7.12: Beam trawl landed value for UK and EU ≥ 12m vessels (data: ICES, 2019) (not to scale).

Demersal fishery – otter trawl and demersal seine

7.7.1.30 In the Hornsea Four commercial fisheries study area landings by vessels using otter trawl are principally taken by Danish (75% by value), French (9%), UK (8%) and Swedish (6%) vessels. The Danish and Swedish demersal trawl vessels are large industrial trawlers targeting sandeel in 37F0 and 37F1. The French demersal fleet are targeting whiting in 36F0 and 37F0, and the UK are targeting a *Nephrops* and mixed demersal fishery.

7.7.1.31 Landings have significantly dropped from 2015 to 2016, likely to be linked to the limitations in TAC for sandeel.

7.7.1.32 Small quantities of landings by demersal seine are recorded across the Hornsea Four commercial fisheries study area, worth €54,000 in average annual first sales value. Landings are principally by UK (60% by value), Dutch (29%) and French (9%) vessels, targeting plaice, whiting and mixed demersal. The majority of landings are from 37F1, with smaller quantities from 36F0 and 37F0.

Hornsea Four array area

7.7.1.33 Very little activity is noted by demersal otter trawlers within the Hornsea Four array area, in 2017 (**Figure 7.15**). Higher levels of activity are seen in 2014 and 2016 (**Volume 5, Annex 7.1: Commercial Fisheries Technical Report**), but this remains relatively limited compared to the areas outside the array boundaries (notably to the east and north east of the array).

7.7.1.34 Two small areas of key sandeel grounds overlap with the array area, in the north west and south east corners of the array (**Figure 7.16**).

Hornsea Four offshore ECC

7.7.1.35 Some activity is noted by demersal otter trawlers in the middle section of the offshore ECC (**Figure 7.15**). Key sandeel grounds are not mapped within the offshore ECC, and so this activity is likely to be French vessels targeting whiting and/or UK vessels targeting *Nephrops* and mixed demersal species.

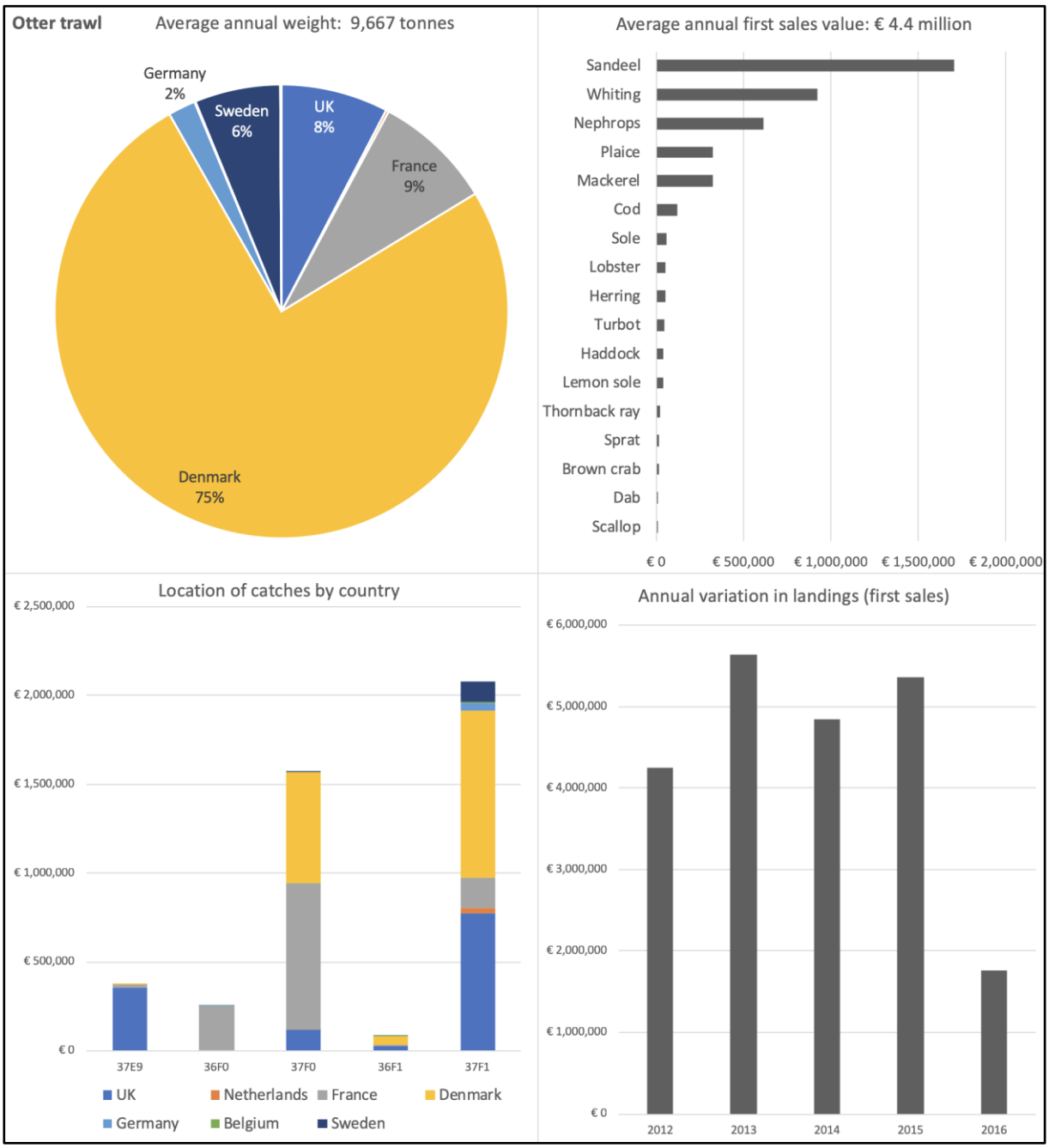

Figure 7.13: Demersal trawl landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source DCF, 2019).

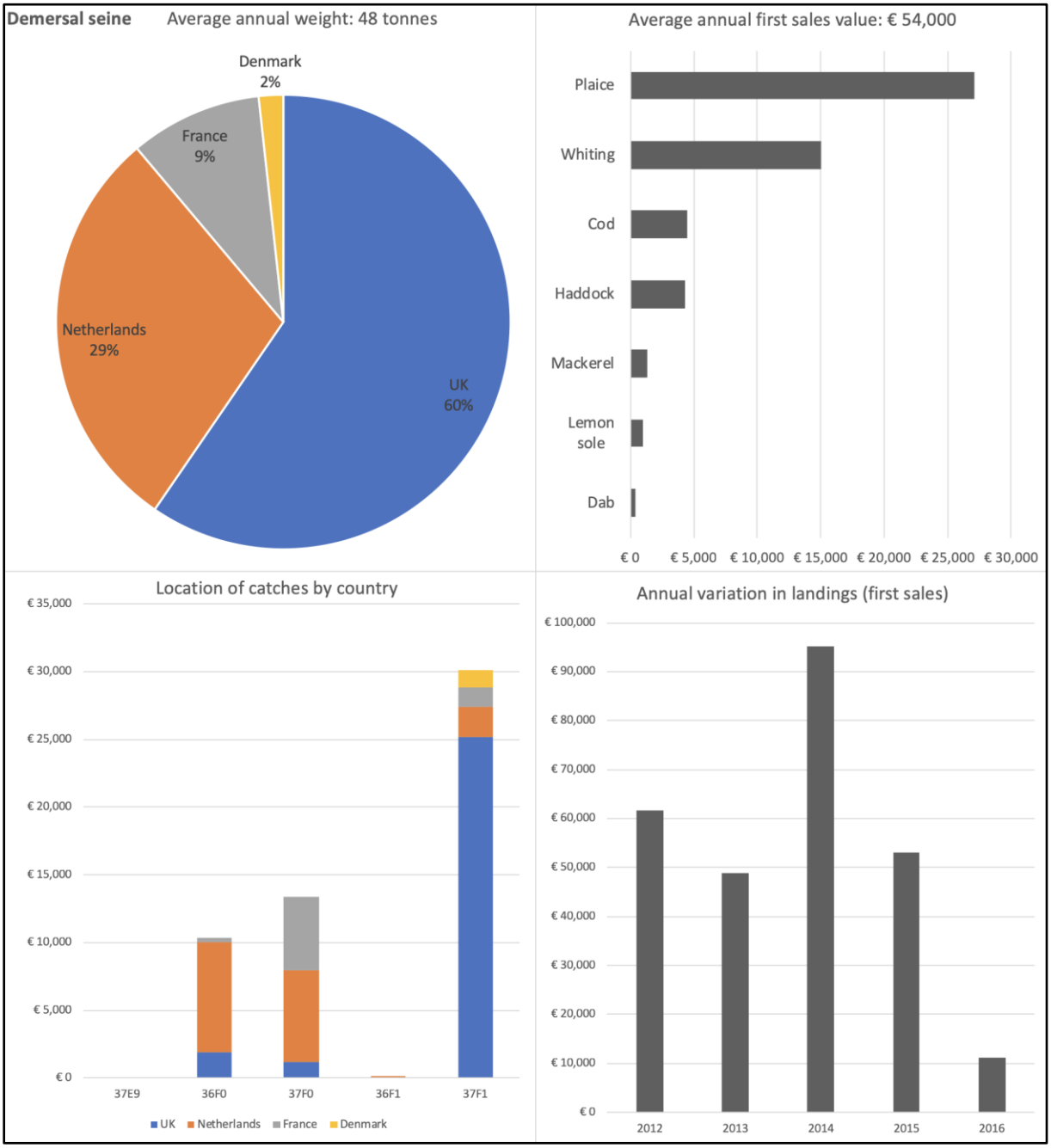

Figure 7.14: Demersal seine landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source DCF, 2019).

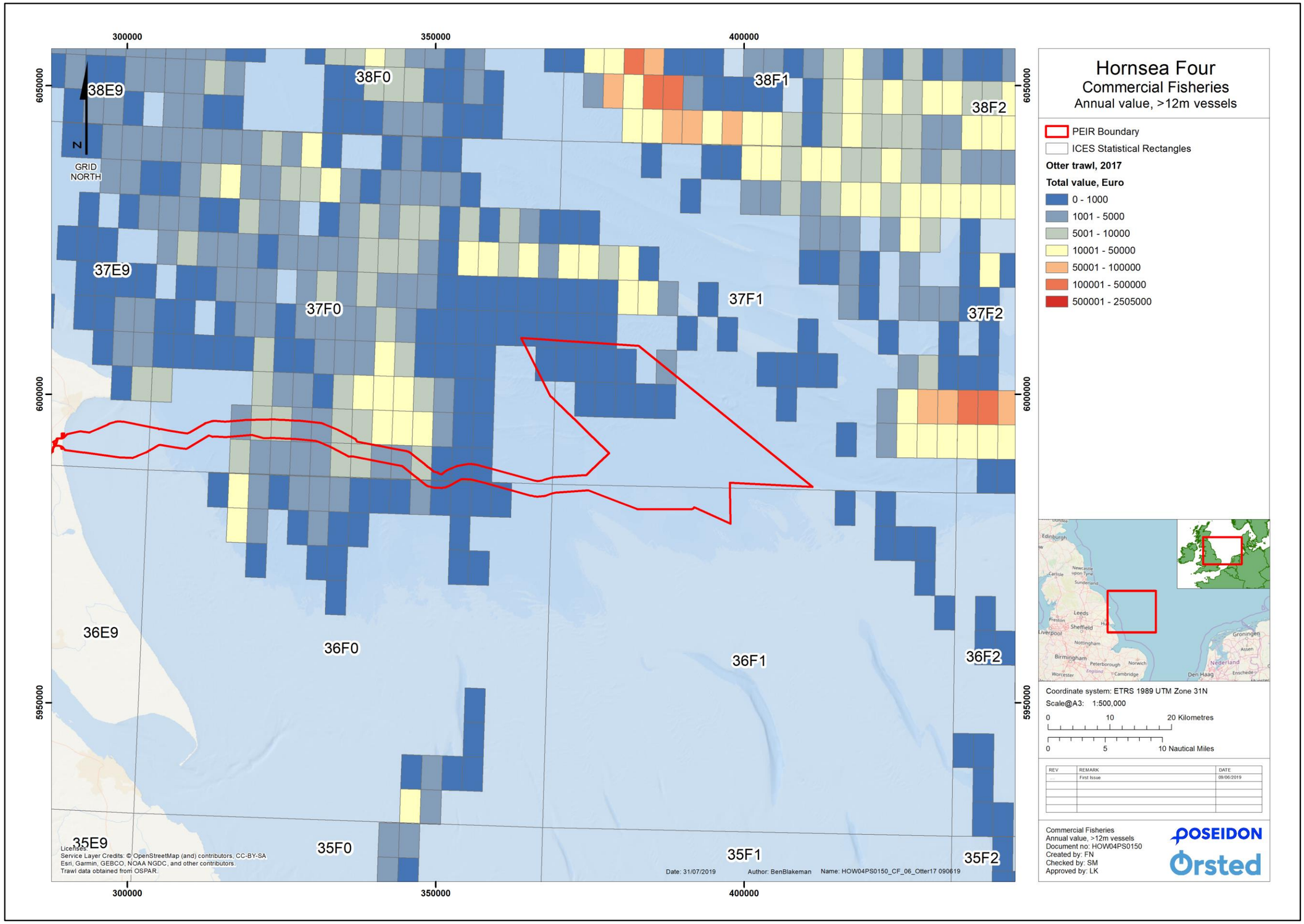

Figure 7.15: Otter trawl landed value for UK and EU ≥ 12m vessels (data: ICES, 2019) (not to scale).

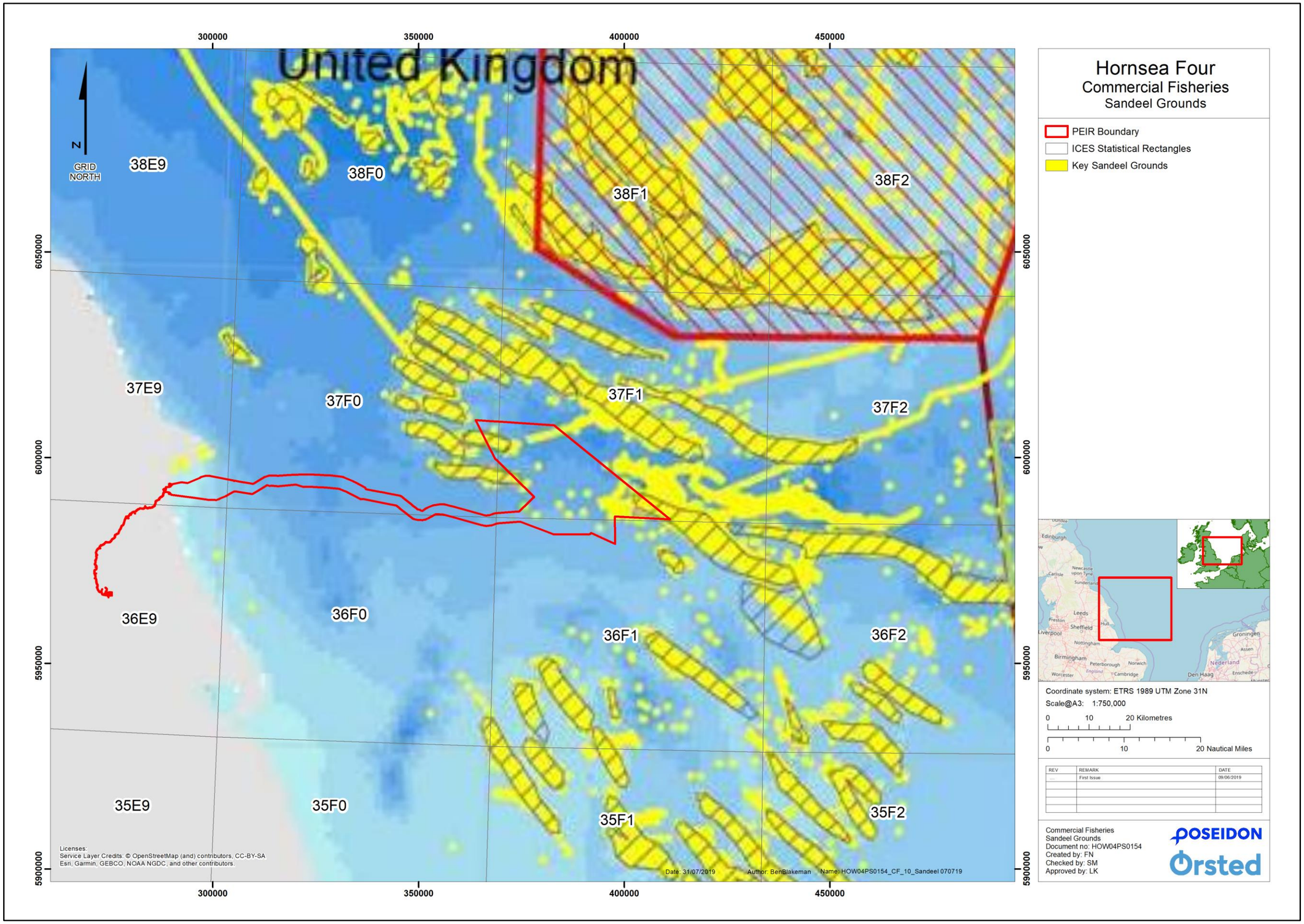

Figure 7.16: Key sandeel grounds in the North Sea (source: DTU Aqua, 2010) (not to scale).

7.7.2 Predicted future baseline

7.7.2.1 Commercial fisheries patterns change and fluctuate based on a range of natural and management-controlled factors. This includes the following:

- Stock abundance: fluctuation in the biomass of individual species stocks in response to status of the stock, recruitment, natural disturbances (e.g. due to storms, sea temperature etc.), changes in fishing pressure etc.;
- Fisheries management: including changes in TACs leading to the relocation of effort, and/or an overall increase/decrease of effort and catches from specific areas;
- Environmental management: including the potential restriction of certain fisheries within protected areas;
- Improved efficiency and gear technology: with fishing fleets constantly evolving to reduce operational costs e.g. by moving from beam trawl to demersal seine;
- Sustainability: with seafood buyers more frequently requesting certification of the sustainably of fish and shellfish products, such as the Marine Stewardship Council certification, industry is adapting to improve fisheries management and wider environmental impacts; and
- Markets: commercial fishing fleets respond to market prices by focusing effort on higher value target species when prices are high and markets in demand.

7.7.2.2 The variations and trends in commercial fisheries activity are an important aspect of the baseline assessment and forms the principle reason for assessing five years of baseline data. Overall, given the time periods assessed, the future baseline scenario is expected to be reflected within the current baseline assessment undertaken.

7.7.2.3 There is, however, uncertainty surrounding the conditions of the withdrawal of the UK from the EU, with the UK becoming an independent coastal state and in control of waters out to 200 nm. Post EU exit, the access rights of non-UK vessels to UK EEZ waters remains unknown. Should access rights follow historic fishing patterns, then the future baseline will remain consistent with the current baseline assessment. Otherwise, effort across the Hornsea Four commercial fisheries study area is likely to be dominated by UK vessels.

7.7.3 Data Limitations

7.7.3.1 Limitations of landings data include the spatial size of ICES rectangles which can misrepresent actual activity across Hornsea Four and care is therefore required when interpreting these data. A further limitation of landings data is the potential under-reporting of landings associated with potting vessels, which may occur as a result of estimating catches (as opposed to accurate weighing) and not reporting catches that fall below the acceptable limit as defined within the UK Registration of Buyers and Sellers (i.e. when purchases of first sale fish direct from a fishing vessel are wholly for private consumption, and less than 30 kg is bought per day).

7.7.3.2 Lack of Norwegian landing statistics, as they are not included within EU databases, is also recognised as a data limitation.

7.7.3.3 Limitations of VMS data are primarily focused on the coverage being limited to vessels ≥15 m (for MMO data on potting gear) and ≥12 m (for ICES data on bottom-contact mobile gear).

It is important to be aware that where mapped VMS data may appear to show inshore areas as having lower (or no) fishing activity compared with offshore areas, this is not the case because VMS data do not include vessels typically operating in inshore area (i.e. which typically comprises of vessels <15 m in length). This is particularly important when assessing the activity across the offshore ECC for the potting fleet.

7.7.3.4 Limitations of surveillance data are primarily focused on the frequency and aerial coverage of patrols. UK surveillance aircraft are used to construct an on-going picture of fishing activity within the UK EEZ and to make effective use of patrol vessel activity by coordinated use of surveillance data. These data cannot be considered to give a complete picture of the actual level of activity and have a number of limitations, including the following key aspects:

- Patrol effort by IFCAs, Royal Navy Fisheries Patrol Vessels and patrol aircraft are optimised for enforcement purposes and not collection of sightings data. Areas with fewer fisheries enforcement issues are therefore likely to be visited less often and result in lower data confidence;
- Surveillance data are only indicative of areas where fishing activities occur, as there is no continuous monitoring of activities;
- Surveillance data present a snapshot of activity in an area and it cannot be assumed that if no vessels have been sighted then no fishing takes place; and
- Vessels fishing at night would likely remain undetected.

7.7.3.5 Data limitations were managed by ensuring accurate interpretation of the data and clear understanding of its scope, together with cross-referencing between data sources and consultation with the fishing industry. As data form only part of the evidence base, the limitations identified are not considered to significantly affect the certainty or reliability of the impact assessments in **Section 7.11**.

7.8 Project basis for assessment

7.8.1 Impact register and impacts "scoped out"

7.8.1.1 Based on the baseline environment, the project description outlined in **Volume 1, Chapter 4: Project Description** and the Commitments set out in **Volume 4, Annex 5.2: Commitments Register**, a number of impacts are proposed to be "scoped out" of the PEIR assessment for commercial fisheries. These impacts are outlined, together with a justification for scoping them out, in a **Table 7.7**. Further detail is provided in **Volume 4, Annex 5.1: Impacts Register**.

7.8.1.2 Please note that the term "scoped out" relates to the Likely Significant Effect (LSE) in EIA terms and not "scoped out" of the EIA process *per se*. All impacts "scoped out" of LSE are assessed for magnitude, sensitivity of the receiving receptor and conclude an EIA significance in the Impacts Register (see **Volume 4, Annex 5.1**). This approach is aligned with Hornsea Four's Proportionate approach to EIA (see **Volume 1, Chapter 5: EIA Methodology**).

Table 7.7: Commercial fisheries impact register.

Project activity and impact	Likely significance of effect	Approach to assessment	Justification
Hornsea Four array area and Hornsea Four offshore ECC construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and offshore ECC areas (CF-C-6).	No likely significant effect	Scoped Out	Impacts are expected to be highly localised and temporary during construction; limited deviations to existing steaming routes are expected. Given adequate notification it is expected that these vessels, which have an operational range beyond that of the development, will be in a position to avoid construction areas with no or minimal impact upon steaming times.
Physical presence of the Hornsea Four array area and export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the Hornsea Four array area and offshore cable corridor (CF-O-14).	No likely significant effect	Scoped Out	No additional steaming is expected to be required. Fleets can transit through the development area; magnitude and sensitivity is negligible/low for all fleets.
Decommissioning activities leading to longer steaming distances to alternative fishing grounds (CF-D-22).	No likely significant effect	Scoped Out	As per justification provided for construction impact.

Notes:
Grey – Potential impact is scoped out and both PINS and Hornsea Four agree.

7.8.2 Commitments

7.8.2.1 Hornsea Four has committed to several Commitments (primary design principles inherent as part of the project, installation techniques and engineering designs/modifications as part of their pre-application phase, to avoid a number of impacts or reduce impacts as far as possible). Further Commitments (adoption of best practice guidance) are embedded as an inherent aspect of the EIA process.

7.8.2.2 The commitments adopted by Hornsea Four in relation to commercial fisheries are presented in **Table 7.8**. The full list of Commitments can be found in **Volume 4, Annex 5.2: Commitments Register.**

Table 7.8: Commercial Fisheries Commitments.

Commitment ID	Measure Proposed	How the measure will be secured
Co81	Where scour protection is required, MGN 543 (or latest relevant available guidance) will be adhered to with respect to changes greater than 5% to the under keel clearance.	DCO Schedule 11, Part 2 - Condition 14 and; DCO Schedule 12, Part 2 - Condition 14 (Offshore safety management)
Co83	Where possible, cable burial will be the preferred option for cable protection.	DCO Schedule 11, Part 2 - Condition 12(1)(h) and; DCO Schedule 12, Part 2 - Condition 12(1)(h) (Cable specification and installation plan)
Co85	No more than two number of foundations to be installed simultaneously.	DCO Schedule 11, Part 2 - Condition 12(1)(g) and; DCO Schedule 12, Part 2 - Condition 12(1)(g) (Marine mammal mitigation protocol)
Co89	Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins).	DCO Schedule 11, Part 2 - Condition 6(8) and; DCO Schedule 12, Part 2 - Condition 6(8) (Notifications and inspections)
Co90	Ongoing liaison with fishing fleets will be maintained during construction, maintenance and decommissioning operations via an appointed Fisheries Company Liaison Officer and Fishing Industry Representative.	DCO Schedule 11, Part 2 - Condition 12(1)(d)(vi) and; DCO Schedule 12, Part 2 - Condition 12(1)(d)(vi) (Project environmental management and monitoring plan)
Co93	Aids to navigation (marking and lighting) will be deployed in accordance with the latest relevant available standard industry guidance and as advised by Trinity House, MCA and Civil Aviation Authority (CAA)	DCO Schedule 11, Part 2 - Condition 7 and; DCO Schedule 12, Part 2 - Condition 7 (Aids to navigation) DCO Schedule 11, Part 2 - Condition 12(1)(j) and; DCO Schedule 12, Part 2 - Condition 14(1)(j) (Aid to navigation management plan)

Commitment ID	Measure Proposed	How the measure will be secured
Co94	The United Kingdom Hydrographic Office will be notified of both the commencement (within two weeks), progress and completion of offshore construction works (within two weeks) to allow marking of all installed infrastructure on nautical charts.	DCO Schedule 11, Part 2 - Condition 6(10) and; DCO Schedule 12, Part 2 - Condition 6(10) (Notifications and inspections)
Co95	A fisheries co-existence and liaison plan will be prepared prior to the commencement of construction.	N/A
Co99	An Emergency Response and Cooperation Plan (ERCoP) will be developed prior to construction as per MGN 543 or the latest relevant available guidance. The ERCoP will detail specific marking and lighting of the wind turbines. The requirements for lighting on offshore obstructions, including to support helicopter hoist operations, is contained in CAP 393 (Article 223) (CAA, 2016a), CAP 764 (CAA, 2016c) and CAP 437 (CAA, 2016b).	DCO Schedule 11, Part 2 - Condition 14 and; DCO Schedule 12, Part 2 - Condition 14 (Offshore safety management)
Co111	A Marine Pollution Contingency Plan (MPCP) will be developed. This MPCP will outline procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising from offshore operations relating to Hornsea Four. The MPCP will also include relevant key emergency contact details.	DCO Schedule 11, Part 2 - Condition 12(1)(d)(i) and; DCO Schedule 12, Part 2 - Condition 12(1)(d)(i) (Marine pollution contingency plan)
Co139	Safety zones of up to 500 m will be applied during construction, maintenance and decommissioning phases. Where appropriate, guard vessels will be used to ensure adherence of Safety Zones and advisory passing distances.	Application for safety zones to be made post consent under 'The Electricity (Offshore Generating Stations) (Safety Zones) (Applications Procedures and Control of Access) Regulations 2007 (SI No 2007/1948)'. Safety zones required are also detailed within the Project Description.
Co180	The following guidance will be followed where appropriate; 'Recommendations For Fisheries Liaison: Best Practice' guidance for offshore renewable developers (FLOWW, 2006 and 2014; BERR, 2008).	N/A

7.9 Maximum Design Scenario

7.9.1.1 This section describes the parameters on which the commercial fisheries assessment has been based. These are the parameters which are judged to give rise to the maximum levels of effect on commercial fisheries receptors. Should Hornsea Four be constructed to different parameters within the design envelope, then impacts would be the same or reduced, but

they would not be any greater. The MDS for commercial fisheries is presented in **Table 7.9** and a summary presented in **Volume 4, Annex 5.1: Impacts Register**.

Table 7.9: Maximum design scenario for impacts on commercial fisheries.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
Construction			
Hornsea Four array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-C-1).	Primary: Co83 Co85 Tertiary: Co81 Co89 Co90 Co95	**Seabed Preparation:** • UXO, boulder, other debris and sandwave clearance, and seabed levelling. **Offshore Platforms:** • 10 foundations; and • Seabed total permanent area: 371,250 m^2 (for 6 small and 3 large OSS), plus 30,625 m^2 (for 1 accommodation platform). **Wind Turbines:** • 180 foundations; • 810 m minimum separation distance; • 45 m diameter footprint per foundation; • 85 m diameter scour protection footprint per foundation; • Seabed total permanent area: 795,216 m^2 (Suction bucket Jacket (WTG-type)); and • Turbines utilising the entire PEIR boundary (600 km^2). **Cables:** • 600 km of inter-array cables; • 90 km of interconnector cables; • 10 km of export cables within the array area; • Cables buried, typically to between 1 and 2 metres but up to 3 m; • Total seabed potential disturbed: 9 km^2 for array cables, plus 1.4 km^2 for interconnector cables and 0.15 km^2 for the export cables within the array; • Cable protection for up to 10% of the inter-array cables and interconnector cables and export cables within the array; • 10.4 m width of rock protection;	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential to restrict access to fishing grounds.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
		• Rock protection area 624,000 m^2 for array cable, plus 94,000 m^2 for interconnector cables; and • Up to 40 cable crossings for array and interconnector cables. **Safety Zones:** • 500 m safety zones around infrastructure under construction; and • 50 m safety zones around incomplete structures. **Construction Duration:** • Total: 3 years, including; • Foundation installation: 12 months; • Turbine installation: 12 months; • Platform installation: 2 months for each platform; and • Cable installation: 12 months. **Exclusion Scenario:** • Localised exclusion from safety zones around construction activities and partially installed infrastructure within the PEIR boundary of 600 km^2 across up to a 3-year period.	
Hornsea Four offshore ECC construction activities leading to reduction in access to, or exclusion from established fishing grounds (CF-C-2).	Primary: Co83 Tertiary: Co89 Co90 Co93 Co94 Co95	**Seabed Preparation:** • UXO, boulder, other debris and sandwave clearance, and seabed levelling. **Offshore Platforms:** • 3 foundations; and • Seabed total permanent area: 91,875 m^2. **Cable:** • Cable installation methods: Trenching, dredging, jetting, ploughing, mass flow excavation, vertical injection, rock cutting; and • 654 km of export cables, i.e., 6 cables, each of 109 km in length, laid in parallel.	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential to restrict access to fishing grounds.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
		Cable Protection: • Cables buried, typically to between 1 and 2 metres; • Total seabed potential disturbed: 9.8 km^2 for export cable; • 10% cable protection, up to 792,000 m^2 area for export cables; • 10.4 m width of rock protection; and • 10 cable crossings. **Safety Zones:** • 500 m safety zones around infrastructure under construction; • 50 m safety zones around incomplete structures; and • Roaming 500m safe passing distance for mobile installation vessels, which may, in exceptional circumstances, be increased to 1,000m dependant on the nature of the installation works. **Construction Duration:** • Total: 3 years construction window, including; • Foundation installation: 12 months; • Platform installation: 2 months per platform; and • Offshore export cable installation: 14 months. **Exclusion Scenario:** • Roaming and localised exclusion around construction activities within the Export Cable Corridor i.e., roaming 0.79 km^2 exclusion across up to a 3-year period.	
Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-3).	Tertiary: Co89 Co90 Co93 Co94 Co95	As per MDS for "Hornsea Four array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds".	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential for displacement.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-4).	Tertiary: Co89 Co90 Co93 Co94 Co95	As per MDS for "Hornsea Four offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds".	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential for displacement.
Hornsea Four array area and offshore ECC construction activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-C-5).	N/A	See Fish and Shellfish Ecology MDS.	The scenarios presented in Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-C-7).	Tertiary: Co89 Co90 Co93 Co94 Co95	**Wind Turbine Foundation Installation:** • 4 installation vessels (90 return trips); • 16 support vessels (360 return trips); • 40 transport / feeder vessels (incl. Tugs) (360 return trips); and • 12 months duration. **Wind Turbine Installation:** • 2 installation vessels (90 return trips); • 40 transport vessels (360 return trips); • 16 support (360 return trips); and • 12 months duration. **Offshore Platform Installation (all offshore substations and accommodation platform:** • 2 primary installation vessels (36 return trips); • 12 support vessels (162 return trips); • 4 transport vessels (72 return trips); and	The maximum number of turbines and associated infrastructure will lead to the highest level of construction activities and therefore highest level of construction vessel round trips. The maximum number of vessels transits and the maximum duration of the construction would result in the greatest potential for interference.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
		• 2 months duration. **Offshore Platform Foundation Installation (all offshore substations and accommodation platform:** • 2 primary installation vessels (24 return trips); • 12 support vessels (108 return trips); • 4 transport vessels (48 return trips); and • 2 months duration. **Inter-Array and Interconnector Cable Installation:** • 3 main cable laying vessels (204 return trips); • 3 main cable burial vessels (204 return trips); and • 12 support vessels (1,080 return trips). **Offshore Export Cable Installation:** • 3 main cable laying vessels (96 return trips); • 3 main cable jointing vessels (72 return trips;) • 3 main cable burial vessels (96 return trips); • 15 support vessels (144 return trips); and • 14 months duration. **Total Vessel Traffic:** • Up to 8 vessels in any given 5 km^2 at any one time.	
Operation and maintenance			
Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-O-8).	Primary: Co83	**Duration:** • Anticipated design life for Hornsea Four of 35 years. **Offshore Platforms:** • 10 foundations;	This represents the maximum duration and extent of fishing exclusion throughout the operation and maintenance phase and hence the greatest potential to restrict access to fishing grounds.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
	Tertiary: Co81 Co89 Co90 Co93 Co94 Co95	• Seabed total permanent area: 371,250 m^2 (for 6 small and 3 large OSS), plus 30,625 m^2 (for 1 accommodation platform); and • Minimum spacing of 100 m for HVAC booster stations. **Component Replacement:** • 300 m^2 jack-up footprint per replacement event; • 20 events over lifetime; and • 6,000 m^2 jack-up footprint per component replacement (20 x 300 m2). **Ladder Replacement:** • 300 m^2 jack-up footprint per ladder replacement event; • 70 ladder replacement events over lifetime; and • 21,000 m^2 total jack-up footprint per platform access ladder replacement (70 x 300 m^2). **Anode Replacement:** • 300 m^2 jack-up footprint per anode replacement event; • 70 anode replacement events over lifetime; and • 21,000 m^2 total jack-up footprint per anode replacement (70 x 300 m^2). **J-Tube Replacement:** • 300 m^2 jack-up footprint per J-tube replacement event; • 20 J-tube replacement events over lifetime; and • 6,000 m^2 jack-up footprint per J-tube replacement (20 x 300 m^2). **Wind Turbines:** • 180 foundations • 810 m from minimum separation distance; • 45 m diameter footprint per foundation; • 85 m diameter scour protection footprint per foundation; and	The smaller the spacing between turbines the greatest the potential for vessels to have restricted access to the site. Assessment assumes that fishing will resume around and between infrastructure within the Hornsea Four array area where possible, with the exception of an assumed 50m operating distance from infrastructure, areas of cable protection, and safety zones around infrastructure undergoing major maintenance.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
		• Seabed total permanent area: 1,180,980 m^2 (Suction bucket Jacket (WTG-type)). **Component Replacement:** • 300 m^2 jack-up footprint per replacement event; • 7 events per turbine over lifetime; • 1,260 total replacement events over lifetime; and • 378,000 m^2 total jack-up footprint over lifetime (1260 x 300 m^2). **J-Tube Replacement:** • 300 m^2 jack-up footprint per replacement event; • 360 replacement events over lifetime; and • 108,000 m^2 total jack-up footprint over lifetime (360 x 300 m^2). **Remedial Cable Burial:** • 2 km length per remedial burial event; • 10 m width seabed disturbance per remedial burial event; • 20,000 m^2 temporary seabed disturbance per reburial event; • 42 remedial cable burial events over lifetime for array cables and 7 for interconnectors; and • 9,800,000 m^2 total seabed disturbance over lifetime (49 x 20,000 m^2). **Cable Repairs:** • 20,000 m^2 temporary seabed disturbance per repair event; • 10 array cable and 5 interconnector cable repair events over lifetime; • 300,000 m^2 total seabed disturbance over lifetime (15 x 20,000 m^2); • 300 m^2 jack-up footprint per repair event; and • 4,500 m^2 total jack-up footprint over lifetime (15 x 300 m^2).	

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
		Safety zones: • 500 m safety zones around manned offshore platforms and temporary 500m safety zones around turbines and offshore platforms undergoing major maintenance.	
Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore ECC leading to reduction in access to, or exclusion from established fishing grounds (CF-O-9).	Primary: Co83 Tertiary: Co81 Co89 Co90 Co93 Co94 Co95	**Duration:** • Anticipated design life for Hornsea Four of 35 years. **Offshore Platforms:** • 3 foundations; and • Seabed total permanent area: 91,875 m^2. **Cables:** • 654 km of export cables; and • 10 cable crossings. **Remedial Cable Burial:** • 2,000 km length per remedial burial event; • 10 m width seabed disturbance per remedial burial event; • 20,000 m^2 temporary seabed disturbance per reburial event; • 14 remedial cable burial events over lifetime; and • 280,000 m^2 total seabed disturbance over lifetime (14 x 20,000 m^2). **Cable Repairs:** • 20,000 m^2 temporary seabed disturbance per repair event; • 35 repair events over lifetime; • 700,000 m^2 total seabed disturbance over lifetime (35 x 20,000 m^2); • 300 m^2 jack-up footprint per repair event; and • 10,500 m^2 total jack-up footprint over lifetime (35 x 300 m^2).	This represents the maximum duration and extent of fishing exclusion throughout the operation and maintenance phase and hence the greatest potential to restrict access to fishing grounds. Assessment assumes that fishing will resume along the Hornsea Four offshore cable corridor, with the exception of an assumed 50 m operating distance from infrastructure, areas of cable protection and safety zones around infrastructure undergoing major maintenance.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
		Cable Protection: • 10% cable protection, up to 792,000 m^2 area for export cables; and • 10.4 m width of rock protection. **Safety Zones:** • 500 m safety zones around manned offshore platforms; and • Temporary 500 m safety zones around turbines and offshore platforms undergoing major maintenance.	
Displacement from Hornsea Four array area and Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-O-10).	Primary: Co83 Tertiary: Co81 Co89 Co90 Co93 Co94 Co95	As per MDS for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds".	As per the justification for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds".
Physical presence of Hornsea Four array area leading to gear snagging (CF-O-11).	Primary: Co83 Tertiary: Co81 Co89 Co90 Co93 Co94 Co95	As per MDS for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds".	This represents the maximum potential for interactions between infrastructure and fishing gear. Assessment assumes that fishing will resume around and between infrastructure within the Hornsea Four array area, with the exception of an assumed 50m operating distance from infrastructure, areas of cable protection, and safety zones around infrastructure undergoing major maintenance.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
Physical presence of the export cable and associated infrastructure leading to gear snagging (CF-O-12).	Primary: Co83 Tertiary: Co81 Co89 Co90 Co93 Co94 Co95	As per maximum design scenario for "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds".	This represents the maximum potential for interactions between infrastructure and fishing gear. Assessment assumes that fishing will resume along the Hornsea Four offshore cable corridor, with the exception of an assumed 50m operating distance from infrastructure, areas of cable protection and safety zones around infrastructure undergoing major maintenance.
Hornsea Four operation and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-O-13).	Primary: Co83 Tertiary: Co81 Co94	See Fish and Shellfish Ecology MDS.	The scenarios presented in Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC infrastructure leading to interference with fishing activity (CF-O-15).	Tertiary: Co89 Co90 Co93 Co95	**Vessel Trips:** • 3,525 return vessel visits per year; • 2,580 return visits to wind turbines per year; • 780 return visits to wind turbine foundations per year; • 65 return visits to offshore platforms (structural scope) per year; • 100 return visits to offshore platforms (electrical scope) per year; • Vessels include: crew transport vessels (CTVs), Service Operation Vessels (SOVs), supply vessels, cable and remedial protection vessels and jack-up vessels; and • Anticipated design life for Hornsea Four of 35 years.	The maximum number of turbines and associated infrastructure will lead to the highest level of operation and maintenance activities and therefore highest level of operation and maintenance vessel round trips.

Decommissioning			
Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co111	In the absence of detailed methodologies and schedules, decommissioning works and associated implications for commercial fisheries are considered analogous with those assessed for the construction phase. Decommissioning is likely to include removal of all of the wind turbine components and part of the foundations (those above seabed level) and removal of all other surface infrastructure. Some or all of the array cables, interconnector cables, and offshore export cables may be removed. Scour and cable protection would likely be left in situ.	
Hornsea Four offshore ECC decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-17).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co111	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	
Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-18).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co111	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	
Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-19).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co111	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	
Physical presence of any infrastructure left in situ	Primary: Co83	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	

leading to gear snagging (CF-D-20).	Tertiary: Co81 Co89 Co90 Co93 Co94 Co95 Co111		
Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-D-21).	Tertiary: Co181	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting decommissioning vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-D-23).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co111	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	

7.10 Assessment methodology

7.10.1.1 The assessment methodology for commercial fisheries is consistent with that presented in Annex C of the Scoping Report.

7.10.2 Impact assessment criteria

7.10.2.1 The criteria for determining the significance of effects is a two-stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. The terms used to define sensitivity and magnitude are based on those used in the DMRB methodology, which is described in further detail in **Volume 1, Chapter 5: Environmental Impact Assessment Methodology**.

7.10.2.2 The criteria for defining sensitivity in this chapter are outlined in **Table 7.10** below.

Table 7.10: Definition of terms relating to receptor sensitivity.

Sensitivity	Definition used in this chapter
Very High	Receptor is highly vulnerable to impacts that may arise from the project and recoverability is long term or not possible. And/or: No alternative fishing grounds are available.
High	Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly. And/or: Low levels of alternative fishing grounds are available and/or fishing fleet has low operational range.
Medium	Receptor is somewhat vulnerable to impacts that may arise from the project and has moderate levels of recoverability. And/or: Moderate levels of alternative fishing grounds are available and/or fishing fleet has moderate operational range.
Low	Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability. And/or: High levels of alternative fishing grounds are available and/or fishing fleet has large to extensive operational range; fishing fleet is adaptive and resilient to change.

7.10.2.3 The criteria for defining magnitude in this chapter are outlined in **Table 7.11** below.

7.10.2.4 In assessing the magnitude of the impact the value and vulnerability of the receptor, i.e. the fishing fleet under assessment, together with the reversibility of the impact are also considered. Due to the range in scale, value (in terms of both landings and income/profit) and operational practises, within the commercial fishing fleets assessed, specific economic criteria were not set for defining value within the categories of high, medium or low. Instead, these classifications were based on judgement informed from the baseline characterisation and consultation with the industry.

Table 7.11: Definition of terms relating to magnitude of an impact.

Magnitude of impact	Definition used in this chapter
Major	Impact is of long-term duration (e.g. greater than 12 years duration) and/or is of extended physical extent; And: Impact is expected to result in one or more of the following: • Substantial loss of target fish or shellfish biological resource (e.g. loss of substantial proportion of resource within project area); and • Substantial loss of ability to carry on fishing activities (e.g. substantial proportion of effort within project area). (Adverse)
	Impact is expected to result in one or more of the following: • Large scale or major improvement of resource quality, measurable against biomass reference points; and • Extensive restoration or enhancement of habitats supporting commercial fisheries resources. (Beneficial)
Moderate	Impact is of medium-term duration (e.g. less than 12 years) and/or is of moderate physical extent; And: Impact is expected to result in one or more of the following: • Partial loss of target fish or shellfish biological resource (e.g. moderate loss of resource within project area); and • Partial loss of ability to carry on fishing activities (e.g. moderate reduction of fishing effort within project area). (Adverse)
	Impact is expected to result in one or more of the following: • Moderate improvement of resource quality; and • Moderate restoration or enhancement of habitats supporting commercial fisheries resources. (Beneficial)
Minor	Impact is of short-term duration (e.g. less than 5 years) and/or is of limited physical extent; And: Impact is expected to result in one or more of the following: • Minor loss of target fish or shellfish biological resource (e.g. minor loss of resource within project area); and • Minor loss of ability to carry on fishing activities (e.g. minor reduction of fishing effort within project area). (Adverse)
	Impact is expected to result in one or more of the following: • Minor benefit to or minor improvement of resource quality; and • Minor restoration or enhancement of habitats supporting commercial fisheries resources. (Beneficial)
Negligible	Impact is of very short-term duration (e.g. less than 2 years) and/or physical extent of impact is negligible; And: Impact is expected to result in one or more of the following: • Slight loss of target fish or shellfish biological resource (e.g. slight loss of resource within project area); and

Magnitude of impact	Definition used in this chapter
	• Slight loss of ability to carry on fishing activities (e.g. slight loss of fishing effort within project area). (Adverse)
	Impact is expected to result in one or more of the following: • Very minor benefit to or very minor improvement of resource quality; and • Very minor restoration or enhancement of habitats supporting commercial fisheries resources. (Beneficial)

7.10.2.5 The significance of the effect upon commercial fisheries is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The method employed for this assessment is presented in Table 7.12. Where a range of significance of effect is presented in Table 7.12, the final assessment for each effect is based upon expert judgement.

7.10.2.6 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 7.12: Matrix used for the assessment of the significance of the effect.

		Magnitude of Impact/Degree of Change			
		Negligible	Minor	Moderate	Major
Value, Importance, Sensitivity	Low	Not Significant	Not Significant or Minor (Not Significant)	Minor (Not Significant)	Minor (Not Significant) or Moderate (Significant)
	Medium	Not Significant	Minor (Not Significant)	Moderate (Significant)	Moderate (Significant) or Major (Significant)
	High	Not Significant	Minor (Not Significant) or Moderate (Significant)	Moderate (Significant) or Major (Significant)	Major (Significant) or Substantial (Significant)
	Very High	Not Significant	Moderate (Significant) or Major (Significant)	Major (Significant) or Substantial (Significant)	Substantial (Significant)

7.11 Impact assessment

7.11.1 Construction

7.11.1.1 The impacts of the offshore construction of Hornsea Four have been assessed on commercial fisheries. The environmental impacts arising from the construction of Hornsea Four are listed in Table 7.9 along with the MDS against which each construction phase impact has been assessed.

7.11.1.2 A description of the potential effect on commercial fisheries receptors caused by each identified impact is given below.

Hornsea Four array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-C-1).

7.11.1.3 During construction of the Hornsea Four array area, associated infrastructure and cabling, commercial fisheries will be prevented from fishing where construction activities are taking place, plus 500 m safety zones around infrastructure under construction or 500 m safe passing distance for mobile installation vessels. The total construction duration for the turbines will be 36 months (three years), with a number/range of construction activities being undertaken simultaneously across the site.

Magnitude of impact

7.11.1.4 This impact will lead to a localised loss of access to fishing grounds and the fish and shellfish resources within these grounds for a range of fishing opportunities during the period of construction, which will directly affect fleets over a short-term duration (i.e., less than 5 years, as per definition in **Table 7.11**). The impact is predicted to be intermittent with localised exclusion surrounding construction activities.

7.11.1.5 In terms of the area impacted by construction activities, in total a maximum of 12.85 km^2 of seabed will be disturbed during construction, which equates to 2.14 % of the total Hornsea Four array area. In addition, there will be 500 m safety distance around infrastructure under construction (equating to 0.79 km^2 per structure) and 500 m safe passing distance for mobile installation vessels (equating to 0.79 km^2 per vessel).

7.11.1.6 The impact is of relevance to international fishing fleets and is described below on a fishery-by-fishery basis.

7.11.1.7 Potting: the UK potting fleet targets lobster and crab across a wide area, from inshore grounds, extending out to the array area. An average annual first sales value of £127,000 landings is taken specifically within the Hornsea Four array area by UK potting vessels ≥ 15m (informed from VMS data providing detailed catch value by area). Consultation indicates that this area is becoming increasingly important to the fleet, as other activities from renewable energy and oil and gas sector displace effort which becomes increasingly concentrated further offshore and into the Hornsea Four array area. The total value taken from the Hornsea Four array study area is £2.9 million; noting that the array area overlaps with approximately 8.5% of this study area, this equates to £250,000 (based on uniform landings across the entire study area). While such a simplistic calculation brings higher level of uncertainty to the resulting figure, it does demonstrate the importance of the potting industry and the expected opportunity within the array area. During construction, potting vessels would be required to remove pots from areas under construction and either relocate, or bring to shore depending on available grounds and fishing preferences. Potting fishermen will therefore experience loss of earnings for the time taken to relocate gear and loss of earning associated with not being able to fish the specific grounds under construction. Potting typically involves a number of fleets being deployed across a range of areas, and it is therefore unlikely that all pots deployed by a single vessel will be impacted at any one time.

7.11.1.8 Dredge: the UK dredging fleet targets scallops but does not operate across the Hornsea Four array area (evidenced by VMS and landings statistics). Scallops are found on clean firm sand and fine gravel and in currents which provide good feeding conditions. The targeted

scallop grounds that run parallel to Holderness Coast are well established and not expected to extend into the Hornsea Four array area.

7.11.1.9 Pelagic: the Dutch, German, Danish, French and Swedish pelagic trawling fleets are large vessels (typically > 25 m in length), targeting highly mobile species (herring and/or mackerel) that consistently move/shoal following spawning migrations. Any activity by pelagic vessels within the array area is highly likely to be a sporadic, transitory event. Highly mobile pelagic species, that move in shoals and are not associated with specific seabed habitats, are assumed to be available to catch across large areas i.e., if a shoal of herring cannot be caught within Hornsea Four array area, this shoal is expected to move to an area where they can be caught. Thereby, while the access to the water column within the Hornsea Four array area may be affected; the opportunity to catch pelagic fish is not lost.

7.11.1.10 Demersal sandeel: Danish and to a lesser extent Swedish industrial otter trawlers target sandeel throughout the North Sea. Industry mapping of sandeel grounds within the North Sea indicate two small areas of key sandeel grounds that overlap with the array area, in the north west and south east corners of the array (**Figure 7.16**). Both these areas represent the end (or beginning) of a sandeel fishing ground i.e., from which a vessel would start or finish a tow, and therefore do not fully restrict access to each of the defined grounds. Large areas of significant sandeel grounds are located north and west of the array area (i.e. outside the array area). It is expected that landings statistics for sandeel within ICES rectangle 37F1 and 37F0 relate to these grounds, outside the array area.

7.11.1.11 The sandeel fishery is highly dependent on recruitment on a year-to-year basis; it is noted that a zero TAC has been in place for 2018 and 2019 due to low stock abundance (ICES, 2019). Sandeel grounds are well established and understood throughout the North Sea and it is reasonable to assume that the small areas of sandeel grounds overlapping the Hornsea Four array area could be productive in the future including within the three year construction period.

7.11.1.12 Demersal mixed fisheries: Dutch and Belgian beam trawlers target sole and plaice; French otter trawlers target whiting and UK otter trawlers target *Nephrops* and mixed demersal species. An average annual first sales value of £477,000 landings is taken specifically within the Hornsea Four array area by these fleets, split evenly across beam trawl and otter trawl vessels (informed from VMS data providing detailed catch value by area). VMS data indicates that in the surrounding area, fishing grounds north, north-east and east of the array area are significantly more important to these fleets.

7.11.1.13 The impact is predicted to be of regional spatial extent, short term duration, intermittent and medium reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **moderate** for potting fisheries, **minor** for pelagic and demersal fisheries, and **negligible** for dredge fisheries.

Sensitivity of the receptor

7.11.1.14 The mobile fleets targeting pelagic, dredge and demersal fisheries across the targeting Hornsea Four array area are typically > 25 m in length and operate across large areas over the North Sea. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas. All mobile fleets are considered to have a large operational range. All pelagic gear fleets are considered to have an extensive operational range, be highly adaptive and resilient to change.

7.11.1.15 The mobile fleets targeting pelagic, dredge and demersal fisheries are considered to have moderate-high levels of alternative fishing grounds; are deemed to be of low vulnerability, high recoverability and low-medium value. The sensitivity of these receptors is therefore, considered to be **low**.

7.11.1.16 The UK potting fleet are typically < 15 m in length and operate across more distinct areas of ground, typically 0 to 12 nm from shore, but also extending from 12 nm, in areas that are already heavily exploited and are therefore more sensitive to disruption. The UK potting fleet are deemed to be of medium vulnerability, medium recoverability and medium value across the Hornsea Four array area. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of the effect

7.11.1.17 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.1.18 Dredge fishery: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.1.19 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **moderate**. The effect is of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation

7.11.1.20 UK potting fleet: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed (Co180). Specifically, this will consist of the provision of evidence and data, examples of which include (FLOWW, 2015):

- Copy of certificate of registry for each vessel for which a claim is being made;
- Copy of a valid MCA certification or equivalent;
- Copy of the relevant vessel fishing licenses and entitlements for each vessel for which a claim is being made;
- Sight of vessels fishing charts and GPS plotter records to provide clear historic evidence of potential disruption in the area of the operations;
- Evidence of sales notes where available for an agreed time period;
- Fishing accounts of the vessels concerned for an agreed time period;
- Fishing vessel or and/or fisheries landings data held by fisheries authorities. Due to the requirements of the Data Protection Act, for access to individual records a declaration will need to be completed in order for records to be released; and
- It may be appropriate to validate sources of evidence not obtained directly from claimants in order to verify accuracy (for example, transcription errors may exist in official landings data). Similarly, corroboration/validation of evidence provided by claimants may be possible via independent sources such as fishery officers, for example.

7.11.1.21 Through the application of justifiable disturbance payments, the residual effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

7.11.1.22 Fishing activity will be locally and temporarily excluded at the location of construction owing to the presence of construction vessels, construction operations and the need to observe The Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS).

7.11.1.23 The construction scenario assumes 36 months of offshore construction. In terms of the area impacted by construction activities, in total 10.6 km^2 of seabed will be disturbed during construction. In addition, an advisory safe passing distance of 500 m radius around cable installation vessels active along the offshore ECC, is recommended i.e., a roaming 0.79 km^2 area along the 109 km offshore ECC.

Magnitude of impact

7.11.1.24 This impact will lead to a loss of access to fishing grounds and the fish and shellfish resources within these grounds for a range of fishing opportunities during the construction activities, which will directly affect fleets over a short-term duration. The impact is predicted to be intermittent and of relevance to international fishing fleets and is described below on a fishery basis.

7.11.1.25 Potting: the Hornsea Four offshore ECC overlaps with fishing ground routinely targeted by UK potting vessels targeting brown crab and lobster using creels and whelk using pots. Lobster is the most valuable species in this area, with approximately 750 tonnes landed annually with a first sales value of £8.5 million from the offshore ECC study area (based on five-year average from 2013-2017). The lobster fishery is estimated to generate £35m a year to the region's economy and support 250 fishermen and 200 onshore jobs (Oliver, 2018). The market for lobster has recently seen improved prices, with a sharp increase from 2015 to 2016 and continued growth in 2017. Brown crab is also highly important, worth £5.9 million annually from the offshore ECC study area, and forms the majority of landings in terms of weight (4,700 tonnes annually). VMS data for potting across the offshore ECC is not representative of the Bridlington and Holderness Coast potting fleet, due to the omission of vessels <15m in length within the dataset.

7.11.1.26 During the construction process vessels with pots set along the Hornsea Four offshore ECC will be required to move these pots and cease fishing activities at particular construction locations. Sufficient notice, together with the support of a guard vessel and offshore FLOs where appropriate, will be provided to facilitate this process.

7.11.1.27 Dredge: the UK dredging fleet targets scallops, including established grounds that run parallel to Holderness Coast between 6 to 12 nm from the coast. Based on VMS data, the most productive scallop grounds are targeted north of the offshore ECC and north of Flamborough Head, between 6 and 12 nm offshore. The southern end of the scallop grounds runs across the portion of offshore ECC between 6 to 12 nm. Based on VMS data, the actual value of the dredge fishery specifically within the offshore ECC is €171,000 in annual first sales.

7.11.1.28 Pelagic: the Dutch, German, Danish, French and Swedish pelagic trawling fleets target herring across a wide area, including ICES rectangle 37F0, which overlaps with the offshore ECC. As described in **paragraph 7.11.1.9**, activity from the pelagic fleet is understood to be sporadic and based on the shoaling behaviour of the fish, there are available to be caught

over a wide area. Thereby, while the access to the water column within the Hornsea Four offshore ECC may be affected; the opportunity to catch pelagic fish is not lost.

7.11.1.29 Demersal sandeel: no established sandeel grounds overlap with the offshore ECC (**Figure 7.16**).

7.11.1.30 Demersal mixed fisheries: there is very low beam trawl activity across the offshore ECC (based on VMS data from 2013 to 2017). An area of ground 12 to 20 nm from shore is routinely targeted by otter trawl vessels, catching whiting, and mixed demersal species. This has a relatively low value compared to adjacent areas, outside the offshore ECC, with an average annual first sales value of approximately €95,000 (based on VMS data).

7.11.1.31 The impact is predicted to be of regional spatial extent, short term duration, intermittent and reversible. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor** for dredge, pelagic and demersal fisheries, and **moderate** for potting fisheries.

Sensitivity of the receptor

7.11.1.32 The sensitivity of receptors is as described in **paragraphs 7.11.1.14** and **7.11.1.16**. The mobile fleets targeting pelagic and demersal fisheries are considered to have high levels of alternative fishing grounds; are deemed to be of low vulnerability, high recoverability and low-medium value. The sensitivity of these receptors is therefore, considered to be **low**. The UK potting fleet are deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **medium**.

7.11.1.33 For the mobile dredge fishery targeting scallops it is recognised that while there are moderate levels of alternative fishing grounds, scallops are strongly associated with specific benthos and grounds running parallel to the Holderness Coast are well established and routinely fished. The dredge fleet are therefore deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of these receptors is therefore, considered to be **medium**.

Significance of the effect

7.11.1.34 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.1.35 Dredge fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.1.36 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **moderate**. The effect is of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation

7.11.1.37 UK potting fleet: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed (Co180).

Specifically, this will consist of the provision of evidence and data, examples of which include (FLOWW, 2015):

- Copy of certificate of registry for each vessel for which a claim is being made;
- Copy of a valid MCA certification or equivalent;
- Copy of the relevant vessel fishing licenses and entitlements for each vessel for which a claim is being made;
- Sight of vessels fishing charts and GPS plotter records to provide clear historic evidence of potential disruption in the area of the operations;
- Evidence of sales notes where available for an agreed time period;
- Fishing accounts of the vessels concerned for an agreed time period;
- Fishing vessel or and/or fisheries landings data held by fisheries authorities. Due to the requirements of the Data Protection Act, for access to individual records a declaration will need to be completed in order for records to be released.
- It may be appropriate to validate sources of evidence not obtained directly from claimants in order to verify accuracy (for example, transcription errors may exist in official landings data). Similarly, corroboration/validation of evidence provided by claimants may be possible via independent sources such as fishery officers, for example.

7.11.1.38 Through the application of justifiable disturbance payments, the residual effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-3).

7.11.1.39 Localised exclusion from fishing grounds during phased construction of Hornsea Four array area may lead to temporary increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict and increased fishing pressure on adjacent grounds.

7.11.1.40 In terms of the area impacted by construction activities within the Hornsea Four array area, in total 12.85 km^2 of seabed will be disturbed during construction. In addition, there will be 500 m safety distance around infrastructure under construction (equating to 0.79 km^2 per structure) and 500 m safe passing distance around construction vessels (equating to 0.79 km^2 per vessel).

Magnitude of impact

7.11.1.41 The impact is predicted to be of regional spatial extent, short-term duration, intermittent and with medium reversibility. It is predicted that the impact will affect the receptor directly. The impact is of relevance to international fishing fleets as described below.

7.11.1.42 Potting: conflict over diminished grounds may occur if displaced vessels operating mobile gear explore grounds traditionally fished by potters. Displacement of mobile gear may therefore increase the risk of interaction with potting grounds and gear. However, potting activity is most prominent in areas inshore from the array area. Furthermore, displacement of mobile gear is expected to be focused on alternative established grounds throughout the North Sea, thereby reducing displacement onto potting grounds.

7.11.1.43 Dredge: displacement from Hornsea Four array area is not expected to effect the dredge fishery operating between 6 to 12 nm from the coast based on the distance from the array area to these grounds, together with the established dredge fishery in this area.

7.11.1.44 Pelagic: pelagic otter trawlers from all nationalities that may occasionally operate within the Hornsea Four array area, fish throughout the North Sea across a range of established fishing grounds. Displacement is not expected to effect pelagic fleets.

7.11.1.45 Demersal: VMS data indicate that there are numerous areas surrounding Hornsea Four array area that are targeted by the same demersal gear types used within the array area. Whether or not displaced vessels are likely to disperse into these areas depends on the normal fishing patterns of the fleets targeting the area. The ICES VMS data shows vast areas targeted by demersal otter trawl, demersal seine and beam trawl fleets, as do the maps of Danish sandeel grounds throughout the North Sea.

7.11.1.46 The impact is predicted to be of regional spatial extent, short term duration, intermittent and reversible. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor** for potting, dredge, and demersal fisheries, and **negligible** for pelagic fisheries.

Sensitivity of the receptor

7.11.1.47 All mobile commercial fisheries fleets operating within the Hornsea Four array area are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to the Hornsea Four array area. All mobile fleets are deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of all mobile fleets is therefore, considered to be **low**.

7.11.1.48 The UK potting fleet operates across large areas inshore from Hornsea Four array area and across the offshore ECC. This form of static fishing gear is considered to be of high vulnerability to gear conflict interactions since it is left unattended on the seabed. It is expected that any displacement from mobile vessels may lead to exploring other fishing grounds outside the Hornsea Four array area, which includes areas currently targeted by potters. The UK potting fleet are deemed to be of high vulnerability, medium recoverability and medium value. The sensitivity of the UK potting fleet is therefore, considered to be **medium**.

Significance of the effect

7.11.1.49 Dredge and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.1.50 Pelagic fishery: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.1.51 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-4).

7.11.1.52 Exclusion from fishing grounds during construction of the offshore ECC may lead to temporary increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict.

7.11.1.53 In terms of the area impacted by construction activities, in total 10.6 km^2 of seabed will be disturbed during construction within the offshore ECC. In addition, a 500 m safe passing distance radius around cable installation vessels active along the offshore ECC, is recommended i.e., a roaming 0.79 km^2 area along the 109 km offshore ECC.

Magnitude of impact

7.11.1.54 The impact is predicted to be of regional spatial extent, medium-term duration, intermittent and with medium reversibility. It is predicted that the impact will affect the receptor directly. The impact is of relevance to international fishing fleets as described below.

7.11.1.55 Potting: vessels deploying creels and pots across the Hornsea Four offshore ECC will be required to temporarily relocate gear to other grounds during the construction process. Each individual vessel deploys between approximately 300 and 3,500 pots. However, it is not likely that all fleets (or creels/pots from one vessel) will overlap the offshore ECC given that a number of fleets of pots and a range of grounds are targeted at any given time. Due to the volumes of gear, vessels leave their pots on the ground (i.e. do not bring pots back to shore in between fishing trips, with the exception of carrying out gear maintenance on specific pots/stings).

7.11.1.56 Therefore, when considering the impact of potters being displaced into grounds already targeted by potters two scenarios are feasible:

- Alternative fishing grounds are available to relocate gear, in which case gear conflict and displacement effects will be low; or
- Alternative fishing grounds are not available as adjacent areas are already being fished by potters, in which case the gear already on the ground limits the level of displacement. While there remains potential for gear conflicts and increased fishing pressure to arise, appropriately mitigated exclusion impacts will limit this (see **paragraph 7.11.1.37**).

7.11.1.57 On balance, the displacement effect to potters targeting the Hornsea Four offshore ECC is considered to have a lower magnitude of impact than the exclusion impact causing the displacement. Taking all of these aspects into consideration, the magnitude of the displacement impact is assessed to be **minor** for UK potters.

7.11.1.58 For all mobile fleets deploying demersal trawl, beam trawl and dredge gear, due to the lower level of activity across the Hornsea Four offshore ECC, together with the range of alternative grounds with higher rates of effort, the magnitude is considered to be **minor**.

7.11.1.59 For all mobile fleets deploying pelagic trawl gear, due to the ability to catch the same shoaling pelagic fish as they move outside the offshore ECC area, the magnitude is considered to be **negligible.**

Sensitivity of the receptor

7.11.1.60 The sensitivity is as assessed in **paragraphs 7.11.1.47** and **7.11.1.48** and considered to be low for all mobile fleets and medium for the UK potting fleet.

Significance of the effect

7.11.1.61 Dredge and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.1.62 Pelagic fishery: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.1.63 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Hornsea Four array area and offshore ECC construction activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-C-5).

7.11.1.64 Temporary displacement due to noise and seabed disturbances during construction activities may decrease or displace commercially important fish and shellfish populations from the area. This section assesses the potential temporary subsequent impact for the owners of fishing vessels, where commercially important stocks may be disturbed or displaced to a point where normal fishing practices would be affected.

Magnitude of impact

7.11.1.65 Detailed assessments of the following potential construction impacts have been undertaken in **Volume 2, Chapter 3: Fish and Shellfish Ecology**:

- Increased suspended sediment concentrations as a result of foundation installation, cable installation and seabed preparation resulting in potential effects on fish and shellfish receptors;
- Sediment deposition as a result of foundation installation, cable installation and seabed preparation resulting in potential effects on fish and shellfish receptors; and
- Underwater noise as a result of foundation installation (i.e., piling) and other construction activities (e.g. cable installation) resulting in potential effects on fish and shellfish receptors.

7.11.1.66 With respect to the magnitude of this impact on commercial fisheries, the overall significance of the effect on fish and shellfish species is considered (i.e. both the magnitude and sensitivity of fish and shellfish species are considered to assess the magnitude on commercial fishing fleets). For instance, where an effect of negligible significance is assessed for a species, a negligible magnitude is assessed for commercial fishing; where an effect of minor adverse significance is assessed for a species, a minor magnitude is assessed for commercial fishing, and so on.

7.11.1.67 Details of the fish and shellfish ecology assessment are summarised in **Table 7.13** justifications for this assessment will not be repeated in this chapter. Evidence, modelling

and justifications for these assessments are provided in **Volume 2, Chapter 3: Fish and Shellfish Ecology**.

7.11.1.68 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of short-term duration. It is predicted that the impact will affect the receptor directly through loss of resources. The magnitude is therefore considered to be **minor** for all species and all potential impacts.

Table 7.13: Significance of effects of construction impacts on fish and shellfish ecology.

Potential impact	Species	Significance of effect
Increased suspended sediment concentrations and smothering	Herring	**Minor**
	Sandeel	**Minor**
Seabed disturbances leading to the release of sediment contaminants.	Herring	**Not significant**
	Sandeel	**Not significant**
Underwater noise and vibration	Herring	**Minor**
	Sandeel	**Minor**
	All other fish/shellfish	**Minor**

Sensitivity of the receptor

7.11.1.69 Exposure to the impact is likely and commercial fleets targeting key species will be affected, including lobster, brown crab, whelk, sole, plaice, sandeel, *Nephrops* and herring.

7.11.1.70 Due to the locality of the impact on brown crab and lobster, there is potential for grounds beyond the immediate construction activities to be affected by increased suspended sediment and sediment deposition, impacting the wider potting fleet. The potting fleet is deemed to be of medium vulnerability, medium recoverability and medium-high value. The sensitivity of the receptor is therefore, considered to be **medium**.

7.11.1.71 Due to the locality of the impact on scallops there is potential for grounds beyond the immediate construction activities to be affected by increased suspended sediment and sediment deposition, impacting the wider area targeted by scallop dredge vessels. The dredge fishery is deemed to be of medium vulnerability, high recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **medium**.

7.11.1.72 Due to the range of alternative areas targeted and the distribution of key commercial species throughout the central and southern North Sea, all other fleets are deemed to be of low vulnerability, high recoverability and medium-low value. The sensitivity of the receptor for pelagic and demersal fisheries is therefore, considered to be **low**.

Significance of the effect

7.11.1.73 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.1.74 Potting and dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-C-7).

7.11.1.75 This assessment focuses on the potential impact of Hornsea Four related vessel traffic and changes to shipping patterns as a result of navigational channels leading to interference with fishing activity (i.e. reduced access) during construction.

Magnitude of impact

7.11.1.76 Vessel movements (i.e. construction vessels transiting to and from areas undergoing construction works) related to the construction of Hornsea Four, the offshore ECC and all associated infrastructure will add to the existing level of shipping activity in the area (see **Volume 2, Chapter 7: Shipping and Navigation** for a full assessment of additional vessel movements).

7.11.1.77 The magnitude for fleets deploying pelagic gear is considered negligible, based on the operational range of such large vessels that typically fish for distinct time periods (e.g. a number of weeks) throughout the year. All other fishing fleets are considered to be able to avoid vessel movements related to construction of the array area and offshore ECC.

7.11.1.78 The impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor** for all fisheries.

Sensitivity of the receptor

7.11.1.79 Construction traffic is likely to constrain most potting activity across established construction supply routes due to the vulnerability of the marker buoys to the propellers of passing construction vessels. The UK potting fishery is deemed to be of high vulnerability, high recoverability and medium-high value. The sensitivity of the receptor is therefore, considered to be **medium**.

7.11.1.80 All other fishery fleets are expected to be in a position to avoid the Hornsea Four construction areas. Demersal trawl fisheries (including beam trawl, otter trawl and demersal seine) are deemed to be of low vulnerability, high recoverability and medium-high value. The sensitivity of the receptor is therefore, considered to be **low**.

7.11.1.81 The pelagic and dredge fisheries are deemed to be of very low vulnerability, very high recoverability and medium-high value. The sensitivity of these receptors is therefore, considered to be **low**.

Significance of the effect

7.11.1.82 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.1.83 Potting and dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Future monitoring

7.11.1.84 Continuous liaison with the fishing industry will be undertaken; further details will be provided in an outline Fisheries Coexistence and Liaison Plan (Co95) at ES stage.

7.11.2 Operation and Maintenance

7.11.2.1 The impacts of the offshore operation and maintenance of Hornsea Four have been assessed on commercial fisheries. The environmental impacts arising from the operation and maintenance of Hornsea Four are listed in **Table 7.9** along with the MDS against which each operation and maintenance phase impact has been assessed.

7.11.2.2 A description of the potential effect on commercial fisheries receptors caused by each identified impact is given below.

Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-O-8).

7.11.2.3 The assessment assumes that commercial fisheries will be prevented from actively fishing within a total area of 3.14 km^2 due to infrastructure within the Hornsea Four array area, including 180 turbines with suction bucket Jacket (WTG-type) foundations, ten platforms for accommodation and substations, together with associated safety zones for maintenance activities and assumed operating distances (full details of the area breakdowns are provided in **Table 7.9**). Minimum turbine spacing is 810 m, including between turbines and all other infrastructure.

7.11.2.4 Out with the area of 3.14 km^2, the assessment assumes that fishing will be possible within the Hornsea Four array area where turbine spacing and turbine layout allow productive grounds can be targeted, with the exception of safety zones around infrastructure undergoing major maintenance and advisory safety distances around vessels undertaking major maintenance activities. In addition, the individual decisions made by skippers with their own perception of risk will determine the likelihood of whether their fishing will resume within the Hornsea Four array area. Inclement weather will be a significant contributor to this risk perception. The type and dimension of fishing gear also influences the potential opportunities within the array area. For example, pelagic trawl, multi-rig otter trawl and demersal seine gear require a wider distance for safe operation and these gears are less likely to target grounds in the vicinity of infrastructure.

Magnitude of impact

7.11.2.5 This impact will lead to localised loss of access to fishing grounds and the fish and shellfish resources within these grounds for a range of fishing opportunities during the operational and maintenance phase, which will directly affect fleets over a long-term duration. The

impact is predicted to be continuous with low reversibility and is of relevance to international fishing fleets.

7.11.2.6 Evidence on the value and importance of the Hornsea Four array area to commercial fishing fleets is the same as that presented for construction in **paragraphs 7.11.1.4** to **7.11.1.12**.

7.11.2.7 Demersal fisheries: the degree to which demersal mobile gear can resume within Hornsea Four offshore array is uncertain and dependant on a number of factors including gear type, width of gear spread when in seabed contact and the vessel skipper's risk perception. A study by Gray *et. al.* (2016) explored changes to fishing practices as a result of the development of offshore wind farms in the Irish Sea. Through industry interviews with mobile demersal otter trawlers targeting *Nephrops* grounds, it was found that for those fishermen who claimed to have operated on fishing grounds now occupied by wind turbines, the majority stated they had not returned or had reduced their fishing effort within the wind farm area two or more years after construction. The main reason for the reduction in effort was increased actual risk associated with the presence of wind farm infrastructure and overall heightened perceived risk (Gray *et. al.*, 2016). The study did find a small number of fishermen operating inside the wind farm areas.

7.11.2.8 While demersal trawl fisheries (including targeting sandeel, sole, plaice, *Nephrops* and mixed demersal) are expected to experience reduced access to the Hornsea Four array area, the VMS data consistently shows highly landings value and therefore higher reliance on areas outside the array area, notably to the north, north east and east of the array area, as well as other grounds throughout the North Sea (such as Dogger Bank). Overall, the presence of Hornsea Four array area is unlikely to lead to an overall decline in landings for these fisheries.

7.11.2.9 Pelagic fisheries: midwater trawls are designed to catch species living anywhere in the water column above the seafloor, including at the surface. Acoustic technology is used to locate the position and depth of the target fish shoal and the path of the boat and depth of the net are adjusted accordingly. Based on the gear width and operational method that requires space to set the trawl net and move into the path of the fish shoal, it is unlikely that pelagic gear would be operated within the array area. However, given the infrequent nature of pelagic fisheries, together with the opportunity to catch the target, highly mobile species when it moves outside the area, the presence of Hornsea Four array area is not expected to restrict the baseline operation of pelagic fisheries throughout the North Sea.

7.11.2.10 Dredge fishery: no established scallop grounds are present within the Hornsea Four array area (**Figure 7.9**). The presence of Hornsea Four array area is not expected to restrict the baseline operation of scallop dredge fisheries.

7.11.2.11 Potting fisheries: a recent study by Roach *et. al.* (2018) investigated the effect of construction and operation of Westermost Rough offshore wind farm on established lobster fishing grounds. The study concluded that:

- The temporary closure during the construction period offered some respite from fishing pressure for adult lobsters and lead to an increase in abundance and size of lobster in the wind farm area;
- Reopening of the site to fishing exploitation saw a decrease in catch rates and size structure, but this did not reach levels below that of the surrounding area;
- Opening the site to exploitation allowed the fishery to recuperate some of the economic loss during the closure; and

- Finally, the authors conclude that temporary closures of selected areas may be beneficial to lobster fisheries and should be considered as a management option for lobster fisheries.

7.11.2.12 It is therefore expected that potting activity will resume within the Hornsea Four array area during operation and maintenance and that catch rates will initially be higher than comparable grounds outside the array area, then return to similar baseline levels.

7.11.2.13 The impact is predicted to be of regional spatial extent, long term duration, continuous and with low reversibility. It is predicted that the impact will affect the receptor directly. Based on the justifications above, the magnitude is therefore, considered to be **minor** for potting, pelagic and demersal fisheries, and **negligible** for pelagic fisheries.

Sensitivity of the receptor

7.11.2.14 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in **paragraphs 7.11.1.14** to **7.11.1.16**, summarised as **low** for mobile pelagic, demersal and dredge fisheries and **medium** for potting fishery.

Significance of the effect

7.11.2.15 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.16 Dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.2.17 Potting fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore ECC leading to reduction in access to, or exclusion from established fishing grounds (CF-O-9).

7.11.2.18 Temporary 500 m safety zones, that may be established around the HVAC booster stations if major works are required, and advisory safety distances requested around vessels engaged in export cable repair works, could limit fishing opportunities within localised areas.

7.11.2.19 The European Subsea Cables Association notes that cables are potentially subsea hazards, and that while great effort is made to bury and protect them, mariners should never assume that cables are completely buried. Furthermore, the Mariners Handbook advises that: "*every care should be taken to avoid anchoring, trawling, fishing, dredging, drilling or carrying out any other activity in the vicinity of cables which might damage them*".

7.11.2.20 Notwithstanding this, subsea cables are widespread throughout the waters of Europe, providing power and telecommunications links, and it is understood that fishing does take place in the vicinity of subsea cables (KIS-ORCA, 2019).

Magnitude of impact

7.11.2.21 For the purposes of this assessment, it is assumed that fishermen will be well informed of the location and integrity of the offshore ECC i.e., locations of protection, details of routine cable integrity surveys and location and schedule for any maintenance works, and that based on this knowledge will seek to exploit grounds across the offshore ECC with caution (see commitments provided in **Table 7.8**). The assessment therefore assumes that fishing will resume within the vicinity of the export cables.

7.11.2.22 Notices to Mariners will be issued in advance of any maintenance works. Potting vessels may be required to temporarily relocate pots during maintenance works, although such works are likely to be infrequent.

7.11.2.23 Pelagic gear does not come into contact with the seabed and therefore the presence of the offshore ECC will not affect potential fishing opportunities.

7.11.2.24 The impact is predicted to be of local spatial extent and of short-term duration for the HVAC booster stations and short-term duration for maintenance works that may be required along the Hornsea Four offshore ECC. It is predicted that the impact will affect the receptor directly. Given that fishing is likely to resume across the majority of the Hornsea Four offshore ECC, the magnitude is considered to be **negligible** for pelagic fisheries and **minor** for all other fishing fleets.

Sensitivity of the receptor

7.11.2.25 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in **paragraphs 7.11.1.32** *et seq.*, summarised as **low** for pelagic and demersal trawl fisheries and **medium** for potting and dredge fisheries.

Significance of the effect

7.11.2.26 Pelagic fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.2.27 Demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.28 Dredge fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.29 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is significant in EIA terms.

Displacement from Hornsea Four array area and Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-O-10).

7.11.2.30 Exclusion from fishing grounds during operation and maintenance of Hornsea Four may lead to increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict.

Magnitude of impact

7.11.2.31 The magnitude of impact of displacement during the operational and maintenance phase is expected to be the same or similar to that during construction for all commercial fishing fleets deploying mobile demersal or pelagic gear (see **paragraphs 7.11.1.41** to **7.11.1.46,** and **7.11.1.54** to **7.11.1.59**), summarised as minor for all demersal trawlers and negligible for vessels deploying pelagic gear.

7.11.2.32 Given that potting can resume across the Hornsea Four offshore cable corridor and within the array area, the magnitude for UK potters is considered to be minor.

7.11.2.33 The impact is predicted to be of regional spatial extent, short term duration, intermittent and with high reversibility. It is predicted that the impact will affect the receptor directly. Based on the justifications above, the magnitude is therefore, considered to be **minor** for potting and demersal fisheries, and **negligible** for pelagic fisheries.

Sensitivity of the receptor

7.11.2.34 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in **paragraphs 7.11.1.47** to **7.11.1.48**, summarised as **low** for mobile pelagic and demersal fisheries and **medium** for potting and dredge fisheries.

Significance of the effect

7.11.2.35 Demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.36 Pelagic fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.2.37 Dredge fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.38 Potting fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Physical presence of Hornsea Four array area leading to gear snagging (CF-O-11).

7.11.2.39 The array cables, interconnector cables, export cables and associated cable protection, together with any structures on the seabed represent potential snagging points for fishing gear and could lead to damage to, or loss of, fishing gear. The safety aspects including

potential loss of life as a result of snagging risk are assessed within **Volume 2, Chapter 8: Shipping and Navigation**.

Magnitude of impact

7.11.2.40 In the instance that snagging does occur, the developer would work to the protocols laid out within the guidance by the FLOWW group and 'Recommendations For Fisheries Liaison: Best Practice' guidance for offshore renewable developers (Co180), in particular section 9: Dealing with claims for loss or damage of gear (FLOWW, 2006 and 2014; BERR, 2008).

7.11.2.41 Snagging poses a risk to fishing equipment and in extreme cases may potentially lead to capsize of vessel and crew fatalities, as well as damage to subsea infrastructure. Three phases of interaction are possible: initial impact of gear and subsea infrastructure; pullover of gear across subsea infrastructure; and snagging or hooking of gear on the subsea infrastructure. The snagging or hooking of fishing gear with infrastructure/cables on the seabed is the most hazardous to the vessel and crew due to the possibility of capsize.

7.11.2.42 It is considered likely that fishermen would operate appropriately given adequate notification of the locations of any snagging hazards; and are highly likely to avoid the infrastructure and cable protection within the Hornsea Four array area.

7.11.2.43 The impact is predicted to be of regional spatial extent, long term duration, continuous and with low reversibility. It is predicted that the impact will affect the receptor directly. Based on the justifications above, the magnitude is therefore, considered to be **minor** for potting and demersal fisheries, and **negligible** for pelagic and dredge fisheries.

Sensitivity of the receptor

7.11.2.44 Due to the nature and operation of mobile trawling gear (i.e., it is actively towed and demersal trawl and dredge gear directly penetrates the seabed with near continuous contact) there is increased vulnerability to this impact and the sensitivity is therefore considered to be **medium** for demersal trawl and dredge fisheries.

7.11.2.45 Pelagic trawl gear is designed to catch fish in the water column and does not normally come into contact with the seabed, sensitivity is considered to be **low**.

7.11.2.46 UK potters show a low vulnerability as the gear is placed, not towed and is less likely to penetrate the seabed. The sensitivity of UK potters is considered to be **low**.

Significance of the effect

7.11.2.47 Demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.48 Dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.2.49 Pelagic fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.2.50 Potting fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Physical presence of the export cable and associated infrastructure leading to gear snagging (CF-O-12).

Magnitude of impact

7.11.2.51 Based on the measures that will be implemented as part of the project and the commitment to follow standard protocols should snagging occur (see Section 7.8.2 and Table 7.8), the magnitude is considered to be **negligible** for fleets deploying pelagic gear and **minor** for all other fishing fleets.

Sensitivity of the receptor

7.11.2.52 Due to the nature and operation of mobile demersal trawling and dredging gear (i.e. it is actively towed and directly penetrates with near continuous contact with the seabed) there is higher vulnerability to this impact and the sensitivity is therefore considered to be **medium**.

7.11.2.53 Fleets deploying pelagic gear have a low vulnerability, as the gear does not normally touch the seabed, as fishing takes place in the water column. The sensitivity of pelagic fleets is considered to be **low**.

7.11.2.54 UK potters show a low vulnerability as the gear is placed, not towed and is less likely to penetrate the seabed. The sensitivity of UK potters is considered to be **low**.

Significance of the effect

7.11.2.55 Demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.56 Dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.57 Pelagic fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **not significant** in EIA terms.

7.11.2.58 Potting fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Hornsea Four operation and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-O-13).

Magnitude of impact

7.11.2.59 Detailed assessments of the following potential construction impacts have been undertaken in Volume 2, Chapter 3: Fish and Shellfish Ecology:

- Long-term loss of habitat due to the presence of turbine foundations, scour protection and cable protection.
- Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection.
- Underwater noise as a result of operational turbines.

7.11.2.60 The approach to this assessment follows that outlines for construction, with details of the fish and shellfish ecology assessment summarised in **Table 7.14**.

7.11.2.61 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of short-term duration. It is predicted that the impact will affect the receptor directly through loss of resources. The magnitude is therefore considered to be **minor** for all species in relation to habitat loss and increased hard substrate, and **negligible** in relation to underwater noise.

Table 7.14: Significance of effects of operation and maintenance impacts on fish and shellfish ecology.

Potential impact	Species	Significance of effect
Increases in suspended sediment concentrations and smothering	Herring	**Minor**
	Sandeel	**Minor**
Long-term loss of habitat due to the presence of turbine foundations, scour protection and cable protection.	Herring	**Minor**
	Sandeel	**Minor**
Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection.	Herring	**Minor**
	Sandeel	**Minor**
Underwater noise as a result of operational turbines.	Herring	**Not significant**
	Sandeel	**Not significant**
	All other fish/shellfish	**Not significant**

Sensitivity of the receptor

7.11.2.62 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in paragraphs 7.11.1.69 to 7.11.1.72, summarised as **low** for mobile pelagic and demersal fisheries and **medium** for potting and dredge fisheries.

Significance of the effect

7.11.2.63 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

7.11.2.64 Potting and dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **minor**. The effect is of **minor adverse** significance, which is not significant in EIA terms.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC infrastructure leading to interference with fishing activity (CF-O-15).

7.11.2.65 The effects of the operational and maintenance phase are expected to be the same or similar to the effects from construction (see paragraphs 7.11.1.75 to 7.11.1.83). The significance of effect is therefore **not significant** in EIA terms for pelagic and dredge fisheries, and **minor** for potting and demersal fisheries, which is also not significant in EIA terms.

Future monitoring

7.11.2.66 Continuous liaison with the fishing industry will be undertaken throughout the lifetime of the project, including issuing Notice to Mariners with details on upcoming maintenance activities. Further details of communication roles and responsibilities will be provided in an outline Fisheries Coexistence and Liaison Plan (Co95) at ES stage.

7.11.3 Decommissioning

7.11.3.1 The impacts of the offshore decommissioning of Hornsea Four have been assessed on commercial fisheries. The environmental impacts arising from the decommissioning of Hornsea Four are listed in **Table 7.9** along with the maximum design scenario against which each decommissioning phase impact has been assessed.

Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16).

7.11.3.2 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 7.11.1.3** to **7.11.1.19**). The significance of effect is therefore **minor** for potting, pelagic and demersal trawl fisheries, which is not significant in EIA terms, and **not significant** in EIA terms for the dredge fishery.

Hornsea Four offshore ECC decommissioning activities leading to reduction in access to, or exclusion from established fishing grounds (CF-D-17).

7.11.3.3 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 7.11.1.22** to **7.11.1.36**). The significance of effect is therefore **minor** for pelagic, dredge and demersal trawl fisheries, which is not significant in EIA terms, and **moderate** for potting fisheries, which is significant in EIA terms.

Further mitigation

7.11.3.4 Potting fisheries: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed (Co180) as described in **paragraph 7.11.1.37**. The residual effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-18).

7.11.3.5 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 7.11.1.39** to **7.11.1.51**). The significance of effect is therefore **minor** for potting, dredge and demersal trawl fisheries, which is not significant in EIA terms, and **not significant** in EIA terms for pelagic fisheries, which is also not significant in EIA terms.

Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-19).

7.11.3.6 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 7.11.1.52** to **7.11.1.63**). The significance of effect

is therefore **minor** for potting, dredge and demersal trawl fisheries, which is not significant in EIA terms, and **not significant** in EIA terms for pelagic fisheries.

Physical presence of any infrastructure left in situ leading to gear snagging (CF-D-20).

7.11.3.7 The effects of decommissioning activities are expected to be the same or similar to the effects from operation phase of the offshore ECC (see **paragraph 7.11.2.39** to **7.11.2.58**). The significance of effect is **not significant** for pelagic fleets and **minor adverse** for all other commercial fishing fleets, which is also not significant in EIA terms.

Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-D-21).

7.11.3.8 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 7.11.1.64** to **7.11.1.74**). The significance of effect is therefore **minor** for all fisheries, which is not significant in EIA terms.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting decommissioning vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-D-23).

7.11.3.9 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 7.11.1.76** to **7.11.1.83**). The significance of effect is therefore **minor** for potting and demersal trawl fisheries, which is not significant in EIA terms, and **not significant** in EIA terms for pelagic and dredge fisheries.

Future monitoring

7.11.3.10 Prior to decommissioning the baseline for commercial fisheries will be reviewed to ensure appropriate assessment of fisheries and fleets in operation at the time of decommissioning.

7.12 Cumulative effect assessment (CEA)

7.12.1.1 Cumulative effects can be defined as effects upon a single receptor from Hornsea Four when considered alongside other proposed and reasonably foreseeable projects and developments. This includes all projects that result in a comparative effect that is not intrinsically considered as part of the existing environment and is not limited to offshore wind projects.

7.12.1.2 A screening process has identified a number of reasonably foreseeable projects and developments which may act cumulatively with Hornsea Four. The full list of such projects that have been identified in relation to the offshore environment are set out in **Volume 4, Annex 5.3: Offshore Cumulative Effects** and are presented in a series of maps within **Volume 4, Annex 5.4: Location of Offshore Cumulative Schemes**.

7.12.1.3 In assessing the potential cumulative impacts for Hornsea Four, it is important to bear in mind that some projects, predominantly those 'proposed' or identified in development plans, may not actually be taken forward, or fully built out as described within their MDS. There is therefore a need to build in some consideration of certainty (or uncertainty) with respect to the potential impacts which might arise from such proposals. For example, those projects under construction are likely to contribute to cumulative impacts (providing effect or spatial pathways exist), whereas those proposals not yet approved are less likely to

contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors.

7.12.1.4 With this in mind, all projects and plans considered alongside Hornsea Four have been allocated into 'tiers' reflecting their current stage within the planning and development process. This allows the cumulative impact assessment to present several future development scenarios, each with a differing potential for being ultimately built out. This approach also allows appropriate weight to be given to each scenario (tier) when considering the potential cumulative impact. The proposed tier structure that is intended to ensure that there is a clear understanding of the level of confidence in the cumulative assessments provided in the Hornsea Four PEIR. An explanation of each tier is included in **Table 7.15**.

Table 7.15: Description of tiers of other developments considered for CEA (adapted from PINS Advice Note 17).

Tier 1	Project under construction.
	Permitted applications, whether under the Planning Act 2008 or other regimes, but not yet implemented.
	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined.
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted.
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted.
	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

7.12.1.5 The plans and projects selected as relevant to the CEA of impacts to commercial fisheries are based on an initial screening exercise undertaken on a long list (see **Volume 4, Annex 5.3: Offshore Cumulative Effects**). A consideration of effect-receptor pathways, data confidence and temporal and spatial scales has been given to select projects for a topic-specific short-list. For the majority of potential effects for commercial fisheries, planned projects were screened into the assessment based on a study area of the North Sea, to provide appropriate coverage of relevant fishing grounds.

7.12.1.6 The specific projects scoped into the CEA for commercial fisheries, as well as the tiers into which they have been allocated are presented in **Table 7.16** below and shown in **Volume 4, Annex 5.4: Location of Offshore Cumulative Schemes**. The operational projects included within the table are included due to their completion/ commissioning subsequent to the data collection process for Hornsea Four and as such not included within the baseline characterisation. Note that this table only includes the projects screened into the assessment for commercial fisheries based on the criteria outlined above. For the full list of projects considered, including those screened out, please see **Volume 4, Annex 5.3: Offshore Cumulative Effects**.

Table 7.16: Projects screened into the commercial fisheries cumulative assessment.

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
1	Viking Link Interconnector	Consented: Construction expected 2020-2023	0.00	0.00	40.66	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Dogger Bank Creyke Beck A Offshore Wind Farm Export Cables	Consented: Construction expected 2021-2024	25.13	0.00	8.46	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Dogger Bank Creyke Beck B Offshore Wind Farm Export Cables	Consented: Construction expected 2021-2024	25.13	0.00	8.46	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Hornsea Project Two Offshore Wind Farm Export Cables	Consented: Construction expected 2020-2021	0.00	8.51	>50	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Hornsea Project One Offshore Wind Farm Export Cables	Under Construction: Construction expected 2019	12.03	21.88	>50	Construction period expected during 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Hundale Potash Mine Offshore Minerals Lease operated by York Potash	Open: Construction expected 2019-2021	>50	18.74	29.94	Construction period expected during and after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Hornsea Project Two Offshore Wind Farm	Consented: Construction expected 2020-2023	0.00	5.84	66.43	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Hornsea Project One Offshore Wind Farm	Under Construction: Construction expected 2019	5.08	21.32	82.50	Construction period expected during 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Hornsea Three Offshore Wind Farm	In planning: Construction	36.34	55.47	116.10	Construction period expected after 2019, so not included within baseline assessment, and

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
		expected 2024-2031+				temporal overlap of construction phase.
1	Triton Knoll Offshore Wind Farm	Consented: Construction expected 2019-2021	56.99	49.70	60.93	Construction period expected during and after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Dogger Bank Creyke Beck A Offshore Wind Farm	Consented: Construction expected 2021-2024	65.86	83.65	107.52	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Dudgeon Offshore Wind Farm	Active: Construction expected 2021-2024	70.83	72.72	101.65	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Dogger Bank Creyke Beck B Offshore Wind Farm	Consented: Construction expected 2021-2024	76.14	94.18	111.26	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Sofia Offshore Wind Farm	Consented: Construction expected 2023-2026	97.75	113.14	143.26	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of construction and operation phase.
1	Dogger Bank Teesside A Offshore Wind Farm	Consented: Construction expected 2023-2026	120.86	135.62	170.16	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of construction and operation phase.
1	Norfolk Boreas Offshore Wind Farm	Pre-planning Application: Construction expected 2022-2025	123.34	133.68	187.40	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Norfolk Vanguard Offshore Wind Farm	Pre-planning Application: Construction expected 2024-2028	123.39	130.86	175.94	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of construction phase.

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
1	Blyth Offshore Wind Farm	Active: Decommissioning expected 2026-2027	178.94	141.07	158.49	Temporal overlap of decommissioning phase with construction phase of Hornsea Four
1	East Anglia Three Offshore Wind Farm	Consented: Construction expected 2020-2023	157.84	164.73	211.81	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
2	East Anglia One North Offshore Wind Farm	Pre-planning Application: Construction expected 2025-2028	178.58	182.88	219.69	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of construction phase.
2	East Anglia Two Offshore Wind Farm	Pre-planning Application: Construction expected 2026-2029	187.28	191.13	224.09	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of construction phase.
1	East Anglia One Offshore Wind Farm	Under Construction: Construction expected 2019-2020	194.09	198.56	236.63	Construction period expected during and after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Thanet Extension Offshore Wind Farm	In planning: Construction expected 2021-2023	275.87	278.37	279.02	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Neart na Gaoithe Offshore Wind Farm	Authorised: Construction expected 2020-2022	296.16	271.32	284.45	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Inch Cape Offshore Wind Farm	Authorised: Construction expected 2020-2022	311.89	291.43	303.06	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Seagreen Alpha Offshore Wind Farm	Authorised: Construction expected 2020-2022	312.11	295.09	304.91	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
1	Seagreen Bravo Offshore Wind Farm	Authorised: Construction expected 2020-2022	312.11	295.09	304.91	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Moray West Offshore Wind Farm	Planned: Construction expected 2022-2024	490.62	478.40	486.94	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Beatrice Offshore Wind Farm	Under Construction: Construction expected 2019	>500	489.40	497.77	Construction period expected during 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Moray East Offshore Wind Farm	Authorised: Construction expected 2019-2020	494.29	484.40	491.93	Construction period expected during and after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Borssele II Offshore Wind Farm	Authorised: Construction expected 2019-2020	261.20	265.55	301.15	Construction period expected during and after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	THV Mermaid Offshore Wind Farm	Authorised: Construction expected 2019	261.10	265.37	300.24	Construction period expected during 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Borkum Riffgrund II Offshore Wind Farm	Authorised: Construction expected 2019-2020	313.28	332.51	392.50	Construction period expected during and after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Deutsche Bucht Pilot Offshore Wind Farm	Planned: Construction expected 2019	269.73	289.19	347.44	Construction period expected during 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Viking Link Interconnector	Consented: Construction expected 2020-2023	0.00	0.00	40.66	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
1	Dogger Bank Creyke Beck A Offshore Wind Farm Export Cables	Consented: Construction expected 2021-2024	25.13	0.00	8.46	Construction period expected after 2019, so not included within baseline assessment, and temporal overlap of operation phase.

7.12.1.7 Certain impacts assessed for the project alone are not considered in the cumulative assessment due to:

- The highly localised nature of the impacts (i.e. they occur entirely within the Hornsea Four boundary only);
- Management measures in place for Hornsea Four (**Table 7.8)** will also be in place on other projects reducing their risk of occurring; and/or
- Where the potential significance of the impact from Hornsea Four alone has been assessed as negligible.

7.12.1.8 The impacts excluded from the CEA for the above reasons are:

- Increased risk of gear snagging;
- Displacement or disruption of commercially important fish and shellfish resources; and
- Increased vessel traffic within fishing grounds as a result of changes to shipping routes and project related vessel traffic leading to interference with fishing activity.

7.12.1.9 Therefore, the impacts that are considered in the CEA during construction and operation and maintenance are as follows:

- Reduction in access to, or exclusion from established fishing grounds; and
- Displacement leading to gear conflict and increased fishing pressure on established fishing grounds.

7.12.1.10 The cumulative MDS described in **Table 7.17** have been selected as those having the potential to result in the greatest cumulative effect on an identified receptor group. The cumulative impacts presented and assessed in this section have been selected from the details provided in the project description for Hornsea Four (summarised for commercial fisheries in **Table 7.9**) as well as the information available on other projects and plans in order to inform a cumulative maximum design scenario. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project design envelope to that assessed here, be taken forward in the final design scheme.

Table 7.17: Cumulative MDS for commercial fisheries.

Project Phase	Potential Impact	Maximum Design Scenario	Justification
Construction and Operation	Reduction in access to, or exclusion from established fishing grounds	Maximum design scenario for Hornsea Four plus the cumulative full development of the following projects within the North Sea: **Tier 1:** - Active aggregate extraction (Hundale Potash Mine); - Consented cable and pipeline projects (Viking Link, Dogger Bank Creyke Beck A Export Cables, Dogger Bank Creyke Beck B Export Cables, Hornsea Project Two Export Cables); - Cables and pipelines under construction (Hornsea Project One Export Cables); - Active offshore wind farms, with construction or decommissioning activities (Dudgeon, Blyth); - Offshore wind farms under construction (Hornsea Project One, East Anglia One, Beatrice); - Consented / planned / authorised wind farm projects (Neart na Gaoithe, Inch Cape, Seagreen Alpha, Seagreen Bravo, Moray East, Borssele II, THV Mermaid, Borkum Riffgrund, Hornsea Project Two, Triton Knoll, Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Sofia, Dogger Bank Teesside A, East Anglia Three); and - Submitted wind farm project applications not yet determined (Hornsea Three, Thanet Extension, Norfolk Boreas, Norfolk Vanguard). **Tier 2:** - Offshore wind farms, with a Scoping Report submitted (East Anglia One North, East Anglia Two). **Tier 3:** - No Tier 3 projects identified.	Outcome of the CEA will be greatest when the greatest number of other schemes, present or planned, are considered.
Construction and Operation	Displacement leading to gear conflict and increased fishing pressure on established fishing grounds		

7.13 Cumulative Effect Assessment

7.13.1.1 A description of the significance of cumulative effects upon commercial fisheries arising from each identified impact is given below. The cumulative effects assessment has been based on information available in Environmental Statements and it is noted that the project parameters quoted within Environmental Statements are often refined during the determination period and in the post-consent phase. The assessment presented here is therefore considered to be conservative, with the level of impacts expected to be reduced compared to those presented here.

7.13.2 Construction Phase

Cumulative effect of reduction in access to, or exclusion from established fishing grounds.

Tier 1

7.13.2.1 There is potential for cumulative reduction in access to or exclusion from established fishing grounds as a result of construction activities associated with Hornsea Four and other projects (Table 7.16). For the purposes of this PEIR, this additive impact has been assessed within the North Sea, which is considered to be representative of the fishing grounds exploited by the fleets active across Hornsea Four. The projects identified under tier 1 are provided in Table 7.16.

7.13.2.2 The impacts of reduced access or exclusion from fishing grounds assessed within individual commercial fisheries assessments for key offshore wind farms are presented in Table 7.18.

7.13.2.3 Due to the proximity of Hornsea Project One and Hornsea Project Two, these offshore wind farms have the most potential to result in a cumulative impact for the Holderness Coast UK potting fleet due to the grounds targeted by these potting fleets, while all other wind farms are expected to have a **negligible** to **minor** magnitude of impact to this fleet.

7.13.2.4 Of particular note, Hornsea Project Two export cable is located 8.5 km from Hornsea Four offshore cable corridor and likely to impact the same potting fleet. However, the impacts are assessed as minor during the construction and operation phases on account of the opportunity for co-existence of potting fisheries within array sites and the localised impacts during construction. There is expected to be five years between the completion of Hornsea Project Two construction and commencement of Hornsea Four construction. This temporal difference in construction programme is expected to limit the scale of cumulative impact on the potting fleet.

7.13.2.5 Overall, for all wind farms included in Tier 1, the magnitude of the cumulative impact is assessed as being **minor** to UK potters.

Table 7.18: Summary of commercial fisheries impact assessment findings for key offshore wind farms included in the cumulative assessment.

Project	Source	Consented Capacity/ scale	Residual Impact assessment results as assessed for individual offshore wind farms	
			Exclusion or reduction in access to fishing grounds	Displacement into alternative grounds.
Hornsea Project One	SMart Wind (2013)	Up to 240 5-8 MW turbines (DCO)	**Minor** for all fleets during all phases of the development	**Minor** for all fleets during all phases of the development
Hornsea Project Two	SMart Wind (2015)	Up to 300 6-15 MW turbines (DCO)	**Minor** for all fleets during all phases of the development	**Minor** for all fleets during all phases of the development
East Anglia One	Scottish Power Renewables and Vattenfall (2012)	714 MW (102x7 MW)	**Minor** to **negligible** for all fleets	**Minor** to **negligible** for all fleets
Triton Knoll	RWE npower renewables (2003)	750-900 MW (113-288x8 MW turbines)	**Negligible** for all fleets	**Negligible** for all fleets
Dudgeon	Warwick Energy (2009)	402 MW and 67 turbines	**Minor** for all fleets during construction and negligible during operations	**Minor** for all fleets during construction and negligible during operations
Dogger Bank Creyke Beck A	Forewind (2013a)	Up to 1.2 GW (Up to 200 turbines of up to 10 MW capacity)	**Minor** for all fleets during all phases, except: **moderate** for potters targeting crab & lobster across export cable route during construction.	**Minor** for all fleets during all phases, except **moderate** for potters targeting crab & lobster across export cable route during construction
Dogger Bank Creyke Beck B	Forewind (2013a)	Up to 1.2 GW (Up to 200 turbines of up to 10 MW turbines)	**Minor** for all fleets during all phases, except: **moderate** for potters targeting crab & lobster across export cable route during construction	**Minor** for all fleets during all phases, except: **moderate** for potters targeting crab & lobster across export cable route during construction
Dogger Bank Teesside A	Forewind (2013b)	Up to 1.2 GW	**Minor** for all fleets during all phases, except: **moderate** for seine nets across wind farm site during construction & operation.	**Minor** for all fleets during all phases, except: **moderate** for seine nets across wind farm site during construction & operation.
Sofia	Forewind (2013b)	Up to 1.2 GW	**Minor** for all fleets during all phases, except: **moderat**e for seine nets across wind farm site during construction & operation.	**Minor** for all fleets during all phases, except: **moderate** for seine nets across wind farm site during construction & operation.
East Anglia Three	ScottishPower Renewables and Vattenfall (2015)	Up to 1200 MW (up to 172 turbines of up to 7 – 12 MW capacity)	**Minor** to **negligible** for all fleets during construction and operations; except moderate (reduced to **minor** with mitigation) for UK static fleet during construction of offshore cable corridor.	**Minor** to n**egligible** for all fleets
Beatrice	Beatrice Offshore Windfarm (2012)	588 MW (84 turbines)	**Minor** for all fleets during all phases	**Minor** for all fleets during all phases

Project	Source	Consented Capacity/ scale	Residual Impact assessment results as assessed for individual offshore wind farms	
			Exclusion or reduction in access to fishing grounds	Displacement into alternative grounds.
Neart na Gaoithe	NnG Offshore Wind (2017)	588 MW (54 turbines)	**Minor** to **negligible** for all fleets during construction and operations; except **moderate** (reduced to **minor** with mitigation) for UK potting fleet during construction of wind farm and moderate (reduced to **minor** with mitigation) for UK demersal trawl fleet during construction of offshore cable corridor.	**Minor** for all fleets during all phases, except: **moderate** for potting across offshore export cable during construction
Inch Cape	Inch Cape Offshore Limited (2018)	72 turbines	**Moderate** for scallop dredge and creel fisheries during construction and operation; **minor** to negligible for all other fleets.	**Minor/Moderate** for all fleets during construction, and operation.
Seagreen Alpha	SSE (2018)	Up to 70 turbines in each project, with maximum of 120 turbines across both sites.	**Moderate** for scallop dredgers during construction (reduced to **minor** with mitigation), **minor** for all other fleets.	**Moderate** for scallop dredgers (reduced to **minor** with mitigation), **minor** for all other fleets.
Seagreen Bravo	SSE (2018)			
Moray East	Moray Offshore Renewables Limited (2016)	950 MW	**Moderate** for scallop dredgers and squid fishery during construction and operation.	**Moderate** for scallop dredgers and squid fishery during construction and operation.
Hornsea Three	Ørsted (2018)	Up to 300 turbines	**Minor** to **negligible** for all fleets during construction and operation; except moderate (reduced to **minor** with mitigation) for UK potting fleet during construction of offshore cable corridor.	**Minor** to **negligible** for all fleets during construction and operation.
Thanet Extension	Vattenfall Wind Power Limited (2018)	Up to 34 turbines	**Minor** to **negligible** for all fleets during construction and operation.	**Minor** to **negligible** for all fleets during construction and operation.
Norfolk Boreas	Norfolk Boreas Limited (2019)	180 x 10MW turbines	**Minor** to **negligible** for all fleets during construction and operation.	**Minor** to **negligible** for all fleets during construction and operation.
Norfolk Vanguard	Norfolk Vanguard Limited (2019)	200 x 9MW turbines	**Minor** to **negligible** for all fleets during construction and operation.	**Minor** to **negligible** for all fleets during construction and operation.

7.13.2.6 In relation to all other fleets (including UK, Dutch, Danish, French, Belgian, Norwegian, Swedish and German demersal and/or pelagic otter trawlers, fly shooters and/or beam trawlers) the following wind farms have the most potential to result in a cumulative impact due to the location of the wind farms and the grounds targeted and/or operational range of the fishing fleets: (from south to north) East Anglia One, East Anglia Three, Triton Knoll, Dudgeon, Hornsea Project One, Hornsea Project Two, Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, and Sofia. Based on the available evidence, including VMS data, all other wind farms are expected to have a **low** to **negligible** magnitude of impact for these fleets.

7.13.2.7 Based on available ESs (DONG Energy, 2014; RWE npower renewables, 2003; Scottish Power Renewables and Vattenfall, 2012; SMart Wind, 2013; SMart Wind, 2015), it is understood that these offshore wind farms are considered to represent effects within a range of **negligible** to **minor** adverse significance to demersal trawl commercial fisheries and **negligible** to **minor** for pelagic fleets. This is due to fishing not being excluded within the operational wind farms, together with commitment to follow FLOWW guidance (2008 and 2014) (Co180). As such a **minor** magnitude is assessed for these fleets.

7.13.2.8 The magnitude of impact of gas and oil fields that have ceased production is considered to be **minor** to all fishing fleets based on the expected time-frame for decommissioning activities and the potential for fishing grounds to be gained based on the cessation of any related safety zones.

7.13.2.9 The magnitude of impact of pipelines and aggregate dredging activities is considered to be **minor** to all fishing fleets based on the expected time-frame for pipeline decommissioning activities and the limited aerial overlap of dredging activities.

7.13.2.10 UK, Dutch, Danish, French, German and Belgian demersal trawlers (including otter trawl, beam trawl, pulse trawl and fly shooting) are known to fish within areas overlapping Round 2 and 3 developments. It is noted that these fleets also operate across most of the North Sea ICES Divisions 4b and 4c. Overall these fleets are considered to be vulnerable to cumulative impacts of exclusion from developed areas as the opportunities and options for fishing current and future alternative grounds are reduced. Demersal fisheries fleets are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **medium**.

7.13.2.11 The Danish and Norwegian pelagic trawlers target wide areas throughout the North Sea when fishing for pelagic, water-column dwelling species including herring and sprat, and are not known to specifically target the Hornsea Four area. Pelagic fisheries fleets are deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**.

7.13.2.12 The operating range of UK potters is more limited than the UK and European trawling fleets due to the size and power of the vessels. The UK potters may therefore be more sensitive to reduced access to Round 2 sites. The UK potting fleet is deemed to be of medium

vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **medium**.

7.13.2.13 All other commercial fisheries fleets are deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of all other commercial fisheries receptors is therefore, considered to be **low**.

7.13.2.14 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect from the reduced access, or exclusion from established grounds from the installation of Hornsea Four cumulatively with the Tier 1 projects is **minor adverse**, which is not significant in EIA terms.

Tier 2

7.13.2.15 The Tier 2 assessment includes two additional wind farm projects: East Anglia One North and East Anglia Two. Based on the proximity of these projects with Hornsea Four (>170 km), the magnitude of impact is considered to be consistent with the Tier 1 assessment for all fishing fleets.

7.13.2.16 The sensitivity of receptors is consistent with the Tier 1 assessment for all fishing fleets.

7.13.2.17 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect from the reduced access, or exclusion from established grounds from the installation of Hornsea Four cumulatively with the Tier 2 projects is **minor adverse**, which is not significant in EIA terms.

Tier 3

7.13.2.18 No Tier 3 projects have been identified.

Cumulative effect of displacement leading to gear conflict and increased fishing pressure on alternative grounds.

Tier 1

7.13.2.19 The effect of displacement leading to gear conflict and increased fishing pressure is directly correlated to the previous impact of reduced access to fishing grounds (i.e. if there is no reduction in access, then there will be no displacement). There is a minor magnitude of impact for reduced access to fishing grounds and therefore significant displacement is not expected. As such the magnitude of impact of displacement is assessed as **minor** for all fleets and fisheries.

7.13.2.20 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds and is therefore **medium** for demersal trawling fleets and potting fleets and **low** for pelagic and all other commercial fishing fleets.

7.13.2.21 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect from the displacement of commercial fisheries leading to gear conflict and increase pressure from the installation of Hornsea Four cumulatively with the Tier 1 projects is **minor adverse**, which is not significant in EIA terms.

Tier 2

7.13.2.22 The Tier 2 assessment includes two additional wind farm projects: East Anglia One North and East Anglia Two. Based on the proximity of these projects with Hornsea Four (>170 km), the magnitude of impact is considered to be consistent with the Tier 1 assessment for all fishing fleets.

7.13.2.23 The sensitivity of receptors is consistent with the Tier 1 assessment for all fishing fleets.

7.13.2.24 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect from the displacement of commercial fisheries leading to gear conflict and increase pressure from the installation of Hornsea Four cumulatively with the Tier 2 projects is **minor adverse**, which is not significant in EIA terms.

Tier 3

7.13.2.25 No Tier 3 projects have been identified.

7.13.3 Operation and Maintenance Phase

Cumulative effect of reduction in access to, or exclusion from established fishing grounds.

Tier 1

7.13.3.1 The cumulative effect during operation and maintenance of Tier 1 projects on reduction in access to or exclusion from fishing grounds is consistent with that presented during construction, see **paragraphs 7.13.2.1** to **7.13.2.14**. As such a **minor** magnitude is assessed for all fleets.

7.13.3.2 The sensitivity of receptors is considered to be consistent with that assessed during construction, see **paragraphs 7.13.2.15** to **7.13.2.17** and is **medium** for all demersal trawlers and UK potters, and **low** for pelagic trawlers and all other fleets.

7.13.3.3 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect from the reduced access, or exclusion from established grounds from the operation of Hornsea Four cumulatively with the Tier 1 projects is **minor adverse**, which is not significant in EIA terms.

Tier 2

7.13.3.4 The magnitude of impact is considered to be consistent with the Tier 1 assessment for all fishing fleets.

7.13.3.5 The sensitivity of receptors is consistent with the Tier 1 assessment for all fishing fleets.

7.13.3.6 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect from the reduced access, or exclusion from established grounds from the operation of Hornsea Four cumulatively with the Tier 2 projects is **minor adverse**, which is not significant in EIA terms.

Tier 3

7.13.3.7 No Tier 3 projects have been identified.

Cumulative effect of displacement leading to gear conflict and increased fishing pressure on alternative grounds.

Tier 1

7.13.3.8 The cumulative effect during operation and maintenance of Tier 1 projects on displacement leading to gear conflict and increase fishing pressure is consistent with that presented during construction, see **paragraph 7.13.2.19**. As such a **minor** magnitude is assessed for all fleets.

7.13.3.9 The sensitivity of receptors is considered to be consistent with that assessed during construction, see **paragraph 7.13.2.20** and is **medium** for all demersal trawlers and UK potters, and **low** for pelagic trawlers and all other fleets.

7.13.3.10 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect on displacement leading to gear conflict and increase fishing pressure from the operation of Hornsea Four cumulatively with the Tier 1 projects is **minor adverse**, which is not significant in EIA terms.

Tier 2

7.13.3.11 The magnitude of impact is considered to be consistent with the Tier 1 assessment for all fishing fleets.

7.13.3.12 The sensitivity of receptors is consistent with the Tier 1 assessment for all fishing fleets.

7.13.3.13 The maximum sensitivity of receptors in the area is medium and the magnitude has been assessed as minor. Therefore, the significance of effect from the displacement of commercial fisheries leading to gear conflict and increase pressure from the operation of Hornsea Four cumulatively with the Tier 2 projects is minor adverse, which is not significant in EIA terms.

Tier 3

7.13.3.14 No Tier 3 projects have been identified.

7.14 Transboundary effects

7.14.1.1 Transboundary effects are defined as those effects upon the receiving environment of other European Economic Area (EEA) states, whether occurring from Hornsea Four alone, or cumulatively with other projects in the wider area. A transboundary screening exercise was undertaken at Scoping (Annex K of the Scoping Report), which identified that there was the potential for transboundary effects to occur in relation to commercial fisheries. The potential transboundary impacts screened into the assessment for commercial fisheries were:

- Effects on commercial fishing fleets as a result of impacts from Hornsea Four on commercial fish stocks in the waters of other EEA States; and
- Effects on commercial fishing fleets from all EEA countries as a result of constraints on foreign commercial fishing activities operating in Hornsea Four, including demersal trawling, beam trawling, demersal seining and other gears. These effects may include reduction in access to fishing grounds and potential displacement of fishing effort from Hornsea Four to alternative fishing grounds in other EEA States, which will have direct implications to that fishing ground.

7.14.1.2 Effects on biological resources could occur over a range of 10s of kilometres from Hornsea Four and could therefore interact with the following EEA states: the Netherlands. Based on the minor to negligible significance of disruption to commercial species during all phases of the project, it is expected that the impact on stocks in the Dutch EEZ is negligible. Therefore, the potential transboundary impact of effects on commercial fish stocks in the waters of other EEA States on commercial fisheries is concluded to be **not significant** in EIA terms.

7.14.1.3 Effects on commercial fishing fleets could occur over a range of 100s of kilometres from Hornsea Four and could therefore interact with the following EEA states: the Netherlands, Germany, Belgium, Denmark, Norway, France and Ireland. Effects on these foreign commercial fishing fleets from EEA states, in terms of reduction in access to grounds within Hornsea Four and displacement into alternative grounds including other EEZs were found to be minor for all non-UK EEA states. Therefore, the potential transboundary impact of constraints on foreign commercial fishing activities is concluded to be of **minor** significance and is therefore considered to be non-significant in EIA terms.

7.15 Inter-related effects

7.15.1.1 Inter-related effects consider impacts from the construction, operation or decommissioning of Hornsea Four on the same receptor (or group). The potential inter-related effects that could arise in relation to commercial fisheries are presented in **Table 7.19**. Such inter-related effects include both:

- Project lifetime effects: i.e. those arising throughout more than one phase of the project (construction, operation, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just one phase were assessed in isolation; and
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor (or group). Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

7.15.1.2 A description of the process to identify and assess these effects is presented in Section 5.8 of **Volume 1 Chapter 5: EIA Methodology**.

Table 7.19: Inter-related effects assessment for commercial fisheries.

Project phase(s)	Nature of inter-related effect	Assessment alone	Inter-related effects assessment
Project-lifetime effects			
Construction, operation and, decommissioning	Reduction in access to, or exclusion from, potential and/or established fishing grounds within the Hornsea Four array area	Not significant to moderate adverse during construction and decommissioning phases and negligible to minor during O&M phase.	During construction and decommissioning phases of project, safety zones, and therefore the areas from which commercial fishing will be excluded, will be highly localised. While there will be a small incremental increase in the area in which fishing may be disrupted as the project is built out, as fishing activity is likely to be able to continue elsewhere during the operational and maintenance phase, effects on commercial fisheries across the phases are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Construction, operation and, decommissioning	Reduction in access to, or exclusion from, potential and/or established fishing grounds within the Hornsea Four offshore ECC	Minor to moderate adverse during construction and decommissioning phases and negligible to minor during O&M phase.	During all phases of the project, safety zones, and therefore the areas from which commercial fishing will be excluded, will be highly localised. During construction, for example, fishing will be excluded from temporary 500 m roaming safety zones around cable installation activities. During operation, there will be no formal exclusion of fishing activity except for within temporary 500 m roaming safety zones implemented during major maintenance activities. In addition, disruption to UK potters along the offshore ECC during construction will reduce during the operational and maintenance phase. Therefore, although there will be a small incremental increase in the area in which fishing may be disrupted as the project is built out, as fishing activity is likely to be able to continue, effects

Project phase(s)	Nature of inter-related effect	Assessment alone	Inter-related effects assessment
			on commercial fisheries across the phases are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Construction, operation and, decommissioning	Displacement from Hornsea Four leading to gear conflict and increased fishing pressure on adjacent grounds	Minor to moderate adverse during construction and decommissioning phases and negligible to minor during O&M phase.	Fishing may be disrupted, and partial exclusion may occur during the construction and decommissioning phases of Hornsea Four. However it is anticipated that fishing will resume where productive grounds can be targeted, with the exception of safety zones around infrastructure undergoing major maintenance and advisory safe distances around vessels undertaking major maintenance activities. Also, alternate fishing grounds will be available for the fleets that operate across the Hornsea Four array and offshore ECC. Therefore, effects on commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Construction, operation and, decommissioning	Displacement or disruption of commercially important fish and shellfish resources	Not significant to minor adverse during all phases.	Project lifetime inter-related effects are unlikely as the majority of disturbance (resulting in highest SSC/deposition) will be during the construction and decommissioning phases with minimal disturbance likely during the operation and maintenance phase. Impacts to prey species (i.e. fish and shellfish) will be at their maximum during the construction phase as a result of effects associated with underwater noise from piling, increased suspended sediments and habitat loss. Across the project lifetime, the effects on commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Construction, operation and, decommissioning	Increased vessel traffic within fishing grounds as a result of changes to shipping routes	Not significant to minor adverse during all phases.	With the successful implementation of measures adopted for this development (i.e. issue of Notices to Mariners (NTMs), preparation of a fisheries co-existence and liaison plan, close liaison with the local vessels), no significant effects are predicted for the construction,

Project phase(s)	Nature of inter-related effect	Assessment alone	Inter-related effects assessment
	and construction vessel traffic leading to interference with fishing activity		operation and maintenance, and decommissioning phases of the project. The majority of vessel traffic (resulting in interference with fishing) is predicted to peak during construction and decommissioning with reduced potential for interference during the operation and maintenance phase. Therefore, across the project lifetime, the effects on commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Operation	Gear snagging and obstruction due to seabed objects within the Hornsea Four array area	Not significant to minor adverse	This effect will only arise during the operation and maintenance phase and as such there will be no inter-related effects across the project phases.
Operation and decommissioning	Gear snagging and obstruction due to seabed within the offshore ECC	Not significant to minor adverse during all phases.	Impacts due to gear snagging will occur during the operation phase due to the presence of cable protection on the seabed and the presence of the export cable. During decommissioning this infrastructure will be removed although cable and scour protection may be left in situ following decommissioning. However, across the project lifetime, the effects on commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Receptor-led effects			
Inter-related effect from the combination of the reduction in access to fishing grounds and the subsequent increased pressure on adjacent grounds.		During the construction and decommissioning phases, both effects will be temporary and short lived, with access to fishing grounds being prevented where construction and decommissioning activity is taking place. During operation the effects will be different depending on the receptors affected. Mobile fishing fleets may access specific grounds within the array area or move to other fishing areas in the North Sea, which could put them into conflict with static gear (i.e. potting) fleets operating closer to shore and along the offshore ECC. As a result, the static fleets will be subjected to potential increases in pressure on their grounds. While the two effects may act together, it is considered that appropriately mitigated loss of access, will limit the impact of displacement and that therefore, overall, any inter-related effect will not	

Project phase(s)	Nature of inter-related effect	Assessment alone	Inter-related effects assessment
		be of any greater significance than those already assessed in isolation (i.e. negligible to moderate adverse significance).	

7.16 Conclusion and summary

7.16.1.1 Commercial fisheries baseline activity data has been assessed for the following countries: UK, Netherlands, France, Belgium, Denmark, Germany, Sweden and Norway. Based on quota allocations and landing statistics for the commercial fisheries study area it is understood that vessels registered to other countries do not operate across the Hornsea Four array area, the offshore ECC and the wider former Hornsea Zone.

7.16.1.2 The key fleets operating across the Hornsea Four include (in no particular order):

- UK potters targeting lobster, brown crab and whelk;
- UK demersal otter trawlers targeting *Nephrops* and mixed demersal species;
- French demersal trawlers targeting whiting;
- UK, Belgian, and Dutch beam trawlers targeting sole, plaice, *Nephrops* and mixed demersal species;
- Dutch, German, Danish, French and Swedish pelagic trawlers, targeting herring that consistently move/shoal throughout the wider southern North Sea; and
- Danish, Swedish and Norwegian demersal trawlers targeting sandeel throughout the North Sea with occasional effort within the array area.

7.16.1.3 **Table 7.20** presents a summary of the impacts assessed within this PEIR, any mitigation and the residual effects.

Table 7.20: Summary of potential impacts assessed for commercial fisheries.

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
Construction				
Hornsea Four array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-C-1).	Potting fisheries Medium	Moderate Moderate adverse	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed.	Minor adverse
	Dredge fishery Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Pelagic fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Hornsea Four offshore ECC construction activities leading to reduction in access to, or exclusion from established fishing grounds (CF-C-2).	Potting fisheries Medium	Moderate Moderate adverse	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed.	Minor adverse
	Dredge fishery Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-3).	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-4).	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl/seine fisheries Low	Moderate Minor adverse	None proposed beyond existing Commitments	Minor adverse
Hornsea Four array area and offshore ECC construction activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-C-5).	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-C-7).	Potting fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Operation				
Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
exclusion from established fishing grounds (CF-O-8).	Pelagic fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore ECC leading to reduction in access to, or exclusion from established fishing grounds (CF-0-9).	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Displacement from Hornsea Four array area and Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CO-O-10).	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Physical presence of Hornsea Four array area leading to gear snagging (CF-O-11).	Potting fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Medium	Negligible Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
Physical presence of the export cable and associated infrastructure leading to gear snagging (CF-O-12).	Potting fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Hornsea Four operation and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-O-13).	Potting fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC infrastructure leading to interference with fishing activity (CF-O-15).	Potting fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Decommissioning				
Hornsea Four array area decommissioning activities leading to reduction in	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery	Negligible	None proposed beyond existing Commitments	Not significant

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
access to, or exclusion from, potential and/or established fishing grounds (CF-D-16).	Low	Not significant		
	Pelagic fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Hornsea Four offshore ECC decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-17).	Potting fisheries Medium	Moderate Moderate adverse	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed.	Minor adverse
	Dredge fishery Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-18).	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-19).	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
	Demersal trawl and seine fisheries Low	Moderate Minor adverse	None proposed beyond existing Commitments	Minor adverse
Physical presence of any infrastructure left in situ leading to gear snagging (CF-D-20).	Potting fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-D-21).	Potting fisheries Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Medium	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Pelagic fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting decommissioning vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-D-23).	Potting fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse
	Dredge fishery Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Pelagic fisheries Low	Negligible Not significant	None proposed beyond existing Commitments	Not significant
	Demersal trawl and seine fisheries Low	Minor Minor adverse	None proposed beyond existing Commitments	Minor adverse

7.17 References

Beatrice Offshore Windfarm Limited (2012). Environmental Statement Beatrice Offshore Wind Farm: Commercial Fisheries Chapter.

BERR (Department for Business, Enterprise and Regulatory Reform) (2008) Fisheries Liaison with Offshore Wind and Wet Renewables Group (FLOWW) Recommendations For Fisheries Liaison: Best Practice guidance for offshore renewable developers.

Blyth-Skyrme, R.E. (2010a) Options and opportunities for marine fisheries mitigation associated with wind farms. Final report for Collaborative Offshore Wind Research Into the Environment contract FISHMITIG09. COWRIE Ltd, London.

Blyth-Skyrme, R.E. (2010b) Options and opportunities for marine fisheries mitigation associated with windfarms: Summary report for COWRIE contract FISHMITIG09. COWRIE Ltd, c/o Nature Bureau, Newbury, UK. 8pp.

Defra (2014) East Inshore and East Offshore Marine Plans.

European Union Data Collection Framework (EU DCF) (2019). Data by quarter-rectangle: Tables and maps of effort and landings by ICES statistical rectangles.

European Union Market Observatory for Fisheries and Aquaculture products (EUMOFA) (2019). Yearly comparison between member states.

Fisheries Liaison with Offshore Wind and Wet Renewables group FLOWW (2015) FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015).

FLOWW (2014) FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison. January 2014.

FOREWIND (2013a) Dogger Bank Creyke Beck A & B, Environmental Statement.

FOREWIND (2013b) Dogger Bank Teesside A & B, Environmental Statement.

Gray, M., Stromberg, P-L., Rodmell, D. 2016. 'Changes to fishing practices around the UK as a result of the development of offshore windfarms – Phase 1 (Revised).' The Crown Estate, 121 pages. ISBN: 978-1-906410-64-3

HM Government (2011) UK Marine Policy Statement.

KIS-ORCA, 2019. Safety of fishermen - reducing risks whilst fishing. http://www.kis-orca.eu/safety/reducing-risks-whilst-fishing#.XRdPSy2ZOjg.

Marine Management Organisation (MMO) (2019) 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; and landing year; landing month; vessel length category; country code; vessel/gear type; port of landing; species; live weight (tonnes); and value.

NnG Offshore Wind Limited (2017). Environmental Statement NnG Offshore Wind Farm: Commercial Fisheries Chapter.

Roach, M., Cohen, M., Forster, R., Revill, A. S., and Johnson, M. The effects of temporary exclusion of activity due to wind farm construction on a lobster (Homarus gammarus) fishery suggests a potential management approach. ICES Journal of Marine Science, doi:10.1093/icesjms/fsy006.

RWE npower renewables (2003) Triton Knoll Offshore Wind Farm Ltd Environmental Statement ES Volume 3 (Annex I) Commercial Fisheries.

Scottish Power Renewables and Vattenfall (2012) East Anglia ONE Offshore Windfarm Environmental Statement Volume 2 Offshore Chapter 13 – Commercial Fisheries. Prepared by Environmental Resource Management (ERM).

Scottish Power Renewables and Vattenfall (2015) East Anglia THREE Chapter 14 Commercial Fisheries Environmental Statement Volume 1 Document Reference – 6.1.14. Report prepared by Brown and May Limited.

SMart Wind (2013) Hornsea Offshore Wind Farm Project One – Environmental Statement Volume 2 Chapter 7 – Commercial Fisheries.

SMart Wind (2015) Hornsea Offshore Wind Farm Project Two – Environmental Statement Volume 2 Chapter 6 – Commercial Fisheries.

Technical University of Denmark National Institute of Aquatic Resources (DTU Aqua) (2011) Maps of key sandeel fishing grounds detailing locations of fishing grounds that have been targeted by Danish registered vessels.

The Crown Estate (2012) UK Fisheries Information Project (UKFIM) beam trawl mapping across Hornsea Zone.

UKFEN (2013) Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments.

Warwick Energy (2009) Dudgeon Offshore Wind Farm Environmental Statement Non-Technical Summary June 2009. Report prepared by Royal Haskoning.