Partners in UK offshore wind

MONA OFFSHORE WIND PROJECT

Preliminary Environmental Information Report

Volume 6, annex 11.1: Commercial fisheries technical report

Image of an offshore wind farm

April 2023
FINAL

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Rev01	First draft	MarineSpace	RPS/bpEnBW		23/06/2023
Rev02	Second draft	MarineSpace	RPS/bpEnBW		14/07/2023
Rev03	Final	MarineSpace	RPS/bpEnBW	Bp/EnBW	07/02/2023

Prepared by:	Prepared for:
RPS	**Mona Offshore Wind Ltd.**

Contents

Tables

Figures

Glossary

Term	Meaning
Beam trawl	Beam trawls consist of nets that are held open by a heavy tubular steel beam, which is towed along the seabed. Beam trawls may use tickler chains, which are attached at the front of the net and slide along the seabed to disturb species of fish within its path, encouraging them to rise up into the net behind.
Demersal trawl	Demersal trawls consist of cone-shaped nets that are towed along the seabed to target demersal fish species. The mouth of the trawl is spread and held open by a pair of adjacent trawl doors.
Company Fisheries Liaison Officer	Primary contact for the Fishing Industry Representative (FIR) and Offshore Fisheries Liaison Officer (OFLO). Main point of contact for bp/EnBW for any commercial fisheries related queries.
Dredge	Dredges consist of rigid structures that target numerous species of shellfish through towing along the seabed. Dredges typically have an open-frame mouth with a collection bag.
Fisheries Industry Representative	Primary contact point within the fishing community, provider of feedback to the Company Fisheries Liaison Officer (CFLO) and OFLO and disseminator of Project information.
Gill nets	Gill nets are nets which hang vertically in the water column which entangle fish as they swim into it.
ICES Rectangle	Defined areas used for the gridding of data. Each rectangle is 30 minute latitude by 1 degree longitude.
Inshore waters (England and Wales)	Mean High Water Springs (MHWS) to 12nm offshore.
Kilowatt	Engine power of a fishing vessel. This is used in the calculation of fishing effort for Vessel Monitoring Systems (VMS) data, whereby the time associated with the VMS report is multiplied by the engine power of the fishing vessel. Engine power with gross tonnage determines the size of fishing licence require and therefore allowable catch, discards and quotas.
Minimum Landing Size	The smallest measurement of a fish or shellfish species that can be legally sold or landed.
Offshore Fisheries Liaison Officer	Liaison between fishing vessels and clients, using local knowledge and fisheries experience to ensure offshore operations run smoothly and encourage co-operation. Provider of feedback to the CFLO and FIR.
Otter trawl	Otter trawls consist of a pair of otter boards (large rectangular boards) which holds open the mouth of a net.
Pelagic trawl	Pelagic trawls consist of nets which are used to catch fish in the water column, rather than on the seafloor.
Seine nets	Seine nets consist of a large net which is drawn together to surround and enclose a shoal of fish.
Static gear	Gear that is set to catch fish or shellfish. This is a collective term and includes gears such as pots, traps and set nets.
Total Allowable Catch	Catch limits which are set for a specific fishery for a certain time period. Total Allowable Catches (TACs) are generally expressed in tonnes of live weight.
Vessel Monitoring System	Satellite tracking system using a device on vessel which transmits the location, speed and course of the vessel.

Acronyms

Acronym	Description
AIS	Automatic Identification System
ANIFPO	Anglo-North Irish Fish Producers
CCW	Countryside Council for Wales
CFLO	Company Fisheries Liaison Officer
CFP	Common Fisheries Policy
DECC	Department of Energy and Climate Change
DPR	Daily Progress Report
EIA	Environmental Impact Assessment
EU	European Union
EU STECF	European Union Scientific, Technical and Economic Committee for Fisheries
FIR	Fisheries Industry Representative
ICES	International Council for the Exploration of the Sea
IVMS	Inshore Vessel Monitoring Systems
ISEFPO	Irish South & East Fish Producers Organisation
MFPO	Manx Fish Producers Organisation
MHWS	Mean High Water Spring
MLS	Minimum Landing Size
MMO	Marine Management Organisation
NEAFC	North East Atlantic Fisheries Commission
NFFO	National Federation of Fishermen's Organisations
NIFPO	Northern Ireland Fish Producers Organisation
NRA	Navigation Risk Assessment
NRW	Natural Resource Wales
NWWAC	North Western Waters Advisory Council
OFLO	Offshore Fisheries Liaison Officer
SFF	Scottish Fishermen's Federation

Acronym	Description
SWFPA	The Scottish White Fish Producers Association Ltd
TAC	Total Allowable Catch
UK	United Kingdom
VMS	Vessel Monitoring Systems
WCSP	West Coast Sea Products Ltd
WFA	Welsh Fishermen's Association
Whitehaven Fishermen's Cooperative	WFC
WG	Welsh Government
WNMP	Welsh National Marine Plan

Units

Unit	Description
£	Pound sterling
knots	Knots (nautical mile per hour)
kW	Kilowatt (power)
kW/day	Kilowatt days
kWh	Kilowatt hours
m	Metres
nm	Nautical miles (distance; 1nm = 1.852km)
t	Tonnes

1 COMMERCIAL FISHERIES TECHNICAL REPORT

1.1 Introduction

1.1.1.1 This Mona Commercial fisheries technical report provides a detailed description of commercial fishing activity within the area of the proposed Mona Offshore Wind Project and the wider, east Irish Sea region. This information will be used to inform the Environmental Impact Assessment (EIA) being undertaken as part of the consenting process for the Mona Offshore Wind Project. The Mona Offshore Wind Project is described in detail in PEIR volume 1, chapter 3: Project description of the PEIR.

1.1.1.2 The technical report has been produced by MarineSpace Ltd on behalf of RPS, which has been appointed as the lead EIA consultant for the Mona Offshore Wind Project by bp/EnBW (hereafter referred to as the Applicant). MarineSpace also provides the role of Company Fisheries Liaison Officer (CFLO) on behalf of the Applicant.

1.1.1.3 This technical report has the following objective:

- To provide a baseline for commercial fishing activity in relation to the Mona Offshore Wind Project, and wider east Irish Sea region, through a review of official datasets; additional information and knowledge obtained through consultation with fisheries groups; and site-specific surveys.

1.1.1.4 This technical report should be read in conjunction with the following:

- Volume 2, chapter 8: Fish and shellfish ecology of the PEIR and volume 6, annex 8.1: Fish and shellfish ecology technical report of the PEIR
- Volume 2, chapter 12: Shipping and navigation of the PEIR and volume 6, annex 12.1: Navigational risk assessment of the PEIR
- Volume 2, chapter 14: Other sea users of the PEIR.

1.1.1.5 Recreational rod and line fishermen, as well as charter-angling operators, are also active in the region, more details can be found in volume 2, chapter 14: Other sea users of the PEIR.

1.2 Study area

1.2.1.1 The Mona Offshore Wind Project is located within the International Council for the Exploration of the Sea (ICES) Division VIIa (Irish Sea) statistical area, which is divided into statistical rectangles for the purpose of recording fisheries landings. The Mona Array Area (illustrated on Figure 1.1 below) will be located within ICES Rectangle 36E5 and 36E6, and the Mona Offshore Cable Corridor (also illustrated on Figure 1.1 below) will be located within 35E6 and 36E6.

1.2.1.2 A broad Mona commercial fisheries study area has been defined for the purposes of this technical report, to provide a wider regional context to the current fisheries activity and to ensure that potential impacts (e.g. displacement of fishing vessels) from the Mona Offshore Wind Project on commercial fisheries are fully assessed. Therefore, for the purposes of this technical report, the Mona commercial fisheries study area is defined as ICES Rectangles 35E5, 35E6, 36E5 and 36E6.

1.2.1.3 The Mona Array Area is predominantly in Welsh waters, with a small overlap with English waters, whereas the Mona Offshore Cable Corridor is located wholly within Welsh waters (See Figure 1.1).

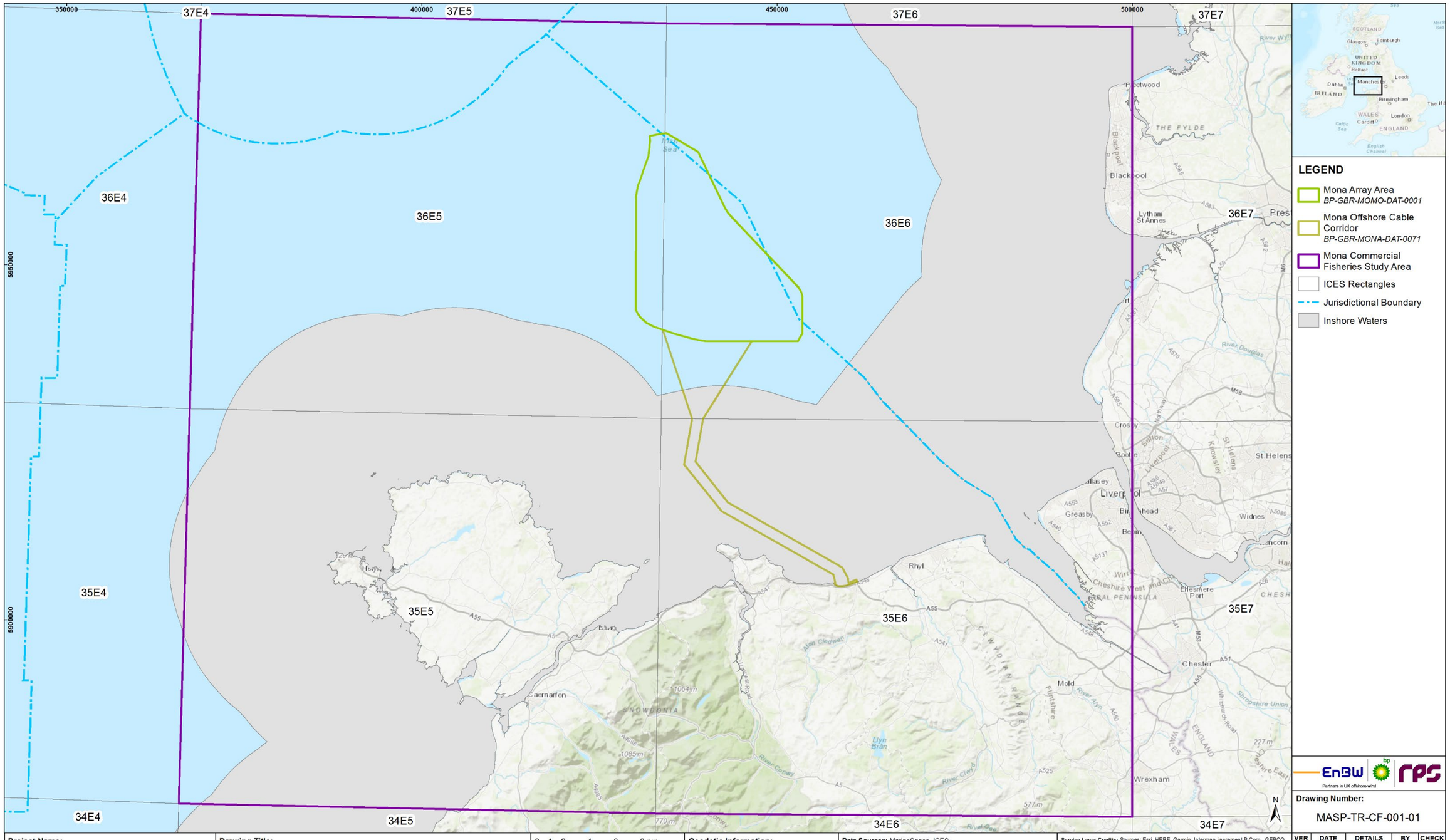


Figure 1.1: The commercial fisheries study area for the Mona Offshore Wind Project.

1.3 Methodology

1.3.1.0 To characterise commercial fishing activity in the Mona commercial fisheries study area, a range of data sources were collated and reviewed, in addition to feedback from project-specific consultation and site-specific surveys.

1.3.1 Official data sources

1.3.1.1 Information on commercial fisheries within the Mona commercial fisheries study area was collected through a detailed desktop review of existing studies and official datasets. This is summarised in Table 1.1.

1.3.1.2 To account for trends and seasonal variations in vessel landings and effort, data over at least a four year time period has been assessed. Where possible, data has been collated for a 10 year period, as consultation feedback has indicated that the scallop fisheries operating in the vicinity of the Mona Array Area are cyclical, over periods of seven to eight years. The most recently available datasets have been collated from the various sources where possible.

1.3.1.3 There is a range of different limitations and assumptions associated with the data, as summarised in Table 1.1. Feedback from consultation (discussed further in Section 1.3.2 and summarised in Table 1.2) has been used to supplement the official datasets, particularly where there are recognised data limitations.

1.3.1.4 It is also important to note that all the values presented by the official data sources relate to value of landings (i.e. first-sale value at the quayside). Additional value (estimated at up to 60% of landed value) is added to many fish products, especially shellfish such as scallop, crab and lobster, via onshore processing. The onshore processing sector is reliant on the fish products represented in the official data sources and supports a large number of jobs.

Table 1.1: Summary of key official data sources.

Title	Source	Year	Limitations
Landing statistics by ICES Rectangle for UK and Isle of Man vessels.	Marine Management Organisation (MMO)	2010 to 2020	• Finest available level of spatial resolution is by ICES Rectangle • Vessels ≤10m are not required to complete logbooks, so may be under-represented within the data • Duplication of species under different common names and grouping at higher taxonomic levels.
Landings statistics by port.	MMO	2010 to 2020	• Vessels ≤10m are not required to complete logbooks, so may be under-represented within the data.
Landings statistics by ICES Rectangle for EU vessels.	European Union Scientific, Technical and Economic Committee for Fisheries (EU STECF)	2006 to 2016	• Finest available level of spatial resolution is by ICES Rectangle • Data is provided by Member States - variable levels of confidence • Vessels ≤10m are not required to complete logbooks, so may be under-represented within the data. • Duplication of species under different common names and grouping at higher taxonomic levels.
Vessel Monitoring Systems (VMS) data for UK and Isle of Man vessels (≥15m).	MMO	2009 to 2020	• Finest available level of spatial resolution is by ICES subrectangle • Uncertainty in exact position of fishing footprint due to resolution • Processing of the VMS data obtains a proxy of effort based on time, position, and a certain speed. However, vessel speed is not 100% accurate as an indicator of fishing activity, since it does not identify whether fishing is occurring or not • Vessels <15m are not included within the dataset.
VMS data for European mobile bottom contacting gear vessels (>12m).	ICES, 2020	2009 to 2020	• Finest available level of spatial resolution is by ICES subrectangle • Uncertainty in exact position of fishing footprint • Processing of the VMS data obtains a proxy of effort based on time, position, and a certain speed. However, vessel speed is not 100% accurate as an indicator of fishing activity since it does not identify whether fishing is occurring or not • Vessels <12m are not included within the dataset • Data only for mobile bottom contacting gears • Data is provided by Member States - variable levels of confidence.
Estimated relative fishing activity (Welsh waters).	Welsh National Marine Plan	2019	• Indicative, data from a variety of sources with different constraints and resolutions.

Title	Source	Year	Limitations
ICES scallop assessment working group.	ICES	2019	• Polygon data based on VMS data, so activity from vessels <10m may not be included (apart from vessels fishing for scallop within the Isle of Man territorial sea) • Preliminary maps, pending verification by the working group • Towards the periphery of the polygons there may be limited fishing intensity • Some of the defined polygons may have areas within them with zero or low VMS data which is not displayed.
Sea Fishing Atlas of Wales	Natural Resources Wales (NRW)	2010	• Indicative, based on anecdotal comments from a variety of sources (limited information on the original sources) • Low level of confidence due to the age of the data.

1.3.2 Informal consultation

1.3.2.1 In addition to the review of official data and relevant studies, informal consultation has also been undertaken with key local and regional fisheries stakeholders since June 2021, to date. This consultation has been arranged by MarineSpace, in its role as CFLO, assisted by the appointed Fisheries Industry Representative (FIR) for the Mona Offshore Wind Project, Tom Watson.

1.3.2.2 A summary of the key issues raised during consultation activities undertaken to date, specific to commercial fisheries, is presented in Table 1.2.

1.3.2.3 Outputs from these consultations have been used to develop further understanding of existing fishing activity in the region and are captured throughout this document. It is intended that these consultations will continue over the consenting phase of the Mona Offshore Wind Project, to ensure that all relevant information from fisheries stakeholders is presented within the EIA.

1.3.2.4 Table 1.2 also includes Scoping Opinion responses which are relevant to commercial fisheries.

Table 1.2: Summary of key consultation topics raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to commercial fisheries.

Date	Consultee and Purpose of Consultation	Topics Raised
June 2021	Individual fishers from Fleetwood and Maryport; Irish South and East Fish Producers Organisation (ISEFPO); Manx Fish Producers Organisation (MFPO); National Federation of Fisherman's Organisations (NFFO); Welsh Fishermen's Association (WFA); Western Fish Producers Organisation (WFPO); and Whitehaven Fishermen's Cooperative (WFC). Introductory meeting to introduce the Mona Offshore Wind Project team, provide fisheries stakeholders with an overview of the Mona Offshore Wind Project, outline the 2021 offshore survey programme and discuss potential impacts on fisheries stakeholders.	• Concerns regarding array layout and coexistence during the operational phases. Scallop vessels would require greater spacing of wind turbines • Concerns regarding cumulative and in-combination impacts with other activities and developments in the region • Concerns regarding impacts on fish stocks • Long-term datasets should be used where possible, particularly due to the dynamic nature of queen scallop beds • There are seven Irish scallop vessels that are normally active in the area December to Spring.
June 2021	Scottish Fishermen's Federation (SFF); Scottish White Fish Producers Association (SWFPA); and West Coast Sea Products Ltd (WCSP). Introductory meeting to introduce the Mona Offshore Wind Project team, provide fisheries stakeholders with an overview of the Mona Offshore Wind Project, outline 2021 offshore survey programme and discuss potential impacts on fisheries stakeholders.	• Lease areas (particularly west parts) are in key queen scallop grounds and also an important area for king scallop • Discussed existing scallop closures in Irish Sea • Concerns regarding array layout and coexistence during the operational phases. Scallop vessels would require greater spacing of wind turbines.
July 2021	Anglo North Irish Fish Producers Organisation (ANIFPO); Northern Ireland Fish Producers' Organisation (NIFPO); and Rederscentrale. Introductory meeting to introduce the Mona Offshore Wind Project team, provide fisheries stakeholders with an overview of the Mona Offshore Wind Project, outline the 2021 offshore survey programme and discuss potential impacts on fisheries stakeholders.	• Concerns regarding Mona Array Area layout and coexistence during the operational phases. Belgian vessels would not fish between wind turbines, so preference for closer spacing to minimise overall area of sea affected by the Mona Array Area • Concerns regarding cumulative and in-combination impacts with other activities and developments • Concerns regarding impacts on fish stocks • Concerns regarding timing of surveys due to herring spawning – request to avoid seismic activity and grab sampling during spawning period • Belgian vessels active in the eastern parts of the lease areas during winter months.

Date	Consultee and Purpose of Consultation	Topics Raised
July 2021	ANIFPO Email correspondence, following introductory meeting, to discuss the 2021 offshore survey programme.	• Douglas Bank herring closure 21 September to 15 November to protect spawning period. Requested benthic sampling to be completed before the spawning period and geotechnical work to avoid if possible.
July 2021	NFFO Introductory meeting to introduce the Mona Offshore Wind Project team, provide fisheries stakeholders with an overview of the Mona Offshore Wind Project, outline the 2021 offshore survey programme and discuss potential impacts on fisheries stakeholders.	• Discussion over practicalities of a Regional Fisheries Working Group • Concerns regarding array layout and coexistence during the operational phases • Emphasised the importance of early engagement with the fishing industry • Concerns regarding cumulative and in-combination impacts with other activities and developments.
December 2021	WCSP Email correspondence regarding value of the fishery.	• Rely heavily on the Mona Array Area catching queen scallop • Western areas are important fishing grounds, but eastern areas are important for spawning • Queen scallop recruitment is cyclical over seven to eight year periods, so assessments should consider longer-term view, (e.g. major stock biomass during 2010-2014) • WCSP vessels typically tow north to south with the tide • Six active vessels, 40 fishers and 100 (onshore) factory staff • Four other queen scallop processors (with multiple vessels) have fished within the Mona Offshore Wind Farm project over the last 10 years.
January 2021	WFPO Email correspondence regarding value of the fishery.	• One beam trawl vessel from the WFPO fishes in the commercial fisheries study area during Q1 and Q2 • One whelk vessel fishers in the commercial fisheries study area during Q3 and Q4.
February 2022	Individual fishers from Fleetwood and Maryport; and ISEFPO. Meeting to update on the Mona Offshore Wind Project's 2022 offshore survey programme, PEIR programme and outline of datasets to inform the PEIR.	• Value of cross-referencing official datasets with feedback from consultation • Discussions regarding survey coordination and working around fishing vessels.
February 2022	MFPO, NFFO and WFC. Meeting to update on the Mona Offshore Wind Project's 2022 offshore survey programme, PEIR programme and outline of datasets to inform the PEIR.	• Concerns regarding the interconnectivity of scallop stocks in the region and potential impacts • Discussion regarding inter-array cable layout (and burial depth) to allow scallop fishing during operational phase.
February 2022	ANIFPO, Rederscentrale and WFPO. Meeting to update on the Mona Offshore Wind Project's 2022 offshore survey programme, PEIR programme and outline of datasets to inform the PEIR.	• Concerns regarding cumulative and in-combination impacts with other activities and developments • Concerns regarding impacts on fish stocks • Issues with VMS data not capturing smaller vessels.
February 2022	SFF, SWFPA and WCSP. Meeting to update on the Mona Offshore Wind Project's 2022 offshore survey programme, PEIR programme and outline of datasets to inform the PEIR.	• Discussion regarding location of offshore substation to cause least disruption to fisheries • Issues with VMS and Automatic Identification Systems (AIS) data not capturing smaller vessels • To minimise the impacts on queen scallop grounds, wind turbines should be micro-sited • Concerns over export cable routes • Importance of the queen scallop grounds, particularly in the western parts of the lease area – approximately three nm corridor, towing north south. There are already telecommunication cables which present difficulties for scallop trawlers • Dogger Bank offshore wind farm is an example of where wind turbine spacing and inter-array cable layout facilitates coexistence • Uncertainties regarding gear penetration depths.
February 2022	Individual charter boat skippers. Email correspondence requesting update on project.	• Requested to be added to future fisheries stakeholder meetings.
March 2022	Welsh Government (WG) Meeting to update on the Mona Offshore Wind Project's 2022 offshore survey programme, PEIR programme and outline of datasets to inform the PEIR.	• Concerns that not all Welsh fishers are represented by the WFA • Belgian beam trawl vessels active out of Holyhead • Issues with VMS data not capturing smaller vessels. iVMS data from inshore vessels will not be available prior to PEIR submission. Therefore, smaller static gear vessels will not be represented in official datasets.
April 2022	SFF, SWFPA and WCSP. Response to the Mona Offshore Wind Project's questionnaire on array layout / fisheries coexistence.	• Information on spatial extent of fishing activity, array layout (wind turbine spacing and inter-array cable layout) and cable burial.
April 2022	Rederscentrale Response to the Mona Offshore Wind Project's questionnaire on array layout / fisheries coexistence.	• Information on spatial extent of fishing activity, array layout (wind turbine spacing and inter-array cable layout) and cable burial.

Date	Consultee and Purpose of Consultation	Topics Raised
May 2022	MFPO Response to the Mona Offshore Wind Project's questionnaire on array layout/fisheries coexistence.	• Information on spatial extent of fishing activity, Mona Array Area layout (wind turbine spacing and inter-array cable layout) and cable burial.
June 2022	Isle of Man Department of Infrastructure Scoping Opinion response.	• Advice on study area for the EIA. • Advice on data sources. • Advice on stakeholder engagement.
June 2022	The Planning Inspectorate Scoping Opinion response.	• Advice on matters to be scoped into the EIA. • Assessment of underwater noise and indirect impacts on commercial fisheries. • Assessment of the risk of introduction and spread of invasive non-native species and potential impacts on commercial fisheries
November 2022	Individual static gear operator from Fleetwood Consultation meeting.	• Concerns regarding noise impacts on whelk. • Concerns regarding array layout and co-existence during the operational and maintenance phase. Static gear vessels lay gear in a north - south alignment within the Mona Array Area. Preference for equally spaced wind turbines in rows and as far apart as possible.
November 2022	SFF, SWFPA and WCSP. Consultation meeting.	• Concerns regarding array layout and co-existence during the operational and maintenance phase. Noted higher density queen scallop ground in the central part of the Mona Array Area. Fishing vessels generally tow in a north – south orientation. • Discussion regarding inter-array cable layout and burial depth to allow scallop fishing during operational and maintenance phase. Gear penetration can vary between 0.05-0.25m. • Concerns regarding impacts on scallop stocks as a result of changes to tidal flow from the installation of wind turbines.
November 2022	MFPO Consultation meeting.	• Queries regarding Mona Array Area layout and co-existence during the operational and maintenance phase. Noted that the Manx fishing vessels only use approximately 100ft of cable, so are able to fish between wind turbines. • Discussion regarding inter-array cable layout and burial depth to allow scallop fishing during operational and maintenance phase. • Concerns regarding impacts on scallop stocks as a result of construction and changes to tidal flow from the wind turbines and foundations.
November 2022	Rederscentrale Consultation meeting.	• Queries regarding Mona Array Area layout and co-existence during the operational and maintenance phase. Noted that fishing between wind turbines of 1km is difficult due to safety reasons. Noted that Rederscentrale vessels do not fish within the Mona Array Area; their fishing activity is mostly to the south of the Mona Array Area • Discussion regarding inter-array cable layout and burial depth. Noted that Rederscentrale's beam trawl vessels that operate within the Irish Sea are using a newer gear technology which does not penetrate as deep into the seabed.
November 2022	ANIFPO, NIFPO, WFA Consultation meeting.	• Concerns regarding Mona Array Area layout and co-existence during the operational and maintenance phase. Orientation of wind turbines in a north – south alignment would be preferable. • Concerns regarding timings of surveys to minimise impacts on fish stocks. • Concerns that VMS data does not capture smaller vessels.
November 2022	ISEFPO Consultation meeting.	• Queries regarding Mona Array Area layout and co-existence during the operational and maintenance phase. Acknowledged that • Discussion regarding inter-array cable layout and burial depth and concerns regarding snagging.

Date	Consultee and Purpose of Consultation	Topics Raised
November 2022	Individual fishing operators from Conwy	• Queries regarding co-existence during the operational and maintenance phase, particularly related to the offshore cable corridor, due to the areas of fishing activity. • Concerns regarding spatial squeeze on fishing vessels due to changes in ferry routes as a result of the Mona Array Area. • Concerns regarding impacts on fish stocks.

1.3.3 Site-specific surveys

1.3.3.1 NASH Maritime was commissioned to undertake two 14 day marine traffic surveys of the Mona Array Area, in December 2021 and July 2022, to inform the Navigation Risk Assessment (NRA) being undertaken as part of wider EIA studies. In addition to visual records collected via these surveys, Automatic Identification System (AIS) and radar data was also collected from the same time periods to supplement the visual observations. AIS data included information on date, average speed, destination, ship name, ship category, length and draft. Radar data included information on vessel type and date. Although this data was collated during different seasons to account for seasonal variation and peak times in marine traffic and fishing activity, it is limited by the short time period captured. Therefore, it has only been used to supplement the official datasets and feedback from consultation with fisheries stakeholders.

1.3.3.2 An Offshore Fisheries Liaison Officer (OFLO) was present on the offshore geophysical, environmental and geotechnical survey vessels during the 2021 and 2022 survey operations. During 2021, only the Mona Array Area, plus a 3km buffer, was surveyed. During the 2022 surveys, the Mona Array Area (plus a buffer of varying distances) and the Mona Offshore Cable Corridor were surveyed. The OFLO provided a Daily Progress Report (DPR) with information on the presence of any fishing vessels, fishing vessel type, location of vessel, name of vessel and whether the vessels were transiting or not. This data is only provided as point data, so does not show individual fishing vessel tracks. This data is also limited by the time period captured and will be used to supplement other datasets. Locations of static gear were also recorded by the OFLO which have been used to inform this assessment, particularly as static gear vessels are generally not captured within the VMS data due to their size. Exact locations of static gear have not been displayed within this technical report, due to commercial sensitivities.

1.3.3.3 During the 2022 surveys, where an OFLO was unable to be present on a survey vessel, MarineSpace undertook daily remote fisheries monitoring via the www.marinetraffic.com web-site; these observations are limited to vessels which have AIS active and the time at which the AIS was monitored. MarineSpace was able to observe fishing vessel patterns and add point data which is presented in this report to supplement official datasets.

1.3.3.4 A scouting survey of the Mona Offshore Cable Corridor was undertaken by the NFFO in March 2022. The survey was undertaken to determine the density and spatial extent of static gear along the Mona Offshore Cable Corridor. Weather conditions were favourable during the scouting surveys, with good visibility, and the vessel performed a minimum of three lines along the Mona Offshore Cable Corridor (two on the outer boundary and one running along the centreline). The NFFO indicated that higher levels of static gear would likely be observed later in the year, however due to vessel availability, another scouting survey did not take place. This data is limited by the short time period of the survey and will be used to supplement other datasets.

1.3.3.5 A summary of the surveys used to inform the commercial fisheries baseline is outlined in Table 1.3.

Table 1.3: Summary of surveys used to inform commercial fisheries.

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
OFLO observations 2021	Mona Array Area plus 3km buffer	OFLO onboard the survey vessel recorded observations of fishing vessels and fishing gear present.	NFFO	30 June to 18 September 2021	n/a
Winter vessel traffic survey	Mona Array Area	AIS and radar.	NASH Maritime	05 to 19 December 2021	Volume 2, chapter 12: Shipping and navigation of the PEIR; volume 6, annex 12.1: Navigational risk assessment of the PEIR.
Scouting survey	Mona Offshore Cable Corridor	Recordings of static gear.	NFFO	06 to 13 March 2022	n/a
Summer vessel traffic survey	Mona Array Area	AIS and radar.	NASH Maritime	30 June to 14 July 2022	Volume 2, chapter 12: Shipping and navigation of the PEIR; volume 6, annex 12.1: Navigational risk assessment of the PEIR.
OFLO observations 2022	Mona Array Area plus buffer area and Mona Offshore Cable Corridor	OFLO onboard the survey vessel recorded observations of fishing vessels and fishing gear present.	NFFO	01 April to 10 July 2022	n/a
MarineSpace observations 2022	Mona commercial fisheries study area	Fisheries monitoring using AIS data (via www.marinetraffic.com).	MarineSpace	10 July – 30 November2022	n/a

1.4 Baseline environment

1.4.1 Regional overview

1.4.1.1 Commercial fishing in the east Irish Sea region has a wide spatial distribution and targets a number of valuable fisheries for demersal, pelagic and shellfish species. Key shellfish species include; king scallop, and queen scallop which are targeted by dredges; and whelk, lobster and crab, which are targeted by pots. The most important demersal target species include bass, sole, thornback ray and plaice, which are typically caught by beam and otter trawlers. Pelagic fish landings from this area are mainly of herring and mackerel, which are predominantly caught by pelagic trawls.

1.4.1.2 Up to 31 December 2020, commercial fisheries within UK waters, including the Irish Sea region were managed through the European Union (EU) Common Fisheries Policy (CFP), with fisheries of some stocks managed by the North East Atlantic Fisheries Commission (NEAFC) and by coastal state agreements. Since the withdrawal of the UK from the EU on the 31 December 2020, the new EU-UK Trade and Cooperation Agreement stipulates that there will be a 5-year transition phase, whereby 25% of the EU quota for British waters will be transferred to the UK fishing fleet. Implications on the commercial fisheries baseline are discussed further in section 1.5.

1.4.2 Overview of the Mona commercial fisheries study area

1.4.2.1 Fishing ports in the Mona commercial fisheries study area with the highest fishing efforts are Amlwch, Conwy, Holyhead and Fleetwood. Fishing vessels that are active in the Mona commercial fisheries study area are also based out of a number of ports across the wider region, including Annan, Douglas, Kilkeel, Kirkcudbright, Maryport and Peel; activity from these vessels is included in this technical report. Rhyl and Conwy are the closest fishing ports to the cable landfall. There are only eight vessels with Rhyl as their home port, all of which are ≤10m in length. There are 16 vessels with Conwy as their home port, 14 of which are ≤10m (MMO, 2022).

1.4.2.2 Within the Mona commercial fisheries study area, the key commercial fishing fleets identified were:

- Dredging and trawling for king scallop and queen scallop
- Potting for whelk, crab and lobster
- Beam trawling for flatfish and other demersal finfish
- Trawling for herring.

1.4.2.3 Other important fisheries in the region include trawling for nephrops towards the Cumbria coast and harvesting for cockles and mussels along the shallow bays between Anglesey and Cumbria, (Walmsley and Pawson, 2007). Harvesting for cockles within the Dee estuary has been taking place for over a century and there are now a number of restrictions in place to manage the fishery; gathering of cockles is restricted to July to December, and there is a limited number of licences available, per year.

1.4.2.4 A summary of each of the key regional fisheries is provided below.

Dredging and trawling for king scallop and queen scallop

1.4.2.5 Within the commercial fisheries study area, UK registered scallop vessels from a variety of English, Welsh, Northern Irish, Scottish and Isle of Man ports are active. Vessels from the Republic of Ireland are also active in this region, targeting both species of scallop, as well as whitefish and shellfish.

1.4.2.6 These species are primarily targeted using towed dredges and otter trawls, by vessels ranging in size from <10m to 25m length.

1.4.2.7 The scallop industry in the UK is one of the highest value commercial fisheries (Cappel *et al*., 2018) and a large proportion of landings are caught in the Irish Sea. Scallop are a non-quota species and, therefore, not subject to Total Allowable Catch (TAC) limits (excluding in Isle of Man waters), however there are technical management measures and minimum landings sizes (MLS) in place. There are restrictions on the number of dredges used, which depend on the distance from the coast. Beyond 12nm, there are no regulatory limits on the maximum number of dredges permitted to be towed behind a vessel. Instead, the number of dredges is limited by the size and engine capacity of the fishing vessels. There are also seasonal closures within the Irish Sea for both king and queen scallop to protect the spawning periods, as outlined in Table 1.4.

Table 1.4: Seasonal closures of the scallop fisheries by administration.

	King scallop closures	Area of closure	Queen scallop closures	Area of closure
England	01 June to 31 October	Irish Sea closed area	01 April to 30 June	ICES area VIIa
Isle of Man	01 June to 31 October	Five closed areas	01 April to 30 June	ICES area VIIa
Wales	01 May to 31 October	Within 1nm of the baseline and specified bays	n/a	n/a

1.4.2.8 It has been established through project-specific fisheries consultation that there are approximately 11 vessels based in Kirkcudbright, Scotland, that fish for queen and king scallop within the Mona commercial fisheries study area: most notably for queen scallop within the Mona Array Area. WCSP is a business based in Kirkcudbright that has six vessels, 40 fishermen and 100 factory staff. There are also Scottish scallop vessels active in the Irish Sea from Annan, and several large (14m to 24m) Scottish nomadic vessels (Cappell *et al*., 2018).

1.4.2.9 Feedback from project specific consultation has established that at the time of writing there are 33 scallop vessels registered in the Isle of Man; however, due to the size and capacity of the Manx vessels, it is expected that the majority of these vessels will not fish beyond the Manx 12nm. Fisheries monitoring has recorded 2 Manx vessels large enough to fish outside of the Manx territorial sea. The majority of these vessels have a licence for both king and queen scallop. There are also multiple businesses on the Isle of Man which process scallops.

1.4.2.10 A 2018 study found that in the Irish Sea, 59 vessels targeting scallop land into Northern Irish ports (Cappell *et al*., 2018); however, it is unlikely that all these vessels

are active within the Mona commercial fisheries study area, particularly given that 53% of the vessels are under 12m in length.

1.4.2.11 It has been established through project specific fisheries consultation that there are also several Irish vessels which are active in the area, predominantly between December to Spring.

1.4.2.12 Welsh vessels based in north Wales/Anglesey are also active in this region at certain times of year, transiting from scallop grounds off the Welsh coast (Cardigan Bay) to this area as/when market forces demand.

1.4.2.13 English scallopers, from as far as the southwest region (Cornwall/Devon), also fish in these areas at times, in a similar, nomadic, fashion to the Welsh vessels.

1.4.2.14 Whereas king scallop grounds are relatively extensive around the UK (WG Scallop, 2020) the major queen scallop beds are within the Irish Sea. Queen scallop are generally found in sandy gravelly substrates, whereas king scallop can be found in rougher sediments. The biology and behaviour are different between the two species, and this is discussed further in volume 6, chapter 8.1: Fish and shellfish ecology technical report of the PEIR. Generally, queen scallop are more mobile than king scallop, which influences the gear types used to catch them, as discussed in section 1.4.6. Further information on the spatial extent of these grounds is also discussed within this technical report (sections 1.4.8 and 1.4.9).

Potting for whelk, crab and lobster

1.4.2.15 Potting for whelk, crab (brown and spider crab) and lobster occurs across the Mona commercial fisheries study area (Walmsley and Pawson, 2007).

1.4.2.16 The whelk fishery in the Irish Sea has expanded significantly over the last two decades (Duncan and Emmerson, 2018). Whelk are landed all year around, and vessels operate across the inshore and offshore parts of the Mona commercial fisheries study area. Highest landings in terms of weight and value are generally during the summer months, which may be, partly, due to lower scallop vessel activity as a result of seasonal closures. Whelk operators land into both English and Welsh ports; there are also vessels from Jersey that target whelk, crab and lobster in the Mona commercial fisheries study area.

1.4.2.17 It is evident through project specific consultation that one of the main whelk operators in the region is based out of Fleetwood and has four vessels that are active within the Mona Array Area and Mona Offshore Cable Corridor.

1.4.2.18 Lobster is generally caught close to the coast in rocky areas. Inshore vessels operating out of Anglesey target lobster (Walmsley and Pawson, 2007). Brown crab are caught within both inshore and offshore parts of the Mona commercial fisheries study area.

1.4.2.19 There are no TACs or quotas for whelk, crab or lobster, however all are subject to a minimum landing size (MLS). Following consultation by Welsh Government in 2017, the MLS for whelk was increased in both July 2019 and July 2020 (Welsh Government, 2020). There is also a landings cap to conserve stocks and ensure the sustainability of the Welsh whelk fishery.

Beam trawling for flatfish

1.4.2.20 The Irish Sea has been an important traditional fishing ground for beam trawl vessels for many decades (NWWAC, 2013). Flatfish, specifically sole, is the main catch for these vessels. Through project specific consultation with fisheries stakeholders, it has been established that there are several large Belgian beam trawl vessels, and one vessel from the southwest of England, that are active in the Mona commercial fisheries area. The grounds targeted for flatfish are generally to the east of the Mona Array Area and are fished during the Spring period.

1.4.2.21 There are TACs in place for sole, and ICES stock assessments highlight that sole stocks have increased in size in the Irish Sea, over recent years (ICES, 2021a).

Trawling for herring

1.4.2.22 The Irish Sea herring fishery is located in the region around the Isle of Man. Herring are targeted by a mix of gear types, including mid-water trawls, pelagic trawls, and purse seine nets. Within inshore waters, gillnets may be used to catch herring. Project specific consultation with fisheries stakeholders indicated that there are at least three pelagic trawlers from Northern Ireland, and two from England, that mostly engage in the herring fishery in the Mona commercial fisheries study area.

1.4.2.23 Following the collapse of the herring stocks in the Irish Sea during the 1980s, annual closures have been brought in to protect spawning and nursery grounds (see also volume 6, chapter 8.1: Fish and shellfish technical report of the PEIR). The Douglas Bank area (south and east of the Isle of Man) is closed between 21 September and 15 November, although gill nets are excluded from this.

1.4.2.24 Herring is subject to TACs, and ICES advice recommends a 15% increase in the TAC for 2022 (ICES, 2021b).

1.4.3 Overview of landings

1.4.3.1 A total of 104,051t was landed by English, Isle of Man, Northern Irish, Scottish, Welsh and Jersey vessels across the Mona commercial fisheries study area (ICES Rectangles 35E5, 35E6, 36E5 and 36E6), between 2010-2020, with Scottish vessels landing the largest proportion of total weight of fish caught by UK vessels (Figure 1.2) (MMO, 2020a).

1.4.3.2 A total of 6,384t was caught by Belgian, French, Irish and Dutch vessels across the Mona commercial fisheries study area, between 2006-2016, with Irish vessels landing the largest proportion of total weight of fish caught by non-UK vessels (Figure 1.3). The non-UK vessels were active across the Mona commercial fisheries study area, although no nearshore activity was recorded for French vessels in rectangles 35E5, 35E6 and 36E5; and for Dutch vessels in rectangles 35E5, 35E6 and 36E6 (STECF, 2017).

1.4.3.3 Data assessed in this study was divided into classes, dependent on the length of the fishing vessel: ≤10m and >10m for the MMO data; <10m, 10-15m and >15m for the STECF data. As expected, for UK vessels, the largest proportion of vessels was from the >10m class (Figure 1.2). The smaller UK vessels were predominantly from Wales and England, reflecting the closer proximity of home ports to this fleet, with relatively small recordings of landings for Isle of Man, Scottish and Northern Irish vessels.

1.4.3.4 As expected, no non-UK vessels <10m were active across the commercial fisheries study area and the largest proportion of vessels was from the >15m class (Figure 1.3). The smaller 10-15m vessels were predominantly from Irish ports, reflecting the closer proximity of home ports to this fleet, with relatively small recordings of landings for French and Dutch vessels.

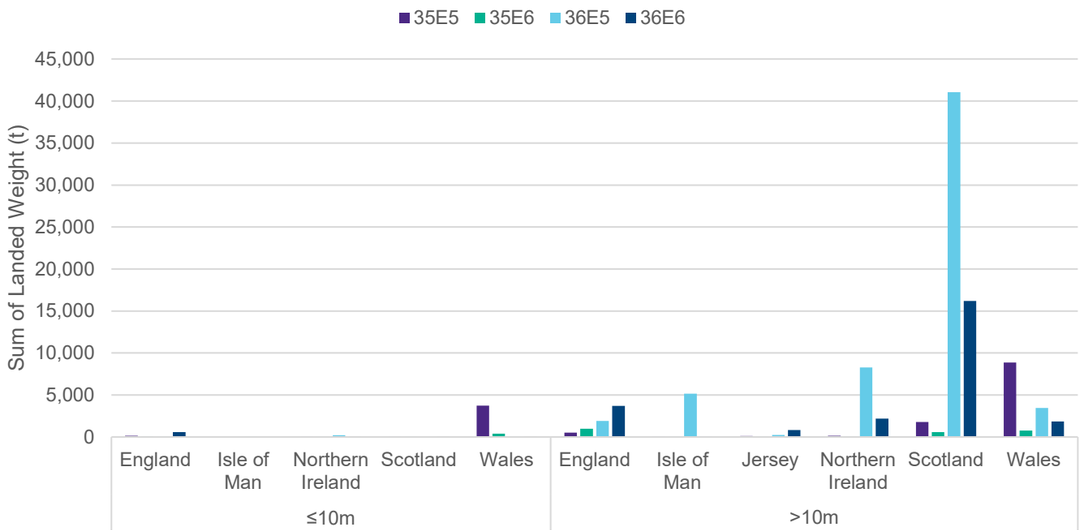


Figure 1.2: Sum of landed weight by vessel size class (2010-2020) within the Mona commercial fisheries study area (UK vessels)[1].

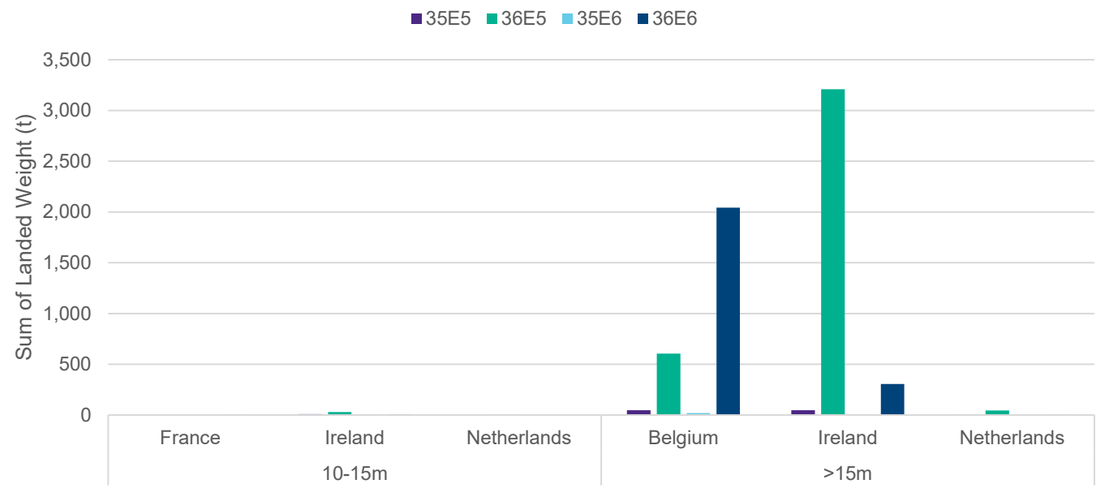


Figure 1.3: Sum of landed weight by vessel size class (2010-2020) within the Mona commercial fisheries study area) (non-UK vessels)[2].

1.4.4 Temporal variation

Annual trends

1.4.4.1 The MMO data show that between 2010-2020, the sum of landed weight by UK vessels across from the Mona commercial fisheries study area varied from a minimum of 4,212t in 2019 to a maximum of 14,133t in 2011 (Figure 1.4). The sum of landed value varied from a minimum of £6,525,706 in 2020, to a maximum of £13,265,148 in 2016 (Figure 1.5).

[1] MMO, 2020a

[2] EU STECF, 2017

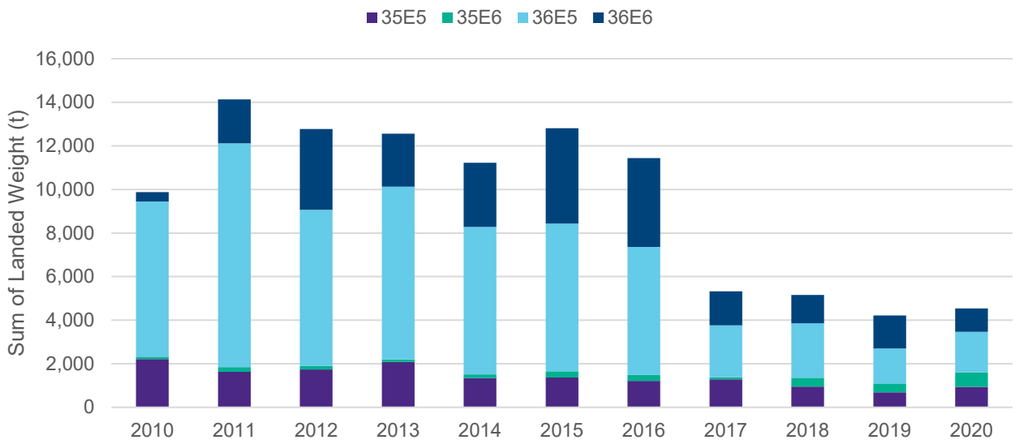


Figure 1.4: Annual trends in landings weight (2010-2020) within the Mona commercial fisheries study area (UK vessels)[3].

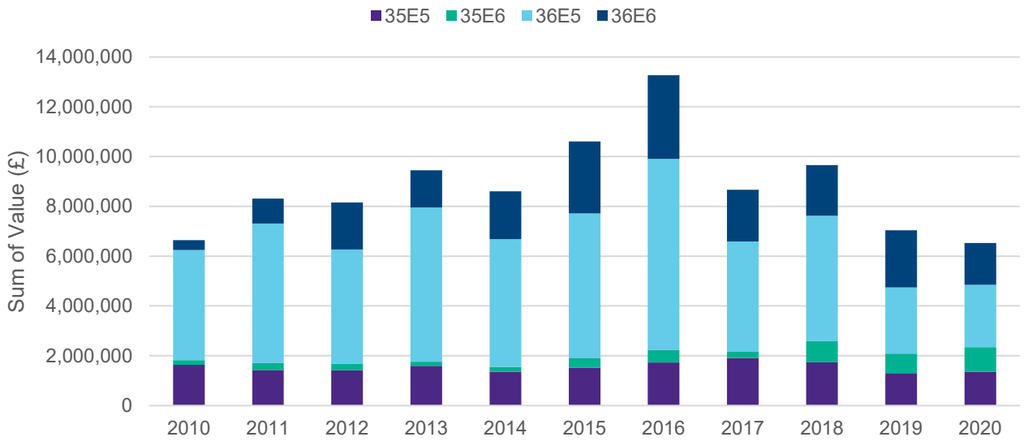


Figure 1.5: Annual trends in sum of landings value (2010 to 2020) within the Mona commercial fisheries study area (UK vessels)[4].

1.4.4.2 The STECF data show that between 2006 to 2016, the sum of landed weight across the Mona commercial fisheries study area varied from a minimum of 390t in 2007 to a maximum of 850t in 2006 (Figure 1.6).

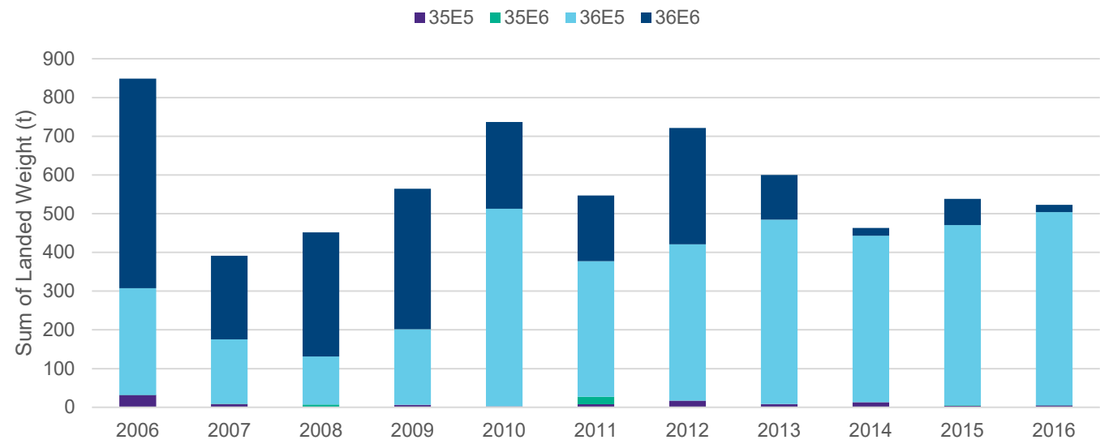


Figure 1.6: Annual trends in sum of landed weight (2006 to 2016) within the Mona commercial fisheries study area (non-UK vessels)[5].

Seasonal trends

1.4.4.3 Across the Mona commercial fisheries study area, the seasonal (intra-annual) range in landed weight (2010 to 2020) by UK vessels varied from 6,189t in December to 12,755t in September (Figure 1.7).

1.4.4.4 The landed value followed a similar trend for UK vessels with the minimum value of £5,214,252 in October and maximum value of £11,118,965 in March (Figure 1.8). With respect to individual rectangles, 36E5 and 36E6 mirrored the overall trend, with peak landings in September and March, whereas 35E5 and 35E6 experienced relatively consistent levels of landings throughout all months. There were lower landings by UK vessels during April to June, which is likely due to seasonal queen scallop closures in the area.

[3] MMO, 2020a

[4] MMO, 2020a

[5] EU STECF, 2017

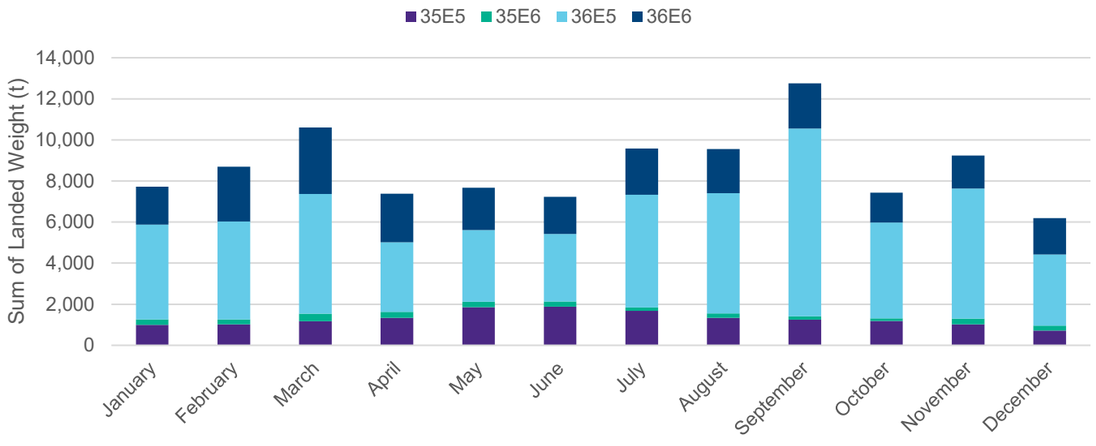


Figure 1.7: Seasonal trends in sum of landed weight (2010 to 2020) within the Mona commercial fisheries study area (UK vessels)[6].

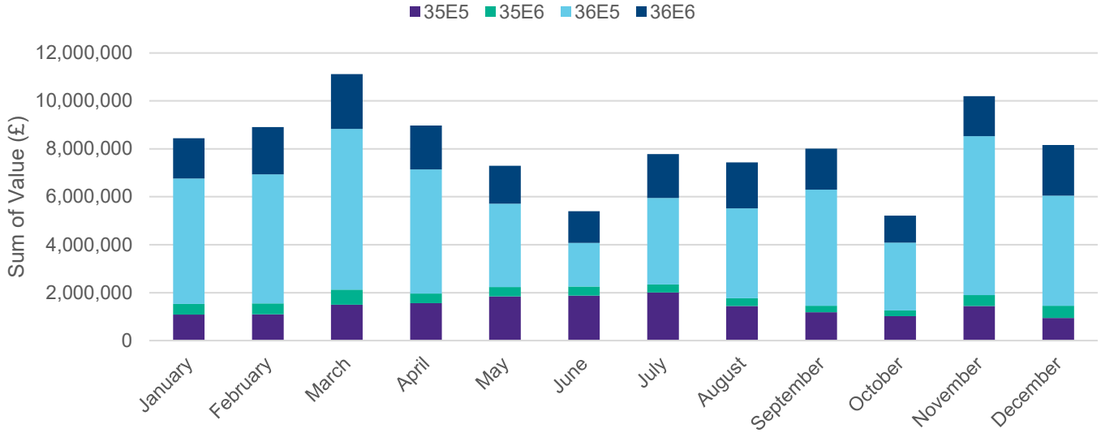


Figure 1.8: Seasonal trends in sum of landed value (2010 to 2020) within the Mona commercial fisheries study area (UK vessels) [7].

1.4.4.5 Across the Mona commercial fisheries study area, the seasonal (intra-annual) range in landed weight (2006 to 2016) by non-UK vessels varied from 400t during July-September to 2,462t during January-March (Figure 1.9). With respect to individual rectangles, 36E5 and 36E6 mirrored the overall trend with peak landings in January-March, April to June and October-December, whereas 35E5 and 35E6 experienced consistently low levels of landings throughout all Quarters. There were lower landings by non-UK vessels during July-September, which was likely due to seasonal scallop closures in the area.

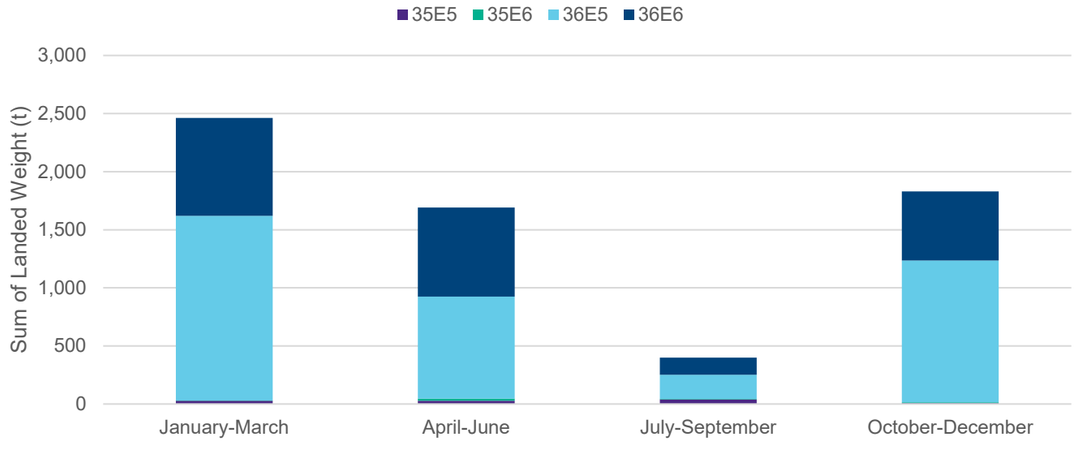


Figure 1.9: Seasonal trends in sum of landed weight (2006 to 2016) within the Mona commercial fisheries study area (non-UK vessels)[8].

1.4.5 Species

1.4.5.1 The MMO and STECF datasets were used to determine the most important species groups and species for UK and non-UK vessels in the commercial fisheries study area. Due to the different formats between the two datasets, they are not directly comparable. The STECF data does not provide information on species group, so this is only presented for UK vessels.

Species landed by UK vessels

1.4.5.2 Shellfish was the most important species group in terms of landed weight and value for UK vessels (Figure 1.10 and Figure 1.11), with the highest landings from ICES Rectangle 36E5. Landings of demersal and pelagic species were significantly lower than shellfish.

[6] MMO, 2020a

[7] MMO, 2020a

[8] EU STECF, 2017

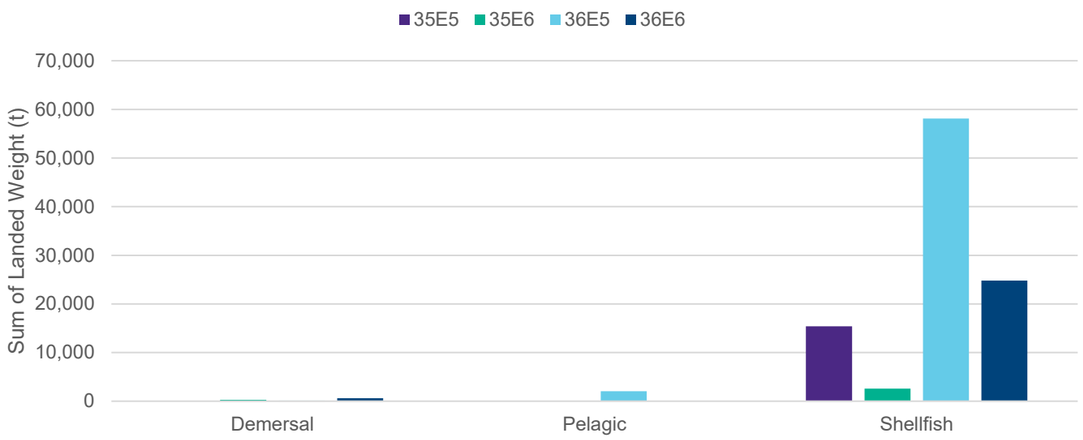


Figure 1.10: Sum of landed weight within the Mona commercial fisheries study area, displayed by species group (UK vessels)[9].

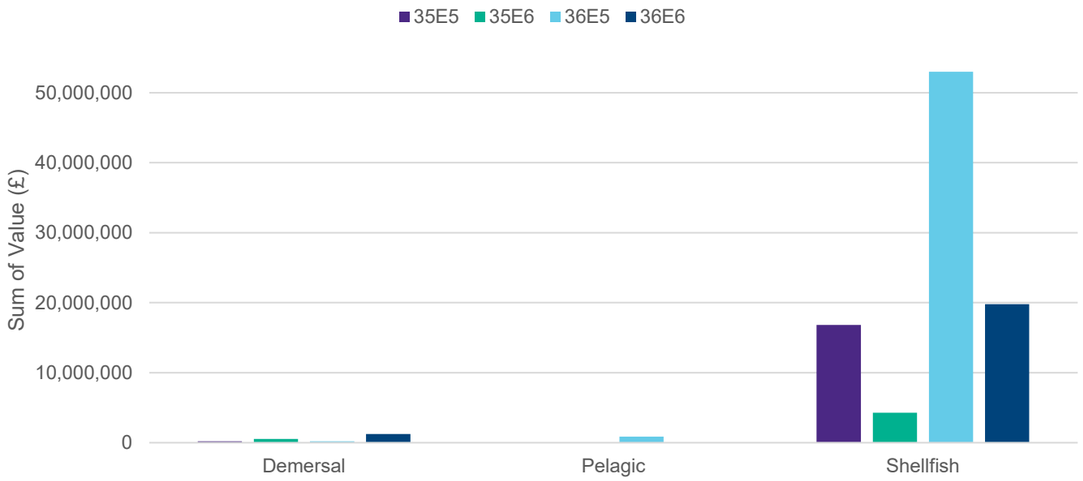


Figure 1.11: Sum of landed value within the Mona commercial fisheries study area), displayed by species group (UK vessels)[10].

1.4.5.3 The top 15 species (by landed weight) caught by UK vessels from the commercial fisheries study area are presented in Figure 1.12. Queen scallop, whelk, king scallop, herring and lobster were the top five species in terms of in terms of both landed weight and landed value. The greatest total weight landed over the time period was from queen scallop, whereas the greatest total value was from king scallop.

1.4.5.4 An overview of the top five species is presented in Table 1.5.

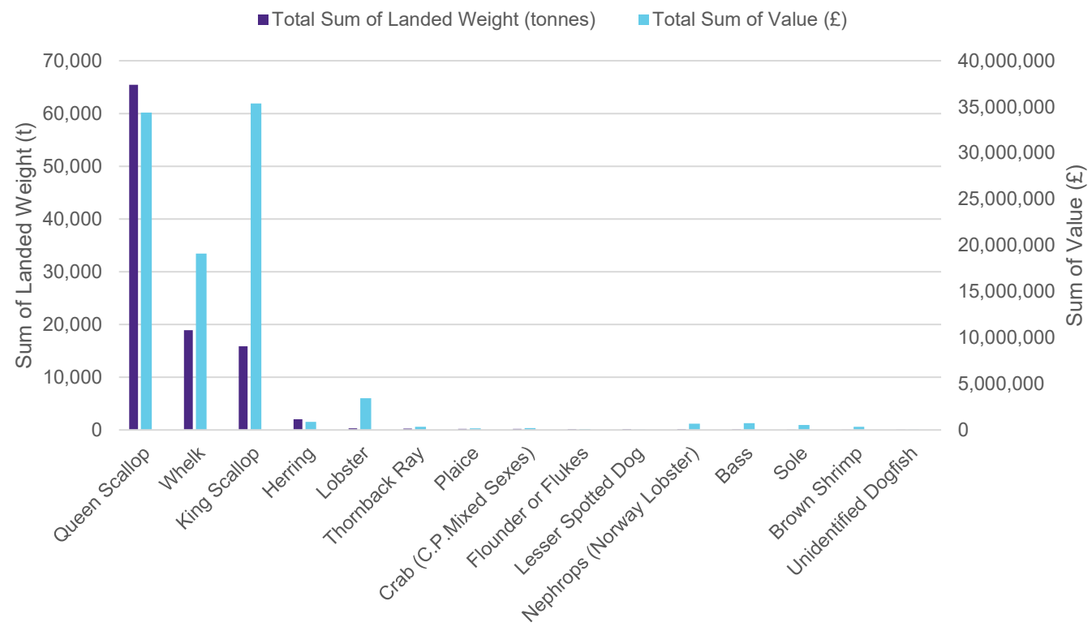


Figure 1.12: Sum of landed weight and value within the Mona commercial fisheries study area for the top 15 species (UK vessels)[11].

Table 1.5: Overview of key species targeted within the Mona commercial fisheries study area.

Species	Latin name	Gear type	Vessel size	Seasonality
King scallop	*Pecten maximus*	Scallop dredge	>10m	King scallop landings are generally highest during November. Fishery closed between 01 June and 31 October.
Queen scallop	*Aquapecten opercularis*	Scallop dredge or otter trawl	>10m	Queen scallop landings are generally highest between July and September. Fishery closed between 01 April and 30 June.
Whelk	*Buccinum undatum*	Pot/trap	>10m and ≤10m	Whelk landings are higher in the summer but caught all year around.
Herring	*Clupea harengus*	Pelagic trawls or purse seine nets	>10 m	Herring landings are highest during August to October. Douglas Bank closure 21 September to 15 November.
Lobster	*Homarus Gammarus*	Pot/trap or bottom trawls	>10m and ≤10m	Lobster landings are higher in the summer but caught all year around.

[9] MMO, 2020a

[10] MMO, 2020a

[11] MMO, 2020a

King scallop

1.4.5.5 King scallop are most commonly found in areas of optimum bivalve feeding conditions, where fine gravel and sand exposed to water currents are present. King scallop achieve reproductive maturity between three to five years, live to 10 to 15 years and are most abundant in depths of 20 to 70m (Cappell et al., 2018; Howarth and Stewart, 2014; Salomonsen et al. 2015). Recruitment is generally perceived as unpredictable, due to the recruitment's dependency on larval production and spawning, as well as the transportation of larvae to areas optimum for development (Delargy et al., 2019). King scallop fisheries in the UK are strictly regulated through the utilisation of gear restrictions, minimum legal landing sizes, effort controls and seasonal closures, as described in section 1.4.2.

1.4.5.6 Over the period 2010-2020, king scallop landings by weight within the Mona commercial fisheries study area, were greatest from November to May (Figure 1.13), with a landed weight range across these months from 1,394 to 2,997t. Landed weight of king scallop showed relatively similar seasonal trends across the 2010 to 2020 period, but with a slightly later peak during 2013. Limited dredging occurred during July to October for all years, due to the king scallop seasonal closure during these months (June to October).

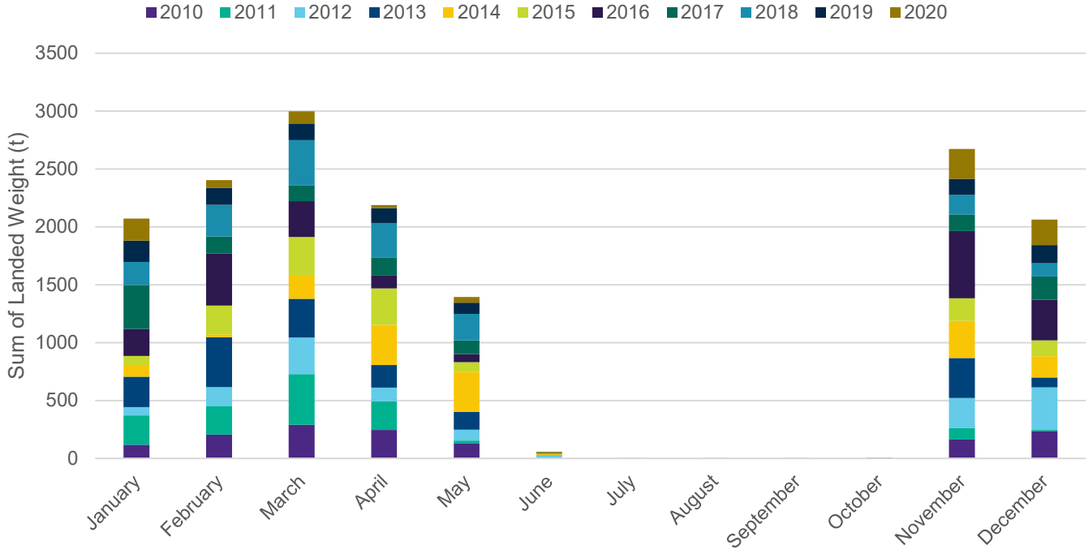


Figure 1.13: Seasonality of landed weight (t) of King scallop (2010 to 2020) within the Mona commercial fisheries study area (UK vessels)[12].

Queen scallop

1.4.5.7 Queen scallop are fished commercially throughout UK waters, with particularly commercially important grounds located around the Isle of Man. Queen scallop can be found in high densities within gravel or sand substrates, at depths of up to 100m.

1.4.5.8 Key differences can be noted between queen and king scallop, where queen scallop possess two distinctive curved shells, the king scallop's upper shell is almost flat, and queen scallop are typically smaller in size. Landings of queen scallop in the UK tend to be less valuable and more variable than king scallop.

1.4.5.9 The most important months for landings of queen scallop during the period 2010 to 2020 were September, August and July, with a landed weight range across these months from 6,721 to 8,999t (Figure 1.14). Landed weight of queen scallop across the 2010 to 2020 period showed relatively similar seasonal trends to that of king scallop. However, in 2013 the landed weight peak of queen scallop occurred slightly later in the year and landed weights from 2017 to 2019 were notably lower.

1.4.5.10 The minimum landed weight of queen scallop occurred during April 2017, at 0.72 t and maximum during September 2015 at 2,038 t. A notable lack of landings can be observed between April to June in recent years, attributed to the 2018 introduction of seasonal closures for queen scallop in the Irish Sea.

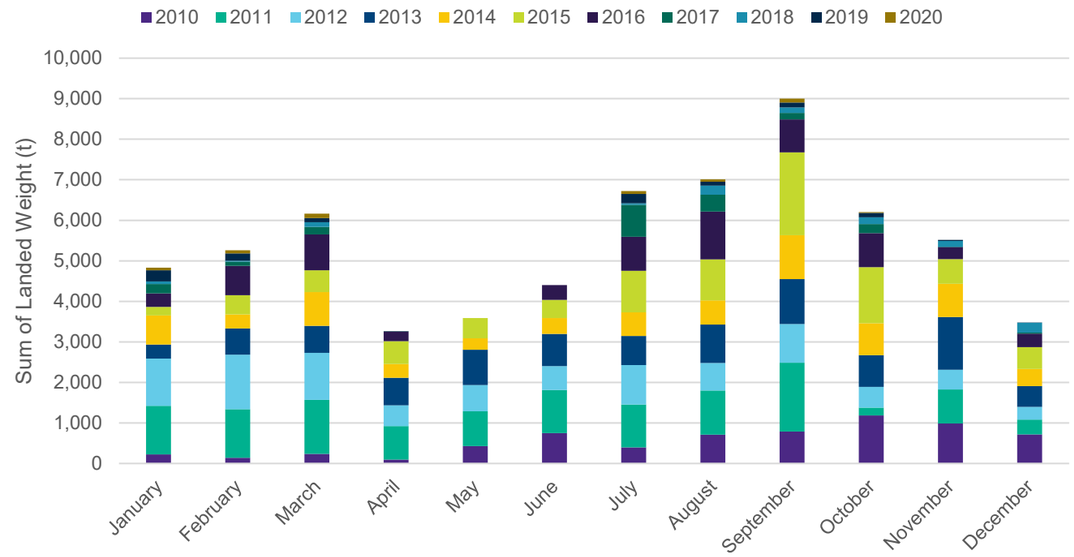


Figure 1.14: Seasonality of landed weight (t) of Queen scallop (2010 to 2020) within the Mona commercial fisheries study area (UK vessels)[13].

Whelk

1.4.5.11 The whelk is most abundant at water depths between 0m to 50m and in habitats of mixed sediments. Depending on their environmental conditions and geographical

[12] MMO, 2020a

[13] MMO, 2020a

location, whelk tend to achieve reproductive maturity at two to three years, grow to 150mm and live for up to 15 years. A whelk's life cycle does not consist of a pelagic phase, instead internally fertilised eggs are laid upon hard substrates, where juveniles emerge after three to five months.

1.4.5.12 Whelk landings, in terms of weight, over the period 2010 to 2020, were most prominent during May to July inclusive, with a landed weight range across these months of 3,552 to 3,740t (Figure 1.15). Landed weight of whelk was notably higher during May 2020 (374t). The minimum landed weight of whelk occurred in January 2014 (3t).

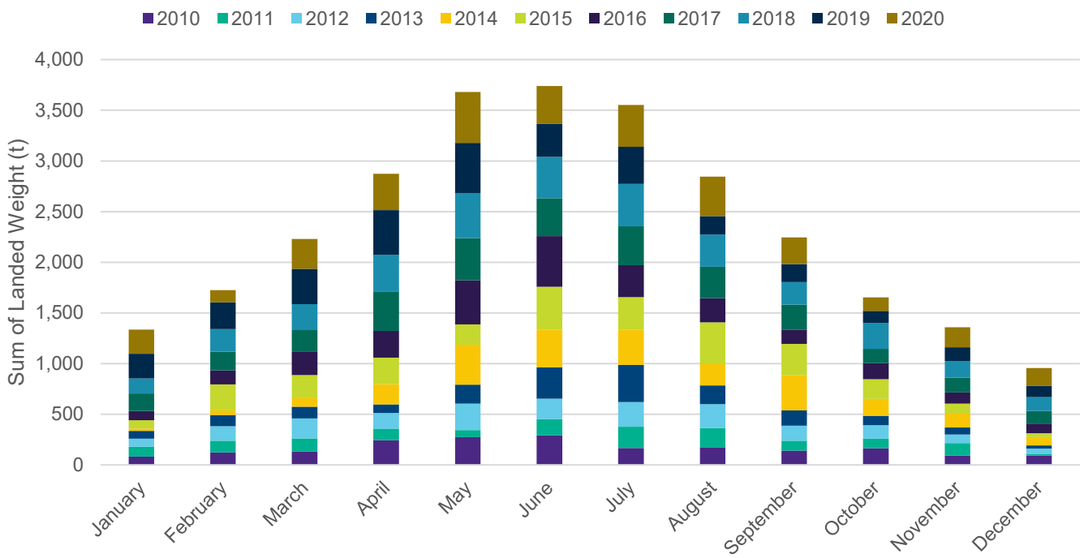


Figure 1.15: Seasonality of landed weight (t) of whelk (2010 to 2020) within the Mona commercial fisheries study area (UK vessels)[14].

Lobster

1.4.5.13 The European lobster is a decapod crustacean that can be typically found sheltering in crevices between boulders and rocks of rough ground and rocky reef habitats. Unlike the edible crab, lobster do not undertake large migrations, and juveniles are known to be particularly sedentary during the first three to four years of their life.

1.4.5.14 Lobster landings, in terms of weight over the period 2010 to 2020, were most prominent during June to August inclusive, although this species is landed all year round (Figure 1.16). The minimum of 0.2t occurred in February 2020, which could have been as a result of lockdowns during the Covid-19 pandemic.

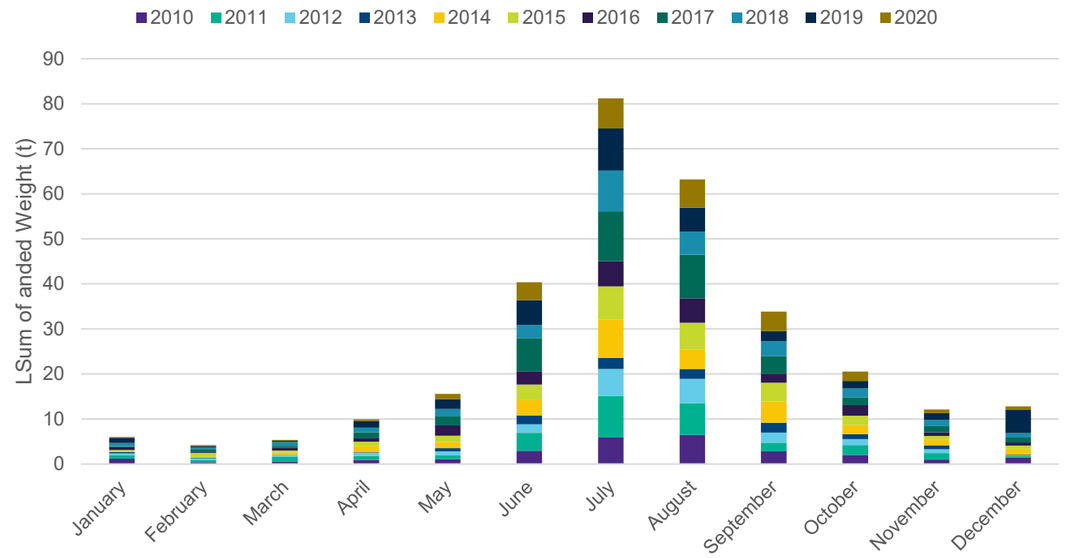


Figure 1.16: Seasonality of landed weight (t) of lobster (2010 to 2020) within the Mona commercial fisheries study area (UK vessels)[15].

Herring

1.4.5.15 Herring are a planktivorous foraging fish, which spawn in coastal areas within specific benthic habitats consisting of gravel and small stones. Spawning occurs throughout September to November, and there are established spawning grounds north and east of the Isle of Man, and on the west Irish coast (Dickey-Collas *et al.,* 2001). A proportion of the stock in the Irish Sea migrates northwards during the summer months.

1.4.5.16 Landings of herring in the commercial fisheries study area over the period 2010 to 2020 were predominantly during June and July (Figure 1.17). A total of 246t was caught during June and 1,800t was caught during July across 2010-2020. Annual landings of herring fluctuate, depending on ICES advice on the stock.

[14] MMO, 2020a

[15] MMO, 2020a

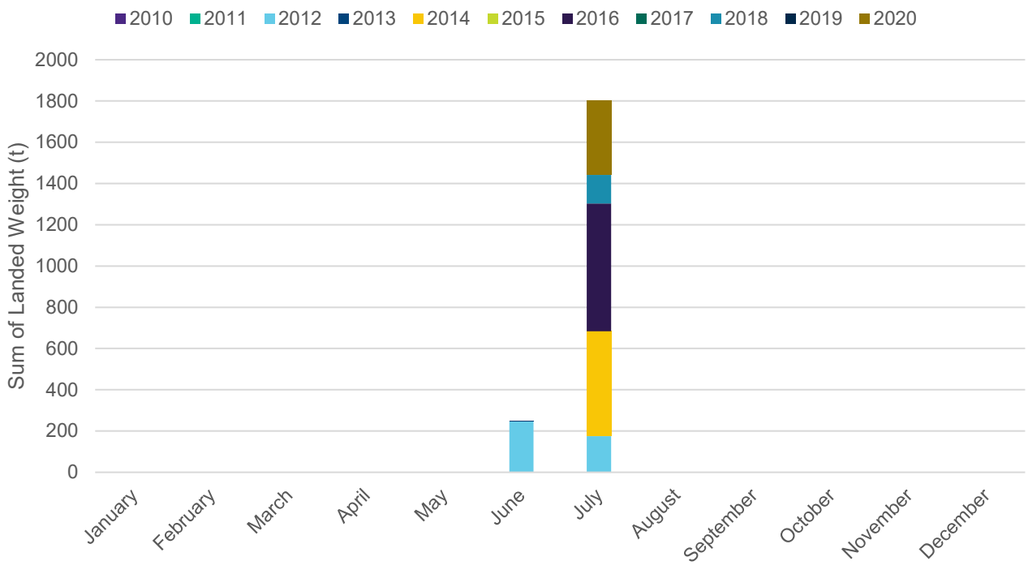


Figure 1.17: Seasonality of landed weight (t) of herring (2010 to2020) within the Mona commercial fisheries study area (UK vessels)[16].

Species landed by non-UK vessels

1.4.5.17 A total of 55 species were landed by Belgian vessels over the period 2006-2016 from the Mona commercial fisheries study area. The top 20 species (Figure 1.18) constituted approximately 99% of the total Belgian catch landed during the monitoring period. The top five species (common sole, European plaice, thornback ray, blonde ray and brill) constituted approximately 82% of the total Belgian tonnage landed from the region. Data from Belgian vessels shows that the fleet's main targets were demersal species from ICES Rectangle 36E6, and similar species were caught in all other associated rectangles (35E5, 35E6 and 36E5).

1.4.5.18 There was a large variety of species caught by the Belgian fleet and, given the understanding that the Belgian fleet almost exclusively uses beam trawls (section 1.4.6), this suggests that other species may have been caught as bycatch during fishing for the main target species.

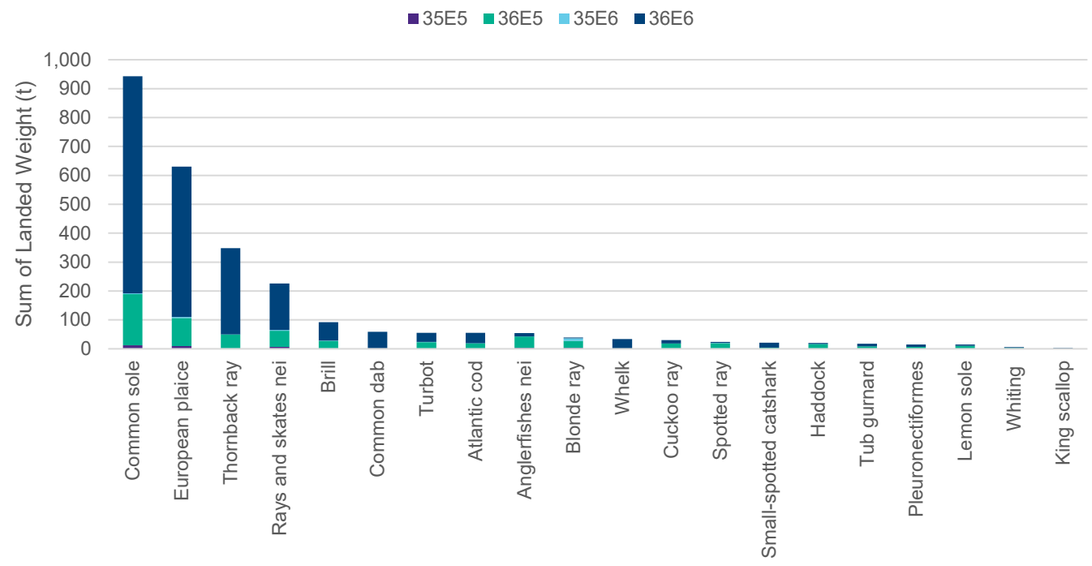


Figure 1.18: Total landings (t) from Belgian vessels within the Mona commercial fisheries study area displayed for the top 20 species[17].

1.4.5.19 A total of 34 species were landed by Irish vessels over the period 2006-2016 within the Mona commercial fisheries study area. The top 20 species in terms of landed weight are displayed in Figure 1.19. The top species (king scallop) constituted approximately 82% of the total Irish catch landed during the monitoring period, with landings predominantly within ICES Rectangle 36E5. King scallop landings are significantly higher than other species landed by Irish vessels, indicating the significant importance of this species to Irish vessels active in the region.

[16] MMO, 2020a

[17] EU STECF, 2017

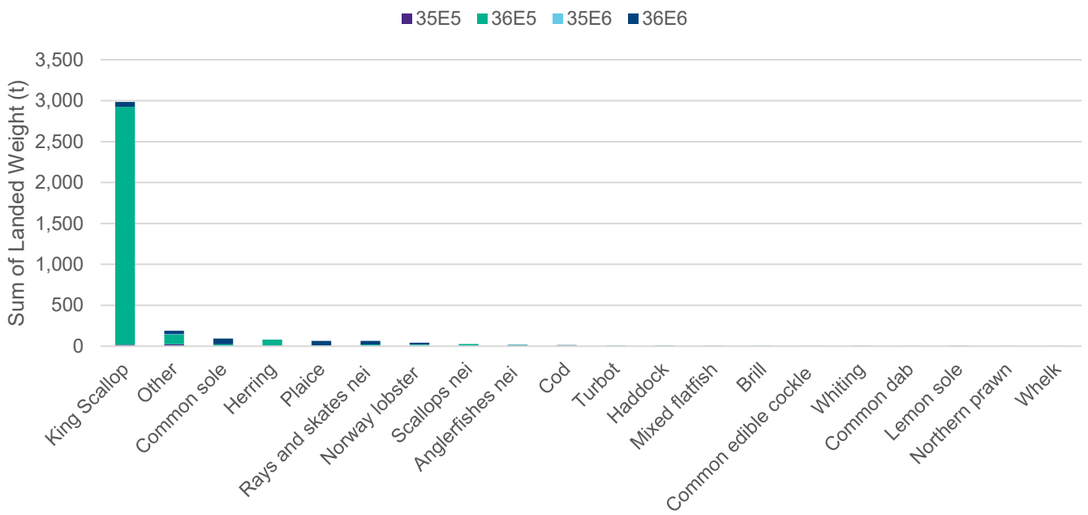


Figure 1.19: Total landings (t) from Irish vessels within the Mona commercial fisheries study area displayed for the top 20 species[18].

1.4.5.20 Only one species (edible crab) was landed by French vessels during 2006-2016 within the Mona commercial fisheries study area (Figure 1.20), and only from within Rectangle 36E6.

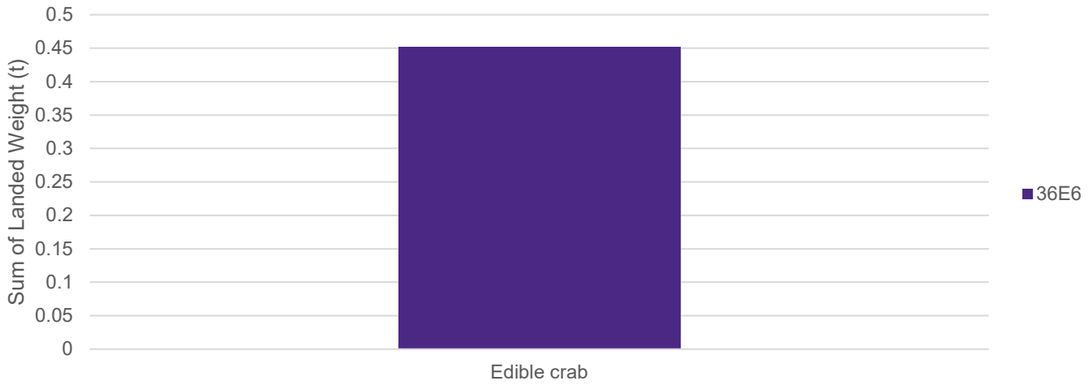


Figure 1.20: Total landings (t) from French vessels within the Mona commercial fisheries study area displayed by species[19].

1.4.5.21 A total of five species were landed by Dutch vessels over the period 2006-2016 (Figure 1.21) within the Mona commercial fisheries study area. There were no landings by Dutch vessels within ICES Rectangle 35E6. The top two species, king scallop and European sprat, constituted approximately 57% and 37%, respectively, of the total Dutch catch landed during the monitoring period. The remainder of the total Dutch tonnage landed from the region was constituted of common shrimp (2%), common sole (2%) and horse mackerel (2%). Data from Dutch vessels shows that the fleet targets the majority of landings from ICES Rectangle 36E5.

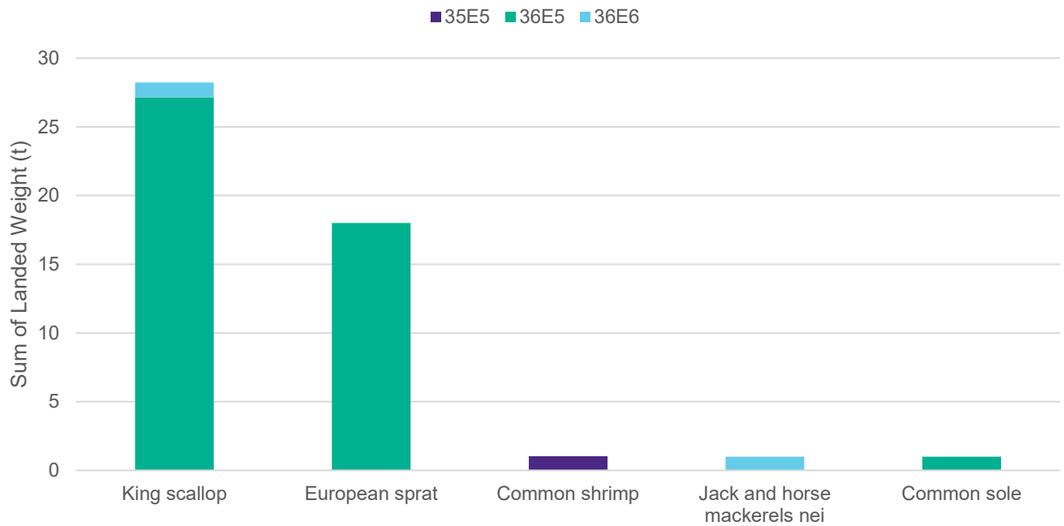


Figure 1.21: Total landings (t) from Dutch vessels within the Mona commercial fisheries study area, displayed by species[20].

1.4.5.22 The STECF species data were analysed further, allowing a closer look at the temporal variation of the top 15 most commercially important species for non-UK vessels. Overall, king scallop, common sole, European plaice, and thornback ray were the dominant species caught by all non-UK vessels in terms of landed weight across all years and ICES rectangles (Figure 1.22). King scallop appeared to be of particular importance in terms of landed weight during 2010-2016, and less so during prior years, which aligns with feedback from project-specific consultation indicating that the fishery is cyclical.

[18] EU STECF, 2017

[19] EU STECF, 2017

[20] EU STECF, 2017

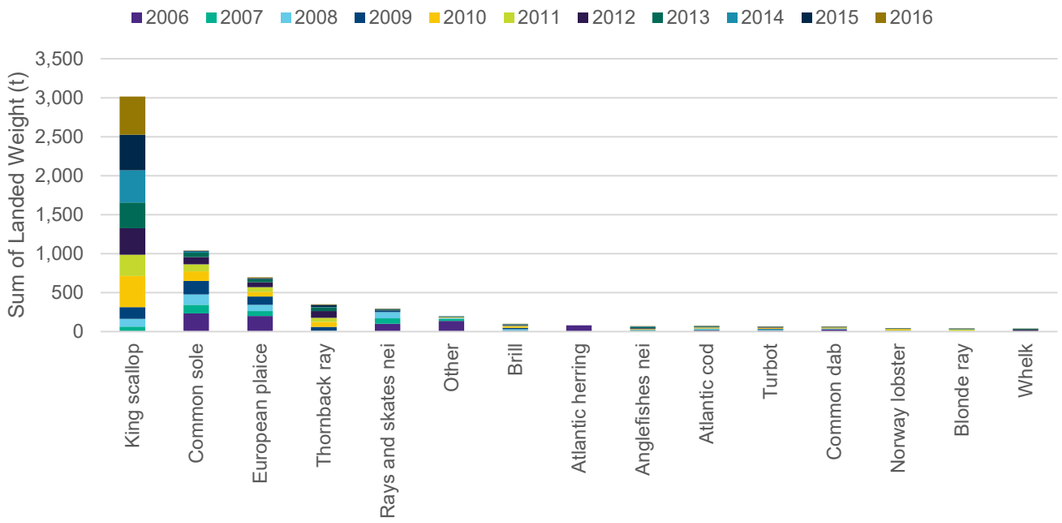


Figure 1.22: Annual trends in the top 15 species by total landings weight (2006-2016) within the Mona commercial fisheries study area (non-UK vessels)[21].

1.4.5.23 Figure 1.23 shows the seasonality for the top 15 species by landed weight from the non-UK vessels across the region. The landings data illustrate that over the period 2006 to 2016, January-March and October to December were the most productive periods of the year in terms of landings for king scallop; July-September was the least productive period, which is when the fishery is closed to protect spawning. Common sole was caught predominantly during the first half of the year, as also indicated by fisheries stakeholders. Notably, Atlantic herring was only caught between July to September.

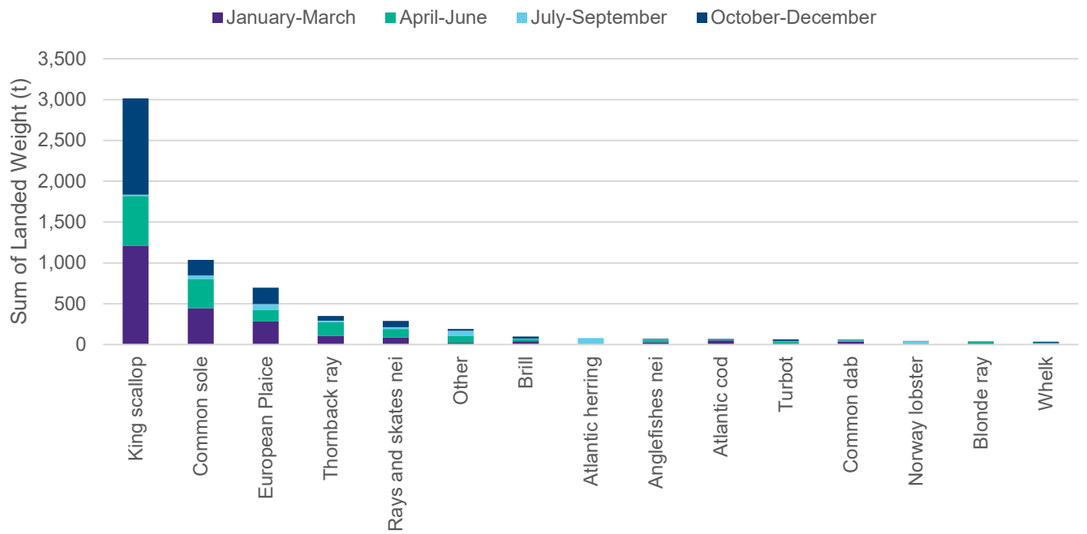


Figure 1.23: Seasonal trends in the top 15 species by total landings weight (2006 to 2016) within the Mona commercial fisheries study area (non-UK vessels)[22].

1.4.6 Gear types

1.4.6.1 The data interrogated in this study provides information on the types of fishing gear used by the UK and non-UK fleets in the Mona commercial fisheries study area. Data has been collated for the most recent 10 year time period: 2010 to 2020 for the MMO data (UK vessels), and 2006-2016 for the STECF data (non-UK vessels).

1.4.6.2 The data shows that eight identifiable gear types were recorded as being used to target fish stocks by UK vessels, specifically: beam trawls, demersal trawls/seines, dredges, drift and fixed nets, gears using hooks, other mobile gears, otter trawl, and pots and traps (MMO, 2020).

1.4.6.3 A total of eight gear types was also recorded for non-UK vessels: beam trawls, demersal seines, dredges, gill nets, longlines, otter trawls, pelagic trawls and pots (STECF, 2017).

1.4.6.4 Dredges accounted for approximately 75% of total landings by UK vessels from the Mona commercial fisheries study area (Figure 1.24). This indicates the importance of the scallop fishery (see section 1.4.5). Pots and traps (targeting crab, lobster and whelk) were also of notable importance in the Mona commercial fisheries study area and consisted mostly of vessels >10m in length.

1.4.6.5 For the non-UK vessels, beam trawls and dredges accounted for a large proportion of total landings from the Mona commercial fisheries study area (Figure 1.25). Similarities in gear types can be observed with UK vessels, which predominantly used

[21] EU STECF, 2017

[22] EU STECF, 2017

dredges. The spatial distribution of vessels using the different gear types within the respective ICES Rectangles is discussed in section 1.4.8.

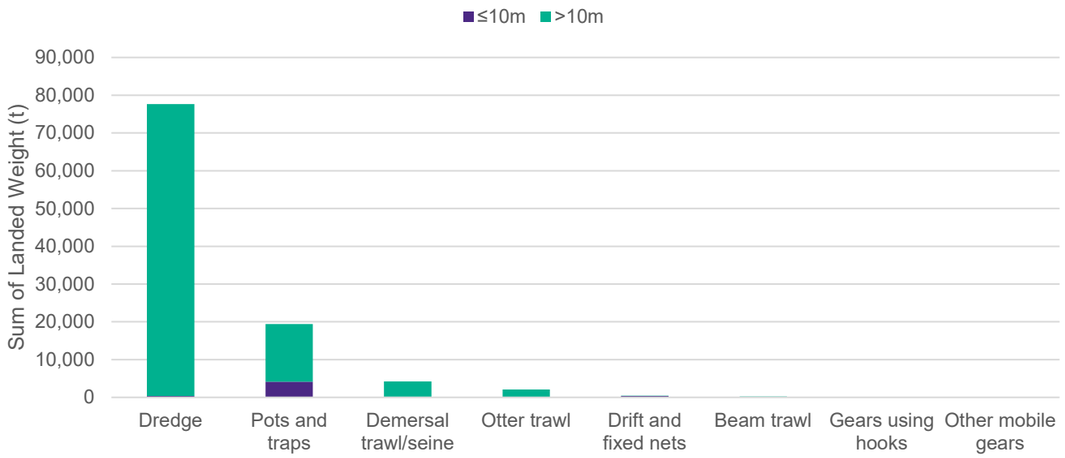


Figure 1.24: Total landings weight by gear type (2010 to 2020) within the Mona commercial fisheries study area (UK vessels)[23].

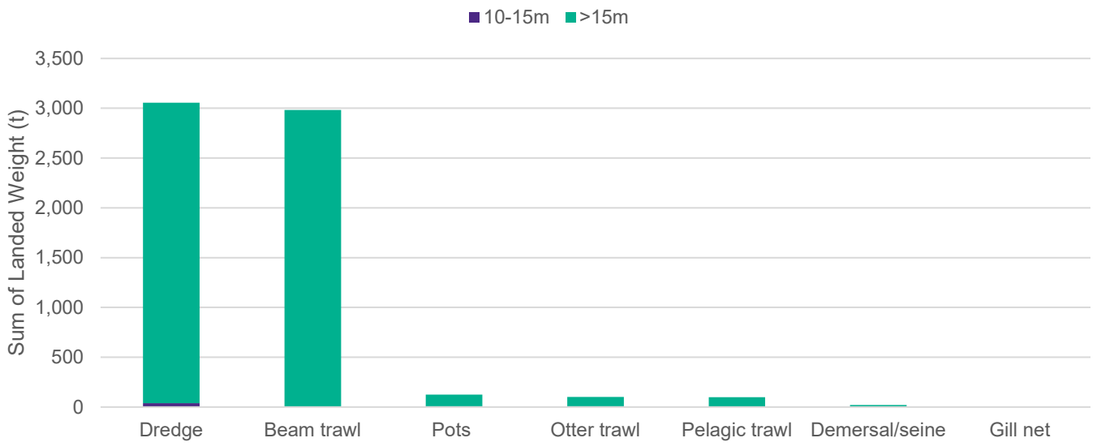


Figure 1.25: Total landings weight by gear type (2006 to 2016) within the Mona commercial fisheries study area (non-UK vessels)[24].

1.4.6.6 The data indicates that English vessels utilised a variety of gear types across the Mona commercial fisheries study area (Figure 1.26). Of the gear types, the use of pots, traps and dredges was most dominant. The data also indicates that ICES rectangle 36E6 was of significant importance to English fleets utilising pots and traps; this likely reflects the whelk fishery, particularly vessels operating out of Fleetwood, which is discussed in sections 1.4.1, 1.4.5 and 1.4.7.

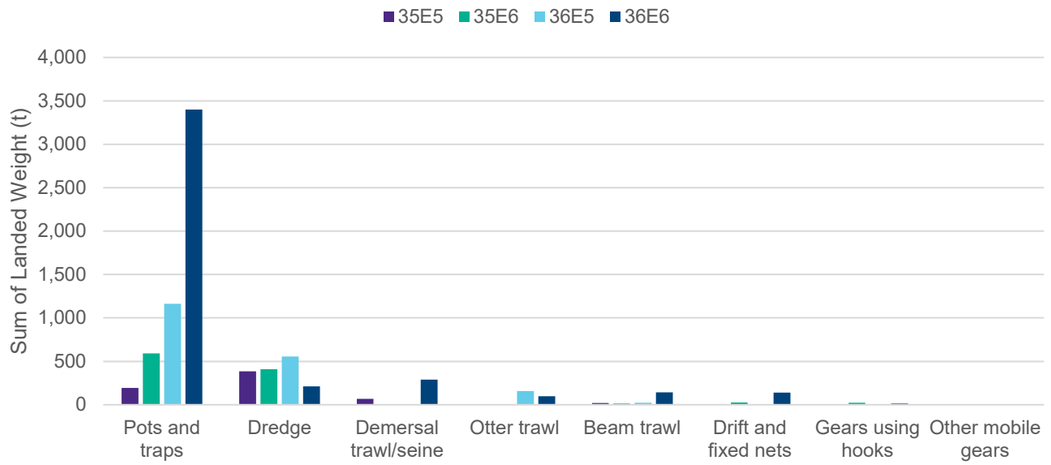


Figure 1.26: Total landings weight from English vessels by gear type (2010 to 2020) within the Mona commercial fisheries study area[25].

1.4.6.7 As expected, Figure 1.27 illustrates that fleets from the Isle of Man were mostly active within ICES Rectangle 36E5 which partly overlaps with Manx waters. Dredges (targeting king and queen scallops) accounted for the majority of landings. Other notable gear types used by the Manx fleet within the Mona commercial fisheries study area were demersal trawl/seine and otter trawl.

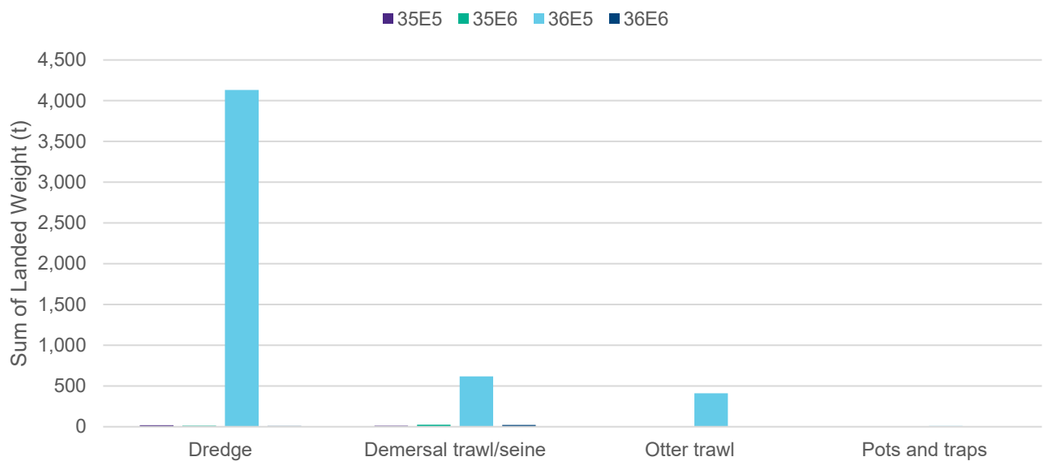


Figure 1.27: Total landings weight from Isle of Man vessels by gear type (2010 to 2020) within the Mona commercial fisheries study area[26].

[23] MMO, 2020a

[24] EU STECF, 2017

[25] MMO, 2020a

[26] MMO, 2020a

1.4.6.8 Jersey based vessels showed significantly less variety of gear types than English and Isle of Man vessels (Figure 1.28). Data shows that Jersey vessels caught a relatively low landed weight (t) in comparison to other UK vessels and only utilised pots and traps within the commercial fisheries study area.

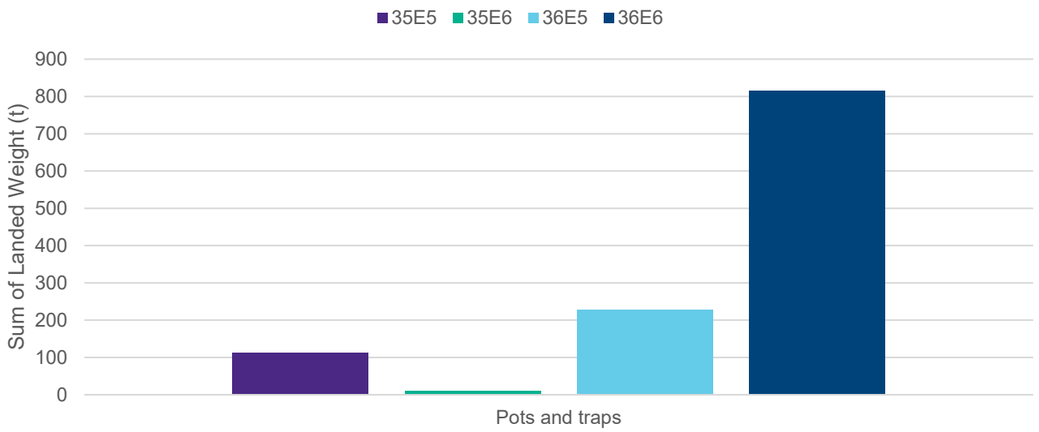


Figure 1.28: Total landings weight from Jersey vessels by gear type (2010 to 2020) within the Mona commercial fisheries study area [27].

1.4.6.9 Similar to vessels from the Isle of Man, Northern Irish vessels were mostly active within ICES Rectangle 36E5. Of the gear types, dredges, demersal trawl/seine and otter trawl were most dominant (Figure 1.29).

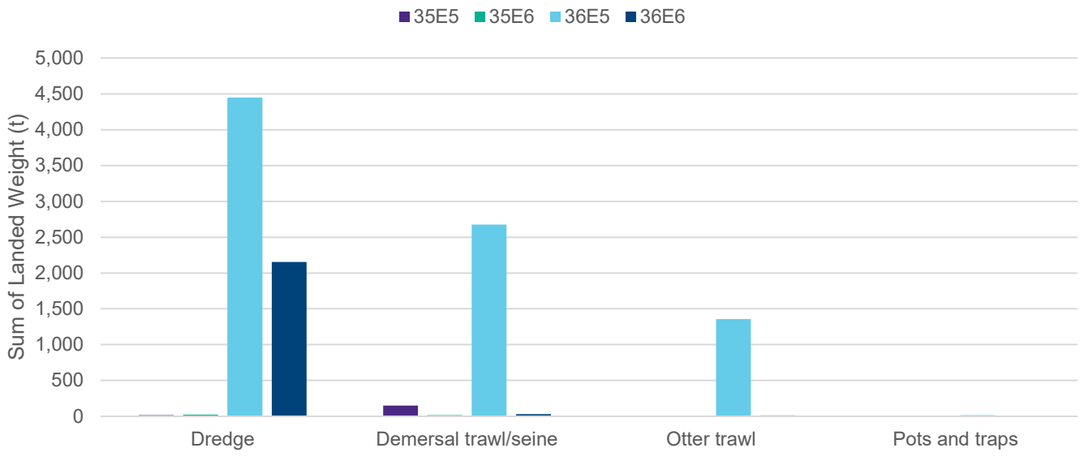


Figure 1.29: Total landings weight from Northern Irish vessels by gear type (2010 to 2020) within the Mona commercial fisheries study area [28].

1.4.6.10 Dredge vessels accounted for the majority of landings for the Scottish fleet active within the Mona commercial fisheries study area (Figure 1.30). Scottish vessels landed a significantly greater weight than vessels from other parts of the UK, particularly within Rectangles 36E5 and 36E6, highlighting the commercial importance of the region for Scottish vessels targeting king and queen scallops.

Figure 1.30: Total landings weight from Scottish vessels by gear type (2010 to 2020) within the Mona commercial fisheries study area[29].

1.4.6.11 Pots and traps and dredges were the dominant gear type used by the Welsh fleet across ICES Rectangles, notably within Rectangle 35E5, where Anglesey is located (Figure 1.31).

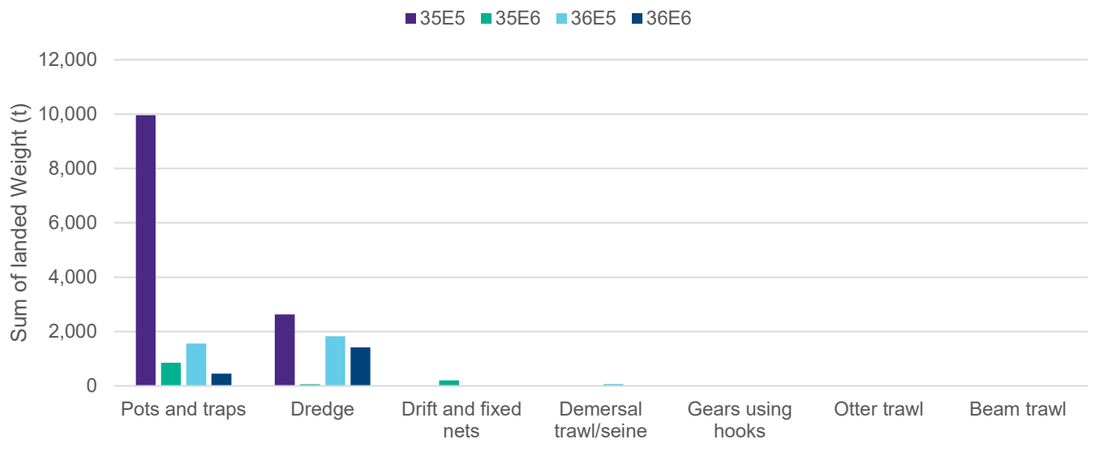


Figure 1.31: Total landings weight from Welsh vessels by gear type (2010 to 2020) within the Mona commercial fisheries study area[30].

[27] MMO, 2020a

[28] MMO, 2020a

[29] MMO, 2020a

[30] MMO, 2020a

1.4.6.12 The data indicates that Belgian vessels almost exclusively utilised beam trawls across the Mona commercial fisheries study area (Figure 1.32), suggesting that the Belgian fleet is targeting demersal species. Beam trawls are known to catch a wide variety of bottom dwelling fish which would result in a varied catch containing flatfish, gadoids, and cartilaginous species, aligning with findings of Belgian landing weights by species in section 1.4.5.

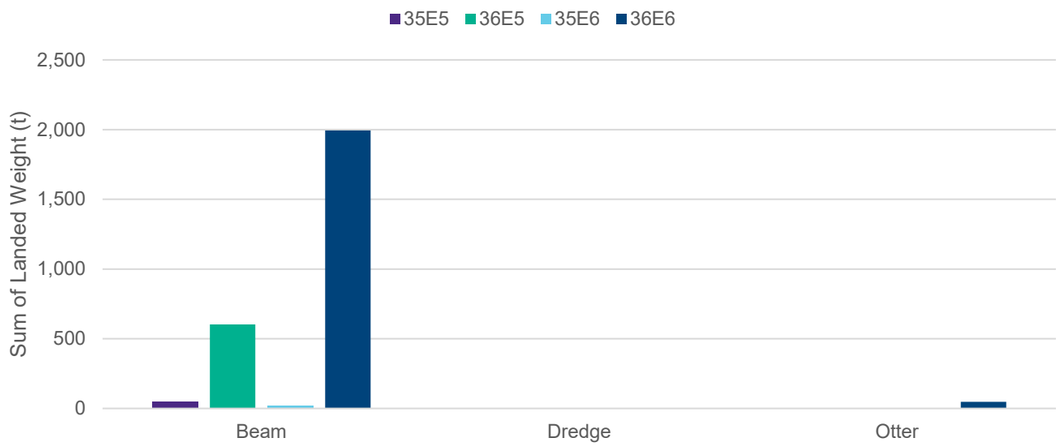


Figure 1.32: Total landings weight from Belgian vessels by gear type (2006 to 2016) within the Mona commercial fisheries study area[31].

1.4.6.13 French vessels caught a very low weight (t) of fish in comparison to other non-UK vessels. Data shows that French vessels only utilise pots within the Mona commercial fisheries study area and are only active in ICES Rectangle 36E6 (Figure 1.33).

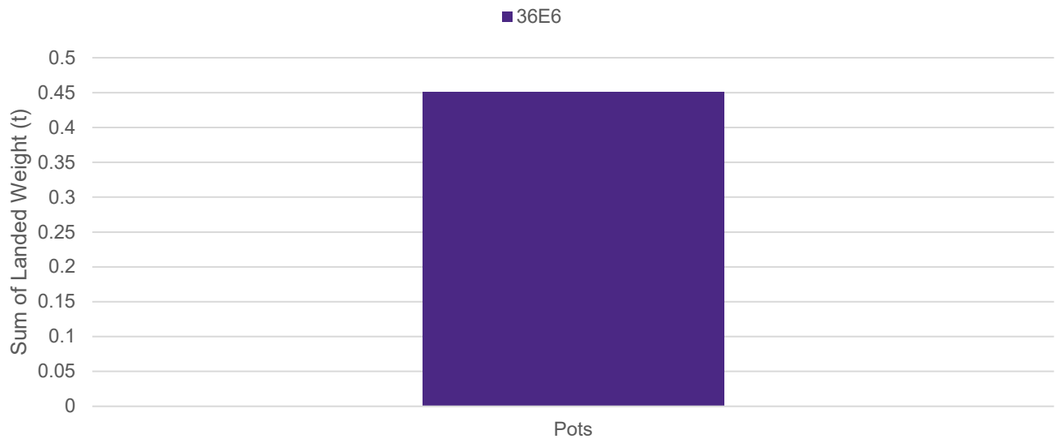


Figure 1.33: Total landings weight from French vessels by gear type (2006 to 2016) within the Mona commercial fisheries study area [32].

1.4.6.14 The Irish fleet showed a variety of gear types, with the utilisation of dredges (targeting king and queen scallops) in ICES Rectangle 36E5 being the most prominent (Figure 1.34). Beam trawl, otter trawl, pelagic trawl and pots were also used by the Irish fleet within the commercial fisheries study area.

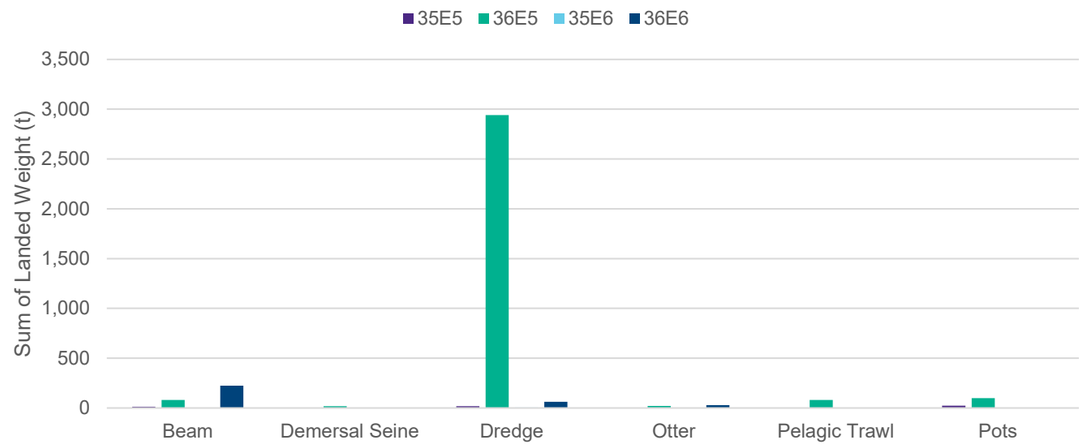


Figure 1.34: Total landings weight from Irish vessels by gear type (2006 to 2016) within the Mona commercial fisheries study area[33].

1.4.6.15 The total landings caught by Dutch vessels in the Mona commercial fisheries study area were significantly lower in comparison to Belgian and Irish vessels. Dredges and

[31] EU STECF, 2017

[32] EU STECF, 2017

[33] EU STECF, 2017

pelagic trawls were the dominant gear type used by the Dutch fleet, notably within ICES Rectangle 36E5 (Figure 1.35). No activity was recorded in ICES Rectangle 35E6.

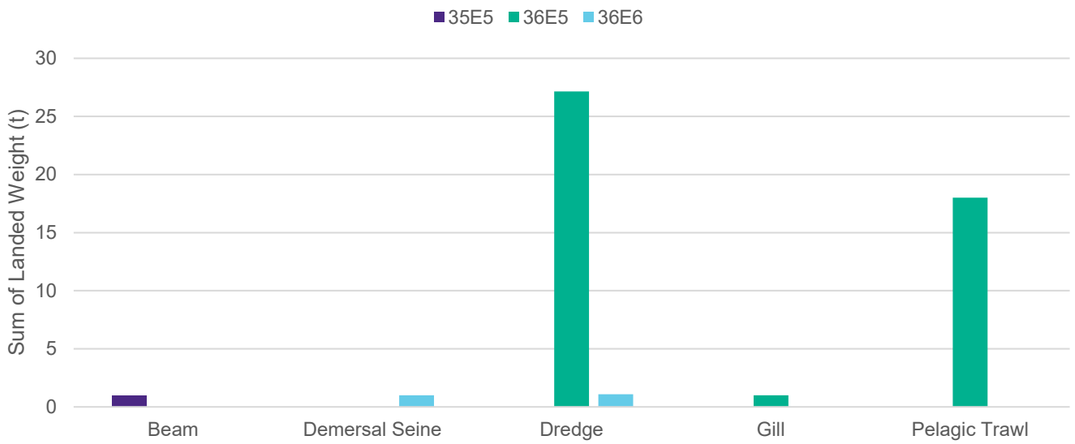


Figure 1.35: Total landings weight from Dutch vessels based on gear type (2006 to 2016) within the Mona commercial fisheries study area[34].

1.4.6.16 It is worth commenting on the general implications of the results of the gear type analysis. The use of dredges and the predominance of landings using fishing vessels >10m in length, indicates that the seabed supports a range of species that live on or just above the seabed, and the region is important for demersal fish and shellfish. Additionally, use of these gear types suggests that the seabed across the region has areas of seabed whose character is conducive to towing bottom fishing gear (i.e. sediment rather than rock).

1.4.6.17 As is evident from the landings data for UK and non-UK vessels, there is a range of fleets targeting different fisheries across the Mona commercial fisheries study area. The highest proportion of landings by weight from UK vessels are caught by dredges, and pots and traps. For non-UK vessels, the highest proportion of landings by weight are caught by beam trawls and dredges. Further details on the gear types and vessels used within the key fisheries and fleets that operate across the commercial fisheries study area are described throughout the following sections.

Dredge

1.4.6.18 Dredges consists of rigid structures that target numerous species of shellfish through towing along the seabed (Figure 1.36 and Figure 1.37). Within the Mona commercial fisheries study area, queen and king scallop are both caught by vessels deploying dredges, although due to the differences in behaviour between the two species, slightly different gear types may be used for them. Scallop dredging is generally undertaken by larger vessels (>10m in length), due to the engine capacity required to tow such a gear type along the seabed. Scallop are also caught by otter trawl vessels, as discussed below.

1.4.6.19 Restrictions on dredging activity differ between regional and national authorities and with distance of the activity from the shore. Vessels operating inshore are limited to the number of dredges, whereas vessels operating offshore may use a high number of dredges.

1.4.6.20 King scallop are generally fished by vessels operating Newhaven dredges which comprise a triangular frame with a toothed lead bar that penetrates the seabed to scare or flip king scallop up and into a collecting bag behind. A number of these dredges are pulled behind a spreading bar either side of a vessel. Scallop vessels operating within the area have been observed to have between approximately 12 to 36 dredges in total.

1.4.6.21 Generally, queen scallop are targeted using skid dredges (or otter trawls as discussed below), which operate in a similar way as the toothed dredges targeting king scallop. However, with the skid dredges, a tooth bar is replaced with a ‘tickler chain’ which disturbs queen scallop resting on the seafloor, causing them to swim upwards into the water column where they can be caught by the dredge.

1.4.6.22 Tow directions are influenced by a range of factors, including the tide and weather. Within the Mona Array Area, tows by dredge vessels are generally north to south. McNab and Nimmo (2021) found that within the Irish Sea region, dredge vessels typically tow their gear at a speed of two to six knots and have a vessel length of 10m to 25m.

1.4.6.23 The penetration depth of a typical Newhaven dredge is approximately 3 to 30cm, but this varies with sediment type (Kaiser et al., 1996; Grieve et al., 2014; Eigaard et al., 2016)). MarineSpace, on behalf of the Applicant, engaged with fisheries groups via questionnaires on their gear penetration depth within the Mona commercial fisheries study area. Results found that skid dredges targeting queen scallop have a maximum penetration depth of 0.2m, whereas dredges targeting king scallop have a maximum penetration depth of 0.3m (although this is dependent on seabed substrate).

[34] EU STECF, 2017

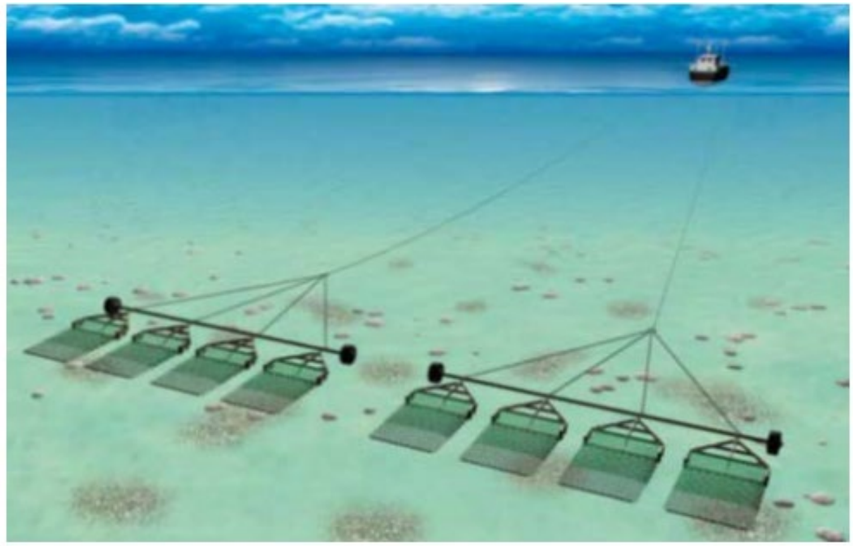


Figure 1.36: Typical dredge gear configuration[35].

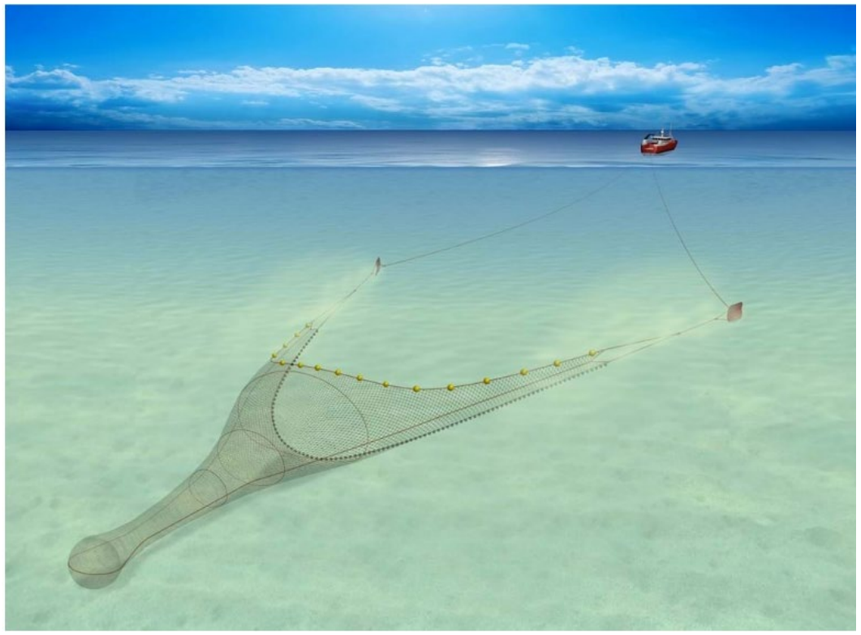
Figure 1.37: Scallop dredge vessel example[36].

bridles are located between the wing-end of the net and the trawl doors, allowing for great areas of seabed to be trawled. These bridles can range from 0m to 300m in length, depending upon the seabed substrate and the target species. Demersal fish species are encouraged in-between the trawl doors, into the mouth of the trawl and along a funnel into the end (the 'cod-end') of the net. A range of net mesh sizes can be utilised to target different demersal species.

1.4.6.25 Otter trawl gears are used to target queen scallop, particularly by vessels from the Isle of Man. This method, similar to skid dredges, targets queen scallop which are more active swimmers than king scallop. Queen scallop are generally caught during the summer months when water temperatures are higher and they are most active (Jenkins *et al*., 2003). The typical towing speed varies with ground, tidal and weather conditions, but is generally between two to three knots (Bloor et al., 2015).

1.4.6.26 McNab and Nimmo (2021) found that within the Irish Sea region, vessels deploying otter trawls typically tow their gear at a speed of two to six knots, while the majority of vessels have a vessel length of <10m.

1.4.6.27 MarineSpace, on behalf of the Applicant, engaged with fisheries groups via questionnaires on their gear penetration depth within the commercial fisheries study area. Results found that vessels using otter trawls have a penetration depth ranging from approximately 0.05m to 0.1m.



Demersal trawls

1.4.6.24 Demersal trawls consist of cone-shaped nets that are towed along the seabed to target demersal fish species (Figure 1.38 and Figure 1.39). The mouth of the trawl is spread and held open by a pair of adjacent trawl doors that possess bridles. These

[35] Seafish, 2022

[36] MarineTraffic, 2022

Figure 1.38: Typical demersal trawl gear configuration[37].

Figure 1.39: Example demersal trawl vessels[38].

Pots and traps

1.4.6.28 The shape, size and number of pots and traps used by vessels, varies depending on the target species, size of vessel and seabed substrate. Surface markers used include cans, buoys and flagged dhans (Figure 1.40).

1.4.6.29 Pots used to catch whelk often comprise a weighted plastic drum (Figure 1.41). The number of whelk pots deployed is, generally, higher than for crab and lobster on a like-for-like basis but depends on the exact area fished and vessel size. Whelk vessels operating offshore (Figure 1.41) in the Mona commercial fisheries study area may be working strings of approximately 100 pots, whereas vessels targeting crab and lobster, will have strings of approximately 25 to 50 pots.

1.4.6.30 Parlour pots are generally utilised for the capture of crab and lobster. The design of these pots typically consists of a steel rod, D-shaped in sections enclosed in netting and protected with rubber strips.

1.4.6.31 McNab and Nimmo (2021) found that within the Irish Sea region, vessels deploying pots and traps typically haul their gear at a speed of zero to nine knots and have vessel lengths of both >10m and ≤10m.

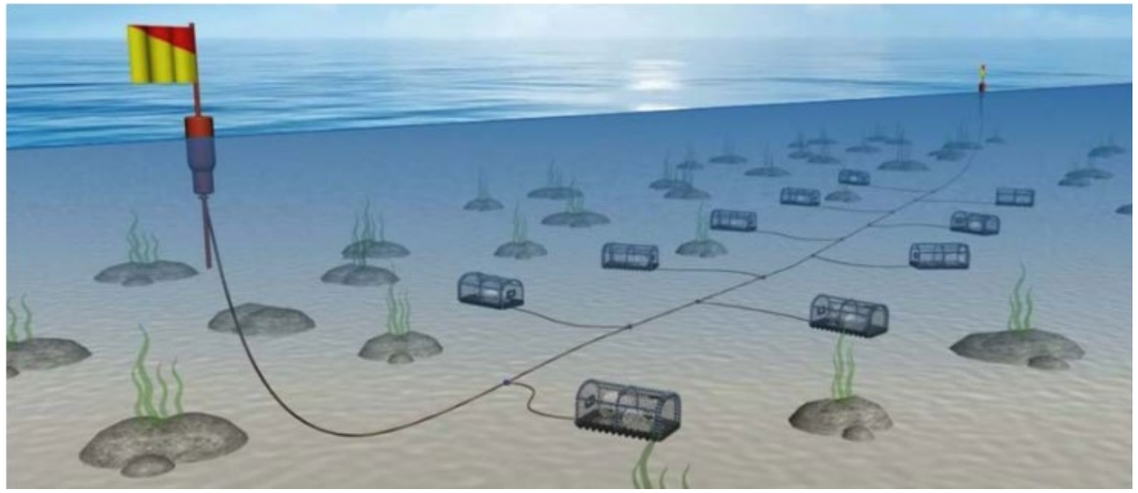


Figure 1.40: Typical potting gear configuration[39].

Figure 1.41: Typical whelk pot and whelk vessel[40].

Beam trawls

1.4.6.32 Beam trawls consist of nets that are held open by a heavy tubular steel beam, which is towed along the seabed. Most beam trawls tow two beams at a time (Figure 1.42). Beam trawling catches a wide range of bottom dwelling species and has the potential to catch a variety of non-target by-catch.

[37] Seafish, 2022

[38] MarineTraffic, 2022

[39] Seafish, 2022

[40] Seafish, 2022 and MarineTraffic, 2022

1.4.6.33 Beam trawls may use tickler chains, which are attached at the front of the net and slide along the seabed to disturb species of fish within its path, encouraging them to rise up into the net behind.

1.4.6.34 McNab and Nimmo (2021) found that within the Irish Sea region, vessels deploying beam trawls typically tow their gear at a speed of 3.5 to eight knots, while the majority of vessels have a vessel length of <10m (Figure 1.43).

1.4.6.35 Towing directions vary depending on a range of factors, including tidal and weather conditions.

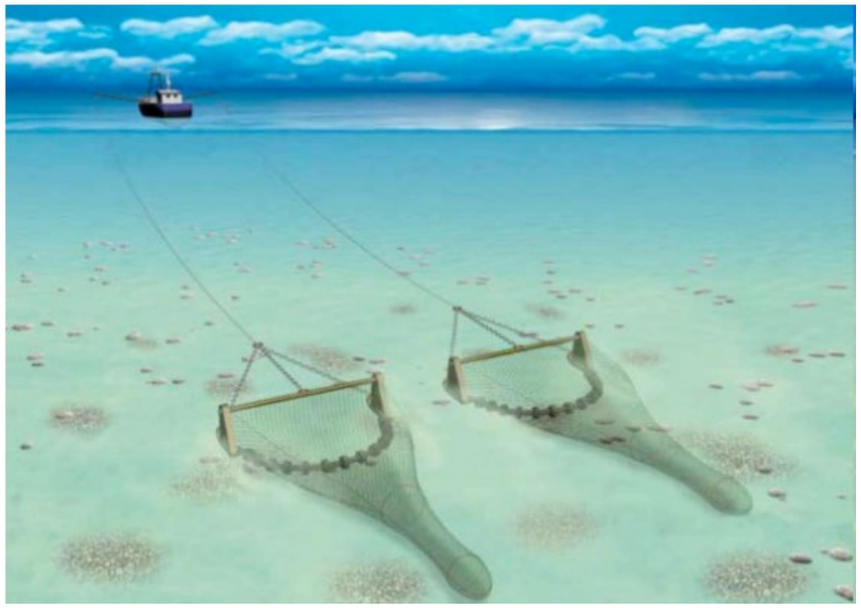


Figure 1.42: Typical beam trawl gear configuration[41].

Figure 1.43: Beam trawl vessel example[42].

1.4.7 Ports

1.4.7.1 Figure 1.44 shows fishing effort (kW/days) in relation to key ports in the region, between 2009-2020 (MMO, 2021b). Fishing effort was similar in England, the Isle of Man and Wales. Within the Mona commercial fisheries study area, Amlwch, Conwy and Holyead in Wales showed consistently high fishing effort between 2009-2020, and Fleetwood and Liverpool had the highest fishing effort in England between 2009-2020. The closest ports to the landfall of the Mona Offshore Cable Corridor, which had fishing effort data recorded, were Conwy and Rhyl. Fishing effort from Rhyl was relatively low across the time period studied.

[41] Seafish, 2022

[42] Seafish, 2022

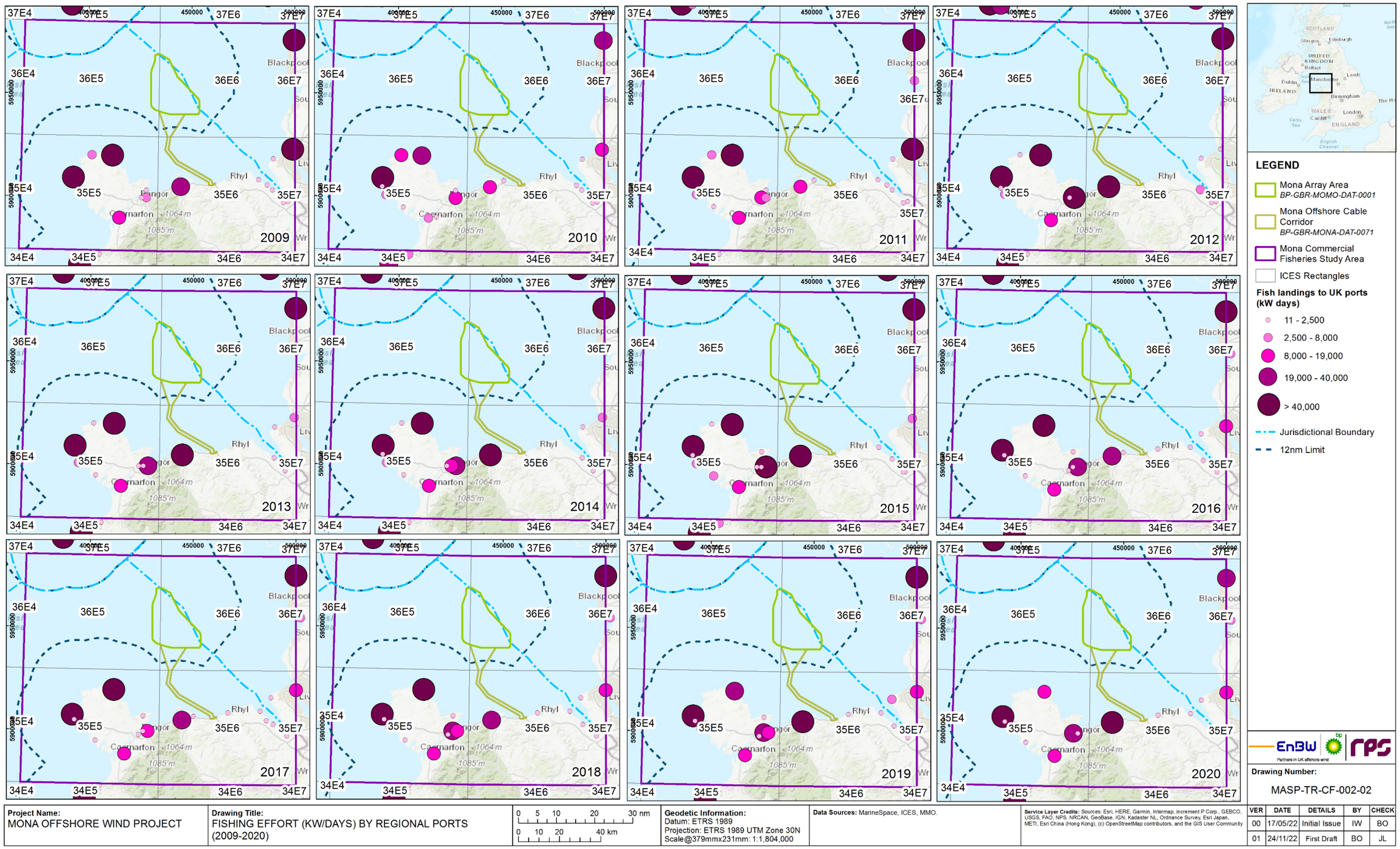


Figure 1.44: Fishing effort (kW/days) by regional ports (2009-2020)[43].

[43] MMO, 2021a

1.4.7.2 Landings data compiled by the MMO (MMO, 2020b) was reviewed for the period 2009 to 2020 and filtered to just show landings into Welsh and English ports within the Mona commercial fisheries study area. The landings dataset provides summaries of fishing activity for both UK commercial fishing vessels landing into the UK and abroad, as well as foreign registered commercial fishing vessels landing into the UK, that are deemed to have been fishing within a specified calendar year.

1.4.7.3 Feedback from project specific consultation with fisheries stakeholders indicated that a large proportion of the shellfish caught within the Mona Array Area, and wider region, is landed into Fleetwood. Therefore, landings into Fleetwood have been analysed in this section, alongside landings from Conwy and Rhyl which are close to landfall of the Mona Offshore Cable Corridor.

1.4.7.4 Data was sorted by port and filtered to analyse details within different vessel size class, species group and nationality of vessels. The data was further sorted by species to then analyse the most important commercial species, in terms of landed weight and value, into each port. This enabled a more detailed analysis of fishing activity from ports within the commercial fisheries study area which are most likely to be affected by the Mona Offshore Wind Project.

Conwy

1.4.7.5 Vessels >10m were dominant, in terms of landed weight at the port of Conwy. Shellfish were the key species group landed, with a total landed weight between 2009 to-2020 of 702t (Figure 1.45). Welsh vessels landed the majority of shellfish species into Conwy (English and Scottish vessels also made minor landings of shellfish species). Vessels >10m from Wales also landed demersal species.

1.4.7.6 Landed weights in the ≤10m vessel size class were lower, with demersal and shellfish species landed mostly by Welsh vessels. For both vessel size categories, the pelagic species group was the least dominant by weight and value of landings.

1.4.7.7 A total of 43 species were landed at Conwy between 2009 to 2020, with whelk the dominant species in terms of landed weight and value (total value of £696,9760) (Figure 1.46). The next top species, in terms of landed weight, were thornback ray, lobster, crab and bass. Lobster was a notable species landed, due to the relative value in comparison to weight landed.

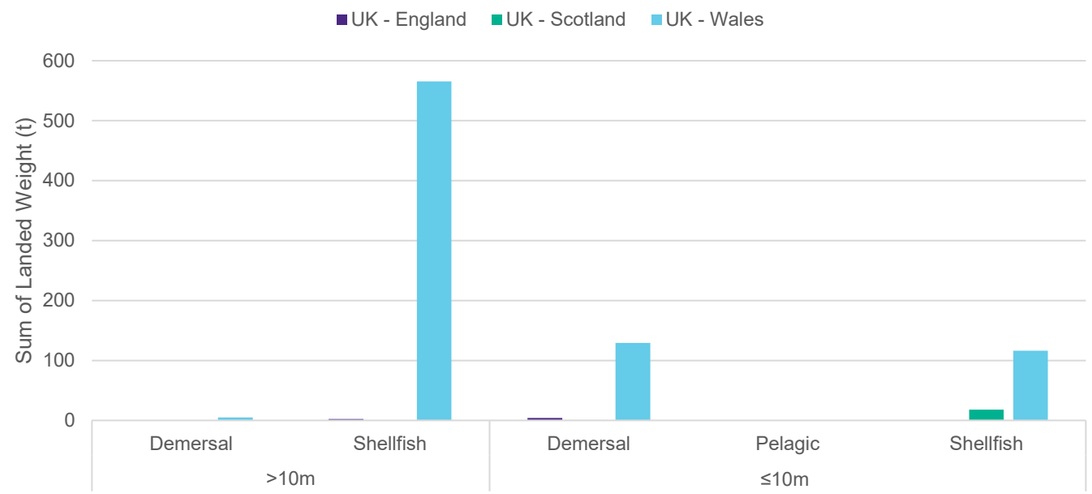


Figure 1.45 Total landings into Conwy (2009 to 2020) displayed by species group, vessel length and nationality.

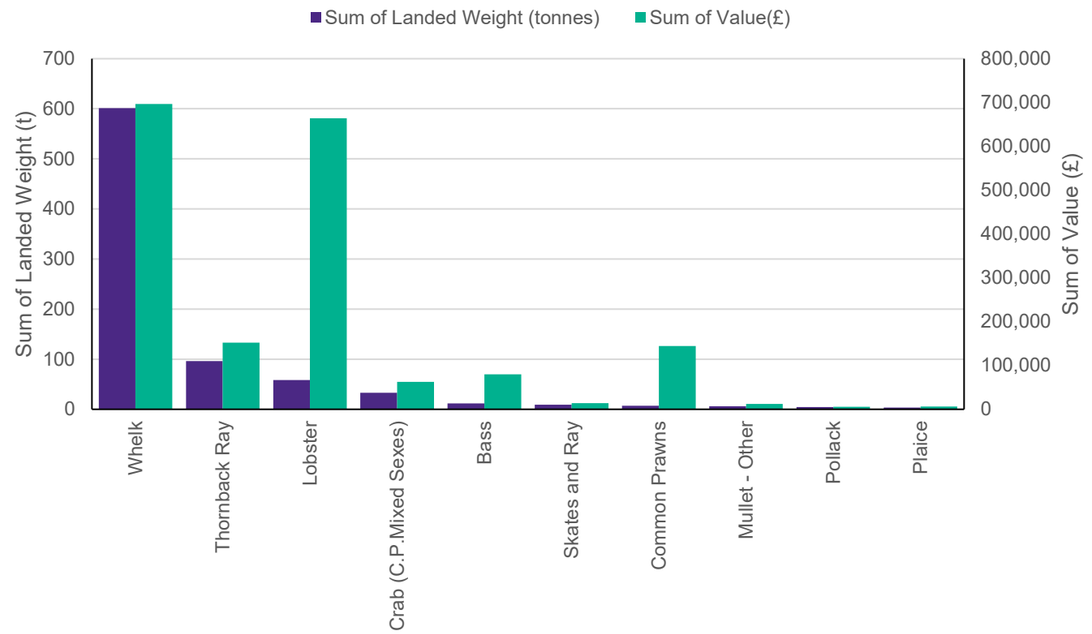


Figure 1.46: Total weight and value of landings into Conwy (2009 to 2020) displayed by the top 10 species by weight[44].

[44] MMO 2020b

Fleetwood

1.4.7.8 Vessels >10m were dominant, in terms of landed weight at the port of Fleetwood. Shellfish was the key species group landed into Fleetwood, with a total landed weight between 2009 to 2020 of 5,465t (Figure 1.47). English vessels landed the majority of shellfish species (Jersey, Welsh and Scottish vessels also made notable landings of shellfish species). Vessels >10m from England also landed demersal species into Fleetwood, but total landed weights between 2009 to 2020 were significantly less than that of shellfish species.

1.4.7.9 Landed weights in the ≤10m vessel size class were lower, with demersal and shellfish species landed mostly by English vessels. For both vessel size categories, the pelagic species group was the least dominant by weight and value of landings.

1.4.7.10 A total of 62 species were landed at Fleetwood during 2009 to 2020, with whelk the dominant species in terms of landed weight and value (total value of £4,549,566) (Figure 1.48). This reflects the role of the whelk fishery which operates out of Fleetwood and aligns with feedback from consultation. The next top species in terms of landed weight were plaice, scallop, thornback ray and lesser spotted dogfish.

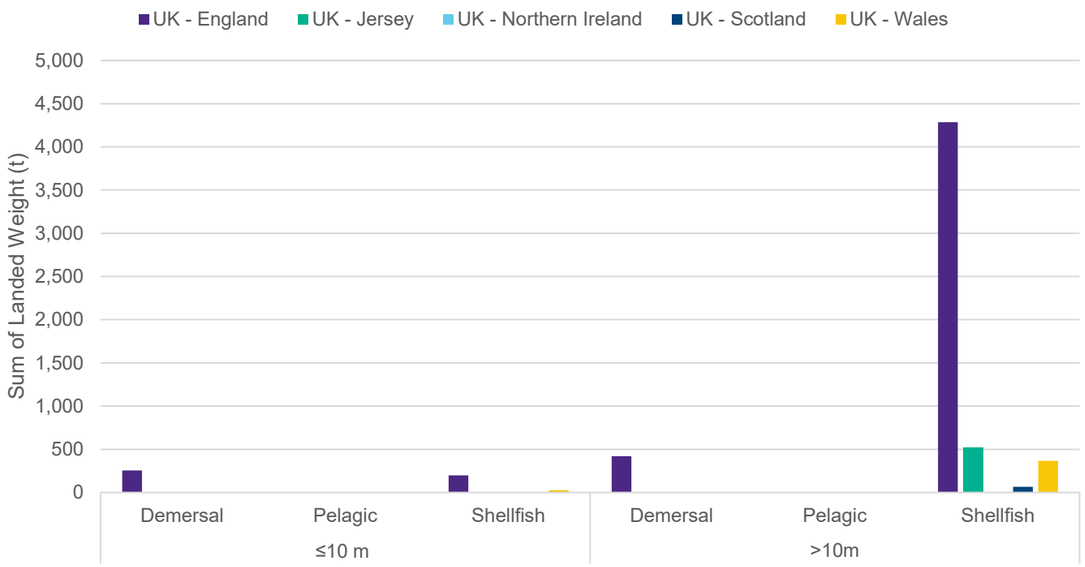


Figure 1.47 Total landings into Fleetwood (2009 to 2020) displayed by species group, vessel length and nationality.

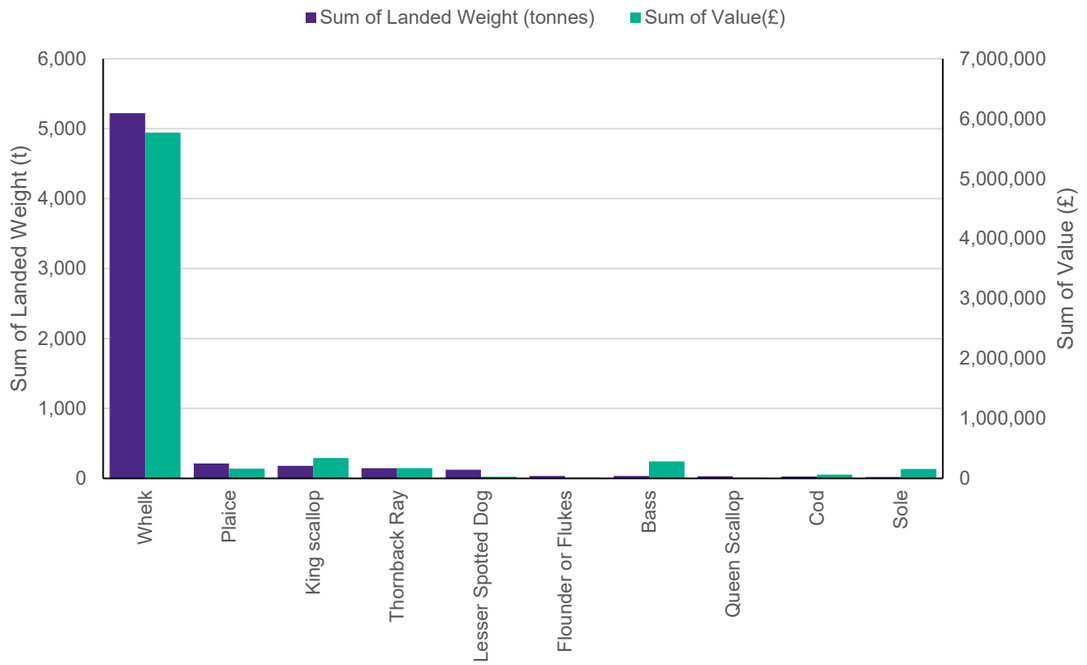


Figure 1.48: Total weight and value of landings into Fleetwood port (2009 to 2020) displayed by the top 10 species by weight[45].

Rhyl

1.4.7.11 Vessels ≤10m constituted all of the landings into Rhyl. Shellfish were the key species group landed (Figure 1.49), caught predominantly by Welsh vessels; a small percentage of the shellfish landings were from English vessels. There were also landings of demersal species into Rhyl.

1.4.7.12 A total of 19 species were landed at Rhyl between 2009 to 2020, with whelk the dominant species in terms of landed weight and value (total value of £38,941) (Figure 1.50). The next top species in terms of landed weight were plaice, bass, brown shrimp and cockle.

[45] MMO, 2020b

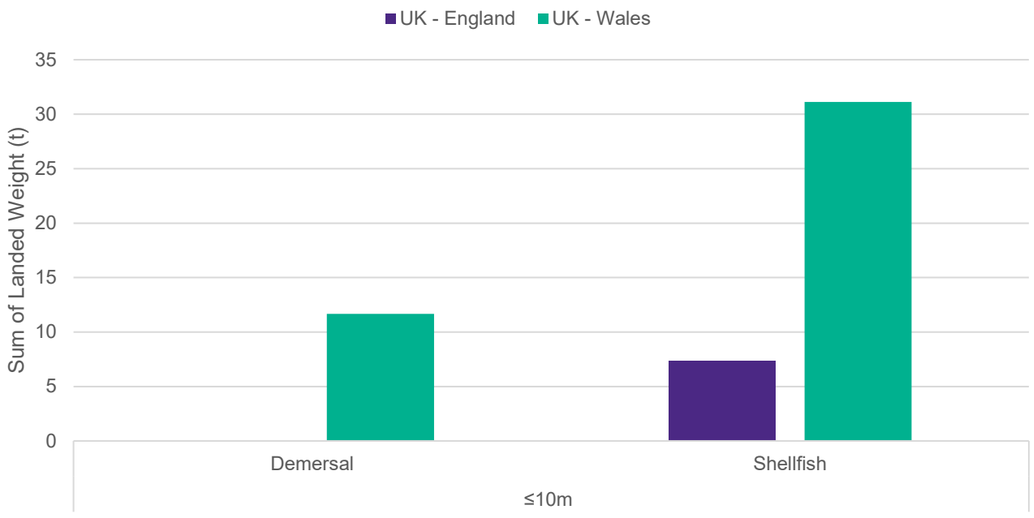


Figure 1.49 Total landings into Rhyl (2009 to 2020) displayed by species group, vessel length and nationality.

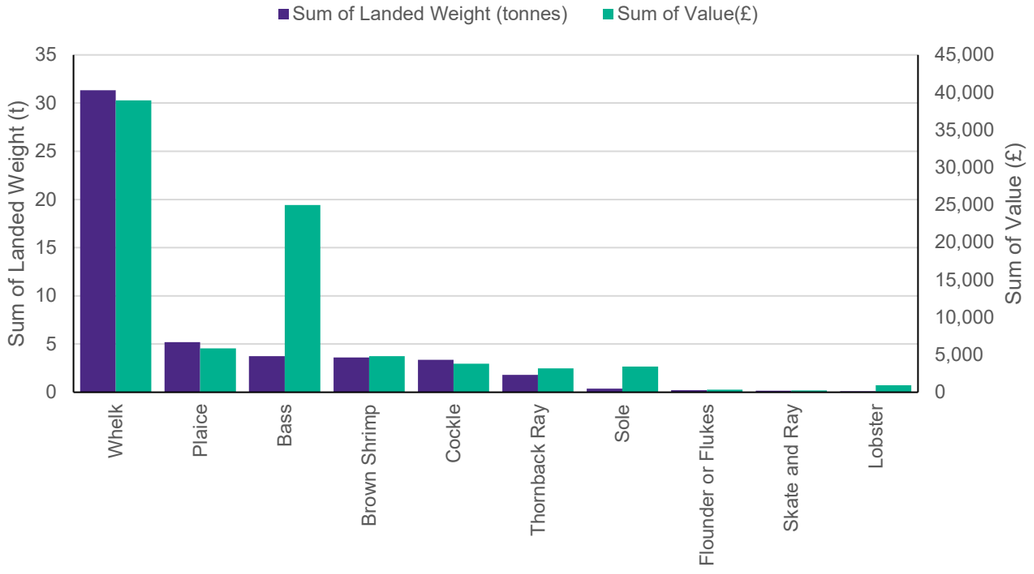


Figure 1.50: Total weight and value of landings into Rhyl port (2009-2020) displayed by the top 10 species by weight[46].

1.4.8 Spatial distribution of fishing activity

VMS data by gear type

1.4.8.1 VMS data between 2009 to 2020 was collated from the MMO and ICES to provide an overview of the spatial extent of fishing activity within the Mona commercial fisheries study area. The MMO dataset only captures data for ≥15m vessels and the ICES dataset is from vessels >12m in length. Smaller vessels are not captured within these datasets, so additional datasets have been used to provide a context for their activity. Fishing effort was provided in kWh, which has been calculated by multiplying the time associated with each VMS report, by the engine power of the vessel concerned at the time of activity.

1.4.8.2 Both the MMO and ICES datasets are split by the ICES subrectangle and have been categorised into aggregated gear groups (Figure 1.51 to Figure 1.54). The ICES data was only for mobile bottom contacting gear types, so pots and traps were not included. MMO data by gear type for pots has been analysed, but data were only available for the period 2016-2020.

1.4.8.3 Figure 1.51 illustrates that potting vessels (≥15m) were active across the Mona commercial fisheries study area. Higher intensities of potting activity were observed on the eastern edge of the Mona Array Area. Feedback from project specific consultation with fisheries stakeholders has suggested that this activity is mostly from whelk vessels. Potting activity fluctuated across the time period studied.

1.4.8.4 Over the period 2009-2020, beam trawl (vessels >12m) activity, sporadically overlapped with small parts of the Mona Array Area, at a relatively low intensity (Figure 1.52). There were two larger areas of higher intensity beam trawling activity outside of the Mona Array Area, observed to the northeast of the Mona Array Area and south of the Isle of Man. Fisheries stakeholders consulted as part of this assessment have indicated that beam trawl vessels from the southwest of the UK are active in the Mona Array Area during the Spring, with these vessels predominantly targeting sole; Belgium beam trawl vessels are generally active east of the Mona Array Area. Beam trawl activity fluctuated across the time period studied.

1.4.8.5 Figure 1.53 illustrates that dredge vessels (>12m) were active across the Mona commercial fisheries study area. These dredge vessels are largely from Ireland, the Isle of Man, Northern Ireland and Scotland (section 1.4.6). Highest intensities of these vessels were observed within the Isle of Man 12nm limit, and within the central and western parts of the Mona Array Area. This is supported by feedback from project specific consultation which highlighted that the central and west part of the Mona Array Area is an important queen and king scallop fishing ground. It is evident that dredge activity and intensity varies by year, which also corroborates with information from fisheries stakeholders, which suggest that the fishery is cyclical over seven to eight year periods.

1.4.8.6 Figure 1.54 illustrates that activity by otter trawl vessels (>12m) was limited within the Mona commercial fisheries study area, with the highest levels observed in the northwest part. Otter trawl vessels from England, Isle of Man and Northern Ireland were active within the Mona commercial fisheries study area (section 1.4.6). Otter

[46] MMO, 2020b

trawl activity fluctuated across the time period studied. Otter trawl vessels from the Isle of Man target queen scallop, generally between July to October.

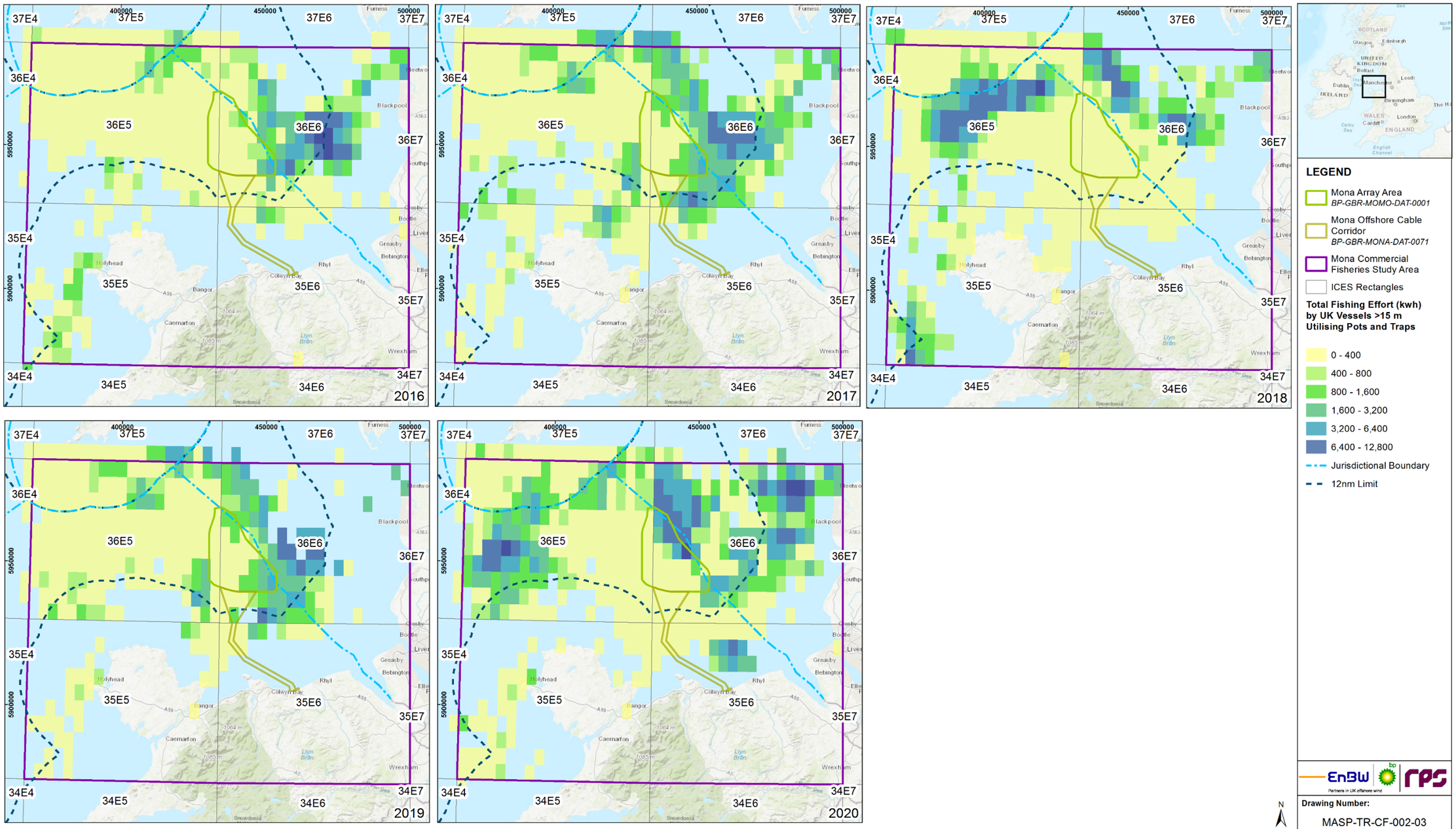


Figure 1.51: Annual fishing effort by vessels utilising pots and traps gear (UK vessels ≥15m) (2016 to 2020)[47].

[47] MMO, 2021b

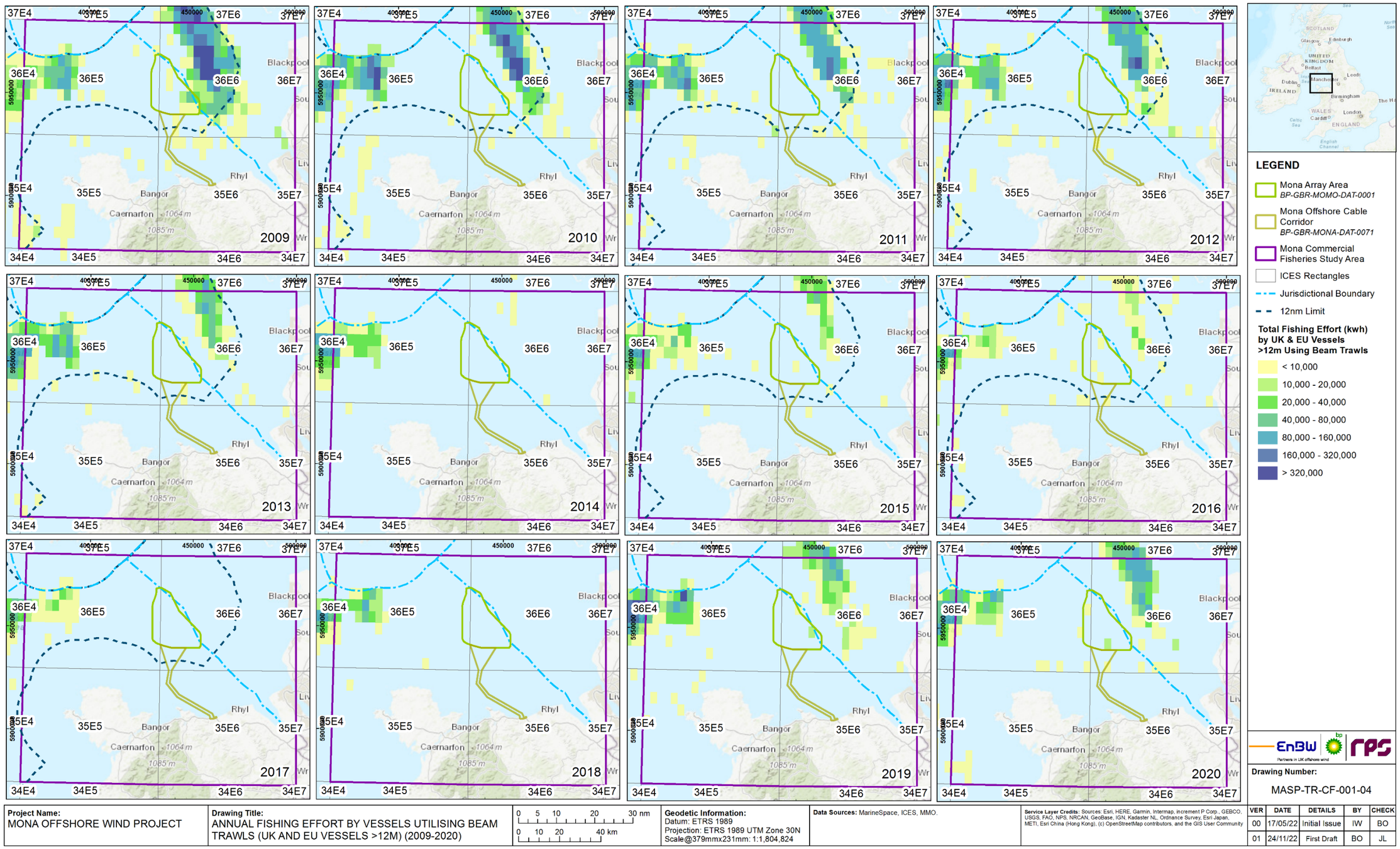


Figure 1.52: Annual fishing effort by vessels utilising beam trawls (UK and EU vessels >12m) (2009 to 2020)[48].

[48] ICES, 2020

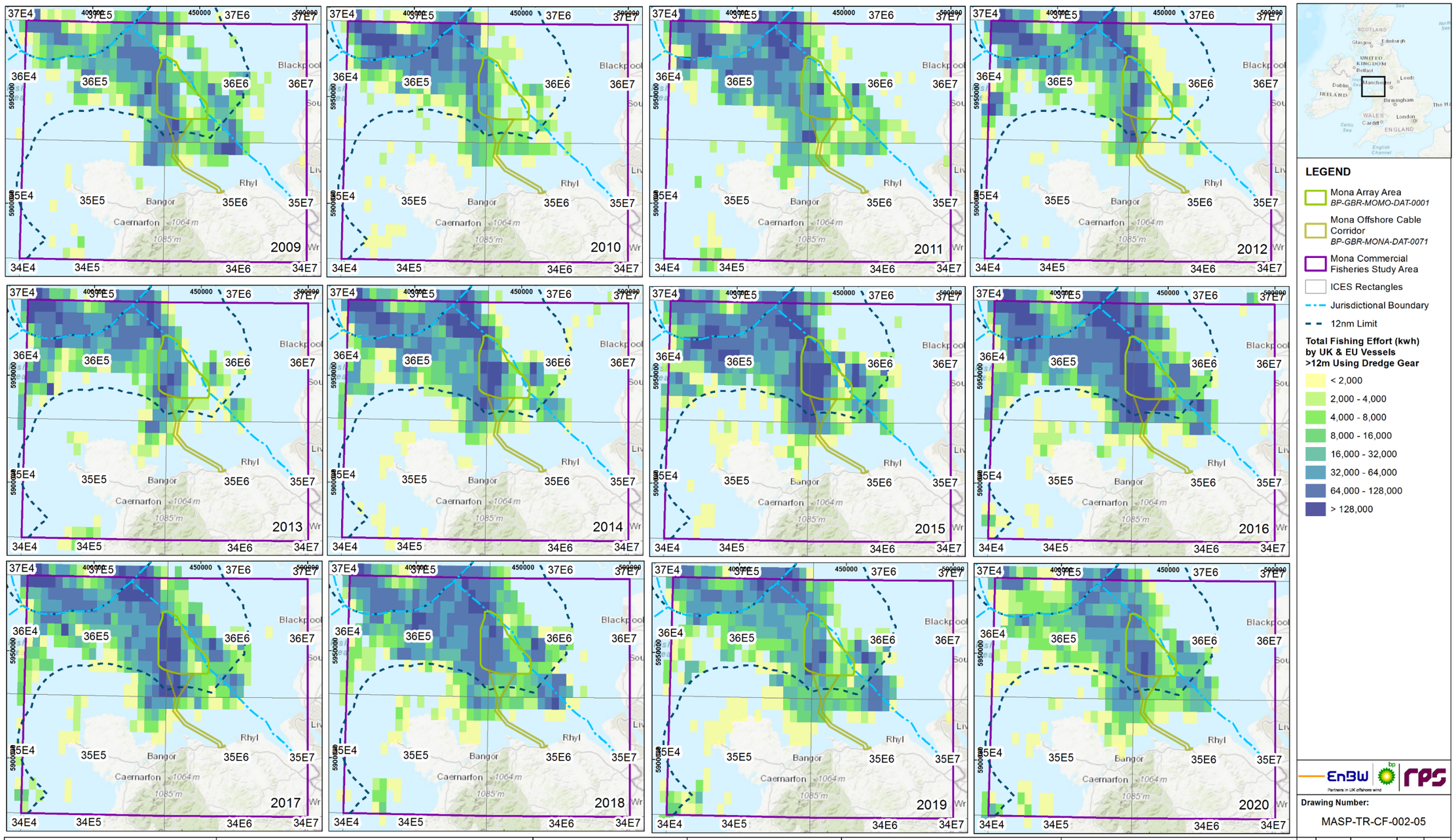


Figure 1.53: Annual fishing effort by vessels utilising dredges (UK and EU vessels >12m) (2009 to 2020)[49].

[49] ICES, 2020

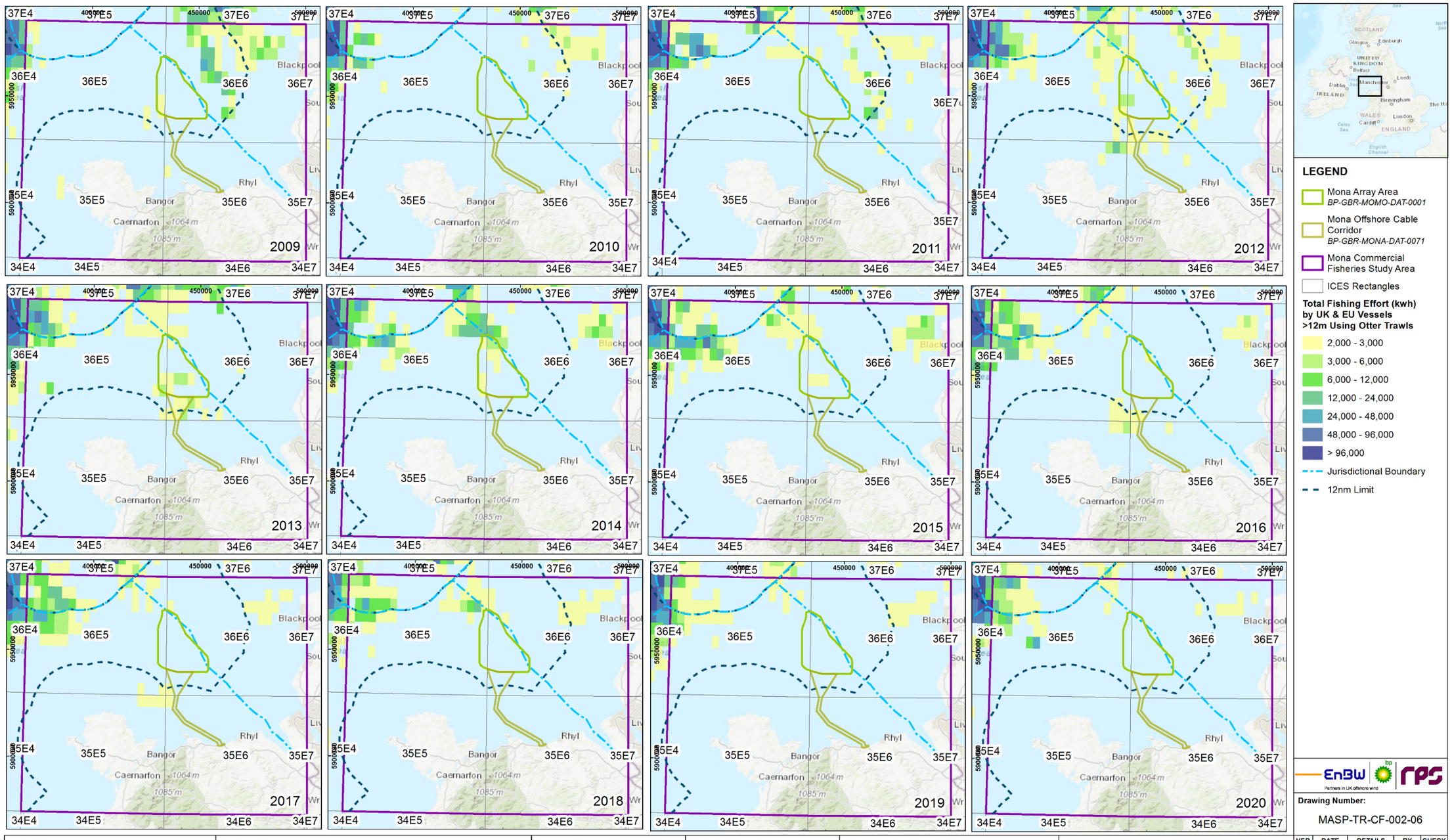


Figure 1.54: Annual fishing effort by vessels utilising otter trawls (UK and EU vessels >12m) (2009 to 2020)[50].

[50] ICES, 2020

Scallop grounds – ICES Scallop Assessment Working Group and consultation feedback

1.4.8.7 The ICES Scallop Assessment Working Group (WGSCALLOP) is one of numerous technical fisheries Working Groups established by ICES. WGSCALLOP specifically seeks to develop and improve stock assessment methods for scallop and increase understanding of scallop populations and fisheries.

1.4.8.8 WGSCALLOP mapped king scallop fishing activity in the Irish Sea based on VMS data from 2009-2019; the data displayed is preliminary, and in the process of being verified by ICES, so will be used to supplement VMS data. This information includes historical data, so may include areas where there is limited fishing intensity (particularly on the edges of the polygons). The VMS data analysed included information on vessels from England, Guernsey, Ireland Jersey, Isle of Man, Scotland and Northern Ireland.

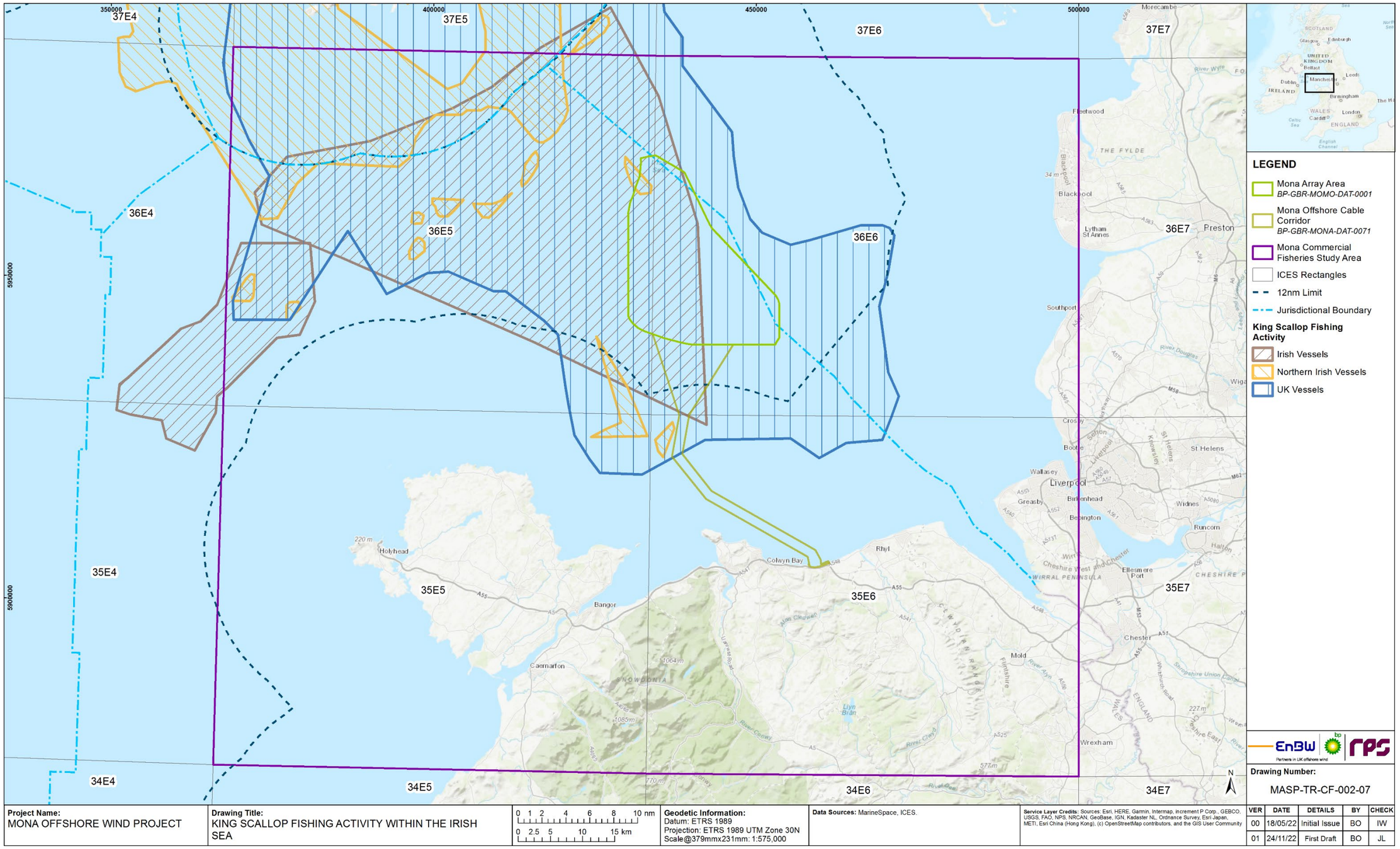
1.4.8.9 Figure 1.55 shows that the king scallop fishery in the Irish Sea overlaps with the majority of the Mona commercial fisheries study area that is beyond 12nm, including the Mona Array Area and offshore parts of the Mona Offshore Cable Corridor. Vessels engaging in the king scallop fishery from the UK showed the largest spatial extent of activity and overlapped with the whole of the Mona Array Area and the north part of the Mona Offshore Cable Corridor (including inside of the 12nm). Irish vessels overlapped with the west half of the Mona Array Area and the north part of the Mona Offshore Cable Corridor. There was a minor overlap of Northern Irish vessel activity and the northwest part of the Mona Array Area.

1.4.8.10 This information is generally consistent with feedback from project specific consultation, which suggested that the king scallop grounds cover a larger area than the queen scallop grounds in the Mona commercial fisheries study area (discussed below).

1.4.8.11 VMS data and feedback from fisheries stakeholders indicates that the central part of the Mona Array Area is the most important area for vessels targeting queen scallop; these areas are displayed in Figure 1.56 which has been produced through close liaison with Scottish fisheries stakeholders and is presented as a guide to inform this technical report.

1.4.8.12 The central band where queen scallop is mostly fished, constitutes sandy gravelly substrates. Other parts of the Mona Array Area are of lesser importance for commercial queen scallop fishing, but are recognised as important spawning areas, particularly in the area to the east. Fisheries stakeholders commented that the ground in the west of the Mona Array Area is rougher substrate and is important for king scallop (Figure 1.55).

1.4.8.13 Further information on the ecology of scallop is detailed in volume 6, chapter 8.1: Fish and shellfish ecology technical report of the PEIR.



Project Name: MONA OFFSHORE WIND PROJECT	**Drawing Title:** KING SCALLOP FISHING ACTIVITY WITHIN THE IRISH SEA	0 1 2 4 6 8 10 nm 0 2.5 5 10 15 km	**Geodetic Information:** Datum: ETRS 1989 Projection: ETRS 1989 UTM Zone 30N Scale@379mmx231mm: 1:575,000	**Data Sources:** MarineSpace, ICES.	**Service Layer Credits:** Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community	**Drawing Number:** MASP-TR-CF-002-07				
						VER	DATE	DETAILS	BY	CHECK
						00	18/05/22	Initial Issue	BO	IW
						01	24/11/22	First Draft	BO	JL

Figure 1.55: King scallop fishing activity within the Irish Sea[51].

[51] ICES (2017)

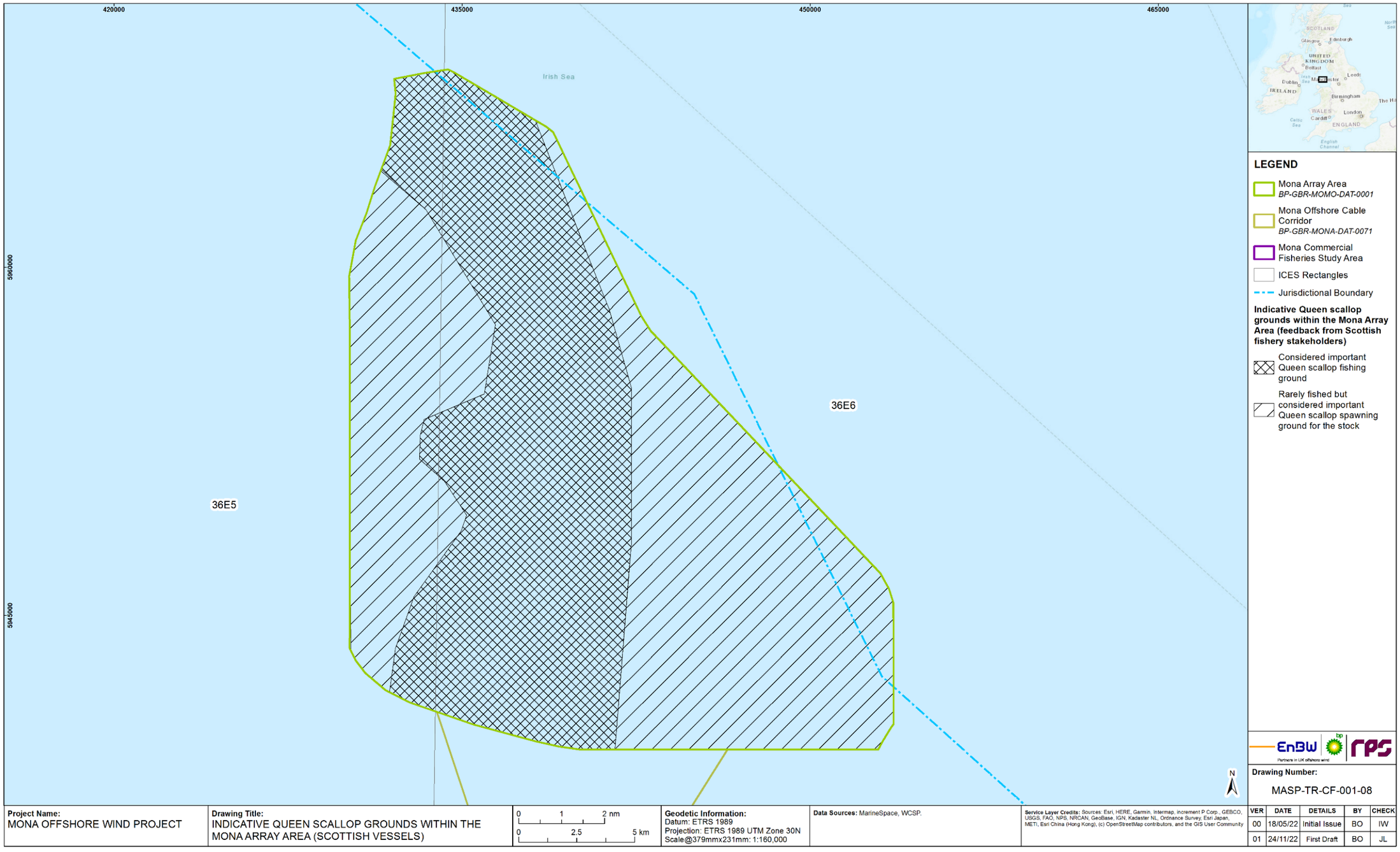


Figure 1.56: Indicative Queen scallop grounds within the Mona Array Area (Scottish vessels)[52].

[52] WCSP (2022)

Welsh Government

1.4.8.14 The Welsh National Marine Plan (WNMP) displays estimated relative fishing activity within Welsh waters. These datasets were compiled from multiple sources, of different spatial extents and resolutions. The maps are purely indicative in nature but have been used to supplement the VMS data which does not capture smaller fishing vessels. The indicative fishing activity illustrated, has been cross referenced with knowledge of the local fleets, based on feedback from informal consultations.

1.4.8.15 Figure 1.57 indicates that there was static gear activity across the entire Mona Offshore Cable Corridor and within the southeast and northwest parts of the Mona Array Area. This generally aligns with feedback from project specific consultation and information collected through site-specific surveys (section 1.4.9). Within the nearshore areas of the Mona Offshore Cable Corridor, static gear activity was slightly elevated.

1.4.8.16 Figure 1.58 indicates that mobile gear activity was relatively high within the west half of the Mona Array Area, which was also clear from VMS data and feedback from consultation. Within the Mona Offshore Cable Corridor, mobile gear activity was relatively high in the north part, with declining intensity towards the inshore areas.

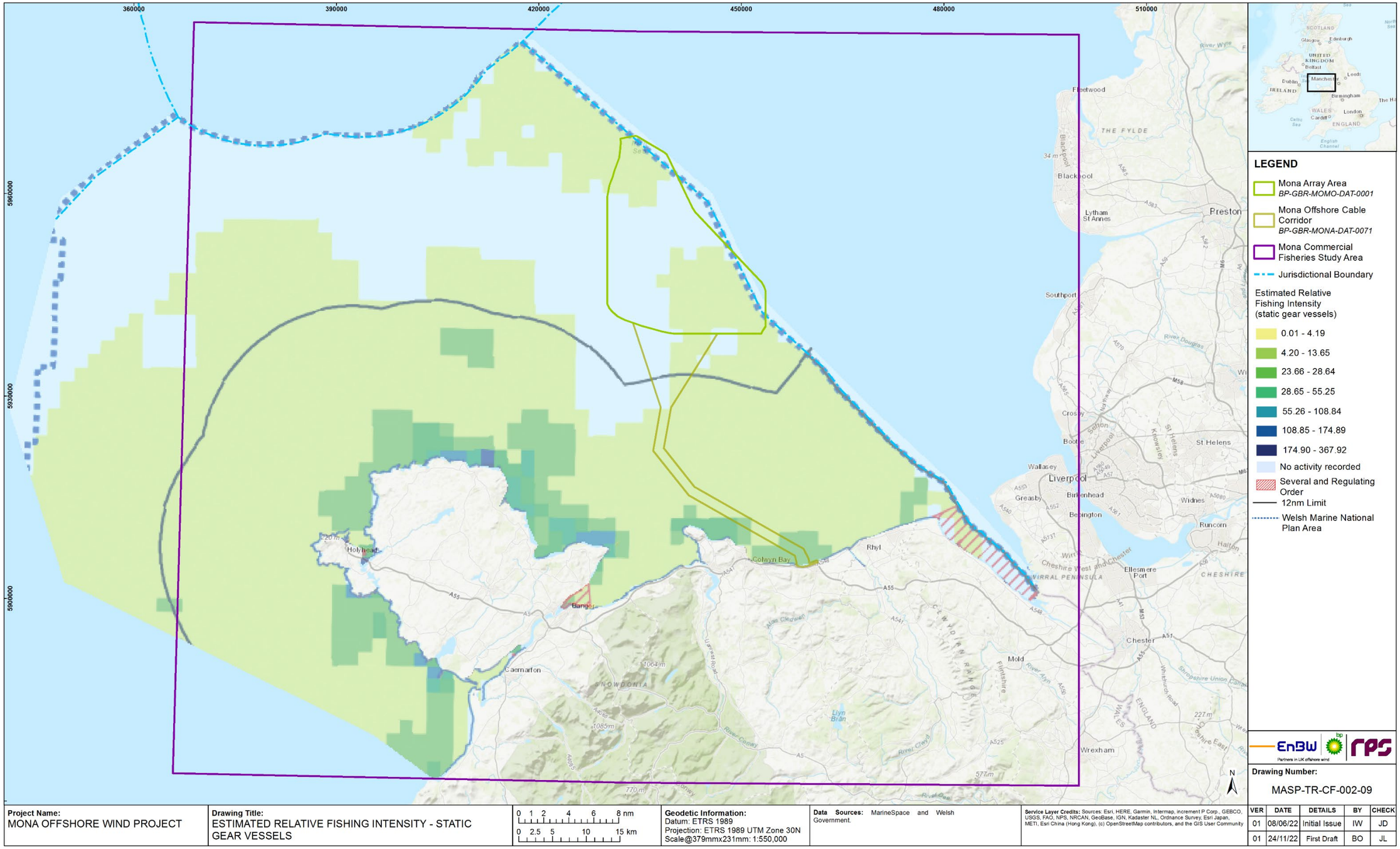
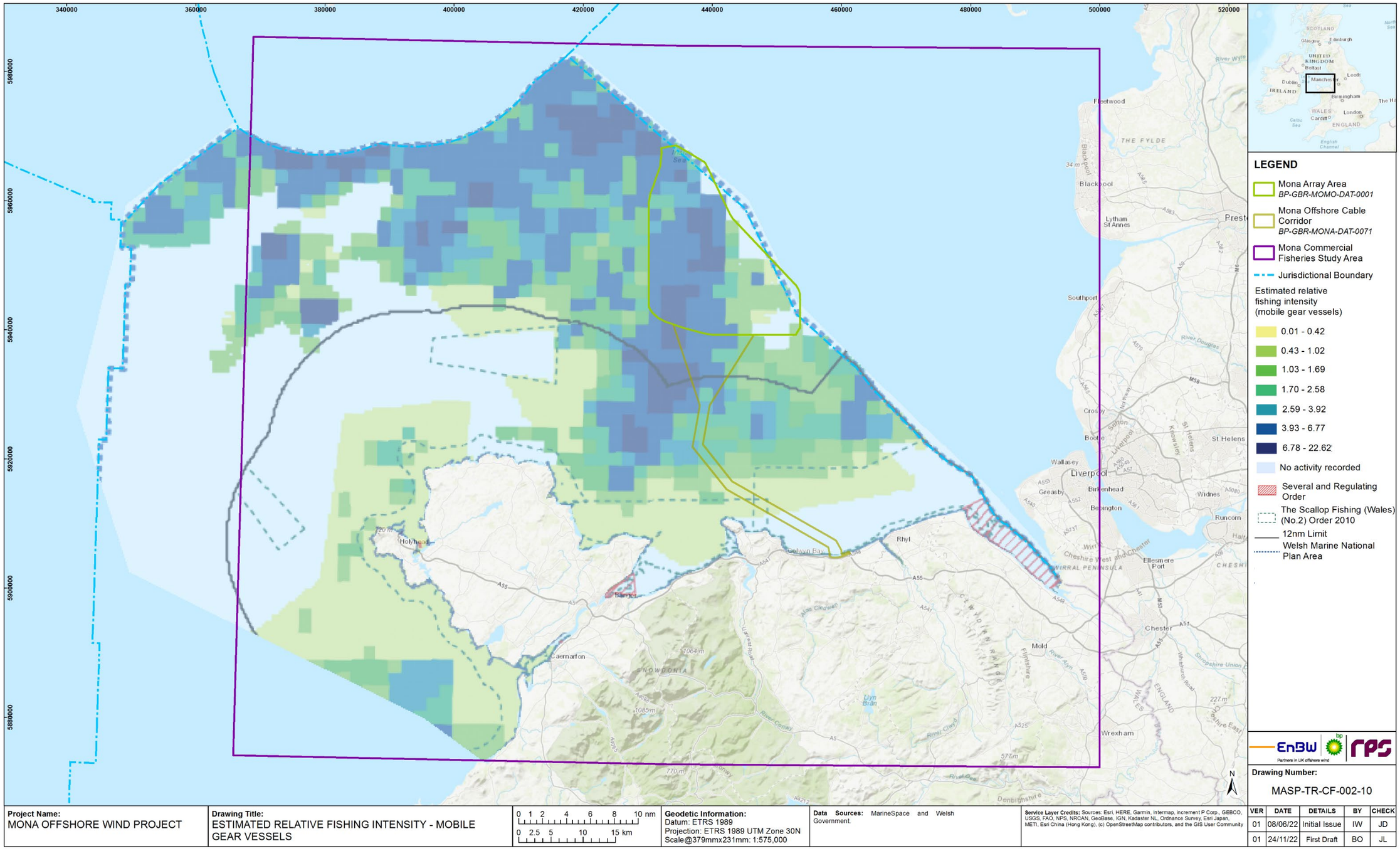


Figure 1.57: Estimated relative fishing intensity – static gear vessels[53].

[53] Welsh Government, 2019



Project Name: MONA OFFSHORE WIND PROJECT	**Drawing Title:** ESTIMATED RELATIVE FISHING INTENSITY - MOBILE GEAR VESSELS	0 1 2 4 6 8 10 nm 0 2.5 5 10 15 km	**Geodetic Information:** Datum: ETRS 1989 Projection: ETRS 1989 UTM Zone 30N Scale@379mmx231mm: 1:575,000	**Data Sources:** MarineSpace and Welsh Government.	**Service Layer Credits:** Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community	**Drawing Number:** MASP-TR-CF-002-10		

VER	DATE	DETAILS	BY	CHECK
01	08/06/22	Initial Issue	IW	JD
01	24/11/22	First Draft	BO	JL

Figure 1.58: Estimated relative fishing intensity – mobile gear vessels[54].

[54] Welsh Government, 2019

Sea Fishing Atlas of Wales

1.4.8.17 The Sea Fishing Atlas of Wales was compiled by the then Countryside Council for Wales (CCW) (now Natural Resources Wales) in 2010, from information collected between 2000-2005 from various sources including fishermen, fishery officers and fishery regulators, and other marine users (NRW, 2010). The maps produced by the project were purely indicative in nature and gave a general idea of where fishing activity was thought to have occurred at the given time; the data displayed is purely to provide an indication of activity of smaller inshore vessels which would not have been captured in the official datasets, as described above. There is a low level of confidence associated with this dataset. The indicative fishing activity illustrated has been cross referenced with knowledge of the local fleets based on feedback from informal consultations.

1.4.8.18 Figure 1.59 indicates that the whelk fishery overlapped with the Mona Offshore Cable Corridor between the 6nm and 12nm limit; this aligns with the MMO landings data which showed that whelk made up a large proportion of the landings in the Mona commercial fisheries study area and for nearby ports (section 1.4.5 and 1.4.7). However, feedback from consultation indicates that this fishery operates over a larger extent than shown in Figure 1.59. The data also shows that vessels using lobster pots, crab pots and set nets were active in the nearshore regions in the vicinity of the Mona Offshore Cable Corridor; static gear was observed within these regions during the scouting surveys (section 1.4.9).

1.4.8.19 Figure 1.60 indicates that beam trawls and otter trawls were used by vessels across a large part of the Mona commercial fisheries study area. This does not fully align with the VMS data (Figure 1.52), and feedback from consultations which indicates they were active in more discrete areas.

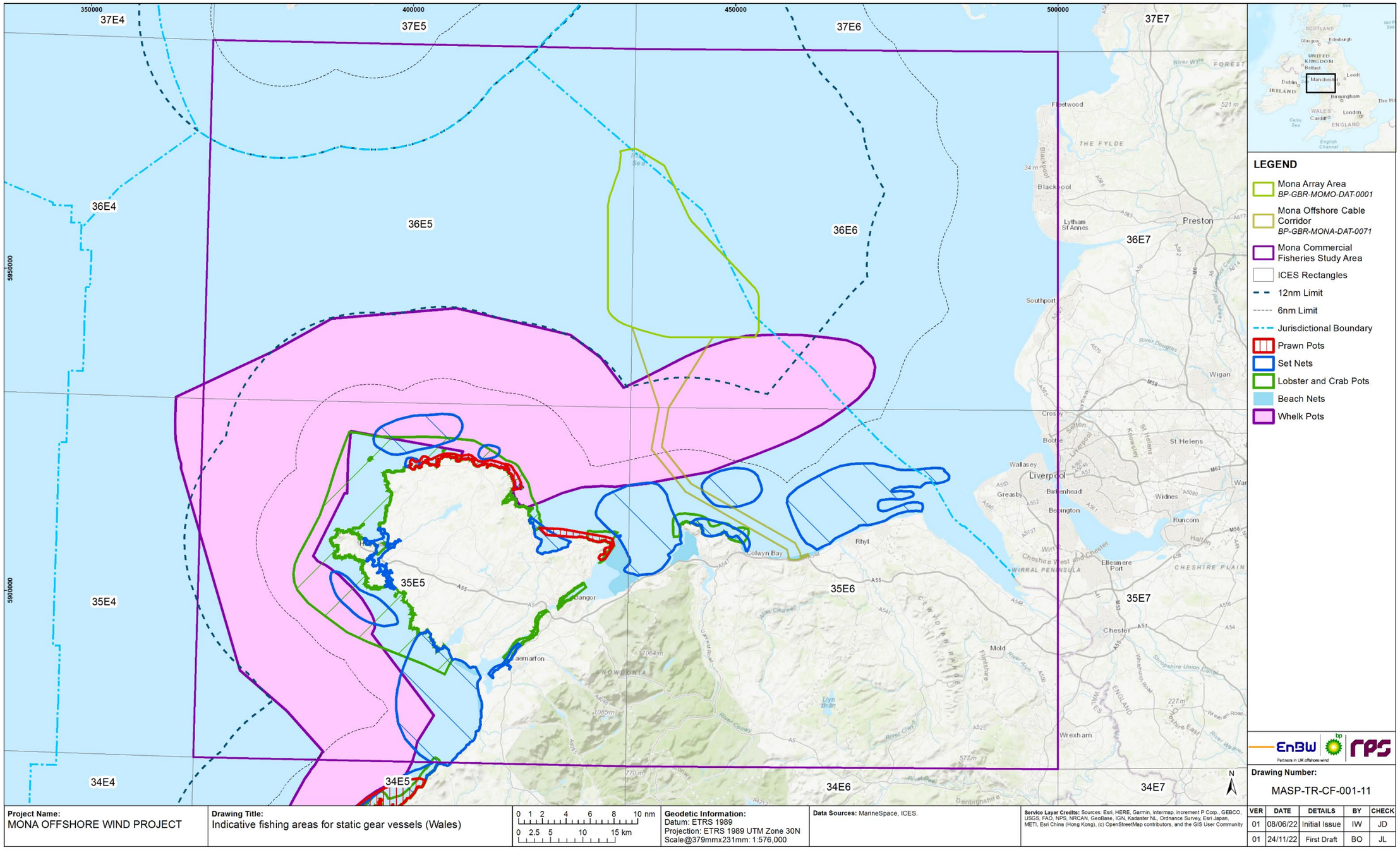


Figure 1.59: Indicative fishing areas – static gear vessels[55].

[55] NRW, 2010

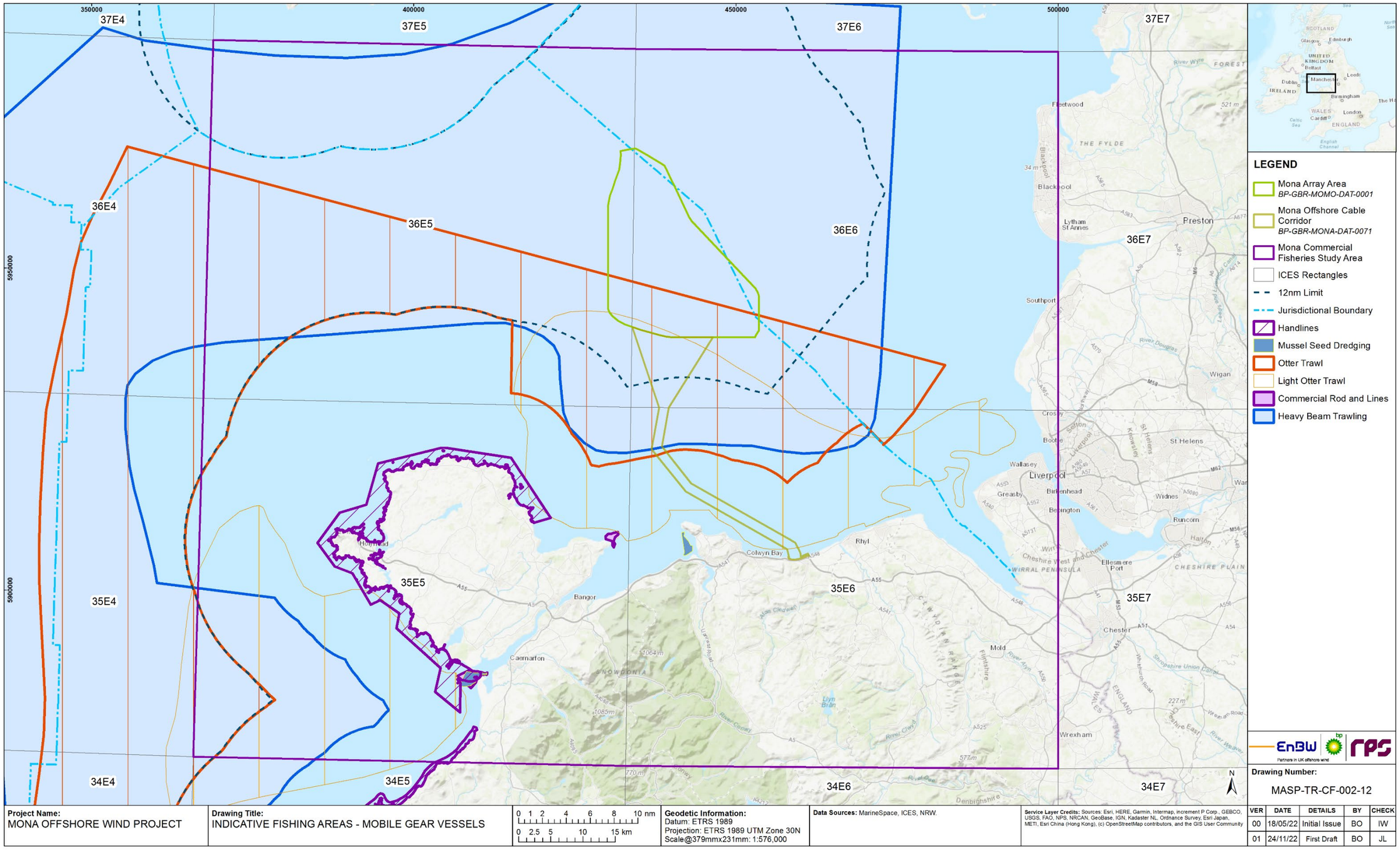


Figure 1.60: Indicative fishing areas – mobile gear vessels[56].

[56] NRW, 2010

1.4.9 Site-specific surveys

1.4.9.1 To complement the official commercial fisheries landings and activity data described in the previous sections, the following sections provide additional information on commercial fishing activity in the Mona commercial fisheries study area.

Vessel traffic surveys

1.4.9.2 A summary of the fishing vessels identified during the two project specific vessel traffic surveys (winter and summer) is presented in Table 1.6. Names and sizes of vessels were only captured by the AIS data, so there may have been additional fishing vessels active in the Mona commercial fisheries study area that are not listed here[57]. Figure 1.61 also displays fishing vessel tracks which were detected by radar from the same time periods as the vessel traffic surveys, however information is not provided on the individual fishing vessels.

Table 1.6: Summary of fishing vessels identified during the Mona vessel traffic surveys 05 to 19 December 2021 and 30 June to 14 July 2022.

Length (m)	Time Period	Vessel type	Nationality
Unknown	December 2021	Unknown	UK
13.2	December 2021	Static gear vessel (pots)	UK
13.39	July 2022	Static gear vessel	UK
15	July 2022	Scallop vessel (dredge)	UK
16	July 2022	Scallop vessel (dredge)	UK
16.4	July 2022	Static gear vessel / guard vessel	UK
18.25	December 2021	Guard vessel	UK
20.5	December 2021	Scallop vessel (dredge)	UK
20.5	December 2021	Guard vessel	UK
22.94	December 2021	Scallop vessel (dredge)	UK
23	December 2021	Scallop vessel (dredge)	UK
26.24	December 2021	Scallop vessel (dredge)	UK
30.57	December 2021	Scallop vessel (dredge)	UK
34.1	December 2021	Scallop vessel (dredge)	UK

1.4.9.3 During the winter survey, 10 fishing vessels were identified from the AIS data, six of which were scallop vessels, two were providing guard vessel services and one was a static gear vessel (Table 1.6). Of the 10 vessels, eight were >18m in length, one was 13.2m and one was unknown. The static gear vessel, which was 13.2m, would not be captured within the VMS data, which includes vessels ≥15m. All of the fishing vessels identified were UK registered. The two guard vessels were providing services to the Hibernia and Havhingsten submarine cables, and their tracks overlapped with the edges of the Mona Array Area (Figure 1.61).

1.4.9.4 Within the south and middle parts of the Mona Array Area there were tracks from two scallop vessels between the longitudes of 4˚W and 3.89˚W (Figure 1.61); these were assumed to be fishing as they showed an average speed of approximately 3.1 to 3.3 knots. This aligns with feedback from project specific consultation and analysis of VMS data which shows that scallop vessels tend to target the central and west parts of the Mona Array Area.

1.4.9.5 The tracks from the static gear vessel overlapped the east part of the Mona Array Area and appeared to be laying pots around a feature (the Admiralty Chart indicates a bank in this area); it appears that the pots are being laid in a north-south orientation, which aligns with feedback from project specific consultation.

1.4.9.6 The radar data collected during the winter survey indicated fishing activity either side of the Mona Array Area, but in relatively proximity to the Mona Array Area (Figure 1.61). The fishing activity approximately 2km east of the Mona Array Area appeared to be one vessel fishing north-south, with tow length approximately 5.5km in length, in a discrete area.

1.4.9.7 During the summer survey, four fishing vessels were identified from the AIS data, none of which were observed during the winter survey. Of the four vessels, one was a static gear vessel which was recorded as providing guard vessel services (16.4m in length), another was a static gear vessel (13.39m in length) and two were scallop vessels (15 and 16m in length) (Table 1.6). All fishing vessels identified were UK registered.

1.4.9.8 Of the four fishing vessels detected by AIS during the summer survey, the guard vessel and whelk vessel were identified within the Mona Array Area, within the northeast part (Figure 1.62). One of the scallop vessels was assumed to be fishing as its speeds were between approximately 2.3 to 4.8 knots; it was observed fishing in a north-west to south-east direction between the Lanis 1 submarine cable and the English – Welsh jurisdictional boundary, approximately 3.3km north of the Mona Array Area. The other scallop vessel appeared to be transiting, just north of the Mona Array Area. The static gear vessel, which was 13.39m in length, was recorded in the northeast part of the Mona Array Area. The radar data collected during the summer survey showed two separate tracks, one within the central southern part of the Mona Array Area and another east of the Mona Array Area (Figure 1.62).

[57] It has been observed that some scallop vessels which fish in the area turn off their AIS during fishing, so may only be captured during steaming.

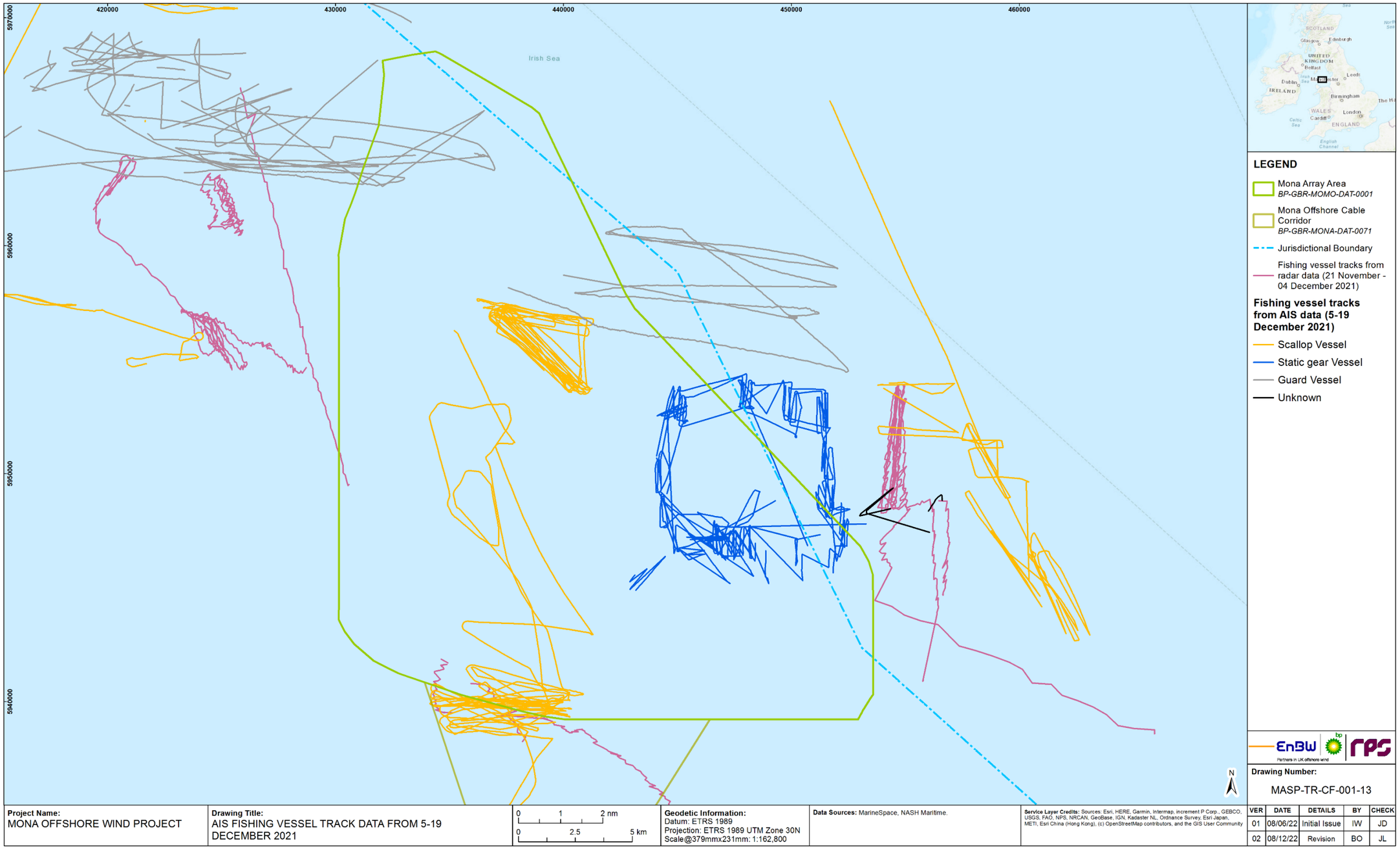


Figure 1.61: AIS fishing vessel track data from 5 to 19 December 2021[58].

[58] NASH Maritime, 2021

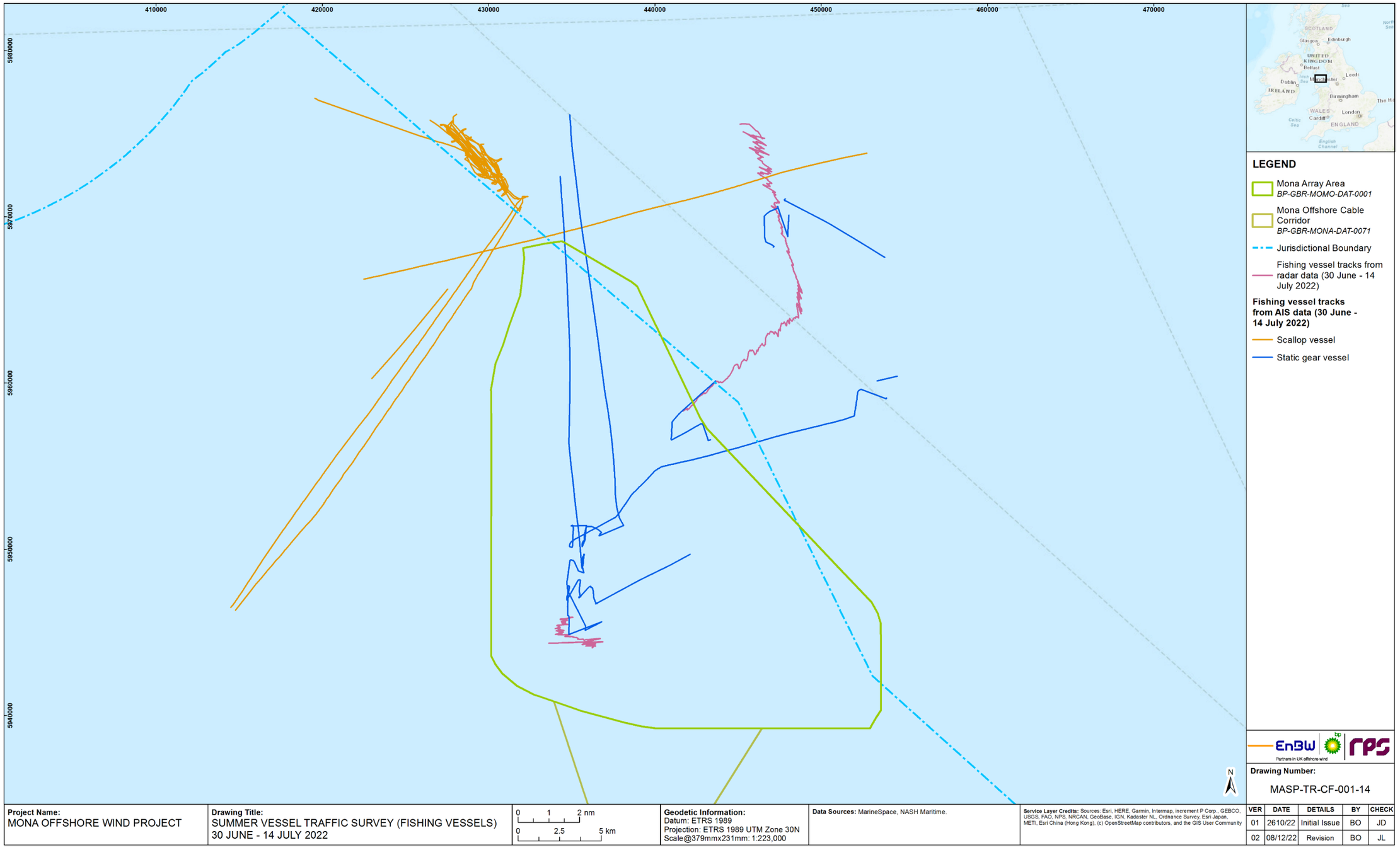


Figure 1.62: AIS fishing vessel track data from 30 June to 14 July 2022.[59]

[59] NASH Maritime, 2022

OFLO and MarineSpace observations

1.4.9.9 A summary of the fishing vessels identified by the OFLO present during the offshore geophysical, environmental and geotechnical surveys undertaken in 2021 and 2022 is presented in Table 1.7. OFLO observations were recorded during the periods 30 June – 18 September 2021 and 01 April – 10 July 2022 and MarineSpace undertook fisheries monitoring fisheries observations until 30 November 2022.

1.4.9.10 Figure 1.63 displays all the observations recorded by the OFLO and MarineSpace, however it is important to note that not all vessels were observed within the Mona commercial fisheries study area or within the Mona Array Area or Mona Offshore Cable Corridor. Table 1.7 outlines the fishing vessels which were identified within the Mona commercial fisheries study area, and notes which vessels were identified within the Mona Array Area and Mona Offshore Cable Corridor.

Table 1.7: Summary of fishing vessels identified by the OFLO and MarineSpace during offshore surveys.

Length (m)	Vessel type	Nationality	Commercial fisheries study area	Mona Array Area	Mona Offshore Cable Corridor
No information	Scallop vessel (dredge)	UK	Y		
No information	Scallop vessel (dredge)	UK	Y		
No information	Otter trawler	France	Y		
10	Otter Trawler	UK	Y		
11.6	Unknown	UK	Y	Y	
12	Static gear vessel	UK	Y	Y	
13.2	Static gear vessel	UK	Y	Y	Y
13.39	Static gear vessel	UK	Y	Y	
13.58	Scallop vessel (dredge)	UK	Y	Y	Y
13.97	Scallop vessel (dredge)	UK	Y		
14.11	Otter trawler	UK	Y	Y	
14.73	Scallop vessel (dredge)	UK	Y	Y	
14.95	Otter trawler	UK	Y		
14.96	Scallop vessel (dredge)	UK	Y		
16	Scallop vessel (dredge)	UK	Y	Y	Y
16.4	Static gear vessel	UK	Y	Y	
17.13	Static gear vessel	UK	Y		
17.99	Trawler	UK	Y		
18.9	Scallop vessel (dredge)	UK	Y	Y	
20.5	Scallop vessel (dredge)	UK	Y	Y	
21.3	Scallop vessel (dredge)	UK	Y	Y	
22.4	Trawler	UK	Y		
22.94	Scallop vessel (dredge)	UK	Y	Y	
23.66	Scallop vessel (dredge)	UK	Y	Y	
24.46	Scallop dredger	Ireland	Y		
29.86	Beam trawler	UK	Y	Y	
34	Beam trawler	Belgium	Y		
34.1	Trawler	UK	Y		
37	Beam trawler	Belgium	Y		
37	Beam trawler	Belgium	Y		
38	Beam trawler	Belgium	Y		
38.9	Beam trawler	Belgium	Y		
40	Beam trawler	Belgium	Y	Y	
43.51	Trawler	UK	Y		

1.4.9.11 During the offshore surveys a total of 34 fishing vessels were observed by the OFLO and MarineSpace within the Mona commercial fisheries study area, 16 of which were observed within the Mona Array Area and 2 of which were observed within the Mona Offshore Cable Corridor. The majority of vessels observed within the Mona commercial fisheries study area were from the UK, with vessels also from Belgium, France and Ireland. Offshore static gear vessels showed the largest spatial extent, with activity across the study area. Scallop vessels were active within the central area of the Mona commercial fisheries study area. Relatively high densities of beam trawl vessels were observed east of the Mona Array Area, beyond the 12nm.

1.4.9.12 Within the Mona Array Area, the only non-UK vessel which was observed was a beam trawl vessel from Belgium, which appeared to be transiting to fishing grounds east of the Mona Array Area (Figure 1.63); this aligns with the information presented in 1.4.3 and with feedback from consultation. A beam trawl vessel from the south coast of England was identified within the south part of the Mona Array Area, which aligns with feedback from consultation. Seven scallop dredge vessels were recorded within the Mona Array Area, generally within the central part, particularly in the most northerly and southerly areas. Four static gear vessels were observed across the Mona Array Area.

1.4.9.13 Two scallop dredge vessels and one static gear vessel were observed within the north part of the Mona Offshore Cable Corridor. There were all identified beyond the 12nm.

1.4.9.14 Static gear (crab and whelk pots) was also recorded and observed within the Mona Array Area and along the Mona Offshore Cable Corridor, but the exact locations of this gear are not shown here due to commercial sensitivities.

1.4.9.15 Figure 1.63 indicates that fishing vessels may transit through the Mona Array Area, for example between Fleetwood and fishing grounds within the wider Irish Sea region.

1.4.9.16 Few scallop vessels were observed by the OFLO during the 2021 and 2022 offshore surveys. This is likely due to the surveys overlapping with the seasonal closures for both queen and king scallop in the Irish Sea and vessels working in other areas to avoid interactions with the survey vessels. Some scallop vessels were also observed transiting towards the fishing grounds within the Mona Array Area but turning AIS off once they started fishing.

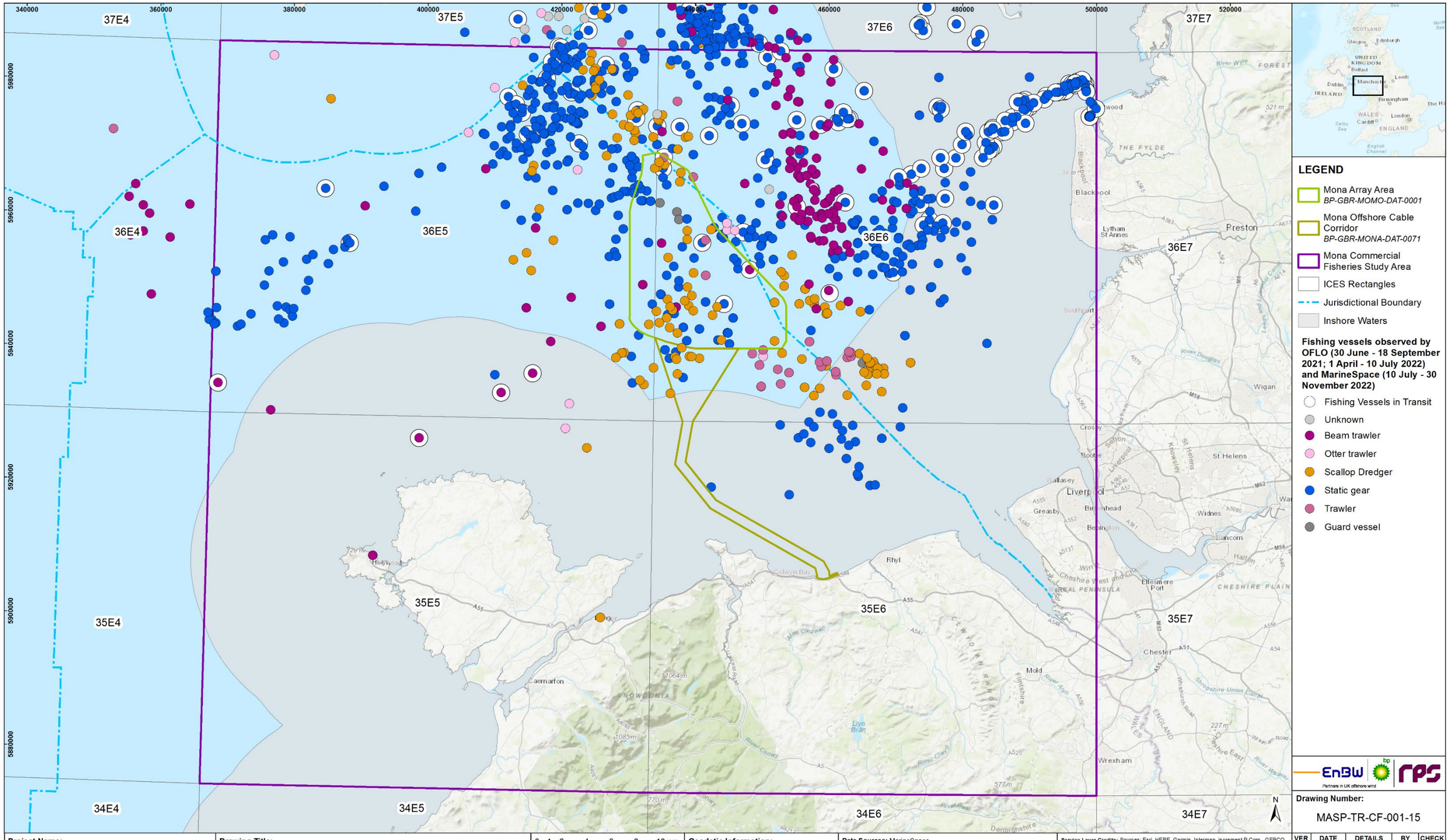


Figure 1.63: Observations of fishing vessels by the OFLO (30 June to 18 September 2021 and 01 April to 10 July 2022) and MarineSpace (10 July - 30 November 2022).

Scouting surveys

1.4.9.17 During the scouting surveys of the Mona Offshore Cable Corridor in March 2022 there were 12 sightings of static gear. All sightings were recorded along the first 15km of the route. The NFFO commented that static gear vessels had not all started relaying gear after the winter, so in these nearshore areas there may be higher levels of gear observed later in the year.

1.5 Future baseline

1.5.1.1 The baseline environment for commercial fisheries is constantly evolving, as the fishing industry is dynamic, with frequent and sometime unpredictable changes which affect activity, such as changes in fish abundance and distribution, climatic conditions, management regulations and fuel costs (DECC, 2016). A review by the Irish Sea Maritime Forum highlighted that 'Brexit', overfishing and spatial conflict are considered key future issues for the fishing industry (Salthouse, 2021).

1.5.1.2 The baseline was described using the most recent datasets available over at least a 4-year time period and, where possible, using a 10-year time period. This should account for variations within the different fisheries, for example the scallop fishery within the Mona commercial fisheries study area is cyclical over seven to eight year periods. Feedback from project specific consultation indicated that reduced levels of queen scallop were observed between 2017-2020, so the next few years are expected to see higher catches and, therefore, a higher level of activity. The future baseline scenario is expected to reflect the cyclical nature of the fisheries which is observed in the datasets analysed.

1.5.1.3 Within the Mona commercial fisheries study area, the impacts of 'Brexit' on the commercial fisheries baseline are uncertain. Fisheries within UK waters were managed through the European Union (EU) Common Fisheries Policy (CFP) prior to the withdrawal of the UK in 2021. Under the new EU-UK Trade and Cooperation Agreement there is a 5-year transition period, whereby 25% of the EU quota for British waters will be transferred to the UK fishing fleet, phased across the five years until 2025. As a result, the UK will receive higher quota shares for some stocks, as outlined in Table 1.8 for species within the Irish Sea. However, a large proportion of landings within the Mona commercial fisheries study area are from non-quota shellfish species, so will not be affected by the quota changes. Quota allocations for 2026 and beyond are likely to be the same as for 2025 and access to EU/UK waters will be subject to annual negotiations. The introduction of the Catch Certificate and other supporting documents, as well as changes to tariffs could act as a barrier to the UK fishing fleet exporting landings to the EU.

Table 1.8: Quota share changes by 2026 for the UK, for species within the Irish Sea[60].

Stock	2020 UK share of EU quota	2026 UK share of EU/UK quota or TAC	UK quota absolute increase
Herring	73.97%	99.01%	25%
Plaice	41.15%	51.11%	10%
Haddock	47.91%	56.02%	8%
Whiting	38.70%	61.00%	22%
Cod	28.79%	44.80%	16%
Sole	21.01%	23.30%	2%

[60] ABPmer, 2021

1.5.1.4 Irish and Belgian vessels are the main non-UK vessels that are active within the Mona commercial fisheries study area. At present, it is not clear how their activity will change post 2026, as they predominantly catch species which are subject to quota allocations. Inshore UK vessels in the Mona commercial fisheries study area generally target non-quota shellfish species, but they could be affected by potential tariff and non-tariff barriers if exporting to the EU.

1.5.1.5 Other pressures on the fishing industry, such as rising fuel costs or potential designations of marine protected areas could affect the commercial fisheries baseline. The impact of the Covid-19 pandemic may not yet be seen in the official datasets (most recent two years of data is not currently available), but there could be changes within the fishing industry due to adapting to, and recovering from, the pandemic.

1.5.1.6 Cumulative impacts on commercial fisheries, including those from proposed offshore developments, are considered in volume 2, chapter 11: Commercial fisheries of the PEIR.

1.6 Summary

1.6.1.1 A description of baseline fishing activity in the region of the Mona Offshore Wind Project has been undertaken via a review of official landings and fishing activity data, feedback from fisheries stakeholders and site-specific surveys.

1.6.1.2 Within the commercial fisheries study area, the key commercial fishing fleets identified were:

- Dredging and trawling for king scallop and queen scallop
- Potting for whelk, crab and lobster
- Beam trawling for flatfish and other demersal finfish
- Trawling for herring.

1.6.1.3 Shellfish account for the largest proportion of landings in the Mona commercial fisheries study area, and dredge and pots were the dominant gear types. This reflects the importance of the king scallop, queen scallop and whelk fisheries in this region, all of which are targeted and captured within the Mona Array Area and Mona Offshore Cable Corridor.

1.6.1.4 Whereas the king scallop grounds are relatively extensive, the queen scallop grounds within the central parts of the Mona Array Area are much more discrete and are heavily relied on by the UK and non-UK fleets. The scallop fisheries are seasonal due to existing closures in the Irish Sea.

1.6.1.5 The whelk fishery within the Mona commercial fisheries study area, including the Mona Array Area, comprises a range of vessel sizes; there are several UK commercial fisheries operators which are able to operate all year round.

1.6.1.6 Beam trawling for flatfish is undertaken predominantly by several vessels from Belgium and the southwest of England. These vessels are generally active in the commercial fisheries study area during the spring, and mostly fish east of the Mona Array Area.

1.6.1.7 Trawling and netting for herring is mostly undertaken by several vessels from Northern Ireland and England; this fishery is very seasonal and occurs mainly during June and July.

1.6.1.8 Within the Mona commercial fisheries study area, fishing activity occurs at lower levels around the coast and activity is generally from static gear vessels. Within the Mona Offshore Cable Corridor, there are several smaller static gear vessels that are active, and which operate out of ports along the North Wales coast.

1.7 References

ABPmer (2021) EU-UK Trade and Cooperation Agreement. Thoughts on fisheries from a UK perspective. White Paper.

Bloor, I., Dignan, S., Murray, L., and Kaiser, M. (2015) Bycatch Survey – Isle of Man Queen Scallop Otter Trawl Fishery Summer 2014. Fisheries & Conservation Report, Bangor University, 67, 14.

Cappell, R., Huntington, T., Nimmo, F., and MacNab, S. (2018) UK Scallop Fishery: Current Trends, Future Management Options and Recommendations. Report produced by Poseidon Aquatic Resource Management Ltd. 2-45.

DECC (Department of Energy and Climate Change). (2016) Offshore Energy Strategic Environmental Assessment 3 (OESEA 3). Available at: https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-3-oesea3. Accessed January 2022.

Delargy, A., Hold, N., Lambert, G., Murray, L., Hinz, H., Kaiser, M., McCarthy, I., and Hiddink, J. (2019) Welsh waters scallop surveys and stock assessment. Bangor University, Fisheries and Conservation Report, 75, 48.

Dickey-Collas, M., Nash, R.D.M., and Brown, J. (2001) The location of spawning Irish Sea herring (Clupea harengus). Journal of the Marine Biological Association of the United Kingdom, 81, 713–714.

Duncan, P.F., and Emmerson, J. (2018) Commercial Fisheries & Sea Angling. In: Manx Marine Environmental Assessment (2nd Ed.). Isle of Man Government. 71.

Eigaard, O.R., Bastardie, F., Breen, M., Dinesen, G.E., Hintzen, N.T., Laffargue, P., Mortensen, L.O., Nielsen, J.R., Nilsson, H.C., O'Neill, F.G., Polet, H., Reid, D.G., Sala, A., Sko¨ld, M., Smith, C., Sorensen, T.K., Tully, O., Zengin, M., and Rijnsdorp, A.D. (2016) Estimating seabed pressure from demersal trawls, seines, and dredges based on gear design and dimensions. – ICES Journal of Marine Science, 73: i27–i43.

EU STECF (Scientific, Technical and Economic Committee for Fisheries) (2017) Fisheries Dependent Information: Landings and effort (hours fished) data 2018. Available at: https://stecf.jrc.ec.europa.eu/dd/effort/graphs-quarter. Accessed January 2022.

Grieve, C., Brady, D.C., and Polet, H. (2014) Best practices for managing, measuring and mitigating the benthic impacts of fishing. Part 1. Marine Stewardship Council Science Series. 2: 18 – 88.

Howarth, L., and Stuart, B. (2014) The dredge fishery for scallops in the United Kingdom (UK): effects on marine ecosystems and proposals for future management. Marine Ecosystem Management Report, University of York, 5, 54.

ICES (2017) Interim Report of the Scallop Assessment Working Group (WG Scallop).

ICES (2020) Spatial Data Layers of Fishing Intensity/Pressure per Gear Type for Surface and Subsurface Abrasion, for the Years 2009 to 2017 in the OSPAR Regions (ver. 2, 22 January 2019): ICES data product release, Available online at: http://doi.org/10.17895/ices.data.4685. Accessed January 2022.

ICES (2021a) ICES Advice on fishing opportunities, catch and effort. Celtic Sea ecogregion. Sole (*Solea solea)* in Division 7.a (Irish Sea). Version 2.

ICES (2021b) ICES Advice on fishing opportunities, catch and effort. Celtic Sea ecogregion. Herring (*Clupea harengus)* in Division 7.a North of 53 °30'N (Irish Sea).

Jenkins, S., Lart, W., Vause, B., and Brand, A. (2003) Seasonal swimming behaviour in the queen scallop (*Aequipecten opercularis*) and its effect on dredge fisheries. Journal of Experimental Marine Biology and Ecology, 289(2), 163-179.

Kaiser, M.J., Hill, A.S., Ramsay, K., Spencer, B.E., Brand, A.R., Veale, L.O., Prudden, K., Rees, E.I.S., Munday, B.W., Ball, B., and Hawkins, S.J. (1996) Benthic disturbance by fishing gear in the Irish Sea: a comparison of beam trawling and scallop dredging. Aquatic Conservation: Marine and Freshwater Ecosystems, 6(4), 269-285.

MacNab, S., and Nimmo, F. (2021) Awel y Môr Offshore Wind Farm Commercial Fisheries Baseline Report. Report, Poseidon Aquatic Resources Management Ltd.

MarineTraffic (2022) Global Ship Tracking Intelligence. Available at: www.marinetraffic.com. Accessed May 2022.

MMO (Marine Management Organisation). (2020a) UK fleet landings by ICES Rectangle (2010-2020). Available at: https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2019. Accessed January 2022.

MMO (Marine Management Organisation). (2020b) UK fleet landings and foreign fleet landings into the UK by port (2009-2020). Available at: https://www.gov.uk/government/statistical-data-sets/uk-fleet-landings-and-foreign-fleet-landings-into-the-uk-by-port. Accessed January 2022.

MMO (Marine Management Organisation). (2021a) Fish Landings to UK Ports. Available at: https://environment.data.gov.uk/dataset/229f21dc-9e8e-4e48-95db-f81bcfc13caa. Accessed January 2022.

MMO (Marine Management Organisation). (2021b) Fishing activity for UK vessels 15m and over, using Vessel Monitoring Systems data (2016-2020). Available online at: https://environment.data.gov.uk/dataset/229f21dc-9e8e-4e48-95db-f81bcfc13caa. Accessed April 2022.

MMO (Marine Management Organisation). (2022) May 2022 Fishing Vessel List. Available at: https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/ukbusinessactivitysizeandlocation. Accessed May 2022.

NASH Maritime, 2021. Project Mona: Marine vessel traffic survey results.

NRW (Natural Resource Wales) (2010) Sea Fishing Atlas of Wales. Provided by NRW via email 2018.

NWWAC (2013) The Irish Sea Sole-Stock: A ''Sole'' Belgian Problem? Working Document for the NWW RAC, Working Group 4-Irish Sea (bijdrage Vanhaecke Hilde, Moreau Kelle, Nimmegeers Sofie, Torreele Els). 1-23.

Office for National Statistics (2022) Official Labour Market Statistics – UK Business Counts. Available at: https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/ukbusinessactivitysizeandlocation. Accessed January 2022.

Salomonsen, H., Lambert, G., Murray, L. and Kaiser, M. (2015) The spawning of King scallop, *Pecten maximus*, in Welsh waters – A preliminary study. Fisheries & Conservation report, Bangor University, 57, 21.

Salthouse, C. (2021) The Future and Changing Context of the Irish Sea in 2020s. Irish Sea Maritime Forum, 9-87.

Seafish. (2022) Basic Fishing Methods. Available at: https://www.seafish.org/document/?id=9f2fcd97-8bef-4c28-9185-b219b8eedf8a. Accessed May 2022.

Walmsley, S., and Pawson, M. (2007) The coastal fisheries of England and Wales, Part V: a review of their status 2005-6. Sci. Ser. Techn. Rep. CEFAS Lowestoft, 140, 6-78.

WCSP (2022) Indicative queen scallop grounds produced using VMS data, plotter data from fisheries stakeholders and discussions with fisheries stakeholders.

Welsh Government (2019) Welsh National Marine Plan.

Welsh Government. (2020) Whelk Management Measures 2020. Report Number WG39405. Available at: https://gov.wales/sites/default/files/consultations/2020-03/whelk-management-consultation-document.pdf. Accessed May 2022.

WG Scallop (2020) Scallop Assessment Working Group (WGSCALLOP). ICES Scientific Reports, 111(2), 57.