Seagreen Phase 1 Wind Farm

Commercial Fisheries Technical Report
Appendix 11A

May 2018

Brown & May Marine Ltd.

Project Title/Location	Seagreen Phase 1 Wind Farm
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Seagreen Phase 1 Wind Farm

Commercial Fisheries Technical Report Appendix 11A

Undertaken by

Brown & May Marine Limited

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Term	Definition / Description
AIS	Automatic Identification System
AMSGA	Arbroath and Montrose Static Gear Association
ASFA	Anglo-Scottish Fishermen's Association
BMM	Brown and May Marine
Bottom (demersal) otter trawling	Fishing whereby a single net is towed behind the vessel on the seabed
CFP	Common Fisheries Policy
Creels	Baited pots used to capture crab and lobster
Demersal	Refers to either fishing gears fished on the seabed or fish species associated with the seabed
EC	European Commission
EU	European Union
FIR	Fisheries Industry Representative
Fleet	Series of creels attached to a mainline, anchored to the seabed and marked with buoys at either end
FLO	Fisheries Liaison Officer
HP	Horse Power
ICES	International Council for the Exploration of the Sea
ICES Statistical Rectangles	The spatial units by which fisheries data are recorded, collated and analysed.
KW	Kilowatt
MS(S)	Marine Scotland (Science)
MS-LOT	Marine Scotland Licensing Operations Team
OFLO	Offshore Fisheries Liaison Officer
Pair Trawling	Fishing method where two vessels tow one large net along the seabed between them
Pelagic	Refers to fishing gear fished in the water column as opposed to seabed or fish present mid-water (e.g. herring, mackerel)
Scallop dredging	Fishing method used to catch scallops. Heavy dredges are towed along the seabed with teeth which rake scallops from the seabed
Seine netting	Fishing method which works by encircling a shoal of fish with ropes laid on the seabed. The fish are herded into the net when the (stationary) vessel begins to retrieve the net
SFF	Scottish Fishermen's Federation
SWFPA	The Scottish White Fish Producers Association
Twin Rig Otter Trawling	Fishing method which effectively uses two nets which are towed behind the vessel. The use of two nets increases the area of seabed covered.
VMS	Vessel Monitoring System. Satellite tracking system used to track positions of EU vessels
Whitefish	Refers to species such as cod, haddock and whiting

1.0 Summary

The key fisheries operating, to varying degrees, within the regional area of the optimised Seagreen Project, which comprises of two offshore wind farm developments named Project Alpha and Project Bravo, are:

- scallop dredging;
- creel fishing;
- *Nephrops* trawling;
- squid trawling; and
- whitefish trawling.

Scallop dredging continues to be the predominant activity within the areas relevant to Project Alpha and Project Bravo. The majority of vessels involved in this fishery are the larger class of nomadic vessels, which operate over the course of a year and target extensive grounds around much of the UK. Direct consultation with fishermen local to the project, identified four to five locally based scallop dredgers, whose operating ranges are less than that of nomadic vessels and confined to grounds off the north-east coast of Scotland.

Over the past 17 years, there has been a progressive increase in the landings of scallops in the area relevant to Project Alpha and Project Bravo and in UK waters as a whole. The available data suggests that in the area under consideration, a typical pattern of cyclical exploitation exists, whereby an area is more intensively fished for two to three years and then left to recover for a period of typically seven to ten years.

Creeling occurs predominantly inshore, operating smaller vessels, which target crab and lobster. Through consultation it is understood that currently three creel fishing vessels target small areas on the western boundary of the Project Alpha site. Expansion of creeling grounds is understood to be mainly as a result of the relatively recent acquisition by certain skippers of vessels with significantly higher steaming speeds and therefore extended operational ranges.

In the case of the *Nephrops* fishery, information obtained through consultation with local fishermen indicates that the defined *Nephrops* fishing grounds do not coincide with the Project Alpha and Project Bravo sites.

The general pattern of squid trawling showed notable inter-annual variation occurring in both fishing effort and landings across the regional study area with lower levels occurring in ICES rectangle 42E8 in which Project Alpha and Project Bravo are located.

In the regional study area, whitefish species (particularly haddock) are targeted in further offshore grounds with negligible activity by this fishery in the immediate area of Projects Alpha and Bravo.

Predicting future patterns of fishing activity is difficult and to an extent subjective. Changes to fisheries regulation in addition to the potential effects of “Brexit”, may impact commercial fishing within the North Sea. It is however possible that much of the current patterns of fishing activity may remain largely as they are, following the end of the “Brexit” transition phase.

2.0 Introduction

The following Commercial Fisheries Technical Report for the optimised Seagreen Project, which comprises of Seagreen Alpha OWF (hereafter referred to as 'Project Alpha') and Seagreen Bravo OWF (hereafter referred to as 'Project Bravo'), provides the baseline description of commercial fishing in respect of these developments. For the purposes of this report, commercial fishing is defined as the legitimate capture of finfish and shellfish for profit by a licensed fishing vessel.

Project Alpha and Project Bravo are located off the Angus coast, in the outer Firth of Forth and Firth of Tay region of Scotland. Project Alpha and Project Bravo form two components within the overall Phase 1 Seagreen offshore wind farm area, which also includes the transmission asset, which is consented and therefore not considered further.

Commercial fishing in the Northern North Sea is a diverse and frequently changing industry, subject to a variety of legislation and regulations, which can be altered and implemented at relatively short notice. Other factors, such as variations in target species, weather, fluctuations in market prices and operating costs, can influence a commercial fisheries baseline both spatially and temporally. Predicting future commercial fisheries baselines is therefore subject to a range of unpredictable variables.

The approach for evaluating the existing baseline starts by providing an overview, which identifies the nationality and fishing methods operating within the vicinity of the developments. Subsequently, this report reviews a number of relevant data and information sources including surveillance sightings, effort and landings data, satellite tracking (VMS) data, ScotMap data, as well as information obtained from direct consultation.

International Council of the Exploration of the Sea (ICES) statistical rectangles have been used to provide a general indication of fishing activity levels and values in the area of the proposed development. ICES rectangles are the smallest spatial unit used for the collection and analysis of fisheries statistics by the European Commission (EC) and Member States. ICES rectangles cover approximately 900nm^2 and align to 30' latitude by 1° longitude. It is appreciated that frequently, fishing activity is not evenly distributed across ICES rectangles. Specific fishing grounds in the immediate vicinity of the proposed developments have been identified where possible through consultation with stakeholders.

2.1 Study Area

The regional study area for the assessment of commercial fishing activities in the vicinity of the proposed Project Alpha and Project Bravo developments is located in ICES Division IVb (Northern North Sea). Whilst both developments are contained entirely within ICES rectangle 42E8, where appropriate, a wider regional study area has been assessed, as shown in Figure 2.1. Furthermore, where appropriate, to provide a proportional context, wider study areas have been evaluated for certain fisheries.

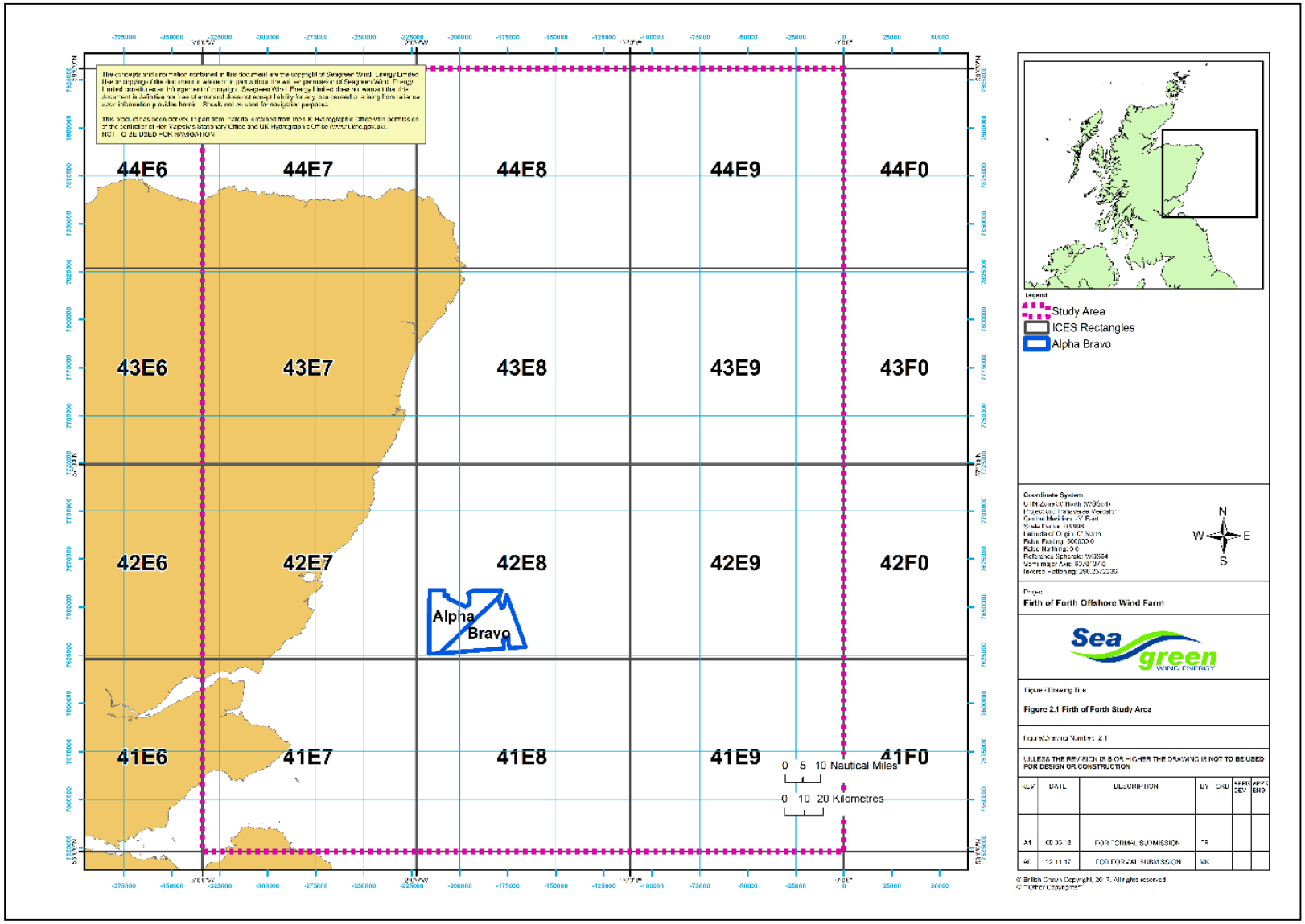


Figure 2.1 Study area in relation to the proposed development

2.2 Data Sources and Information Limitations

The principal data and sources used to inform this technical report are as follows:

- UK Marine Management Organisation (MMO)
  - Surveillance sightings data (2012 to 2016)
  - Fisheries landings values and effort data (2000 to 2016)
  - Vessel Monitoring Systems (VMS) Data (2012 to 2016)

- Automatic Identification System (AIS) data (2017)

- Fishermen and fishermen's representatives
  - Direct consultation undertaken by Scottish Fishermen's Federation (SFF)-contracted Fishing Industry Representatives (FIRs) (2011 to 2017)

- Marine Scotland
  - ScotMap (report and data set) (2007 to 2011)
  - A Kafas, A McLay, M Chimienti, BE Scott, I Davies, M Gubbins, R May (2017)
  - Direct consultation with Andronikos Kafas on behalf of Marine Scotland Science (2017)

- The International Council for the Exploration of the Sea (ICES)

- Fisheries consultation responses from 2011 for the original Seagreen Phase 1 projects EIA.

The data and information used are subject to certain limitations and sensitivities, described in Annex 1.

In order to ensure that fishing activities were assessed over a sufficiently long period, at least five years of data have been analysed. However, where annual trends are assessed in section 2.5.7, data going back to the year 2000 has been analysed.

It was suggested in the scoping opinion that a number of additional data sources should be referenced in the baseline. Subsequently, during the conference call with MS-LOT on 12th December 2017, the reservations about the use of these sources were discussed, which are summarised below:

- Plotter data from the Crown Estate's Fishermen's Information Mapping database; it was considered that this is of limited use as the charts are so crowded with plotter tracks that meaningful analysis is difficult and due to Data Protection reservations, the Crown Estate do not allow identification of individual vessels.

- "Evidence Gathering in Support of Sustainable Scottish Inshore Fisheries"; as per consultation with the project manager, Dr Nick Lake, this data is not available.

- "Scottish Inshore Fisheries Integrated Data System (SIFIDS)"; as above.

- Interpolated VMS fishing tracks (Mailys Bilett); this paper has not yet been peer-reviewed and is therefore unavailable.

- "The Crown Estate: Changes to Fishing Practices around the UK as a Result of the Development of Offshore Windfarms – Phase 1"; this study has a number of limitations revolving around the small sample size and the interpretation of the pre-installation fishing activity.

2.3 Guidance – Consultation

The principal guidance used for the production of this technical report is given below:

- A meeting held on the 27th June 2017 attended by MS-LOT, MSS, SFF and Seagreen
- MS-LOT Scoping Opinion, dated 15th September 2017
- A teleconference held on the 12th December 2017 attended by MSS, Seagreen and BMM
- Direct communications with SFF FIRs, 2017 - 2018

In addition to the recommendations in respect of the data and information sources to be used as given in section 2.2 above, the guidance given by MS-LOT and the SFF is as summarised below:

- The prevalent fishing activity in the area remains as scallop dredging;
- Scallop fishing activity was stated to be 'episodic', with peaks in activity occurring every five to seven years and as such, datasets should cover at least seven to ten years;
- Scallop dredging tends to target an area until it is fished out, then the vessels move on;
- Over the past 15 years squid fishing activity in the general area has increased;
- Vessels trawling for squid work out to approximately 20 miles offshore;
- Static gear fishing has also increased over the past ten years in the general area, with vessels from further afield (e.g. Eyemouth and Stonehaven) now targeting the area;
- It was considered that there would be a likelihood of finding static gear within the wind farm sites;
- A request was made for a refinement in detail beyond that of ICES rectangles.

Two local Fishing Industry Representatives (FIRs) were contracted through the Scottish Fishermen's Federation (SFF) to undertake direct consultation with a representative sample of fishermen operating from ports considered to be local to the project. This consultation involved phone calls and email liaison with the Scottish White Fish Producers' Association inshore policy officer for information on trawl vessels and visiting scallopers, as well as face-to-face meetings. Questionnaires and charts for fishermen to draw their fishing grounds were also distributed and collected by the FIRs. This information was then compiled onto GIS charts.

Table 2.1 contains a summary of the consultation undertaken to date with fishermen.

Table 2.1 Summary of local fisheries stakeholder consultation

Consultees	Role / Organization	Consultation Date
Fisherman 1	Arbroath and Montrose Static Gear Association (AMSGA)	5/12/17

Fisherman 2	AMSGA	23/11/17
Fisherman 3	AMSGA	23/11/17
Fisherman 4	Scottish White Fish Producers' Association (SWFPA)	19/12/17
Fisherman 5	SWFPA	19/12/17
Fisherman 6	SWFPA	19/12/17
Fisherman 7	AMSGA	5/12/17
Fisherman 8	AMSGA	5/12/17
Fisherman 9	Anglo-Scottish Fishermen's Association (ASFA)	1/12/17
Fisherman 10	ASFA	1/12/17
Fisherman 11	ASFA	22/11/17
Fisherman 12	ASFA	22/11/17
Fisherman 13	ASFA	1/12/17
Fisherman 14	ASFA	1/12/17
Fisherman 15	ASFA	22/11/17
Fisherman 16	ASFA	22/11/17
Fisherman 17	Independent	5/12/17
Fisherman 18	Independent	23/11/17
Fisherman 19	Independent	22/11/17
Fisherman 20	ASFA	5/12/17
Fisherman 21	Dunbar Fishermen's Association	22/11/17
Fisherman 22	SWFPA	19/12/17
Fisherman 23	SWFPA	19/12/17
Fisherman 24	SWFPA	19/12/17
Fisherman 25	AMSGA	10/12/17
Fisherman 26	AMSGA	10/12/17
Fisherman 27	AMSGA	10/12/17
Fisherman 28	AMSGA	9/12/17
Fisherman 29	AMSGA	18/12/17
Fisherman 30	AMSGA	18/12/17
Fisherman 31	AMSGA	01/05/18
Fisherman 32	AMSGA	04/05/18
Fisherman 33	SWFPA	08/05/18
Fisherman 34	SWFPA	08/05/18

2.4 Fisheries Controls and Legislation

The UK's commercial fishing industry is subject to a range of constraints and legislation which are currently set by the EU and Scottish government agencies and local authorities or bodies. The majority of such measures have a direct impact on fishing activity and therefore on landings weights and values. Furthermore, many regulations are implemented at short notice with limited consultation, thereby affecting confidence in predicting future trends.

At present, the overarching policy governing fisheries legislation and controls is the EU Common Fisheries Policy (CFP). There is however uncertainty over future UK fisheries policy as a consequence of the result of the "Brexit" referendum, although in the shorter term, UK fisheries policy may for the most part incorporate the legislation and controls of the EU CFP.

Full details of the existing controls and legislation applied to commercial fishing are summarised in Annex 2.

2.5 Overview of Fishing Activity

2.5.1 MMO Surveillance Sightings

The distribution of surveillance sightings of fishing vessels recorded in the area of the Project Alpha and Project Bravo sites are shown by nationality and gear type in Figure 2.2 and Figure 2.3. Due to the scheduling of surveillance flights and fisheries protection vessel cruises, it should be noted that surveillance sightings data does not fully describe the actual levels of fishing activity. It does, however, identify the categories of vessels operating within an area as well as giving a general indication of the distribution of activity by method and nationality.

As shown in Figure 2.2, virtually all of the recorded activity within the area under consideration is by UK vessels, the majority of which tends to be concentrated inshore of the wind farm sites. South of the wind farm sites, in ICES rectangle 41E8, a limited number of sightings of Danish vessels have been observed in the regional area in the past, south of Project Alpha and Project Bravo. A solitary French trawler has also been sighted in 41E7.

As shown in Figure 2.3, between 2012 and 2016, the majority of UK activity within the wind farm sites and their adjacent areas is scallop dredging with significantly lower levels of creeling activity also being recorded. Demersal trawling and creeling are shown to be mainly concentrated on areas inshore and to the south of the wind farm sites.

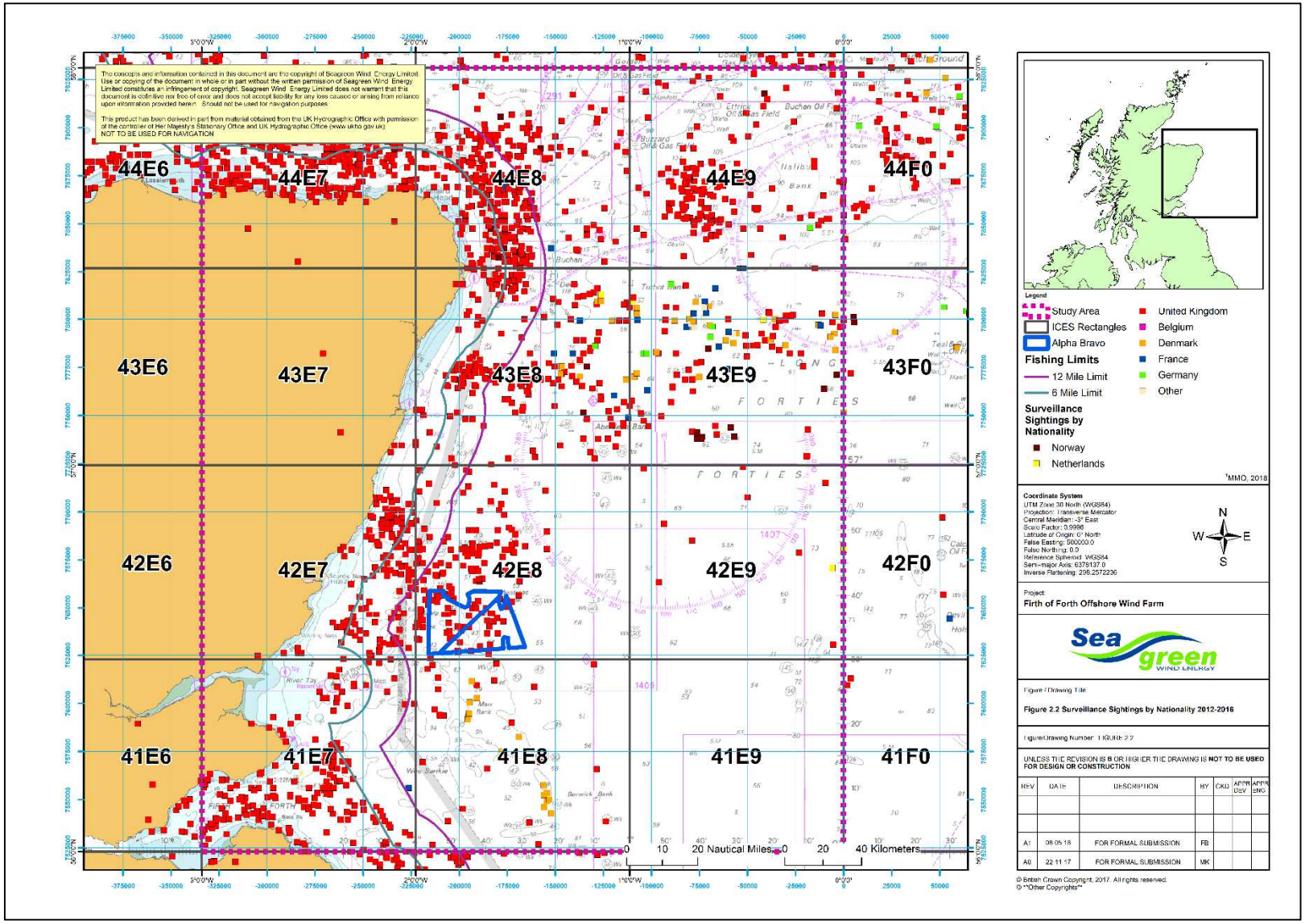


Figure 2.2 Surveillance sightings by nationality (2012-2016) (source: MMO, 2018)

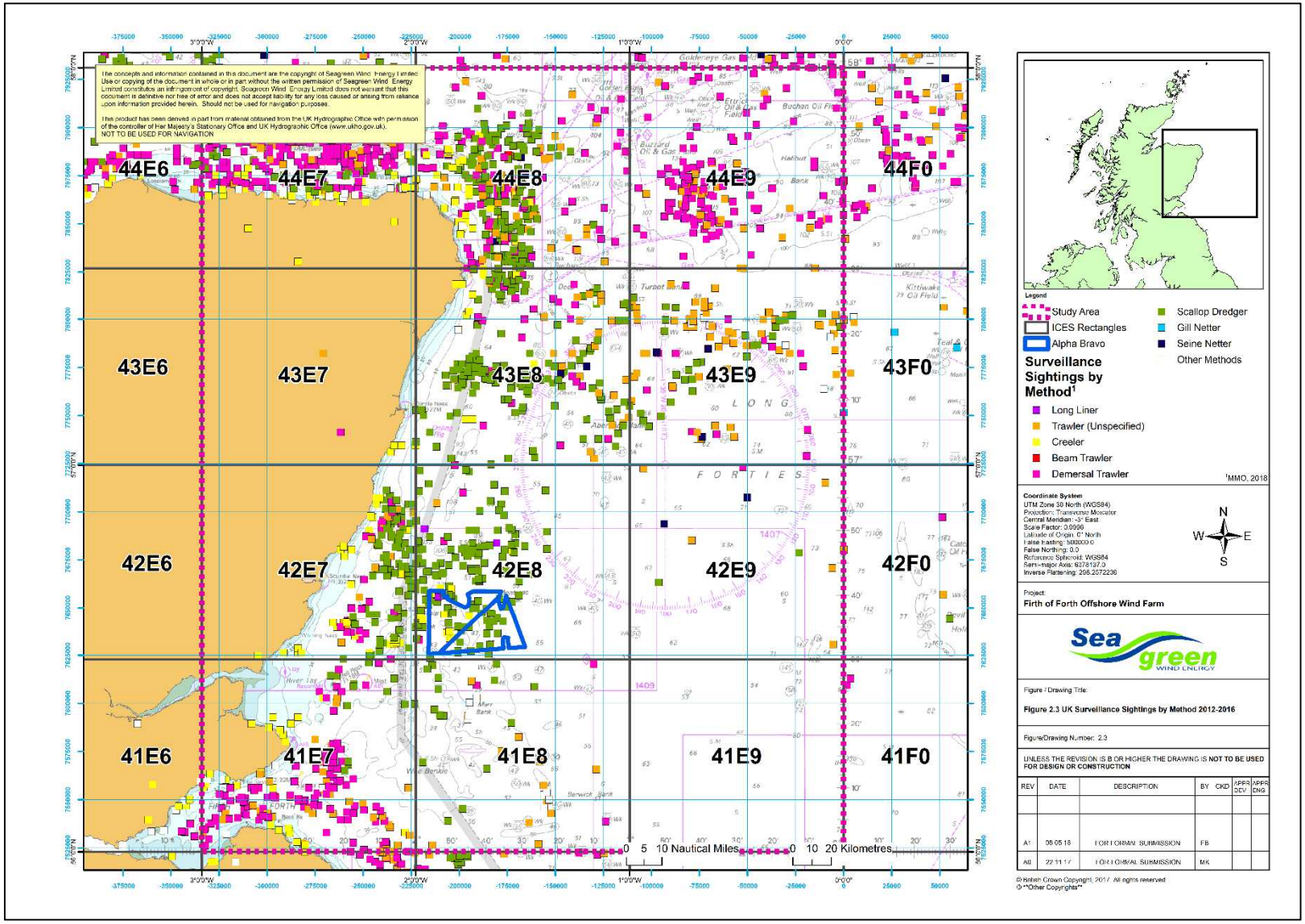


Figure 2.3 UK Surveillance sightings by method (2012-2016) (source: MMO, 2018)

The percentage of sightings by method for each rectangle are shown in Table 2.2.

In summary, the main fishing activities undertaken in the vicinity of the proposed development identified through the initial data analysis and through consultation are:

- Scallop dredging;
- Creeling for lobster;
- Demersal trawling for *Nephrops*, squid and whitefish; and
- Trawling for sandeels by the Danish fleet in ICES 41E8.

As previously stated, these activities (with the exception of trawling for sandeels) are almost entirely undertaken by UK registered vessels.

Table 2.2 Surveillance sightings (2012-2016) in ICES rectangles 41E7, 41E8, 42E7 and 42E8 by nationality and method (source: MMO, 2018)

ICES Rectangle	Nationality	Method	% of total Sightings
42E8	United Kingdom	Scallop Dredger (French/Newhaven)	86.0
		Potter/Whelker	9.5
		Demersal Stern Trawler	1.7
		Other Dredges (Including Mussel)	0.6
		Long Liner	1.7
		Trawler (All)	0.6
		United Kingdom % Of Total Sightings (All Gears)	**100**
41E7	United Kingdom	Demersal Stern Trawler	51.6
		Potter/Whelker	17.8
		Trawler (All)	16.4
		Scallop Dredger (French/Newhaven)	6.4
		Null	2.3
		Unknown	2.3
		Other Dredges (Including Mussel)	1.4
		Stern Trawler (Pelagic/Demersal)	0.9
		Demersal Side Trawler	0.5
		United Kingdom % Of Total Sightings (All Gears)	**99.54**
	France	Pelagic Stern Trawler	0.5
		France % Of Total Sightings (All Gears)	**0.46**
41E8	United Kingdom	Scallop Dredger (French/Newhaven)	40.0
		Demersal Stern Trawler	6.7
		Trawler (All)	6.7
		Stern Trawler (Pelagic/Demersal)	4.4
		United Kingdom % Of Total Sightings (All Gears)	**57.78**
	Denmark	Industrial Trawler (Sandeeler)	28.9
		Trawler (All)	6.7
		Pair Trawler (All)	2.2
		Pelagic Stern Trawler	4.4
		Denmark % Of Total Sightings (All Gears)	**42.22**

42E7	United Kingdom	Scallop Dredger (French/Newhaven)	48.9
		Demersal Stern Trawler	16.5
		Potter/Whelker	22.2
		Trawler (All)	6.3
		Null	4.0
		Stern Trawler (Pelagic/Demersal)	2.3
		United Kingdom % Of Total Sightings (All Gears)	**100**

2.5.2 MMO Landings and Effort Data

As shown in Figure 2.4, the majority of the landings values from rectangle 42E8 are from over 15m vessels, whereas in the two inshore rectangles (41E7 and 42E7) the highest proportion of values is from under 10m vessels but with significant values also from 10m – 15m vessels.

The distribution of values by method (Figure 2.5) confirms that within 42E8, in which the wind farm sites are located, the predominant activity in terms of recorded landings values is boat dredging, assumed to be scallop dredging, with lower values attributed to bottom otter trawls and creels.

This is further corroborated by the breakdown of species landings values, wherein most of the value within 42E8 comes from scallops *Pecten maximus* (Figure 2.6 and Figure 2.7). This is followed by squid *Loligo forbesii* and *vulgaris* and *Nephrops norvegicus* (targeted by bottom trawls) and lobster *Homarus gammarus* (targeted by creels).

Figure 2.8 and Figure 2.9 show that in the regional context, relatively low squid landings values are derived from 42E8 and negligible values for *Nephrops*.

As shown by Figure 2.6, in the ICES rectangles in the east and north of the study area, some distance from Project Alpha and Project Bravo, significant catches of whitefish, predominantly haddock are recorded.

The majority of fishing effort in 42E8, as would be expected, comes from vessels over 15m in length, with lower levels of activity for under 10m and 10m-15m vessels (Figure 2.10). Effort by method is given in Figure 2.11, which likewise shows that the majority of fishing effort comes from dredgers in 42E8, whereas in the nearshore ICES rectangles activity by creelers is more prevalent.

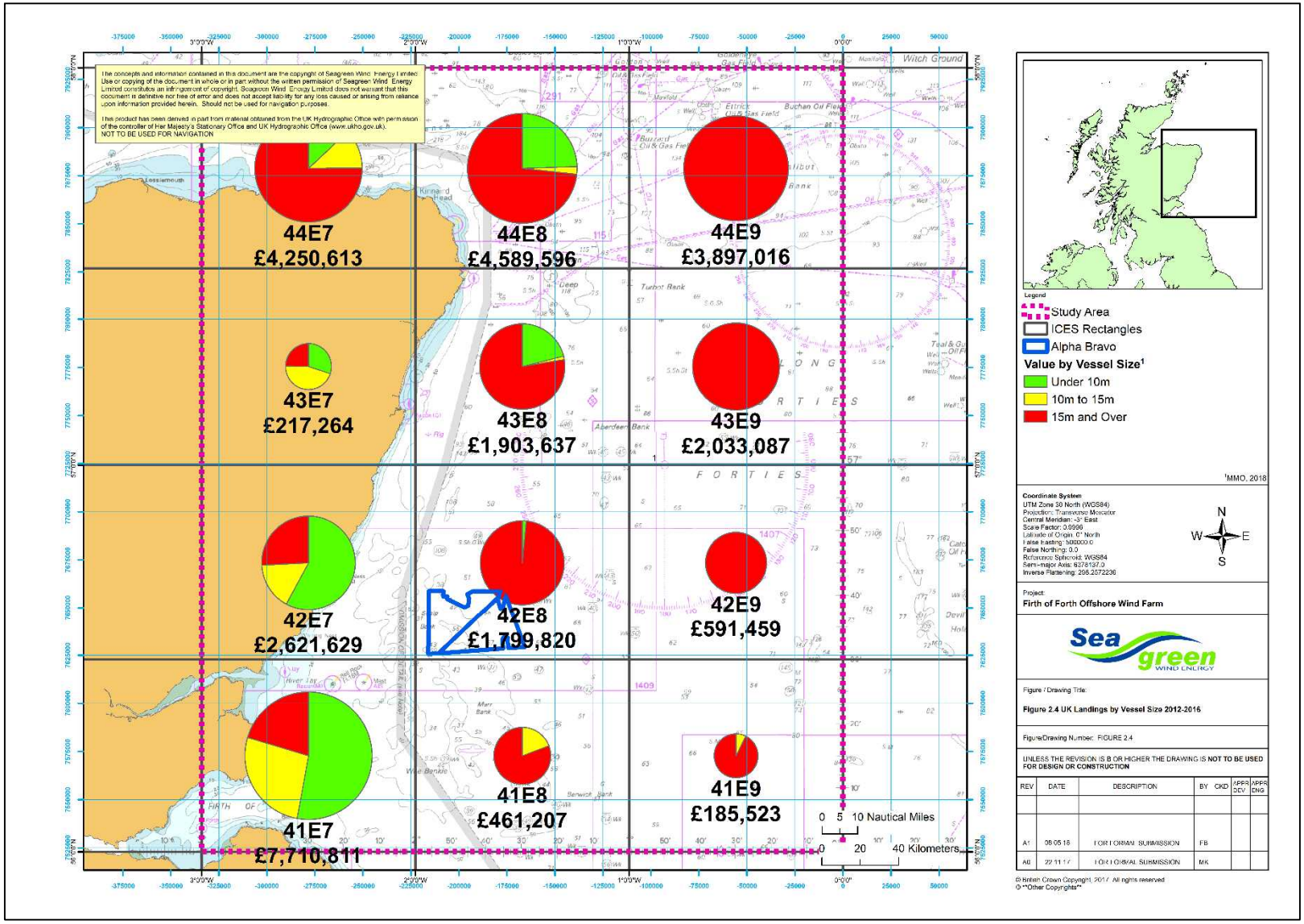


Figure 2.4 Average Annual Landings values by vessel size (2012-2016) (source: MMO, 2018)

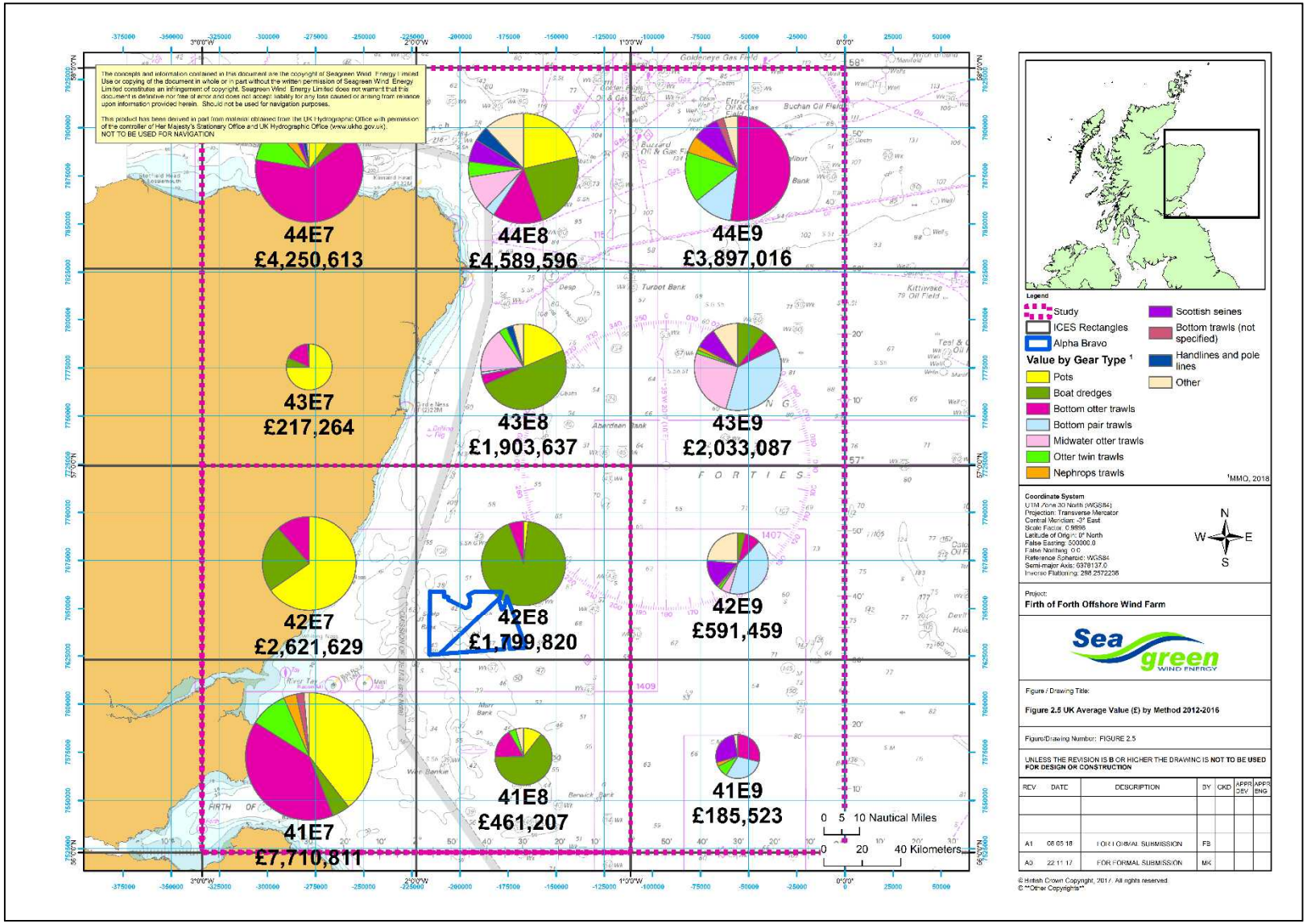


Figure 2.5 Average Annual Landings values by fishing method (2012-2016) (source: MMO, 2018)

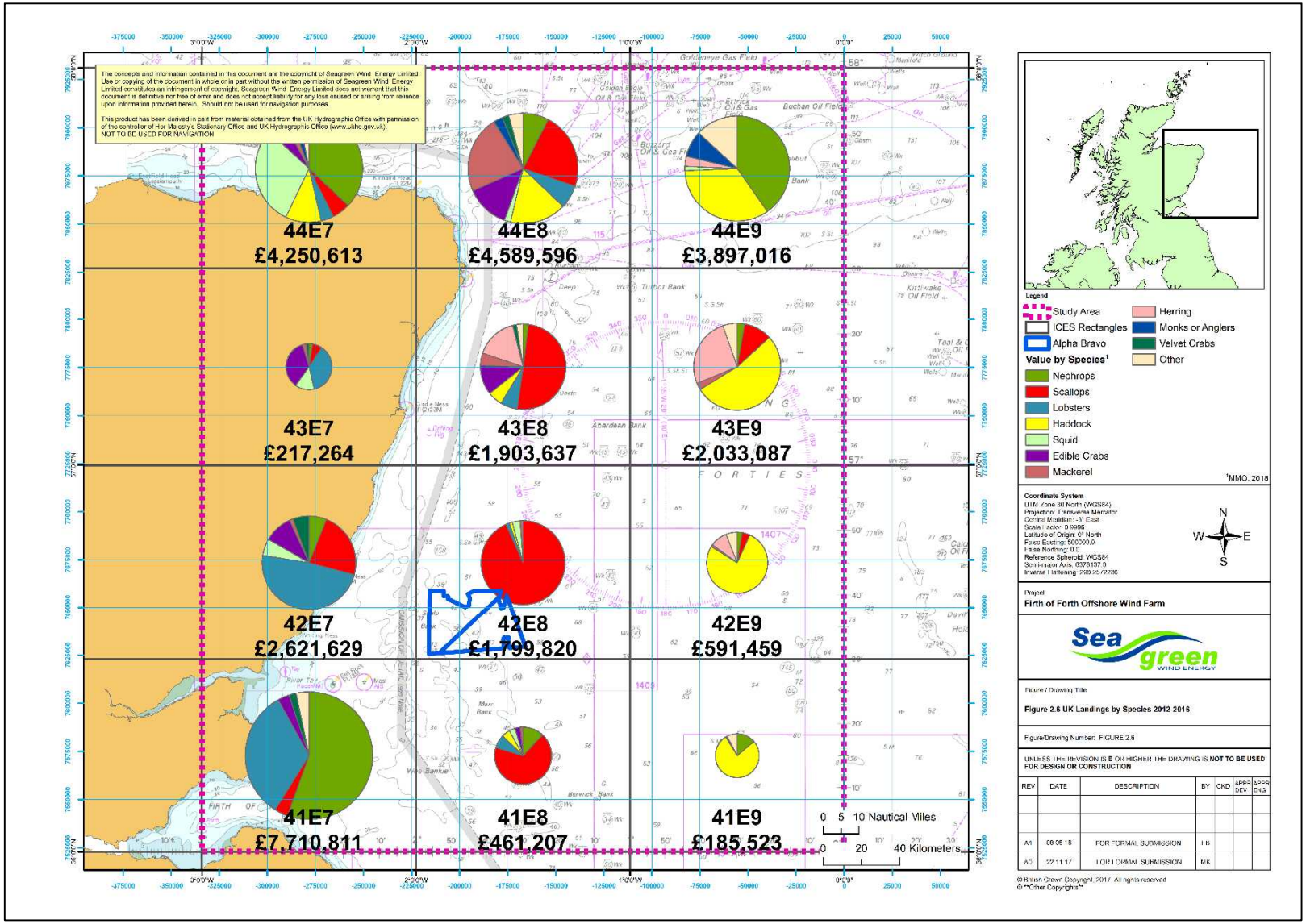


Figure 2.6 Average Annual Landings values by species (2012-2016) (source: MMO, 2018)

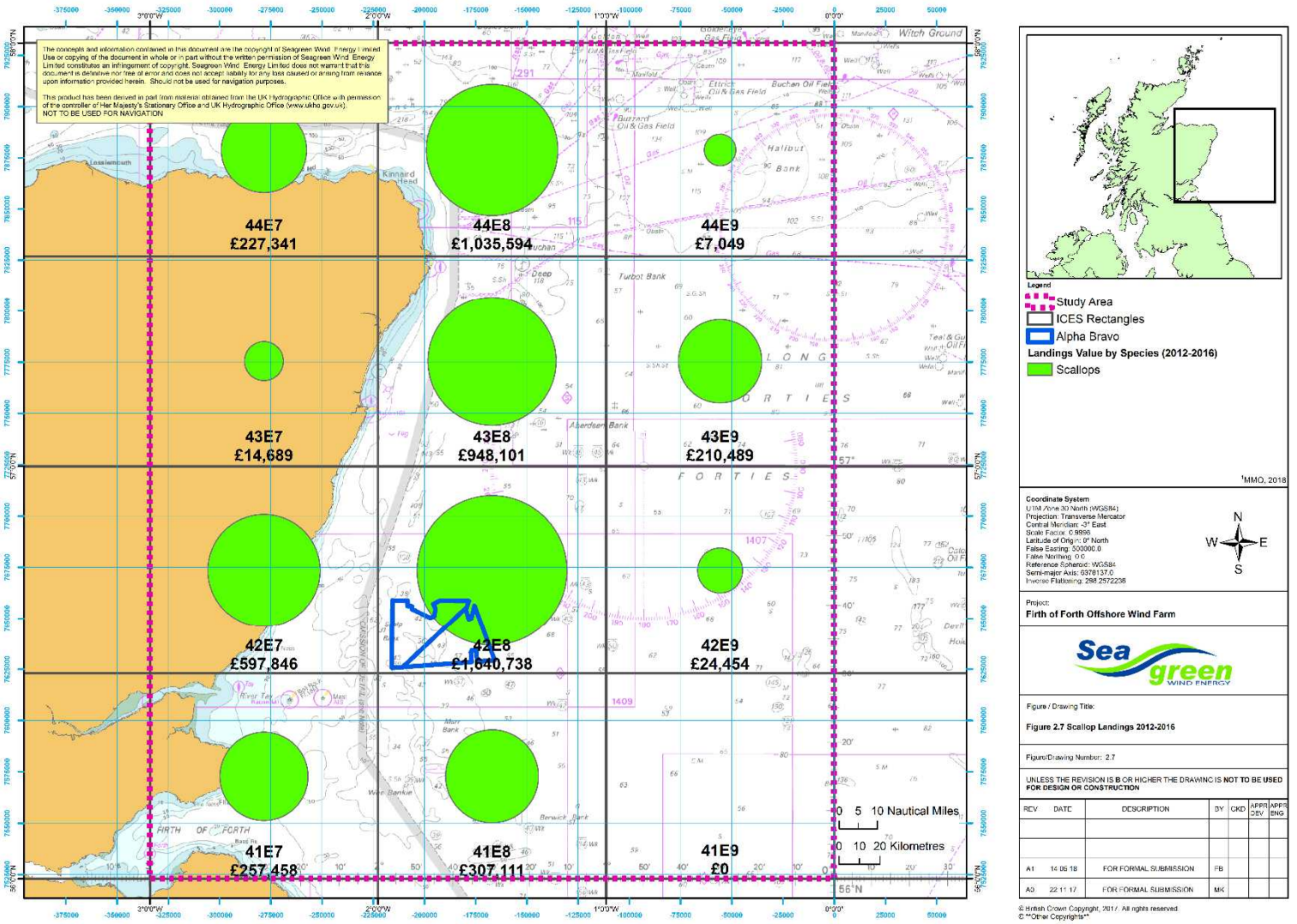


Figure 2.7 Scallop Landings values (2012-2016) (source: MMO, 2018)

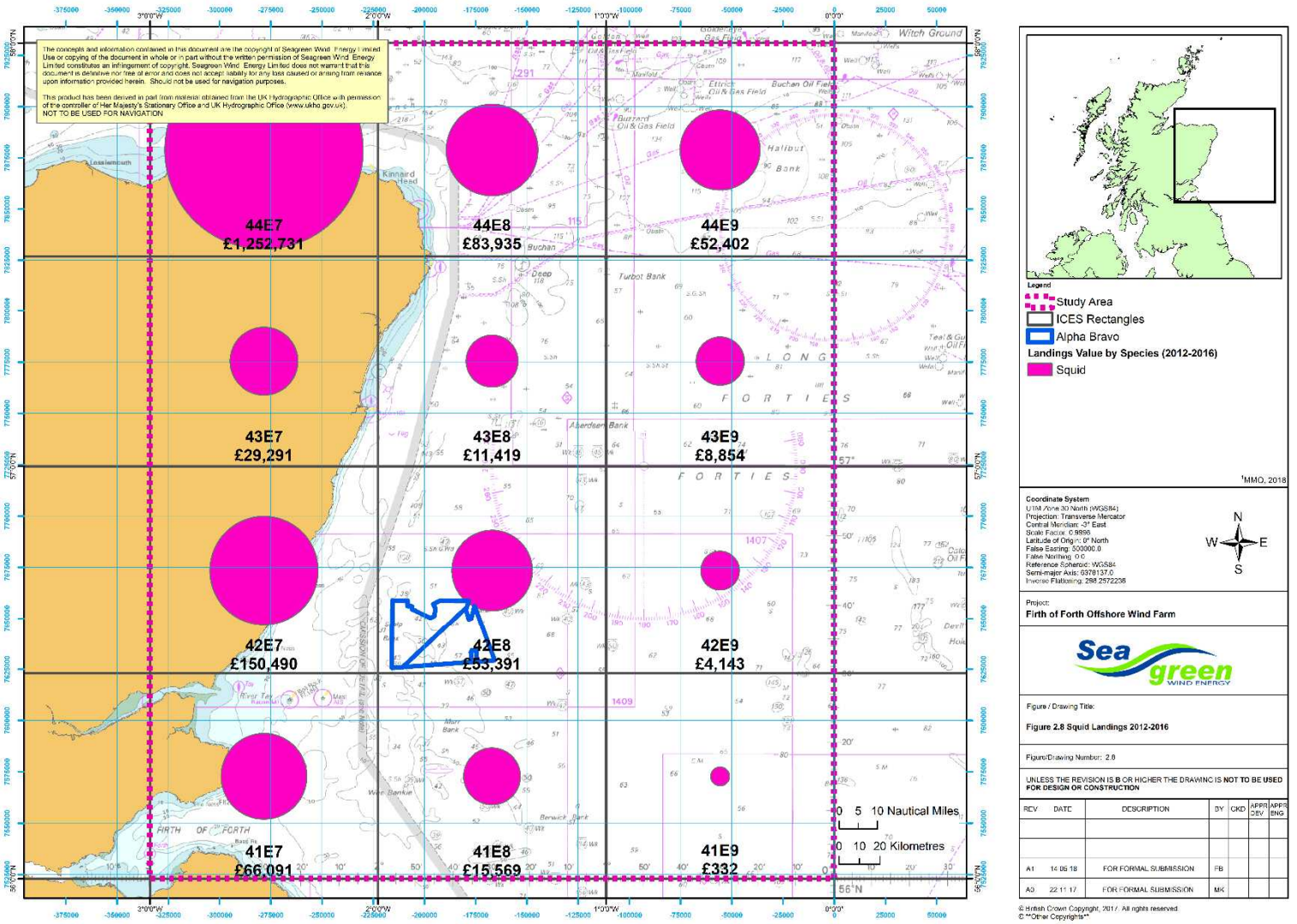


Figure 2.8 Squid Landings values (2012-2016) (source: MMO, 2018)

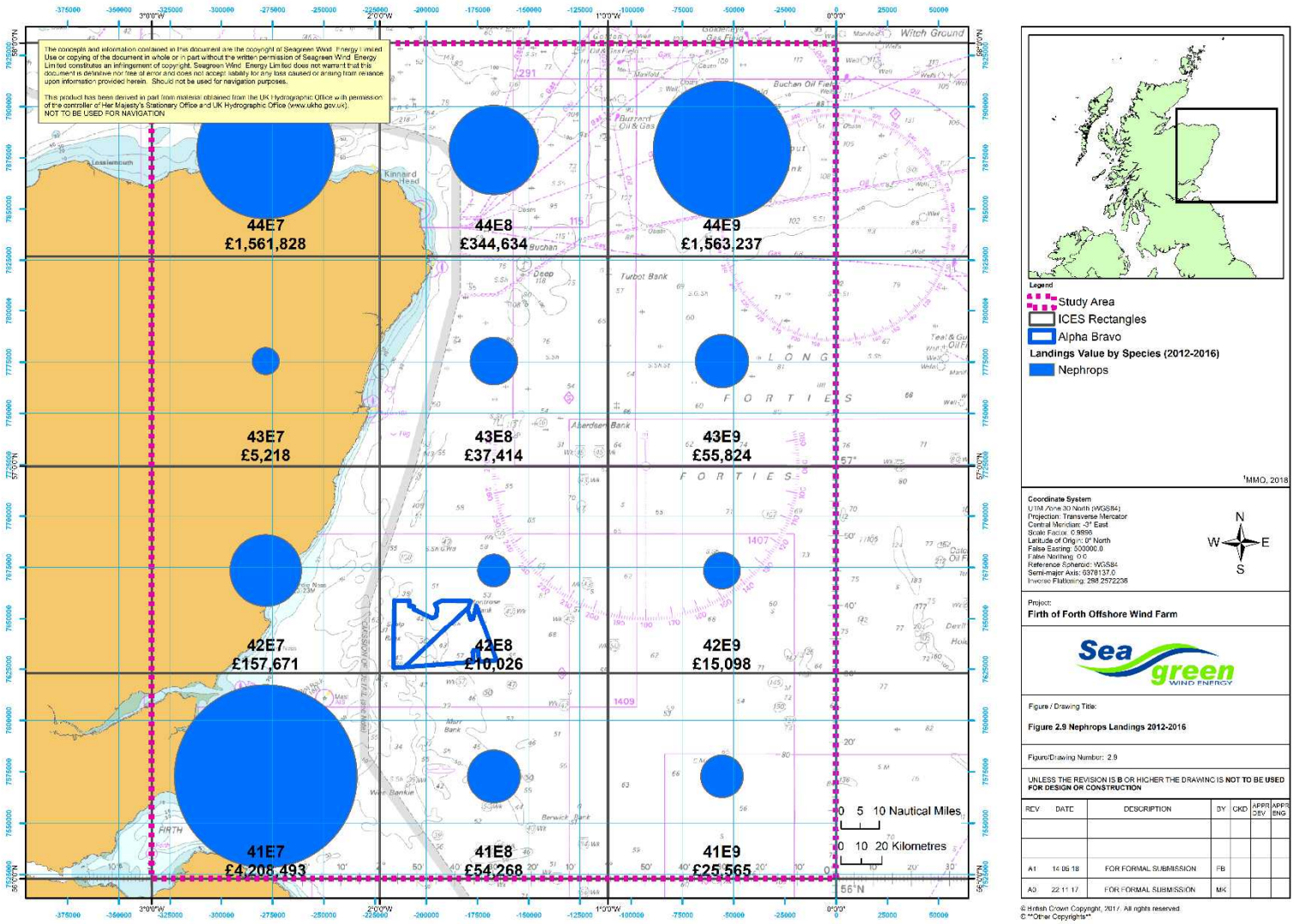


Figure 2.9 *Nephrops* Landings values (2012-2016) (source: MMO, 2018)

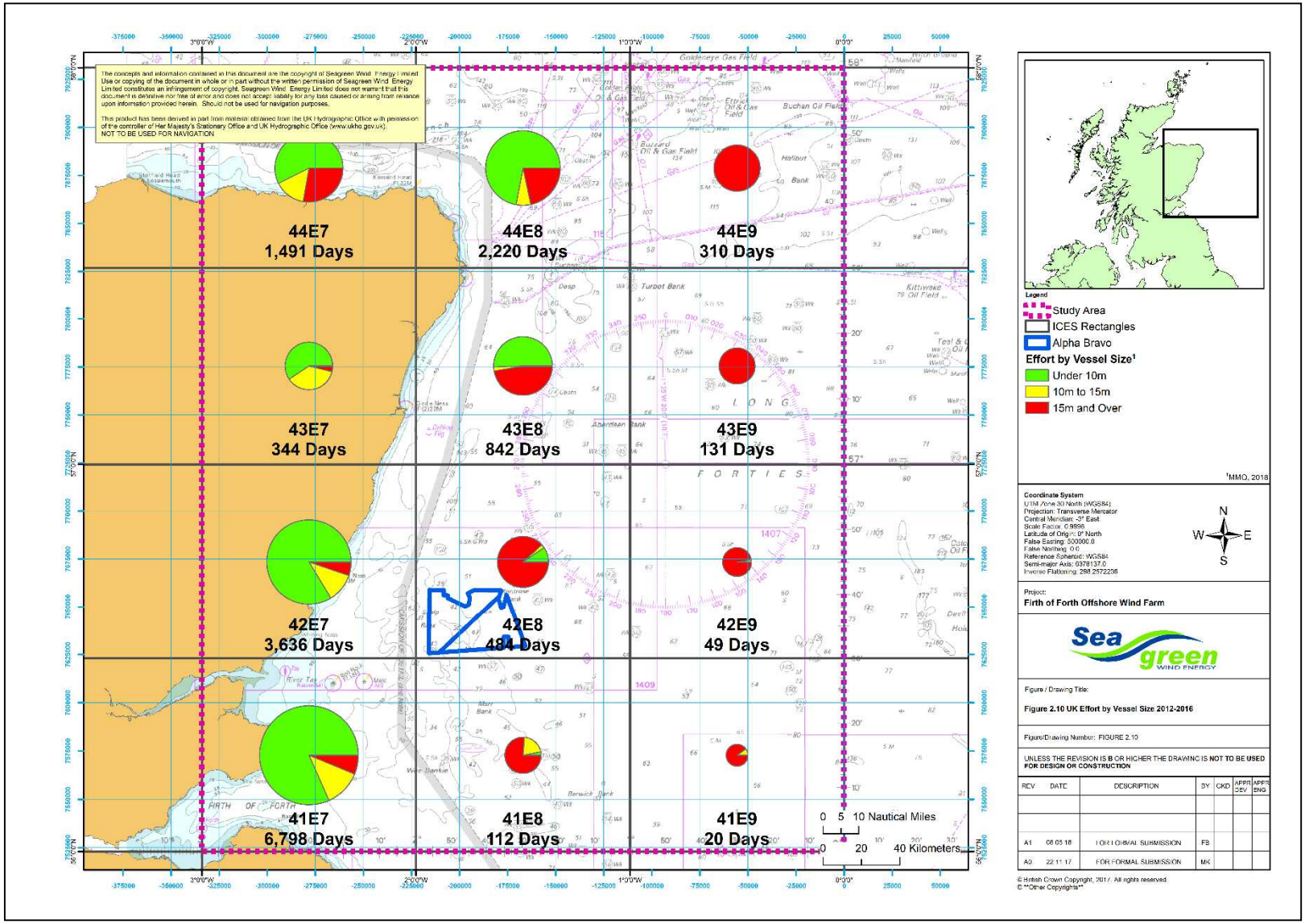


Figure 2.10 Average Annual Effort (days fished) by vessel size (2012-2016) (source: MMO, 2018)

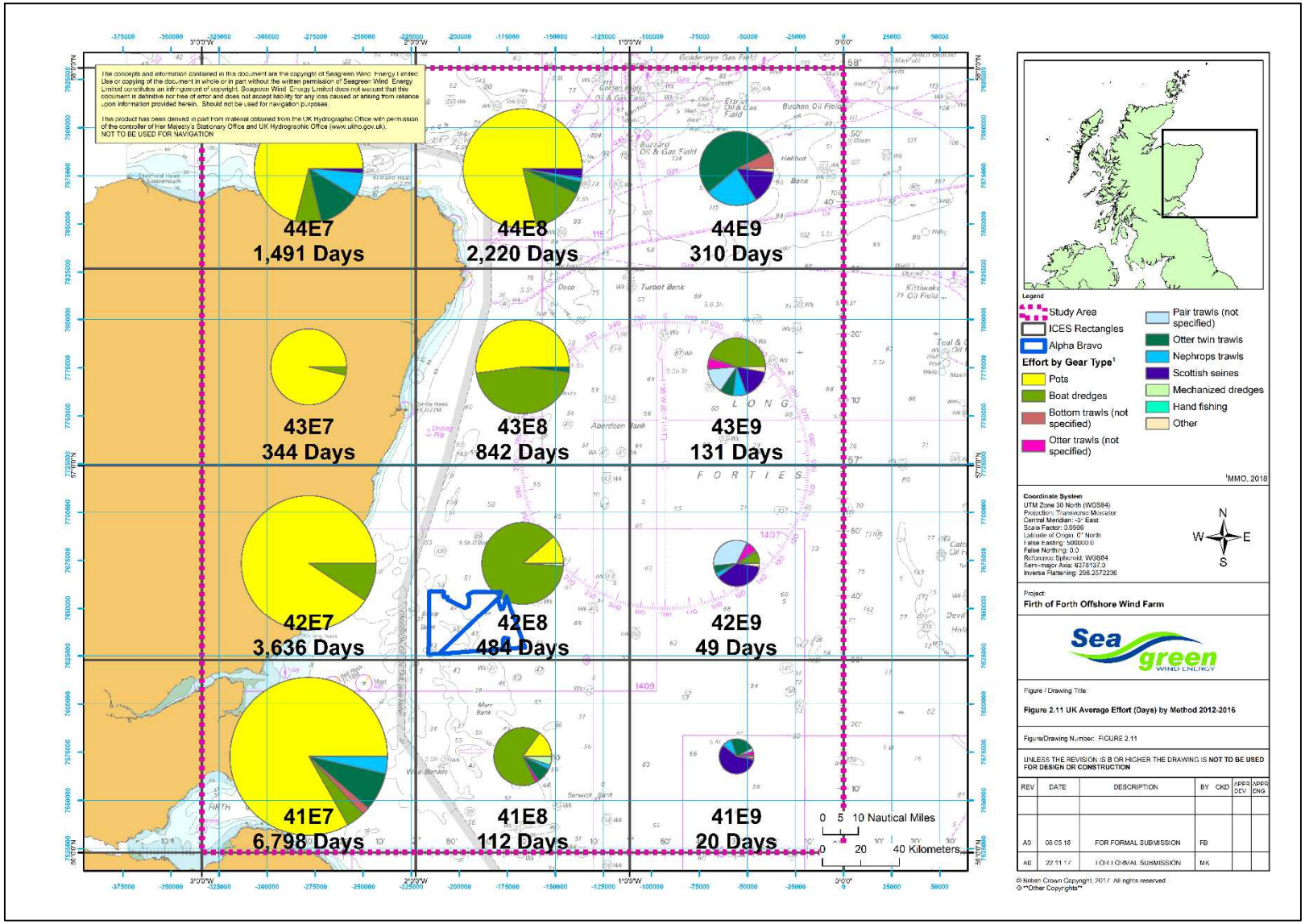


Figure 2.11 Average Annual Effort (days fished) by fishing method (2012-2016) (source: MMO, 2018)

2.5.3 MMO Landings by Port

Table 2.3 gives the landings values by port from ICES Rectangle 42E8 and the percentage of 42E8's total average annual value (across five years; 2012-2016) this represents, as well as the percentage of each port's total value that landings from 42E8 represent. Whilst the highest landings value from 42E8 is into Peterhead by a significant margin, these landings only constitute 1.15% of the total value of landings for the port.

Table 2.4 shows the pattern of landings values for each port over the last five years for which data is available. With the exception of Peterhead, this illustrates a variable pattern of landings values during the period considered.

Table 2.3 Average Landings Values (£) by Port in 42E8

Ports	Average Annual Landings Values (£) (2012-2016) in 42E8	% of 42E8's Total Average Annual Value	Total Average Annual Port Value (2012-2016)	% of Total Average Annual Port Value that 42E8 Represents
Peterhead	£1,117,231	62.07%	£97,466,390	1.15%
Aberdeen	£331,561	18.42%	£1,137,287	29.15%
Fraserburgh	£240,225	13.35%	£27,495,995	0.87%
Montrose	£32,838	1.82%	£380,267	8.64%
Arbroath	£17,979	1.00%	£1,456,578	1.23%
Hartlepool	£14,198	0.79%	£1,751,297	0.81%
Eyemouth	£14,134	0.79%	£2,749,287	0.51%
Stonehaven	£9,287	0.52%	£287,668	3.23%
North Shields	£5,071	0.28%	£6,253,165	0.08%
Scheveningen	£3,866	0.21%	£2,521,578	0.15%
Catterline	£3,253	0.18%	£10,415	31.24%
Blyth	£2,202	0.12%	£2,478,200	0.09%
Amble	£1,568	0.09%	£1,676,091	0.09%
Buckie	£1,363	0.08%	£2,638,819	0.05%
Gourdon	£1,322	0.07%	£369,243	0.36%
Whitby	£1,169	0.06%	£2,539,278	0.05%
Macduff	£964	0.05%	£851,274	0.11%
Johnshaven	£656	0.04%	£186,224	0.35%
Pittenweem	£351	0.02%	£3,126,311	0.01%
Brixham	£338	0.02%	£7,012	4.82%
Scarborough	£131	0.01%	£4,845,075	0.00%
Lowestoft	£114	0.01%	£168	67.65%
Grimsby	£1	0.00%	£3,235,726	0.00%
Total	**£1,799,820**			

Table 2.4 Total Annual Landings Values (£) by Port in 42E8

	Total Annual Landings Values (£) per Year in 42E8						
Port of Landing	2012	2013	2014	2015	2016	Grand Total	Average across five years
Peterhead	£466,654	£459,009	£368,763	£1,860,882	£2,430,846	£5,586,155	£1,117,231
Aberdeen	£676,891	£312,564	£133,796	£305,081	£229,475	£1,657,806	£331,561
Fraserburgh	£62,391	£165,741	£397,711	£305,067	£270,215	£1,201,124	£240,225
Montrose	£12,422	£7,984	£0	£132,748	£11,037	£164,191	£32,838
Arbroath	£20,188	£1,866	£5,653	£4,836	£57,351	£89,894	£17,979
Hartlepool	£45,015	£1,776	£13,130	£0	£11,072	£70,992	£14,198
Eyemouth	£33,159	£8,083	£0	£0	£29,426	£70,668	£14,134
Stonehaven	£39,243	£4,469	£967	£665	£1,089	£46,433	£9,287
North Shields	£0	£2,755	£0	£22,599	£0	£25,354	£5,071
Scheveningen	£0	£0	£0	£19,332	£0	£19,332	£3,866
Catterline	£0	£0	£0	£0	£16,266	£16,266	£3,253
Blyth	£0	£1,387	£1,657	£3,456	£4,509	£11,009	£2,202
Amble	£0	£7,839	£0	£0	£0	£7,839	£1,568
Buckie	£855	£0	£1,669	£1,795	£2,495	£6,813	£1,363
Gourdon	£3,036	£0	£234	£1,527	£1,814	£6,610	£1,322
Whitby	£0	£5,843	£0	£0	£0	£5,843	£1,169
Macduff	£0	£0	£0	£1,712	£3,107	£4,819	£964
Johnshaven	£0	£0	£0	£0	£3,282	£3,282	£656
Pittenweem	£0	£0	£0	£0	£1,755	£1,755	£351
Brixham	£0	£1,690	£0	£0	£0	£1,690	£338
Scarborough	£0	£0	£0	£0	£653	£653	£131
Lowestoft	£0	£0	£569	£0	£0	£569	£114
Grimsby	£0	£0	£3	£0	£0	£3	£1

2.5.4 VMS Data

Approved for publication VMS data is currently only available for vessels over 15m in length, and therefore, does not represent the activity of smaller vessels in the area. ScotMap data (section 2.5.5) has therefore been included to address this gap, as it includes activity from the under 15m fleet.

2.5.4.1 UK VMS Data

VMS data for individual fishing methods can be seen in Figure 2.12, Figure 2.13, Figure 2.14, Figure 2.15, Figure 2.16 and Figure 2.17. UK VMS data for dredges (Figure 2.12 and Figure 2.13) shows high levels of activity off the east coast of Scotland, with the higher proportion of both value and effort concentrated within 44E8 and 42E8. This corresponds with the MMO landings data given above.

VMS landings values and effort for creels (Figure 2.14 and Figure 2.15) illustrates no activity in the vicinity of Project Alpha and Project Bravo. This is to be expected however, as the majority of creeling vessels are under 15m.

The VMS data for demersal trawlers (Figure 2.16 and Figure 2.17) shows higher values and effort within ICES rectangle 41E7, 44E7 and 44E9. This also corroborates the MMO landings data given above. The VMS data also shows some fishing activity in the south west corner of 42E8, and from consultation, it is understood that this is likely to be associated with squid trawling activity.

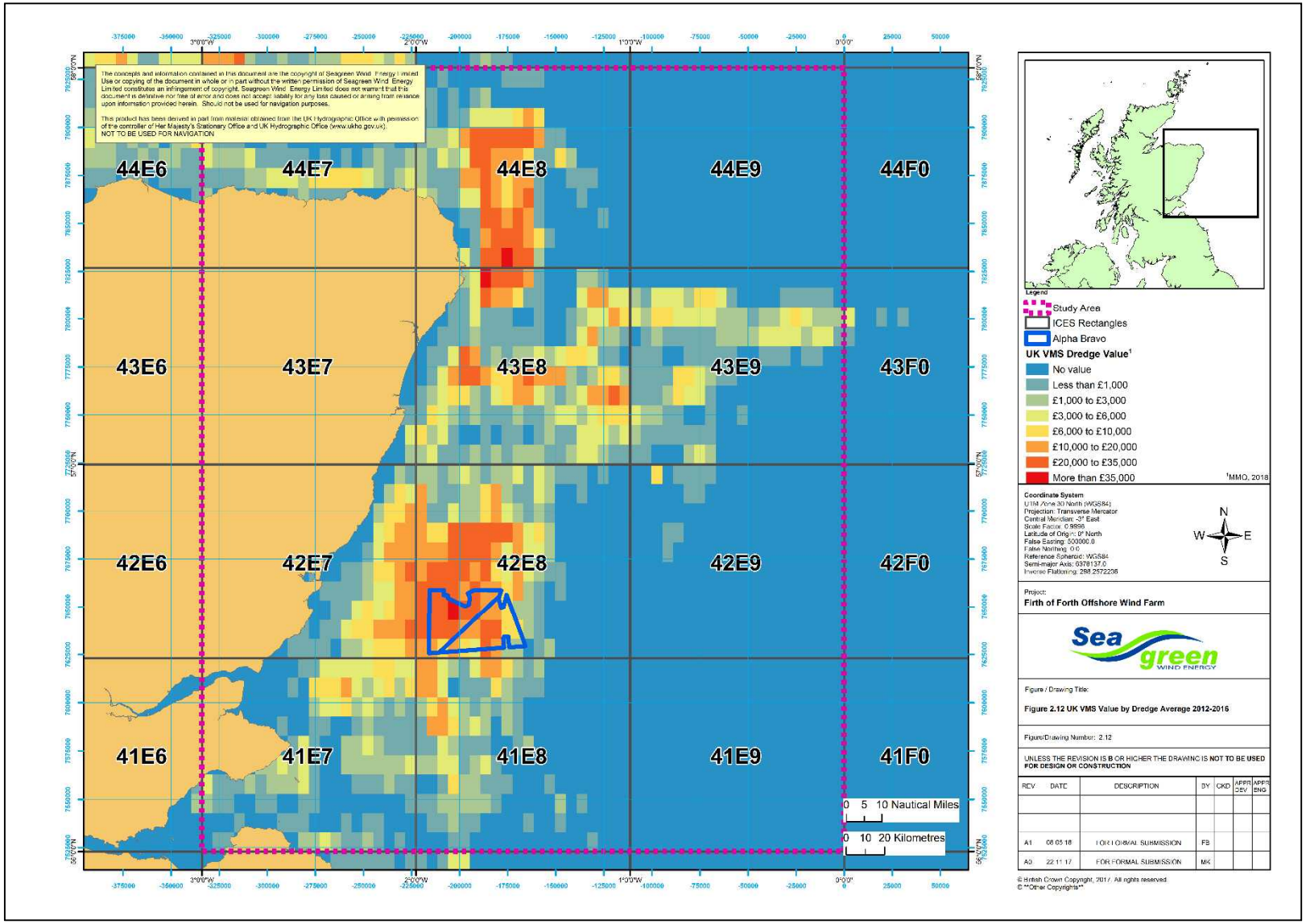


Figure 2.12 UK VMS value by dredges (2012-2016) (source: MMO, 2018)

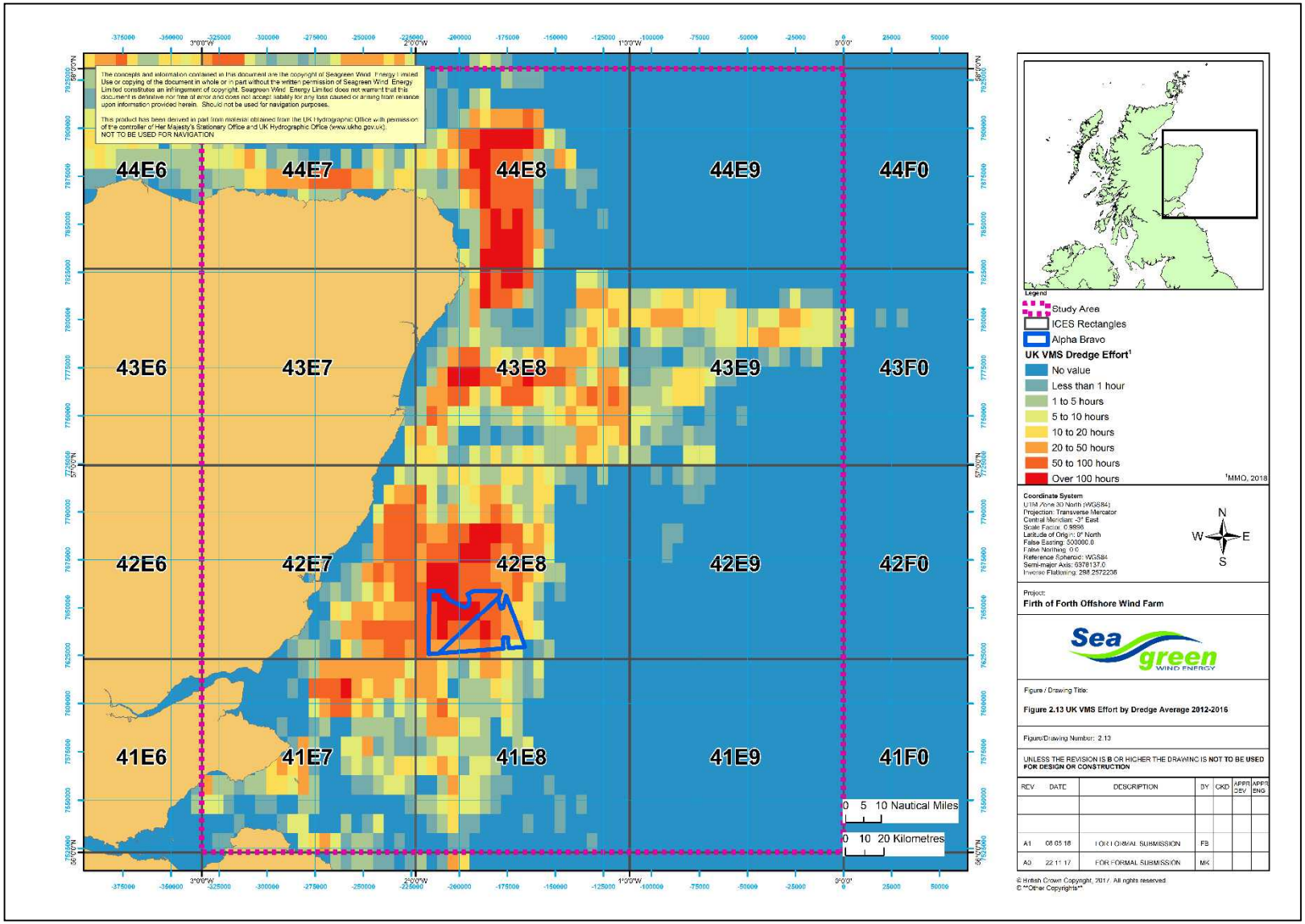


Figure 2.13 UK VMS effort by dredges (2012-2016) (source: MMO, 2018)

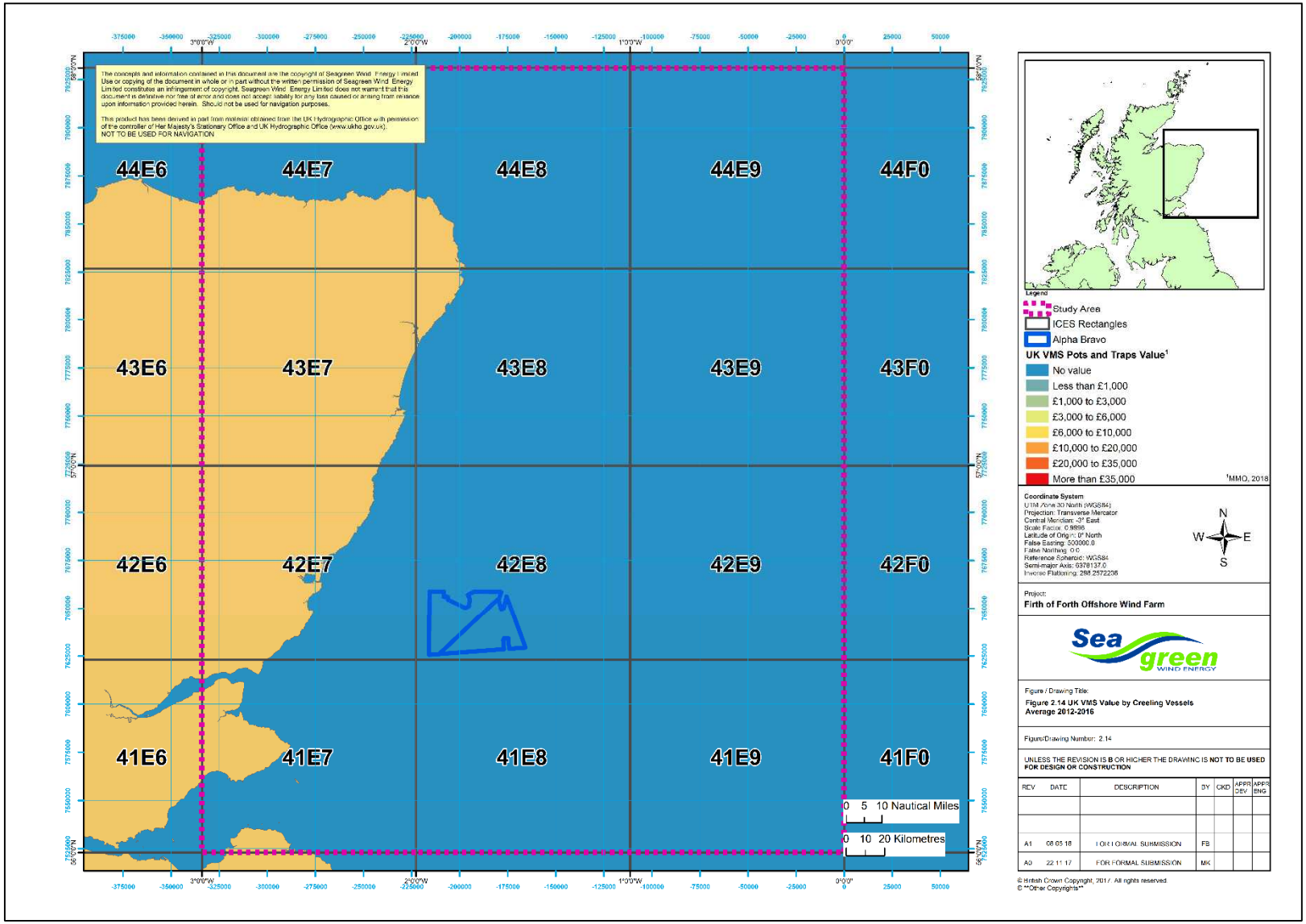


Figure 2.14 UK VMS value by creelers (2012-2016) (source: MMO, 2018)

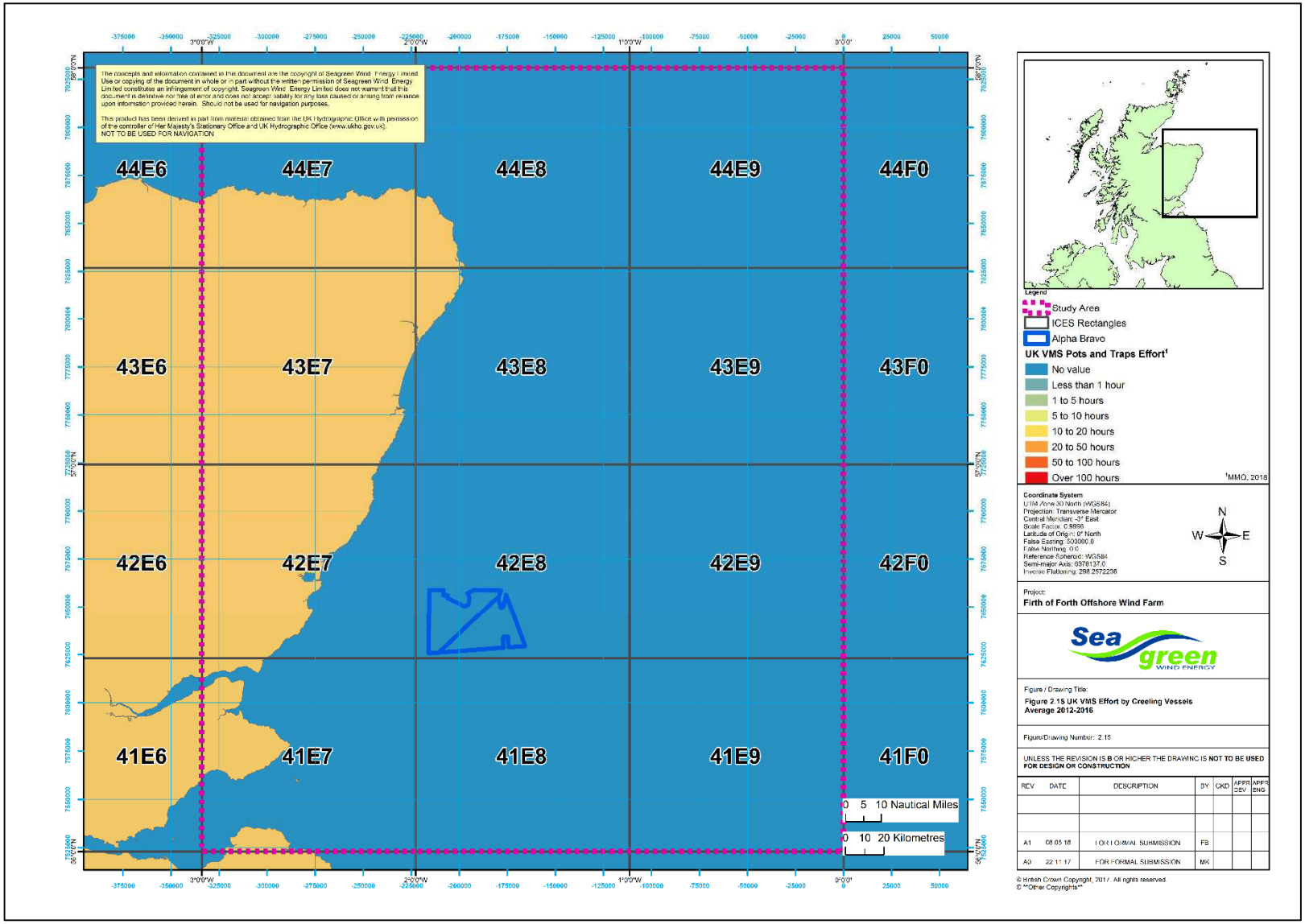


Figure 2.15 UK VMS effort by creelers (2012-2016) (source: MMO, 2018)

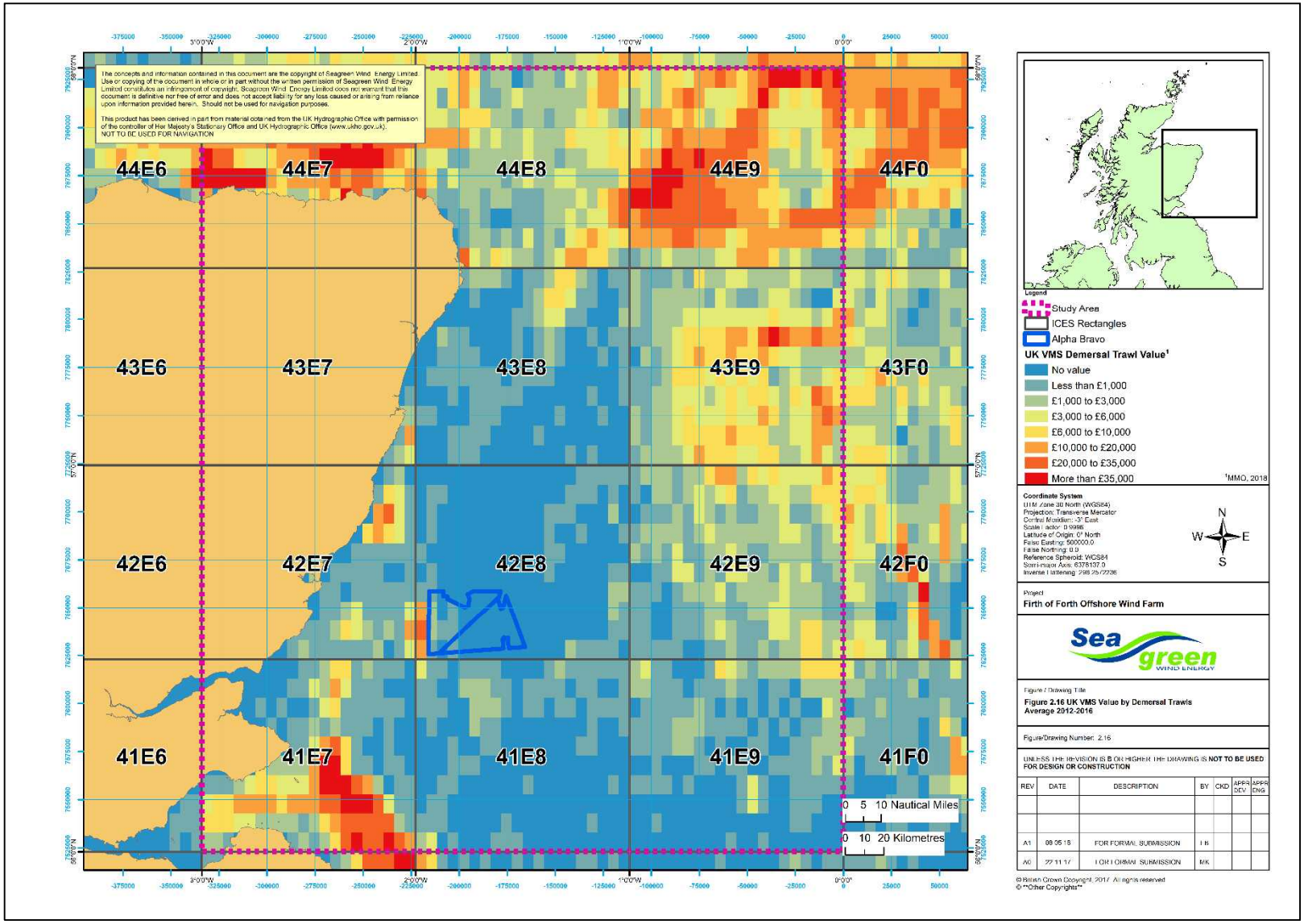


Figure 2.16 UK VMS value by demersal trawls (2012-2016) (source: MMO, 2018)

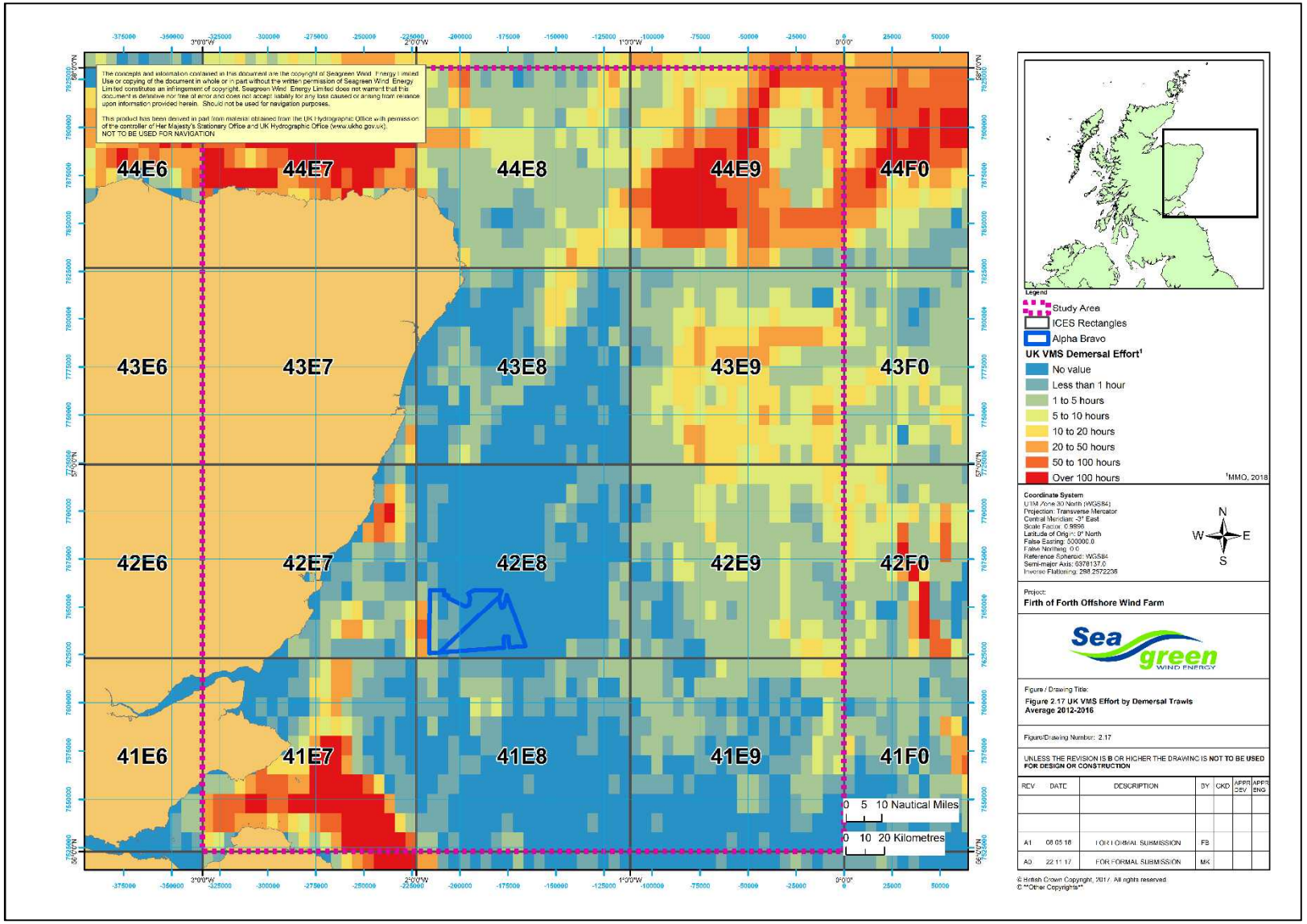


Figure 2.17 UK VMS effort by demersal trawls (2012-2016) (source: MMO, 2018)

2.5.4.2 Marine Scotland Science Fisheries Information Network VMS Data (for Dredging)

The Marine Scotland supplied FIN VMS data is shown in Figure 2.18 and Figure 2.19. This data includes all forms of dredge fishing, with vessel data being recorded every two hours. Vessel fishing activity was defined at a uniform speed of 3.5 knots and includes all UK registered vessels.

As shown by Figure 2.18, effort appears to remain relatively constant and at a similar distribution over the five years between 2012 and 2016.

Figure 2.19 shows the monthly effort patterns over the same period (2012-2016). To aid interpretation of seasonal patterns, the total monthly effort deployed in the study area (in fishing day units – d) is annotated in the top right corner for all respective panels. The data shows a pattern whereby scallop dredging effort peaks between April and August and falls during winter months.

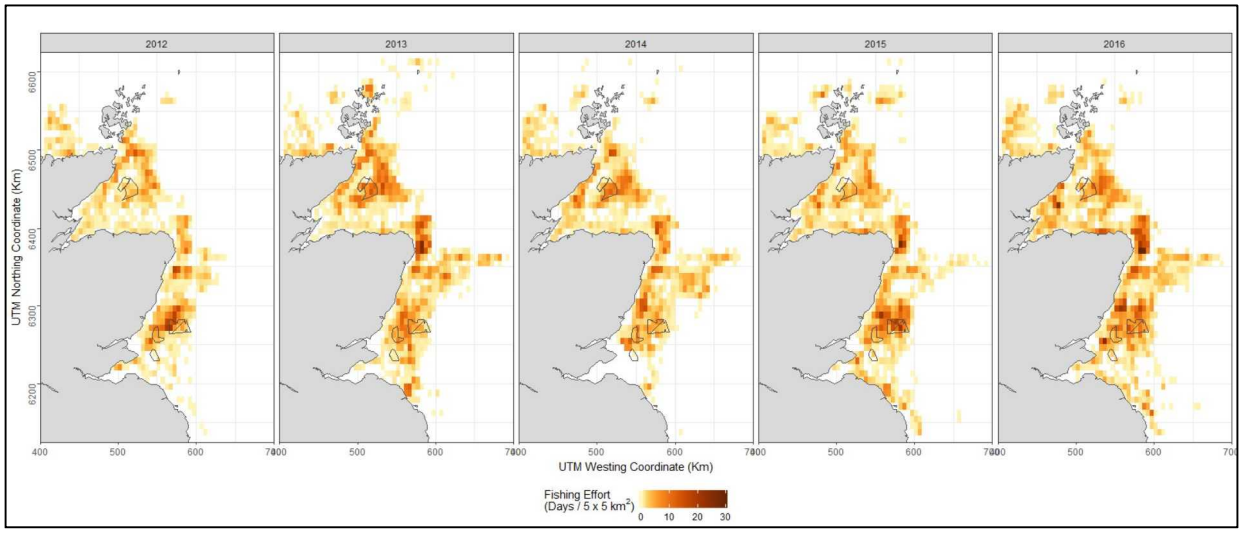


Figure 2.18 Annual scallop dredging effort (VMS) in the east coast of Scotland, 2012-2016

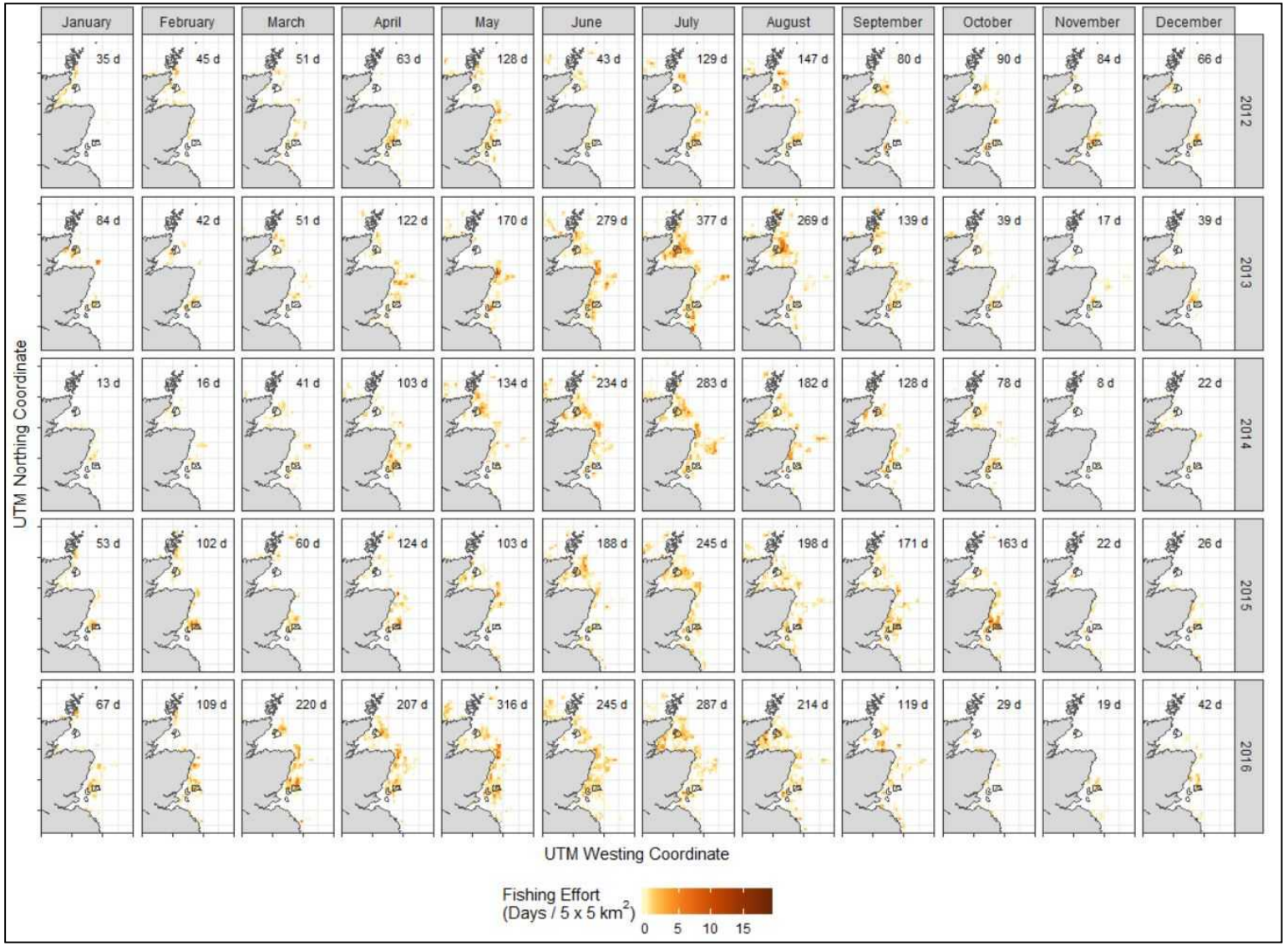


Figure 2.19 Monthly scallop dredging effort (VMS) in the east coast of Scotland, 2012-2016

2.5.4.3 Danish VMS Data

Danish VMS density data for sandeel trawling can be seen in Figure 2.20. Whilst minimal activity was recorded in 41E8, there has been only occasional observations of Danish sandeel trawling in 42E8.

Since 1990, a sandeel fishery developed off the Firth of Forth. Landings from this fishery peaked at over 100,000 tonnes in 1993 and there was concern at the removal of such large quantities of sandeels because of the area's importance for breeding seabirds, which prey upon sandeels as a key component of their diet. In 2000, the UK called for a moratorium on sandeel fishing in areas adjacent to seabird colonies and a precautionary closure was established along the UK north east coast. Commercial exploitation of sandeels in the Firth of Forth remains a prohibited activity under EU, UK and Scottish legislation.

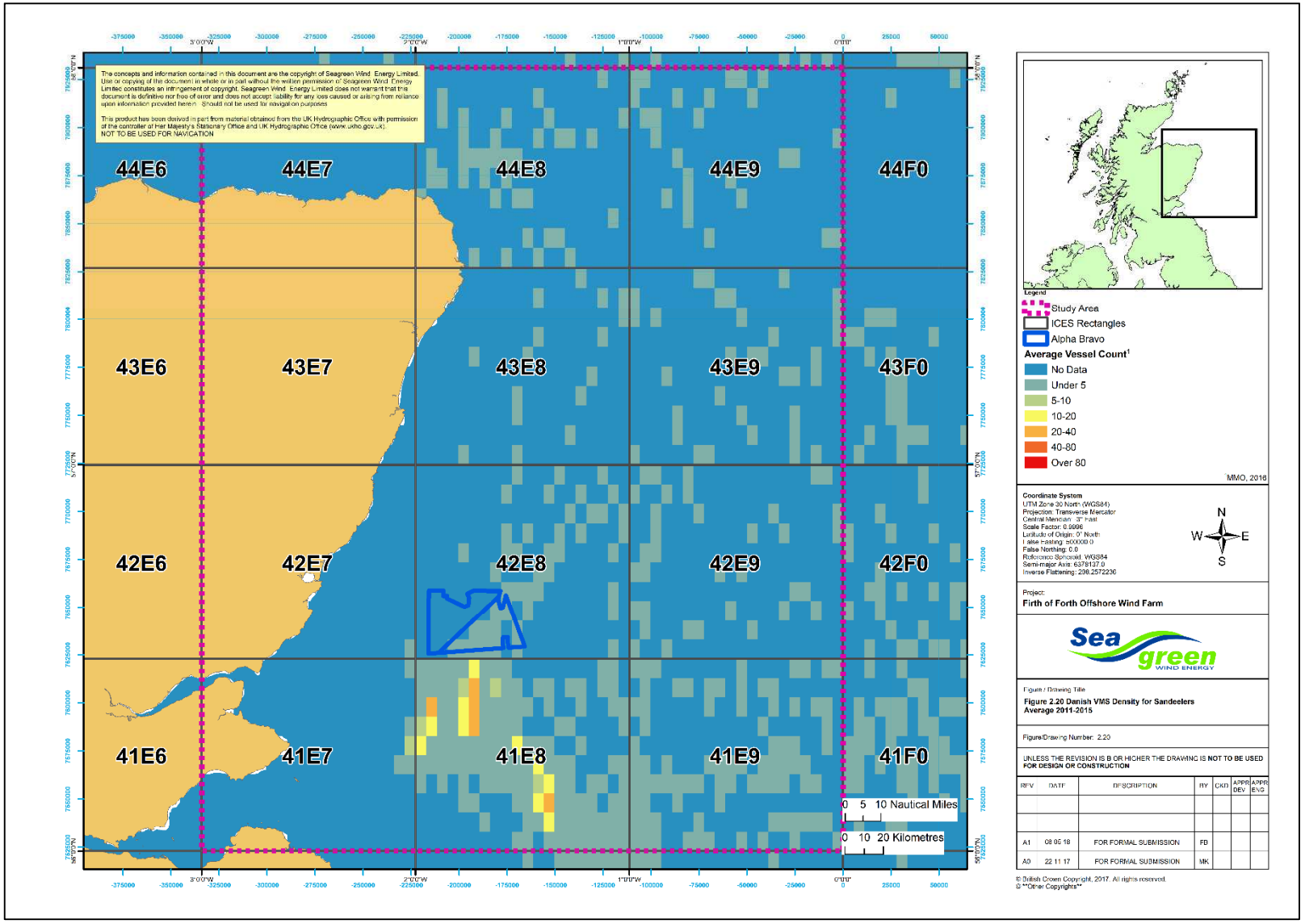


Figure 2.20 Danish average VMS density for sandeelers (2011-2015) (source: MMO, 2016)

2.5.5 Marine Scotland ScotMap Data

ScotMap illustrates spatial activity of Scottish registered under 15m fishing vessels and was carried out as part of the Inshore Fisheries Mapping Project (2007-2011). The data set used was collected during face-to-face interviews with individual vessel owners and operators. The data was then aggregated and analysed to provide information on monetary value, relative importance (relative value) and the usage (number of fishing vessels and crew).

It should be noted that whilst this dataset only goes up to 2011, it does however provide data on under 15m vessels which are not included in the MMO VMS data set.

Figure 2.21 shows that the majority of monetary value in the regional area for under 15m vessels is located within the nearshore ICES rectangles 42E7 and 41E7. This is likely due to the size of the vessels (under 15m) which tend to focus a high proportion of their activity in nearshore waters. The data displays similar patterns of landings value distribution within the ICES rectangles as the MMO landings data (section 2.5.2).

Figure 2.22 gives the annual average number of under 15m vessels recorded for all fishing methods. ICES rectangle 41E7 recorded the highest number of vessels, with an average of between 35 and 94 vessels recorded per year. This is expected to be due to the smaller class of vessels concentrating their activity in areas covered by the nearshore ICES rectangles. ICES rectangle 42E8, in which the wind farm sites are located, shows the lowest vessel density with a pocket of moderate density (between 9 and 11 vessels) within the western boundary of the Project Alpha site.

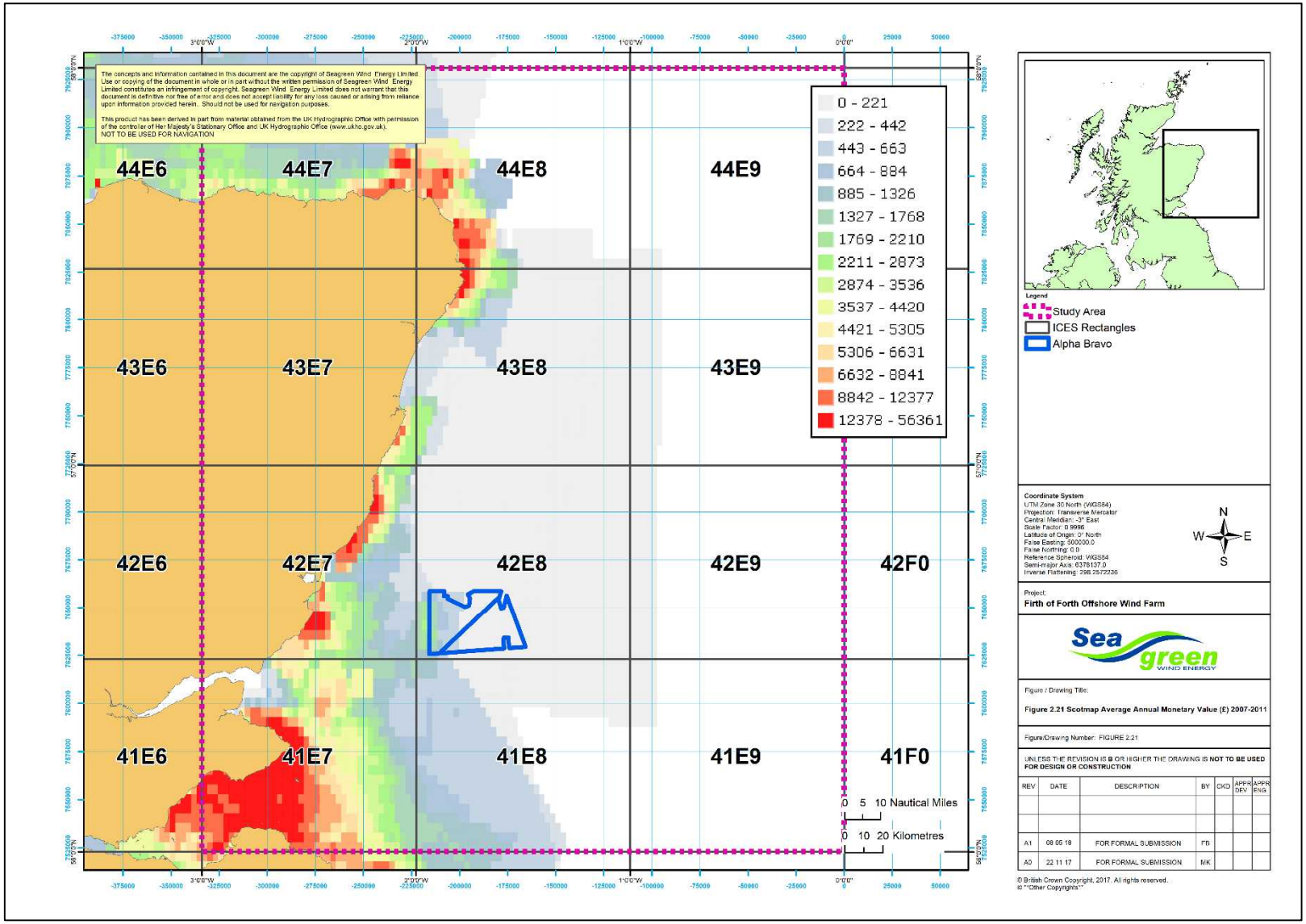


Figure 2.21 ScotMap average monetary value per year (£) (2007-2011) (source: Marine Scotland, 2017)

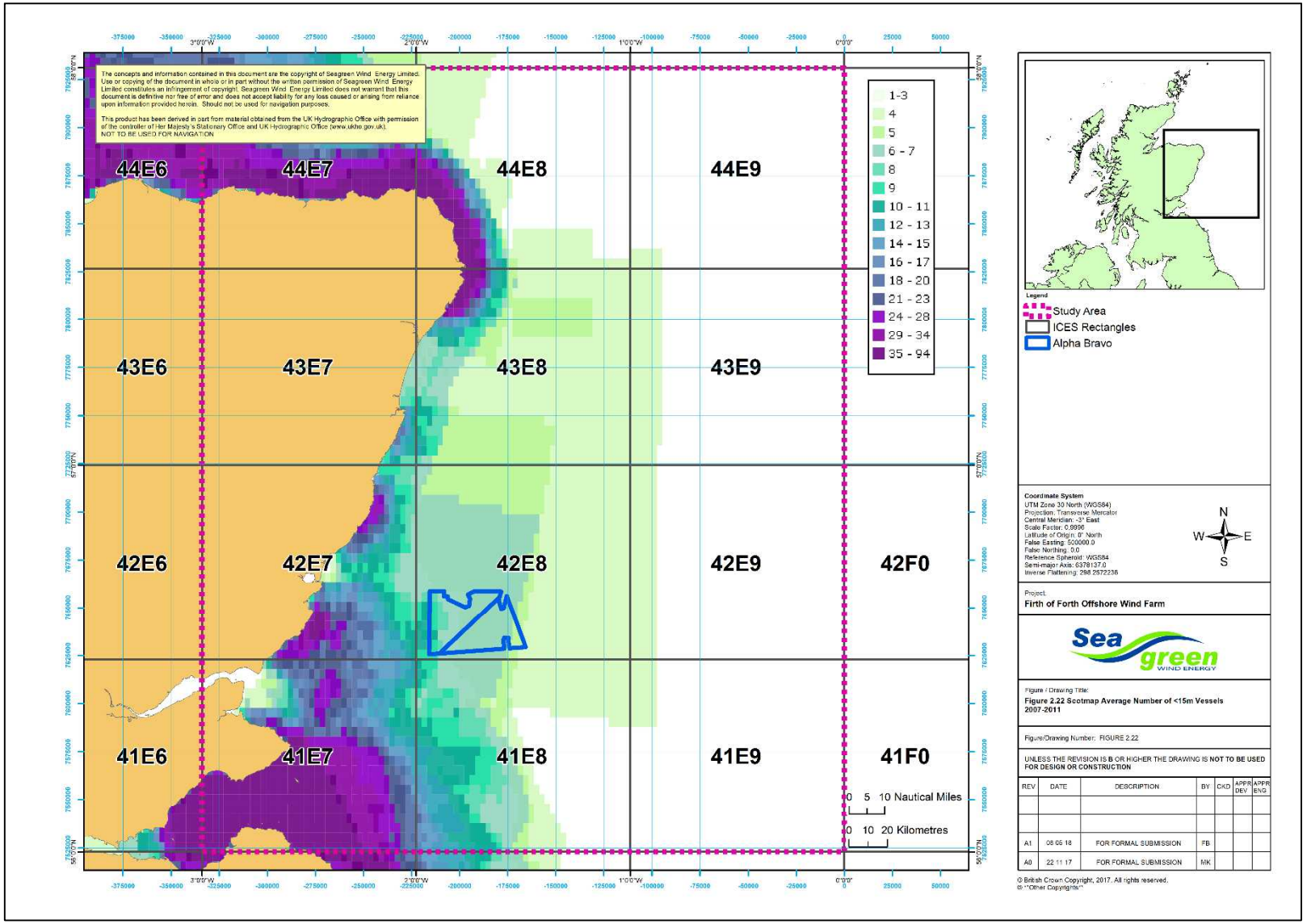


Figure 2.22 ScotMap average vessel numbers per year (2007-2011) (source: Marine Scotland, 2017)

2.5.5.1 Scallop Dredging

Figure 2.23 indicates a relatively low value for scallop dredging by under 15m vessels occurring within all ICES rectangles and covering the areas of Project Alpha and Project Bravo, with fishing activity being mostly associated with the western half of ICES 42E8. Figure 2.24 also demonstrates a low number of vessels present within the study area. These low values are however probably due to the fact that the majority of UK scallop dredge vessels are larger than 15m in length.

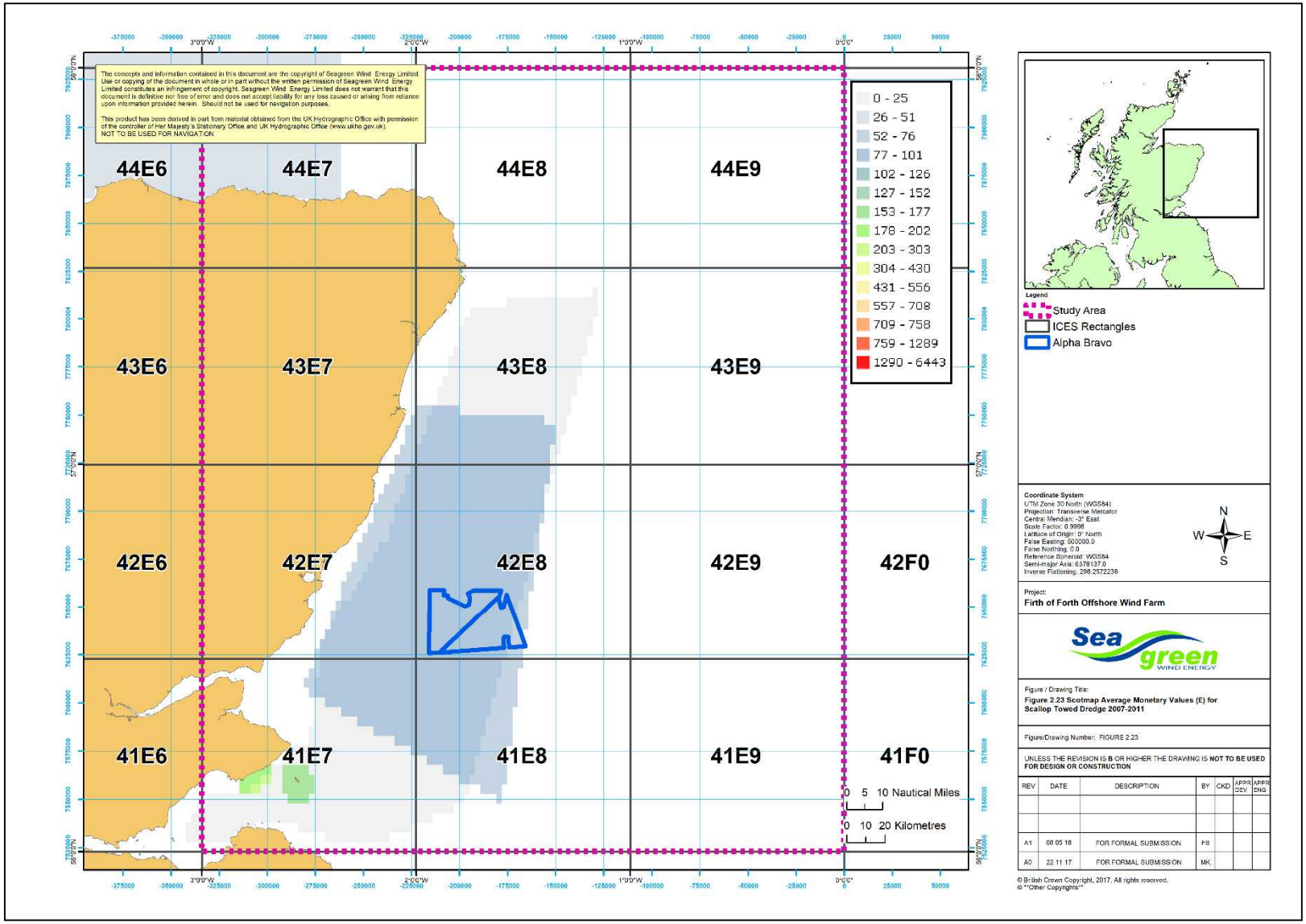


Figure 2.23 ScotMap average monetary value for scallop dredgers per year (£) (2007-2011) (source: Marine Scotland, 2017)

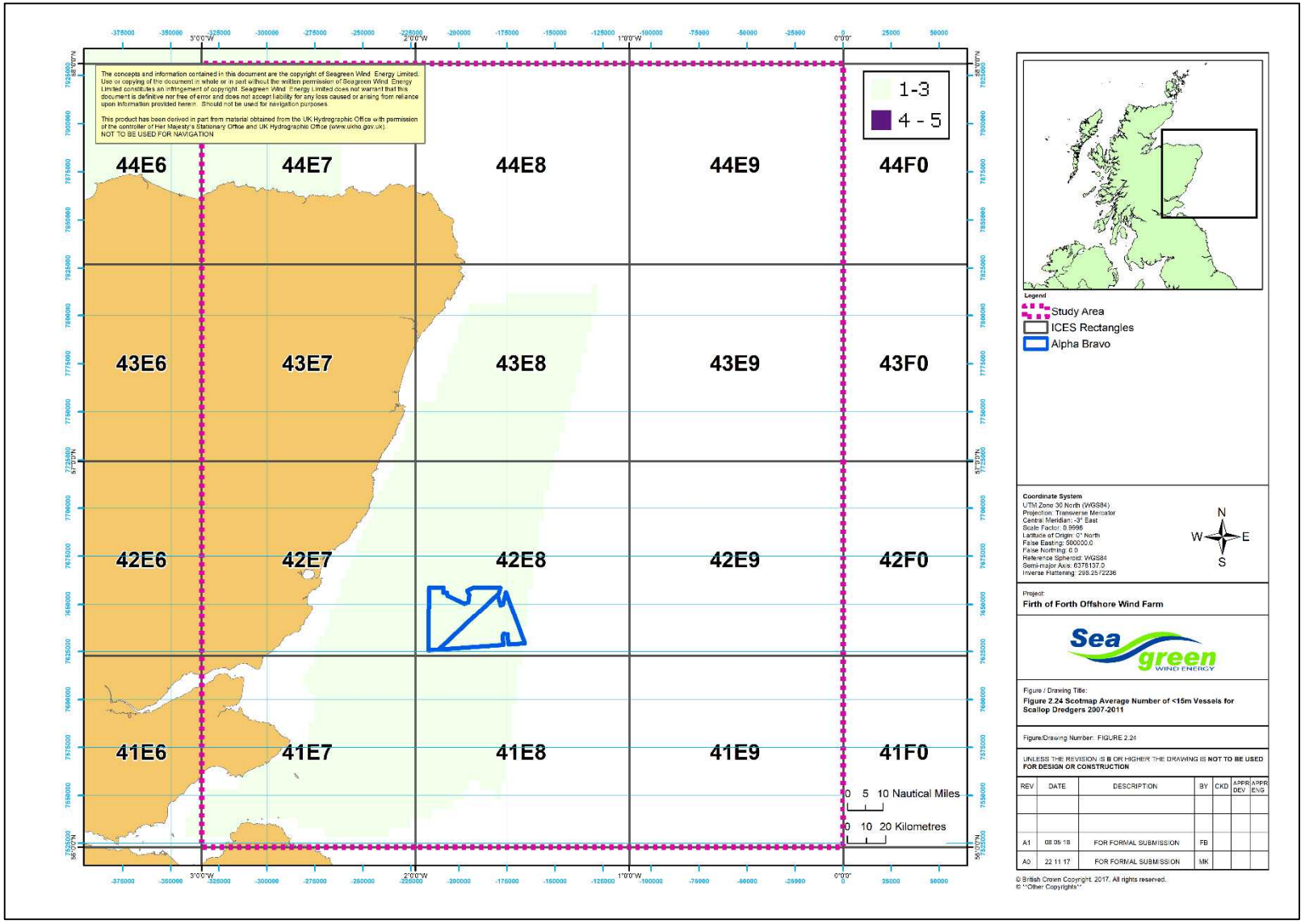


Figure 2.24 ScotMap average vessel numbers for scallop dredgers per year (2007-2011) (source: Marine Scotland, 2017)

2.5.5.2 *Nephrops* Trawling

Figure 2.25 and Figure 2.26 show that *Nephrops* fishing activity is mainly associated with ICES rectangle 41E7. This is also demonstrated by the MMO landings data (see above). Both figures suggest that there is no activity for *Nephrops* by vessels under 15m within ICES 42E8 and therefore none within Project Alpha and Project Bravo.

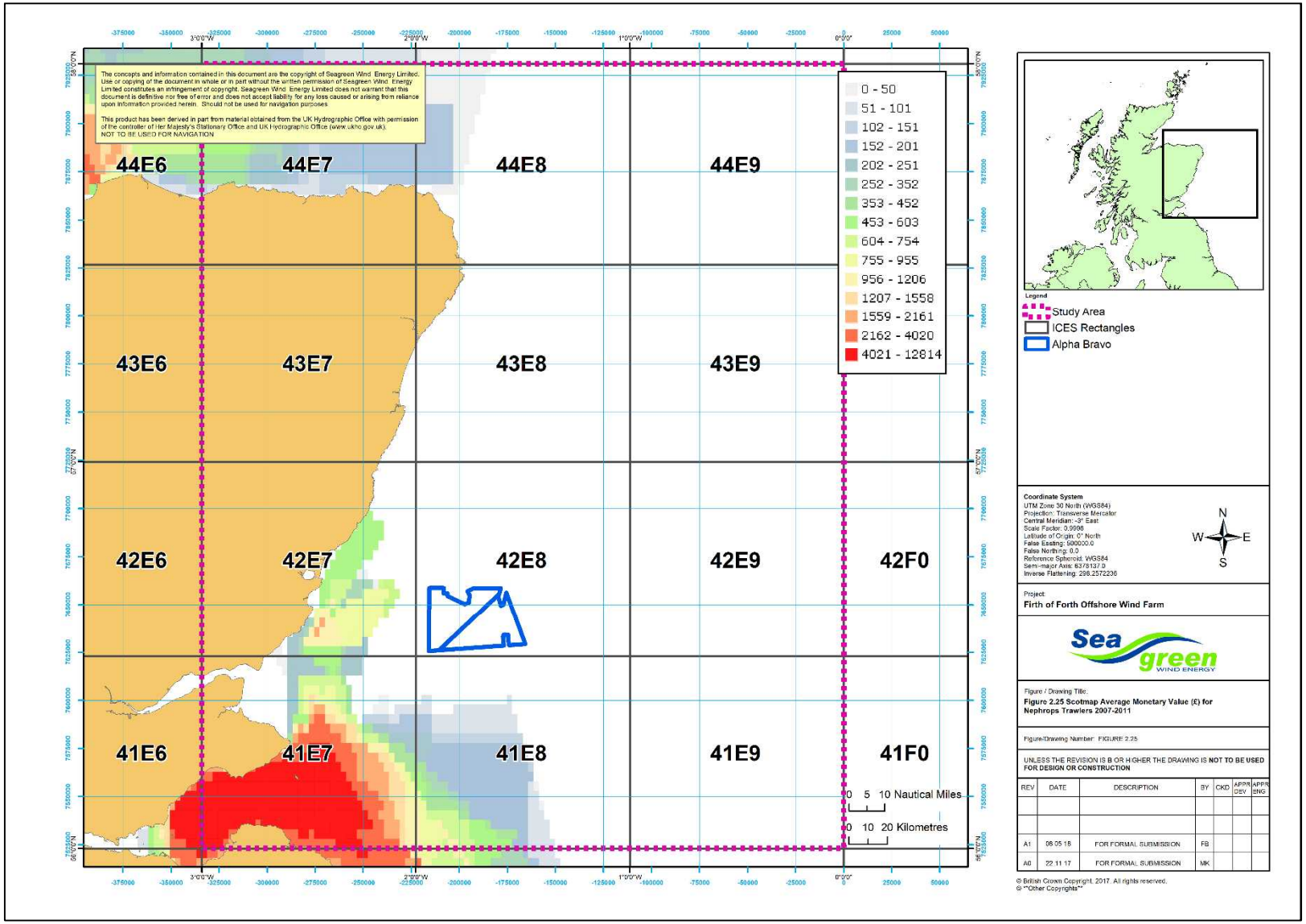


Figure 2.25 ScotMap average monetary value for *Nephrops* trawlers per year (£) (2007-2011) (source: Marine Scotland, 2017)

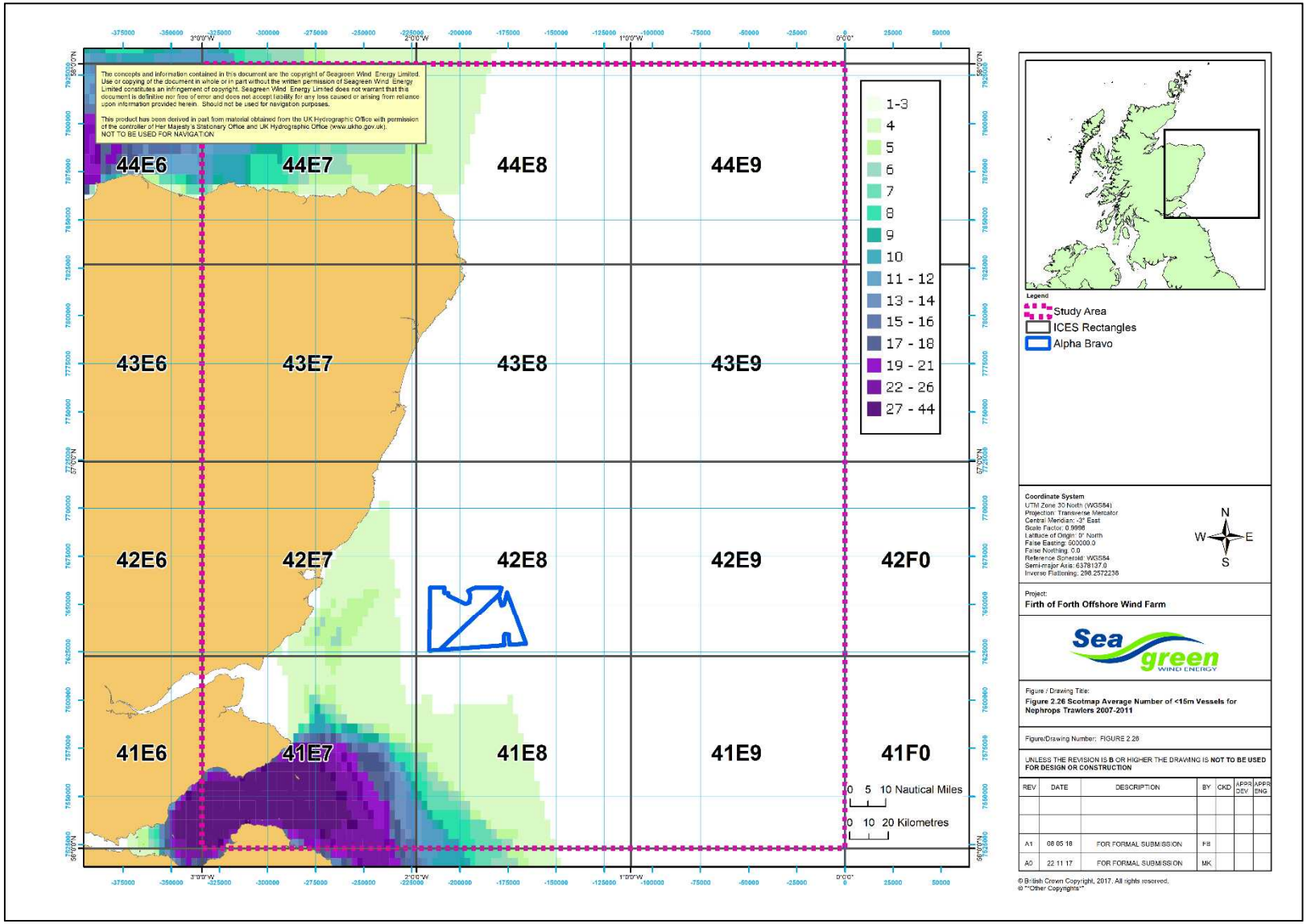


Figure 2.26 ScotMap average vessel numbers for *Nephrops* trawlers per year (2007-2011) (source: Marine Scotland, 2017)

2.5.5.3 Crab and Lobster Creeling

Figure 2.27 shows the highest values for crab and lobster creeling are located within ICES Rectangles 41E7 and 42E7, with the majority of activity within inshore waters. ICES rectangle 41E8 has the lowest creeling value but with a higher proportion of its area fished than 42E8. Within the site boundary, creeling is shown to generate relatively modest values.

Figure 2.28 shows that creeling vessel density generally correlates with total creeling values, with low densities within Project Alpha and Project Bravo.

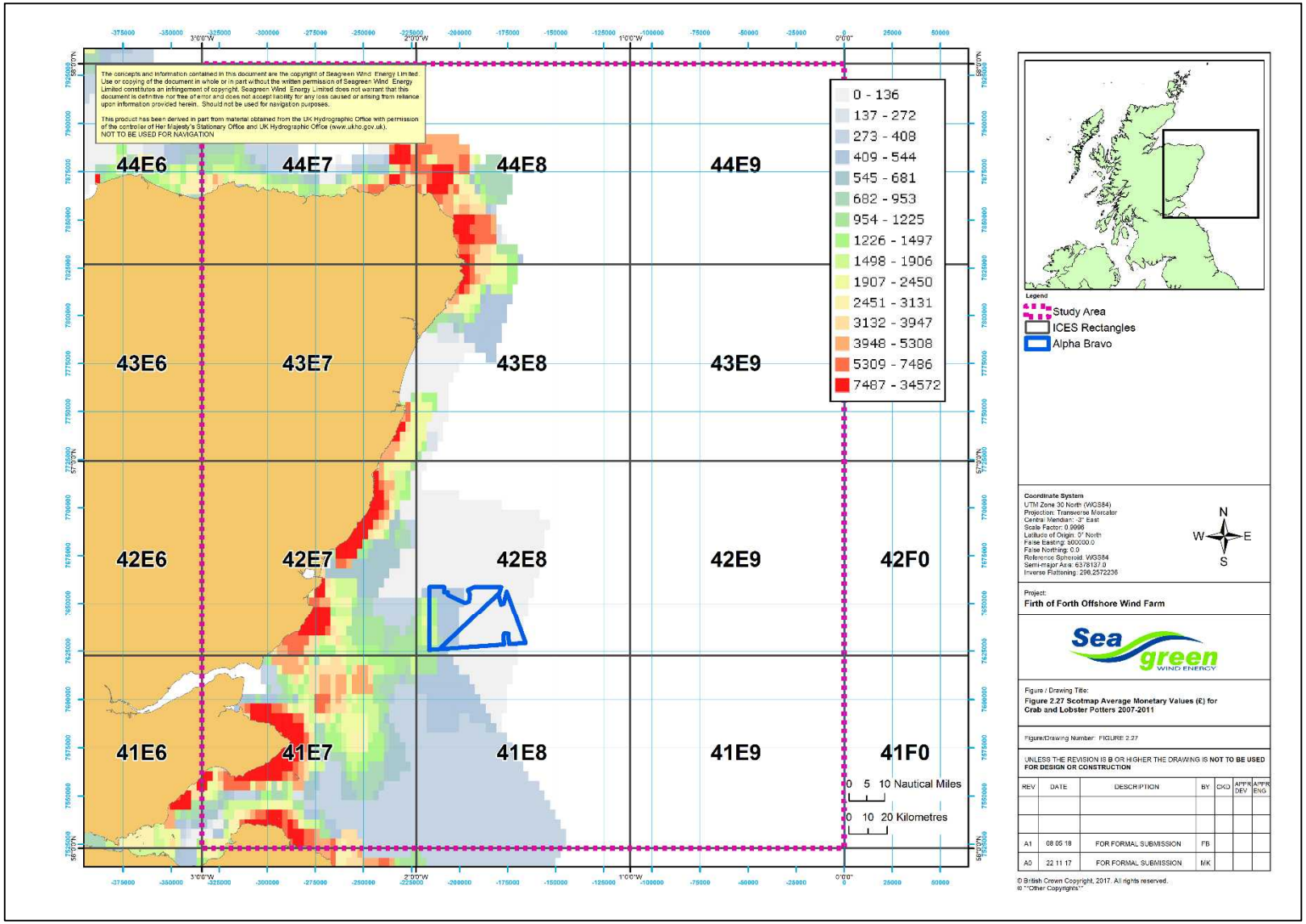


Figure 2.27 ScotMap average monetary value for crab and lobster creelers per year (£) (2007-2011) (source: Marine Scotland, 2017)

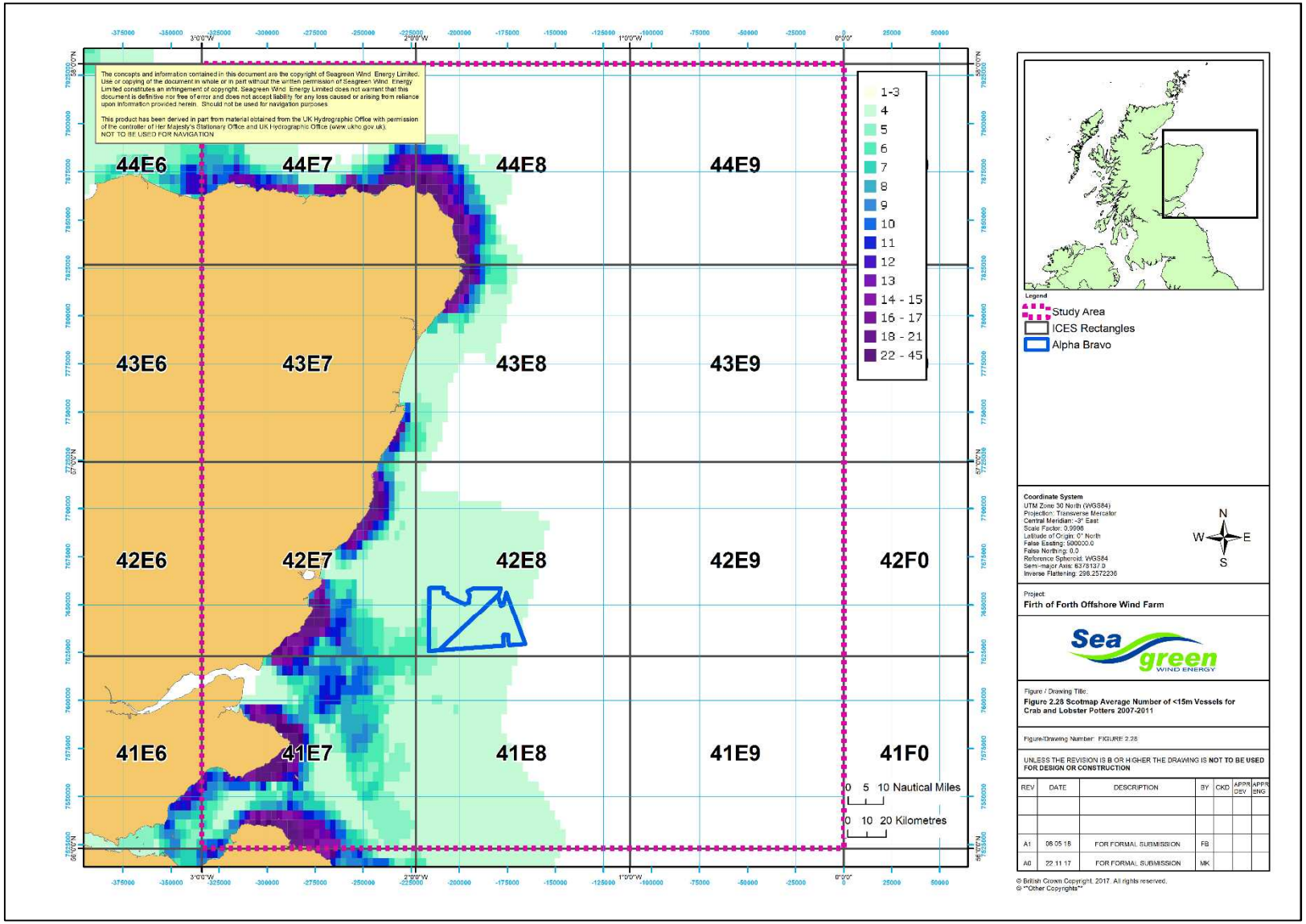


Figure 2.28 ScotMap average vessel numbers for crab and lobster creelers per year (2007-2011) (source: Marine Scotland, 2017)

2.5.5.4 Other Trawls

Figure 2.29 shows other trawling methods, i.e. not classified as *Nephrops* trawls under ScotMap data. ICES rectangles 41E7 and 44E7 record the highest spatial values in the regional area. ICES rectangle 42E7 also sustains some moderate trawling activity. Within ICES rectangle 42E8 a low trawling value is shown over both Project Alpha and Project Bravo.

Figure 2.30 shows the highest vessel density to be within ICES rectangles 41E7, 44E7, followed by 42E7. Despite the region of moderate value found in Figure 2.29, which crosses over the western boundary of Project Alpha, this is not reflected by the vessel density data.

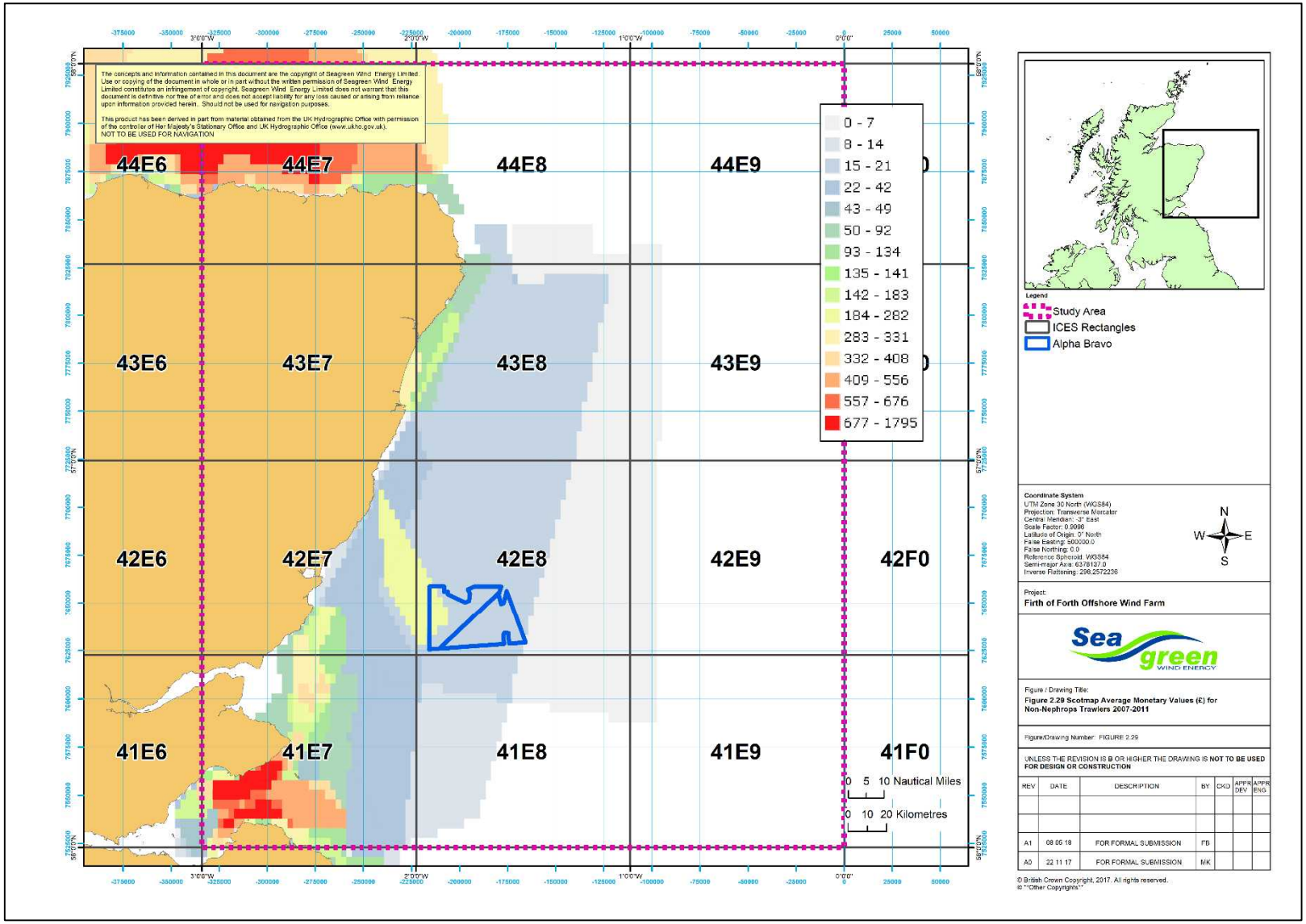


Figure 2.29 ScotMap average monetary value for other (non-*Nephrops*) trawlers per year (£) (2007-2011) (source: Marine Scotland, 2017)

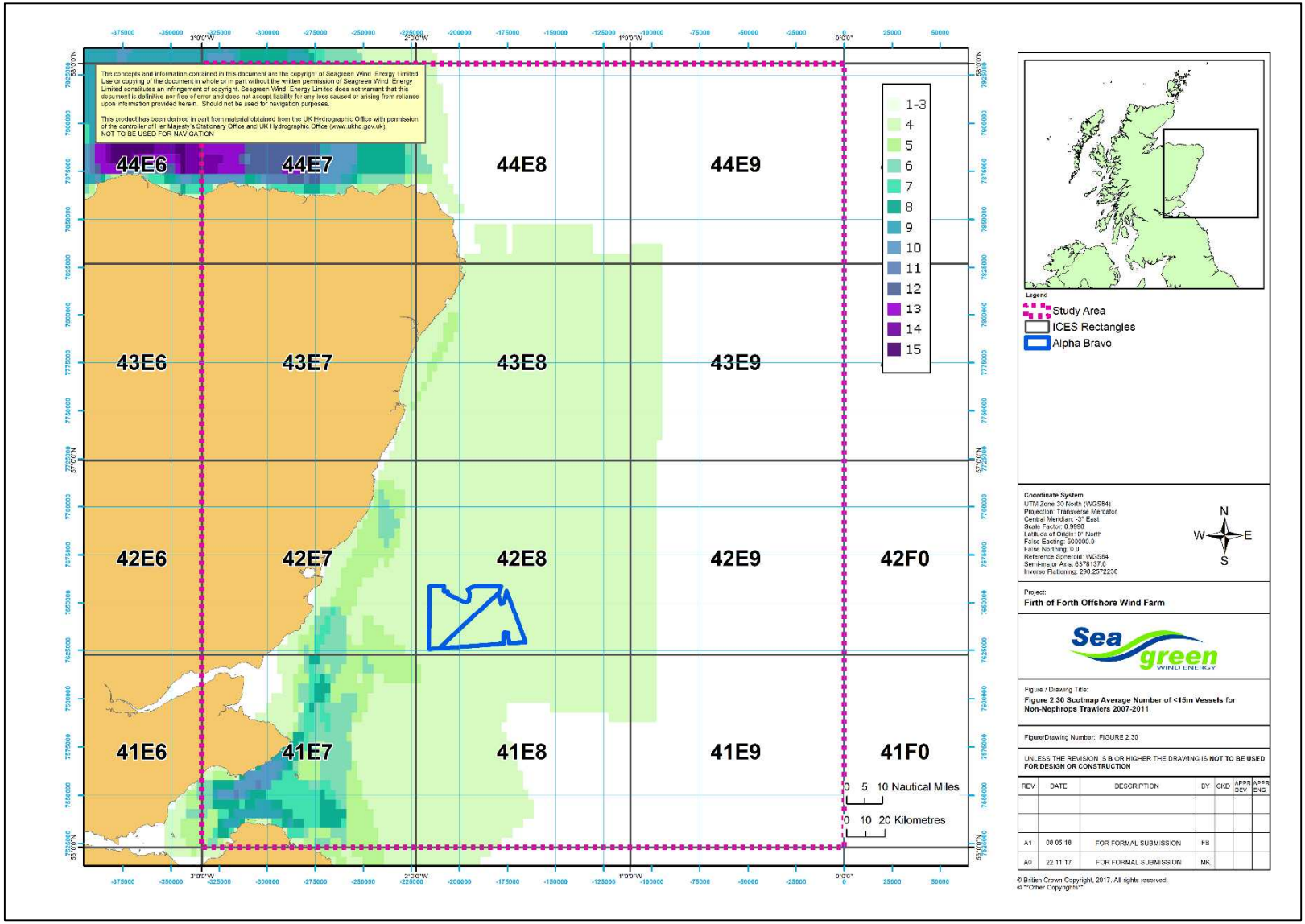


Figure 2.30 ScotMap average vessel numbers for other (non-*Nephrops*) trawlers per year (2007-2011) (source: Marine Scotland, 2017)

2.5.6 Vessels, Gears and Operating Practices

With the exception of the nomadic fleet of scallop dredgers, which fish grounds all around the UK, on the basis of consultation undertaken and fisheries data obtained, it is understood that the majority of vessels, which may fish the Project Alpha and Project Bravo sites are mainly based at a number of Scottish east coast locations. These locations are listed in Table 2.5.

Table 2.5 Vessels operating from locations around the proposed development area (source: Marine Scotland, 2018)

Creek	Number of Vessels Registered
Aberdeen	15
Anstruther	39
Pittenweem	19
Arbroath	26
Eyemouth	30
Port Seton	16
Peterhead	96
Fraserburgh	136
Montrose	12
St Monans	8
Dunbar	30
Burnmouth	12
Macduff	21
Gourdon	14
Johnshaven	12
Stonehaven	9
Crail	11
St Andrews	16

The principal target species identified during consultation with local fisheries stakeholders were stated to be shellfish (lobsters, edible crabs and whelks), squid and scallops.

2.5.6.1 Scallop Dredging

Scallop vessels generally tow between one and two beams onto which a number of dredges are attached, depending on vessel size, engine power and winch capacity. The number of dredges per side can typically vary from three to four on a 10 m boat to up to 14 for the larger class of vessel. The principal type of dredge used is the Newhaven 'Springer' type, whereby the scallops are 'raked' from the seabed by steel teeth that are attached along the leading edge of the dredges. The teeth can penetrate the seabed to depths of approximately 20 cm (see Figure 2.31).

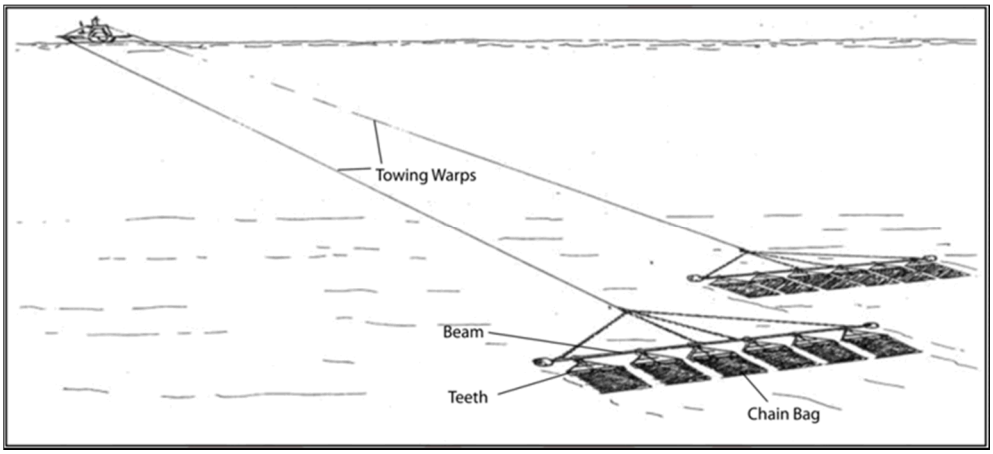


Figure 2.31 Springer Scallop Dredges (BMM, 1984)

Due to the growth rates of scallops and in the case of king scallops, their sessile nature, scallop grounds tend to be subject to concentrated dredging activity for a period of time after which grounds may be left to recover, or to sustain reduced effort, for periods of typically between 5-7 years. The inter-annual cycles of effort and landings values, including those for scallops, are discussed in further detail in sections 2.5.7 and 2.5.8.

As previously stated, the majority of Scottish scallop dredging activity is by the larger class of vessels, which are nomadic, targeting grounds all over the UK. The consultation undertaken by the FIRs has however identified that the area in which the developments are located, are fished by the smaller class of more locally-based vessels.

Table 2.6 summarises the range of specifications of Scottish scallop dredgers as derived from consultation, observations of vessels in port and published fishing vessel lists.

Table 2.6 Scallop dredging vessel specifications collected from consultation with local fishermen (source: BMM, 2017)

Home ports	Dunbar, Fraserburgh, Oban, Gourdon, Annan
Lengths	15 - 36 metres
Main engine power	245 - 1,582 horsepower
Typical fishing trip durations	0.75 - 4 days
Seasonality of activity	All year
Average no. of days fishing per year	200 - 300+ days
Average towing speeds	2 - 3 knots
Average towing durations	1 - 3 hours

Examples of the local Scottish scallop dredgers operating in the area under consideration are shown in Plate 2.1, Plate 2.2 and Plate 2.3. Plate 2.4 shows a medium sized, wider ranging Scottish scallop dredger. Plate 2.5 and Plate 2.6 show two of the larger nomadic-type of UK scallop dredgers, which fish grounds all around the UK.

Automatic Identification System (AIS) data is shown in Figure 2.32. This illustrates that scallop dredging occurs over extensive grounds around the UK. These tracks correspond with the UK-wide VMS value and effort data for scallop dredgers which show concentrated areas of activity around the Scottish coast, in the Irish Sea, in the Channel and off the coast of Normandy (Figure 2.33 and Figure 2.34). Despite the relatively high intensity of activity displayed within the study area compared to other fishing methods and species, this accounts for in the order of 1.15% of the total VMS value for scallops fished in the UK.

Plate 2.1 Emma Kathleen (ME87), a scallop dredger from home port of Gourdoun (source: SFF, 2018)

Plate 2.2 Ubique (KY28), a scallop dredger from home port of Arbroath (source: SFF, 2018)

Plate 2.3 Marigold, a scallop dredger from home port of Arbroath (source: SFF, 2018)

Plate 2.4 Natalie B (PD1023), a medium sized Scottish scallop dredger (source: ASFA, 2017)

Plate 2.5 Cornelius Gert Jan (GY89), a nomadic scallop dredger from home port of Ayr (source: BMM, 2011)

Plate 2.6 Glendeveron (BM500), a nomadic scallop dredger from home port of Brixham (source: BMM, 2011)

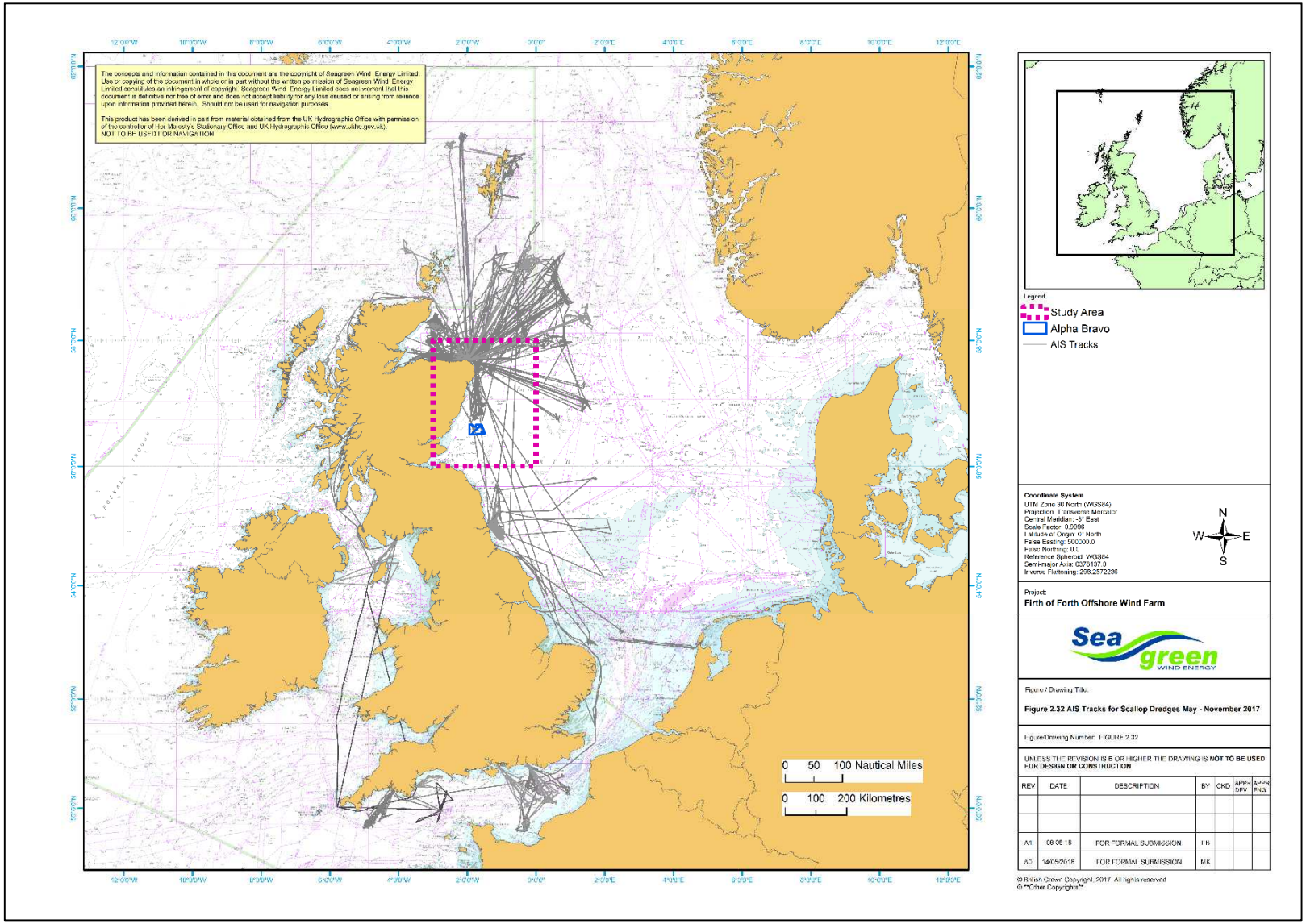


Figure 2.32 AIS tracks for scallop dredgers May to November 2017 (source: BMM, 2017)

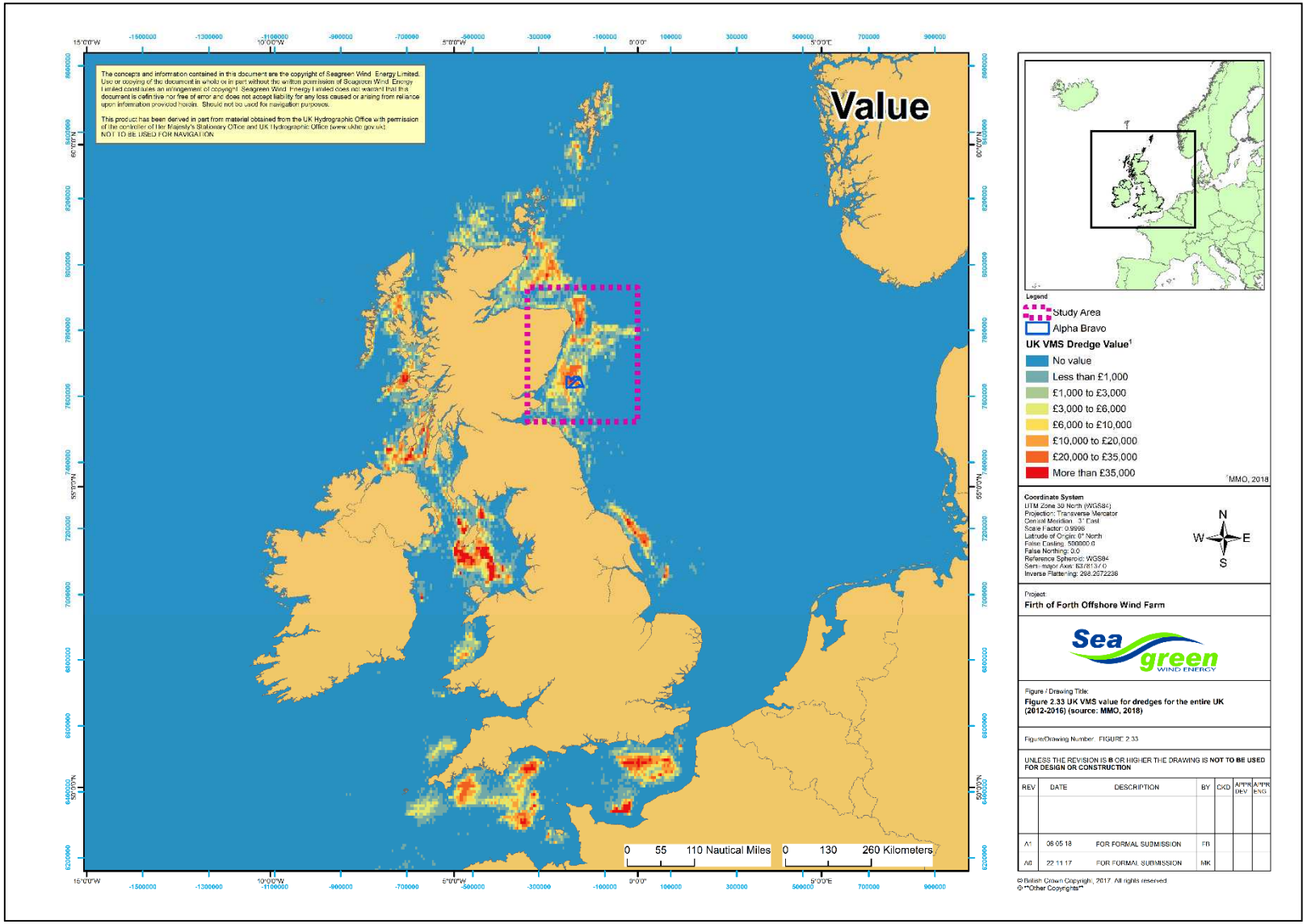


Figure 2.33 UK VMS value for dredges for the entire UK (2012-2016) (source: MMO, 2018)

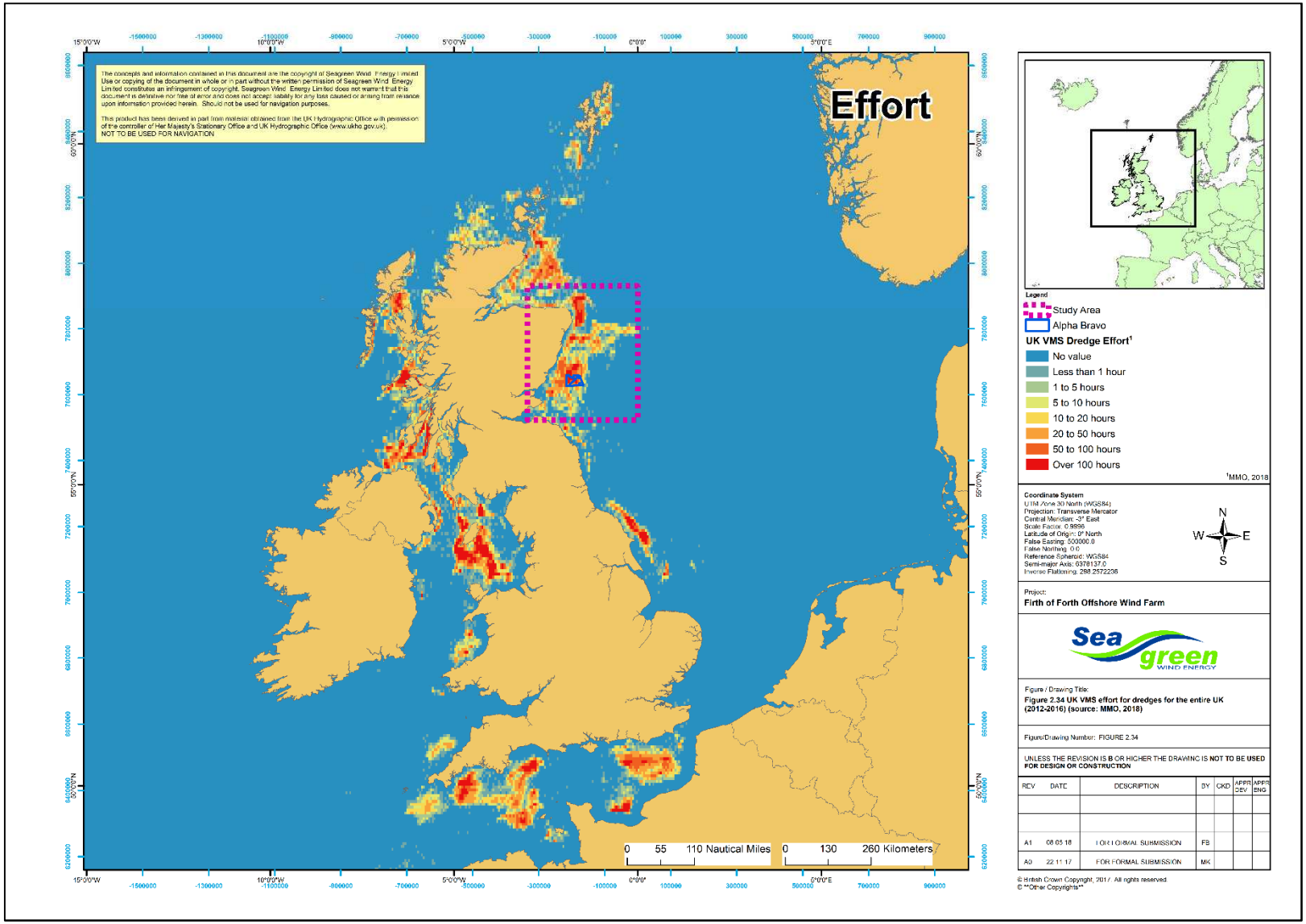


Figure 2.34 UK VMS effort for dredges for the entire UK (2012-2016) (source: MMO, 2018)

2.5.6.2 Creeling

Creeling for crab and lobster occurs throughout UK waters although the design of creels may vary depending on region and target species. In general, all creels have one or more "funnel" shaped entrances for the shellfish to enter (Plate 2.7). Creels are rigged in fleets of between 10 and 50 creels per fleet (in a string) depending upon the vessel size and the area to be fished. Lengths of a fleet (or string) of creels may range from 100 to 500 metres, anchored at each end with either an anchor or chain clump weights. A variety of surface markers are used including flagged dhans (marker flags), buoys and cans. Soak times, the time between baiting and deployment to emptying and harvesting, varies from approximately 12 hours to three days, although this can be longer during periods of adverse weather. Vessels engaging in creeling are generally under 10m in length, with crew members typically varying from one to three.

Plate 2.7 "Parlour" creels used to target lobsters (source: BMM, 2017)

Table 2.7 shows creeling vessel specifications collected from initial consultation with local fishermen in 2017. Examples of creeling vessels are shown in Plate 2.8 and Plate 2.9.

Table 2.7 Creeling vessel specifications collected from consultation with local fishermen (source: BMM, 2017)

Home ports	Arbroath, Burnmouth
Lengths	8.54 - 11.98 metres
Main engine power	100 - 441 kilowatts
Fishing associations	Anglo-Scottish Fishermen's Association, Arbroath and Montrose Creel Association, Arbroath and District Creel Association, Arbroath Static Gear Association
Typical fishing trip durations	6 - 18 hours
Typical distance steamed from home ports	10 - 40 nautical miles
Seasonality of activity	3 – 12 months
Average no. of days fishing per year	200 - 365
Number of days fished in the development area	130 - 305
Creel type	Parlour
No. of fleets	40 - 55
Fleet length (m)	250 - 1200
No. of creels per fleet	15 - 40

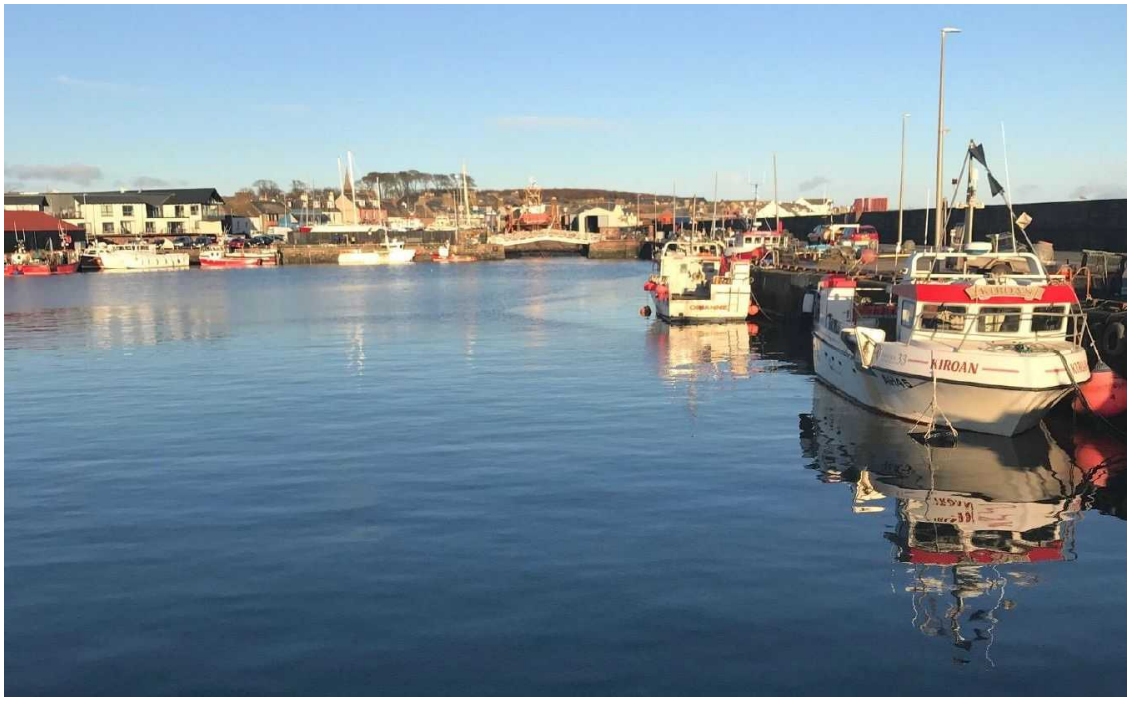


Plate 2.8 Kiroan (AH45) left of picture, a creeler from home port of Arbroath (source: ASFA, 2017)

Plate 2.9 Venture (AH36), a creeler from home port of Arbroath (source: ASFA, 2017)

2.5.6.3 Demersal Otter Trawling

Demersal otter trawling involves the towing of one or more funnel-shaped nets over the seabed, the lateral opening of which are achieved by the trawl doors and the vertical opening by a series of spherical floats along the headline of the net. The groundlines, which maintain contact with the seabed vary in type depending upon the grounds fished and the species targeted.

Towing speeds over the ground are generally between 2.5 and 3.5 knots, with towing directions being influenced by factors such as seabed topography and direction of tidal flow.

Traditionally demersal otter trawling involved the towing of a single net (Figure 2.35). The past 20 years have however seen the development of twin rig (Figure 2.36) and occasionally triple rig demersal otter trawling whereby two or even three nets are towed between the trawl doors.

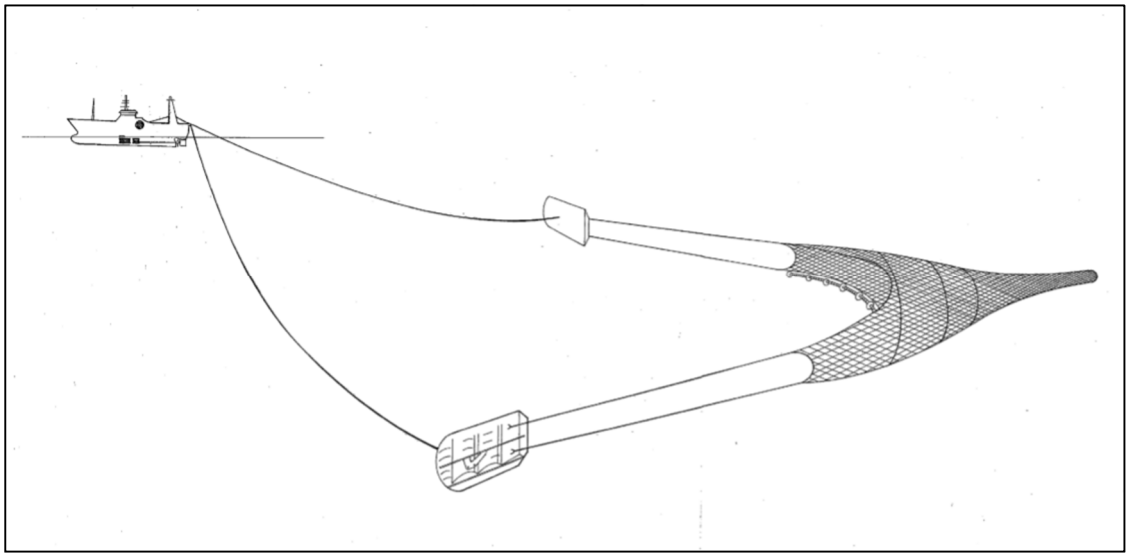


Figure 2.35 Typical single rig otter trawl (source: BMM, 2017)

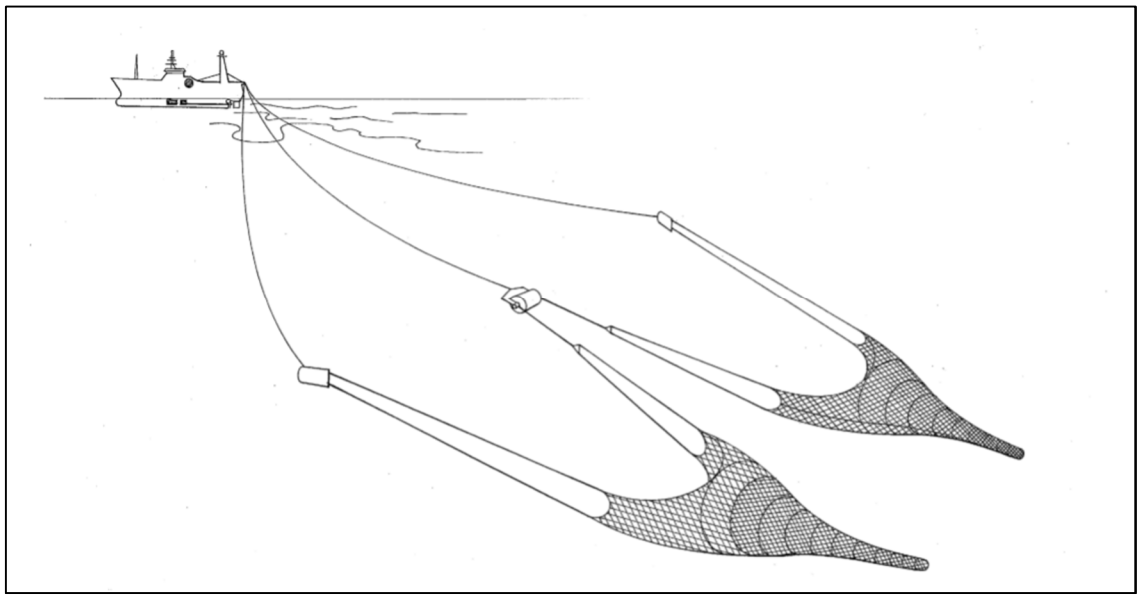


Figure 2.36 Twin rig trawl (source: BMM, 2017)

Table 2.8 shows demersal trawling vessel specifications collected from consultation with local fishermen in 2017. Examples of demersal trawlers are shown in Plate 2.10 and Plate 2.11.

Table 2.8 Trawling vessel specifications collected from consultation with local fishermen (source: BMM, 2017)

Home ports	Arbroath, Buckie, Dunbar, Eyemouth, Newhaven, Port Seton, Seahouses
Lengths	9.9 - 26.3 metres
Main engine power	130 - 738 kilowatts
Fishing associations	Anglo-Scottish Fishermen's Assocation, Arbroath and District Creel Association, Scottish White Fish Producers Association
Typical fishing trip durations	0.7 - 5 days
Typical distance steamed from home ports	5 - 200 nautical miles
Seasonality of activity	All year
Average no. of days fishing per year	200 - 300
Principal fishing method(s)	Twin rig, single rig demersal trawl
Main species targeted by method	*Nephrops*, prawn, squid
Average towing speeds	2.2 - 3.5 knots
Average towing durations	2 - 4 hours

Plate 2.10 Moray Endeavour (BCK17), a demersal trawler from home port of Buckie (source: ASFA, 2017)

Plate 2.11 Twilight (AH16), a demersal trawler from home port of Arbroath (source: ASFA, 2017)

The whitefish fishery in the Firth of Forth has declined over the years, particularly during the past five years. According to MMO landings data, haddock and cod continue to constitute the majority of whitefish landing weights. No vessels, trawlers or otherwise, were identified as targeting whitefish during the 2017 stakeholder consultation undertaken by the FIRs.

2.5.6.4 Fishing Grounds

The following charts depicting fishing grounds have been derived from consultation undertaken by FIRs in 2011 and in 2017.

Figure 2.37 illustrates the scallop fishing grounds derived from consultation with fishermen in 2011. Further direct consultation was not undertaken in 2017, as it is understood that these grounds have not materially changed since 2011. It is of note that the grounds as shown broadly align with the VMS data given in Figure 2.12 and Figure 2.13, which further suggests activity is mainly by the larger class of over-15m vessels.

The consultation undertaken in 2011 (Figure 2.38) shows the creeling grounds concentrated well to the west and southwest of the Project Alpha and Project Bravo sites. The subsequent 2017 consultation (Figure 2.39) however indicates creeling activity by four vessels occurring within the wind farm sites. This recent development was stated to be the result of a number of creeling fishermen investing in the faster class of vessel, such as the Cleopatra type, an example of which is shown in Plate 2.8. As a consequence of the significantly higher steaming speeds of such vessels, they are able to operate over a larger fishing area and further from their base ports.

Figure 2.40 illustrates creeling areas for specific vessels as derived from the SWFPA website. The purpose of this is to inform towed gear vessels, particularly scallop dredgers, of the locations of creeling grounds in order to avoid conflicts with creel gears. As is apparent, a negligible proportion of

the creel grounds presented on the website overlap into Project Alpha and Project Bravo and that only the creels of four vessels do so. Furthermore, the majority of the creel deployments are along the western boundary of Project Alpha.

Nephrops trawling grounds have been identified during consultation undertaken between 2011 and 2017 (Figure 2.41). These grounds do not overlap into Project Alpha and Project Bravo and are clustered in the inshore ICES rectangle 41E7.

Squid trawling grounds derived from consultation in 2011 are shown in Figure 2.42. As shown, these grounds are extensive, a small proportion of which overlap the Project Alpha and Project Bravo sites. As is apparent, however, the grounds identified from the consultation in 2017 (Figure 2.43), showing both *Nephrops* and squid grounds do not overlap with Project Alpha and Project Bravo.

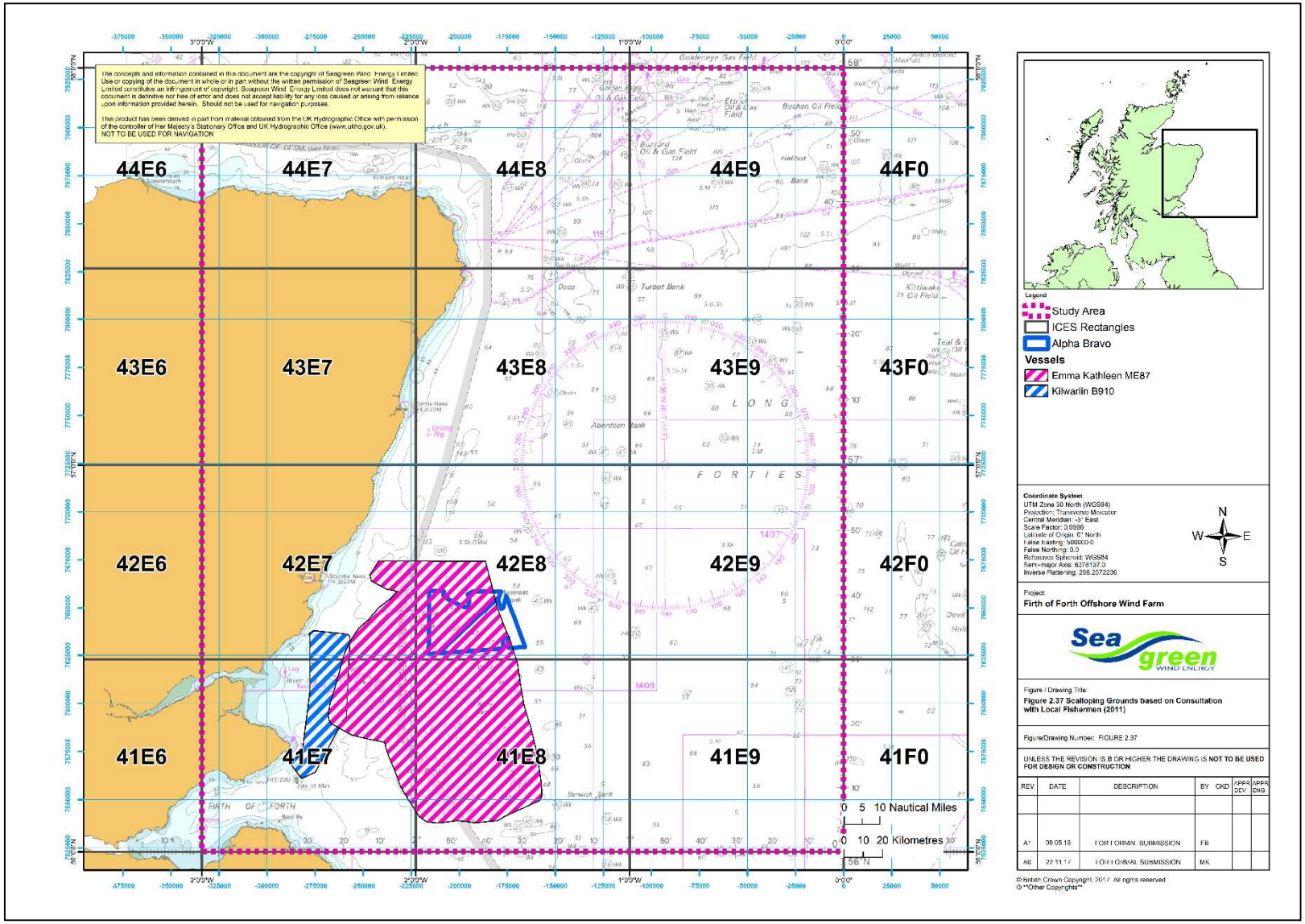


Figure 2.37 Scallop fishing grounds based on consultation with fishermen (source: BMM, 2011)

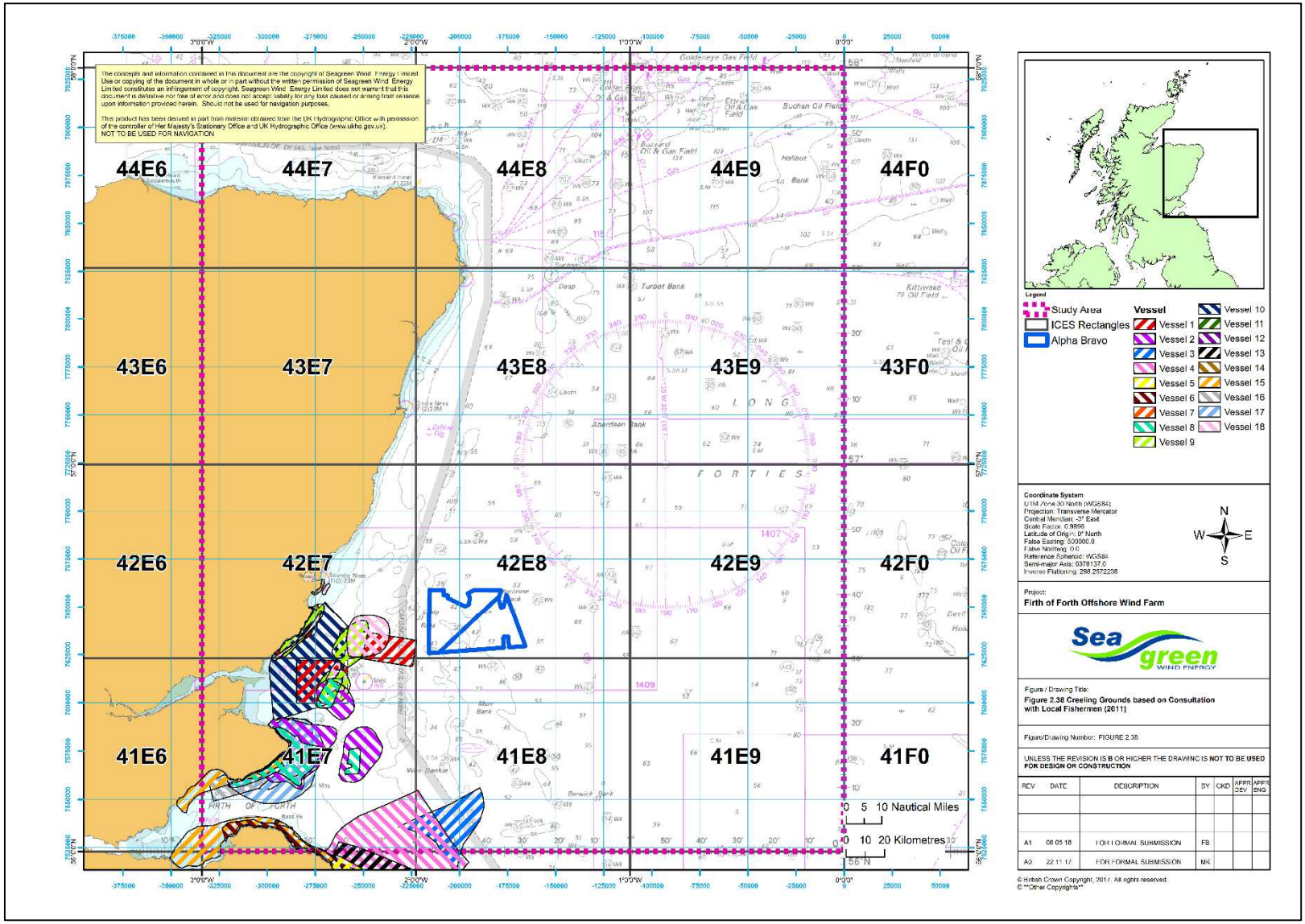


Figure 2.38 Creeling fishing grounds based on consultation with fishermen (source: BMM, 2011)

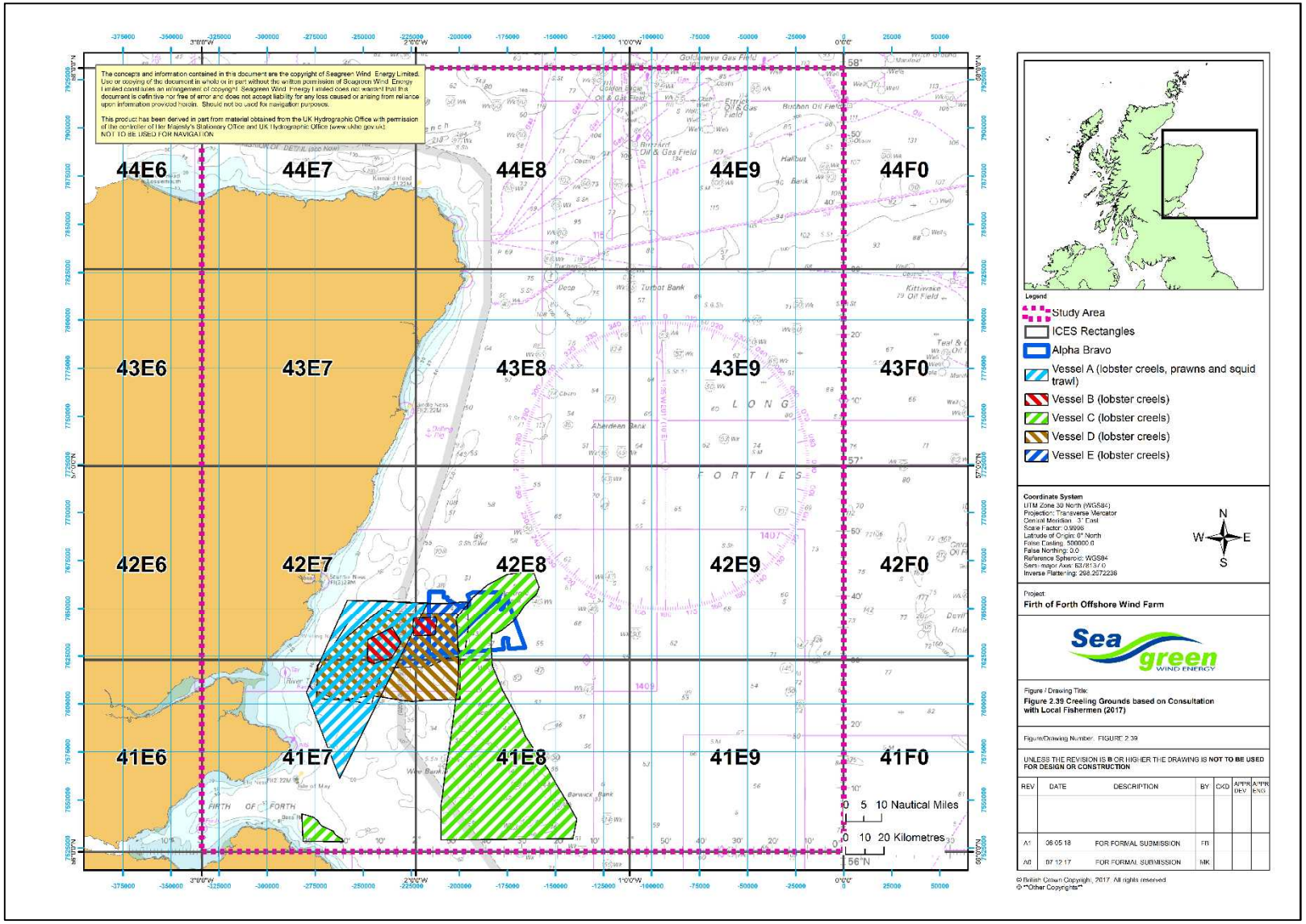


Figure 2.39 Creeling fishing grounds based on consultation with fishermen (source: BMM, 2017)

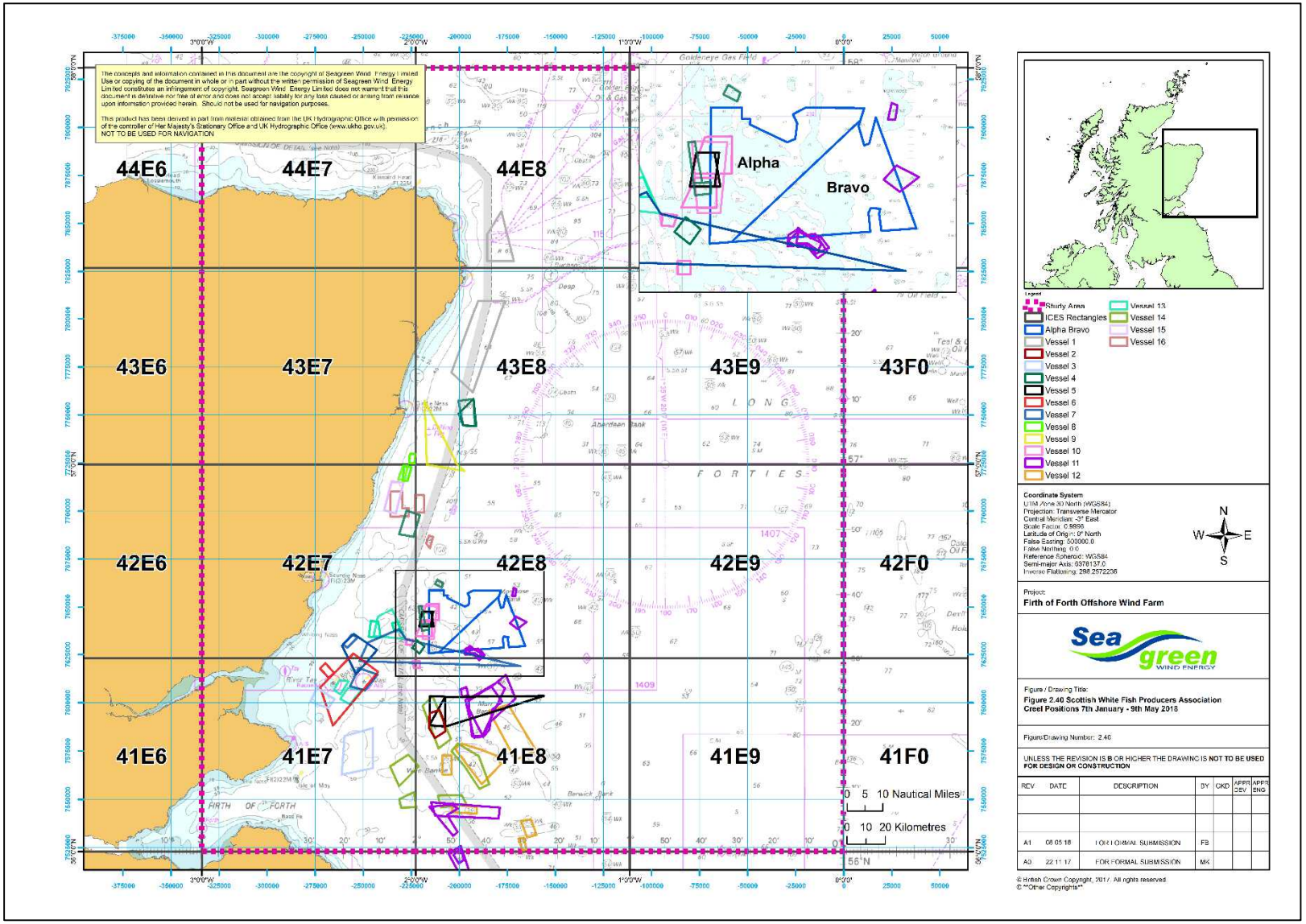


Figure 2.40 Scottish White Fish Producers Association creel positions (7th January – 9th May 2018) (source: SWFPA, 2018)

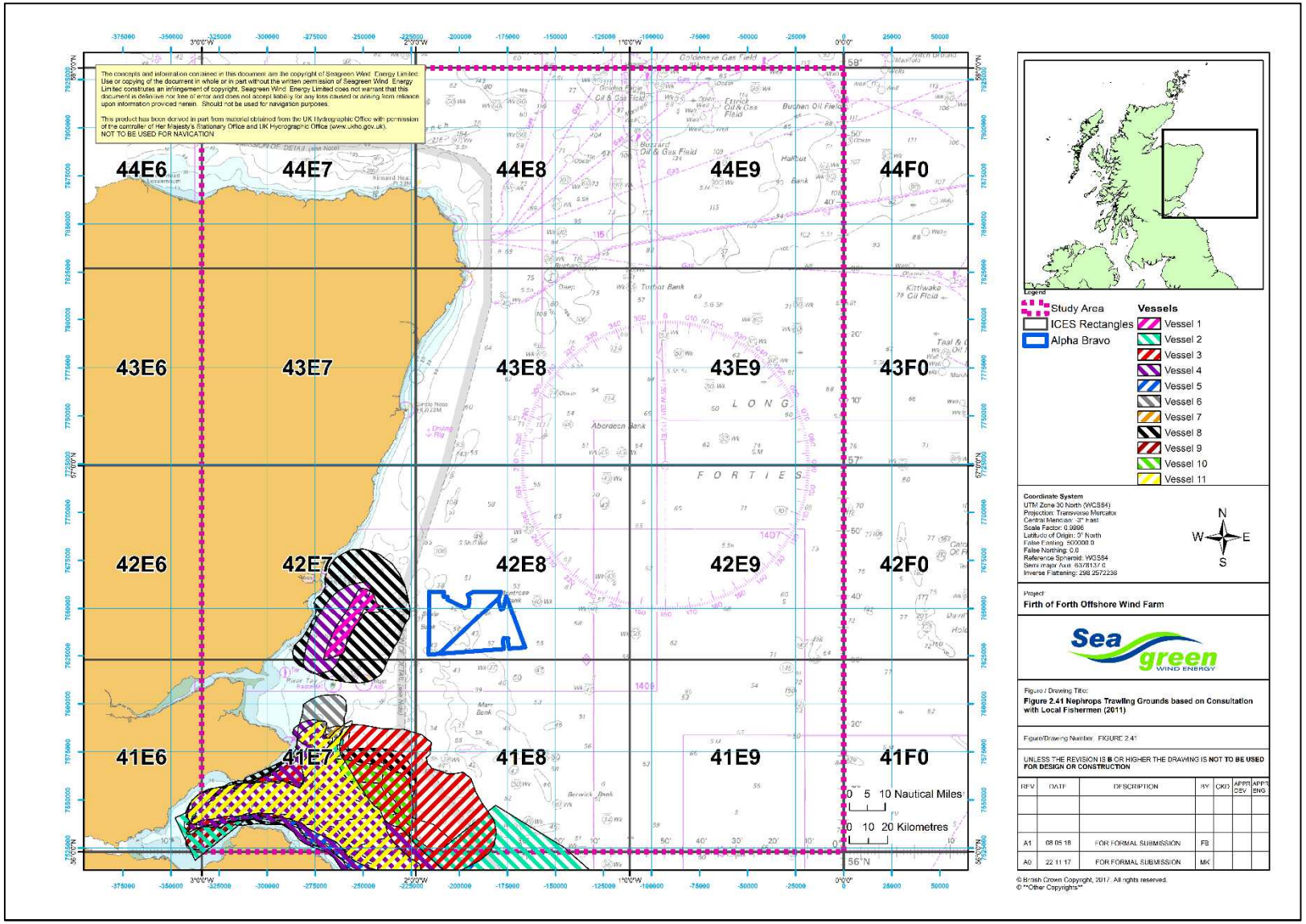


Figure 2.41 *Nephrops* trawling fishing grounds based on consultation with fishermen (source: BMM, 2011)

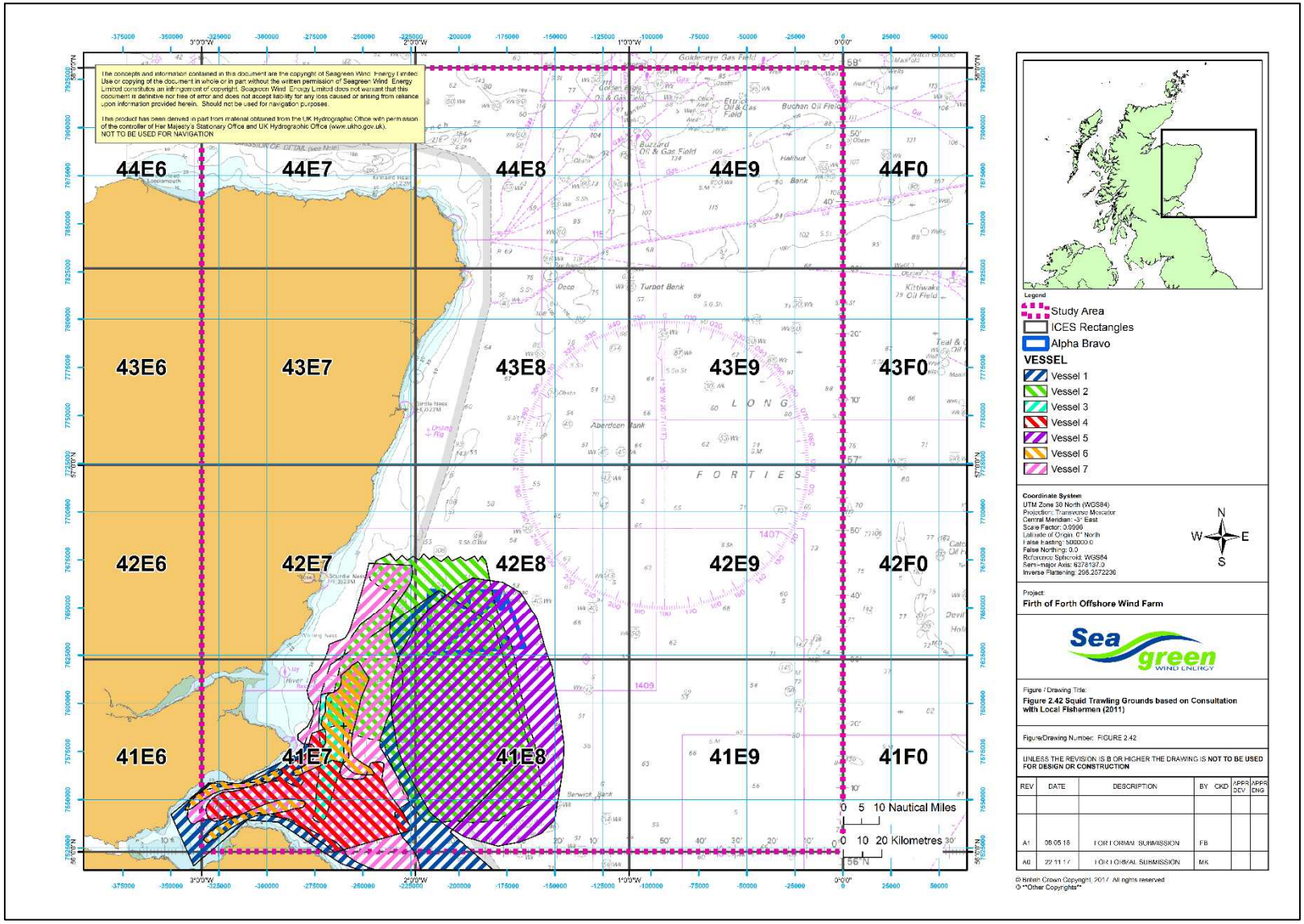


Figure 2.42 Squid trawling fishing grounds based on consultation with fishermen (source: BMM, 2011)

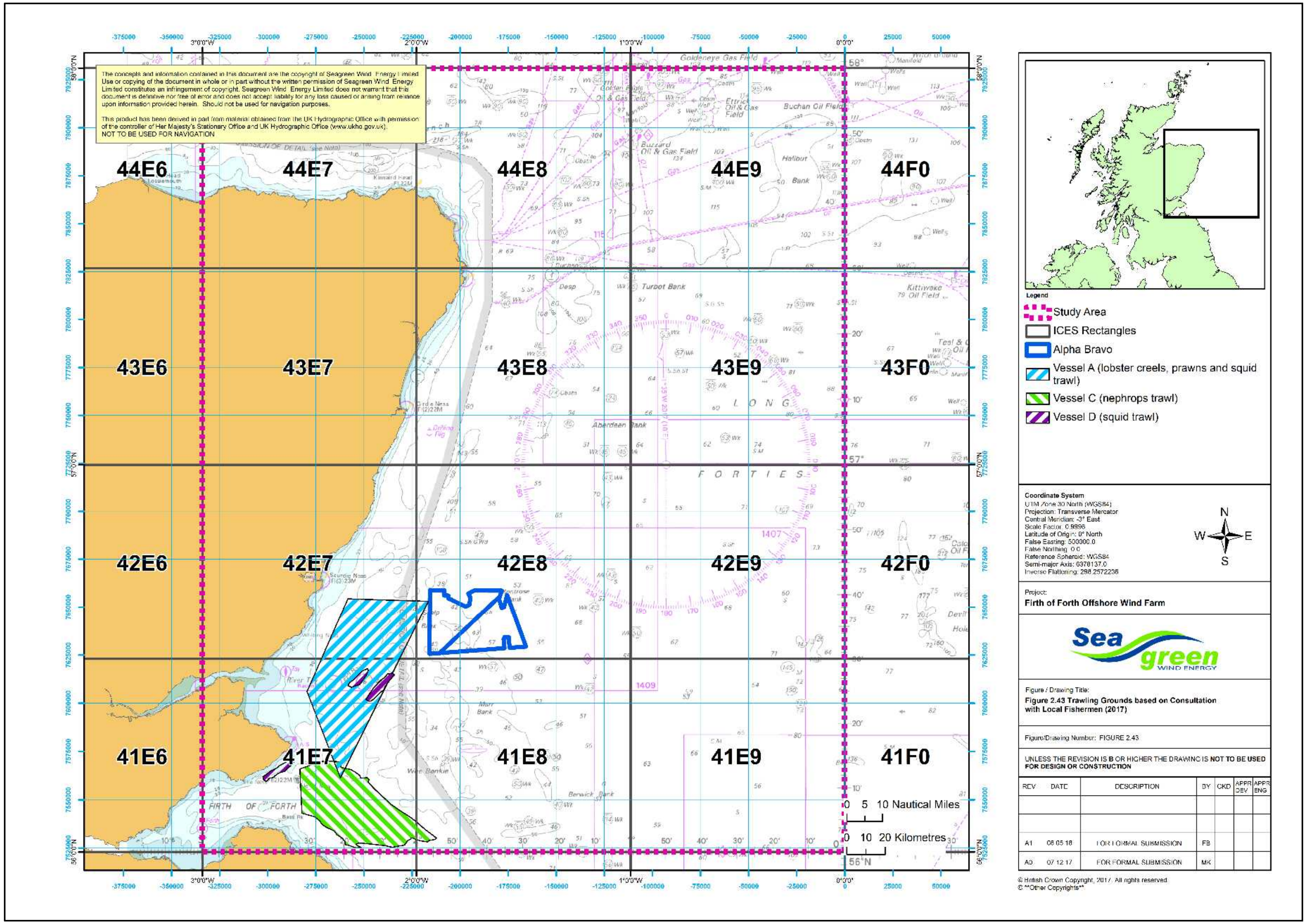


Figure 2.43 Trawling fishing grounds based on consultation with fishermen (source: BMM, 2017)

2.5.7 Annual Landings and Effort Data

Figure 2.44 and Figure 2.45 show MMO total landings value and effort for a 17-year period. The data shows that there is high inter-annual variance for both fishing effort and value within ICES 42E8. Total values correlate with total fishing effort; therefore, inter-annual fluctuations of value are mainly a function of fishing effort. The data also shows variation spanning approximately 10-year intervals. This variation is due to the high proportion of scallop landings within ICES 42E8.

Figure 2.46 shows annual variation in landings values by species for ICES rectangle 42E8 for the period 2007-2016. Scallop values peaked in 2016 at £2,945,929 with the lowest landings value being £130,119 in 2011.

Lobster values have similarly peaked for the most recent year taken into consideration, 2016, at £78,065, with its lowest recorded values in 2000, 2001, 2004 and 2007 at £0. Squid landings peaked in 2011 at £186,706 and were lowest in 2007 (£28), and £25,742 in 2016.

Lobster and squid values have varied considerably between 2007 and 2016 with no obviously discernible pattern over the period.

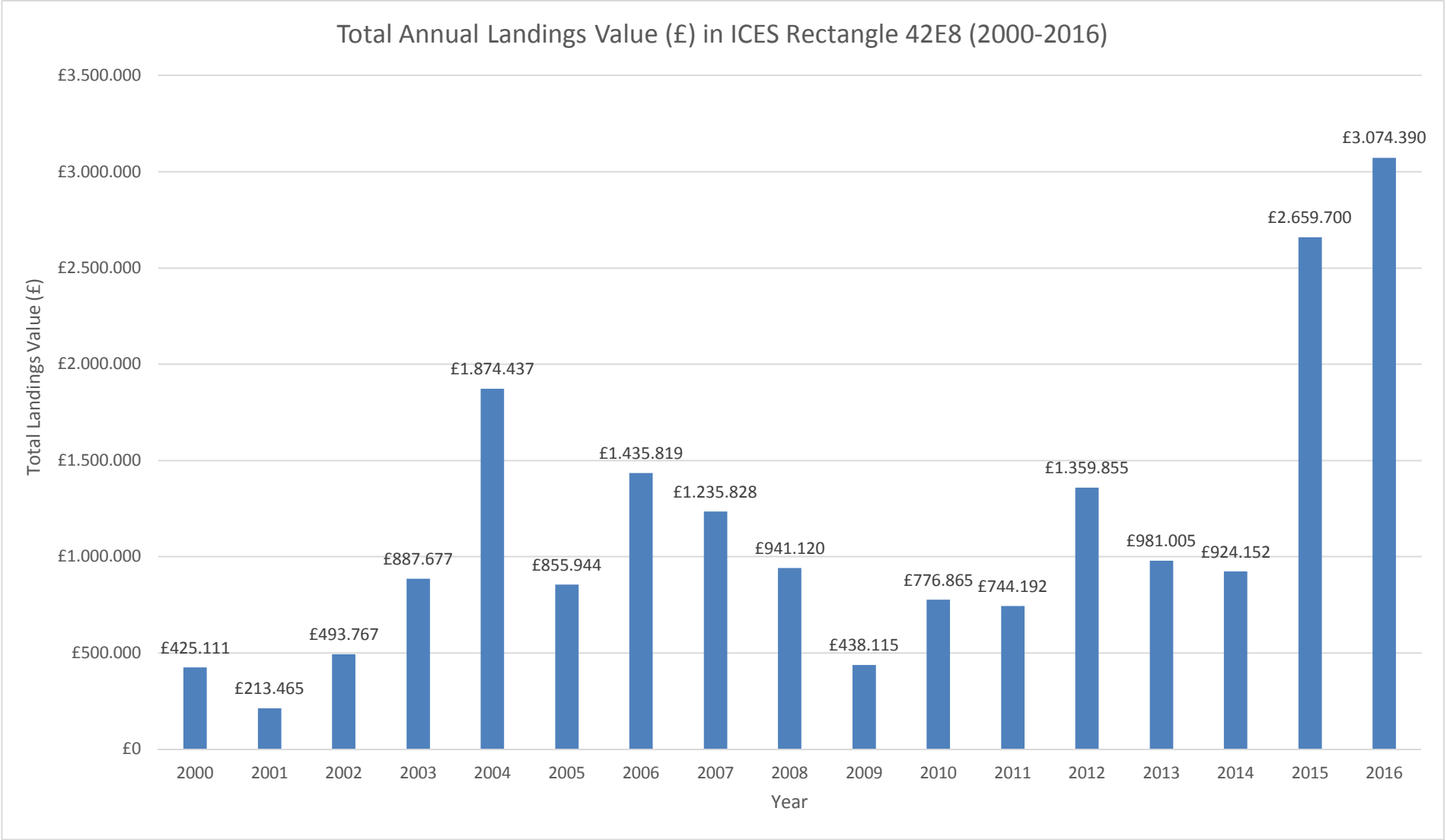


Figure 2.44 Annual landings value in ICES rectangle 42E8 (2000-2016) (source: MMO, 2018)

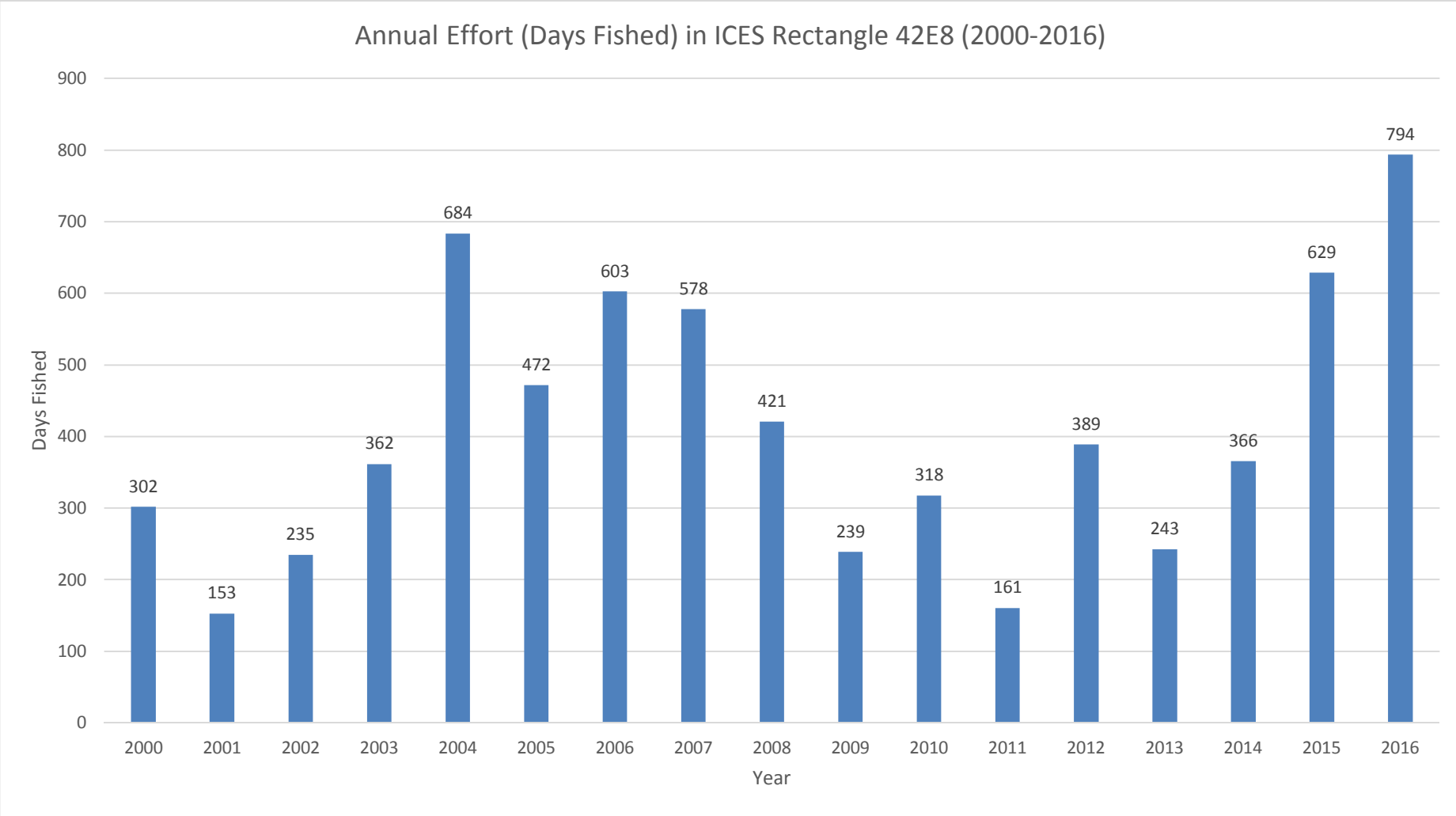
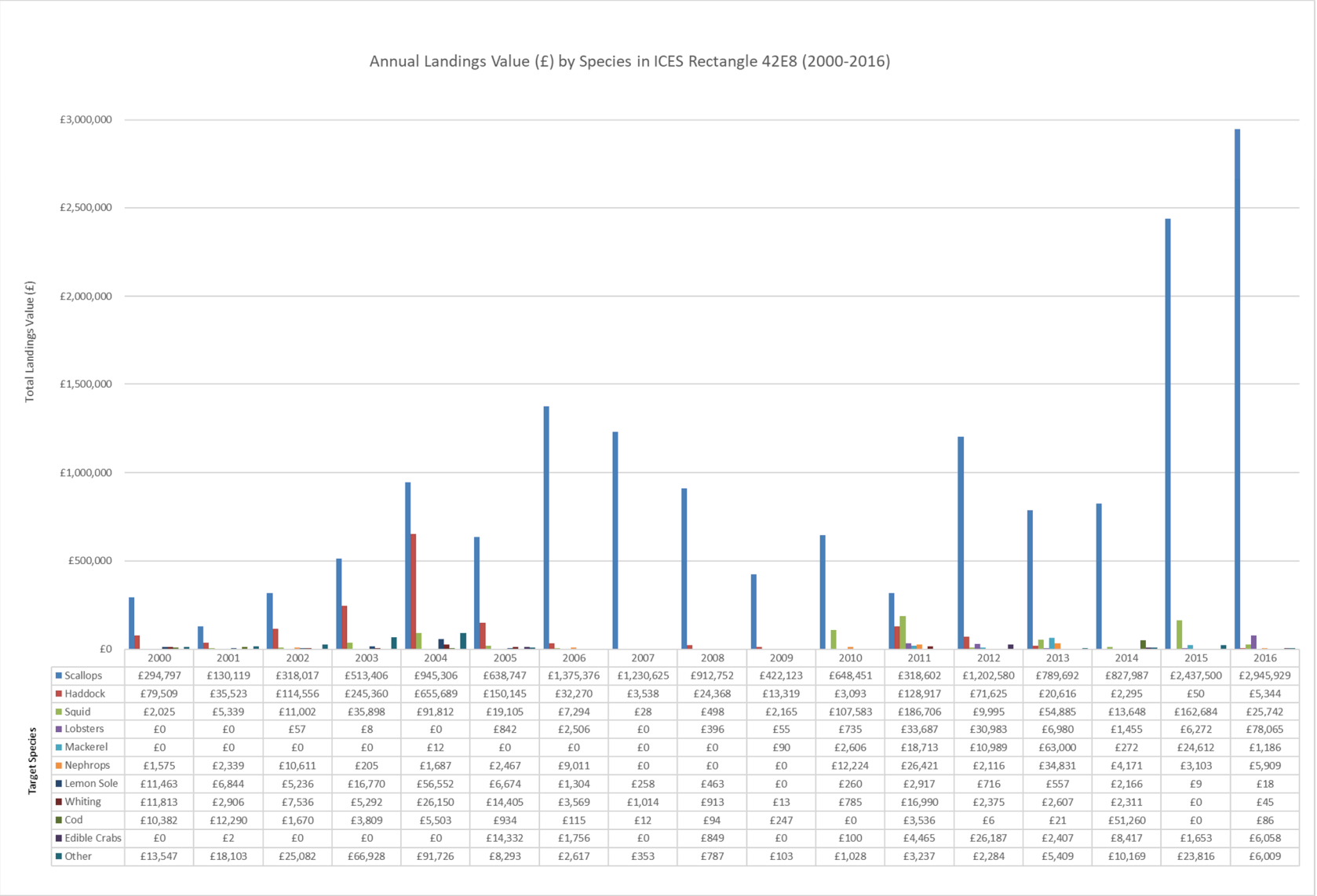


Figure 2.45 Annual effort (days fished) in ICES rectangle 42E8 (2000-2016) (source: MMO, 2018)



Target Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Scallops	£294,797	£130,119	£318,017	£513,406	£945,306	£638,747	£1,375,376	£1,230,625	£912,752	£422,123	£648,451	£318,602	£1,202,580	£789,692	£827,987	£2,437,500	£2,945,929
Haddock	£79,509	£35,523	£114,556	£245,360	£655,689	£150,145	£32,270	£3,538	£24,368	£13,319	£3,093	£128,917	£71,625	£20,616	£2,295	£50	£5,344
Squid	£2,025	£5,339	£11,002	£35,898	£91,812	£19,105	£7,294	£28	£498	£2,165	£107,583	£186,706	£9,995	£54,885	£13,648	£162,684	£25,742
Lobsters	£0	£0	£57	£8	£0	£842	£2,506	£0	£396	£55	£735	£33,687	£30,983	£6,980	£1,455	£6,272	£78,065
Mackerel	£0	£0	£0	£0	£12	£0	£0	£0	£0	£90	£2,606	£18,713	£10,989	£63,000	£272	£24,612	£1,186
Nephrops	£1,575	£2,339	£10,611	£205	£1,687	£2,467	£9,011	£0	£0	£0	£12,224	£26,421	£2,116	£34,831	£4,171	£3,103	£5,909
Lemon Sole	£11,463	£6,844	£5,236	£16,770	£56,552	£6,674	£1,304	£258	£463	£0	£260	£2,917	£716	£557	£2,166	£9	£18
Whiting	£11,813	£2,906	£7,536	£5,292	£26,150	£14,405	£3,569	£1,014	£913	£13	£785	£16,990	£2,375	£2,607	£2,311	£0	£45
Cod	£10,382	£12,290	£1,670	£3,809	£5,503	£934	£115	£12	£94	£247	£0	£3,536	£6	£21	£51,260	£0	£86
Edible Crabs	£0	£2	£0	£0	£0	£14,332	£1,756	£0	£849	£0	£100	£4,465	£26,187	£2,407	£8,417	£1,653	£6,058
Other	£13,547	£18,103	£25,082	£66,928	£91,726	£8,293	£2,617	£353	£787	£103	£1,028	£3,237	£2,284	£5,409	£10,169	£23,816	£6,009

Figure 2.46 Annual landings value by species in ICES rectangle 42E8 (2000-2016) (source: MMO, 2018)

2.5.8 Seasonality

For the assessment of seasonality, the most recent five year period has been used in order to take account of the recent increase in scallop activity within the area.

Average monthly landings values by species are given in Figure 2.47 illustrating the seasonal variation for ICES rectangle 42E8. The higher levels of scallop landings are shown to occur in February, March and peaking in April, with lower levels occurring in the remaining months.

Both squid and lobster are primarily targeted between July and October with activity peaking in August and September respectively.

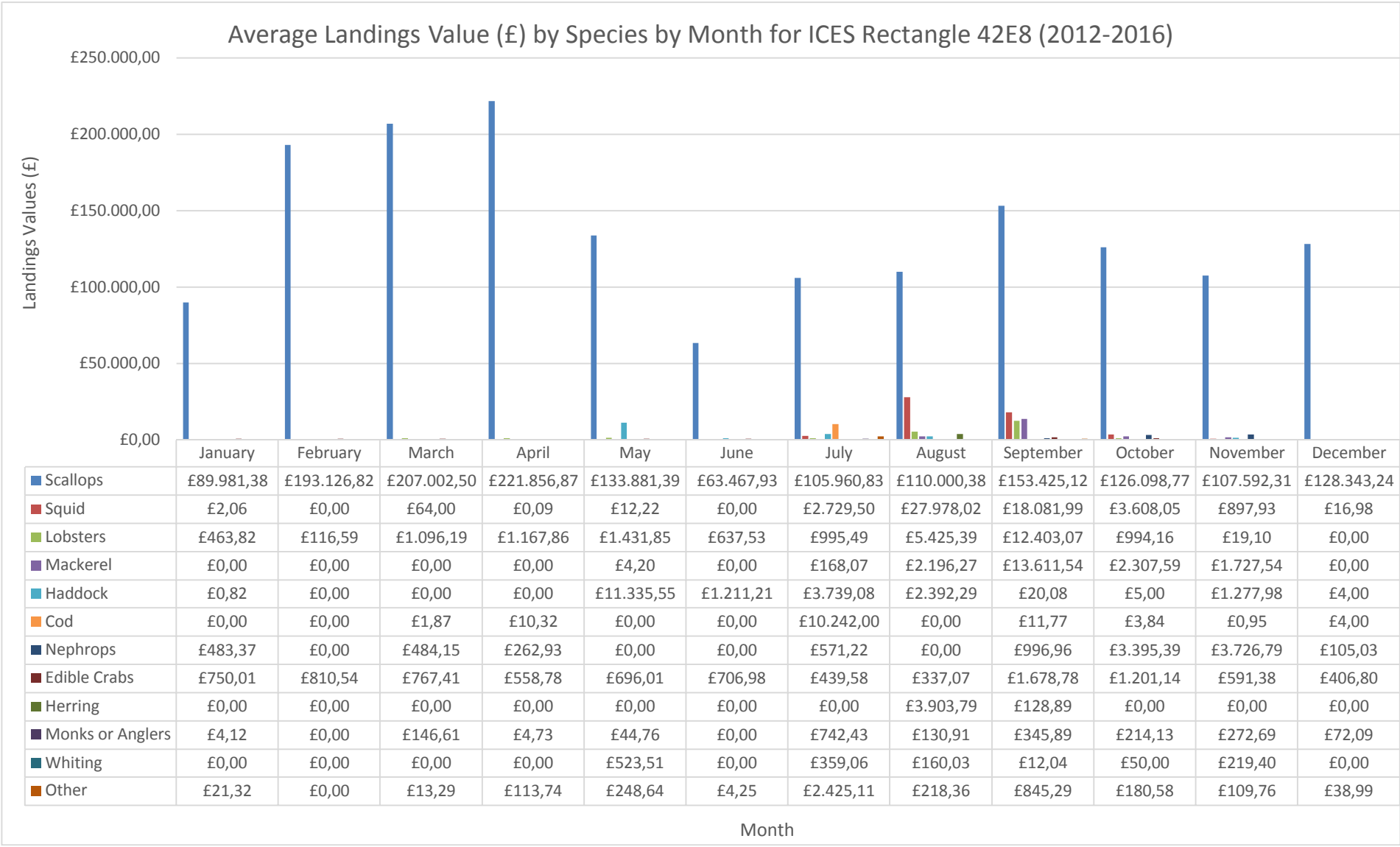
Mackerel is targeted over the summer and autumn with haddock fishing showing a similar seasonal pattern.

The landings by vessel length are given in Figure 2.48, with the highest year-round landings being by vessels of 15m and over (i.e. scallop dredgers and trawlers). In the case of the smaller vessels of under 15m in length, the higher values are recorded between July and October.

Average monthly landings by gear type are shown in Figure 2.49, which shows that boat dredges generate the highest values year-round, with a peak in April. This reflects the peak in scallop landings values observed in April.

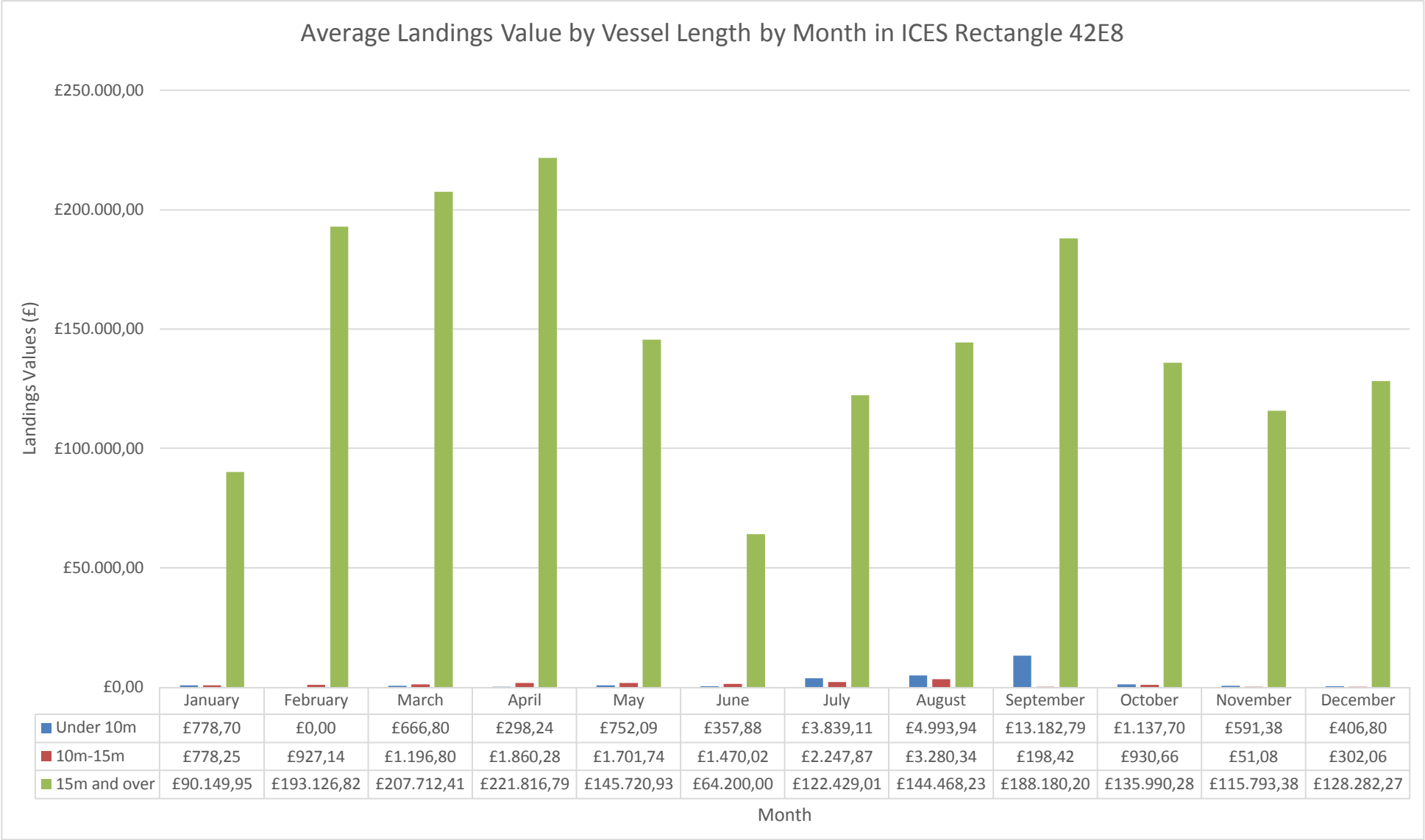
Demersal (bottom) otter trawls are shown to return their highest values in September, aligning with the peak in squid landings values for the same month.

Average monthly effort by vessel length (Figure 2.50) showing the most days fished being from vessels of 15m and over in length, with a peak again in April, again further reflecting scallop dredging activity.



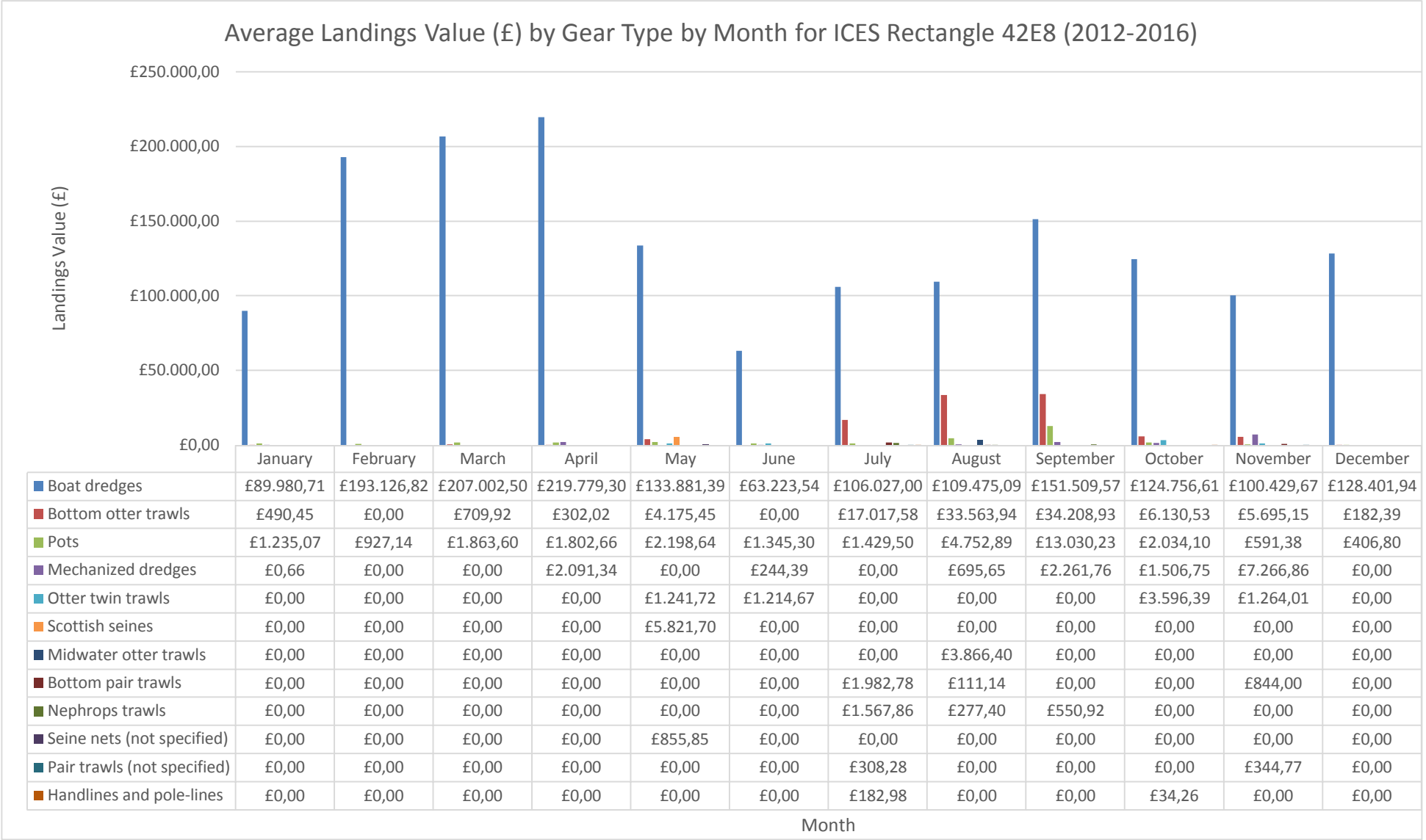
	January	February	March	April	May	June	July	August	September	October	November	December
Scallops	£89.981,38	£193.126,82	£207.002,50	£221.856,87	£133.881,39	£63.467,93	£105.960,83	£110.000,38	£153.425,12	£126.098,77	£107.592,31	£128.343,24
Squid	£2,06	£0,00	£64,00	£0,09	£12,22	£0,00	£2.729,50	£27.978,02	£18.081,99	£3.608,05	£897,93	£16,98
Lobsters	£463,82	£116,59	£1.096,19	£1.167,86	£1.431,85	£637,53	£995,49	£5.425,39	£12.403,07	£994,16	£19,10	£0,00
Mackerel	£0,00	£0,00	£0,00	£0,00	£4,20	£0,00	£168,07	£2.196,27	£13.611,54	£2.307,59	£1.727,54	£0,00
Haddock	£0,82	£0,00	£0,00	£0,00	£11.335,55	£1.211,21	£3.739,08	£2.392,29	£20,08	£5,00	£1.277,98	£4,00
Cod	£0,00	£0,00	£1,87	£10,32	£0,00	£0,00	£10.242,00	£0,00	£11,77	£3,84	£0,95	£4,00
Nephrops	£483,37	£0,00	£484,15	£262,93	£0,00	£0,00	£571,22	£0,00	£996,96	£3.395,39	£3.726,79	£105,03
Edible Crabs	£750,01	£810,54	£767,41	£558,78	£696,01	£706,98	£439,58	£337,07	£1.678,78	£1.201,14	£591,38	£406,80
Herring	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£3.903,79	£128,89	£0,00	£0,00	£0,00
Monks or Anglers	£4,12	£0,00	£146,61	£4,73	£44,76	£0,00	£742,43	£130,91	£345,89	£214,13	£272,69	£72,09
Whiting	£0,00	£0,00	£0,00	£0,00	£523,51	£0,00	£359,06	£160,03	£12,04	£50,00	£219,40	£0,00
Other	£21,32	£0,00	£13,29	£113,74	£248,64	£4,25	£2.425,11	£218,36	£845,29	£180,58	£109,76	£38,99

Figure 2.47 Average seasonal variation (landings) by species in ICES rectangle 42E8 (2012-2016) (source: MMO, 2018)



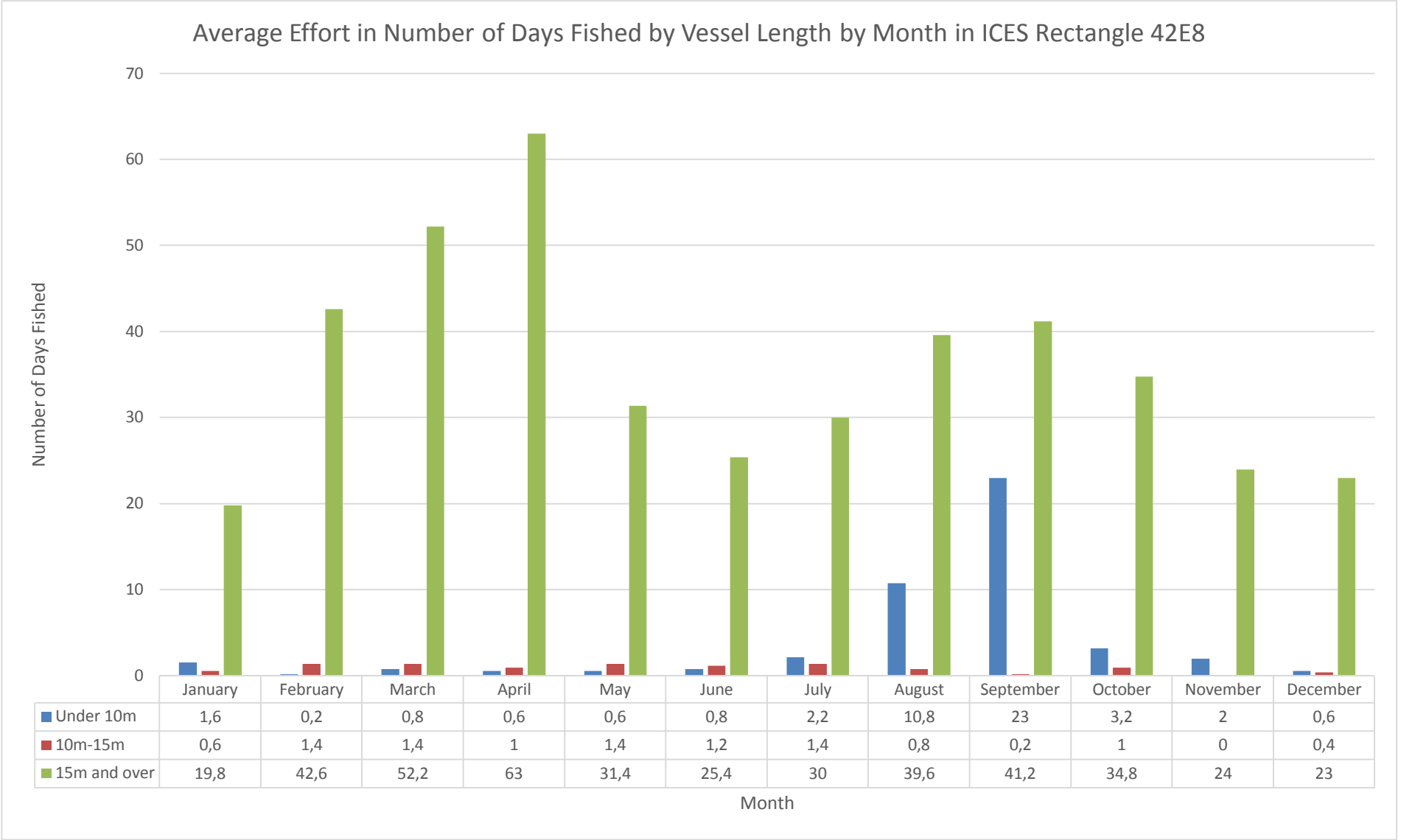
	January	February	March	April	May	June	July	August	September	October	November	December
Under 10m	£778,70	£0,00	£666,80	£298,24	£752,09	£357,88	£3.839,11	£4.993,94	£13.182,79	£1.137,70	£591,38	£406,80
10m-15m	£778,25	£927,14	£1.196,80	£1.860,28	£1.701,74	£1.470,02	£2.247,87	£3.280,34	£198,42	£930,66	£51,08	£302,06
15m and over	£90.149,95	£193.126,82	£207.712,41	£221.816,79	£145.720,93	£64.200,00	£122.429,01	£144.468,23	£188.180,20	£135.990,28	£115.793,38	£128.282,27

Figure 2.48 Average seasonal variation (landings) by vessel length in ICES rectangle 42E8 (2012-2016) (source: MMO, 2018)



	January	February	March	April	May	June	July	August	September	October	November	December
Boat dredges	£89.980,71	£193.126,82	£207.002,50	£219.779,30	£133.881,39	£63.223,54	£106.027,00	£109.475,09	£151.509,57	£124.756,61	£100.429,67	£128.401,94
Bottom otter trawls	£490,45	£0,00	£709,92	£302,02	£4.175,45	£0,00	£17.017,58	£33.563,94	£34.208,93	£6.130,53	£5.695,15	£182,39
Pots	£1.235,07	£927,14	£1.863,60	£1.802,66	£2.198,64	£1.345,30	£1.429,50	£4.752,89	£13.030,23	£2.034,10	£591,38	£406,80
Mechanized dredges	£0,66	£0,00	£0,00	£2.091,34	£0,00	£244,39	£0,00	£695,65	£2.261,76	£1.506,75	£7.266,86	£0,00
Otter twin trawls	£0,00	£0,00	£0,00	£0,00	£1.241,72	£1.214,67	£0,00	£0,00	£0,00	£3.596,39	£1.264,01	£0,00
Scottish seines	£0,00	£0,00	£0,00	£0,00	£5.821,70	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00
Midwater otter trawls	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£3.866,40	£0,00	£0,00	£0,00	£0,00
Bottom pair trawls	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£1.982,78	£111,14	£0,00	£0,00	£844,00	£0,00
Nephrops trawls	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£1.567,86	£277,40	£550,92	£0,00	£0,00	£0,00
Seine nets (not specified)	£0,00	£0,00	£0,00	£0,00	£855,85	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00
Pair trawls (not specified)	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£308,28	£0,00	£0,00	£0,00	£344,77	£0,00
Handlines and pole-lines	£0,00	£0,00	£0,00	£0,00	£0,00	£0,00	£182,98	£0,00	£0,00	£34,26	£0,00	£0,00

Figure 2.49 Average seasonal variation (landings) by gear type in ICES rectangle 42E8 (2012-2016) (source: MMO, 2018)



	January	February	March	April	May	June	July	August	September	October	November	December
Under 10m	1,6	0,2	0,8	0,6	0,6	0,8	2,2	10,8	23	3,2	2	0,6
10m-15m	0,6	1,4	1,4	1	1,4	1,2	1,4	0,8	0,2	1	0	0,4
15m and over	19,8	42,6	52,2	63	31,4	25,4	30	39,6	41,2	34,8	24	23

Figure 2.50 Average seasonal variation (effort) by vessel length in ICES rectangle 42E8 (2011-2015) (source: MMO, 2018)

2.6 Factors Affecting Future Fishing Activity

Given below are summaries of the main factors which can influence future patterns in UK fishing.

2.6.1 Reform of the Common Fisheries Policy (CFP)

Since 1983, the EU CFP has been one of the principal factors dictating the structure and capacity of the UK fishing fleet. The CFP was reviewed both in 2002, 2008 and most recently in 2014. As previously mentioned, however, there is currently uncertainty over how much of CFP policy regulations and controls will remain in place following the end of any transition period after the UK's withdrawal from the EU in 2019. Included below are brief summaries of the main components of the CFP regulations currently affecting UK fisheries, some or even all of which may be transposed into UK fisheries policy.

The reformed CFP places an emphasis on achieving long-term environmental sustainability. The main aspects were:

- Fisheries to be managed in accordance with Maximum Sustainable Yield (MSY) by 2015 where possible and 2020 by the latest,
- A ban on discarding; the discard ban is to be phased in to all EU fisheries by 2019,
- Measures to reduce overcapacity, with an obligation to report on the balance between fleet capacity and fishing opportunities and implement plans to address imbalances,
- New mandatory rules on the labelling of fisheries products on sale to consumers,
- Establishment of the European Maritime and Fisheries Fund (EMFF); and
- Fisheries management is underpinned by data on biological and socio-economic factors. Member states are to expand and coordinate data collection, with funding provided by the EMFF.

The discard ban was implemented for pelagic vessels in January 2015 and is being rolled out to cover all vessels in the coming years.

2.6.1.1 Changes in Quotas

Over the past ten years, the quotas for a number of species have shown a progressive decline due to concern over the condition of a number of fish stocks within the North Sea. For example, a number of beam trawl vessels previously targeting flatfish species with quota allocations have converted to targeting non-quota species such as scallops. It is possible that more vessels could switch to alternative species as quota allocations become more restrictive.

2.6.1.2 Community Quota

A number of fishing communities around the UK have signed up to community quota schemes. The community quota scheme has been established to find a long-term solution for the under-10m fleet. The scheme will enable fishermen and other local businesses and organisations to manage their quotas flexibly and allow them to swap and purchase additional quota. The scheme may also introduce a rights-based management scheme for shellfish, beginning with edible crab and lobsters (Defra, 2011).

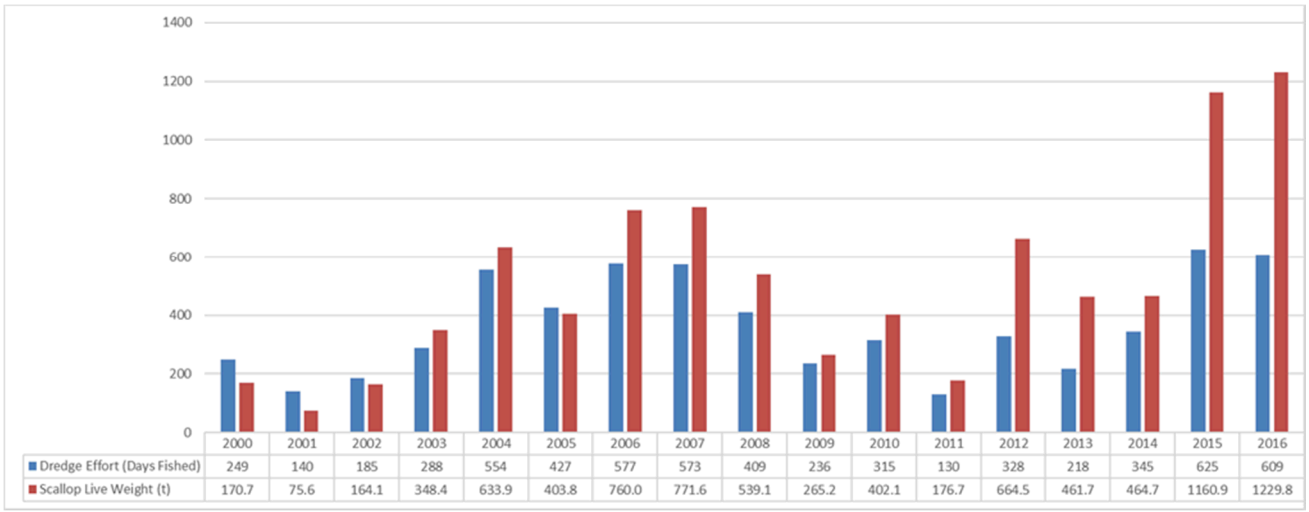
2.6.1.3 Days at Sea

Over 10m vessels are restricted by the number of days per month they can spend fishing depending on species targeted, gear type and mesh size. The present days at sea system is under review in the CFP reform which may result in changes to the current restrictions.

2.6.2 Potential Future Patterns

2.6.2.1 Scallop Fishery

As stated in the scoping opinion, scallop landings generally follow a pattern of increase and decrease over ten-year periods. As shown by Figure 2.51, within ICES rectangle 42E8 this is the case, with peaks in 2007 and again in 2016. It is of note that the peak in 2016, and indeed the effort and landings weights in 2015 are substantially higher than the two-year peaks of 2006 and 2007. Also of note is that in 2015 and 2016, landed live weight significantly increased whereas effort was similar to 2006 and 2007, suggesting a substantial increase in catch per unit effort (CPUE). Taking the past patterns and recent high levels of catches, it may be that this will be followed by a decline in scallop fishing activity in the area due to the need for a recovery period.

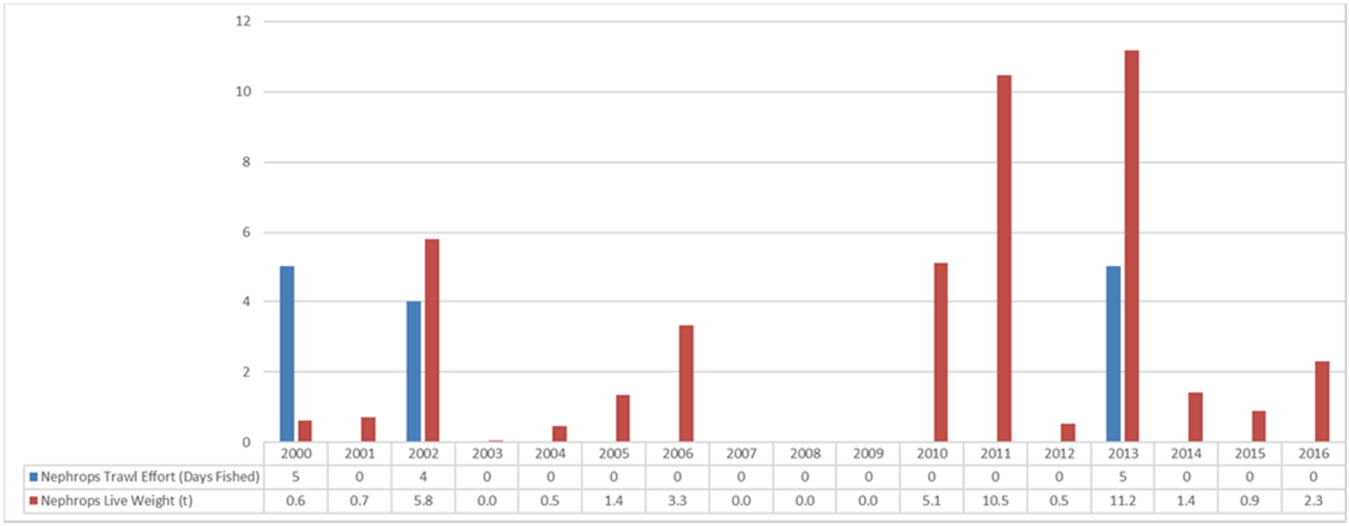


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Dredge Effort (Days Fished)	249	140	185	288	554	427	577	573	409	236	315	130	328	218	345	625	609
Scallop Live Weight (t)	170.7	75.6	164.1	348.4	633.9	403.8	760.0	771.6	539.1	265.2	402.1	176.7	664.5	461.7	464.7	1160.9	1229.8

Figure 2.51 Annual dredge effort (days fished) and scallop landings (live weight) for ICES rectangle 42E8 (source: MMO, 2017)

2.6.2.2 *Nephrops* Fishery

Figure 2.52 shows MMO effort data for *Nephrops* trawlers and *Nephrops* landings by live weight in 42E8. Effort is shown to be low, especially in recent years, and does not follow the trends in landings by live weight, illustrating that *Nephrops* landings data includes other methods of capture. The inconsistency in effort and landings weights and the extremely low amounts recorded preclude any reliable prediction of future patterns.

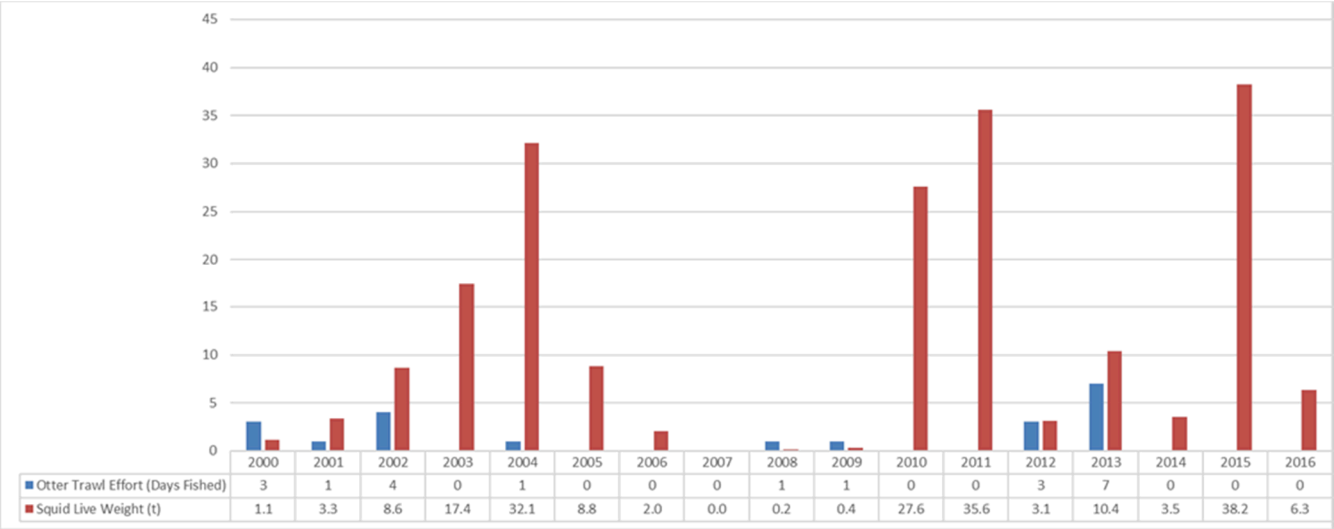


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Nephrops Trawl Effort (Days Fished)	5	0	4	0	0	0	0	0	0	0	0	0	0	5	0	0	0
Nephrops Live Weight (t)	0.6	0.7	5.8	0.0	0.5	1.4	3.3	0.0	0.0	0.0	5.1	10.5	0.5	11.2	1.4	0.9	2.3

Figure 2.52 Annual trawl effort (days fished) and *Nephrops* landings (live weight) for ICES rectangle 42E8 (source: MMO, 2017)

2.6.2.3 Squid Fishery

Figure 2.53 shows MMO effort data for otter trawls and squid landings by live weight in ICES 42E8. Similarly, effort for otter trawls in 42E8 is shown to be low, and again there is a high degree of variation in landings weights over the period considered. Since 2010 there has been a proportional increase in years with higher landings (2010, 2011 and 2015). The data given in Figure 2.53 broadly corroborates the scoping opinion that squid fishing is highly variable but that it has increased over the past 15 years.

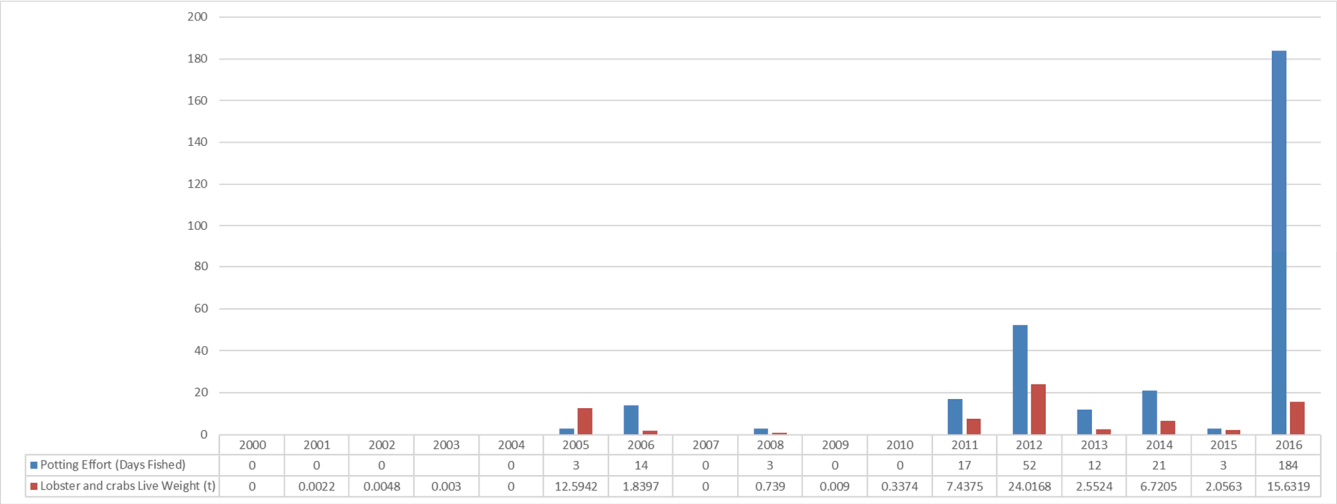


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Otter Trawl Effort (Days Fished)	3	1	4	0	1	0	0	0	1	1	0	0	3	7	0	0	0
Squid Live Weight (t)	1.1	3.3	8.6	17.4	32.1	8.8	2.0	0.0	0.2	0.4	27.6	35.6	3.1	10.4	3.5	38.2	6.3

Figure 2.53 Annual otter trawl effort (days fished) and squid landings (live weight) for ICES rectangle 42E8 (source: MMO, 2017)

2.6.2.4 Lobster and Crab Fishery

Figure 2.54 shows MMO effort data for creels and combined lobster and crab landings by live weight in ICES 42E8. Effort in 42E8 has increased noticeably since 2010, with little activity observed from 2000 to 2011. The peak in effort occurred in 2016 and it is possible that creeling effort may increase further in the coming years. It is of note that combined lobster and crab landings data by live weight does not appear to correlate with the effort data.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Potting Effort (Days Fished)	0	0	0		0	3	14	0	3	0	0	17	52	12	21	3	184
Lobster and crabs Live Weight (t)	0	0.0022	0.0048	0.003	0	12.5942	1.8397	0	0.739	0.009	0.3374	7.4375	24.0168	2.5524	6.7205	2.0563	15.6319

Figure 2.54 Annual creeling effort (days fished) and crab and lobster landings (live weight) for ICES rectangle 42E8 (source: MMO, 2017)

3.0 Discussion

As described in the sections above, there is currently no single data set, source or model that can determine patterns of commercial fishing activity within relatively small sea areas. As a consequence, this report has been compiled using data and information obtained and derived from a number of sources.

Preliminary evaluation of commercial fishing activity using MMO surveillance sightings data identified the relevant vessel categories/fisheries to Project Alpha and Project Bravo to be UK vessels (Figure 2.2). The distribution of UK sightings are concentrated primarily inshore of the wind farm sites. High levels of creelers have been observed inshore, with a very small proportion of creel fishing vessels found on grounds in the west of Project Alpha, with demersal trawlers concentrated in areas to the south of the wind farm sites (Figure 2.3). Of the vessels sighted within Project Alpha and Project Bravo, the majority are scallop dredgers.

Landings data (Figure 2.4 to Figure 2.6) illustrates that within the immediate area of Project Alpha and Project Bravo (ICES rectangle 42E8), fishing activity is almost exclusively undertaken by the larger class of vessel (over 15m), deploying dredges for the harvesting of scallops. The only other activity of any significance is squid trawling and creeling by local static gear vessels to a much lesser extent.

VMS data given in Figure 2.12 and Figure 2.13, illustrates three distinct grounds within the regional study area, targeted by scallop dredgers. Both Project Alpha and Project Bravo are situated within one of the larger scalloping areas located in 42E8. Specific scallop dredge VMS data from Marine Scotland reflects this pattern and further illustrates the extent of activity within the regional area and beyond. As shown by VMS in the national context (Figure 2.33 and Figure 2.34), however, there are important areas for scallop dredging around the UK, such as the English Channel, Irish Sea and off the north-east coast of England. AIS data (Figure 2.32) further illustrates that scallop dredging occurs over extensive grounds around much of the UK.

VMS data on demersal trawlers in the regional context, shows that they focus much of their fishing effort to the north-east of the study area, with some activity to the south-west of the project and in the inshore Firth of Forth area (Figure 2.16 and Figure 2.17). For whitefish species such as haddock, in the north west of the study area, some distance from Project Alpha and Project Bravo.

Danish sandeel fishing has, in the past, been observed in the vicinity of the offshore wind farm sites. As a consequence of the regional sandeel ban currently in place, there has not been recent sandeel fishing within the area under consideration or is there expected to be in the future.

Scotmap data (Figure 2.22 to Figure 2.30) for under 15m vessels indicates low landings values and low levels of effort within Project Alpha and Project Bravo. Activity is predominantly inshore over an extensive area along the north-east Scottish coast, including the Firth of Forth.

As previously discussed, both AIS and VMS data show that nomadic scallop dredging occurs extensively around much of the UK, thus the area of the wind farm sites represent a small proportion of the overall scalloping grounds for the nomadic fleet. Direct consultation undertaken on BMM's behalf by the SFF has identified four to five locally based scallop dredgers, with a smaller overall operating area than that of nomadic fleet.

As previously discussed, creel fishing activity is predominantly focussed on grounds inshore of Project Alpha and Project Bravo. Consultation undertaken for upcoming geophysical surveys in 2018

and information and charts provided by fishermen has identified four vessels, which fish small areas just within the boundaries of Project Alpha and Project Bravo (Figure 2.40).

Annual MMO landings data (Figure 2.44, Figure 2.45 and Figure 2.46) show, for scallops in particular, high inter-annual variance for both fishing effort and landings for the ICES rectangle in which Project Alpha and Project Bravo are situated (42E8). Inter-annual fluctuations of value are driven mainly by fishing effort. Scallop landings generally follow a pattern of increase and decrease over ten-year periods. 2015 and 2016 yielded high levels of catches, thus it may be that this will be followed by a decline in scallop fishing activity in the area due to the need for a recovery period.

Predicting future patterns of fishing activity is difficult and to an extent subjective. Changes to fisheries regulation in addition to the potential effects of “Brexit”, may impact future commercial fishing activity within the UK. It is, however, possible that much of the current patterns of fishing activity may remain largely unchanged, following the end of the “Brexit” transition phase.

4.0 References

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5.0 Appendix

5.1 Annex 1 – Data Sources and Sensitivities

5.1.1 Surveillance Sightings Data

As a component of fisheries protection and to ensure the fishing industry complies with UK and EU law, aircraft and surface vessels are used to compile surveillance sightings of fishing vessels in UK waters. The data has been used to give a relative spatial distribution of fishing activity by method and nationality within a given area. It should be noted that, due to the low frequency of flights in an area, which are generally weekly and only occur during daylight hours, the sightings data should not be used to give a quantitative assessment of fishing activity. The MMO has provided sightings of all fishing vessels in UK waters by nationality and method between 2012 and 2016.

5.1.2 Fisheries Statistics

UK fisheries statistical data for a ten-year period between 2006 and 2015 has been collected by the MMO by ICES rectangle for all UK and non-UK fishing vessels landing into UK ports. The data includes landings by value and effort (days fished). This data set has been analysed to identify:

- Species targeted,
- Fishing methods used,
- Vessel categories (under 10m, 10m-15m, over 15m),
- Annual variations,
- Seasonal variations, and
- Landings values and effort by port.

The main source of fisheries landing data is the EC daily log sheets that all vessels over 10m must complete and submit. Fishing vessels under 10m in length are not required to submit daily log sheets, although skippers can choose to do so. Dockside inspections are made on the under 10m fleet by local fisheries officers. The Shellfish Entitlement Scheme (2004) and the 'Registration of Buyers and Sellers of First Sale Fish and Designation Auction Site Scheme' (2005) further facilitate collection of fisheries data from the under 10m fleet. It should be noted that data collected prior to the introduction of these schemes may underestimate the true levels of activity from the under 10m fleet. It should also be recognised that under these schemes, fishermen are required only to identify the ICES sub-area within which catch was taken and not the specific ICES rectangle.

5.1.3 Satellite Tracking (VMS) Data

5.1.3.1 MMO VMS Data

VMS data is the most comprehensive fisheries data set currently available which shows the intensity of over 15m fishing vessel activity in the vicinity of SP1WF. Since January 2005, all EC vessels over 15m in length have been fitted with satellite tracking equipment which transmits the vessels' position at a minimum of every two hours to the relevant Member States' fisheries authority. The MMO monitors all UK vessels irrespective of location, and all foreign vessels within the UK Exclusive Economic Zone (EEZ). Information regarding non-UK vessels cannot be disclosed by the MMO without prior permission from the vessels national regulating body.

The satellite data has been cross-referenced with landings and effort data to give values in a 0.05° by 0.05° grid for the years 2011 to 2015. The disclosure of independent UK vessels' identities is restricted under the Data Protection Act (1998) and the coordinates of individual vessels are only available at the request of the vessels skipper/owner. Any rectangles that record less than five transmissions are not included in the data set and specific fishing methods have been identified. All vessels that are stationary in port have not been included in the data set and the VMS data does not differentiate

between vessels fishing and steaming. As a result, the data has been filtered by speed, with vessels travelling at speeds of between 1 and 6 knots included (Lee et al., 2010).

Due to VMS only applying to vessels over 15m in length, activity by vessels under 15m in length will not be represented in the analysis. As of 2012, EU legislation required all Member State vessels over 12m in length to have VMS installed. Due to delays in the release of this data by MMO, however, this will not be included in this assessment.

5.1.3.2 Fisheries Information Network VMS Data

Multi-year VMS data for UK fishing vessels (5 years, between 2012 and 2016) was sourced through the Scottish fisheries administration database (Fisheries Information Network). The raw data was filtered to include commercial fishing vessels registered in the UK, deploying dredge-class gears and targeting primarily king scallops. The data includes spatial locations of fishing vessels recorded, mostly at 2-hour intervals. Additional attributes for each VMS point include unique identifiers for individual vessels and trips, home and landing ports, gear used, as well as vessel average speed (based on Harversine calculations) and course. The dredge gear class (DRE) includes boat dredge, hand dredge and mechanized dredge gears. All dredge-class gears were treated the same in the analysis. UK vessels include vessels from England, Scotland, Wales and Northern Ireland.

Raw data has been filtered by identifying records with any erroneous coordinates and headings, duplicated records, speeds above 20 knots and a time difference of less than 5 minutes. Records within 1 km radius of major Scottish fishing ports have also been removed to avoid fishing activity misidentification when filtering by speed at a later phase of the analysis. Fishing activity is identified using a uniform speed rule of 3.5 knots.

5.1.4 Marine Scotland ScotMap Data

Marine Scotland provides the following information about ScotMap data in Scottish Marine and Freshwater Science Vol 5 No 17:

> ScotMap provides spatial information on the fishing activity of Scottish registered commercial fishing vessels under 15 m in overall length. The data were collected during face-to-face interviews with individual vessel owners and operators and relate to fishing activity for the period 2007 to 2011. Interviewees were asked to identify the areas in which they fish, and to provide associated information on their fishing vessel, species targeted, fishing gear used and income from fishing.
>
> The dataset, as of July 2013, is based on interviews of 1,090 fishermen who collectively identified 2,634 fishing areas or 'polygons', the majority of which relate to creel fishing. The data collected were aggregated and analysed to provide raster data and mapped outputs of the monetary value, relative importance (relative value) and the usage (number of fishing vessels and number of crew) of seas around Scotland. Examples of the mapped outputs for subsets of the data representing the main types of fishery prosecuted by the under 15 m fleet, and for the combined data set, are presented and discussed.
>
> Not all fishermen initially targeted for the ScotMap project were interviewed (72% vessel coverage overall) and not all those interviewed provided earnings information (10% earnings disclosure decline rate overall). Individuals defined their fishing areas with variable levels of precision. Users of the data should be aware of this, particularly of the coverage provided by the ScotMap data which varies regionally.

5.1.5 AIS (Automatic Identification System)

5.1.5.1 Marine Traffic

As of May 2014, the International Maritime Organization (IMO) required all vessels over 15m to carry an AIS transponder on board, which transmits their position, speed and course, among some other static information, such as vessel's name, dimensions and voyage details.
This data has been used to generate vessel tracks. Real time AIS allows monitoring of an area and identification of key vessels. These vessels' fishing voyages can then be tracked.

5.2 Annex 2 – Fisheries Legislation

5.2.1 Fishing Vessel Licences

For a vessel to commercially fish (i.e. to catch and sell fish for profit) it must hold a valid licence. The current vessel licensing scheme was introduced to stabilise fleet numbers and reduce catching capacity through the use of vessel capacity units (VCUs). Successive decommissioning schemes have also reduced the size of UK and several other Member States' fleets over the past 20 years.

5.2.2 Territorial Limits and Fishing Rights

Under the United Nations (UN) Convention on the Law of the Sea (UNCLOS, 1982), the UK's territorial sea extends out to 12nm from the mean low water mark. With few exceptions, access within 6nm of the coast is restricted to the vessels of that country.

5.2.3 Regional and Local Fishing Restrictions

Scottish ministers are responsible for the regulation of sea fishing around Scotland and within 12nm of Scottish coasts. Inshore fisheries in the Scotland are regulated primarily through the Inshore Fishing (Scotland) Act 1984.

SP1WF falls within the jurisdiction of the North and East Coast Regional Inshore Fisheries Groups (RIFG), (a non-statutory body that aim to improve the management of Scottish inshore fisheries up to 6nm) which enforces the local byelaws within 6nm of the coast. Byelaws include:

- Minimum Landing Sizes (MLS) for fish and shellfish species
- Maximum number of dredges (scallop dredging)
- Fishing permits for shellfish species

5.2.4 Quota Restrictions

In European waters, quota in the form of Total Allowable Catches (TACs) is allocated to EU Member States by ICES sub-area based on historic fishing rights. A quota is a permission to catch quota stocks that are allocated between non-sector vessels (those who own quota), Producer Organisations (who manage quota for their members) and the inshore fleet. The UK quota management system aims to ensure that the quota is shared fairly amongst the UK fishing industry and that fishing activity is managed to ensure that these quotas are not exceeded.

Following heavy criticism of the quantity of discards under the quota system (due to the catch being undersized or over-quota), this was addressed in the reform of the Common Fisheries Policy (CFP) and has led to the introduction of discard ban regulation for pelagic fleets from 2015 and demersal fleets from 2016.

5.2.4.1 Over 10 Metre Fleet

National, regional and individual quotas for the over 10m fleet are assigned on the basis of historic rights. Vessel quotas are tangible assets which are eligible to be sold or leased, and national quotas may be exchanged between Member States.

5.2.4.2 Under-10 Metre Fleet

Vessels under 10m in length represent 77% of the UK's fishing fleet but are allocated 4% of the UK's fishing quota. Half of the under-10m fleet have uncapped licences allowing them to catch more than 300kg of quota species per year. This inshore fleet represents over 50% of full time employment across the UK fleet, with majority of landings being non-quota stocks, particularly shellfish (NUFTA, 2017).

5.2.5 The Common Fisheries Policy (CFP)

The main method the European Union (EU) utilises to manage fishing activity in European waters is the CFP. The CFP provides a management strategy for fishing activities in order to prevent overfishing and provide economic and social stability to fishing communities.

The UK government retains a reserved power with regard to European fisheries negotiations, such as the setting of quotas. The implementation of fisheries regulations is undertaken by the Scottish Government in Scottish waters.

Changes to the CFP came into legislation in 2014. The changes were wide-ranging and cover all aspects of fisheries management and objectives. The key priorities of the reform were to ban discards, fish at sustainable levels and decentralise decision making, allowing Member States to agree the measures appropriate to their fisheries. A ban on discarding pelagic fisheries (such as mackerel and herring) started on 1st January 2015, with a ban on discards in all other fisheries to be phased in between January 2016 and 2019.

Due to the EU referendum and subsequent negotiations over the departure of the UK from the EU it is not possible to predict at the time of writing the future changes to fishing regulation and international rights which will be made as part of the negotiations. Until the end of these negotiations the CFP will still be enforced.

5.2.6 Shellfish Entitlements

National shellfish entitlement licences were introduced in 2004 for vessels targeting crabs and lobsters. The licence allows an unrestricted quantity of crab and lobster to be caught by vessels which have a historic record in the fishery. Vessels that are under-10m and have a valid shellfish licence must submit weekly log sheets for crab and lobster to the local Fishery Officer. Licenced vessel owners who do not hold the shellfish Entitlement are allowed to land up to five lobsters and 25 crabs per day.

5.2.7 Marine Protected Areas

The aims of Marine Protected Areas (MPAs) are to protect species and habitats of EU and national importance through the management of sea areas. In the UK, there are various types of MPAs:

- Special Areas of Conservation (SACs) - designated to protect species and habitats under the EC Habitats Directive both inshore and offshore
- Special Protection Areas (SPAs) - areas where birds and their habitats are given protection under the EC Wild Bird and Habitat Directive. SPAs have little or no impacts on the commercial fisheries sector
- Conservation MPAs – designed to protect species and habitats of national importance under the Marine (Scotland) Act 2010.

A number of these are included in the area of the proposed development (see Figure A5.1), in ICES rectangle 42E8.

Of particular importance to this baseline are the conservation measures for ocean quahog. In the Firth of Forth Complex MPA Management Options Paper, it was suggested that a number of management options could be implemented to achieve the conservation objectives for the ocean quahog. These included restrictions on gears known to impact the species, i.e. scallop and hydraulic dredging, as well as a general restriction on gears that penetrate deeply into the sediment. It was deemed that the effects of static gear (creeling) on achieving this conservation aim would be minimal, so no further action would be required here.

It was recommended that the potential impacts of renewable energy developments on the protected features within the MPA would be assessed through the existing EIA process on a case-by-case basis, involving consultation with Marine Scotland and JNCC.

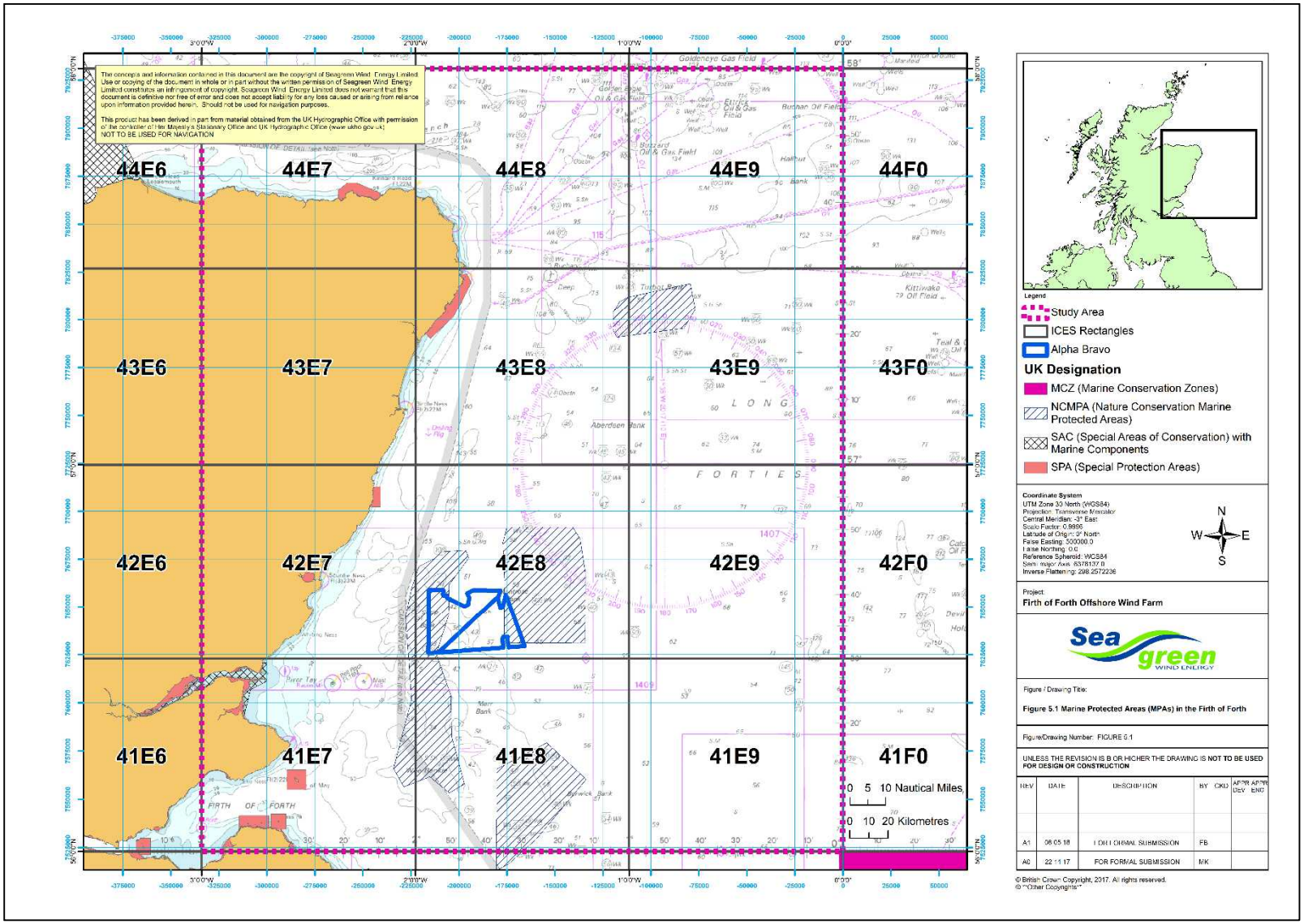

Figure A5.1 Marine Protected Areas (MPAs) in the vicinity of the study area (source: JNCC, 2017)