



Marine Management Organisation

United Kingdom commercial sea fisheries landings by Exclusive Economic Zone of capture: 2012 - 2016



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Marine Management Organisation

United Kingdom commercial sea fisheries landings by Exclusive Economic Zone of capture: 2012 - 2016

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1. Introduction

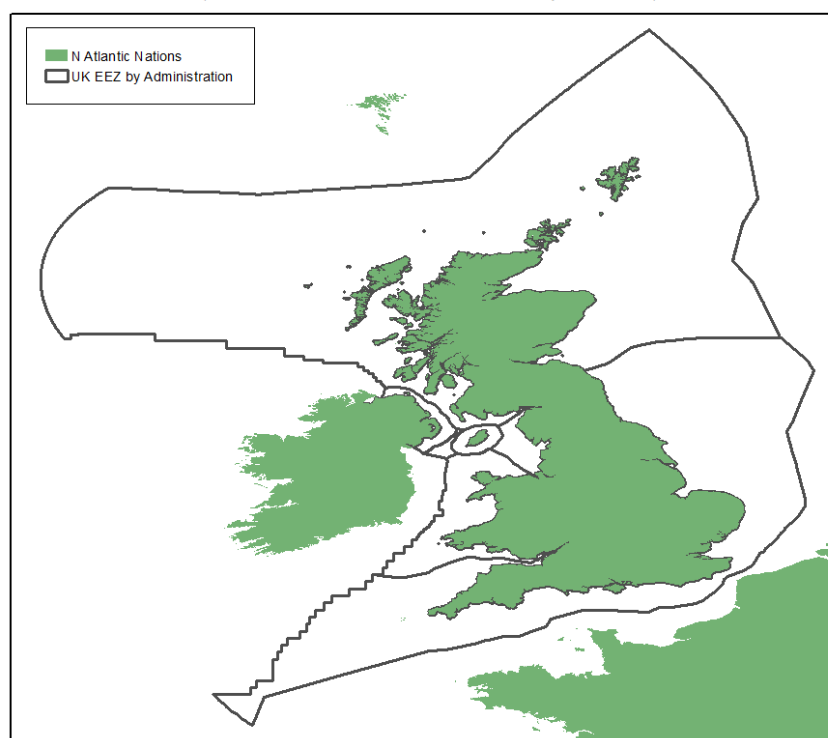
This report provides commentary to a new dataset produced by the Marine Management Organisation's (MMO's) Statistics and Analysis team. It separates the UK's commercial sea fisheries landings by the nationality of the waters in which the fish were caught. This report sets out the data sources and methodologies employed alongside high level statistical summaries of UK landings. The accompanying data set disaggregates landing by nationality. To provide appropriate context, estimates of the landings of other European Union Member States (hereafter referred to as OMS) are provided. Statistics for OMS were obtained from publically available datasets (see section 2 for more detail) and as such the MMO takes no responsibility for their quality; they are given for context only. This report provides the final form version of the provisional *ad hoc* statistical release published on the 1st February 2017¹.

Exclusive Economic Zones (EEZs)

The term Exclusive Economic Zone, hereafter abbreviated to EEZ, is taken to mean the entire zone under the exclusive jurisdiction of a coastal state or international organisation. This will include the territorial seas (0 – 12 nautical miles from the coast as well as the UNCLOS Exclusive Economic Zone from 12 up to 200 nautical miles from the coast.

Figure 1 – The UK EEZ

The United Kingdom's Exclusive Economic Zone
(Boundary as per The Exclusive Economic Zone Order 2013 SI No. 3161 of 2013)
(Internal administrative divisions as per UKHO)



¹ <https://www.gov.uk/government/statistics/provisional-statistics-uk-fleet-landings-from-other-eu-member-states-waters-2015>

2. Data Sources and Methodology

This report is designed to supplement and expand on the MMO's annual UK Sea Fisheries Statistics 2016, a National Statistics publication. In addition to logbook data from UK administrative data systems, the data underlying this analysis are taken from the '2012 – 2016 UK Fleet Landings by ICES Rectangle' dataset published with the main UK Sea Fisheries Statistics 2016 report. As such, we do not set out here the methodology used to create the underlying dataset, as this is available within the main report. Instead we set out below the method and data sources employed to determine the nationality of the waters of origin for UK commercial sea fisheries landings. It should be noted that unlike UK Sea Fisheries Statistics 2016 the statistics presented here are not National Statistics and are distinct from those published in that report. Nonetheless, these statistics have been produced in compliance with the UK Code of Practice for Official Statistics².



Landings vs. Catches

Landings mean those fish that once taken from the sea are physically landed into a port or transhipped at sea to another vessel to be landed into a port at a later time. **Catches** mean all fish taken from the sea regardless of whether they are landed or discarded back into the sea. We do not set out catches here and so these statistics cannot be used to deduce overall extraction rates from the EEZs concerned.

2.1 UK Data

The UK gathers commercial sea fishing activity data from its fleet, in line with the requirements of the European Union's (EU's) Common Fisheries Policy (CFP), via logbooks and sales notes. For every trip undertaken vessels of greater than 10 m in overall length are required to set out which International Council for the Exploration of the Sea (ICES) area and statistical rectangle (see figure 2) they took fish from. In addition, any vessel fishing outside of Union waters, those seas not within the EEZs of EU member states, is required to record the nationality/organisational control of the waters they fished in (e.g. Norway, North Atlantic Fisheries Organisation, and international waters). For vessels under 10 m in overall length, who do not submit logbooks, area of fishing information is estimated by local MMO data entry staff after a vessel's return, based on known areas of activity of the vessel.

From the available data we can define landings by the nationality of waters outside of Union waters with confidence. However, inside Union waters it is more challenging. Vessels using logbooks and administered by Marine Scotland record whether their Union waters catches are within or outside the UK EEZ, but not which specific OMS waters they were fishing in when outside the UK EEZ. For vessels administered in the UK by authorities outside Scotland logbooks simply record fishing within Union waters, but not which specific EEZ.

In many instances the ICES statistical rectangle reported in a logbook will have 100% of its sea water surface area within the EEZ of a single member state or will be reported

² <https://www.statisticsauthority.gov.uk/osr/code-of-practice/>

in a zone outside Union waters. In which case we know with confidence the EEZ of capture from knowing the rectangle. However, of the 1,382 ICES statistical rectangles (hereafter known simply as rectangles) in Union waters, 299 are shared by two or more EU member states. For these rectangles we need a method of apportioning landings to specific zones or EEZs.

Our estimates rely on the assumption that fish were caught evenly across the entire sea surface area of the rectangle in question. By making this assumption for a given rectangle it follows that the fraction of total landings originating from a given EEZ is the same as the fraction of total sea surface area that the EEZ in question occupies of that rectangle. Thus we have been able to apportion landings from shared Union waters rectangles by multiplying the total landings for that rectangle by the fraction of sea water surface area occupied by the Member States in the rectangle.



Rectangle apportioning example

Rectangle 37F5 in the southern North Sea is shared between the EEZs of Germany and the Netherlands. With 78% of the waters being Dutch and 22% of the waters being German. Following the apportioning method described above 148 tonnes (78%) of the 191 tonnes landed in total from the rectangle by UK vessels in 2016 were allocated to the Netherlands EEZ, with the remainder 43 tonnes (22%) being allocated to the German EEZ.

2.2 Obtaining factors for rectangle sea surface area by EEZ

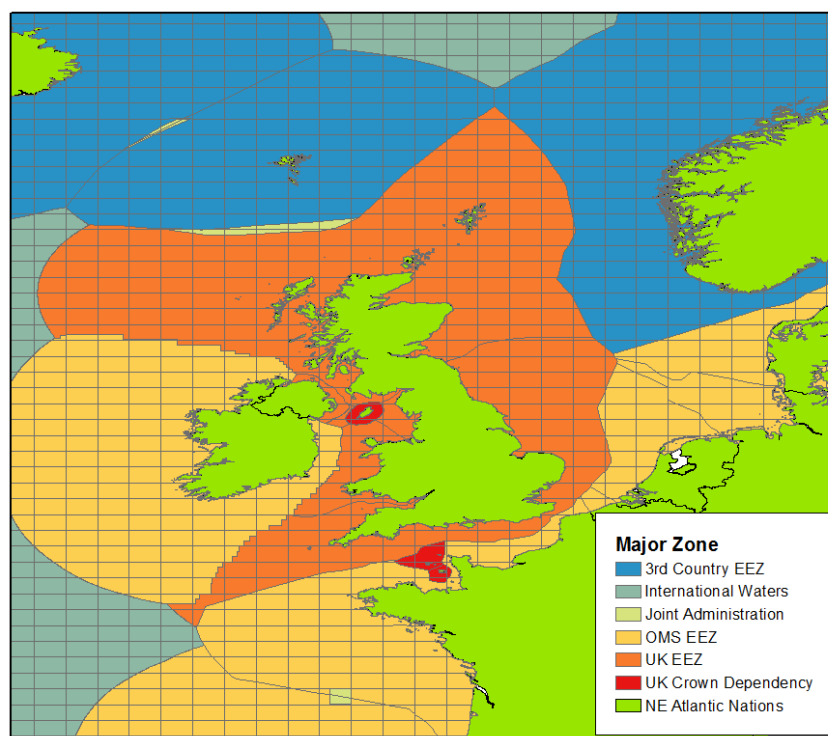
The method described above relies on knowing what fraction of the total sea water surface area of a rectangle each nation's EEZ occupies. To obtain this information spatial analysis was required. A spatial dataset containing the boundaries of all world EEZs³ was segmented by a spatial dataset containing the boundaries of the ICES rectangles⁴. The spatial data were projected in ArcGIS (version 10.2.2) using an ETRS89 Lambert Azimuthal Equal-Area projection, centred on Western Europe. From this, the fraction of total sea surface area, excluding any land area, occupied by each national EEZ was calculated for each rectangle. In addition to giving the whole UK EEZ we have also disaggregated it, based on UK Hydrological Office (UKHO) data into the UK's devolved fisheries administration areas and contiguous Crown Dependencies (i.e. Isle of Man and the Channel Islands); British overseas territories are excluded from this analysis.

³ <http://www.marineregions.org/downloads.php> (World EEZ v9)

⁴ <http://www.ices.dk/marine-data/maps/Pages/ICES-statistical-rectangles.aspx>

Figure 2 – ICES statistical rectangles versus major zones (H1) and EEZs

Major zones in NE Atlantic waters surrounding the United Kingdom
Superimposed onto ICES statistical rectangles



As mentioned above, for those rectangles shared between two or more zones/EEZs it may be necessary to estimate the division of landings originating from each of the EEZs involved. Table 1 below summarises the percentage of total UK quantity or value needing to be apportioned as a measure of the degree of estimation required in the five year time series presented here. The data were apportioned according to 2 distinct hierarchies, the first (H1) being the four major zonal divisions: UK waters, OMS waters, 3rd Country waters and international waters (see figure 2). The second hierarchy (H2) apportioned the data down to the national EEZ level (e.g. France, Norway) for non-UK countries and to the UK fisheries administration level (i.e. England, Wales, Scotland, Northern Ireland and Crown Dependencies) for the UK EEZ. As H2 disaggregates to a smaller spatial scale than H1, it follows that the percentage of data apportioned is greater in H2 than H1.

Table 1 – Per cent UK data apportioned (by hierarchy, quantity and value)

Year	H1 (Quantity)	H1 (Value)	H2 (Quantity)	H2 (Value)
2012	13%	14%	21%	23%
2013	13%	15%	22%	23%
2014	11%	14%	20%	23%
2015	11%	13%	19%	23%
2016	12%	14%	18%	23%
Total	12%	14%	20%	23%

If just apportioning at the level of major zonal divisions (H1), it is only necessary to apportion 12% of the total tonnage of fish landed by UK vessels. However, to get to a more detailed level of division of activity to the level of each individual EEZ/UK administrative zone (H2), a greater amount of quantity or value data (20% of total tonnage) has to be apportioned.

2.3 OMS data

To place the UK statistics in the context of other fishing nations with which we share fishing grounds we have produced estimates of landings by EEZ for OMS. To do this we utilised publically available rectangle level landings data published by the European Commission's Joint Research Centre (JRC)⁵. This dataset has coverage for the NE Atlantic area, including the UK EEZ, but does not include the Mediterranean or Black seas and has poor coverage for distant waters. As such it cannot be treated as a complete picture of overall OMS landings, but should instead be regarded as a comprehensive view of OMS landings from the waters in proximity to the UK EEZ. This dataset did not include any monetary values at first sale for the landings reported. Therefore, we estimated these values in pounds sterling (£) by using annual average prices per tonne from UK administrative data sources. While this will reflect what the fish may have sold for at first sale if landed by UK vessels, into predominantly UK ports, it may not be a true reflection of the actual value achieved by the OMS vessels landing into predominantly OMS ports.

We followed the same apportioning methodology for the OMS dataset as for UK data. The important difference between the two datasets is that the UK data contained logbook records denoting the zone of capture (described in section 2.1 above). Such zone of capture records were absent in the OMS data and so all rectangles shared between any H1 or H2 zones had to be apportioned, rather than just those with ambiguous zone information as for the UK data. The potential biases introduced by the apportioning method in the OMS data are likely to be much greater than those in the UK data, given the much larger fraction of OMS data that was apportioned.

At the time of analysis the 2016 version of the OMS dataset was publically accessible, meaning the latest year for which data were available was 2015. The 2017 version has since been published, but there has been insufficient time to revise our analysis to include this new version. To our knowledge no publically available dataset of landings by third countries (i.e. Norway, the Faeroe Isles or Iceland) is available at rectangle level. Therefore, we have not been able to reproduce this analysis for these nations.

⁵ <https://stecf.jrc.ec.europa.eu/dd/effort> (2016 version) - at the time of publication this dataset had been updated to the 2017 version

2.4 Limitations and Uncertainties

As with any process of estimation the apportioned statistics presented here have uncertainties associated with them. The uncertainty in this analysis is introduced primarily through the assumption of even catching of fish across entire rectangles. While necessary this assumption may not be valid in all circumstances, for example where the species concerned is relatively immobile and constrained by habitat to small areas all catches will likely concentrate on that part of the rectangle that forms a suitable habitat for the species in question, e.g. king scallops. This may thus lead to misattribution of landings for this species when apportioning between EEZs.

Given the potential for error in the method, charts in this report are given with upper and lower limits denoting the theoretical maximum and minimum value for the apportioned rectangles in question. The upper limit is calculated by allocating all landings in a given rectangle to the zone in question, even if that zone's surface area share of the rectangle is low. The lower limit is calculated by allocating landings to a given zone only where it occupies all of the sea water surface area of a given rectangle. These are extreme theoretical limits but their distance from each other and the apportioned estimate provides a sense of the precision of the estimate. Where the range is relatively wide the apportioned value is relatively imprecise and where the range is narrow the apportioned value is relatively precise.

For UK data the precision of these statistics depends primarily on what fraction of the data has had to be apportioned to create the statistic. When using UK data to look at the UK's EEZ as a whole a relatively small number of rectangles have to be apportioned, therefore apportioned estimates at this high level are relatively precise. In contrast, when looking at smaller spatial areas, for example Area IVc (the southern North Sea) a relatively large number of the rectangles are shared between OMS and so the amount of apportioning is larger, producing more imprecise estimates.

UK administrative data gathering systems are subject to robust and ongoing quality assurance processes to identify and correct data input errors. These processes are set out in the appendices of the UK Sea Fisheries Statistics 2016 publication. The publically available data for OMS are a combination of data from all OMS with fishing in the areas covered. Each OMS dataset is subject to that member state's data validation procedures, of which some may be more robust than for others. This means that the quality of OMS data is difficult for us to assess or control, therefore we are providing signposts to sources rather than republishing the data ourselves. There are however known issues in the 2016 version of the OMS data with poor coverage pre-2013 for some OMS and occasional omissions in more recent years (e.g. all Sand Eels missing for Denmark in 2015). For this reason we have restricted our analyses to data between 2013 and 2015 only for OMS, however we understand many of these issues have been rectified in the 2017 version of the dataset.

On occasion UK logbook records are missing key information, such as the rectangle, zone or ICES division of capture. In these cases UNK (i.e. unknown) values are captured. This creates ambiguity as to where the fish were caught. In cases where the ambiguity is such that no objective determination could be made as to the provenance of the landings the data are not apportioned or assigned to a zone. This means that the totals of the four major zonal divisions from H1 do not sum to the overall reported landings by UK vessels. Table 2 below shows the overall % of the total landings and value for each year that could not be objectively assigned to a spatial zone.

Table 2 – Per cent UK data quantity and value spatially unassigned by year

Year	% unassigned quantity	% unassigned value
2012	3.5%	3.0%
2013	0.8%	0.7%
2014	0.6%	0.6%
2015	0.9%	0.8%
2016	0.6%	1.1%

3. Landings by major zonal division

The sections below detail the estimated landings by the UK fleet originating from the major zonal divisions of H1, with comparisons made to the reported landings of OMS where appropriate. It is clear from figure 3 below that the UK catches the vast majority of its fish, 81% by quantity, from its own EEZ. With OMS EEZs being the next most important zone of capture, at 11% by quantity. In comparison, OMS annually take, on average (2013 – 2015), 57% of their NE Atlantic fish from Union waters (excluding the UK EEZ). The next most important zone is the UK EEZ from which 34% of their NE Atlantic landed quantity of fish originates. Figures 5 – 8 below show the spatial extend of landings by rectangle of capture from the UK and OMS datasets. Remember that OMS data do not include their Mediterranean, Black Sea or distant waters landings.

Figure 3 – UK vessel landings by major zonal division (H1): 2016 (showing uncertainty range)

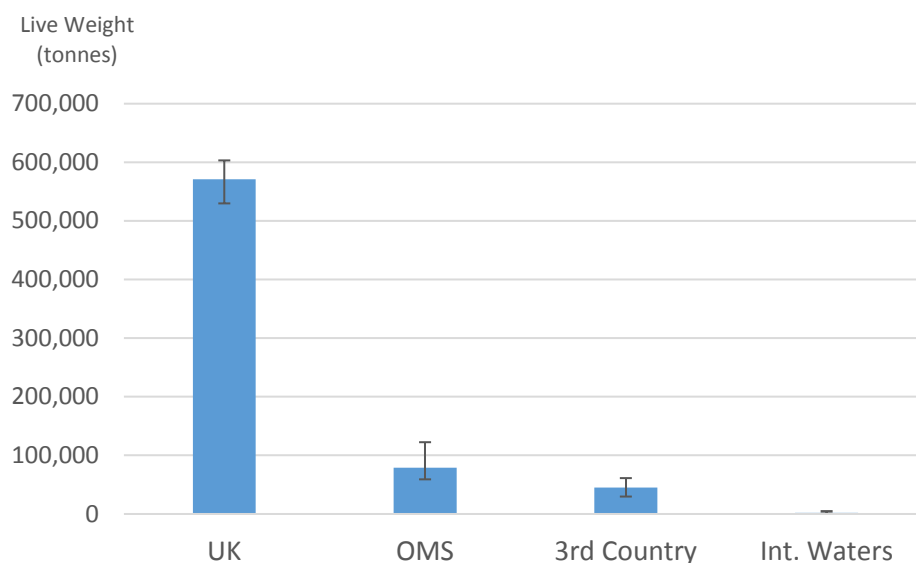


Figure 4 – OMS vessel landings by major zonal division (H1): av. 2013 - 2015 (showing uncertainty range)

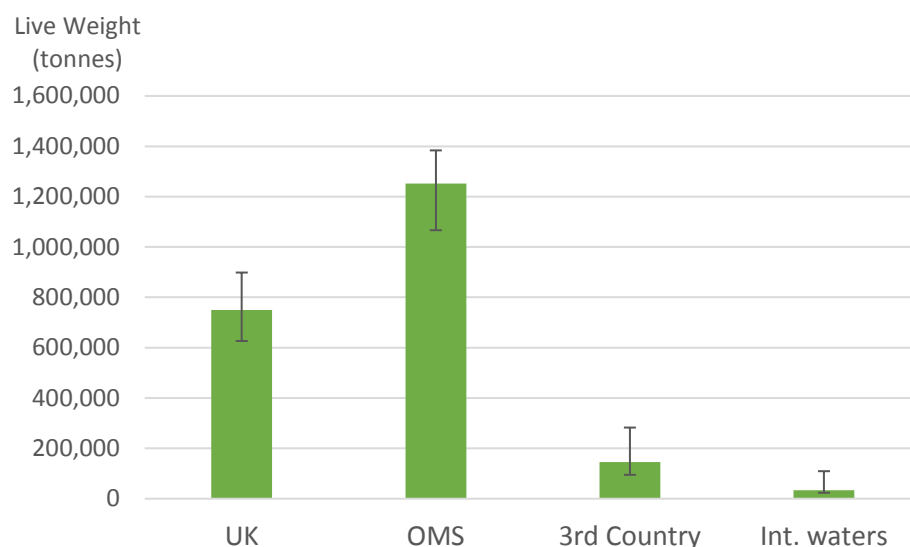


Figure 5 – UK landings by ICES rectangle (2016)

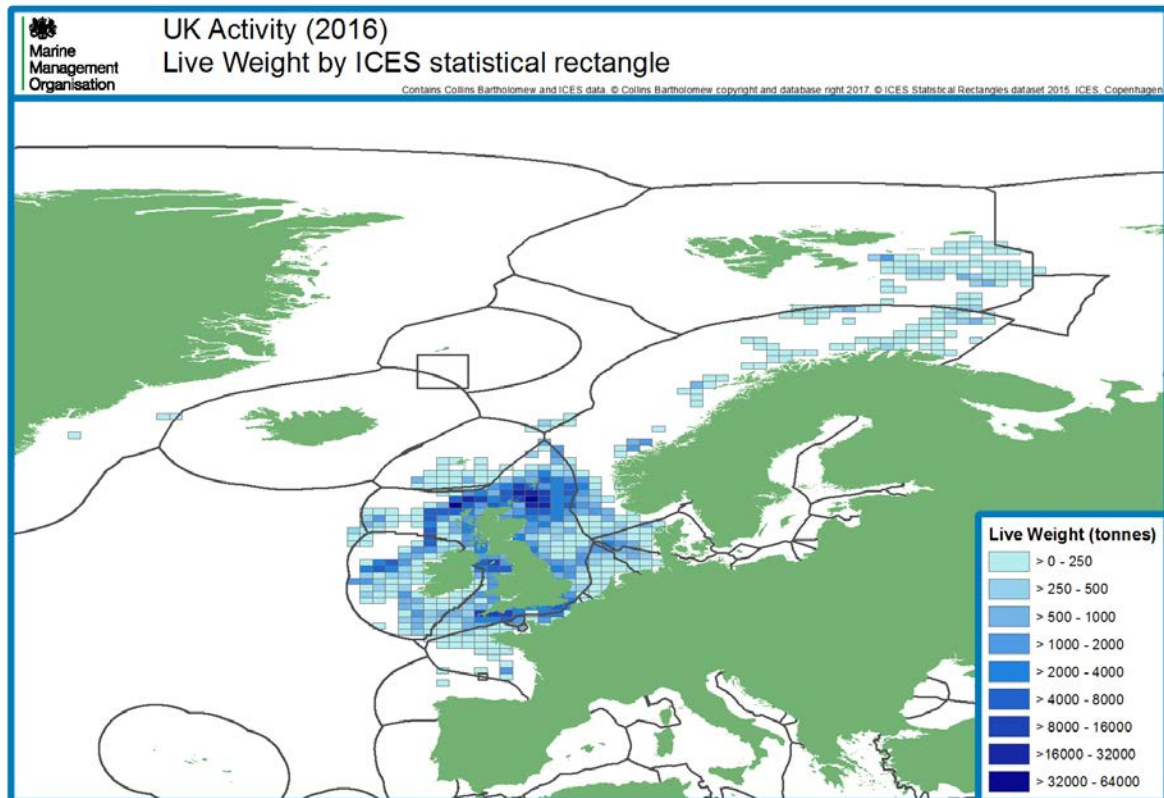


Figure 6 – OMS landings by ICES rectangle (av. 2013 - 2015)

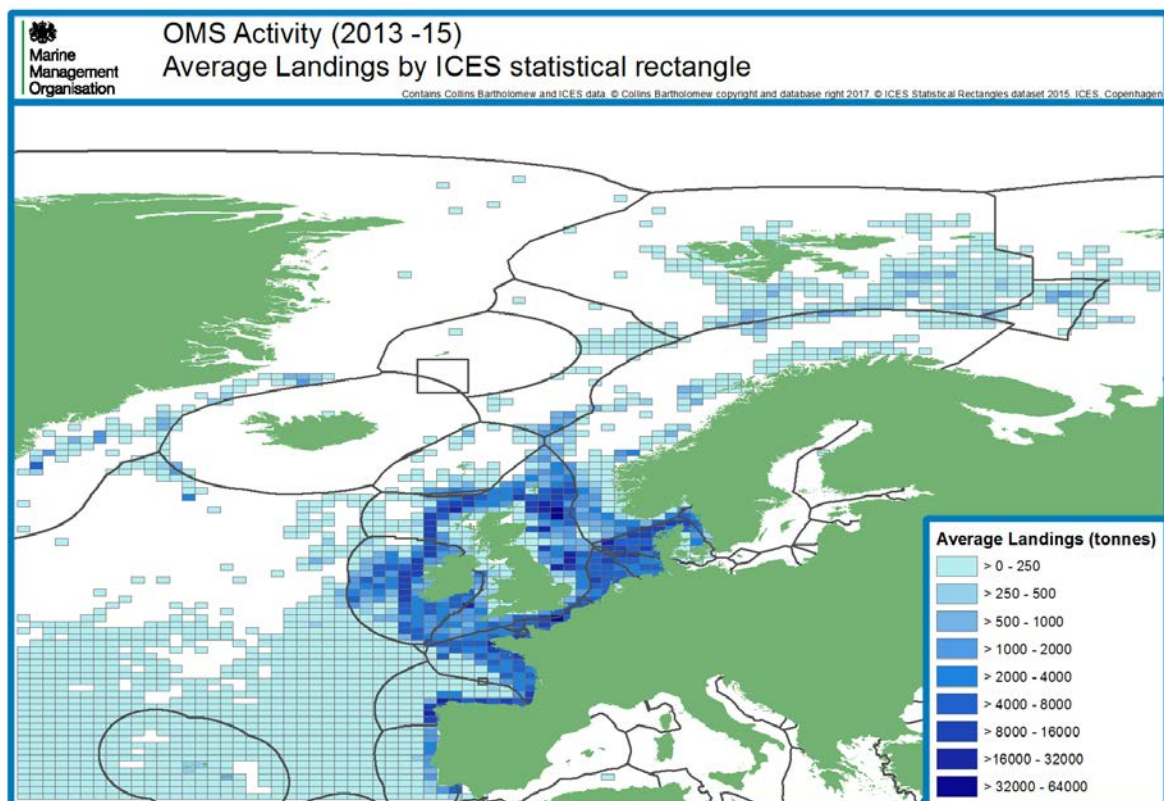


Figure 7 – UK landed value by ICES rectangle (2016)

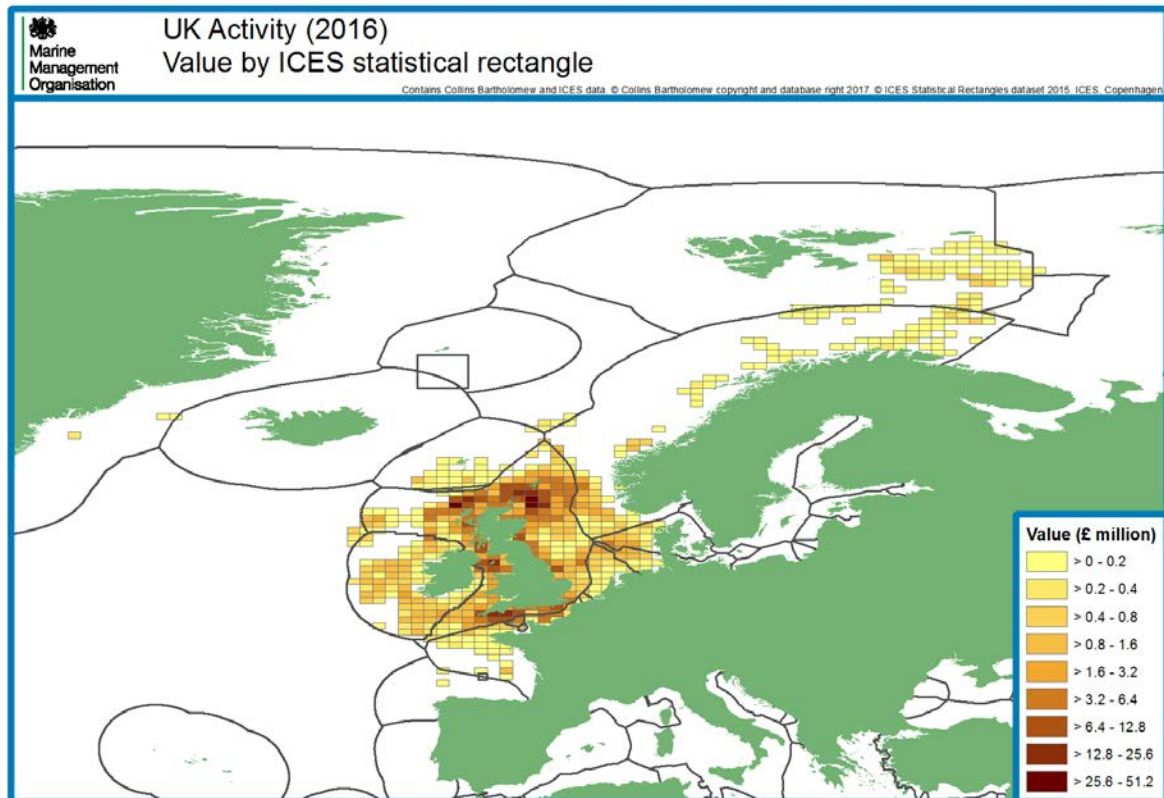
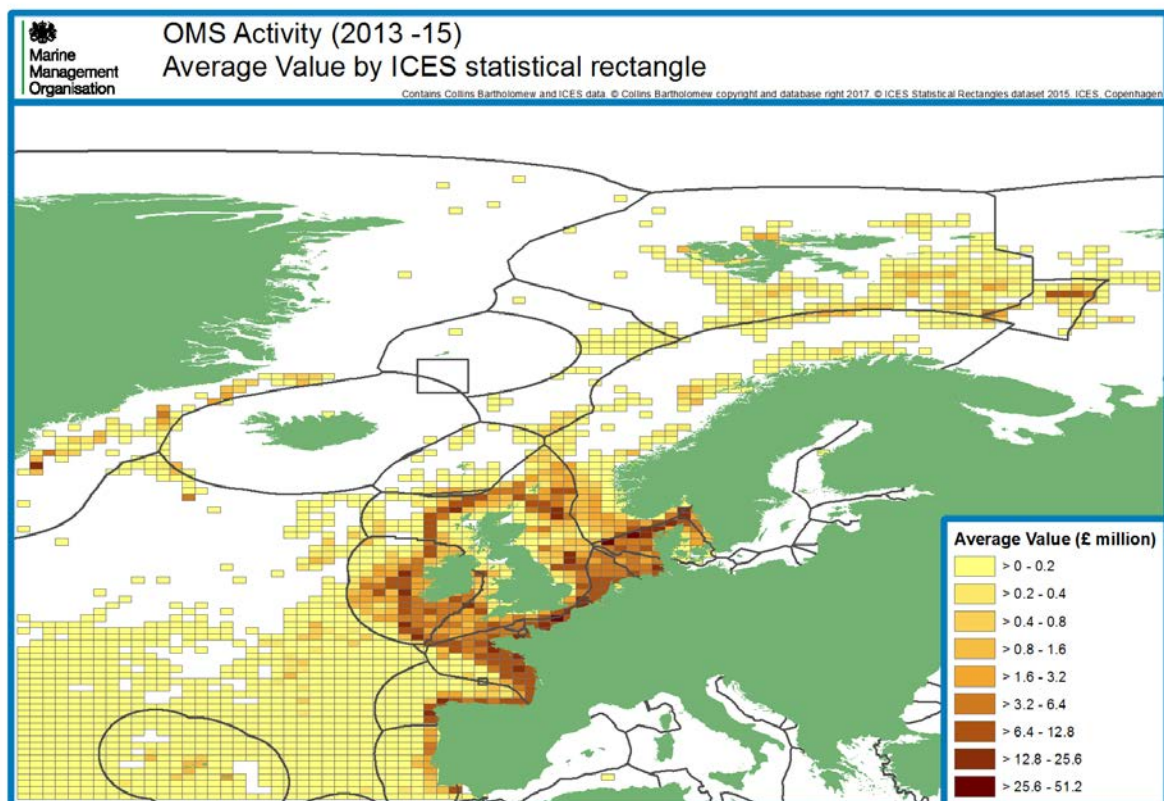


Figure 8 – OMS landed value by ICES rectangle (2013 - 2015)



3.1 Landings from the UK EEZ

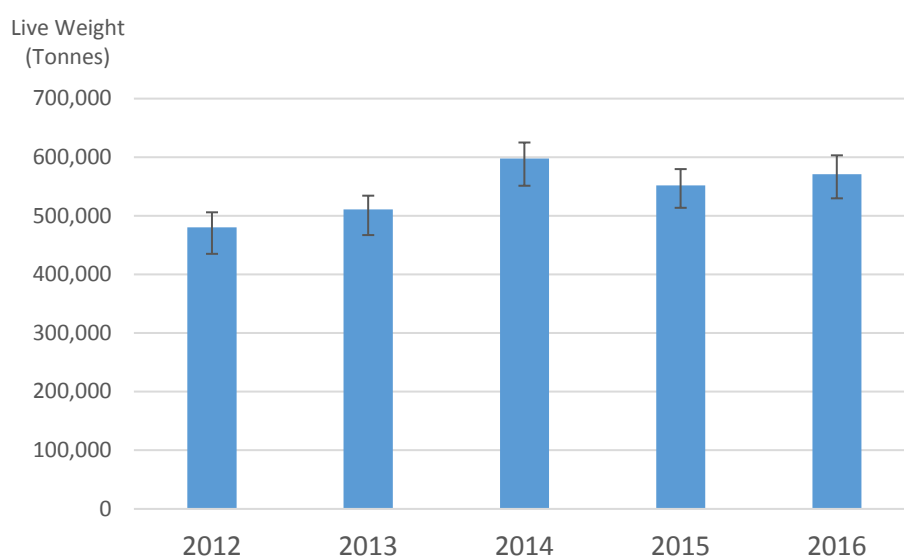
In 2016 UK vessels landed 701,000 tonnes of fish worth £936 million, of which approximately 571,000 tonnes (£774 million) were caught within the UK's EEZ, representing 81% of quantity landed and 83% of value landed. The top three most valuable species landed by UK vessels from the UK's EEZ were Mackerel (203,000 tonnes, £177 million), Nephrops (29,000 tonnes, £97 million) and King Scallops (26,000 tonnes, £61 million). The most valuable ICES divisions within the UK's EEZ to the UK fleet were Area IVa (253,000 tonnes, £308 million), Area VIa (160,000 tonnes, £188 million) and Area VIIe (40,000 tonnes, £76 million).

In comparison OMS caught an annual average of 749,000 tonnes of fish worth £575 million per year from the UK's EEZ in the period 2013 – 2015, representing 34% of their landed quantity from NE Atlantic waters. The top three most valuable species landed by OMS per year from the UK's EEZ were Mackerel (136,000 tonnes, £84 million), Herring (248,000 tonnes, £81 million) and Sand Eels⁶ (74,000 tonnes, £59 million). The most valuable ICES divisions in the UK EEZ to OMS vessels per year were Area IVa (294,000 tonnes, £162 million), Area VIa (173,000 tonnes, £119 million) and Area IVb (154,000 tonnes, £97 million).

Table 3 – UK vessel landings from the UK EEZ by species group (2016)

Species Group	Live Weight (tonnes)	Value (£ mn)
Demersal	117,000	£228
Pelagic	315,000	£237
Shellfish	139,000	£309
Total	571,000	£774

Figure 9 – UK vessel landings from the UK EEZ (showing uncertainty range)



⁶ Sand Eels figures not corrected for missing Danish data in 2015, as such an under-estimate

3.2 Landings from OMS EEZs

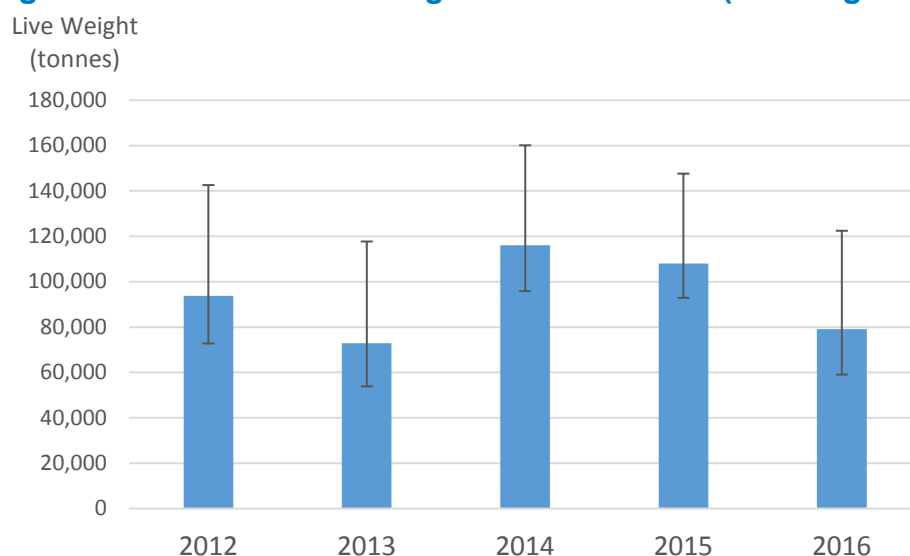
In 2016 the UK fleet landed 79,000 tonnes of fish, worth £96 million from the EEZs of OMS. This represents 11% of quantity landed and 10% of value landed. The species of most value to the UK fleet in OMS waters were Plaice (12,000 tonnes, £16 million), Monks and Anglers (5,000 tonnes, £15 million) and Hake (3,000 tonnes, £8 million). The ICES divisions of most value to the UK fleet in OMS EEZs were Area IVb (15,177 tonnes, £26 million), Area VIIj (9,000 tonnes, £17 million) and VIId (7,000 tonnes, £10 million).

In comparison OMS landed 1,252,000 tonnes of fish, on average per year between 2013 and 2015, from their NE Atlantic EEZs (i.e. not including the Mediterranean or Black seas) worth £1.5 billion. This represents 57% of landed quantity from NE Atlantic waters. The top 3 most valuable species, on average per year between 2013 and 2015, were Hake (72,000 tonnes, £117 million), Sole (16,000 tonnes, £124 million) and Sand Eels⁷ (70,000 tonnes, £99 million). The most valuable ICES divisions to OMS vessels within OMS EEZs, on average per year between 2013 and 2015, were Area IVb (281,000 tonnes, £260 million), Area VIIj (101,000 tonnes, £156 million) and Area VIIIa (84,000 tonnes, £155 million).

Table 4 – UK vessel landings from OMS EEZs by species group (2016)

Species Group	Live Weight (tonnes)	Value (£ mn)
Demersal	27,000	£60
Pelagic	42,000	£16
Shellfish	10,000	£20
Total	79,000	£96

Figure 10 – UK vessel landings from OMS EEZs (showing uncertainty range)



⁷ Sand Eels figures not corrected for missing Danish data in 2015, as such an under-estimate

3.3 Landings from Third Countries' EEZs and international waters

In 2016 the UK fleet landed 45,000 tonnes of fish worth £54 million from the EEZs of neighbouring third countries, 94% of which originated from the Norwegian/Svalbard EEZs. This represented 6% of both quantity and value landed. The species of most value to UK vessels caught in third countries' waters were Cod (18,421 tonnes, £22 million), Haddock (7,236 tonnes, £11 million) and Herring (7,367 tonnes, £4 million). The ICES divisions of most value to UK vessels in third countries EEZ's were Area IVa (18,667 tonnes, £27 million), Area I (9,023 tonnes, £9 million) and Area IIa (8,277 tonnes, £6 million).

In 2016 the UK fleet landed 1,940 tonnes of fish worth £2 million from international waters, representing 0.3% and 0.2% of quantity and landed value. The species of most value to UK vessels caught in international waters were Haddock (676 tonnes, £1 million), Mackerel (1,046 tonnes, £0.6 million) and Monks and Anglers (114 tonnes, £0.3 million). The vast majority (99.9% by quantity/value) of the fish caught in international waters were taken from Area VIb and IIa.

Table 5 – UK vessel landings from third countries' EEZs by species group (2016)

Species Group	Live Weight (tonnes)	Value (£ mn)
Demersal	35,000	£46
Pelagic	10,000	£7
Shellfish	-	-
Total	45,000	£54

Table 6 – UK vessel landings from international waters by species group (2016)

Species Group	Live Weight (tonnes)	Value (£ mn)
Demersal	840	£1.3
Pelagic	1,100	£0.7
Shellfish	-	-
Total	1,940	£2

Figure 11 – UK vessel landings from third countries' EEZs (showing uncertainty range)

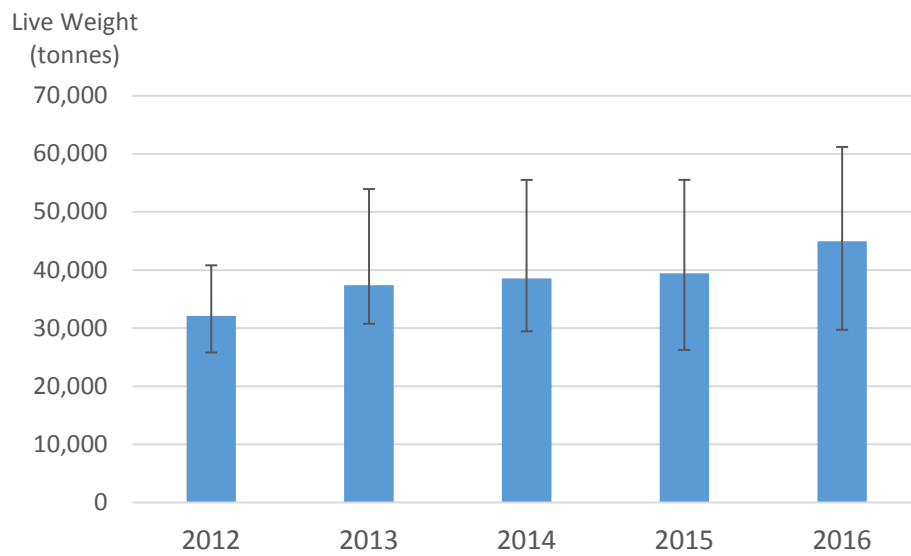
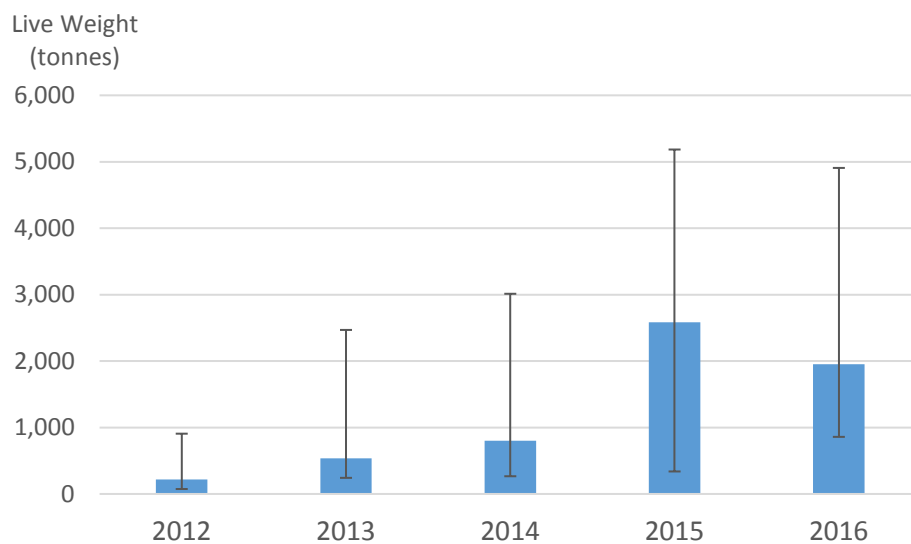


Figure 12 – UK vessel landings from international waters (showing uncertainty range)



4. – End user feedback



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