Marine Management Organisation

Mapping important areas for the UK and non-UK 12-metre and over fishing fleets – phase 3 (MMO1467)

Non-Technical Summary

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MMO1467: Mapping important areas for the UK and non-UK 12-metre and over fishing fleets – phase 3: Non-technical summary

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Context

In 2022, following the publication of the British Energy Security Strategy, the Department for Environment, Food and Rural Affairs commissioned the Marine Management Organisation (MMO) to model areas for future offshore wind and map important areas for current fisheries in English waters. The work in support of this commission created initial maps of current fishing activity for UK 12-metre and over and under 12-metre fleets as well as for the non-UK 12-metre and over fleet covering the period 2016-2021. Alongside these maps an internal technical report suggested future area for development. The maps were subsequently engaged on with the fisheries industry in the summer of 2023, leading to further recommendations for future improvements.

In 2025 the MMO continued the fisheries activity mapping work, to further develop understanding of the areas used by, and important to, the fishing industry. This provided the opportunity to and act on recommendations from the first round of mapping as later engagement.

Unlike the initial report the UK under 12-metre fleet has not been included in this phase of work as currently available data does not facilitate analysis beyond what was completed in 2022. Due to the coarse resolution (reported to rectangles of half a degree of latitude by one degree longitude) of the UK under 12-metre data it is expected that increasing the time series will not show any significant changes in distribution of important fishing areas for that fleet segment, until further data sources can be drawn on including inshore VMS and under 10m catch recording.

Aims and Objectives

The aims and objectives for this project, which will build on previous iterations of fisheries mapping, are to:

1) Extend the time series of data used to with them recent data from 2022 and 2023, explore year to year variability in location and size of core areas, assess how this influences size and location of important areas
2) Improve data confidence by rerunning previous analysis using improved GeoFISH data inputs
3) Test application of the methodology for determining important areas for target fisheries species
4) Align analysed gear groupings with those used in the Fisheries Sensitivity Mapping and Displacement model (FiSMaDiM) for greater comparability
5) Explore areas of local importance through examination of catch locations against their ports of landing

6) Test the robustness of the assumptions made for the cut-off threshold for which an area is defined as a ‘core area’ for fishing
7) Adress several recommendations gathered during the 2023 engagement on the first phase of work

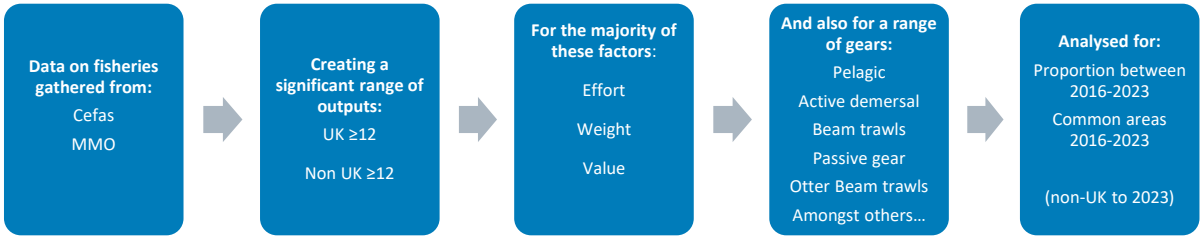
Methods

Like earlier fishing activity mapping, data was gathered from the Cefas GeoFISH database. Geofish is a database that links and presents MMOs fisheries data in a geographic context. It is based on vessel landings data linked to vessel monitoring system position data.

For this analysis the time series was expanded to include the most recent data including 2022 and 2023. Data was quality assured, and several developments of applied to improve the robustness of the data and improve linking between the different sets of data.

A range of fishing activity metrics were generated; (fishing effort (hours and kilowatt hours), weight, and value of landings). Metrics were used to describe the distribution and intensity of fishing activity and were mapped across the study area consisting of English, Welsh and NI Marine Areas.

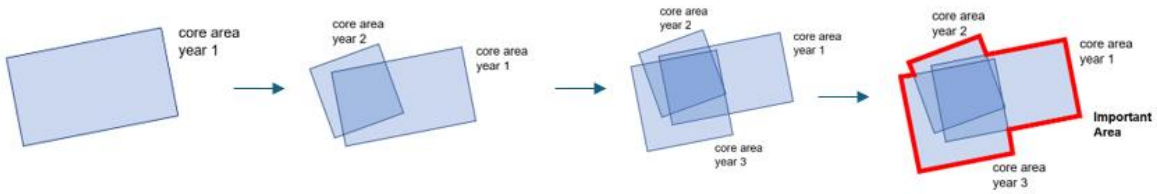
The sea was divided into small cells of 0.05 degrees of latitude and longitude (0.05 c-squares) for the mapping. The contribution each cell to total activity across the whole study area was calculated, and ranked against the other cells, to understand which cells contribute proportionally more to fishing activity.



During early mapping work, analysis indicated that fishing activity is often concentrated consisting of smaller, intensively fished areas, and larger, infrequently fished areas. The term “core areas” was used to defined areas of higher fishing activity for any particular year that included the top 80% of all activity. The 80% threshold was set in agreement with policy and decision-makers, as this represented the point where a significant proportion of lesser fish area is removed leaving the areas which contained the most intense activity.

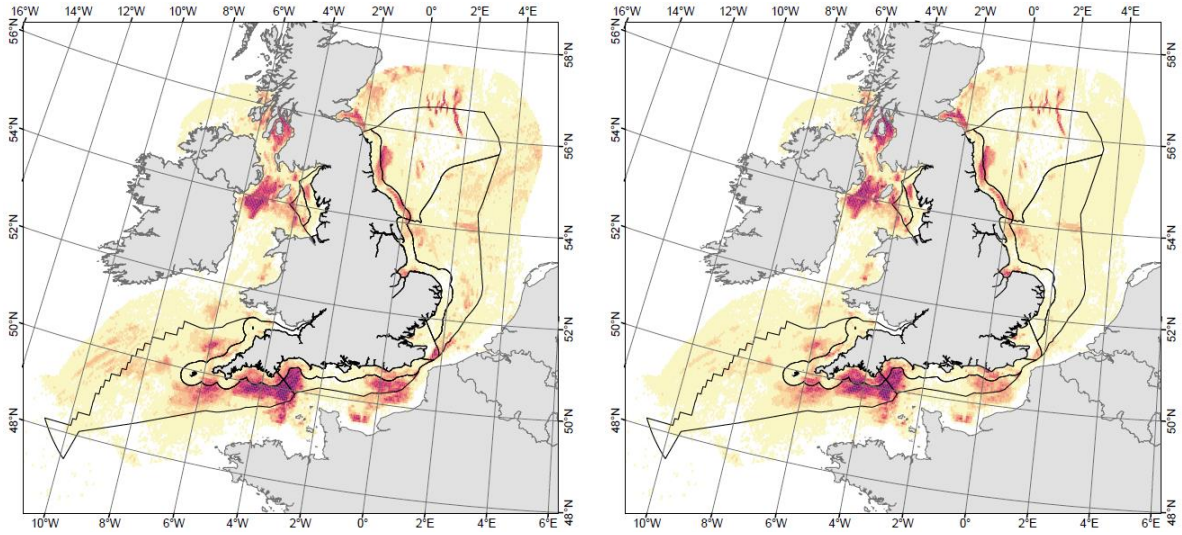
“Important” areas were then defined as the total of all the core areas from any one or more years in the time series combined. As a longer time series included the year to year variability in core areas, the longer the time series, the bigger the important area tends to become.

Analysis also explored the location and size of important areas and how they differed when data considered different fishing gears or focused on particular species groupings.



Results

Fishing activity was widespread present in more than 81% of the study area. However, activity is usually concentrated and consists of smaller, intensively fished areas, and larger, infrequently fished margins (Figure 1). At a national level, areas of high and low fishing activity were broadly similar regardless of which metric of activity was used to describe activity, although at small scales e.g., individual grid squares, differences in relative importance exist.



Effort (kWh)

Effort (hours)

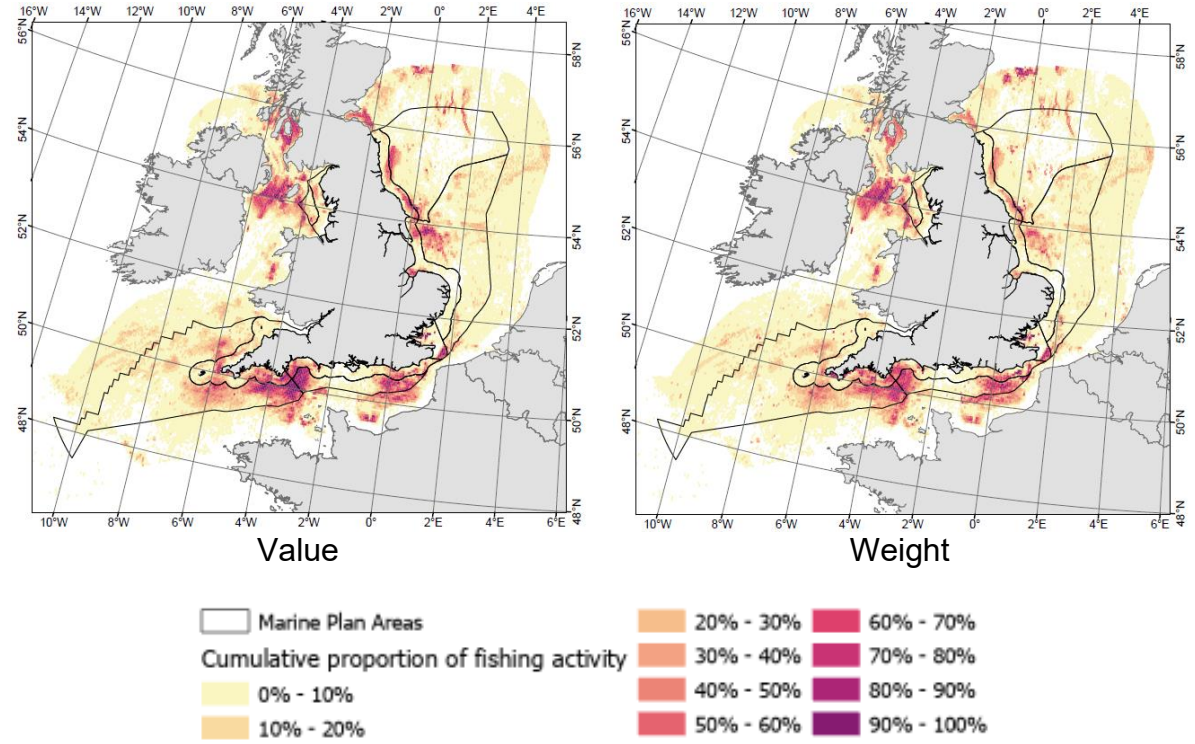
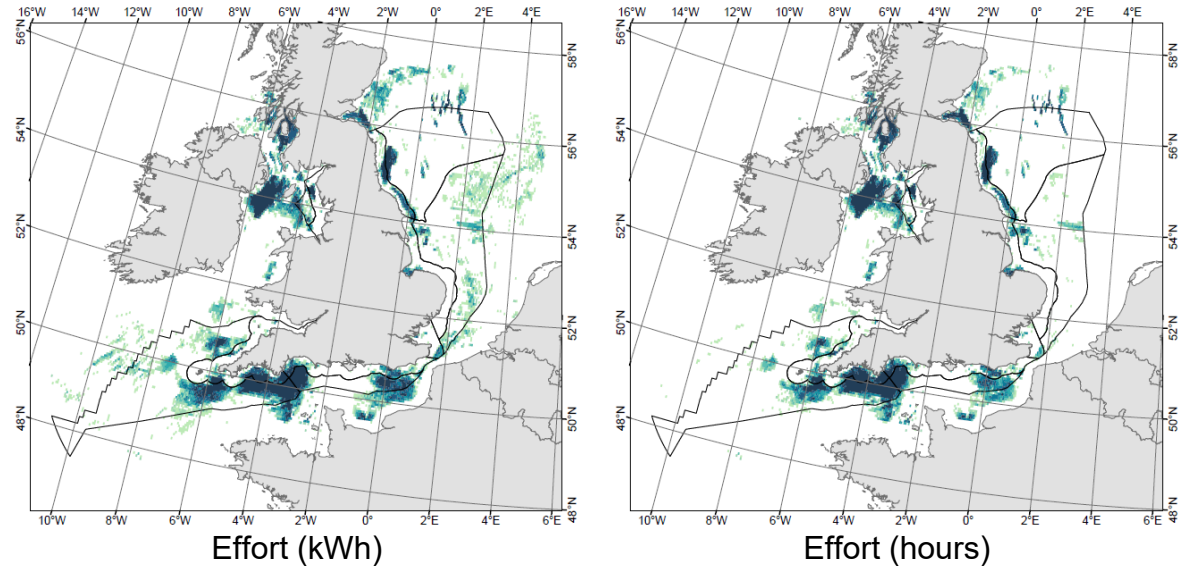


Figure 1. Spatial distribution of fishing activity for the UK 12-metre and over fleet 2016-2023, visualised using the cumulative proportion of fishing activity by metrics: effort in kilowatt hours (top left), effort in hours (top right), value (bottom left), and weight (bottom right).

"Core areas" (footprint of the top 80% of cumulative fishing in each year) showed year to year differences in both size and location but with substantial overlap among years (Figure 2 and Table 1).



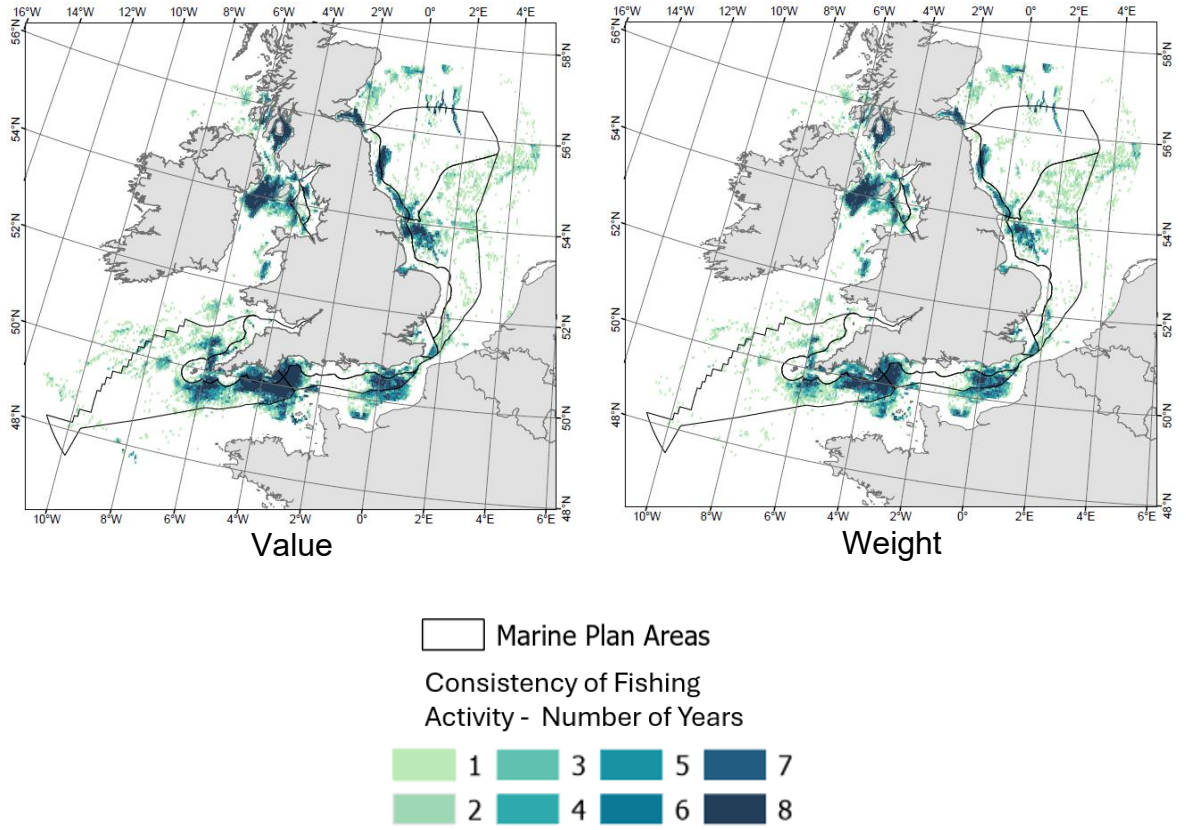
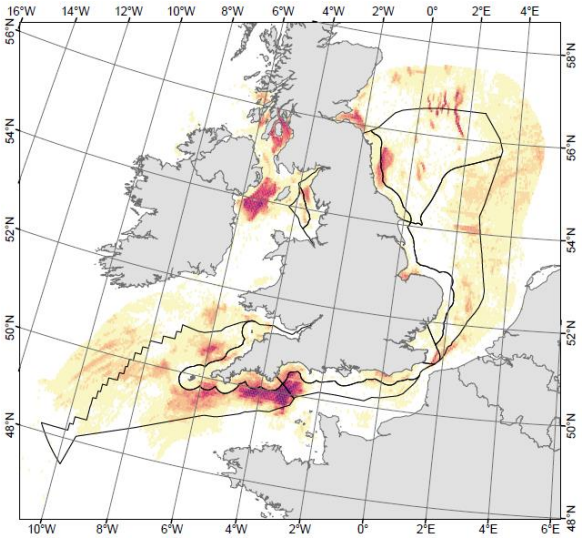


Figure 2. Important fisheries areas for the UK 12-metre and over fleet across all gears using effort (kWh) (top left), effort (hours) (top right), value (bottom left), weight (bottom right) 2016-2023.

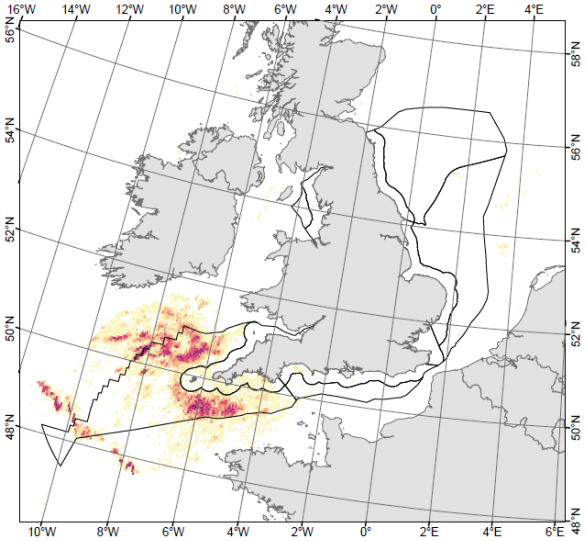
Table 1. Percentage contribution towards the total important area by number of years and by metric.

Number of Years	*Weight tonnes (%)*	*Value £ (%)*	*Effort (kWh) (%)*	*Effort (hours) (%)*
1	37.72	34.56	30.52	20.92
2	16.20	16.07	14.48	13.25
3	9.65	8.91	9.46	9.22
4	7.48	6.58	7.42	8.26
5	6.20	5.96	6.67	7.73
6	6.07	6.13	5.99	7.63
7	6.19	6.52	8.08	8.77
8	10.50	15.28	17.39	24.22

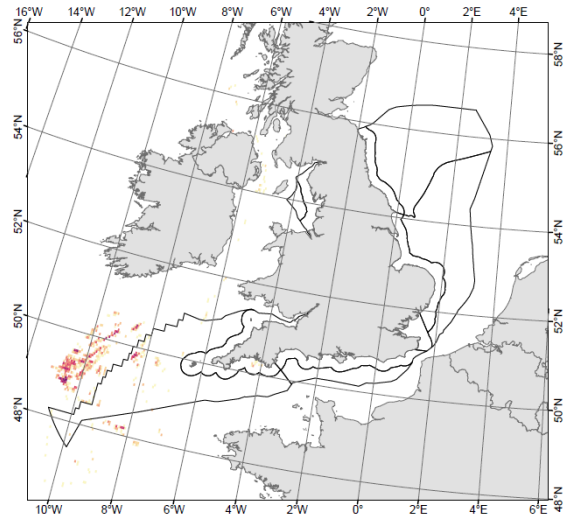
Different metrics for fishing activity identify similar important areas suggesting strong links between effort and landings-based metrics at the scale assessed. However, important areas differed strongly when separated by gear groupings, or between the UK and non-UK 12-metre and over fleets, and among target species (Figure 3, 4, 5, 6 and 7)



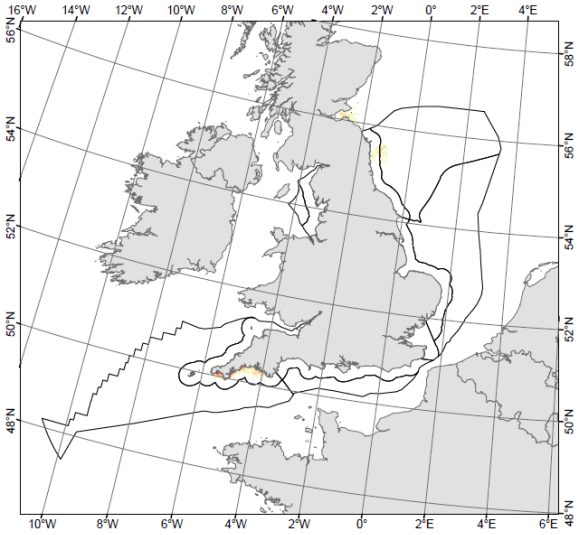
Demersal Trawls



Gillnets and entangling Nets



Hooks and Lines



Surrounding Nets

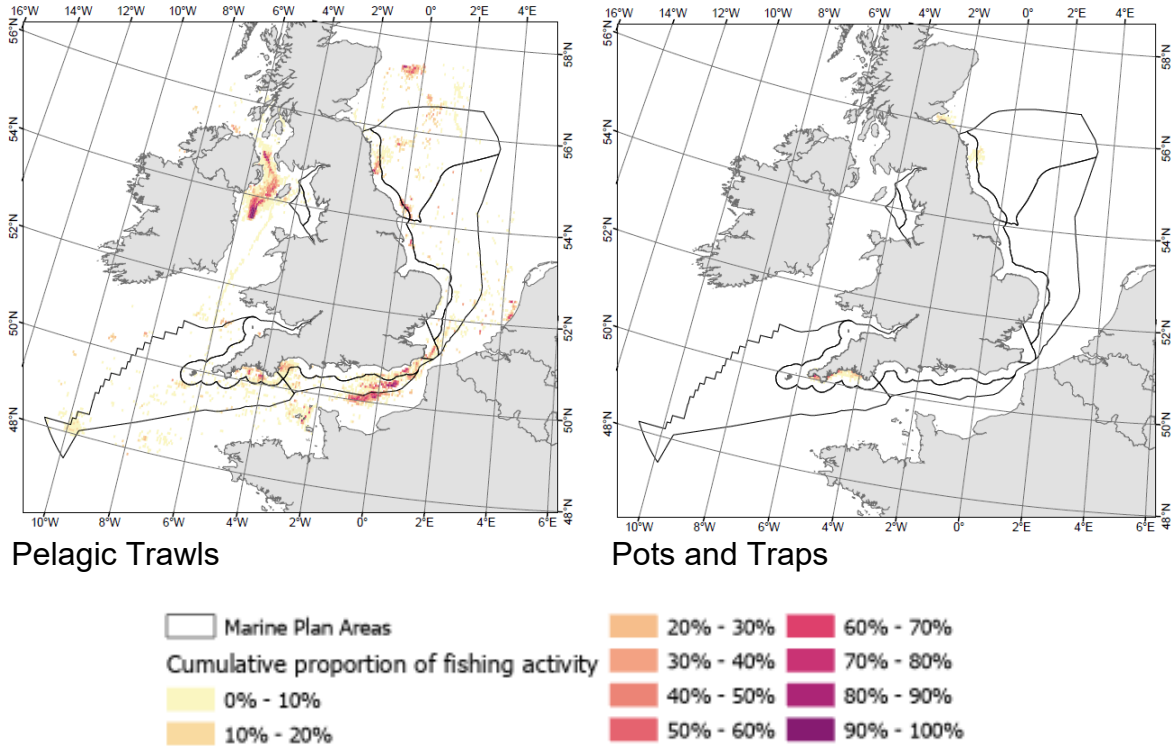
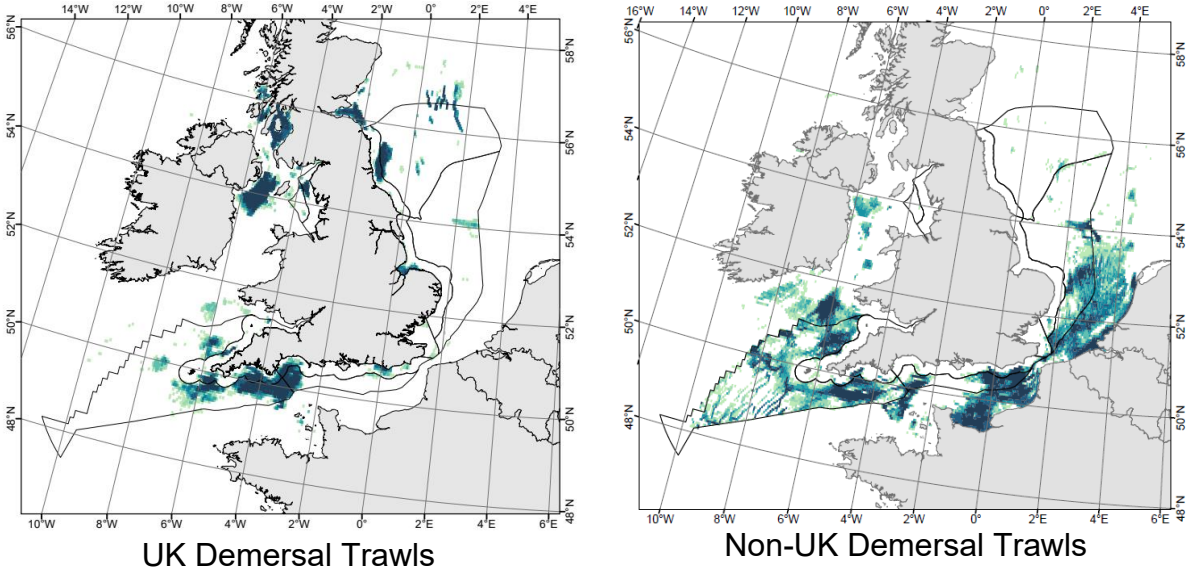
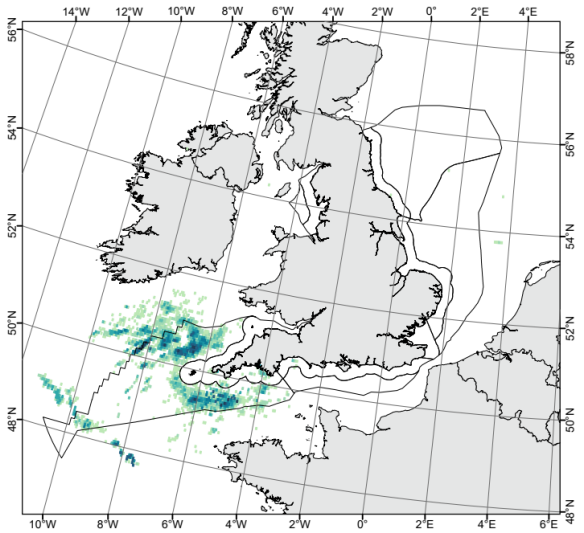
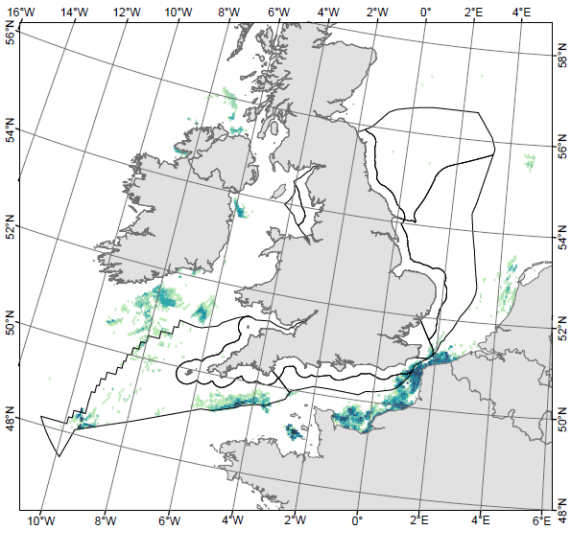


Figure 3. Spatial distribution of fishing activity for the UK 12-metre and over fleet 2016-2023, visualised using the cumulative proportion of fishing effort (kWh) across six gear groupings: demersal trawls (top left), gillnets and entangling nets (top centre), hooks and lines (top right), surrounding nets (bottom left), pelagic trawls (bottom centre), and pots and traps (bottom right).

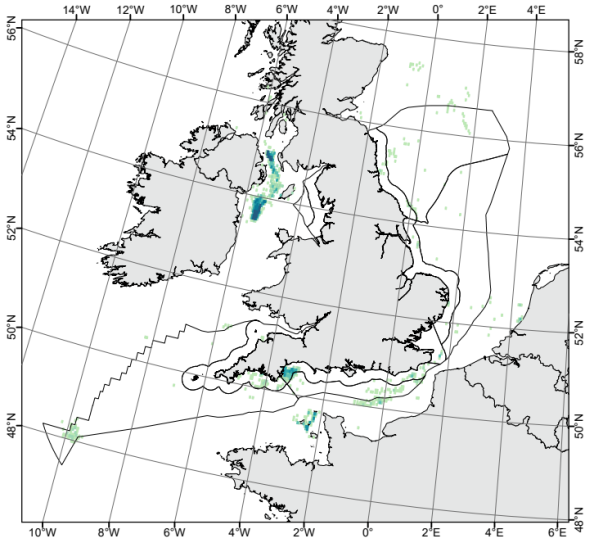




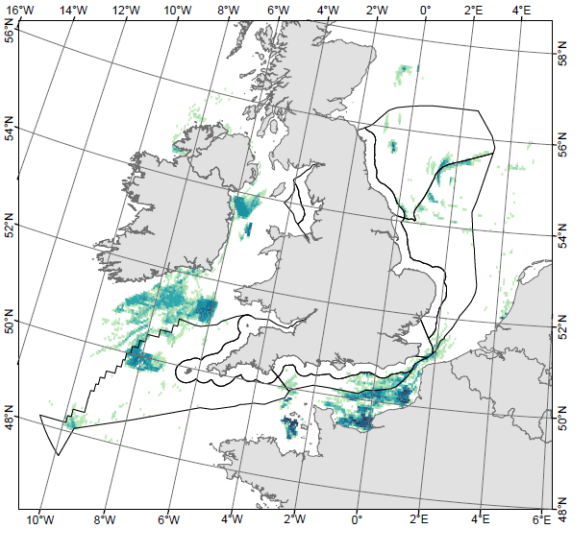
UK Gillnets and Entangling Nets



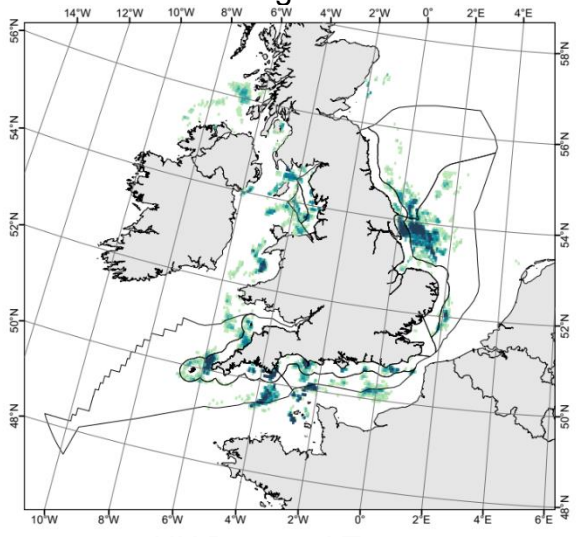
Non-UK Gillnets and Entangling Nets



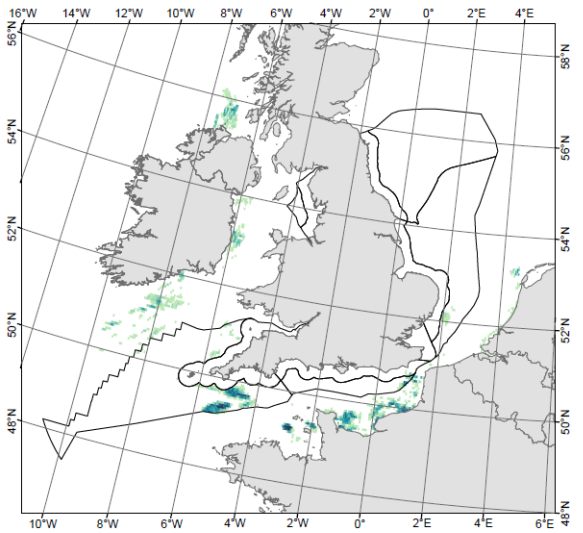
UK Pelagic Trawls



Non-UK Pelagic Trawls



UK Pots and Traps



Non-UK Pots and Traps

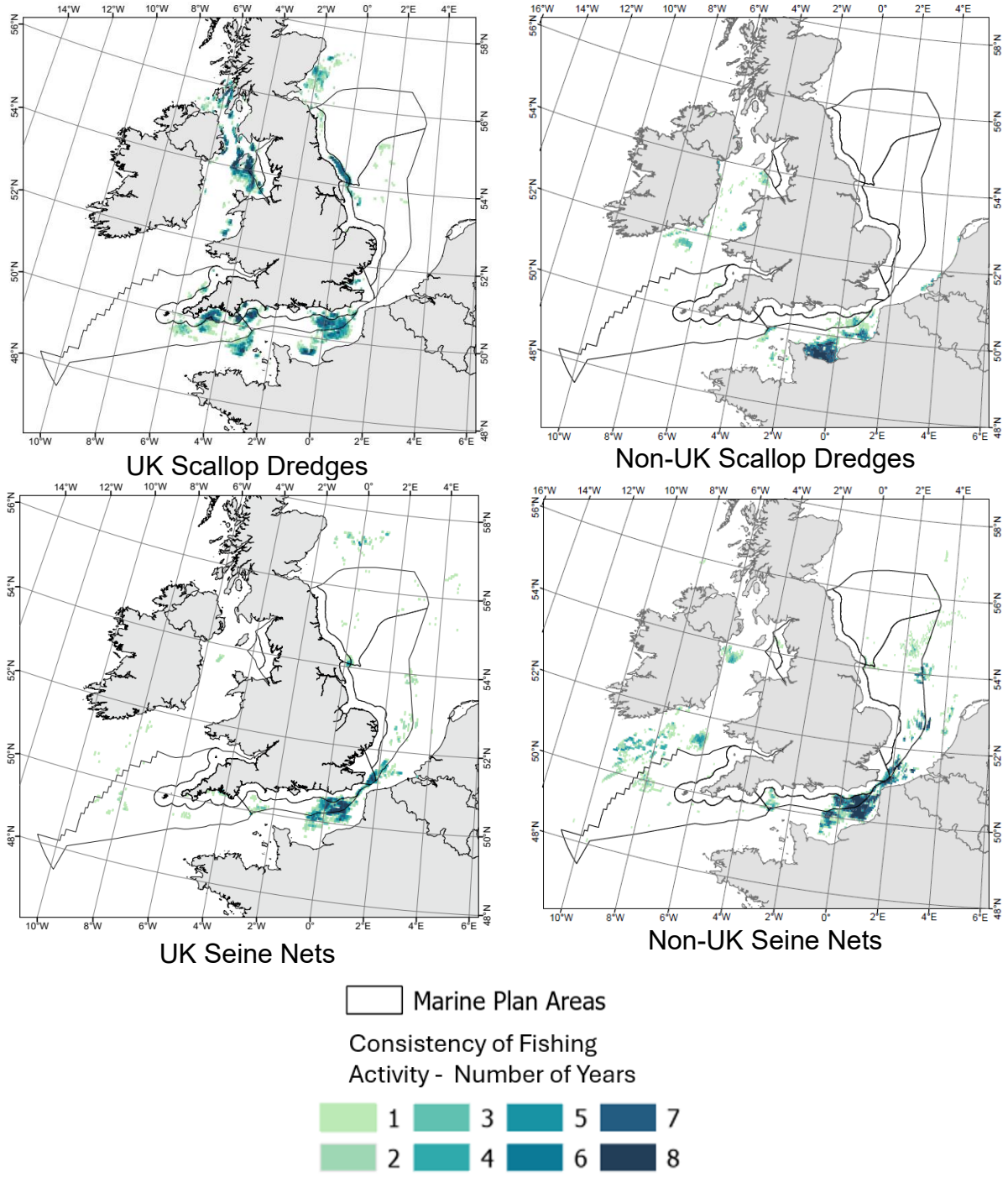
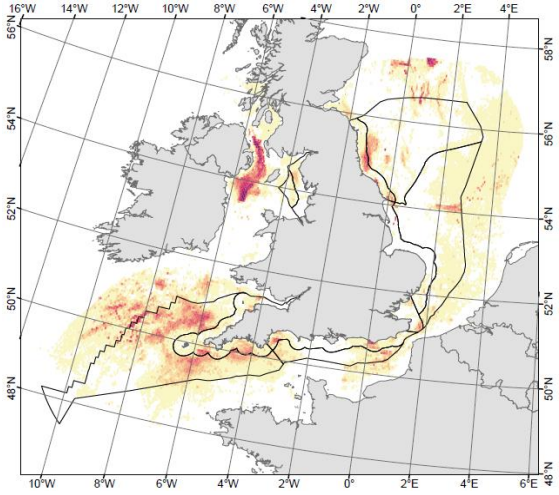
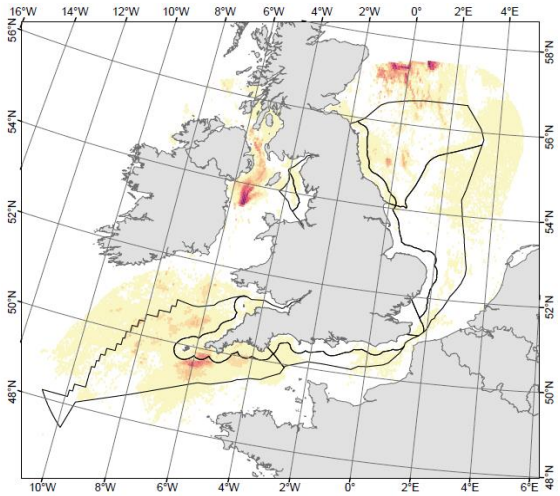


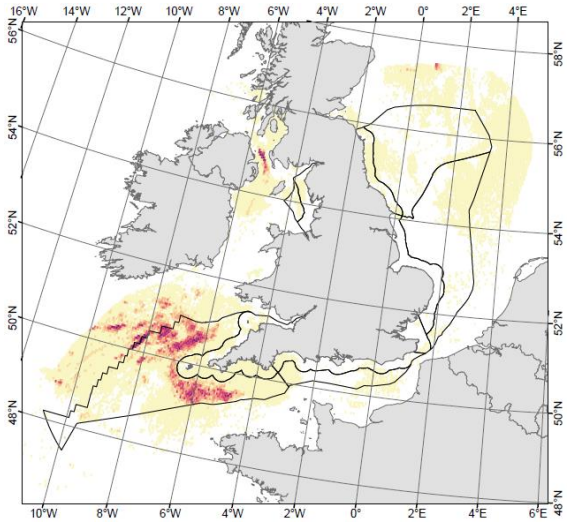
Figure 4. "Important areas" for the UK (left) and non-UK fleet (right) 2016 – 2023 using the effort (hours) metric across the six gear groupings: demersal trawls (first row), gillnets and entangling nets (second row), pelagic trawls (third row), pots and traps (fourth row), scallop dredges (fifth row), and seine nets (sixth row).



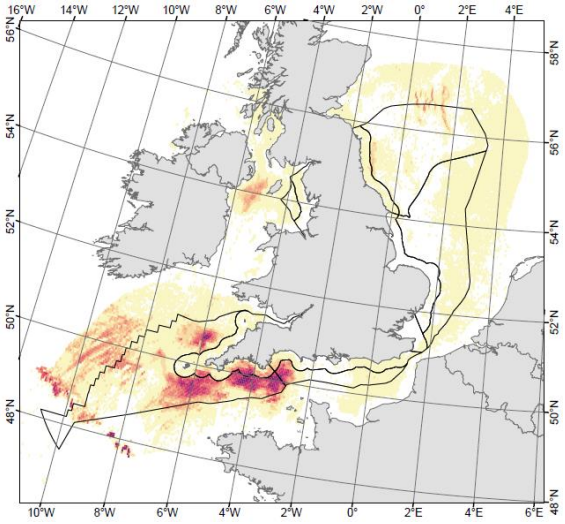
Cod



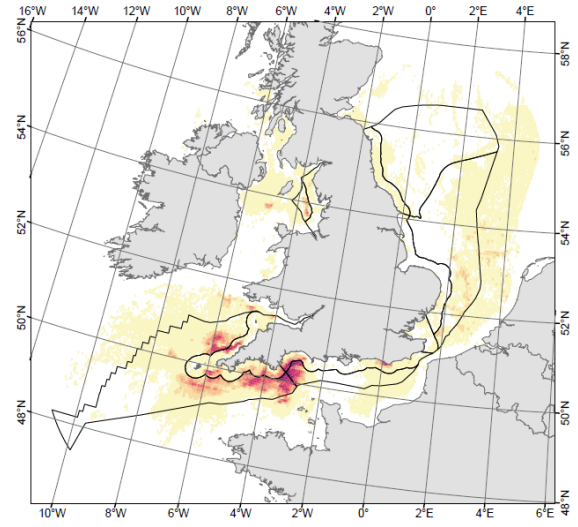
Haddock



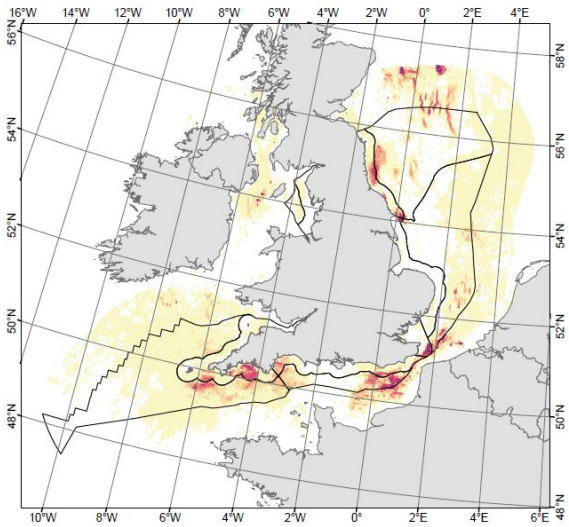
Hake



Monkfish and Anglerfish



Sole



Whiting

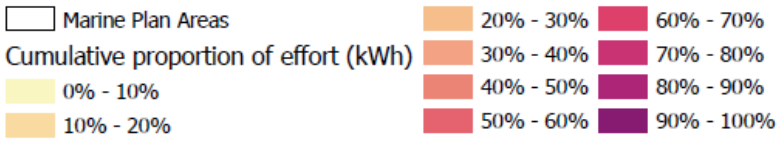


Figure 5. Spatial distribution of fishing activity for the UK 12-metre and over fleet 2016-2023, visualised using the cumulative proportion of landing value across six target demersal fish species: cod (top left), haddock (top centre), hake (top right), monkfish and anglerfish (bottom left), sole (bottom centre), and whiting (bottom right).

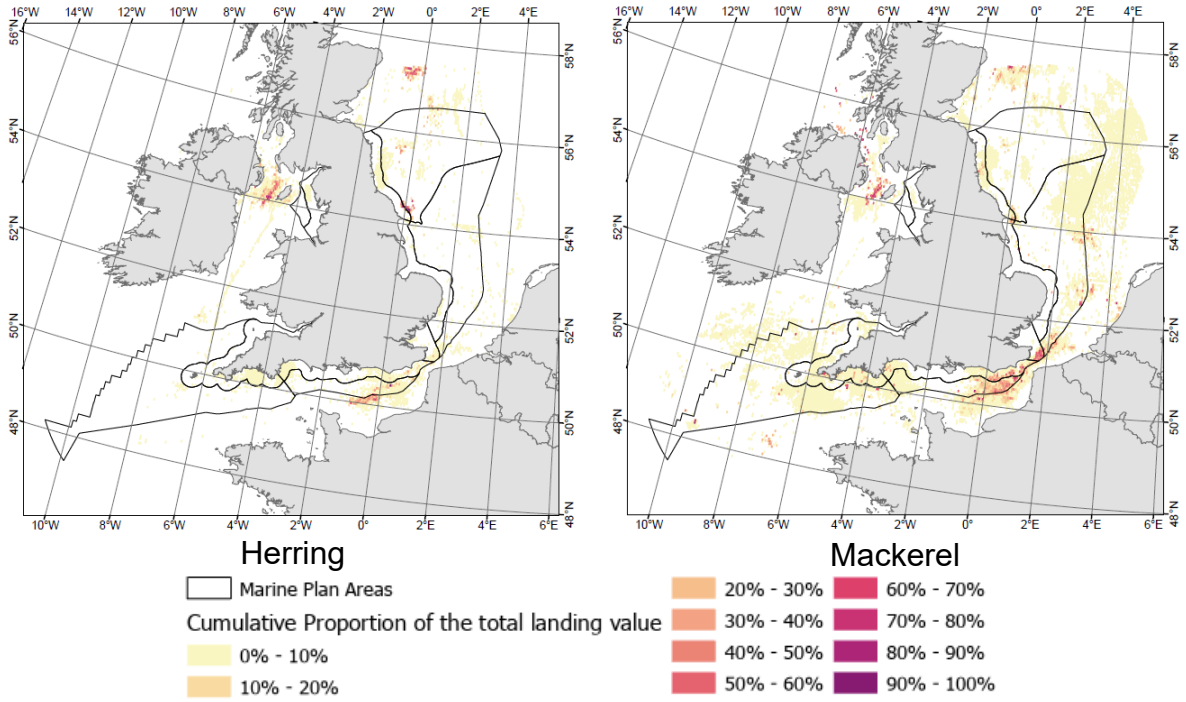


Figure 6 Spatial distribution of fishing activity for the UK 12-metre and over fleet 2016-2023, visualised using the cumulative proportion of landing value across 2 target pelagic fish species: herring (left) and mackerel (right).

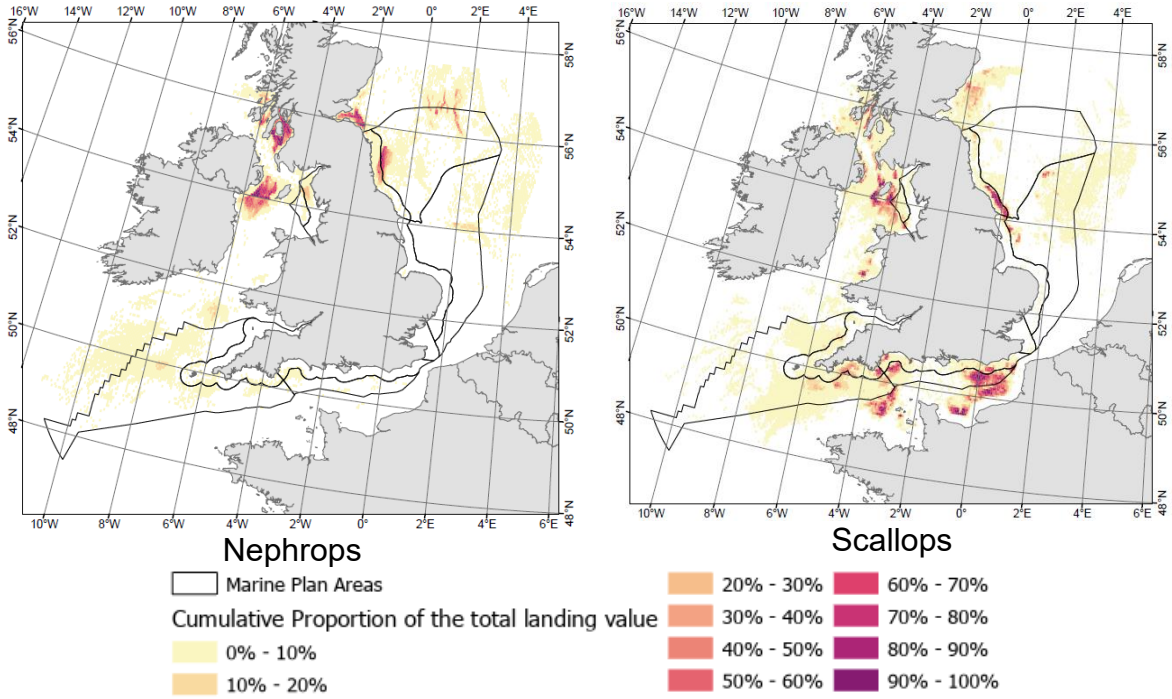


Figure 7 Spatial distribution of fishing activity for the UK 12-metre and over fleet 2016-2023, visualised using the cumulative proportion of landing value across 2 target dredged/trawled demersal invertebrate species: nephrops (left) and scallops (right).

Analysis of important areas was also assessed on gear groupings at a marine plan area scale for the north east marine plan area and south west marine plan area to investigate any significant differences in how important areas present when assessed on a regional versus a national scale confirming that the scale of assessment was relevant in which areas were identified (Figure 8).

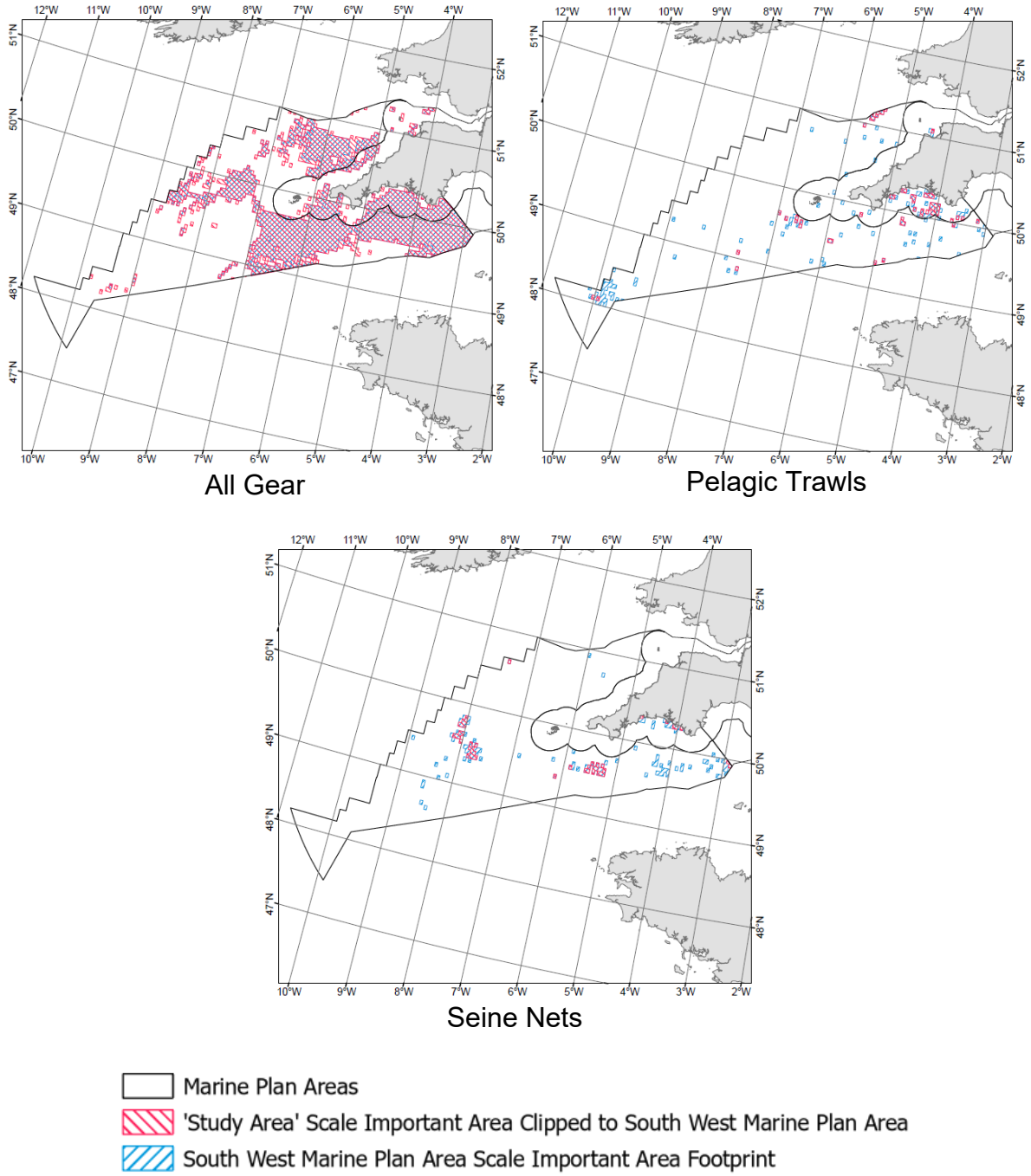


Figure 8. Comparison of the study area (UK) important area footprint 2016-2023 clipped to the south west marine plan area against important areas created when the raw data is clipped to the south west marine plan area prior to data processing (UK 12-metre and over effort (kWh)) for three gear groupings: all gear (top left), pelagic trawls (top right), and seine nets (bottom).

Analysis was also run to identify the areas of the sea from which most ports received landings, with up to 24 different ports landing fish from western Scotland and north-east England (Figure 9). Examination of the areas where individual ports received landings from further highlighted that while an area may not register as an important

area at a national level, they may still be highly valuable at a local community level (Figure 10).

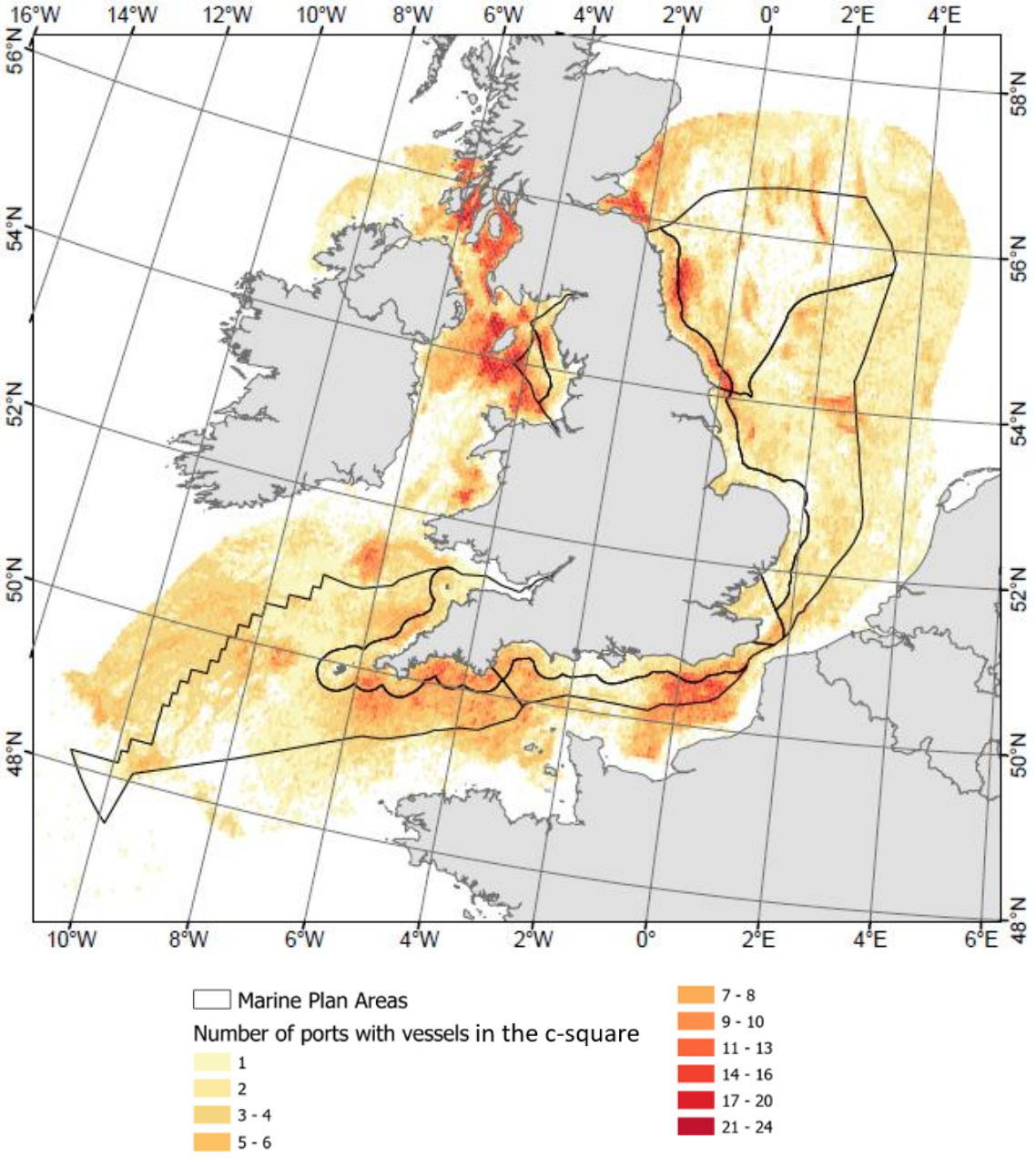


Figure 9. Map showing the number of ports operating around the UK based on fishing activity for the UK 12-metre and over fleet 2016-2023.

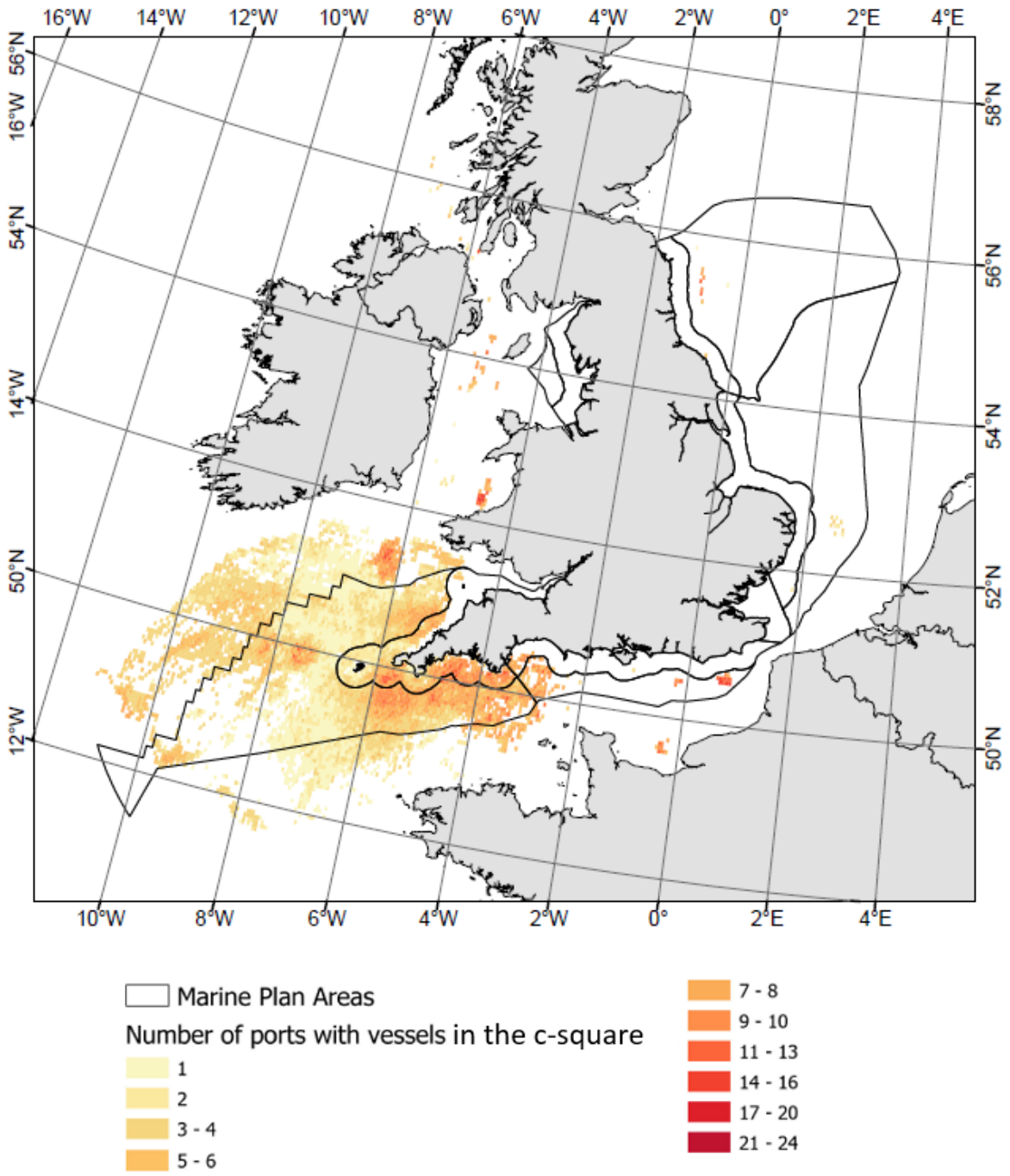


Figure 10. Map showing the number ports landing catch in the same area as Newlyn based on fishing activity for the UK 12-metre and over fleet 2016-2023.

The 80% activity threshold identified in 2022 was re-evaluated and found to be generally appropriate with a degree of variation between different gears and species. However, the method used to test the threshold was also found to perform poorly where the overall spatial extent of the dataset being examined was small, and further refinement of the method will be required to further improve confidence.

Discussion

All gears, except demersal trawls and pots and traps, demonstrate that the greatest percentage of their important areas are made up of areas which were only a core area for a single year. Indicating that fisheries other than demersal trawls generally operate in different areas in different years. This likely means that intervention for these gear types based on the location of the fishery in a single year is possibly not effective, and highlighting the need for engagement with the local fishing sector in this area to understand which particular areas are important each current season.

Similar trends are visible for species as cod, haddock, hake, mackerel and whiting where their important areas are majorly composed of areas which were only core areas for a single year. These species are highly mobile and migrate depending on weather trends and food availability and variation in location of core areas among years may represent this mobility and climatic influence. Fast growing and more immobile species, which are dependent on specific habitat types, such as crab and nephrops fisheries, had more consistency in important areas across the years. This suggests that location-based intervention for fisheries based on a single years location may not be effective. Fisheries that have highly consistent year-on-year locations may also be more sensitive to displacement and spatial intervention for these fisheries may be more effective as they are tied to a specific area.

Overall, the size of the area important to fisheries has increased between 2016 and 2023 as the time series was expanded and included more among year variation. This may be the result of natural variability among years or long term systematic drivers of in distribution of some fisheries, including climate change, quota allocation and fisheries closures through byelaws or displacement due to infrastructure development or regulatory changes that continually alter fishing patterns.

Analysis of landings by ports reveals that there are areas which are highly locally important to certain ports but are not visible on national scale dataset. Catch landed from the ports at Ipswich and Bembridge, for example, are almost exclusively in areas which are not considered important on a national scale. Reviewing these data and making appropriate intervention to consider these areas in decision-making, in addition to national datasets, is therefore essential.

The important of understanding how important areas differ between a national and a local perspective is supported by analysis of important areas at a more local scale, for the south west and north east marine plan areas. analyses demonstrated that generating important areas for a specific locality reveals hotspots of activity that are not visible nationally.

Some important areas for species and gears are present across the value and weight metrics, but not across the effort metric. This includes important areas for

pots, traps and crabs, near Flamborough Head and the Wash. This is likely driven by the comparatively low effort (KwH) used for these near-shore fisheries, and the higher landing value of for example the Cromer Crab fishery in the Wash. This further highlights the importance of consideration of local, historical and artisanal fisheries which may have high value but do not contribute significantly to national fishing effort.

Areas used by the UK and non-UK fleet differed. The UK fleet, for example, tends to deploy gillnets and entangling nets mostly in south-west England, whereas the non-UK fleet use these gear types more heavily in the English Channel. This may be as the non-UK fleet frequents areas which are closer to their port of origin in France, the Netherlands and Belgium. Importantly, this means that management intervention or impacts linked to gear type may have disproportionate effects on UK and non-UK fleets depending on the area.

MMO has also supported work with similar intentions led by others, particularly with the Centre for Environment Fisheries and Aquaculture Science project FiSMaDiM (**Fi**sheries **S**ensitivity **Ma**pping and **Di**splacement **M**odelling). While projects differed in the data used, some processing assumptions and the metrics or indicators used to describe "importance", at broad scales both project identify similar areas and overlaps suggest nationally important areas can be robustly identified regardless of method. At finer scales choices about what measure of importance is being considered or how the data is cut to nation or gear becomes more influenced but choices of methodology and require more nuance in understanding to make appropriate use choices. Combining and analysing which areas are included in both datasets as "important" may be useful for future policy and decision-making to identify especially important areas, with high confidence.

Future Development

There is potential to continue develop this work further through additional exploration of the existing data and through processing new useful information which help to build upon our understanding of fishing activity around the UK. Possible future development include:

- Validate the data and map outputs through engagement with the industry
- Further refinement and testing of the 80% threshold for "important area"
- Further explore fisheries at a local scale, by mapping supply chains, land-based employment and port of admin/home port as opposed to landing port
- Explore relationship between gear and species activity areas
- Map activity areas against changes to quotas and fisheries closures through byelaws
- Continue to explore further approaches to mapping the UK under 12m fleet, including through iVMS and CatchApp data

- Analyse areas of overlap between MMO important areas and FiSMaDiM outputs
- Break data down further than annually, to investigate seasonal patterns in fishery activity