



HM Government

East Inshore and East Offshore Marine Plans

Annex 1: Supporting information on the production of maps



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Contents

Chapter 1	Supporting information on the production of maps	3
	Introduction	3
	Figure 5: Broadscale habitats	3
	Figures 6a and 6b: Habitats and species of conservation importance and Figure 7: Species (of low or limited mobility) of conservation importance	5
	Figure 8: Habitats Directive, Annex 1 habitats	6
	Figure 10: Seabird foraging ranges	8
	Figure 16: Areas of identified tidal stream resource (TIDE1)	9
	Figure 17: Potential opportunity for carbon capture and storage (CCS1)	10
	Figure 18: Important navigation routes (PS2)	12
	Figure 19: Ports and shipping context	13
	Figure 21: Areas of high potential aggregate resource (AGG3)	14
	Figure 23: MMO fishing activity by E.U. (inc.UK) over 15m vessels (time spent in hours 2007-2010, mobile gears)	16
	Figure 24: MCZ Fisherman project combined gear fishing intensity	18

Figure 25: Total Fishing Effort 2011 (Fisheries Activity Database- all gears)	19
Figure 26: High intensity fish spawning and fish nursery grounds	21
Figure 27: Optimum sites of aquaculture potential (AQ1)	22

Chapter 1

Supporting information on the production of maps

Introduction

The information contained in this annex gives detailed explanation on the creation of a number of maps in the East Inshore and Offshore Marine Plans. The annex does not address every map in the plans. The maps addressed in this annex are those that required some level of explanation or additional analysis of data for the purposes of supporting marine planning.

Figure 5: Broadscale habitats

This figure shows a map of broadscale habitats derived from both modelled and survey based data. It incorporates the predictive habitat layer from UKSeaMap 2010, the Joint Nature Conservation Committee's revised habitat layer for the Marine Management Organisation's East plan areas and Mapping European Seabed Habitats survey data from April 2013. Each of these datasets are described below.

UKSeaMap 2010 predicts the presence and extent of European Nature Information System¹ classified habitats in United Kingdom marine waters by overlaying physical data layers in a model and translating these into European Nature Information System habitats descriptions. The physical layers used were: substrate, biological zones, (made up of bathymetry, light penetration and depth to wave base), kinetic energy (made up of tidal current and wave-generated kinetic energy), biogeographic zone (derived from bathymetry data) and salinity. These source layers were a combination of both surveyed and modelled information with varying confidence. In combining survey and modelled data it was assumed that:

- habitat maps derived from surveys that collected both remote sensing and ground truthing data should take priority over modelled data

¹ The European Nature Information System Habitat types classification is a comprehensive pan-European system to allow standardised descriptions and collection of data across Europe through the use of criteria for habitat identification; it covers all types of habitats from natural to artificial, from terrestrial to freshwater and marine (<http://eunis.eea.europa.eu/about.jsp>).

- where survey-derived maps had a confidence score of 60% or less, predictive data would be used
- in the intertidal area all survey data was used irrespective of confidence scores as the predictive habitat model does not extend to these locations

More information on the modelling processes involved in deriving the UKSeaMap 2010 can be found here: www.jncc.defra.gov.uk/ukseamap.

The revised habitat map was created by updating the substrate layer (a component of the model that defines broadscale habitats) in the UKSeaMap 2010 predictive habitat model. This provided a more accurate output in locations where improved substrate data was available. The full methodology of how the Joint Nature Conservation Committee's revised habitat layer for the Marine Management Organisation's East plan areas was created can be found in the marine Management Organisation report.²

The Mapping European Seabed Habitats project created a single Geographical Information System layer that combined all available broadscale habitat maps, an overview of the process can be found here: www.searchmesh.net/Default.aspx?page=1921.

The final dataset incorporating the three data sources described above was created by erasing areas covered by Mapping European Seabed Habitats surveys from both the UKSeaMap 2010 predictive habitat layer and the revised habitat map for the East plan areas datasets. The areas covered by the revised habitat map for the East plan areas were also erased from the UKSeaMap 2010 predictive habitat layer. This left the UKSeaMap 2010 dataset with gaps where the other two higher confidence datasets had coverage. The three data layers were then merged to produce a single dataset.

Please note the following limitations to this dataset:

Although this dataset is considered the best available broadscale habitat map, it is heavily based on modelled data. This has inherent inaccuracies and issues in both the confidence and the extent of the presence of particular habitats.

² Marine Management Organisation (2012). Compilation and confidence assessment of seabed habitat data. A report produced for the Marine Management Organisation, pp 18. Marine Management Organisation Project No: 1014. ISBN: 978-1-909452-05-3.

Figures 6a and 6b: Habitats and species of conservation importance and Figure 7: Species (of low or limited mobility) of conservation importance

Features of conservation importance are species and habitats that are particularly threatened, rare, or declining. These were principally identified from features listed under existing legislation and international conventions, such as the Wildlife and Countryside Act 1981, United Kingdom Biodiversity Action Plan, Convention on Biological Diversity, and the Oslo Paris Convention for the Protection of the Marine Environment of the North-East Atlantic. Data displayed on these maps highlight known features of conservation importance derived from the Department for Environment and Rural Affairs MB0102³ project which was commissioned to produce the data layers necessary for the recommendation of Marine Conservation Zones.

The MB0102 project includes both point and polygon data. Point data comes from samples collected for example through grab, quadrat, and photographic survey, whereas polygon data is derived from a combination of area-wide remote sensing, point samples, extrapolation and in some cases modelling methods. There are some instances where the same biotope (a description of a physical habitat with associated biological community) is mapped with both points and polygons due to different surveys collecting data using different techniques; for this reason point data may occur outside polygon data for the same biotope. The MB0102 data has been supplemented by additional evidence collected by the Net Gain regional Marine Conservation Zone project, for example the data on peat and clay exposures around Holme-next-the-Sea given to English Heritage by Norfolk Council.

Please note the following limitations to this dataset:

- data quality for any given point or polygon may differ due to the survey it came from
- confidence in the extent of Net Gain data showing peat and clay exposures around Holme-next-the-Sea is considered to be low due to the data collection period (2003) and the method used to digitise the original data provided. However, the occurrence of this habitat was verified by Net Gain through site visits, photographic evidence and surveys in 2011
- the MB0102 project data confidence assessment was based on the volume of data acquired and the information provided by experts and organisations. This yielded different confidence results for different species, ranging from low to high

Further information on the data collected for the Department for Environment and Rural Affairs MB0102 project and its associated confidence rating can be found in reports 2b and 2c (mapping protected habitats and non-mobile species):

<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16368>

³ Department for Food and Rural Affairs (2011), Marine Protected Areas - gathering/developing and accessing the data for the planning of a network of Marine Conservation Zones - MB0102.

<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16368>

Figure 8: Habitats Directive, Annex 1 habitats

The Marine Policy Statement states that marine planning should take into account obligations made under the European Commission Habitats Directive (92/43/EEC) which promotes the conservation of biodiversity. Habitats in particular need of protection are listed under Annex 1 of the Habitats Directive and are displayed in Figure 8 where data is available.

Annex 1 reefs:

The reef data displayed in Figure 8 has been mapped as a result of surveys undertaken by Natural England, Natural Resources Wales, Scottish Natural Heritage, the Joint Nature Conservation Committee, British Geological Survey and National Oceanography Centre. These surveys used a combination of remote sensing and ground truthing and/or were specifically designed to identify Annex I habitats. Areas mapped as potential reef are a result of surveys, but further work may be needed to delineate the precise boundaries of the habitat. This figure shows data from version seven of the dataset which was created in 2013.

Further information on Annex 1 reef can be found at <http://jncc.defra.gov.uk/page-1448#>

Annex 1 sandbanks:

Annex I sandbanks in United Kingdom waters have been delineated, where possible, using a combination of British Geological Survey Seabed Sediments (v3) and bathymetry, slope and aspect from multibeam data where available, otherwise the 2012 Department for Environment, Food and Rural Affairs/Astrium Digital Elevation Model. The Interpretation Manual of European Union Habitats - EUR25⁴ includes the following in its definition of sandbanks:

- permanently submerged;
- top of bank is generally in <20m of water depth;
- composed mainly of sandy sediment;
- may be non-vegetated or vegetated with *Zostera marina* (sea grass) and/or free living species of the Corallinaceae family (maerl).

The Interpretation Manual of European Union Habitats EUR27 subsequently added that the bank must be: “an independent elevation from the seabed, predominantly surrounded by deeper water”.

For a full methodology please refer to UK_Sandbanks_Method which can be accessed here

⁴ European Commission (2007), Interpretation Manual of European Union Habitats, EUR 27.
http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf

http://jncc.defra.gov.uk/plugins/MPSMapper/Downloads/C20121212_Annex1Sandbanks.zip

Please note the following limitations to this dataset:

- there are 13 marine Annex 1 habitats present in United Kingdom waters yet only two of these are shown here due to data availability;
- there is ongoing work by the Joint Nature Conservation Committee and Natural England to further develop these datasets (including a specific project to more precisely delineate the boundaries of Annex 1 sandbanks).

Figure 10: Seabird foraging ranges

This figure shows interpreted foraging areas for both summer and winter seasons for a range of seabirds. The data are taken from the Natural England “seabird sensitivity mapping for English territorial waters” project which is due to be published at the end of March 2014. This report will contain in-depth descriptions of the datasets and analysis methods used to create the dataset.

The dataset combines input values from the Wildlife and Wetlands Trust and the European Seabirds at Sea databases. These two datasets are described below.

The Joint Nature Conservation Committee’s European Seabirds at Sea database includes surveyed track lines from European Seabirds at Sea boat surveys from 1979 to 2011 extracted to show sightings in English Waters only. Additional data has also been added from The Crown Estate's data catalogue which includes publically available bird survey data to support offshore wind farm environmental assessments.

Aerial survey data from the Wildlife and Wetlands Trust, recorded between 2001 and 2011 has also been included in this study.

Summer months are determined to be April to September (inclusive) with remaining months classed as wintering with both periods shown in figure 10. All species that were observed in English waters from each of the two studies were included as part of the analysis. A full list of these is included in the report.

The two datasets described above were combined and densities calculated using density surface modelling using a 3km by 3km grid creating the outputs that are presented in figure 10. For confidence purposes, data was only extracted on a species by species basis where the coefficients of variance were less than 0.3.

Please note the following limitations to this dataset:

High intensity aerial surveys provided good estimates of inshore species around small coastal features but estimates are less reliable further offshore away from the surveyed areas. By contrast the generally wider spaced transects of the boat surveys enabled more confident predictions to be made across larger areas, though any finer scale patterns may have remained undetected.

It is known that some of the European Seabirds at Sea data are decades old and spatial and temporal coverage between the datasets, though good in some areas, is poor in others. This has led to areas of poorer quality predictions.

Figure 16: Areas of identified tidal stream resource (TIDE1)

The data displayed in figure 16 sets out areas of identified tidal stream resource that could be harnessed in the future for power generation. The areas have been identified using the same parameters that defined The Crown Estate's Wave and Tidal Key Resource Areas⁵ work.

The marine Management Organisation used Seazone bathymetry data filtered to sites of 5m depth and over, and the Atlas of United Kingdom Renewable Energy Resource⁶ with mean spring peak current filtered to over 1.5m/s.

Please note the following limitations to this dataset:

The results of The Crown Estate study are theoretical estimates of the wave and tidal energy resources available in broad geographic areas around the United Kingdom. The thresholds used to define areas are based on industry estimates.

It is important to understand that the study did not take into account existing sea uses, sensitivities or environmental factors which are likely to constrain deployments to smaller areas of seabed in practice. This is not because such factors are unimportant, but since at the industry's present stage of development, it is difficult to quantify these constraints.

More information on limitations and thresholds are available through The Crown Estate website: <http://www.thecrownestate.co.uk/energy-infrastructure/wave-and-tidal/>.

⁵ The Crown Estate (2012). United Kingdom Wave and Tidal Key Resource Areas Project. Available online at: <http://www.thecrownestate.co.uk/media/355255/uk-wave-and-tidal-key-resource-areas-project.pdf>

⁶ ABPmer (2008). Atlas of United Kingdom Marine Renewable Energy Resources. Available online at: <http://www.renewables-atlas.info/> [date of access 15/01/2010]

Figure 17: Potential opportunity for carbon capture and storage (CCS1)

The areas identified in figure 17 for having potential for carbon capture and storage are derived from two different sources:

- active and inactive oil and gas fields (taken from United Kingdom Deal's 'hydrocarbon field' dataset)⁷. Data on the location of oil and gas fields was used to extract the location of those fields where production was still ongoing but also where production had ceased (these areas are of particular interest due to the presence of existing oil and gas infrastructure). The East marine plan areas represent the greatest opportunity for carbon capture and storage development in the English marine area due in part to the high concentration of existing oil and gas infrastructure. Storage is also possible within some active oil and gas fields as part of enhanced hydrocarbon recovery. This would involve the introduction of carbon dioxide to an aquifer, displacing the hydrocarbons, allowing their recovery under pressure
- saline aquifers as defined by the British Geological Survey⁸ as potential geological storage sites in which large quantities of carbon dioxide could be isolated from the atmosphere to prevent them acting as a greenhouse gas

It should be noted that none of the sites featured in figure 17 are currently being used for carbon capture and storage and that their inclusion is intended to be indicative of potential areas where carbon capture and storage may develop. For more information on this study the full report can be accessed at the following link: <http://nora.nerc.ac.uk/4837/1/CR06185N.pdf>

Please note the following limitations to this dataset:

Whilst saline aquifers represent significant potential for trapping buoyant fluids such as carbon dioxide, there are a number of possible limitations to using them in this way:

- there are potential permeability barriers within the formation in various parts of the Southern North Sea Basin such as faults (which may act as intra-reservoir seals) which are clearly imaged on seismic surveys
- it is difficult to demonstrate that firstly the saline aquifer will not leak and secondly that significant masses of carbon dioxide can be injected into them. Although the Bunter Sandstone is, in regional terms, sealed by the overlying Haisborough Group mudstones and halites, there are crestal faults on many of the domes and it is uncertain whether, or at what pore fluid pressure, these might leak
- the integrity and injectivity of individual structures cannot be estimated from the data available for the British Geological Survey study. If three-

⁷ Department of Energy and Climate Change website, accessed 13/02/2014. <https://www.gov.uk/oil-and-gas-offshore-maps-and-gis-shapefiles>.

⁸ British Geological Survey (2008), Industrial carbon dioxide emissions and carbon dioxide storage potential in the United Kingdom, Commercial Report CR/06/185N. <http://nora.nerc.ac.uk/4837/1/CR06185N.pdf>

dimensional seismic data was available and licensed, and well test data was available, it could provide a much more detailed view of the potential of an individual structure but it still would not be able to provide any guarantees about either injectivity or integrity. This could only be proved or disproved by field injection tests.

Figure 18: Important navigation routes (PS2)

The data to support PS2 was based on interpretation of the Marine Management Organisation's shipping density data.⁹ This interpretation aimed to identify corridors of shipping activity where more than 1000 ships per year transit, and was completed by Geographic Information System processing and manual data interpretation by Anatec using their ShipRoutes database. Once these routes have had been identified, the 90% of the lane width was determined to provide the extent of the important navigation route. This is the same method as described by [MGN 371](#). The policy layer was then created by removing space allocated to harbour authority administrative areas (who have jurisdiction over these areas), International Maritime Organization routes (which are addressed separately through policy PS1) and Round 3 wind farm zones (who are considering and accounting for navigation corridors through their Zone Appraisal and Planning processes).

The Marine Management Organisation's shipping density data was computed using Anatec's Ship Routes database represented over a 0.5km by 0.5km grid. The data includes the estimated number of ships passing through the cell per year and the breakdown of shipping by ship type (cargo, tanker, ferry and offshore).

Please note the following limitations to this dataset:

The data is modelled in part from logging Automatic Identification System data which is based on Very High Frequency signals that contain information on the location and vessel type. Very High Frequency signals are limited by line of sight range due to the curvature of the earth which means this data is limited to being collected within 30 nautical miles of any receiver. Anatec have receivers collecting data along the coast as well as on oil and gas platforms meaning areas outside the coverage of these receivers will be under-represented in the dataset.

The other source of information that Anatec use to build this model is estimation using known ship routing frequencies which Anatec collect in their 'Ship Routes' database. The data inshore and around oil and gas infrastructure (where Anatec have Automatic Identification System receivers logging traffic) will be far more reliable than offshore locations which will be purely estimates based on common ship routing. When calculating ship density, the movements of 'non-routine traffic' such as fishing vessels, military vessels, tugs, dredgers and recreational craft are excluded.

⁹ Marine Management Organisation (2013), Anatec - 90th Percentile Shipping Density , URI 1600043. <http://www.marinemanagement.org.uk/evidence/documents/mdr.pdf>

Figure 19: Ports and shipping context

Figure 19 is an indicative map to supply supporting information for policies PS1, PS2 and PS3. Layers that have been included are:

- Navigational approaches
- Harbour administrative areas
- Round 3 areas of search (zones)
- Identified scheduled services
- Indicative shipping activity (90th percentile from the centre line in areas of over 1000 transits per year)

Identified scheduled services were defined by interpreting shipping traffic coming out of the Humber and heading to European ports. The information on scheduled services was supplied by the Association of British Ports and consisted of destination ports and crossing frequency.

The indicative shipping density data¹⁰ on this map is the full dataset without the areas that are covered by harbour authority administrative areas, International Maritime Organization routes and Round 3 wind farm zones erased, as in the analysis undertaken for Figure 18.

¹⁰ Marine Management Organisation (2013), Anatec - 90th Percentile Shipping Density , URI 1600043. <http://www.marinemangement.org.uk/evidence/documents/mdr.pdf>

Figure 21: Areas of high potential aggregate resource (AGG3)

The data displayed on figure 21 represents key outputs from the British Geological Survey [Report](#), depicting mineral resources of current or potential future economic interest in the East marine plan areas. The data displayed on the map was created by combining the two following project outputs:

- the geological distribution of all offshore aggregate minerals: this data highlights the presence of coarse sand and gravel considered to be of national importance, suitable for construction or beach nourishment. This layer was created using data held by the BGS, augmented by data collected from Regional Environment Characterisation Reports¹¹ funded by the Marine Aggregate Levy Sustainability Fund. Three Regional Environmental Characterisation studies have been undertaken in the East Inshore and East Offshore Plan Areas - The Humber, The East Coast, and the Outer Thames Estuary. Geophysical data, grab samples and bathymetric data collected and processed as part of the Regional Environmental Characterisation studies was incorporated into the dataset used to interpret the distribution of sand and gravel resources;
- prospective areas for coarse sand and gravel in the Humber, East Anglia region and the Outer Thames Estuary: these are prospective areas for construction aggregates, where the geographical and depositional setting indicates that geological features and associated deposits are likely to be present, but where there was no data available to confirm this.

The Round 3 wind farm zones were then removed from the resulting area, as it was identified through the marine planning options process that aggregate extraction would need to take place outside of Round 3 zones.

Please note the following limitations to this dataset

The purpose of the map is to show the defined areas of high potential aggregate resource to which policy AGG3 applies. It highlights areas within which potentially workable minerals may occur. These areas are not of uniform or equal potential and also take no account of planning constraints that may limit their working. The economic potential of individual sites can only be proved by a detailed evaluation programme (which is an essential precursor to the submission of a planning application for mineral extraction).

With reference to the marine aggregates map, extensive areas are shown as having no mineral resource potential; however some aggregate dredging does occur in these areas. The presence of these operations generally reflects local or specific situations that are not resolved by the resolution of data that is available for compilation of this regional-scale map and require site-specific investigation to identify. This can result in marine mineral licences covering areas where no resource is shown. It is possible that local variations in geology that are too subtle to be

¹¹ Marine Aggregate Levy Sustainability Fund, website accessed 13/02/2014, Marine Aggregate Levy Sustainability Fund Geographic Information System. <http://www.marinealsf.org.uk/data/>

resolved by this regional-scale survey can contain substantial volumes of resource and could prove to be significant future resources.

Please see the following link for the full project report:

<http://www.thecrownestate.co.uk/media/340963/BGS%20east%20coast%20report.pdf>

Figure 23: MMO fishing activity by E.U. (inc.UK) over 15m vessels (time spent in hours 2007-2010, mobile gears)

The Marine Management Organisation vessel monitoring system data was processed to show 15-metre and over vessel fishing activity, or those vessels deemed to be fishing (for example, as opposed to steaming) from 2007 to 2010, by extracting the data for vessels travelling between 0 and 6 knots. Data displayed shows the time spent fishing (in hours) for 15-metre and over vessels using mobile gears only, and was created by summing the fishing activity for United Kingdom and non-United Kingdom vessels (Belgium, Denmark, Netherlands, France, Germany, Ireland, Spain and Sweden). Areas exhibiting zero minutes fished were removed from the dataset. For the purposes of the data displayed, mobile gears¹² were combined. Since static gear fishers by the very nature of their activity are not generally considered to travel at a speed of 1 – 6 knots, (possible steaming to grounds excepted), the Marine Management Organisation considered the vessel monitoring system data to be unhelpful in determining European Union static gear fishing activity.

The Marine Management Organisation United Kingdom fishing activity data is distributed in the shape of a J-curve and has been manually classified by the Marine Management Organisation for ease of viewing. A standard classification was used whereby the maximum value of the data was taken and then divided by two to create two points representing the top class. The data was then successively divided by 2 until the smallest value in the data was reached. Each time the data was divided, a new class was created. As the data was showed in 'minutes fished' the remaining values were then divided by 60 to give 'hours fished.' This classification method ensures that each class range has approximately the same number of values with each class and that the change between intervals is fairly consistent.

Please note the following limitations to this dataset:

- the dataset only covers activity by 15-metre and over vessels – there are significant elements of fishing activity that are not covered (particularly near the coast where smaller boats are more prevalent);
- since this dataset includes information on value and weight of fish caught by the United Kingdom fleet, it has been necessary for the data to match up with satellite position reports (from the vessel monitoring system signal) and reported activity from landings records (to include data on weight and value within particular International Council for the Exploration of the Sea rectangles). However there are a number of instances where this matching is not exact, affecting the accuracy of the data. For example, only approximately 50% of the satellite position reports which are estimated as representing fishing activity can be matched to dates where fishing activity was reported within that particular International Council for the Exploration of

¹² Mobile gears are: beam trawls, beach seines, Danish seines, pair seines, Scottish seines, seine nets, boat dredges, hand dredges, mechanised dredges, pumps, otter trawls, otter trawls – bottom, otter trawls – midwater, otter twin trawls, pair trawling, pair trawls – bottom, pair trawls – midwater, bottom trawls nets, nephrops trawls, shrimp trawls – bottom, midwater trawls, shrimp trawls – midwater, other trawls not specified, purse lines, purse seine – one boat, purse seine – two boats and miscellaneous gear.

the Sea rectangle. The following table illustrates firstly the estimated percentage of 15-metre and over fishing activity that supplies both the satellite data and the landings data, and secondly the estimated percentage of 15-metre and over fishing activity where an exact match was able to be made between the activity and satellite data.

Year	Percentage of activity that supplies both activity and satellite data for United Kingdom fleet	Percentage of exact match between satellite and activity data for United Kingdom fleet
2007	84	61
2008	84	58
2009	86	66
2010	86	65
2007-2010	85	62

Table 1.1: Percentage of activity that supplies both activity and satellite data and exact match between satellite and activity data for United Kingdom fleet

Problems in matching satellite and activity data arise for a variety of reasons. There can be errors in the reporting of activity data (historically reported in paper logbooks) and for satellite data, the 1 – 6 knot speed range used to determine whether a position report relates to fishing activity or not are applied generically. In reality, differences may occur across vessels and gear type.

Figure 24: MCZ Fishermap project combined gear fishing intensity

During the planning process, the Marine Management Organisation received feedback from a number of stakeholders with regard to the limitations of the inshore fishing data displayed in the draft Evidence and Issues report, as a number of stakeholders were unable to identify their specific fishing activity. In response to this, the Marine Management Organisation acquired the Fishermap survey data (collected by the regional Marine Conservation Zone projects) for use in marine planning.

The objective of the Fishermap project was to collect information on the activities of commercial fishermen using under 15-metre vessels between the years 2003 to 2010. In total, the research collected data across the four regional Marine Conservation Zone projects on 260 vessels using bottom gear, 161 dredgers, 22 pelagic trawlers and seiners, 253 hook and line fishermen, 509 netters and 559 fishermen using pots and traps. In the East marine plan areas no vessels with pelagic mobile gear were recorded. This data was then amalgamated and summed onto a sampling grid with each grid cell having the dimensions of 1/160 degree latitude by 1/80 degree longitude.

The combined dataset was created using the following method: each of six gear types (pots and traps, nets, mobile pelagic gear, hook and line, dredging gear and mobile demersal gear) were standardised to the same scale 0 -1. The layers were then combined together adding the scores for each gear type in the same grid cell. The final score for each grid cell represents the % of participants undertaking their activity (in a particular grid cell), averaged across the six gear types. The data has been displayed using Jenks Natural Breaks statistical classification method.

Please note the following limitations to this dataset:

In the East marine plan areas, the Net Gain regional Marine Conservation Zone project sampled approximately 50% of the total fleet within this region; however a significant number of skippers requested that their data not be shared with third parties. When this occurred their results have not been displayed unless the total number of vessels within a sampling unit exceeds four (as this level of aggregate prevents the identification of individual activity). The omission of these records does not cause the relative distribution of fishing effort to be altered; however, it does reduce the total extent of fishing activity that is being represented.

Figure 25: Total Fishing Effort 2011 (Fisheries Activity Database- all gears)

This dataset displays commercial fishing effort for United Kingdom registered vessels, in Kilowatt days (i.e. engine power multiplied by days at sea) to International Council for the Exploration of the Sea statistical rectangle level. The data was calculated using data collected and processed by officials of the various Fisheries Administrations in the United Kingdom, namely the Marine Management Organisation, Marine Scotland, Northern Irish Department of Agriculture and Rural Development (DARD), Welsh Assembly Governments (WAG) and Departments in Jersey, Guernsey and the Isle of Man. The main legislation used to collect these data is:

- 1). The European Union fisheries legislation on keeping and submitting logbooks and providing landing declarations and sales notes, primarily Council Regulation (EC) No. 1224/2009 (the Control Regulation);
- 2). General powers under the [Sea Fisheries \(Conservation\) Act 1967](#) under which Ministers granting a licence can require the master, owner or charterer of the vessel named in the licence to provide them with such statistical information as they may direct.

The method of data collection depends on the length of the vessel. Data collection for over 10-metre vessels comes primarily from the fishing logbook, but also from landing declarations and sales notes. The fishing logbook captures data on fishing activity by individual vessels by trip and for each day of activity within a trip. This includes details of the catch, by species, in terms of the presentation and quantity of fish retained on board. Information is also collected on the gear used and the International Council for the Exploration of the Sea division, rectangle and zone for the activity. Supply of logbook data is mandated by legislation for all over 10-metre vessels in respect of catches of all species. Logbook data for United Kingdom vessels must be submitted within 48 hours of landing to United Kingdom authorities; this includes landings into foreign ports. Landing declarations provide information on the weight and presentation of fish landed by species.

For under 10-metre vessels, there is no statutory requirement under either European Union or national legislation for fishermen to declare their catches. Historically, information for this sector has been collected with the co-operation of the industry: it comprised log sheets and landing declarations voluntarily supplied by fishermen as well as sales notes and assessments of landings collected from market sources and by correspondents located in the ports. Collection of this data has now been replaced after the introduction in September 2005 of a scheme of registration for buyers and sellers of first sale fish (see above). Sales notes are now used in addition to the voluntary information from fishermen. During 2005 and 2006, United Kingdom Fisheries Administrations introduced a system of restrictive licensing for activity targeted at shellfish. As part of this system, new reporting requirements were introduced involving a requirement for under 10-metre vessels to complete diaries of their daily activity which needed to be submitted on a monthly basis. Summary information from these diaries is now in use in Northern Ireland but was discontinued in the rest of the United Kingdom at the end of February 2009.

Please note the following limitations to this dataset:

Data collected for over 10-metre vessels aims to achieve full coverage of activity. For the under 10-metre vessels, landings are only reported where the fish are sold or data have been provided voluntarily, leading to reduced coverage. The reliability of the data collected is dependent on the information provided by fishermen. Despite legal obligations for fishermen to declare their catches, a proportion of fishing activity remains unreported.

Figure 26: High intensity fish spawning and fish nursery grounds

The data displayed on Figure 26 has been derived from the Department for the Environment and Rural Affairs MB5301 project 'Mapping spawning and nursery areas of species to be considered in Marine Protected Areas',¹³ which builds on a study by Coull, et al.¹⁴ The purpose of the project was to determine important spawning areas for fish species by assessing the presence of eggs and larvae in ichthyoplankton surveys and to determine important nursery areas for fish species by assessing the presence of juvenile fish in trawl surveys.

Please note the following limitations to this dataset:

Data is displayed in International Council for the Exploration of the Sea half rectangles, as displaying in higher resolution polygons was deemed to be inaccurate due to the subtle shifts in species using these grounds.

¹³ Department for Environment, Food and Rural Affairs (2010), Mapping spawning and nursery areas of species to be considered in Marine Protected Areas (Marine Conservation Zones), MB5301. http://randd.defra.gov.uk/Document.aspx?Document=MB5301_9578_FRP.pdf

¹⁴ United Kingdom Offshore Operators Association Ltd (1998) (now Oil and Gas United Kingdom), Fisheries Sensitivity Maps in British Waters, Coull, K.A., Johnstone, R., and S.I. Rogers. http://www.cefas.co.uk/media/29947/sensi_maps.pdf

Figure 27: Optimum sites of aquaculture potential (AQ1)

The data shown in figure 27 identifies where policy AQ1 applies within the East Marine plan areas. The dataset presents the output of modelling to determine favourable locations for: macroalgae culture, bivalve bottom culture, finfish cage, lobster restocking, rope-cultured bivalve shellfish or trestle/bag culture of bivalves.

The data is derived from [MMO1040](#)¹⁵ which contains information on the spatial trends of aquaculture potential in the South and East Inshore and Offshore marine plan areas.

In order to measure the sustainability of the natural resource which is needed to accommodate different aquaculture types a spatial model was created. This model was used to assist in site selections, and by doing so also provided outputs on the different natural and anthropogenic limitations on aquaculture developments.

MMO1040 collated datasets to derive areas as well as a modelling methodology. The environmental datasets that fed into the model were: bathymetry, (derived from the Department for Environment, Food and Rural Affairs Digital Elevation Model), predicted seabed sediments and combined seabed energy, (both from UKSeaMap 2010 (McBreen, et al., 2010)).

Please note the following limitations to this dataset:

- the model does not contain any measure of water quality (eg dissolved oxygen, sediment loading or contaminants) and therefore is likely to overestimate the area deemed suitable for aquaculture developments (particularly finfish cage culture, rope-grown bivalve culture and macroalgae culture);
- the UKSeaMap 2010 predicted seabed sediment map (McBreen, et al., 2010) is modelled at a coarse scale which has led to inaccuracies in the identification of areas which have potential for aquaculture development;
- the UKSeaMap 2010 combined seabed energy map included in the model (McBreen, et al., 2010) provides an approximation of the environmental conditions that are likely to limit aquaculture development (eg strong currents and large waves);
- UKSeaMap 2010 is known to under-estimate rock habitats because of the type of sampling data (sediment grabs) used to underpin the model. The Marine Management Organisation is working with the Joint Nature Conservation Committee to develop these data to lead to improvements in future models.

More accurate results could be obtained by using more precise component datasets (such as the maximum wave height and tidal current range, which would feed into the

¹⁵ Marine Management Organisation (2013), Spatial trends in aquaculture potential in the South and East Inshore and Offshore Marine Plan Areas (MMO 1040), Available online at: <http://www.marinemanagement.org.uk/evidence/1040.htm>

combined seabed energy input dataset) and if more detail on the technical constraints of aquaculture activities was available. The dataset shows potential based on current technologies as defined in Table 10 of the MMO1040 Aquaculture Potential Final Report.