

# Appendix 1H: Other Users

## A1h.1 Introduction

The coasts and seas of the UK are intensively used for numerous activities of local, regional and national importance including coastally located power generators and process industries, port operations, shipping, oil and gas production, fishing, aggregate extraction, military practice, as a location for submarine cables and pipelines and for sailing, racing and other recreation. At a local scale, activities as diverse as saltmarsh, dune or machair grazing, seaweed harvesting or bait collection may be important.

These activities necessarily interact at the coast and offshore and spatial conflicts can potentially arise. A key consideration of this SEA is the potential for plan elements to interact with other users and material assets, the nature and location of which are described below.

## A1h.2 Ports and shipping

### A1h.2.1 Commercial ports

UK ports are located around the coast, with their origin based on historic considerations including, principally, advantageous geography (major and other ports are indicated in Figure A1h.1 below). In 2014 some 503.2 million tonnes (Mt) of freight traffic was handled by UK ports, which is comparable to that handled in the previous year. 98% of this traffic was handled by major ports (Inwards traffic at 318.1Mt and outwards traffic of 173.8Mt) which have shown a 35% increase in traffic since 1980. The 2008 recession had an accompanying 11% downturn in movements from a peak of 584.5Mt in 2005.

Grimsby and Immingham is the UK's busiest port, handling 12% of the UK's traffic (equal to 59.4Mt) in 2014. Other major ports in Regional Sea 2 include London, Felixstowe and Dover, handling approximately 44.5, 28.1 and 27.6Mt respectively (DfT 2014). In Regional Sea 1, the largest ports are Tees and Hartlepool (39.5Mt) and the Forth (24.6Mt), while in Regional Sea 8 the largest ports are Orkney and Sullom Voe, which handle a significant amount of crude oil, some 0.9Mt and 7.18Mt respectively in 2014. Southampton on the south coast is the largest port within Regional Sea 3, handling 36.7Mt, and within Regional Sea 4 Milford Haven handled the most traffic at 34.3Mt.

Regional Sea 6 includes the major ports in Northern Ireland: Belfast, which handled 16.8Mt and Larne at 2.4Mt. It also includes the major ports on the west coast of Britain, the largest of these being Liverpool (31Mt) and the Clyde (16.2Mt). There are few large ports in Regional Sea 7, with Glensanda being the largest. Glensanda only has export traffic almost entirely consisting of granite, amounting to 6.3Mt in 2014.

The cargo from UK main ports in 2014 was the largest cargo type at 187.8Mt. The main components of this cargo are crude oil (89.5Mt) and oil products (74.5Mt). Dry bulk cargoes totalled 122Mt, consisting primarily of coal (44.7Mt), ores (20.8Mt), agricultural (14.1Mt) and other (42.4Mt) products.

The main origins of UK cargo in 2014 were Norway (22.5Mt), France (17.8Mt), USA (13.3Mt), Russia (12.4Mt) and the Netherlands (11.4Mt), with destinations dominated by the Netherlands (16.9Mt) and France (12.2Mt).

### A1h.2.2 Commercial shipping and ferry operations

As indicated above, the shipping industry continues to be the dominant carrier of goods to and from the UK, making up approximately 95% of imports and exports to the country by tonnage (DfT 2014). It is estimated that the maritime services sector which would include port and shipping related activity employed approximately 239,200 people in 2013, or 0.7% of total UK employment (Oxford Economics 2015). In terms of regional variation, this sector is particularly important in Scotland (2.6% of GDP), Northern Ireland (2%) and North East England (2%).

The North Sea (Regional Seas 1 & 2) contains some of the world's busiest shipping routes, with significant traffic generated by vessels trading between ports at either side of the North Sea and the Baltic (Figure A1h.2). North Sea oil and gas fields generate moderate vessel traffic in the form of support vessels, principally operating from Peterhead, Aberdeen, Montrose and Dundee in the north and Great Yarmouth and Lowestoft in the south (UKHO 2013), which in turn results in busy port approaches at these locations. Oil related operations to the west of Shetland bring regular traffic into Regional Sea 8.

Similarly, there is traffic associated with the gas fields of the eastern Irish Sea with supply trips operating out of ports including Liverpool, Barrow and Heysham. Within Regional Seas 6 and 7, major routes pass on either side of the Outer Hebrides and in the south, the North Channel has moderate traffic bound for the Firth of Clyde and Irish Sea. There is moderate traffic in a north-south direction through the Irish Sea between lanes which link England and Scotland with the Isle of Man, Northern Ireland and the Irish Republic. The Bristol Channel and Liverpool Bay areas are a moderate source of traffic in Regional Sea 4 and 6 as these areas contain several large ports.

Some of the highest traffic densities are located in routes from the Humber, south to the Thames Estuary (Regional Sea 1), Strait of Dover and English Channel (Regional Sea 3). The density of shipping in the Strait of Dover and eastern English Channel is also exemplified by International Maritime Organisation (IMO) routeing in this area in the form of an extensive traffic separation scheme. Under the terms of Chapter V of the Safety of Life at Sea (SOLAS) Convention, the IMO is the only organisation which establishes such measures, which are put in place to aid navigation of certain ships or ships with certain cargoes and include traffic separation schemes (e.g. Dover Strait), areas to be avoided (e.g. around Orkney and Shetland), deep water routes which are areas surveyed for obstacles (e.g. west of the Outer Hebrides). All UK routeing measures are shown on Figure A1h.2.

In relation to shipping routes and navigational safety, the Maritime and Coastguard Agency (MCA) note MGN 371 (replaces MGN 275) provides guidance on UK navigational practice, safety and emergency response issues with regard to Offshore Renewable Energy Installations (OREIs). The note makes a number of recommendations around the themes: considerations on site position, structures and safety zones; and navigation, collision avoidance and communications. A template for assessing the best distance between wind farm boundaries and shipping lanes is also provided, and attention is drawn to the BERR (2007) guidance on applying for safety zones around offshore renewable energy installations (now replaced by DECC 2011). The MCA guidance indicates a number of scenarios with difference spacing of wind farms from shipping lanes, indicating the relative tolerability of wind farm distances from lanes. The minimum distance at which risks to shipping would be very low is recommended to be a distance greater than 5nm. A number of recommendations are also provided in relation to search and rescue operations, counter pollution or salvage incidents which should be borne in

mind during turbine design (e.g. turbines should have illuminated unique identification numbers visible in normal lighting and all tidal conditions, structures should be illuminated for aviation purposes and have high contrast markings, there should be control mechanisms so the OREI can be fixed). In addition to MGN 371 content, stakeholder engagement raised several additional points to consider regarding wind farm site design:

- Search and Rescue operations are easier where turbine spacing is wider
- It can be easy to become disorientated when navigating within wind farms turbine arrangement in a regular, square grid pattern assists orientation
- Wind farms consisting of a square/rectangular block of turbines are potentially considered safer from a navigational perspective; depending on the location, odd shapes and single turbines pose a greater navigational risk
- Construction phase activities must include appropriate lighting and in some cases safety zones

The availability of ship Automatic Identification System (AIS) data has been variously used to plot shipping routes around the UK (DECC 2009, MMO 2013b, MMO 2014c). Ship AIS uses Very High Frequency (VHF) transmitters which broadcast a signal at regular intervals providing vessel information which includes: location, identification number, destination, speed and bearing and a timestamp for the message. The information collected by the system is limited by range which may vary between 20nm and 350nm depending on the strength of the transmitter, atmospheric and sea state conditions, and visibility/height of receivers – an average range of 40nm may be expected (MMO 2014). Two classes of AIS data are collected: AIS-A and AIS-B. These are used on larger vessels (>300 gross tonnes on international voyages and all cargo ships of >500 gross) and all passenger ships, and the fishing and recreational sailing sectors respectively. AIS data has provided a useful means of creating density grids of UK vessel traffic (MMO 2013b, 2014c), however it has a number of limitations:

- AIS data may contain errors or contain limited route information where transmissions from individual vessels are infrequent
- Not all vessels carry the AIS system or operate it in a continuous manner
- The range of the AIS system can be limited under a number of conditions. The AIS-B system has limited power compared to AIS-A to prevent overloading system bandwidth, therefore its range will generally be less than that of AIS-A and perhaps as low as 10nm.

MMO (2014c) identify a number of potential future improvements to the AIS system and data processing which would the interpretation of the nature of vessel movements around the UK coast (e.g. an annual/quarterly report of changes in vessel movement, higher frequency/continuous assessment of yearly AIS data, combine with satellite AIS to improve coverage, quantification of the proportion of vessels not identified using AIS, use of data to provide vessel dwell time, identification of specific traffic types (e.g. oil and gas support, renewables, construction traffic), comparison of VMS and AIS-B data). The AIS density grid shown in Figure A1h.3 (after MMO (2014c)) has a 2km grid resolution and is derived from 42 days of raw AIS-A and AIS-B data. The 42 days are made up of the first 7 days of every second month in the year.

Figure A1h.1: Major UK ports and relative tonnage of cargo handled, 2014

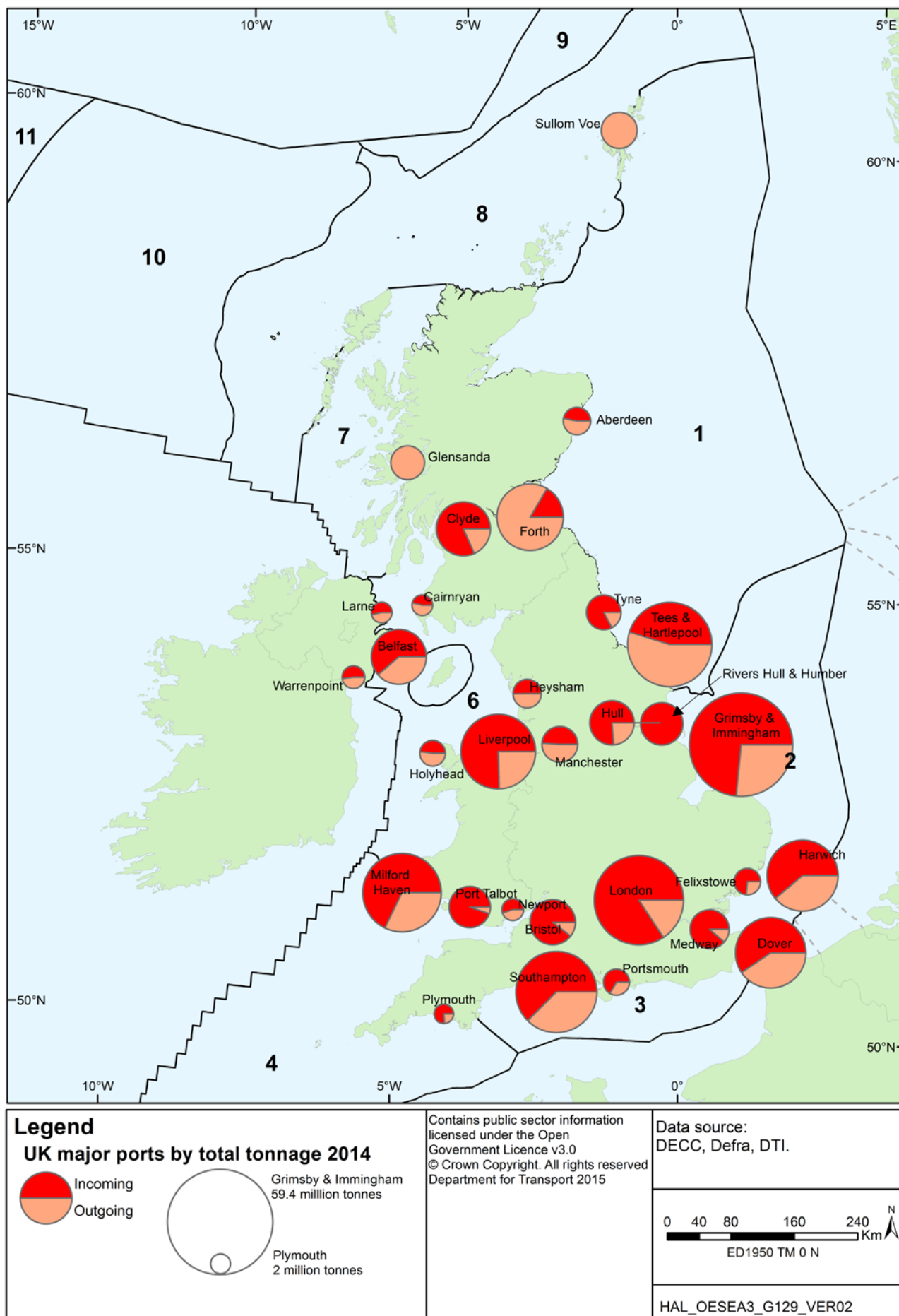


Figure A1h.2: UKCS shipping density by UKCS block and IMO routing measures

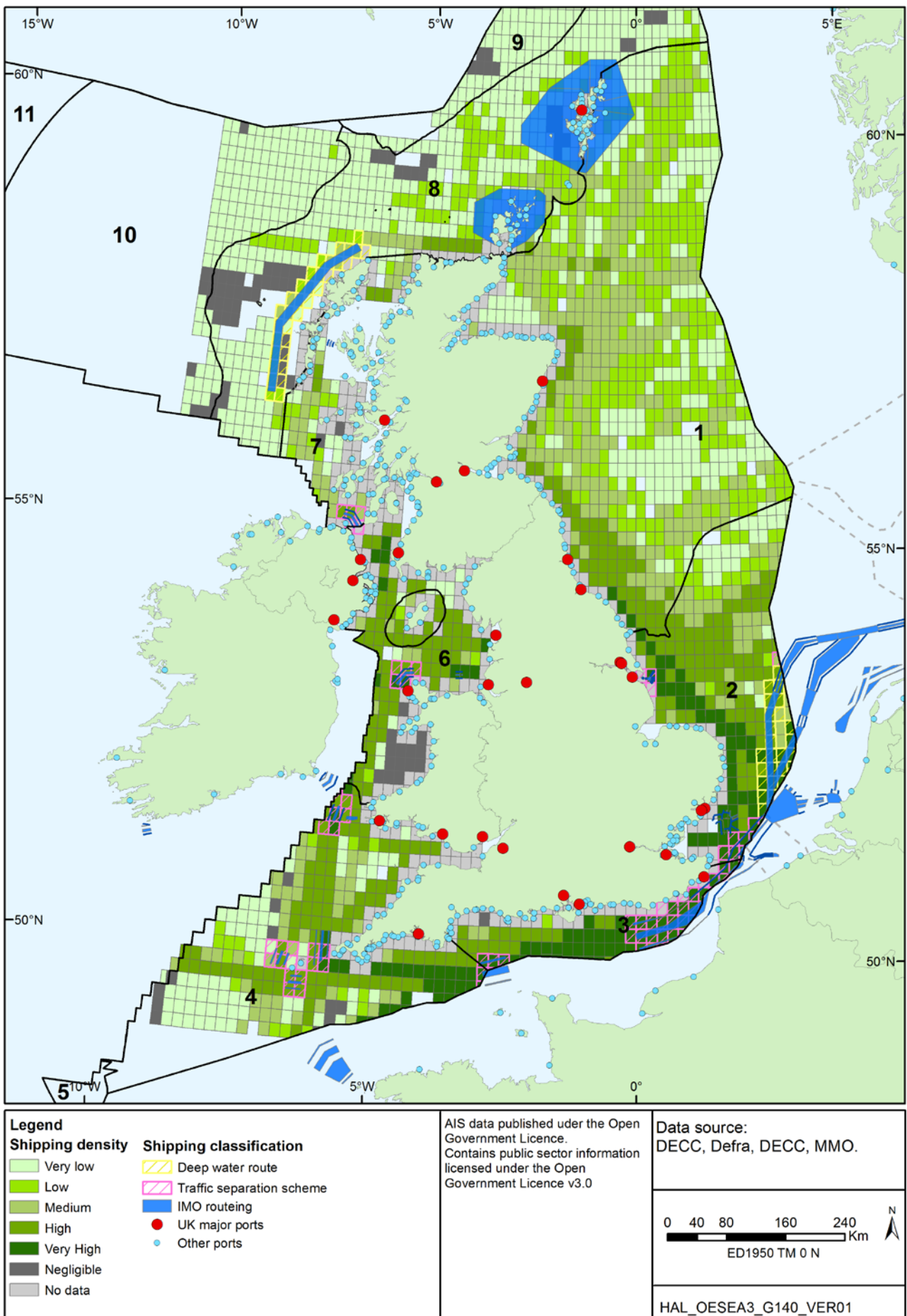
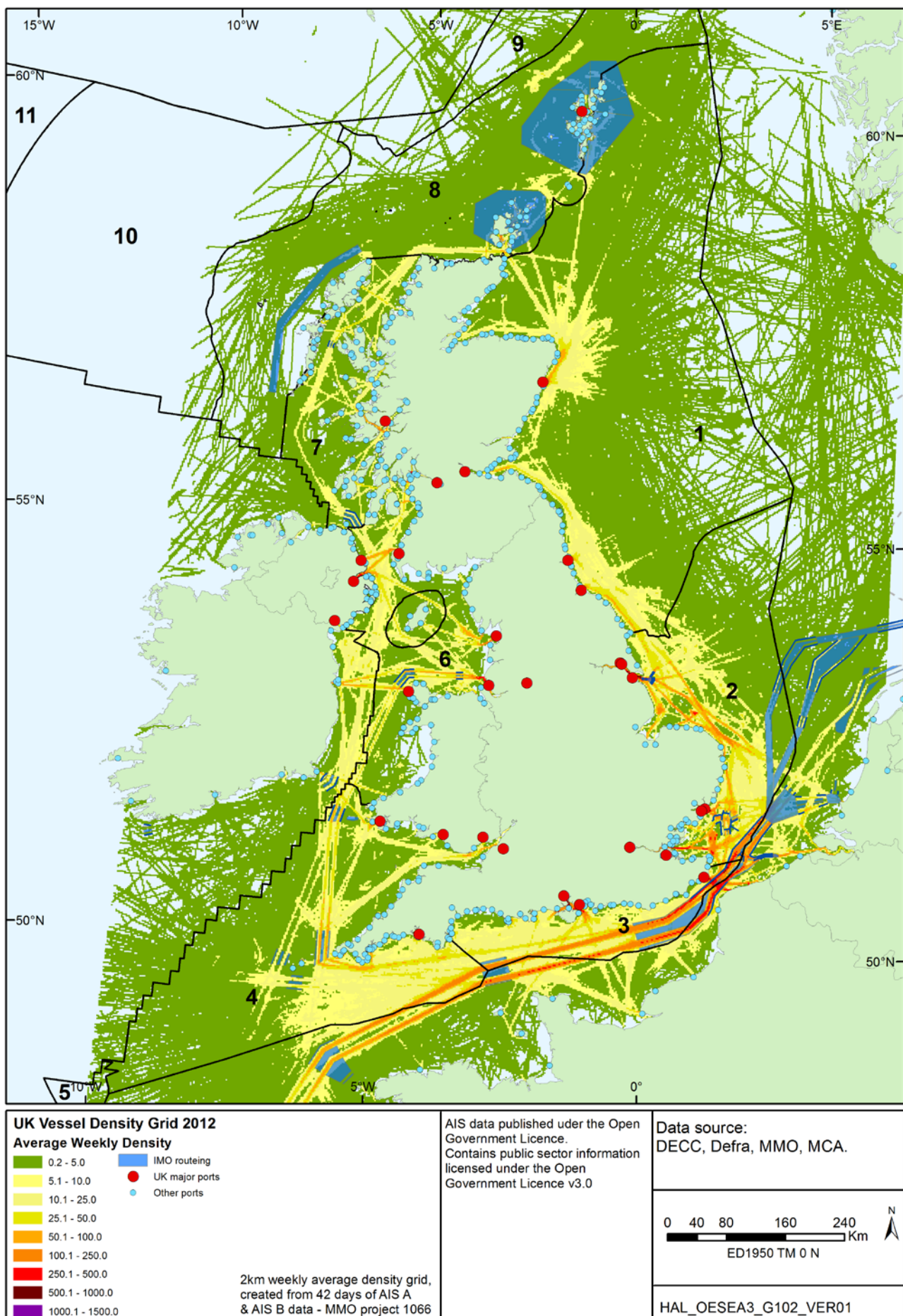


Figure A1h.3: AIS density grid, 2012



### A1h.2.3 Anchorages and places of refuge

Safe anchorages are locations around the coast which offer particularly protected environs and good holding ground in which ships can shelter during adverse conditions. UKHO sailing directions and charts provide a comprehensive account of these.

The MCA considers any location around the coast (anchorage or port) a potential place of refuge, which is defined as a location into which a ship in need of assistance can be brought to be stabilised through repair or transshipment of cargo, ultimately averting a pollution incident (see IMO Resolution A.949). Due to the unique nature of each incident, there is no ranking given to any area of refuge, and the identification of an appropriate place of refuge is based on the circumstances of a particular incident, including the prevailing weather and the potential type of threat that is posed.

### A1h.2.4 Ferry routes

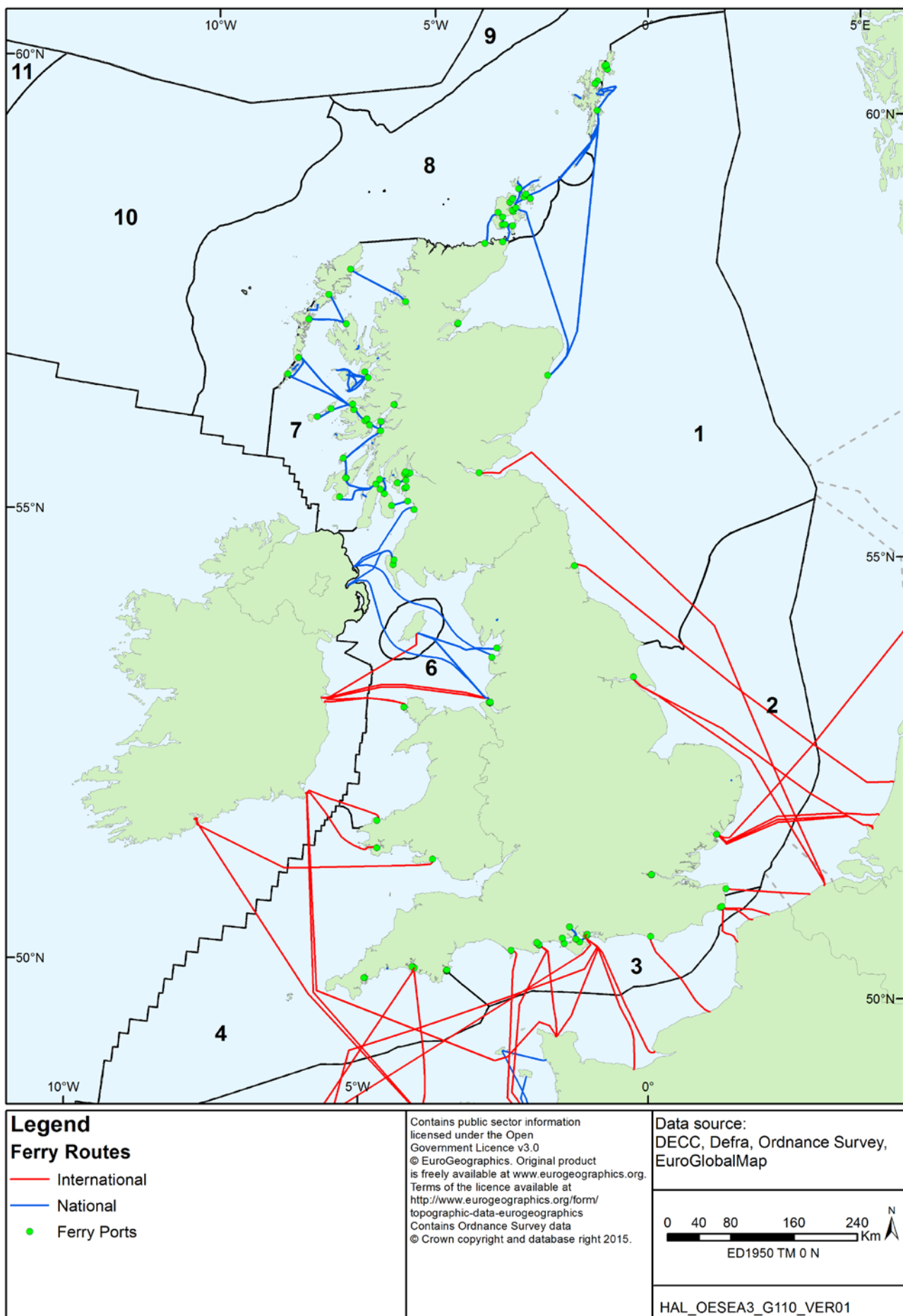
There are a number of regular internal and national ferry routes around the UK (Figure A1h.4). There is a complex network of ferry routes in Regional Sea 7 which connects the numerous islands (e.g. Islay, Coll, Tiree, the Outer Hebrides) to the Scottish mainland (not shown on map). In Regional Sea 6 the North Channel is traversed by ferries travelling between Larne and Belfast to Troon, Stranraer or Cairnryan, while the southern half of the Irish Sea sees traffic between English ports and the Isle of Man and Ireland. The Celtic Sea has ferries travelling between Ireland and Wales and Ireland and mainland Europe.

Ferries depart from numerous ports along the south coast of England and channel hop to the Channel Islands and several different mainland European ports. Ferry routes within Regional Sea 1 are predominately between Aberdeen and the Northern Isles and Newcastle and Amsterdam, and as well as having routes with starting ports originating in Regional Sea 2, the southern North Sea is traversed by routes emanating from the north and travelling to mainland Europe. Sea passenger statistics are reported annually for the UK by the Department for Transport<sup>1</sup>. The busiest international ferry routes are Dover-Calais, Dover-Dunkirk and Holyhead-Dublin, with 21.3 million passengers using international short routes in 2013. The busiest domestic crossings are Cairnryan/Stranraer-Belfast, Cairnryan-Larne and Liverpool-Douglas, carrying approximately 3 million passengers in 2014.

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<sup>1</sup> DfT Maritime and shipping statistics website (<https://www.gov.uk/government/collections/maritime-and-shipping-statistics#publications-released-during-2015>) accessed 05/11/2015.

Figure A1h.4: Ferry terminals and indicative ferry routes





### A1h.2.5 Recreational sailing

Recreational boating takes place ubiquitously along the coast of the UK though there are some notable areas of high usage. In response to the lack of information highlighted by the Round 2 Wind Strategic Environmental Assessment (SEA), the Royal Yachting Association (RYA), supported by the Cruising Association, began identifying cruising routes, general sailing and racing areas around the UK. This initial work published in, *Sharing the wind* (RYA & CA 2004), was based on extensive consultation and qualitative data collection from RYA and Cruising Association members. The RYA was then commissioned by the DTI (now DECC) as part of the SEA process, to produce a report describing the recreational boating use within Regional Sea 6 (RYA 2005). These activities are largely transferrable to the other Regional Sea areas being considered in the current Offshore Energy SEA. Recreational sailing includes:

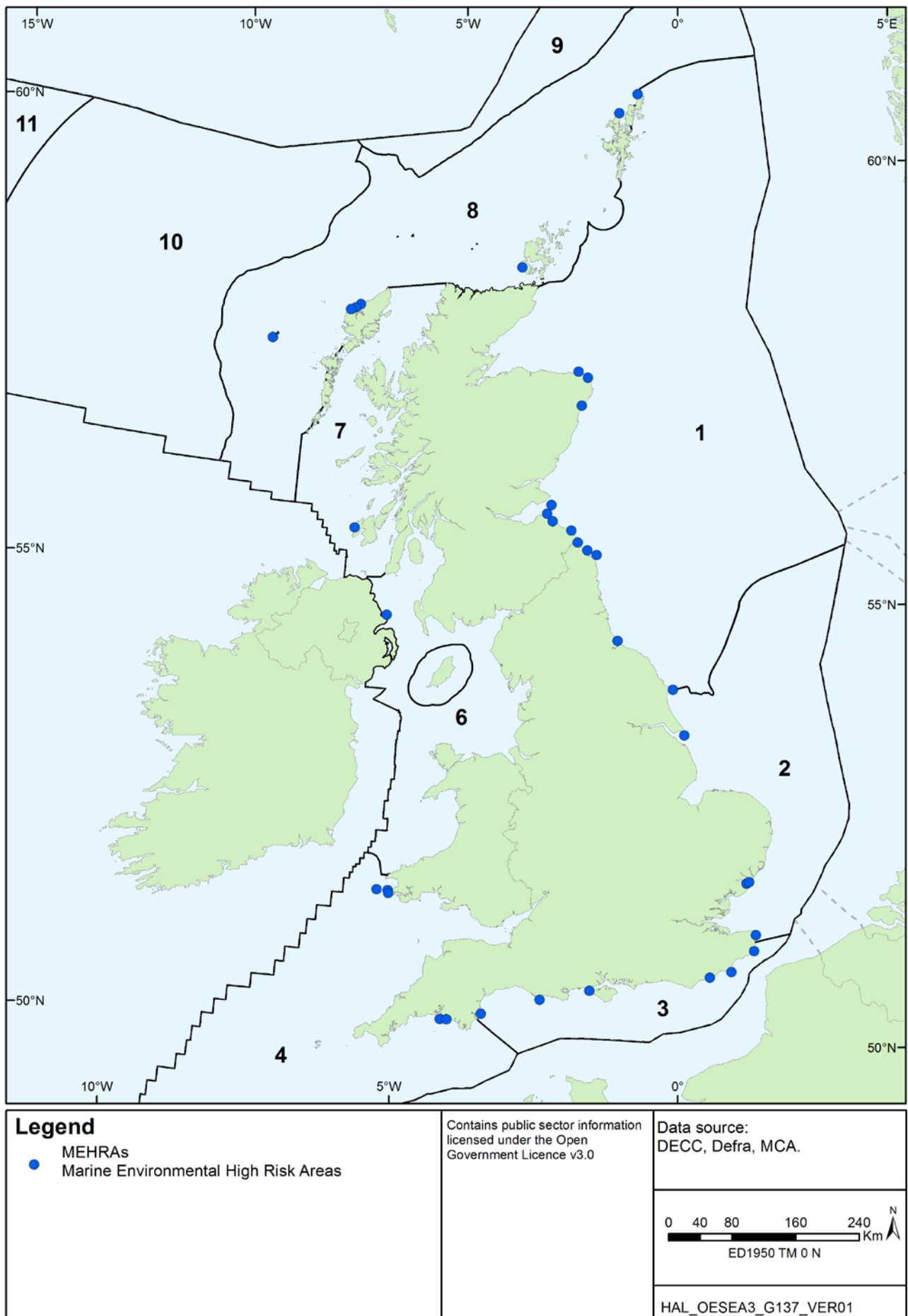
- canoeing, sail-boarding and personal watercraft limited to a few places inshore
- dinghy sailing in most estuaries in suitable weather and tide conditions
- day-sailing and racing around the coast approximately out to 15 miles
- cruiser passage making between most combinations of yachting base

Coastal marinas, RYA clubs and cruising routes as well as racing and sailing areas from the RYA cruising routes atlas were mapped in OESEA (DECC 2009) and remain current, and have been used to inform this SEA. The RYA is in the process of updating the atlas and augmenting it through the use of AIS data to examine the passages of recreational craft, while recognising the limitations of this system for small vessels which may not have AIS installed.

### A1h.2.6 Marine Environmental High Risk Areas

Following the *Braer* oil spill (5<sup>th</sup> January 1993), the Donaldson Inquiry of 1994 proposed the establishment of Marine Environmental High Risk Areas (MEHRAs) to protect marine areas of high environmental sensitivity at risk from shipping. An assessment was carried out to identify the environmental sensitivity of the UK coastline and coastal waters. Thirty-two MEHRAs have been established (Figure A1h.5) covering approximately 9% of the UK coastline. The location of these is indicated by markings on UK Hydrographic Office charts and through Notices to Mariners, and Marine Guidance Notices issued by the Maritime and Coastguard Agency.

Figure A1h.5: Marine Environmental High Risk Areas



### A1h.3 Aviation

Certain civilian and military aerodromes and technical sites are officially safeguarded to ensure that their operation is not compromised by developments such as wind farms. Safeguarding maps produced for civilian sites indicate areas within which consultation is required before a development takes place (see Figure A1h.6). A 30km buffer delineates the area for which a local planning authority is required to consult the relevant aerodrome regarding any wind turbine proposal. This buffer reduces to 17km for aerodromes which are non-radar equipped and with a runway of 1,100m or more, and 5km for which are non-radar equipped and with a runway of less than 1,100m. These buffers are used to prompt discussion and do not present definitive distances within which developments will be opposed (CAA 2013). The safeguarding of military technical sites is conducted on a case by case basis. Similar effects can generate operational problems for air traffic services in the UK which are provided by NATS En-Route Ltd. (NERL). NERL has made available map data indicating the likelihood of interference from wind turbines on its radar network (see Figure A1h.6) for a range of blade tip heights (20 to 200m). These buffers are indicative, and do not affect the consultation requirements for formal planning applications set out in *The Town and Country Planning (Safeguarded Aerodromes, Technical Sites and Military Explosive Storage Areas) Direction 2002* (see Figure A1h.6).

The Aviation Management Board, Aviation Advisory Panel and Fund Management Board<sup>2</sup> contribute to the production of the Aviation Plan, a document focused on research for technical solutions to the issues caused by wind farms in relation to aviation, and in particular radar. The latest Aviation Plan (2015) outlines progress since 2008. There has been some progress in developing a technical solution to radar interference, however no single solution has been identified, with terminal air traffic control (ATC) for military and civilian Primary Surveillance Radars (PSRs) a major area where no solution has been proven. NERL has worked with Raytheon, its radar manufacturer, to develop a commercial solution (Project RM), with a deal having been signed between NATS, SSE and Vattenfall to modify two radar sites. It is estimated that Project RM could unlock planning objections to up to 2GW of new wind capacity.

A 9nm consultation zone exists around offshore oil and gas surface infrastructure within which wind farm developers must engage with helicopter and installation operators (CAA 2013). Development is not precluded within such areas, but consultation between the relevant parties is encouraged to avoid conflict. Helicopter final approaches are into the wind and so may be from any direction, and commence at approximately 5-6nm around installations at a height of 1000-1500ft (m), achieving 200ft during the day and 300ft during the night by 2nm of the destination. There are therefore potentially additional aviation related constraints associated with offshore oil and gas surface infrastructure within these distances, and the CAA have formerly indicated the need to maintain a 6nm radius obstacle-free zones around installations to ensure helicopter activities are not impacted during routine flights, Missed Approach Procedures (MAP) and in emergency evacuations (see CAA 2013). Wind turbine placement may impact on helicopter activities within 9nm of an installation in a number of ways, such as steeper and quicker descents, more complicated platform rescue operations and economic impacts and possible cessation of viable helicopter activity.

Consultation zones are primarily distributed in the North Sea, west of Shetland and eastern Irish Sea, coincident with oil and gas infrastructure (Figure A1h.6). In addition to helicopter

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<sup>2</sup> <https://www.gov.uk/government/groups/aviation-management-board-aviation-advisory-panel-and-fund-management-board>

destinations, Helicopter Main Routes (HMRs)<sup>3</sup> have been used in the North Sea and Morecambe Bay for a number of years, obstacles to which could result in effects on helicopter traffic including increased flight height which might be limited by freezing levels. The CAA indicates that there should be no obstacles within 2nm of HMRs.

Helicopter based Search and Rescue (SAR) operations are coordinated from 10 bases throughout the UK, operated by Bristow Helicopters Ltd under contract managed by the Maritime and Coastguard Agency (MCA). These operations were formerly operated by the RAF and Royal Navy using Sea King helicopters from 8 bases, and a commercial contract at a further 4. These are being transitioned to the new arrangements contracted to Bristow which are expected to be complete by summer 2017. The new service will operate 22 helicopters, with Sikorsky S92 helicopters operating from Stornoway, Sumburgh, and new bases at Newquay, Caernarfon and Humberside airports. AgustaWestland AW189 helicopters will operate from Lee on Solent, Prestwick airport, and new bases at St Athan, Inverness and Manston airports (Figure A1h.7). These helicopters have an operational radius of 250nm and 200nm respectively.

A trial of helicopter SAR operations at the North Hoyle wind farm, off the North Wales coast, was performed in 2005 (MCA & RAF 2005). A number of constraints on safe helicopter operation within the wind farm were observed which included:

- Target vessels within 100m or wind turbines were difficult to distinguish due to radar side lobe returns from structures
- The inability to lock the movement of turbines poses a potential hazard
- Approach distances are limited in clear weather
- Inability to conduct a rescue in restricted visibility
- Tracking of the helicopter by shore-based radar was poor
- There was an increase in the aircraft power requirement
- There were limitations on helicopter radar search platforms in large and irregular wind farms
- Thermal imaging camera use was less effective in mist and precipitation, though clearly identified persons, turbines and vessels in dry weather
- There was no influence on compass operation
- VHF radio was affected

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<sup>3</sup> As defined in the UK AIP: <http://www.ead.eurocontrol.int/eadbasic/eais-E8E8FE4C54A2BC43679B6D52DFBDC8FB/3QDXTD5E6YWTY/EN/2015-11-12-AIRAC/html/index-ead-en-GB.html?target=eAIP/EG-GEN-0.1-en-GB.html>

Figure A1h.6: Possible aviation related constraints

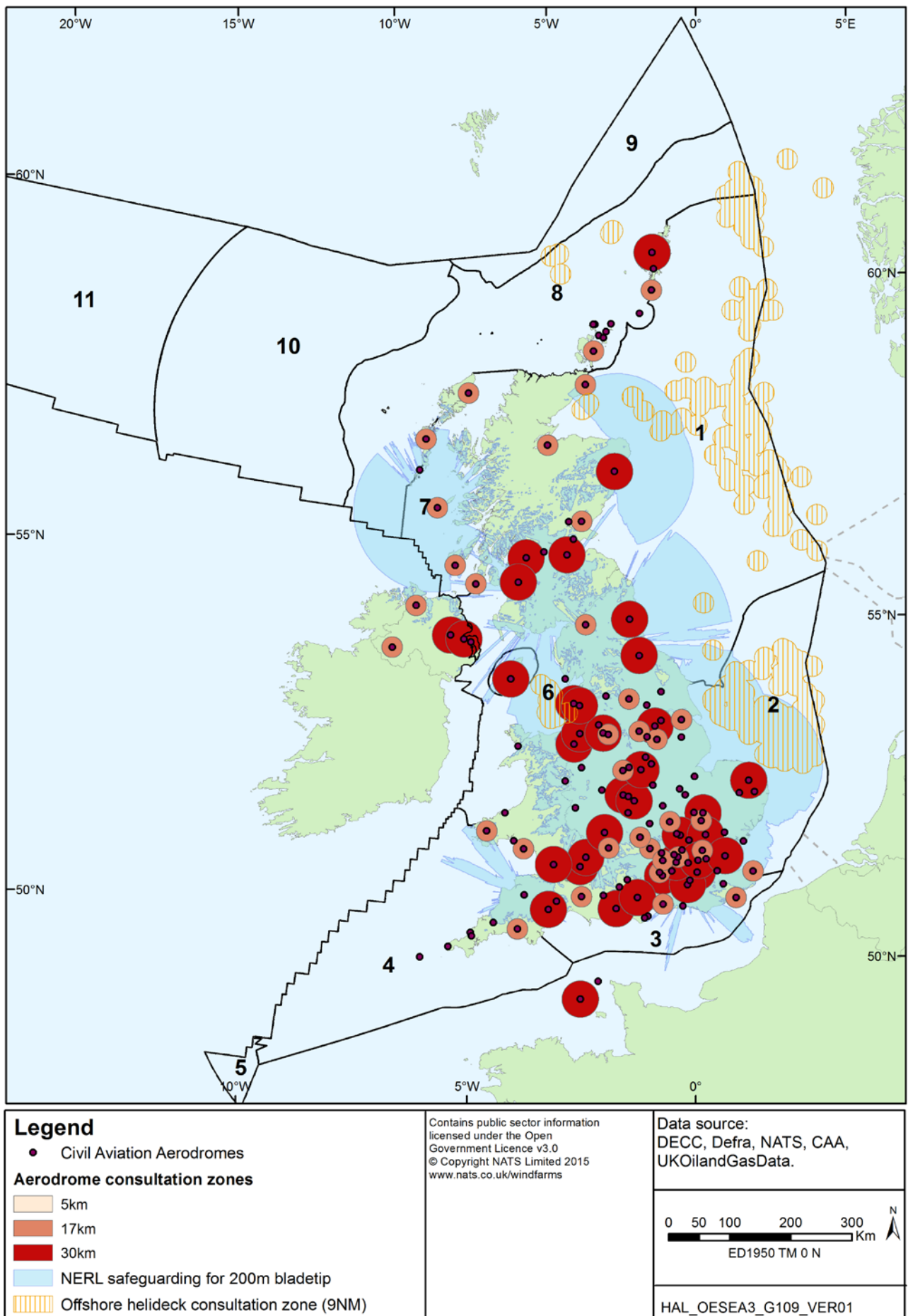
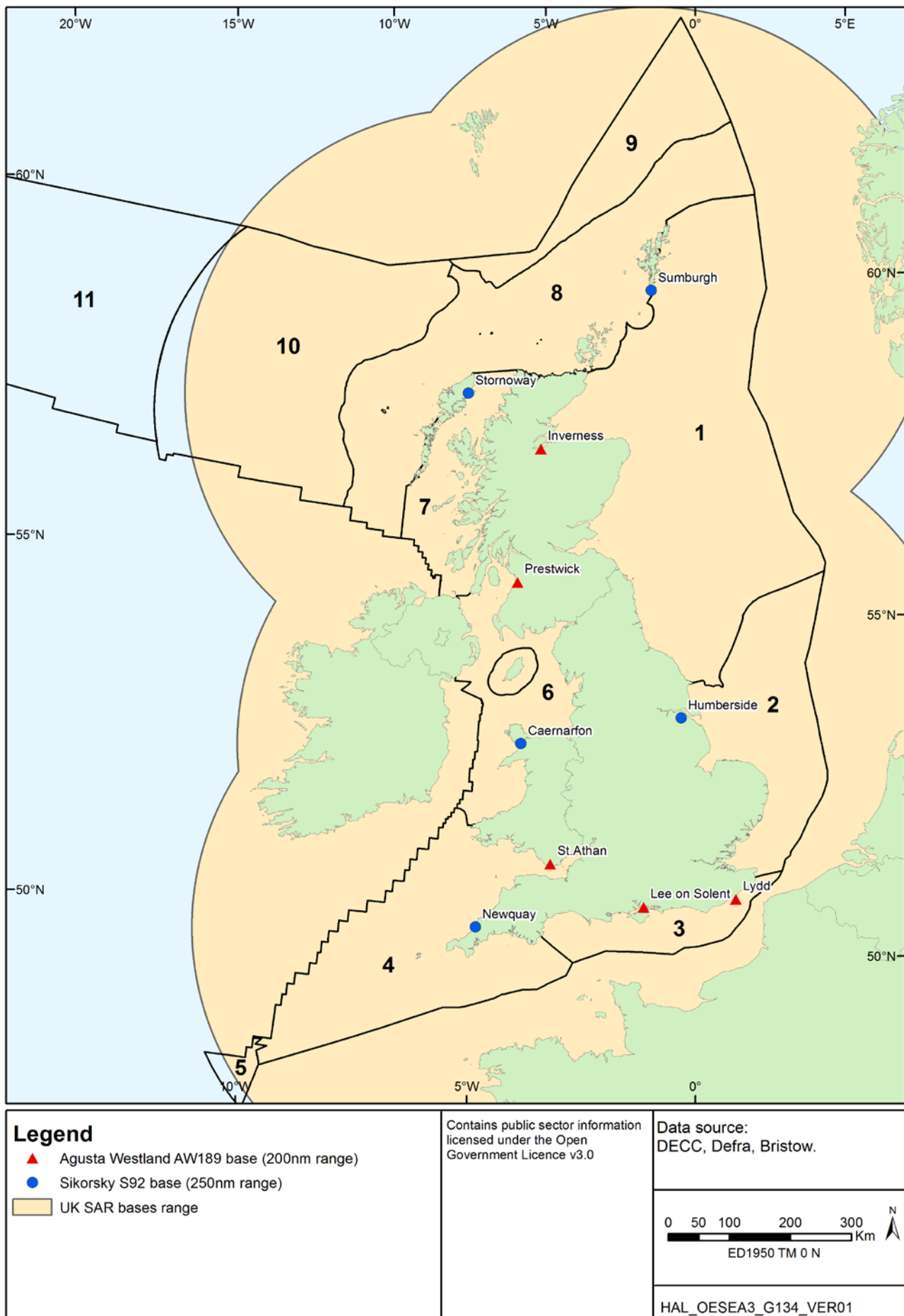


Figure A1h.7: UK Search and Rescue (SAR) helicopter response bases



## A1h.4 Military activity

Practice and Exercise Area (PEXA) charts, produced by the UK Hydrographic Office, provide information relating to military activity within the UKCS. These are kept up to date through the Admiralty Notices to Mariners service and show areas which are in use, or available for use by the Ministry of Defence for military practice and exercises. PEXA designations occur in every Regional Sea with a coastline and in Regional Sea 10 (Figure A1h.8). The presence of a PEXA does not preclude other activities except for some danger areas marked with the prefix D where airspace restrictions apply and where live firing may take place (indicated on Figure A1h.8). The Marine Policy Statement indicates that marine activities must not prejudice defence and national security interests – planning and consultation between those wishing to undertake offshore activities and the MoD should help to minimise any conflicts of interest where PEXAs exist. Further guidance and information for developers is being provided at the regional scale through the marine planning process.

The UK low flying system (LFS) allows training within the whole of the UK airspace and seas out to 3nm from the shore, and encompasses a vertical distance from ground level to 2,000ft – the operational heights of aircraft within low flying range are listed in Table A1h.1 below. No designated Tactical Training Areas are present over the sea, these being restricted to areas of central Wales, northern Scotland and the Borders, and within which fixed wing aircraft may travel at between 100 and 150ft depending on their size.

**Table A1h.1: Operational altitude for low flying military training aircraft**

| Elevation    | Maximum potential height of turbine                                      | Description of activities  |
|--------------|--|--|
| <2,000 ft    | No interference  | Fixed wing low flying  |
| <500 ft      | Possible Interference from turbine below 500 ft (assuming 140m bladetip) | Low flying for helicopters and specified training aircraft                 |
| <250 ft      |  | Limit for low flying fixed wing aircraft – outside Tactical Training Areas |
| 100-150ft    |  | Limit for low flying fixed wing aircraft – inside Tactical Training Areas  |
| Ground level |  | Limit for helicopter training  |

Source: DTI (2002)

The MoD (2014) have provided guidance on the lighting of offshore wind farms, however CAA, MCA and Trinity House requirements exceed the guidance provided in most cases, which is a combination of visible and infrared (IR) lighting. The standard was identified through an air-sea trial at North Hoyle.

Military radar, like civilian radar, may suffer from degraded performance due to wind farm operations (see sections above). It was previously MoD policy not to let any wind farm development take place within 74km of Air Surveillance and Control Systems (ASACS) if it would be in the direct field of view (Figure A1h.9). In June 2011 an agreement between the MoD and wind developers led to the procurement of a TPS77 radar that provided mitigation from the effects of wind farms located at Remote Radar Head (RRH) Trimmingham. Following on from this, two further upgrades were installed at RRH Saxton Wold and RRH Brizlee Wood, with a further agreement signed the upgrade of the radar at RRH Buchan in Scotland to the TPS77 standard. Commissioning and trials of these radars is ongoing.

Figure A1h.8: Location of PEXA areas

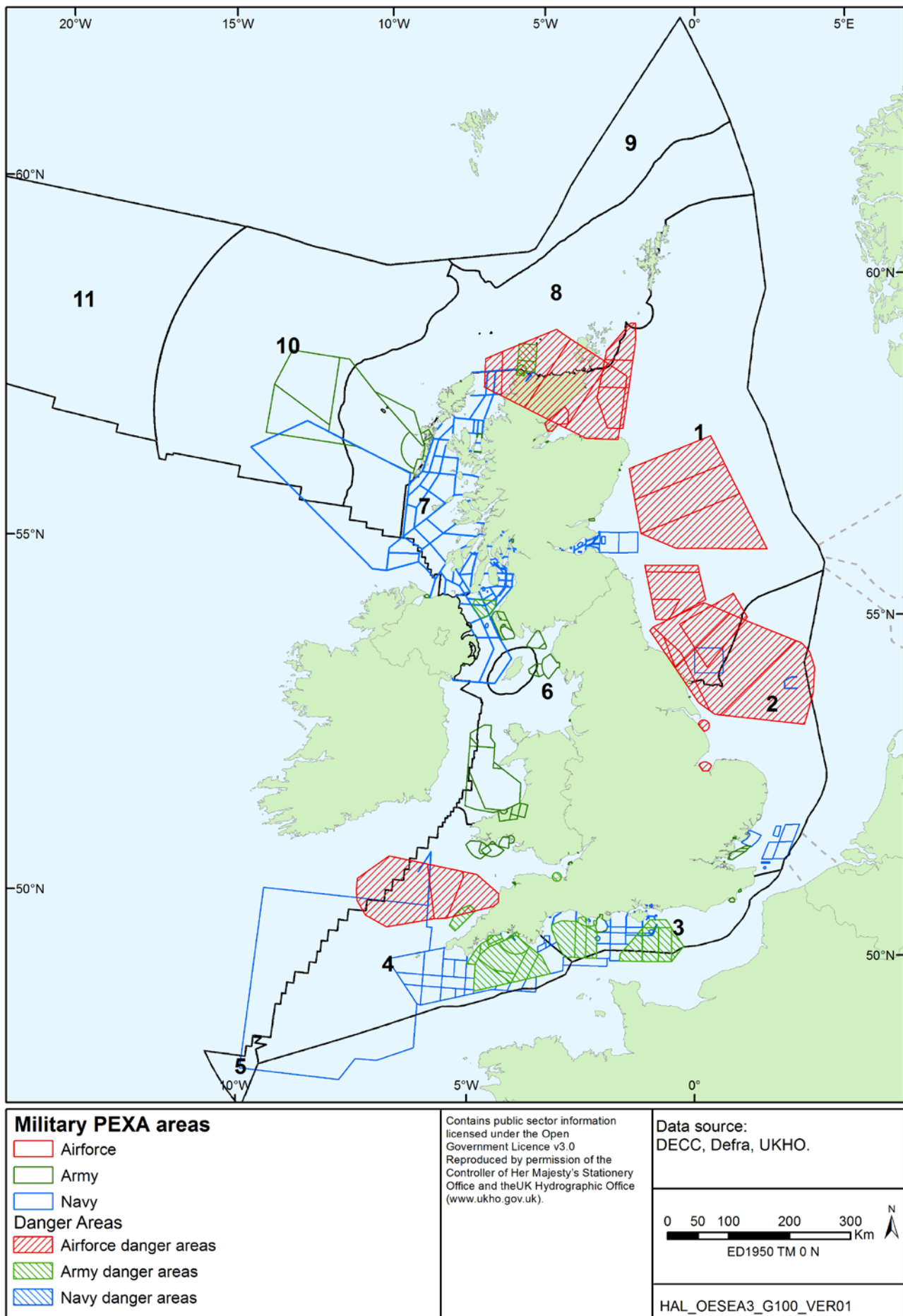




Figure A1h.9: Military radar sites contributing to UK ASACS

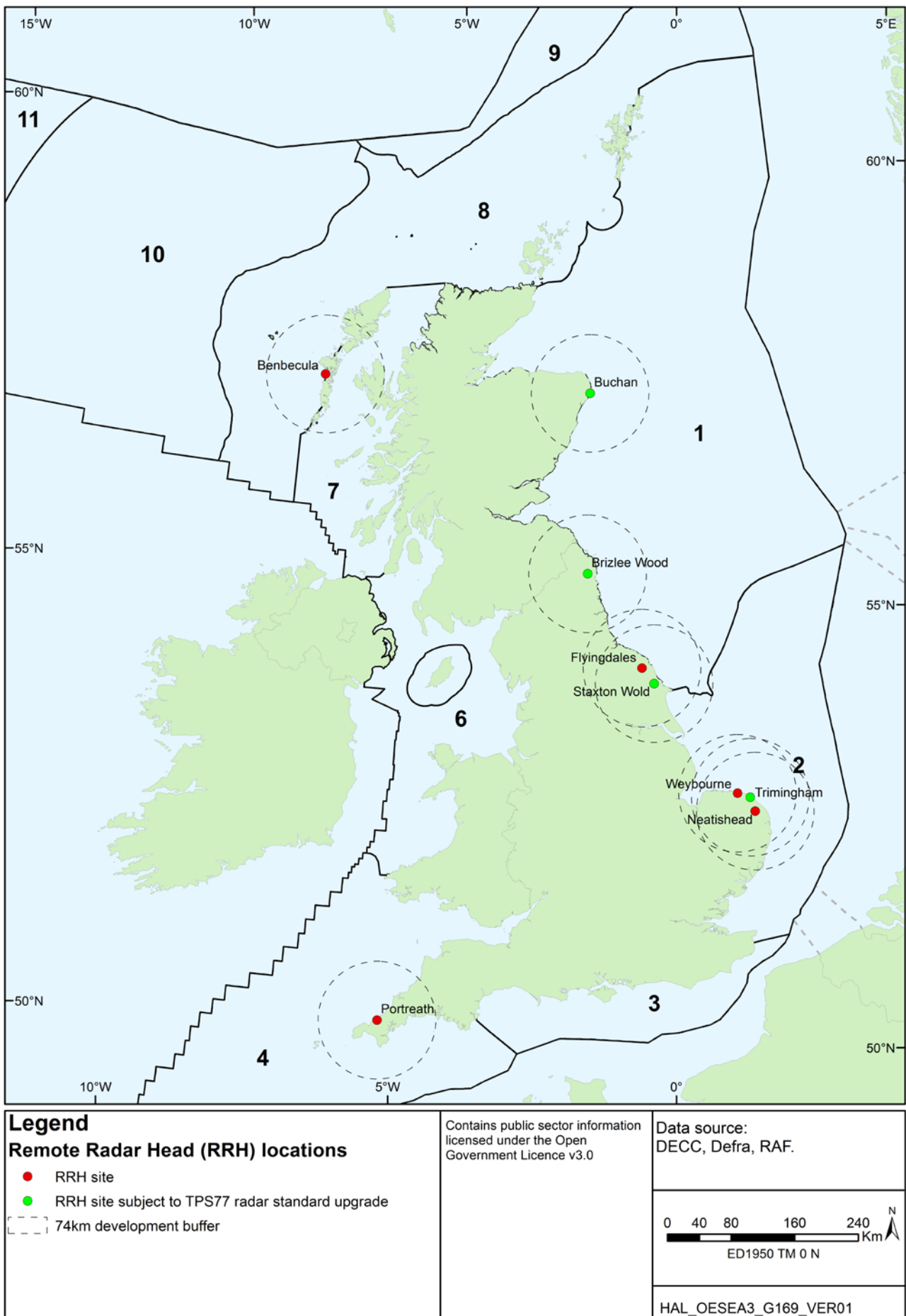
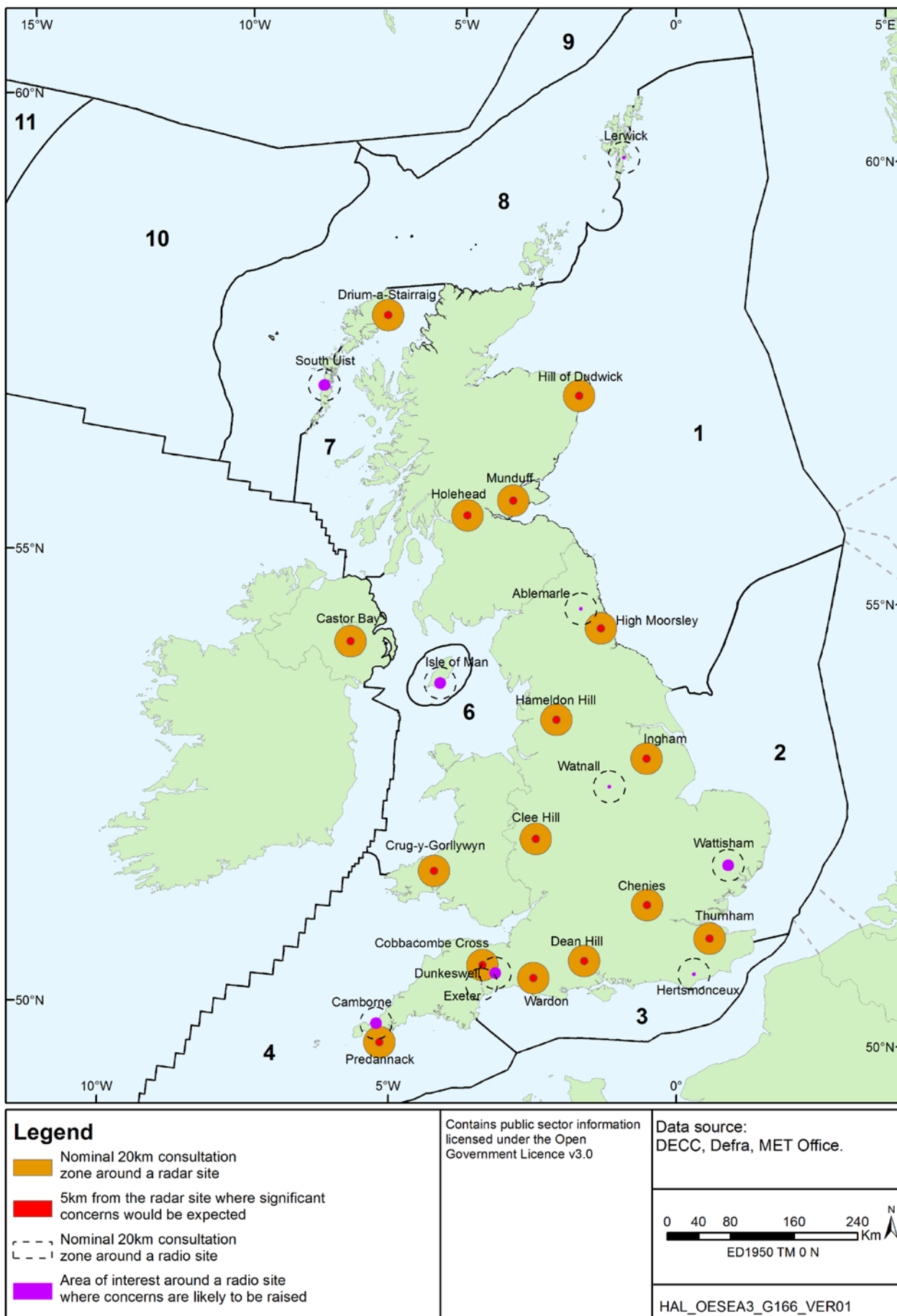


Figure A1h.10: UK weather stations and related consultation zones



## A1h.5 Met Office radar

The Met Office uses a number of radio communication and remote sensing techniques to inform the public weather service and to provide meteorological information to a range of other stakeholders including to aviation, road, rail and maritime users, defence, civil contingency services (e.g. to the Cabinet Office, Scottish Government, Environment Agency and SEPA), and utilities. Like other radar, impositions from structures, particularly wind farms, can generate potential interference (Met Office 2012). The Met Office engages in the consultation process of planning applications to ensure proposals are appropriately assessed and mitigated against, with weather radio and meteorological stations being safeguarded. For the types of radar operated by the Met Office (C-Band) it was recommended by the Operational Programme for the Exchange of weather RAdar information (OPERA), see Met Office (2012), that turbines should not be located within 5km of a radar antenna, and that an impact study should be undertaken for proposals within 20km, recommendations were adopted by the Met Office (see Figure A1h.10). Additional meteorological stations are also safeguarded but the distance from these for which there is concern related to the siting of wind farms is variable (also shown on Figure A1h.10). These concerns are primarily in relation to onshore development however some consultation zones reach the coast or overlap small areas of nearshore waters.

## A1h.6 Oil and gas activity

### A1h.6.1 UK context

Oil and gas related activities are chiefly centred on the southern, central and northern North Seas (Regional Seas 1, 2 and 8), west of Shetland (Regional Seas 8, 9 and 10), and the eastern Irish Sea (Regional Sea 6) – Figures A1h.11 and 12.

In the central and northern North Sea (primarily Regional Sea 1 but also includes eastern parts of Regional Sea 8, see Figure A1h.11), oil is the dominant hydrocarbon resource produced (ca. 70% of the 106 installations in the central and northern North Sea are for oil). Production in Regional Sea 1 is primarily located on a north-south axis along the median line from quadrants 29-30 in the south to 11 in the west (Moray Firth), reaching quadrant 211 in the far north and east of Shetland. Quadrants 204 and 206 in Regional Sea 8 include the Foinaven, Schiehallion and Clair oil fields as well as the Laggan and Tormore gas condensate fields in quadrants 205 and 206 on the boundary with Regional Sea 9. In Regional Sea 2, gas developments predominate with a comprehensive network of installations (177 gas platforms in the southern North Sea) and pipelines in quadrants 43, 44 and 47-49. In Regional Sea 6, gas is the predominant hydrocarbon resource produced from the East Irish Sea basin (12 of the 17 installations in the Irish Sea) from quadrants 110 and 113 (see Figure A1h.12). Oil is currently only produced from the Douglas Field in Quadrant 110.

A substantial array of fixed surface infrastructure is associated with oil and gas production which includes production and accommodation platforms and numerous FPSOs. Pipelines carrying oil, gas, condensate and other chemicals connect these fields to coastal infrastructure (see Figures A1h.11 and A1h.12). Major pipeline landfalls in Regional Sea 1 include those at Sullom Voe, Shetland and the Flotta terminal, Orkney. St Fergus gas terminal in north-east Scotland is one the largest in the UK and is supplied from installations in the central and northern North Sea, including the East Shetland Basin, and also from the Norwegian Sector. The BP-owned Forties Pipeline System extends from the Forties Charlie platform, via the Forties Unity Platform, to Cruden Bay in Aberdeenshire, and constitutes one of the most substantial pipeline systems in the North Sea. Gas pipelines serving the platforms of the southern North Sea connect to terminals at Bacton, Theddlethorpe and Easington/Dimlington (Regional Sea 2). In Regional Sea 6, gas pipelines connect to Barrow-in-Furness and Point of Ayr gas terminals with oil sent to an offshore storage installation.

Figure A1h.11: Oil and gas infrastructure (north)

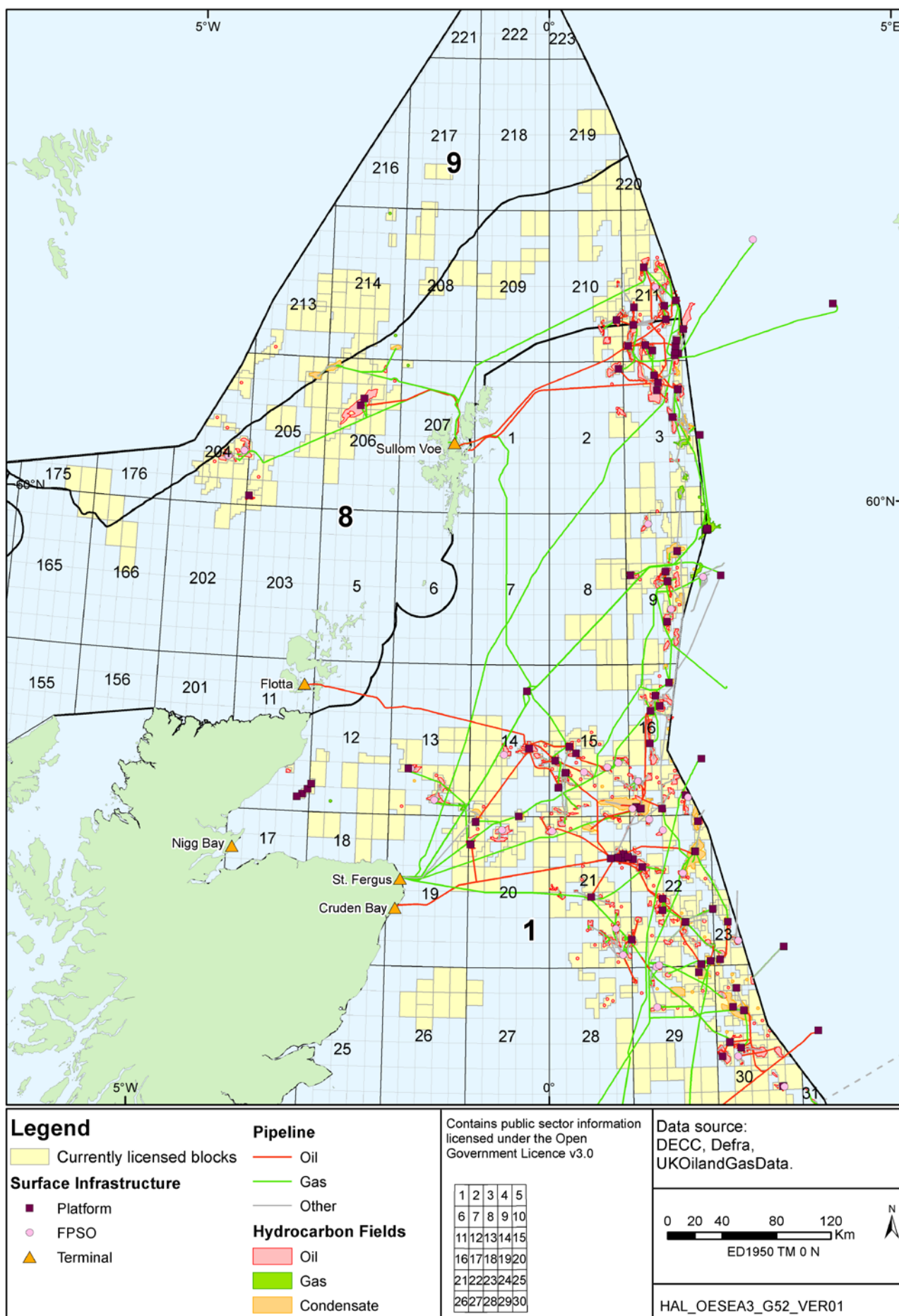
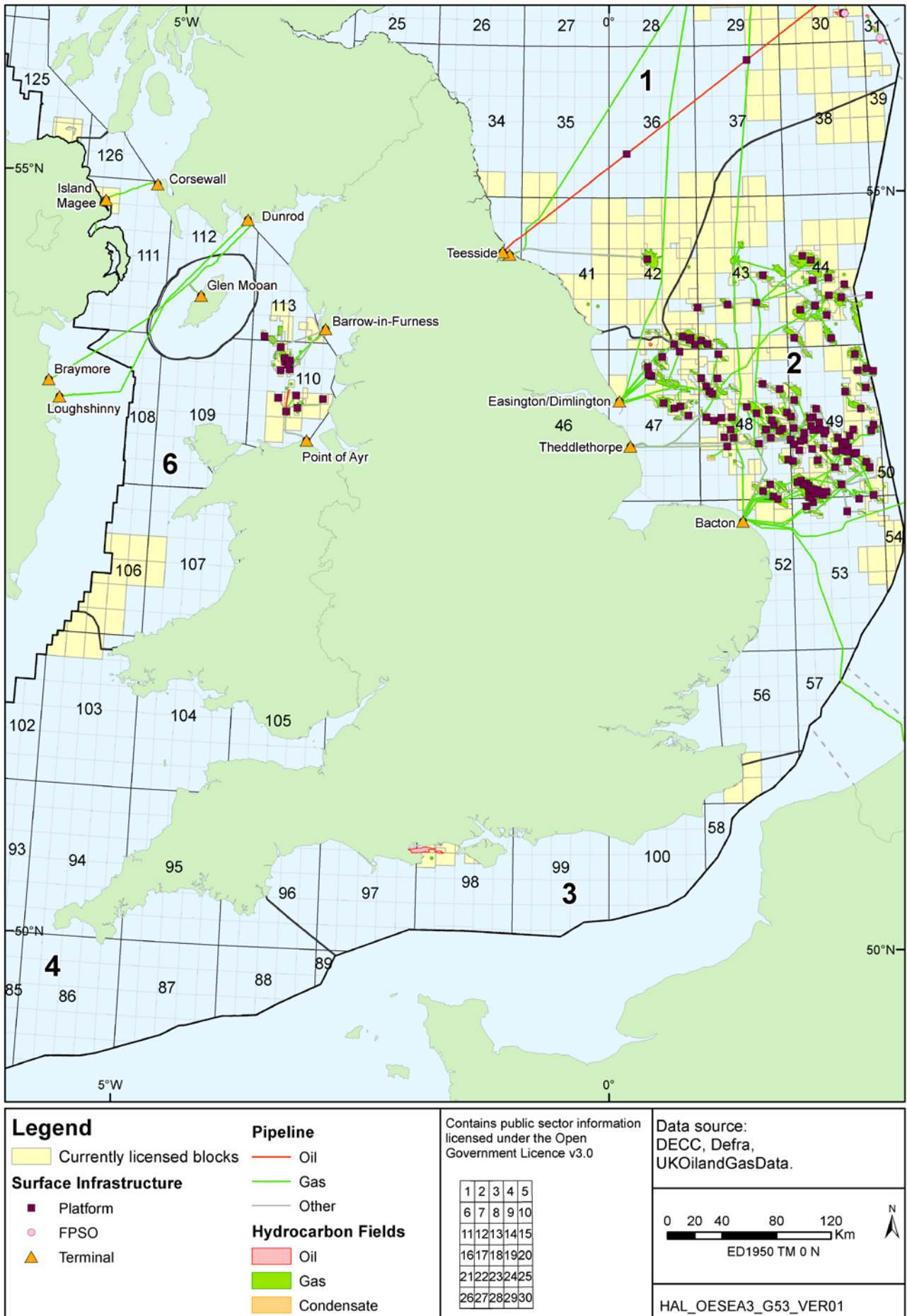
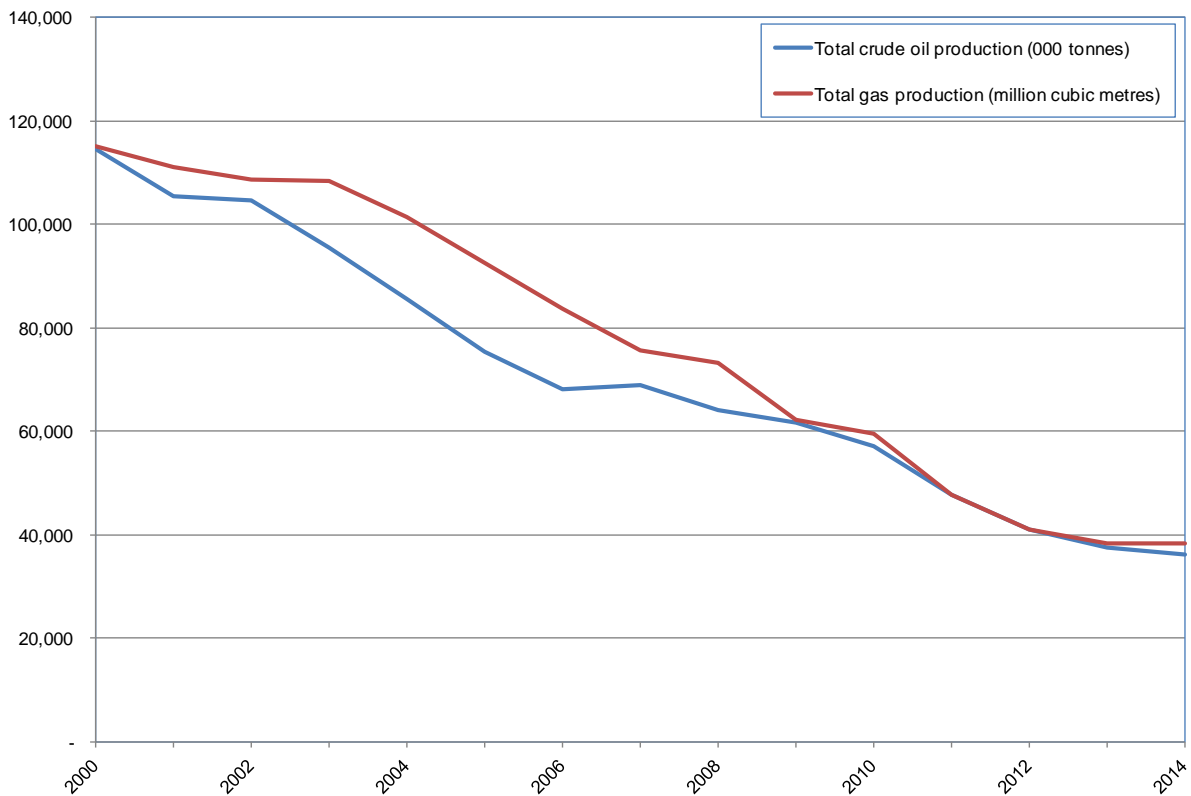


Figure A1h.12: Oil and gas infrastructure (south)



The oil and gas fields of the UKCS are at a mature stage of development, many fields having been discovered in the 1960s and 70s. Hydrocarbon resources in UK waters are steadily declining and decommissioning of infrastructure is an area of growing importance (OGA 2015, see Section A1h.6.1.2 below). There has been a slowdown in production decline in recent years (see Figure A1h.13, OGA 2015), primarily as a result of investment in new production and improved output from existing facilities (OGUK 2015). There have also been record levels of capital expenditure over the past three years (from £11.4 billion in 2012 to £14.8 billion in 2014, OGUK 2015), albeit with more than half on maintaining and upgrading ageing North Sea infrastructure. Government revenues from UK oil and gas production in 2014 totalled ca. £4.8 billion, down from £6.2 billion in 2013<sup>4</sup>, with imports responsible for meeting 48% of UK oil and gas demand in 2014<sup>5</sup>. The *Energy Bill*, introduced to the House of Lords on 9<sup>th</sup> July 2015, will formally establish the Oil and Gas Authority as an executive agency of DECC responsible for regulating offshore and onshore oil and gas operations including: oil and gas licensing; exploration and production; fields and wells; infrastructure, and carbon capture and storage (CCS) licensing.

**Figure A1h.13: Total crude oil and gas production from the UKCS, 2000-2014**



Note: Total crude oil production includes offshore production, total terminal receipts and extended well tests and does not include natural gas liquids. Total gas production includes dry gas and associated gas.

Source: DUKES F.1 Crude oil and Natural Gas Liquids production (<https://www.gov.uk/guidance/oil-and-gas-uk-field-data>) and DUKES F.2 Gas production (<https://www.gov.uk/government/statistics/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes>).

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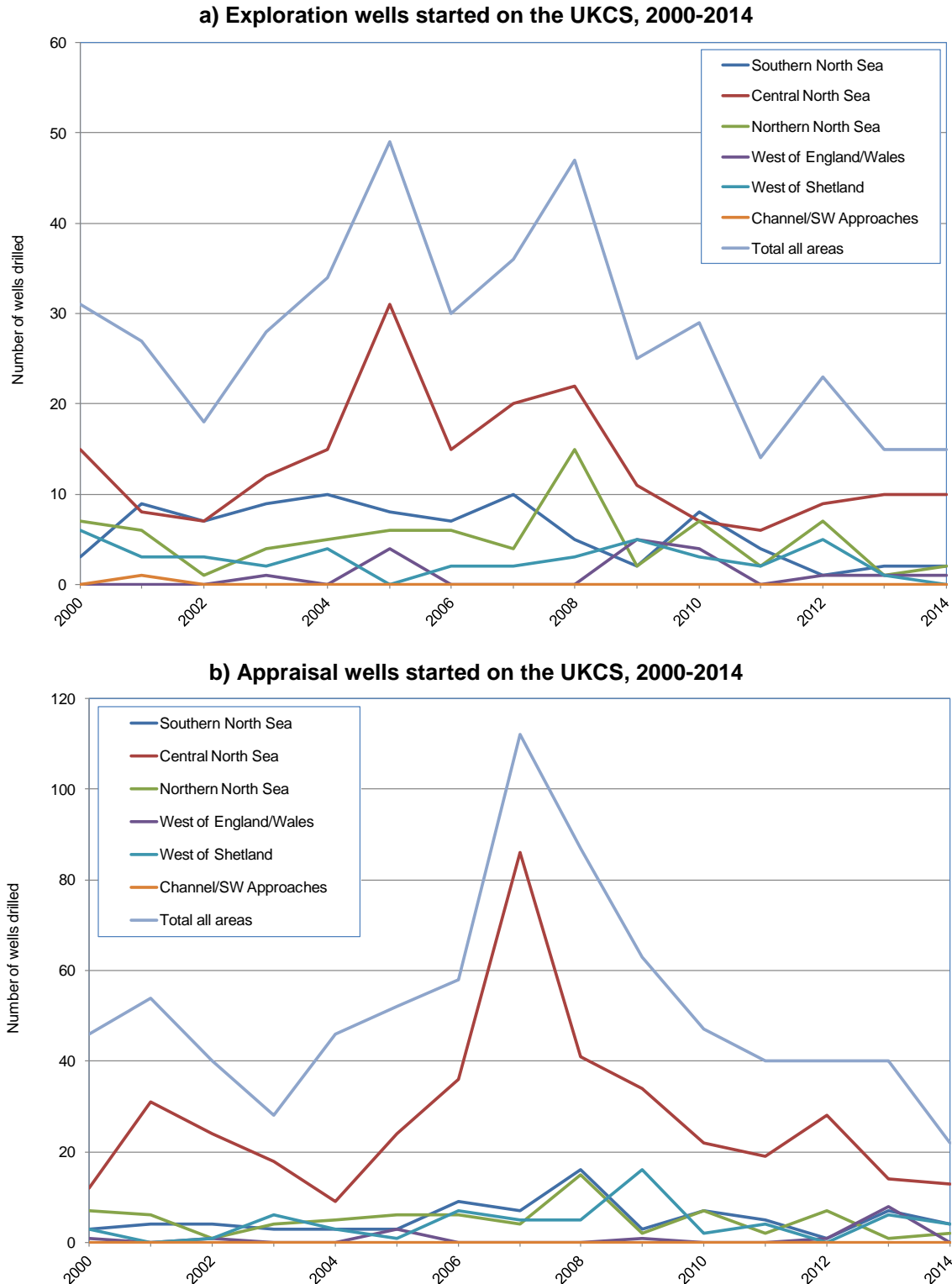
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/383910/UKCS\\_Tax\\_Table\\_December\\_2014.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/383910/UKCS_Tax_Table_December_2014.pdf)

5 [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/414172/Production\\_projections.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414172/Production_projections.pdf)

### A1h.6.1.1 Drilling activity on the UKCS

Exploration and appraisal (E&A) drilling has been declining since the beginning of the financial crisis in 2008 (see Figures A1h.14 and A1h.15). The majority of E&A wells drilled were in the central North Sea (Regional Sea 1).

**Figure A1h.14: Exploration and appraisal drilling on the UKCS, 2000-2014**

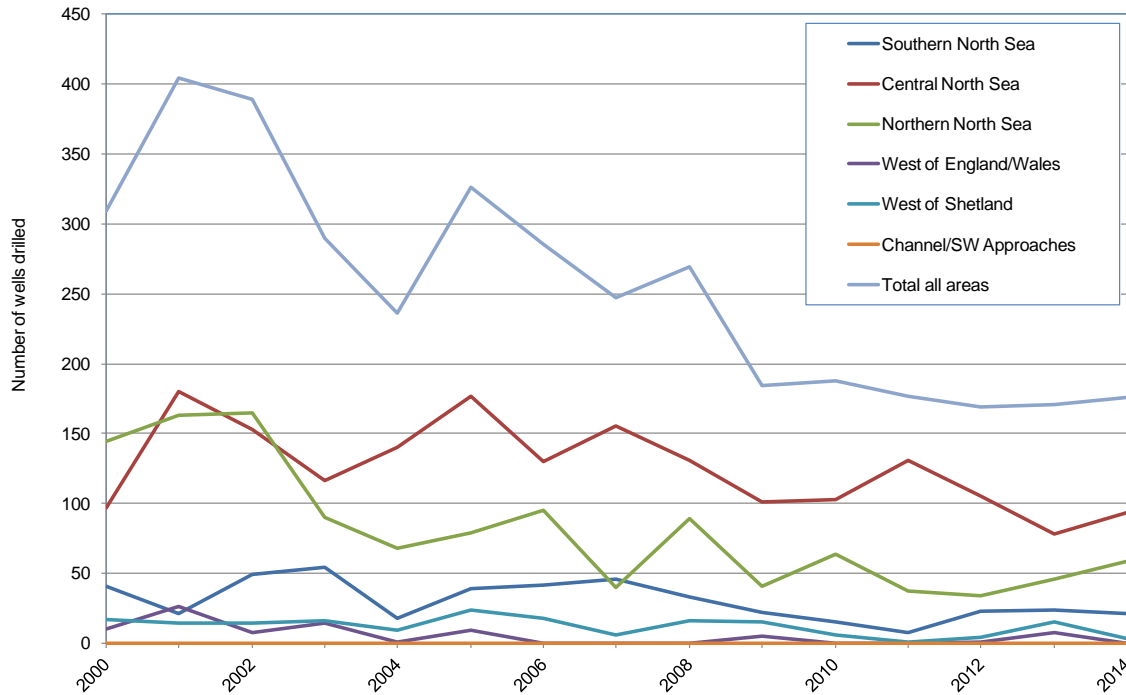


Notes: Includes sidetracks. Central North Sea (Regional Sea 1), Northern North Sea (Regional Seas 1, 8 and 9), Southern North Sea (Regional Sea 2), West of England/Wales (Regional Seas 4 and 6), West of Shetland (Regional Seas 8, 9, 10 and 11), Channel/SW Approaches (Regional Seas 3, 4 and 5)

Source: <https://www.gov.uk/guidance/oil-and-gas-wells#drilling-activity>

The Oil and Gas UK activity survey (2015) indicated that operational factors such as access to rigs, the cost of drilling wells and competition for resources have constrained exploration and appraisal (E&A) activity in recent years. Falling oil price, inability to access finance and the fiscal environment were also seen as significant barriers to activity. The survey also indicated that operators appear to have prioritised the drilling of development wells rather than E&A activity in 2014, reflecting the drive to monetise opportunities at a time of high oil prices. This is reflected in the modest increase in the number of development wells drilled over the last few years, primarily in the northern North Sea (Regional Seas 1, 8 and 9) and also the central North Sea (Regional Sea 1).

**Figure A1h.15: Development wells started on the UKCS, 2000-2014**



Note: As for Figure A1h.14 above.

Source: <https://www.gov.uk/guidance/oil-and-gas-wells#drilling-activity>

**A1h.6.1.2 Decommissioning activity on the UKCS**

Decommissioning is an area of growing importance for the UKCS. Over the next 35 years, over 5,500 wells, 400 facilities and 10,000km of pipelines will be decommissioned, at an aggregate estimated cost in excess of £50 billion (2014 prices) (OGA 2015).

Table A1h.2 provides summary details of decommissioning programmes that have been approved by DECC since 2010, those that have been closed out and those under consideration by DECC.



Table A1h.2: Decommissioning programmes under consideration and approved

| RS  | Blocks                                    | Main points of programme   | Year of approval | Close out received |
|---|---|--|------------------|--------------------|
| <b>Decommissioning programmes under consideration (August 2015)</b> |   |  |                  |                    |
| 2   | 49/26                                     | Removal of topsides, jacket and bridge link  | -                | -                  |
| 1   | 9/14a & 9/14b                             | Removal of subsea installation. Partial removal of gas import pipeline. Leave pipeline bundles <i>in situ</i>  | -                | -                  |
| 2   | 49/28                                     | Removal of topsides, jackets and subsea installations. Pipelines to remain buried <i>in situ</i> .   | -                | -                  |
| 2   | 49/24 & 49/29                             | Wellhead protection frames to be removed, pipelines to remain buried <i>in situ</i> .  | -                | -                  |
| 2   | 53/1d & 53/2b                             | As above.  | -                | -                  |
| 2   | 50/26a                                    | As above.  | -                | -                  |
| 2   | 53/3c & 53/4b                             | Removal of topsides, jackets and subsea installations. Pipelines to remain buried <i>in situ</i> .   | -                | -                  |
| 2   | 53/4d                                     | Wellhead protection frames to be removed, pipelines to remain buried <i>in situ</i> .  | -                | -                  |
| <b>Approved decommissioning programmes</b>                          |   |  |                  |                    |
| 1   | 211/29                                    | Removal of topside to shore for recycling and disposal   | 2015             | -                  |
| 2   | 47/15b                                    | Removal of subsea installations to shore for recycling/disposal. Removal of sections of un-trenched pipelines; trenched pipelines decommissioned <i>in situ</i>  | 2015             | -                  |
| 2   | 49/10c                                    | As above.  | 2015             | -                  |
| 8   | 211/19                                    | Topsides and jacket to top of footings to be removed to shore for recycling/disposal. Removal of sections of un-trenched pipelines; trenched pipelines decommissioned <i>in situ</i>   | 2014             | -                  |
| 1   | 15/21, 15/26, 15/27 & 15/28               | Removal of subsea installations to shore for recycling/disposal. Selective recovery of pipelines.  | 2014             | -                  |
| 1   | 16/7b & 16/8b                             | Footings to remain in place, steel topsides and jacket to top of footings to be removed to shore   | 2013             | -                  |
| 8   | 204/20, 204/25a, 204/25b, 205/16, 205/21b | Removal of FPSO for potential re-use. Recovery of pipelines where possible. Production flowlines left <i>in situ</i> .   | 2013             | -                  |
| 1   | 15/21                                     | Removal of FPSO for re-use. Removal of subsea installations to shore for recycling/ disposal. Selective recovery of pipelines.   | 2013             | -                  |
| 2   | 53/1a                                     | Removal of small steel platform to shore for recycling / disposal. Pipelines decommissioned <i>in situ</i> .   | 2012             | 2013               |
| 1   | 31/21, 31/26, 31/27a, 39/1 & 39/2         | Removal of FPSO for re-use. Removal of subsea installations to shore for recycling/ disposal. Full removal of un-trenched pipelines; trenched pipelines decommissioned <i>in situ</i>  | 2012             | -                  |
| 8   | 211/18a                                   | Removal of subsea installation to shore for recycling/ disposal. Selective recovery of pipelines.  | 2011             | -                  |
| 2   | 49/29b & 53/4A                            | Removal of small steel platform for re-use outside of UK waters. Selective recovery of pipelines.  | 2010             | -                  |
| 2   | 49/29b & 49/30d                           | Removal of subsea installation to shore for recycling. Production pipeline with piggy-backed umbilical - leave <i>in situ</i> ; jumpers, spool pieces and associated pipeline equipment - remove to shore for re-use or recycling. | 2010             | 2011               |
| 1   | 22/02b & 22/03a                           | Tow away FPSO for future use at another location. Remove manifold and wellhead to shore for re-use, recycling or disposal. Production pipeline - leave <i>in situ</i> ; umbilical - remove in sections                             | 2010             | 2012               |

Source: <https://www.gov.uk/guidance/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines>

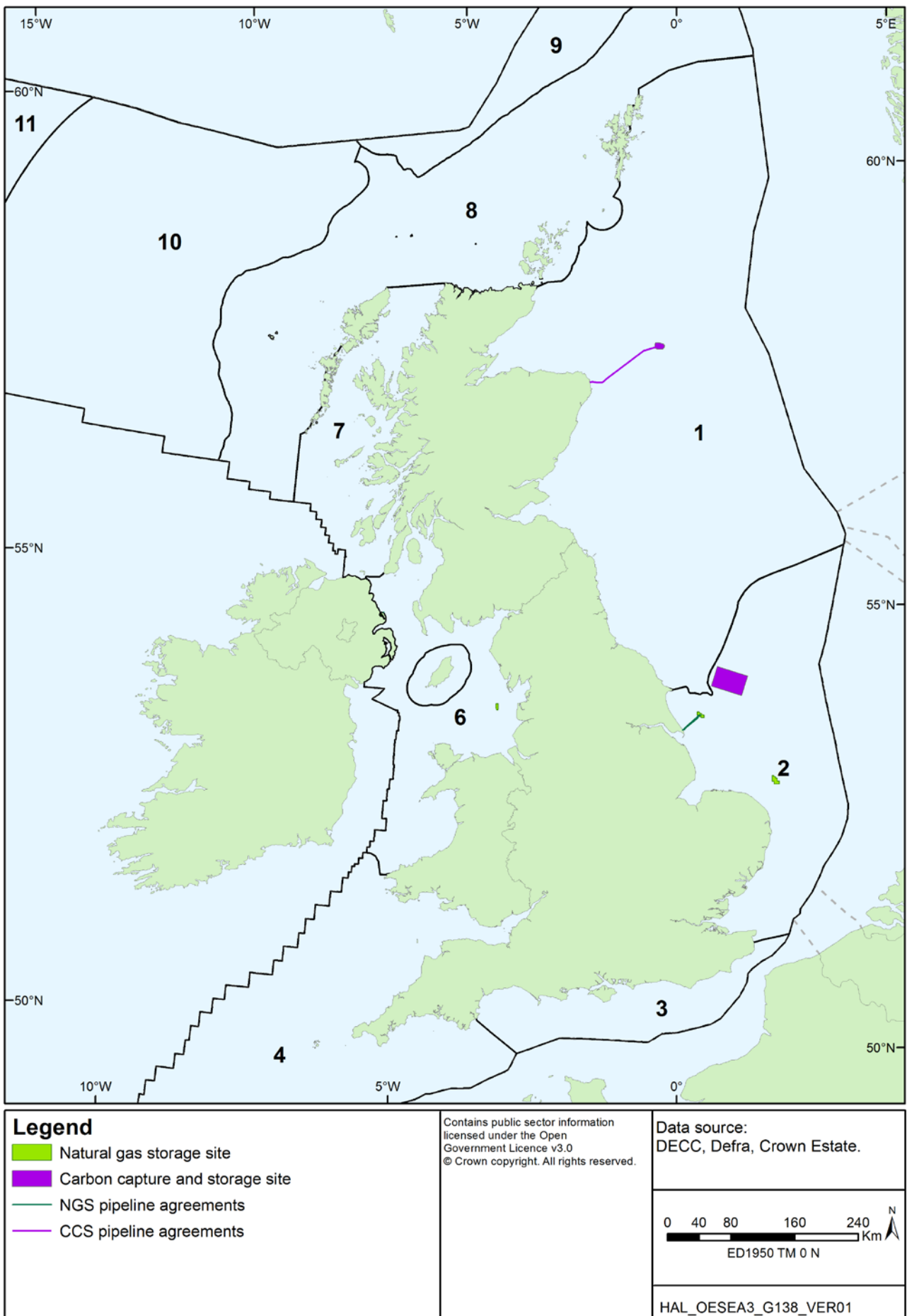
## A1h.7 Gas storage, including carbon dioxide

The use of geological formations (depleted hydrocarbon reservoirs, saline aquifers and halite deposits) for the storage of natural gas and CO<sub>2</sub> produced from power generation and industrial processes is currently at an early stage of development. To date, projects have been proposed for storage in a depleted hydrocarbon reservoir (Peterhead CCS Project) and a saline aquifer (Yorkshire and Humber CCS Transportation and Storage Project). Agreements for lease and carbon dioxide appraisal and storage licences are in place for two areas associated with these projects (Figure A1h.16). Initially, storage sites are likely to focus on relatively well understood and low risk depleted hydrocarbon fields or saline aquifers (see Appendix 1b Geology, Substrates & Coastal Processes).

The Rough Alpha facility located in Block 47/8 (central North Sea) is currently the only offshore gas storage facility (3.3 billion m<sup>3</sup> capacity) in operation in the UK, utilising a depleted gas field. Gas is injected via 24 wells which have been drilled into the reservoir and withdrawn the same way but through up to 29 wells using the internal pressure of the reservoir. Extracted gas undergoes several separation processes offshore before onward subsea transport to the Easington terminal, and after further processing, enters the National Transmission System capable of supplying in excess of 7.5% of peak day demand. There are a number of potential gas storage developments in gas fields in the Irish Sea (e.g. Gateway Storage, using constructed salt caverns is one of a number of projects that have been put on hold or cancelled which also includes the Baird storage project in the North Sea, National Grid 2014a) and southern North Sea (e.g. planning has been granted for ENI's proposed facility at the Deborah field (4.6 billion m<sup>3</sup> capacity) but a final investment decision has not yet been made (National Grid 2014a). UK facilities (onshore and offshore) collectively have approximately 4.8 billion m<sup>3</sup> of storage capacity and a delivery rate of 154 million m<sup>3</sup> per day.

The latest UK risk assessment of security of gas supply (DECC 2014a) indicates that there has been a 25% increase in gas storage capacity in the past 10 years and that potential storage sites with planning permission could at least double current capacity (those in-planning or with planning permission have a combined capacity of 7.8 billion m<sup>3</sup>). Storage capacity in the UK is comparatively less compared to wider Europe, as supply has to date been dominated by domestic supply and an abundance of import infrastructure (DECC 2014a). Whilst new gas import infrastructure may be constructed, domestic gas supply has been in decline in recent years (see above), which is enhancing import dependency, which could reach 90% by 2035 (National Grid 2015c).

Figure A1h.16: Carbon dioxide and gas storage lease/licence areas



## A1h.8 Offshore renewable energy activity

### A1h.8.1 Wind

Table A1h.3 and Figure A1h.17 shows the updated status of the offshore wind developments in UK waters. To date, offshore wind development has followed a series of leasing rounds by The Crown Estate for areas of the seabed for commercial development:

- Round 1 was launched in 2001 and is now almost complete. It involved 18 sites in England and Wales, and added a potential capacity of 1.5GW.
- In 2003, the much larger Round 2 was issued, located further offshore and in deeper waters. It was formed of the three strategic areas; Greater Wash, Greater Thames and Irish Sea and when complete Round 2 will add another 7GW of capacity.
- In 2010 The Crown Estate announced the award of development rights to four Round 1 and Round 2 sites to extend their geographical areas.
- Round 3, released in 2010 is the biggest so far and featured nine zones across the UK. Round 3 is set to enter construction from 2015 onwards and has a total of more than 24GW already leased to developers.
- In addition to Rounds 1, 2 and 3, there was a further development programme in Scottish Territorial Waters overseen by the Scottish government providing the potential for over 2.5GW across 4 sites.
- In 2013, The Crown Estate announced a leasing round for testing and demonstration of emerging offshore wind technologies.

Additionally, Glosten Associates propose to install a demonstrator floating wind turbine based on tension leg foundation technology (PelaStar) at the Wave Hub site off Cornwall, using a Haliade 150-6MW turbine.

**Table A1h.3: Current status of UK offshore wind developments (October 2015)**

| Wind farm                                | Location             | Round         | Capacity (MW) | Number of turbines | Status                   |
|--|----------------------|---------------|---------------|--------------------|--------------------------|
| <b>Regional Sea 1</b>                    |                      |               |               |                    |                          |
| Beatrice Demonstrator Site               | Outer Moray Firth    | Pilot         | 10            | 2                  | In operation             |
| Beatrice                                 |                      | STW           | 664           | 84-86              | Consented                |
| Zone 1 Telford                           |                      | 3             | 372           | 62                 | Consented                |
| Zone 1 Stevenson                         |                      | 3             | 372           | 62                 | Consented                |
| Zone 1 MacColl                           |                      | 3             | 372           | 62                 | Consented                |
| Hywind 2 Demonstration                   | NE Scotland          | Demonstration | 30            | 5                  | Consented                |
| Aberdeen Demonstration                   |                      | Demonstration | 66            | 11                 | Consented                |
| Kincardine                               |                      | Demonstration | 50            | 8                  | Pre-planning             |
| Zone 2 Seagreen Alpha                    | Outer Firth of Forth | 3             | 525           | 75                 | Consented                |
| Zone 2 Seagreen Bravo                    |                      | 3             | 525           | 75                 | Consented                |
| Inch Cape                                |                      | STW           | 784           | 95-110             | Consented                |
| Neart na Gaoithe                         |                      | STW           | 448           | 75                 | Consented                |
| Methil (Samsung) Demo                    | Firth of Forth       | Demonstration | 7             | 1                  | In operation             |
| Methil Demonstration Project - 2B Energy |                      | Demonstration | 14            | 1                  | Pre-planning application |

| Wind farm                    | Location                       | Round                 | Capacity (MW) | Number of turbines | Status                   |              |
|------------------------------|--------------------------------|-----------------------|---------------|--------------------|--------------------------|--------------|
| Blyth                        | NE England                     | 1                     | 4             | 2                  | In operation             |              |
| Blyth Demo                   |                                | Demonstration         | 99            | 15                 | Consented                |              |
| Teesside                     |                                | 1                     | 62            | 27                 | In operation             |              |
| <b>Regional Sea 2</b>        |                                |                       |               |                    |                          |              |
| Zone 3 Creyke Beck A         | Dogger Bank, Central North Sea | 3                     | 1,200         | 200                | Consented                |              |
| Zone 3 Creyke Beck B         |                                | 3                     | 1,200         | 200                | Consented                |              |
| Zone 3 Teesside A            |                                | 3                     | 1,200         | 200                | Consented                |              |
| Zone 3 Teesside B            |                                | 3                     | 1,200         | 200                | Consented                |              |
| Zone 4 Heron Wind            | Central North Sea              | 3                     | 600           | 75-120             | Consented                |              |
| Zone 4 Njord                 |                                | 3                     | 600           | 75-120             | Consented                |              |
| Zone 4 Optimus               |                                | 3                     | 900           | 130                | Awaiting consent         |              |
| Zone 4 Breesea               |                                | 3                     | 900           | 130                | Awaiting consent         |              |
| Zone 4 Hornsea SPC5          |                                | 3                     | 500           | -                  | Pre-planning application |              |
| Zone 4 Hornsea SPC6          |                                | 3                     | 500           | -                  | Pre-planning application |              |
| Zone 4 Hornsea SPC7          |                                | 3                     | 500           | -                  | Pre-planning application |              |
| Zone 4 Hornsea SPC8          |                                | 3                     | 500           | -                  | Pre-planning application |              |
| Westermost Rough             |                                | Humber (Greater Wash) | 2             | 210                | 35                       | In operation |
| Humber Gateway               |                                |                       | 2             | 219                | 73                       | In operation |
| Triton Knoll                 | Greater Wash                   | 2                     | 1,200         | 75-150             | Consented                |              |
| Lynn                         |                                | 1                     | 97            | 27                 | In operation             |              |
| Inner Dowsing                |                                | 1                     | 97            | 27                 | In operation             |              |
| Lincs                        |                                | 2                     | 270           | 75                 | In operation             |              |
| Race Bank                    |                                | 2                     | 580           | 91                 | Consented                |              |
| Dudgeon                      |                                | 2                     | 402           | 67                 | Under construction       |              |
| Sheringham Shoal             |                                | 2                     | 317           | 88                 | In operation             |              |
| Scroby Sands                 |                                | East Anglia           | 1             | 60                 | 30                       | In operation |
| Zone 5 East Anglia One       | 3                              |                       | 714           | 89-102             | Consented                |              |
| Zone 5 East Anglia Three     | 3                              |                       | 1,200         | 172                | Pre-planning application |              |
| Zone 5 East Anglia Four      | 3                              |                       | 1,200         | -                  | Pre-planning application |              |
| Galloper Extension           | Thames                         | Extension             | 340           | 56-68              | Consented                |              |
| Greater Gabbard              |                                | 2                     | 504           | 140                | In operation             |              |
| Gunfleet Sands I             |                                | 1                     | 108           | 30                 | In operation             |              |
| Gunfleet Sands II            |                                | 2                     | 65            | 18                 | In operation             |              |
| Gunfleet Sands Demonstration |                                | Demonstration         | 12            | 2                  | In operation             |              |
| London Array 1               |                                | 2                     | 630           | 175                | In operation             |              |
| Kentish Flats 1              |                                | 1                     | 90            | 30                 | In operation             |              |
| Kentish Flats 2              |                                | Extension             | 50            | 15                 | Under construction       |              |
| Thanet                       |                                | 2                     | 300           | 100                | In operation             |              |

| Wind farm                            | Location          | Round                            | Capacity (MW)                | Number of turbines | Status             |              |
|--------------------------------------|-------------------|----------------------------------|------------------------------|--------------------|--------------------|--------------|
| <b>Regional Sea 3</b>                |                   |                                  |                              |                    |                    |              |
| Zone 6 Rampion                       | English Channel   | 3                                | 400                          | 116                | Consented          |              |
| Zone 7 Navitus Bay                   |                   | 3                                | 970 (630 TAMO <sup>6</sup> ) | 121                | Consent refused    |              |
| <b>Regional Sea 4</b>                |                   |                                  |                              |                    |                    |              |
| WaveHub deployment                   | PelaStar          | North Cornwall                   | Demonstration                | 6                  | 1                  | Pre-planning |
| <b>Regional Sea 6</b>                |                   |                                  |                              |                    |                    |              |
| Rhyl Flats                           | Eastern Irish Sea | 1                                | 90                           | 25                 | In operation       |              |
| Gwynt y Mor                          |                   | 2                                | 576                          | 160                | In operation       |              |
| North Hoyle                          |                   | 1                                | 60                           | 30                 | In operation       |              |
| Burbo Bank                           |                   | 1                                | 90                           | 25                 | In operation       |              |
| Burbo Bank Extension                 |                   | Extension                        | 258                          | 32                 | Under construction |              |
| West of Duddon Sands                 |                   | 2                                | 389                          | 108                | In operation       |              |
| Barrow                               |                   | 1                                | 90                           | 30                 | In operation       |              |
| Ormonde                              |                   | 1                                | 150                          | 30                 | In operation       |              |
| Walney 1                             |                   | 2                                | 184                          | 51                 | In operation       |              |
| Walney 2                             |                   | 2                                | 184                          | 51                 | In operation       |              |
| Walney Extension                     |                   | Extension                        | 660                          | 90                 | Consented          |              |
| Robin Rigg East                      |                   | Eastern Irish Sea - Solway Firth | 1                            | 90                 | 30                 | In operation |
| Robin Rigg West                      |                   |                                  | 1                            | 90                 | 30                 | In operation |
| <b>Regional Sea 8</b>                |                   |                                  |                              |                    |                    |              |
| Dounreay Offshore Development Centre | Floating Wind     | North Scotland                   | Demonstration                | 30                 | 5                  | Pre-planning |

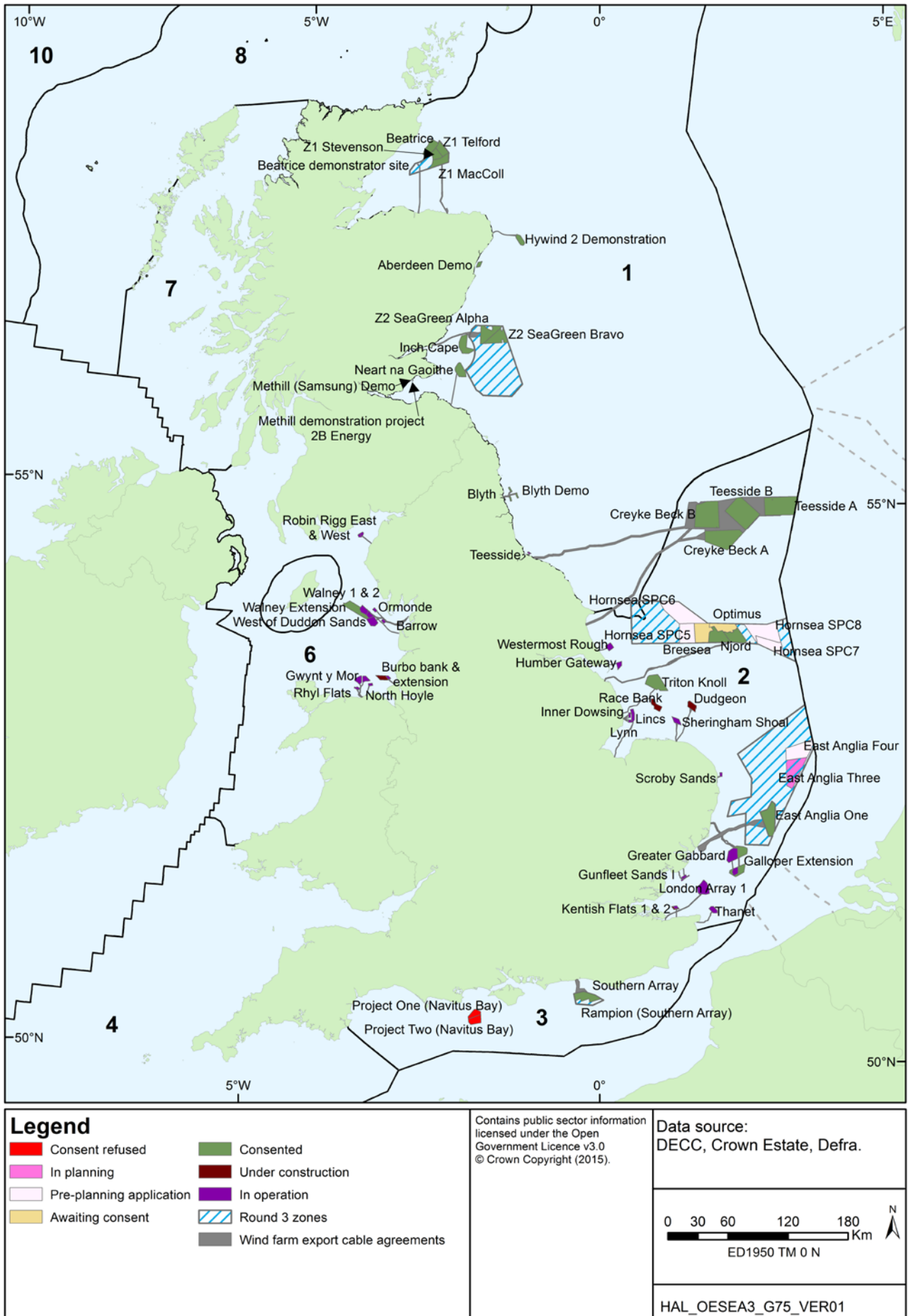
Source: The Crown Estate data as at 17<sup>th</sup> September 2015. The Crown Estate (2015b) Energy and infrastructure key facts 2015-16: UK offshore wind.

Electricity generated by offshore wind increased from 11,472GWh in 2013 to 13,404GWh in 2014, an increase of ca. 17%. Generation for the most recent quarter (Q2 2015) was 3,565GWh (provisional figure) which represents a 70% increase over the same quarter in 2014 (2,092GWh). This was due to a combination of higher wind speeds compared to the previous year<sup>7</sup> and also increased capacity. Cumulative installed capacity increased by ca. 22% between 2013 (3,696MW) and 2014 (4,501MW). The cumulative installed capacity for the most recent quarter (Q2 2015, 5,025MW, provisional figure) represented a 23% increase over that from the same quarter in 2014 (DECC Energy Trends Section 6 – Renewables <https://www.gov.uk/government/statistics/energy-trends-section-6-renewables>, accessed October 2015). Electricity production by UK offshore wind is provided hourly by The Crown Estate offshore wind electricity map (<http://www.thecrownestate.co.uk/energy-and-infrastructure/offshore-wind-energy/offshore-wind-electricity-map/>).

<sup>6</sup> The Applicant submitted a Turbine Area Mitigation Option to provide a mechanism to approve a reduced number of turbines.

<sup>7</sup> Although average wind speeds in 2015 Q2 were only marginally higher than the ten year mean (8.6 knots and 8.4 knots respectively), wind speeds for 2014 Q2 were the second lowest for quarter two since 2010.

Figure A1h.17 – Wind energy activity and leasing areas



## A1h.8.2 Other marine renewables

Wave and tidal stream development has followed a series of leasing rounds by The Crown Estate for areas of the seabed for test and demonstration projects as well as for commercial development:

- In 2010, the first commercial wave and tidal stream leasing round for ten sites in Scotland's Pentland Firth and Orkney waters was undertaken. 1.2 GW of installed capacity was proposed by the wave and tidal energy developers for 2020, 600MW each from wave and tidal energy.
- Further wave and tidal stream leasing was undertaken in 2013 focussing on test and demonstration projects. Third party organisations were invited to manage them and sublet areas within the zones for test and demonstration activities.
- In September 2015, The Crown Estate announced a new leasing for small-scale wave and tidal stream sites focussed on areas where the existing test and demonstration sites or zones are not fulfilling specific site conditions of a particular technology type or where there is a local development opportunity at a small scale.

### A1h.8.2.1 Tidal Stream Projects

Table A1h.4 and Figure A1h.18 provide summary details of current tidal stream projects within UK waters and their status in terms of development and deployment.

**Table A1h.4: Current status of UK tidal stream projects (October 2015)**

| Project                              | Type of project           | Installed capacity (MW) | Status             |
|--------------------------------------|---------------------------|-------------------------|--------------------|
| <b>Regional Sea 3</b>                |                           |                         |                    |
| Perpetuus Tidal Energy Centre (PTEC) | Managed test facility     | 20                      | Under construction |
| Portland Bill                        | Commercial                | 30                      | In planning        |
| <b>Regional Sea 4</b>                |                           |                         |                    |
| North Devon Demonstration Zone       | Demonstration zone        | -                       | In planning        |
| Ramsey Sound                         | Engineering demonstration | 1.2                     | Pre-construction   |
| St David's Head                      | Commercial demonstration  | 10                      | In development     |
| <b>Regional Sea 6</b>                |                           |                         |                    |
| West Anglesey Demonstration Zone     | Demonstration zone        | -                       | In development     |
| Holyhead Deep                        | Commercial demonstration  | 10                      | In development     |
| Skerries                             | Commercial demonstration  | 10                      | Pre-construction   |
| Strangford Lough Array               | Commercial                | 20                      | In development     |
| Strangford Lough                     | Engineering demonstration | Not grid connected      | Operational        |
| Seagen Strangford Lough              | Engineering demonstration | 1.2                     | Operational        |
| Torr Head                            | Commercial                | 100                     | In planning        |
| Fair Head                            | Commercial                | 100                     | In development     |
| Mull of Galloway                     | Commercial                | 30                      | In development     |
| Sanda Sound                          | Engineering demonstration | 0.035                   | Under construction |
| <b>Regional Sea 7</b>                |                           |                         |                    |
| Mull of Kintyre                      | Engineering demonstration | 3                       | In planning        |



| Project                    | Type of project           | Installed capacity (MW) | Status                             |
|----------------------------|---------------------------|-------------------------|------------------------------------|
| Isle of Islay (West Islay) | Commercial                | 30                      | In planning                        |
| Islay Demonstration Zone   | Demonstration zone        | -                       | In planning                        |
| Sound of Islay             | Commercial demonstration  | 10                      | Pre-construction                   |
| Kyle Rhea                  | Commercial demonstration  | 8                       | Application withdrawn <sup>8</sup> |
| Regional Sea 8             |                           |                         |                                    |
| Inner Sound                | Commercial                | 400                     | Under construction                 |
| Ness of Duncansby          | Commercial                | 100                     | In development                     |
| Brough Ness                | Commercial                | 100                     | In development                     |
| Brims Tidal Array          | Commercial                | 200                     | In development                     |
| Shapinsay Sound            | Managed test facility     | -                       | Operational                        |
| Stronsay Firth             | Managed test facility     | -                       | In planning                        |
| Fall of Warness            | Managed test facility     | -                       | Operational                        |
| Westray South              | Commercial                | 200                     | In development                     |
| Lashy Sound                | Commercial                | 30                      | In development                     |
| Bluemull Sound             | Engineering demonstration | 0.5                     | Under construction                 |

Source: The Crown Estate data as at 17<sup>th</sup> September 2015. The Crown Estate (2015a) Energy and infrastructure key facts 2015-16: UK ocean energy.

### A1h.8.2.2 Wave energy projects

Table A1h.5 and Figure A1h.19 provide summary details of current wave projects within UK waters and their status in terms of development and deployment.

#### Figure A1h.5: Current status of UK wave energy projects (October 2015)

| Project                                | Type of project          | Potential capacity (MW)                                      | Status                |
|--|--------------------------|--|-----------------------|
| Regional Sea 4                         |                          |  |                       |
| FabTest, Falmouth Bay                  | Managed test facility    | Full scale sea trials only, not planned to be grid connected | Operational           |
| Wave Hub                               | Managed test facility    | -  | Operational           |
| North Cornwall Demonstration Zone      | Demonstration zone       | -  | In development        |
| South Pembrokeshire Demonstration Zone | Demonstration zone       | -  | In planning           |
| Regional Sea 8                         |                          |  |                       |
| Harris Demonstration Zone              | Demonstration zone       | -  | In development        |
| Bernera, Isle of Lewis                 | Commercial demonstration | 10   | Agreement terminating |
| Galson, Isle of Lewis                  | Commercial demonstration | 10   | Pre-construction      |
| North West Lewis                       | Commercial               | 30   | Pre-construction      |
| Scapa Flow                             | Managed test facility    | -  | Operational           |
| Billa Croo                             | Managed test facility    | -  | Operational           |
| Brough Head                            | Commercial               | 200  | In development        |

Source: The Crown Estate data as at 17<sup>th</sup> September 2015. The Crown Estate (2015a) Energy and infrastructure key facts 2015-16: UK ocean energy.

<sup>8</sup> <http://www.gov.scot/Topics/marine/Licensing/marine/scoping/MCT>

Figure A1h.18 – Tidal stream activity and leasing areas

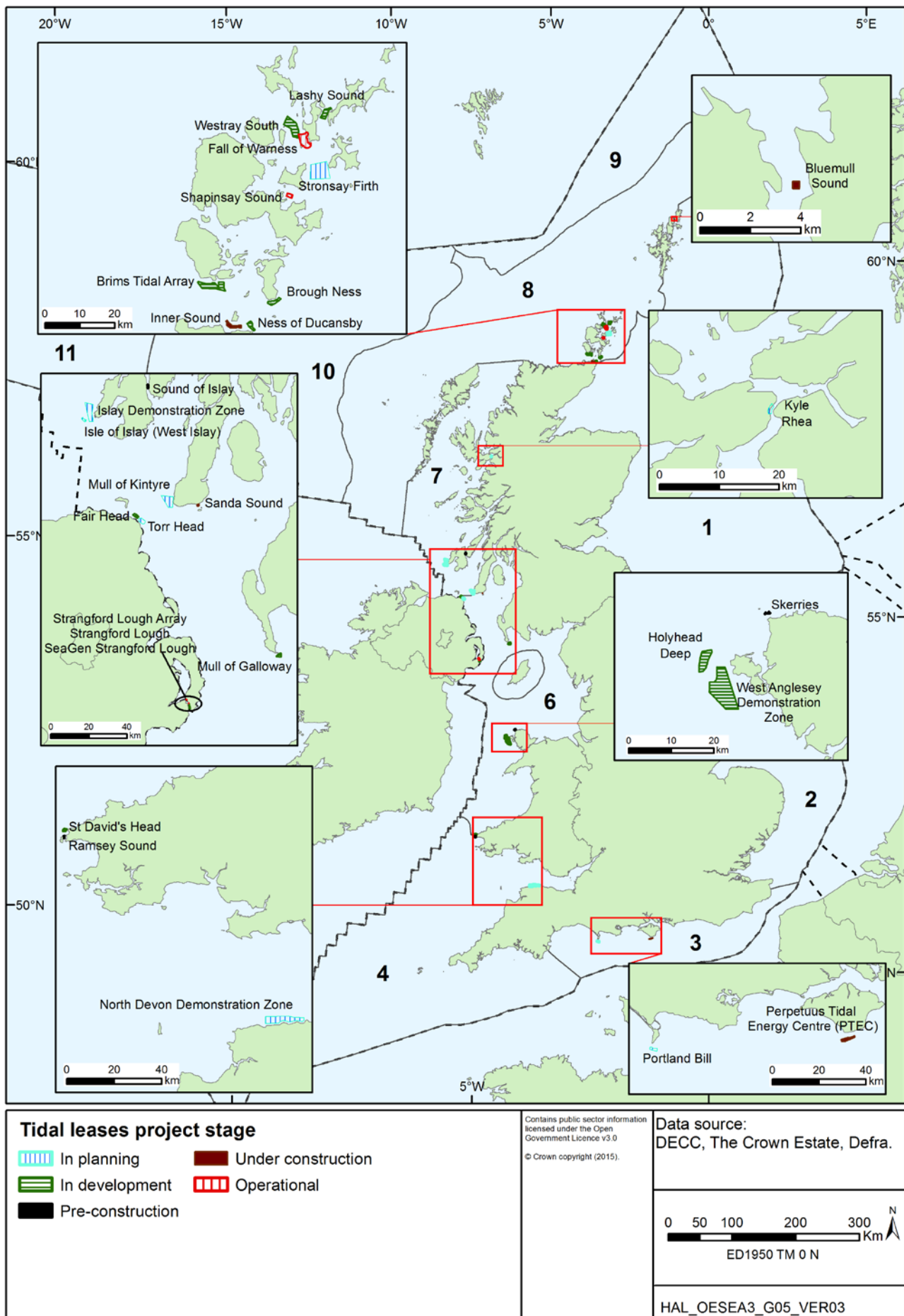
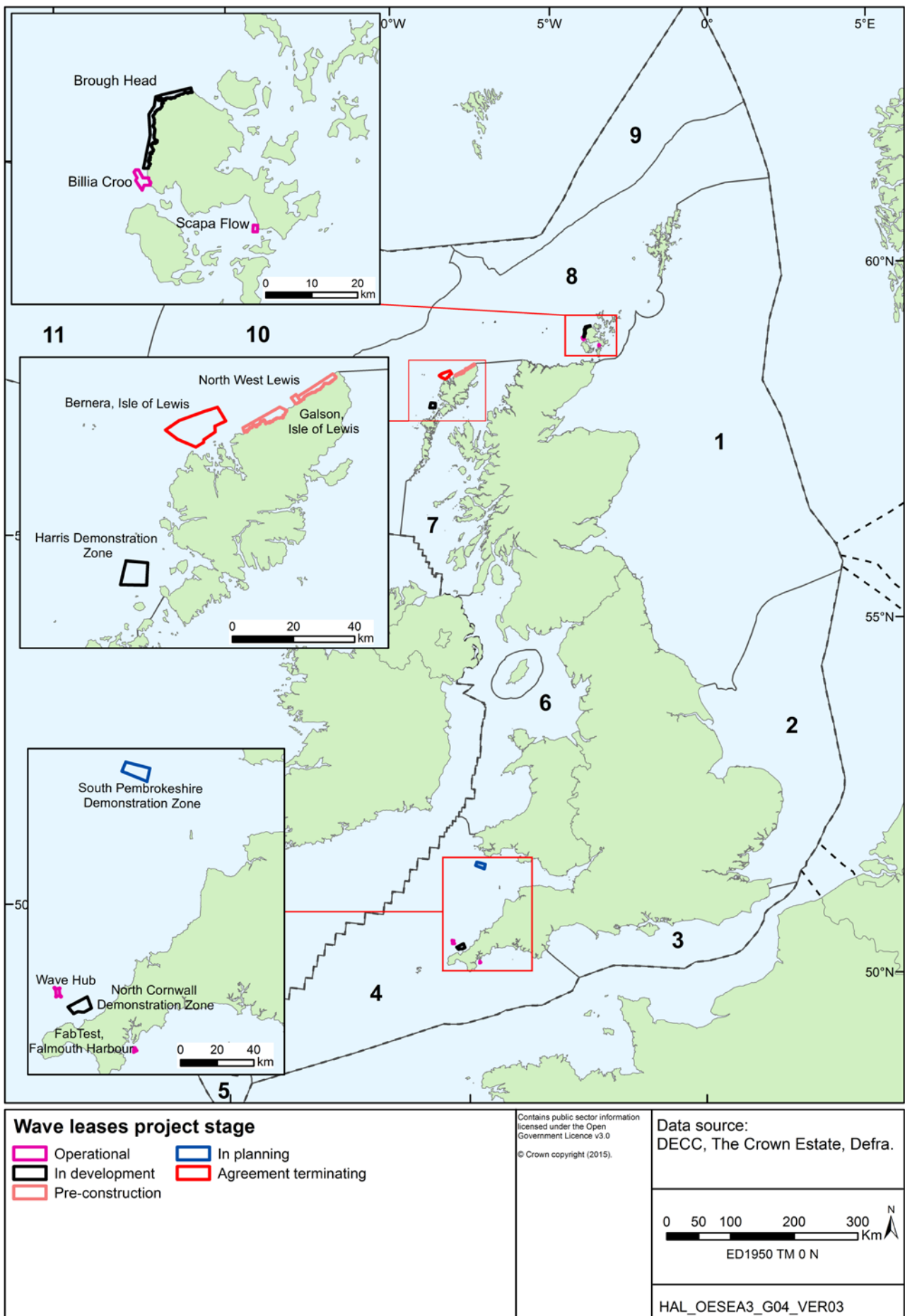


Figure A1h.19: Wave energy activity and leasing areas



### A1h.8.2.3 Tidal range projects

Currently only one tidal range project, the Tidal Lagoon Swansea Bay has been granted a development consent order (June 2015). The consent order is for the construction of a tidal lagoon enclosed by ca. 9.6km seawall and containing up to 16 hydro-turbines with a gross combined installed generating capacity of 320MW<sup>9</sup>. No lease has yet been awarded for the project, and in the UK Government announced a review of tidal lagoon in February 2016 to understand how they could contribute to the UK energy mix.

A pre-application scoping report seeking an opinion for another proposed tidal lagoon in Cardiff Bay was submitted to the National Infrastructure Planning Inspectorate in March 2015<sup>10</sup>. The proposed lagoon would consist of a ca. 25km long breakwater extending 8km offshore with approximately 60-90 turbines with an expected generating capacity of 1,800 to 2,800MW.

The DECC Severn Tidal Power Feasibility Study (STPFS), concluded in 2010<sup>11</sup> and included a cost-benefit analysis of five short-listed tidal power schemes for the Severn Estuary, examining a variety of tidal technologies including barrages, lagoons and fences. Of these schemes, the Cardiff-Weston tidal barrage was identified as offering best value for money, although it was also found to be the most environmentally damaging of the schemes put forward. At the time, the Government did not see a strategic case for public investment in a Severn tidal power scheme, although it did not preclude a privately-financed scheme coming forward. The Energy and Climate Change Committee undertook an inquiry into private sector plans to construct a tidal barrage across the Severn, concentrating on the proposals from the Hafren Power Company for an 18km tidal barrage between Brean in England and Lavernock Point in Wales. The inquiry concluded that the project was still at a relatively early stage of development and would require further work before it could be taken further. The Committee's final report was published in June 2013<sup>12</sup>.

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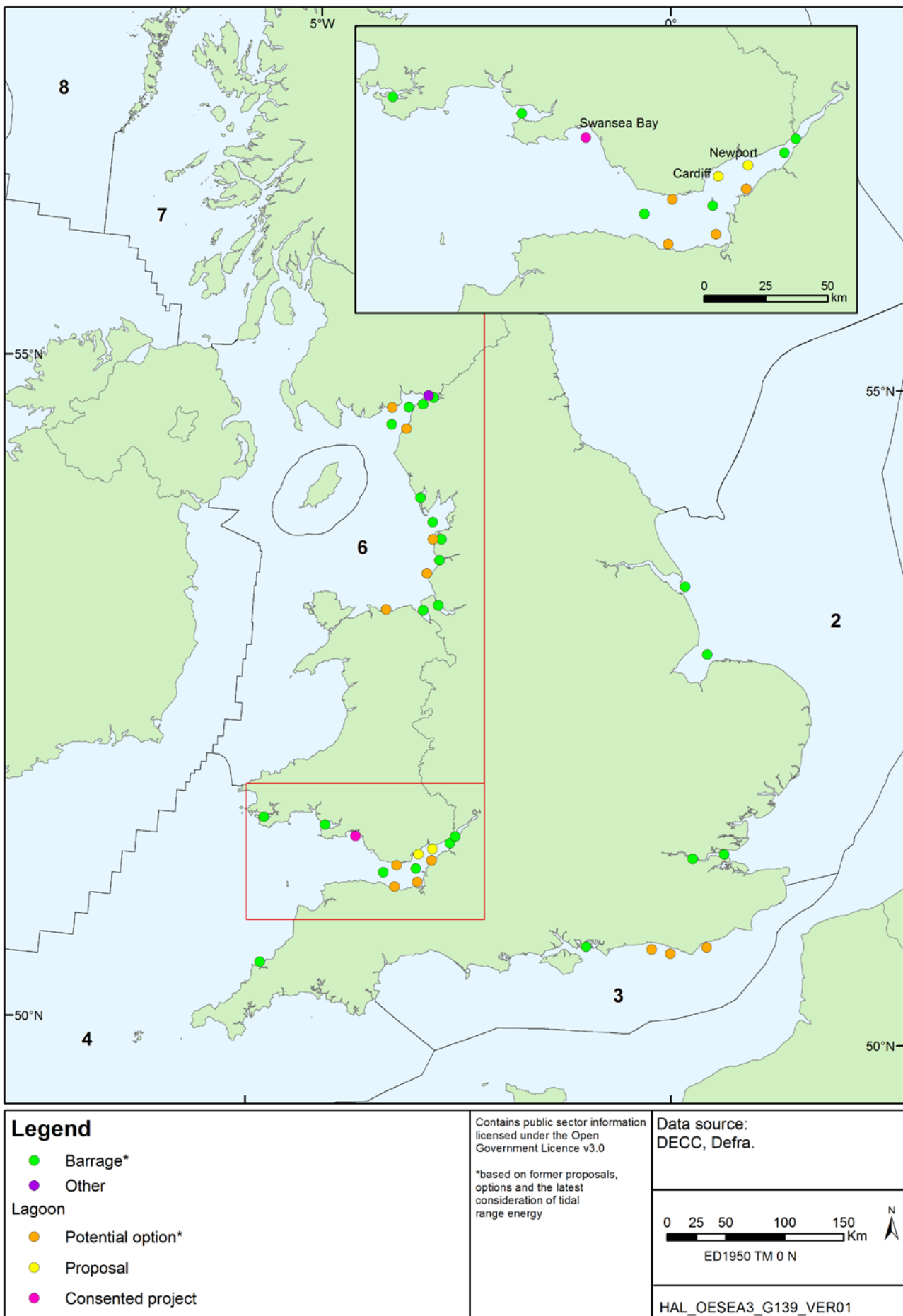
<sup>9</sup> [http://www.legislation.gov.uk/uksi/2015/1386/pdfs/uksi\\_20151386\\_en.pdf](http://www.legislation.gov.uk/uksi/2015/1386/pdfs/uksi_20151386_en.pdf)

<sup>10</sup> <http://infrastructure.planninginspectorate.gov.uk/projects/wales/tidal-lagoon-cardiff/?ipcsection=docs>

<sup>11</sup> <https://www.gov.uk/government/collections/severn-tidal-power-feasibility-study-conclusions>

<sup>12</sup> <http://www.parliament.uk/business/committees/committees-a-z/commons-select/energy-and-climate-change-committee/inquiries/parliament-2010/a-severn-barrage/>

Figure A1h.20: Former and existing proposals for tidal range projects



## A1h.9 Electricity network

### A1h.9.1 Electricity supply

There are three main components to the supply of electricity in the UK, these are:

- Generation, dominated by large power stations
- The transmission network or National Grid which transmits electricity across the UK from power stations via high voltage (400kV and 275kV) overhead lines
- Regional distribution networks of overhead lines and cables delivering lower voltage power (from 132kV to 230kV) from the grid to consumers

Offshore wind farms are linked to the National Grid via export cables and onshore substations allowing the electricity that is generated to be delivered to consumers.

### A1h.9.2 The National Grid

The UK National Grid is made up of four transmission networks. The largest in terms of length and share of total transmission covers England and Wales and is owned by National Grid. There are two networks in Scotland owned by Scottish Power and Scottish and Southern Energy, and one in Northern Ireland owned by Northern Ireland Electricity. National Grid is the National Electricity Transmission System Operator (NETSO) for Great Britain and manages the flow of electricity across National Electricity Transmission System (NETS).

The transmission network (Figure A1h.21) is used to transport electricity from generation plants to areas of demand. Much of the network was built in the 1950-60s when large coal-fired power stations constructed close to mines were a primary form of electricity generation. As a consequence of this, the grid is heavily reinforced in former coal mining regions (Regional Seas 1 & 2) with fewer high voltage lines in areas like north west Scotland (Regional Sea 7) and mid-Wales (Regional Sea 6). Scotland and Wales are both net exporters of electricity, with England importing electricity from both countries and from continental Europe (via the France and Netherlands interconnectors) – Northern Ireland is similarly a net exporter and trades electricity with the Republic of Ireland (DECC 2014b). Overhead interconnectors connect the Scottish network to England and subsea interconnectors exist between Scotland and Ireland.

### A1h.9.3 UK network development and capacity

A former study undertaken for OESEA (National Grid 2008) looked at the potential of connecting up to 25GW of offshore wind generation to the onshore grid, and indicated that for two scenarios (one agreed with DECC with input from The Crown Estate, and other reflecting National Grid's contracted position) there was a deficit in capacity in almost all areas of the country, but that there was sufficient capacity in the current system to accommodate 10GW without significant system reinforcement (taking into account closures of conventional plants and greater sharing of system capacity for wind generation).

The latest Network Development Policy Update (2013)<sup>13</sup> indicates how National Grid will make decisions about the reinforcement of wider transmission system boundaries including decisions

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<sup>13</sup> [http://www.nationalgrid.com/NR/rdonlyres/034CF928-2052-41CD-90FF-A2623B375FF2/60854/2012\\_NGET\\_Network\\_Development\\_Policy\\_Resubmissionproposedver41\\_HR.pdf](http://www.nationalgrid.com/NR/rdonlyres/034CF928-2052-41CD-90FF-A2623B375FF2/60854/2012_NGET_Network_Development_Policy_Resubmissionproposedver41_HR.pdf)

about anticipating customer requirements for transmission capability. This document along with the System Operability Framework (National Grid 2014b) and the Electricity Ten Year Statement (National Grid 2015a) are underpinned by the Future Energy Scenarios (FES) publication (National Grid 2015b). The latest FES scenarios can be summarised as:

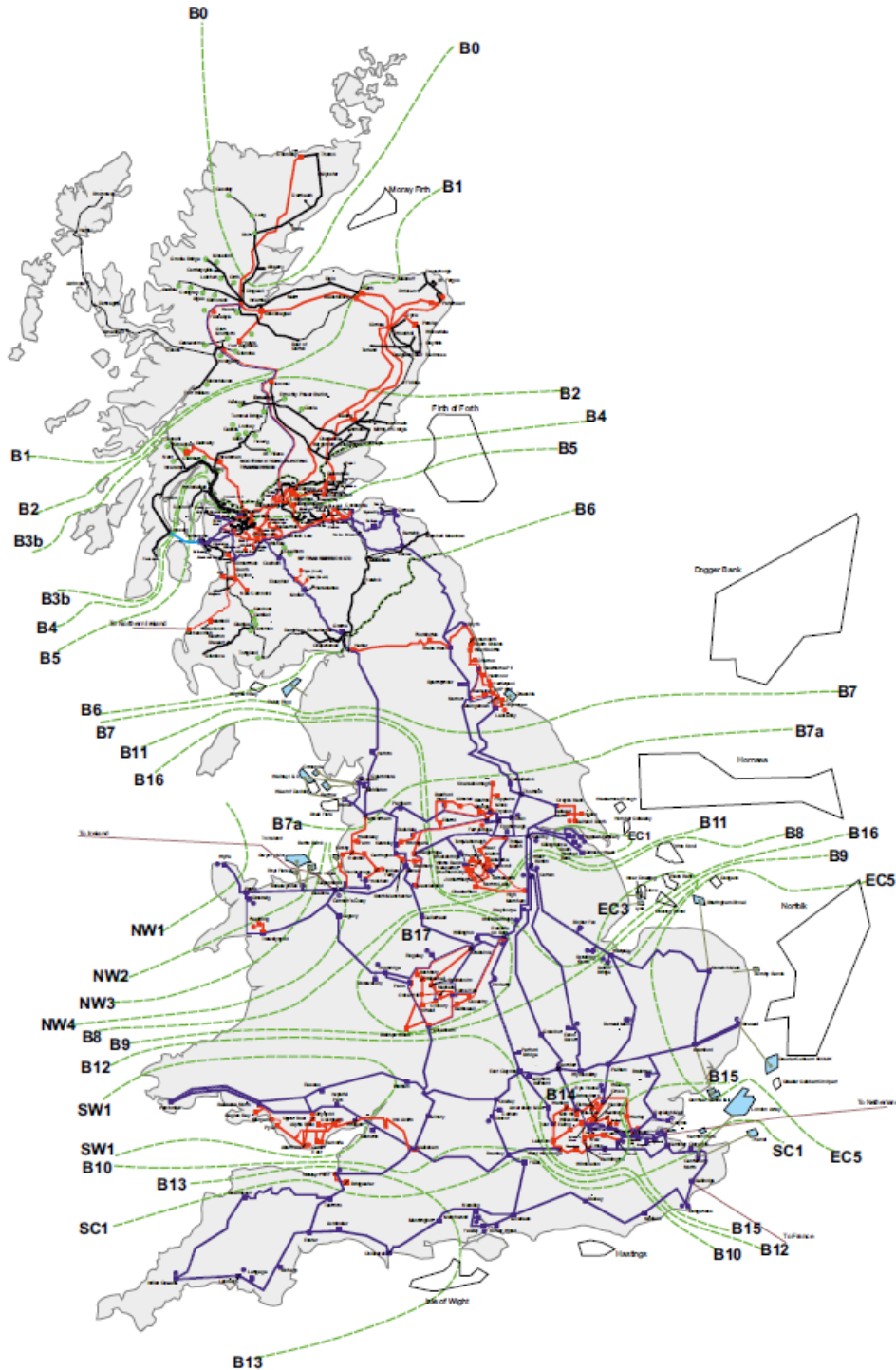
- **Gone Green** is a world where green ambition is not restrained by financial limitations. New technologies are introduced and embraced by society, enabling all carbon and renewable targets to be met on time.
- **Slow Progression** is a world where slower economic growth restricts market conditions. Money that is available is spent focusing on low cost long-term solutions to achieve decarbonisation, albeit it later than the target dates.
- **No Progression** is a world focused on achieving security of supply at the lowest possible cost. With low economic growth, traditional sources of gas and electricity dominate and there is limited innovation changing how we use energy.
- **Consumer Power** is a world of relative wealth, fast paced research and development and spending. Innovation is focused on meeting the needs of consumers, who focus on improving their quality of life.

The latest ETYS (National Grid 2015a) acknowledges the currently installed renewables capacity and the development in the existing system to accommodate it over the next 5 years as part of its future energy scenarios termed the “contracted background” (see Figure A1h.22). This includes all existing and new contracted generation (i.e. that which has contractual agreement with the NETSO for access rights to the NETS) dated to June 2015. National Grid (2015a) indicate that over the next 5 years this will be dominated by renewables deployment and in particular offshore wind, with gas-fired and nuclear energy dominating traditional forms of energy having strong build-out programmes for the next 10 years. The installed capacity for offshore wind by 2020 as part of this scenario appear to be largely consistent with that of present UK Government decarbonisation goals, that of 10GW by 2020. Whilst the 2015 ETYS indicates that reinforcements have been required in the north and east of the system to support wind power expansion, the 2014 statement acknowledged that continued delay of offshore wind developments and new nuclear has deferred the need for many network development projects which were identified, but that significant investment would still be required to meet scenario needs beyond 2020.

A separate Network Options Assessment (NOA) will be published in March 2016, which will include preferred options for grid reinforcements and the 2015 ETYS provides some indications of what is planned. The boundary requirements (i.e. that required to transfer forecast electricity generation across certain boundaries in the UK – boundaries referred to in the ETYS are those shown in Figure A1h.21) are expected increase in the north, particularly in Scotland, due to an expected increase in renewable energy being connected to the system in the coming years (both onshore and offshore), particularly in the central belt and borders given the direction of energy transfer. Certain other areas such as East Anglia may also have greater capability requirements in the near term given preferred location of wind farm landfalls and new nuclear, however other areas such as the Humber the transfer increase from offshore sources is offset somewhat by the expected closure of conventional plants. Similarly, expected connection of renewables (tidal and wind) and new nuclear is expected to require new transmission capacity in North and South Wales. Other drivers for grid reinforcements in the south come from the ability to handle new interconnectors (see below). The export requirements across the network

depend on the scenario being considered, in some cases deviating depending on expected nuclear or renewable connection timing.

**Figure A1h.21: National Grid transmission network and ETYS boundaries**



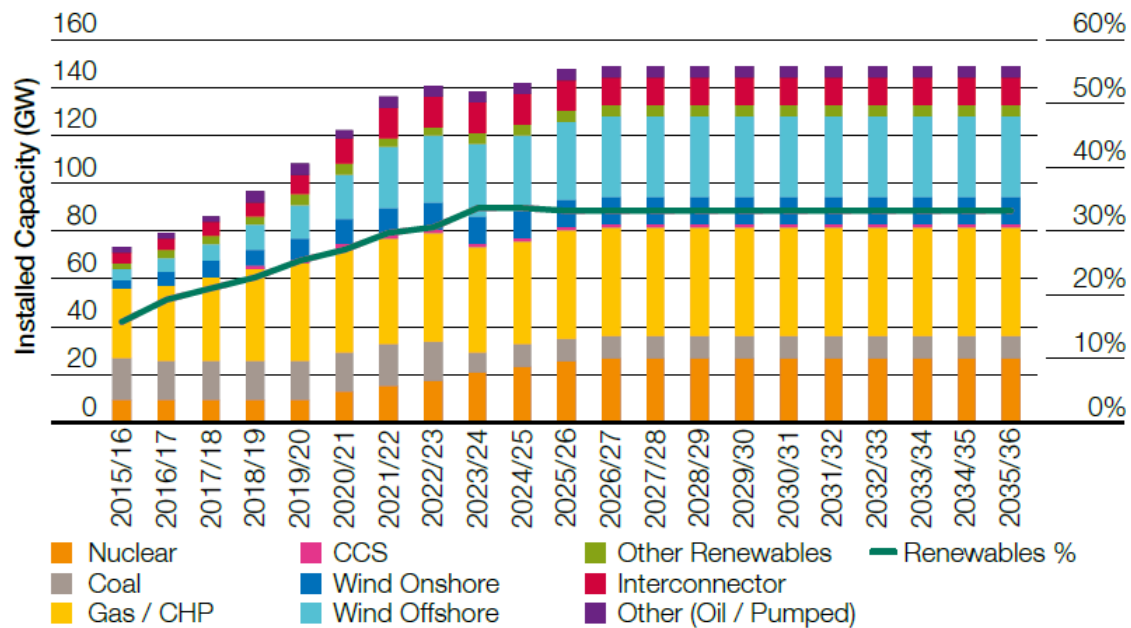
Source: National Grid (2015a)

The Integrated Offshore Transmission Project (IOTP), a joint project between National Grid and the developers of the Dogger Bank, Hornsea and East Anglia projects, has been considering system requirements, technology and commercial frameworks in order to try and provide a prediction of integrated offshore development from now up to 2030. This was informed by two of the FES scenarios (gone green and slow progression) and another two based on



Transmission Entry Capacity and that agreed with industry. 12 designs were agreed to proceed to cost benefit analysis after which the project will be subject to industry consultation.

**Figure A1h.22: ETYS scenario: Contractual background**



Source: National Grid (2015a)

#### A1h.9.4 Offshore grid connections and networks

Bringing electricity onshore from offshore wind farms to the point of use requires a link to the National Grid transmission system which may involve the construction of new onshore cables and substations or substation upgrades allowing the electricity supply to be transformed to the correct voltage for the National Grid. There are currently 30 operational offshore wind farms (including extensions and demonstration projects) each with connections to the National Grid (see Table A1h.3), and agreements for lease are in place for cable routes for wind farms yet to be constructed (Figure A1h.21). National Grid & The Crown Estate (2011) noted a number of benefits to the potential development of a coordinated offshore grid to bring electricity onshore from Round 3 developments (e.g. reduced overall consenting burden on offshore wind operators, lower costs, reduced number of landfalls) but that a number of challenges exist such as the uncertainty associated with wind deployment rate and technology development.

A Memorandum of Understanding was signed in 2010 formalising the regional cooperation of 10 North Sea countries in the development of a possible offshore electricity grid in the greater North Sea, termed the North Seas Countries' Offshore Grid Initiative (NSCOGI). The countries are Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden, Norway and the United Kingdom. Three working groups make up the initiative which is steered by a project board, these groups are: Grid configuration, Regulatory issues, and Planning and Permitting. Transmission System Operators (TSOs) have completed a grid study (NSCOGI 2012) which suggested multi-lateral cooperation was the right way to proceed, and that the economic effectiveness of a meshed grid increases in line with offshore wind development. Building on this work, it was decided that there would also be increased engagement of

NSCOGI in TSO work relating to the ENTSO-E<sup>14</sup> 2014 Ten Year Network Development Plan (TYNDP) as there are clear synergies between these initiatives. The TYNDP fulfils the requirements of Regulation EC 714/2009 on conditions for access to the network for cross-border exchanges in electricity, which under Regulation EU 347/2013 on guidelines for trans-European energy infrastructure (the TEN-E Regulations)<sup>15</sup>, should incorporate Projects of Common Interest (PCIs). The Regulations streamline permitting processes for PCIs that have been agreed by Member State's Regional Groups to ensure that they are not unduly delayed through slow planning consent procedures in Member States and will also give the developers of PCIs access to European funding (e.g. the Connecting Europe Facility)<sup>16</sup>. It also identifies 4 priority electricity corridors which include a Northern Seas offshore grid incorporating the North Sea, the Irish Sea, the English Channel, the Baltic Sea and neighbouring waters. The DECC (2014c) "*Manual of Procedures: The permitting process for Projects of Common Interest in the UK*" provides useful information on the relevant UK consenting regimes.

A number of studies have been undertaken to assist in determining the potential for offshore-onshore grid connections, including meshed grids in relation to wider North Sea offshore renewable energy production (see EC 2014, National Grid 2014a), with ongoing work in relation to the latter (e.g. the Commission project, *Environmental Baseline Study: Development of Renewable Energy Sources, Energy Storages and Meshed Electricity Grid in North and Irish Seas*).

In December 2014, the European Commission adopted its Work Programme for 2015<sup>17</sup>; one of its key priorities is to build a European Energy Union. To this end, the EC published Communication COM(2015)80, "*A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*"<sup>18</sup> in February 2015 setting out the key actions to be taken in order to ensure energy supply security, reduce dependence on imports from third countries, further integrate national energy markets and improve participation of consumers, enhance energy efficiency, decarbonise the energy mix and promote research and innovation in the energy field. A specific minimum interconnection target has been set for electricity at 10% of installed electricity production capacity of each Member State<sup>19</sup>, to be achieved by 2020. Measures to achieve this 10% target were set out in Commission Communication COM(2015)82 presented as part of the Energy Union Strategic Framework. The UK (at 6%) is one of 12 Member States which remain below the 10% electricity interconnection target. The State of the Energy Union report, COM(2015) 572, provided an overview of progress over the nine months since framework was created, and identifies key issues that require specific attention in 2016<sup>20</sup> and in 2016, the Commission will report on the necessary measures to reach a 15% target by 2030.

Existing interconnectors on the UKCS, projects listed on the latest TYNDP and PCIs are shown in Table A1h.6.

<sup>14</sup> European Network of Transmission System Operators for Electricity – represents 41 TSOs from 34 countries and has the main objectives of integrating renewable energy sources and completing the internal energy market. <https://www.entsoe.eu/about-entso-e/>

<sup>15</sup> <https://www.gov.uk/government/speeches/designation-of-decc-secretary-of-state-as-competent-authority-for-ten-e>, [http://ec.europa.eu/energy/infrastructure/transparency\\_platform/map-viewer/](http://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/)

<sup>16</sup> Regulation 1316/2013 establishing the Connecting Europe Facility

<sup>17</sup> [http://ec.europa.eu/priorities/work-programme/index\\_en.htm](http://ec.europa.eu/priorities/work-programme/index_en.htm)

<sup>18</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2015:80:FIN>

<sup>19</sup> Originally advocated by the Barcelona European Council in 2002 within a 2005 timeframe -

[http://ec.europa.eu/invest-in-research/pdf/download\\_en/barcelona\\_european\\_council.pdf](http://ec.europa.eu/invest-in-research/pdf/download_en/barcelona_european_council.pdf)

<sup>20</sup> <https://ec.europa.eu/energy/en/news/energy-union-track-deliver>

In August 2014 Ofgem put in place a new regulated route for near term interconnector investment – the 'cap and floor' regime. Under the cap and floor approach developers identify, propose and build interconnectors and there is a cap and floor mechanism to regulate how much money a developer can earn<sup>21</sup>. The approach was first developed for project Nemo, the proposed interconnector between Belgium and UK, and the FAB Link, IFA2, Viking Link and Greenlink interconnectors have been granted a cap and floor regime in principle. A second window to apply for cap and floor regulation is due to take place in 2016. As an alternative to the cap and floor regulatory regime in UK, developers can seek exemptions from EU and domestic regulatory requirements<sup>22</sup> (as in the case of the ElecLink project).

Submarine power cables have their highest densities in the southern North Sea, South West Approaches, Bristol Channel, Irish Sea and North Channel – Figure A1h.23. The UK interconnector capacity is presently 3.8GW, and several interconnectors are planned for areas around the UK over the coming years, potentially delivering up to 7.5GW of additional electricity capacity.

**Table A1h.6: Operation interconnectors and those listed as PCIs and/or TYNDP projects**

| RS                                 | Name                       | Connection       | Capacity (MW)   | PCI | TYNDP | Anticipated operational date |
|------------------------------------|----------------------------|------------------|-----------------|-----|-------|------------------------------|
| <b>Operational Interconnectors</b> |                            |                  |                 |     |       |                              |
| 2                                  | BritNed                    | Netherlands      | 1,200           |     |       |                              |
| 3                                  | IFA                        | France           | 2,000           |     |       |                              |
| 6                                  | Moyle                      | Northern Ireland | 450 to 295 from |     |       |                              |
| 6                                  | EWIC                       | Ireland          | 500             |     |       |                              |
| 6                                  | Isle of Man Interconnector | Isle of Man      | 74              |     |       |                              |
| <b>PCI or TYNDP Projects</b>       |                            |                  |                 |     |       |                              |
| 1                                  | NorthConnect               | Norway           | 1,400           |     | ✓     | 2022                         |
| 1                                  | NSN                        | Norway           | 1,400           | ✓   | ✓     | 2019                         |
| 1                                  | NorthConnect               | Norway           | 1,400           |     | ✓     | ~2022                        |
| 2                                  | Nemo                       | Belgium          | 1,000           | ✓   | ✓     | 2019                         |
| 2                                  | Viking Link                | Denmark          | 1,000           |     | ✓     | 2020                         |
| 2                                  | Belgium-GB2                | Belgium          | 1,000           | ✓   | ✓     | 2030                         |
| 3                                  | IFA2                       | France           | 1,000           | ✓   | ✓     | 2019                         |
| 3                                  | ElecLink                   | France           | 1,000           | ✓   | ✓     | 2018                         |
| 4                                  | FABLink                    | France           | 1,400           | ✓   | ✓     | 2020                         |
| 4                                  | BritIB                     | France and Spain | 1,000           |     | ✓     | 2020                         |
| 5                                  | Energy Bridge              | Ireland          | 5,000           | ✓   |       | 2017-2020                    |
| 6                                  | MAREX                      | Ireland          | 1,200           | ✓   | ✓     | 2020                         |
| 6                                  | Greenwire                  | Ireland          | 3,000           | ✓   | ✓     | -                            |

<sup>21</sup> An Initial Project Assessment (IPA) looks at whether the interconnector is needed and in particular whether it is likely to be in the interest of UK consumers. This is the first stage of the cap and floor process. The second stage is the Final Project Assessment (FPA) which assesses detailed costs, finalises the regulatory regime and sets the provisional levels of the cap and floor.

<sup>22</sup> <https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors>

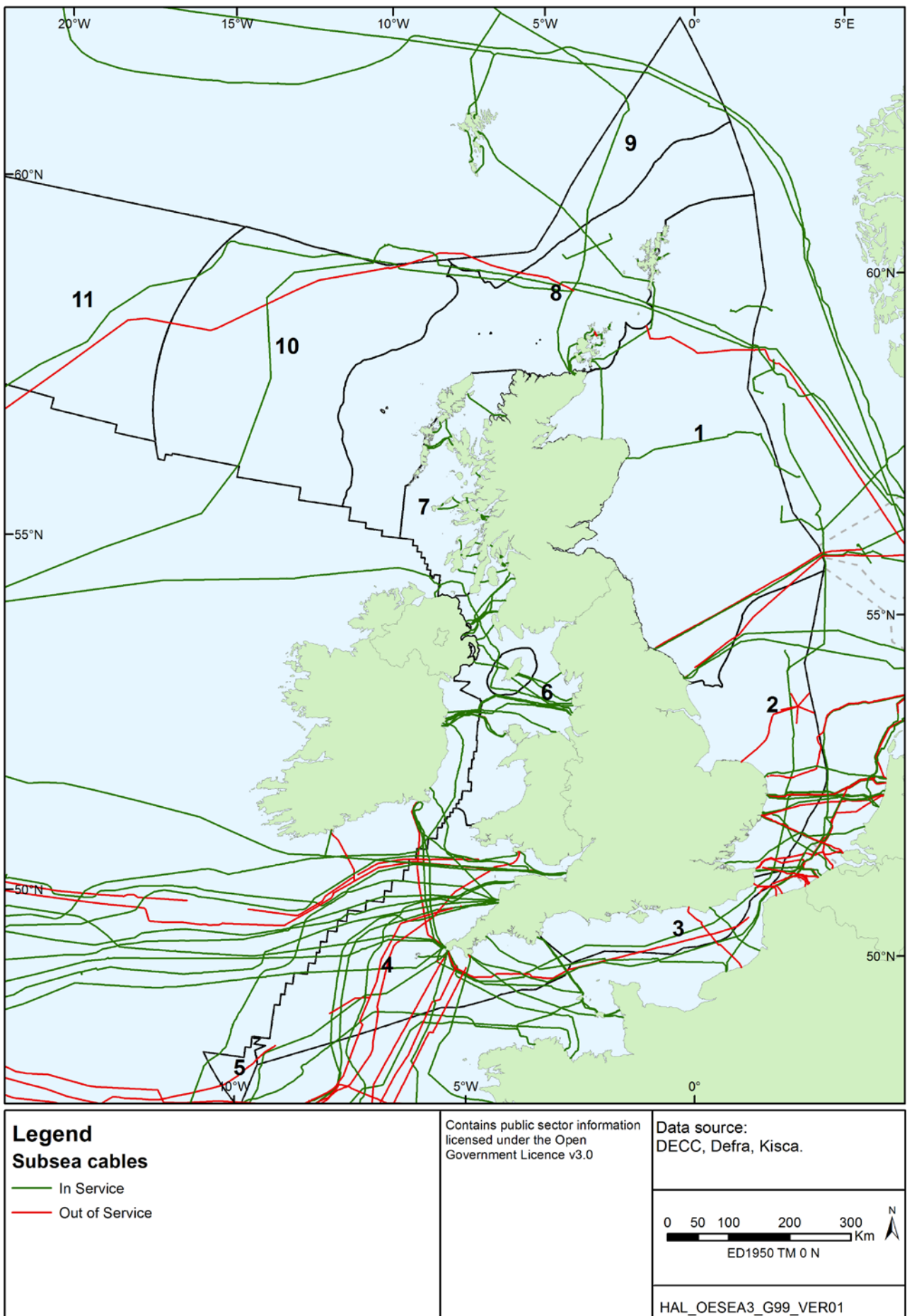
| RS   | Name                 | Connection   | Capacity (MW) | PCI | TYNDP | Anticipated operational date |
|------|----------------------|--|---------------|-----|-------|------------------------------|
| 7    | Irish-Scottish Isles | Coordinated offshore grid in the Irish Sea and west of Scotland. | 1,200         | ✓   | ✓     | 2020-2030                    |
| 6, 7 | Codling Park         | Ireland  | 500-1,000     | ✓   |       | 2020                         |
| 8    | Interco Iceland-UK   | Iceland  | 800-1,200     |     | ✓     | -                            |

Source: National Grid (2015a), National Grid website (<http://www2.nationalgrid.com/About-us/European-business-development/Interconnectors/belgium/>), EC Projects of Common Interest website ([http://ec.europa.eu/energy/infrastructure/transparency\\_platform/map-viewer/](http://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/))

## A1h.10 Submarine cables

Submarine cables may be used for telecommunications and electricity transmission (see above) offshore, and these are shown in Figure A1h.23.

Figure A1h.23: Location of submarine cables



## A1h.11 Dredging and aggregate extraction

Marine sand and gravel account for 20% of all industrial aggregates in England and Wales used for concrete production for roads and building construction and as a source of material for beach replenishment.

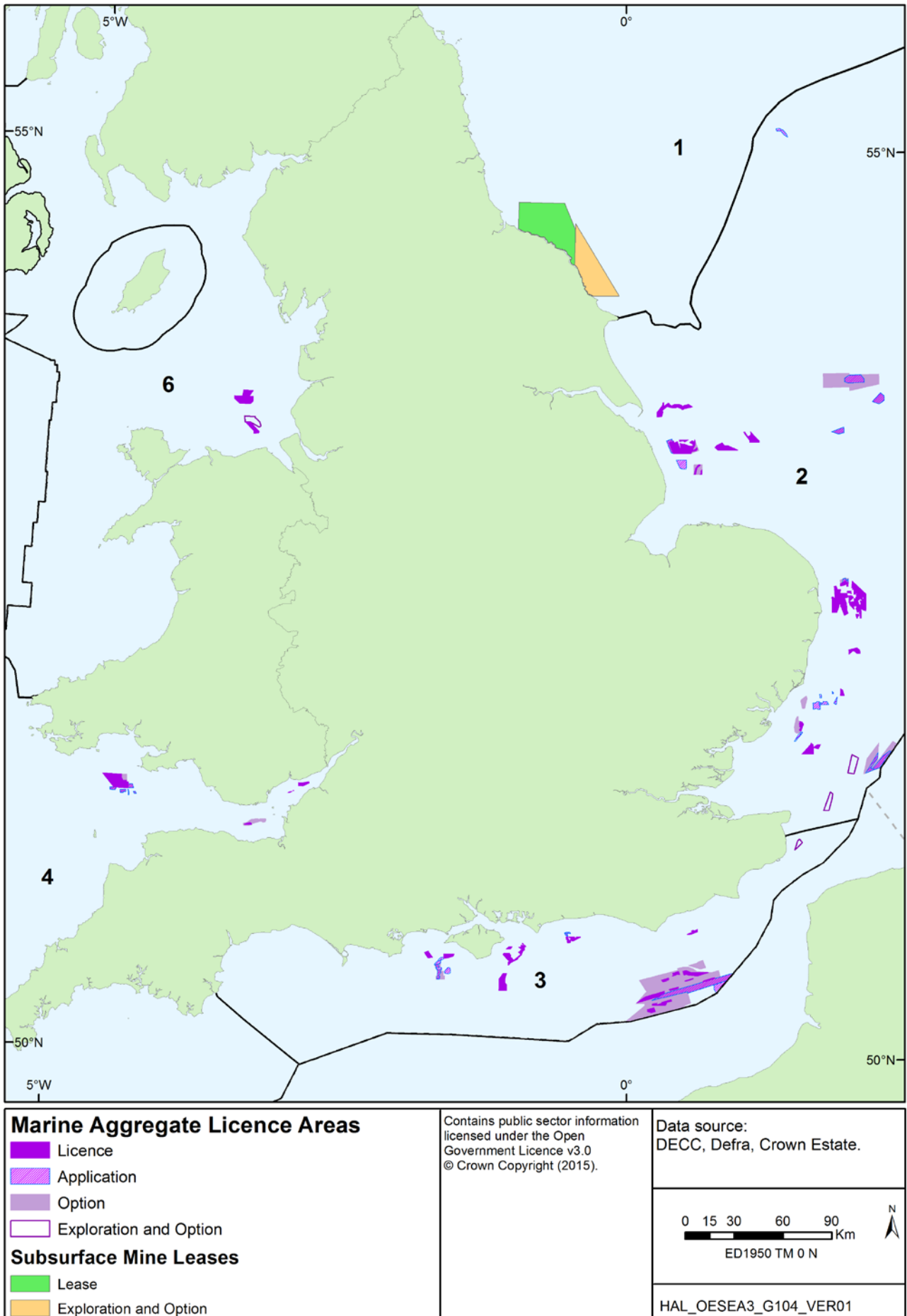
Aggregate extraction occurs in three main areas in the southern North Sea (Figure A1h.24); off the Humber Estuary, east of Great Yarmouth and Lowestoft and in the Greater Thames Estuary where there are extensive sand and gravel deposits, and extraction in this area accounts for ca. 60% of the UKs aggregate landings (based data covering 1998-2012, The Crown Estate and British Marine Aggregate Producers Association (TCE & BMAPA) 2014). Cumulative footprints for aggregate dredging (where areas are repeatedly dredged over several years) are relatively large for both the Humber region and for the Thames. The other principal dredging areas in UK waters are located in Regional Seas 3, 4 and 6. Aggregate extraction in Regional Sea 3 is centred on the south-east and south-west of the Isle of Wight, in the Owers region and also in the east English Channel. The principal target for extraction is the Quaternary gravel and sand lag deposit which covers much of the central and eastern English Channel. There are a number of areas in the Severn estuary and in the east Irish Sea which are currently licensed for marine aggregate extraction. There are currently no licences for marine aggregates extraction in Scotland however the Scottish National Marine Plan recognises the potential for marine aggregates to be extracted in the medium to long term, with former sites in the Clyde and Firths of Forth and Tay having previously been licensed. Similarly, to date extraction in Northern Irish waters has been limited and no areas are presently licensed.

Overall, new technologies have allowed the dredging industry to reduce its spatial footprint (both in terms of licensed area and dredged area) and its potential for impact on other users, which includes the offshore renewables industry (TCE & BMAPA 2014), and an overview of industry best practice is provided by Newell & Woodcock 2013). In addition, more detailed active dredging records can now be used to generate a 'cumulative footprint' map in order to determine what constitutes a 'new' area of dredging and the overall spatial and temporal impact on the marine environment (TCE & BMAPA 2014). Figures relating to the cumulative footprint and new areas of seabed dredged for the period 1998-2012 are provided in TCE & BMAPA (2014). The cumulative area of seabed dredged during this period was 512km<sup>2</sup>, with newly dredged areas accounting for 6.1km<sup>2</sup> in 2012.

## A1h.12 Marine mines

Potash has been commercially extracted from the north Yorkshire coast since 1973 at Boulby potash mine, and more recently an agreement was signed in 2011 between The Crown Estate and York Potash for rights to explore for potash off the coast of Hunsdale (Figure A1h.24) for which cores were obtained between 2011 and 2013.

Figure A1h.24: Marine aggregate and mine licences



## A1h.13 Marine waste disposal

### A1h.13.1 Disposal of dredged material

Since 1994, the dumping at sea of most forms of industrial waste has been prohibited, with the disposal of sewage sludge phased out in 1998. Dredged waste from excavated ports and navigation channels now forms the majority of the remaining material eligible for disposal at sea. Responsibility for licences to carry out disposal in UK waters for England and Wales lies with the Marine Management Organisation. Marine Scotland is the responsible body for Scotland and the Department of the Environment for Northern Ireland. Licensed waste sites for the disposal of dredged material are generally located in inshore waters and every Regional Sea area that abuts a coastal regional has waste sites located within it. Regional Sea areas 5, 9, 10 and 11 are entirely marine and do not contain any of these sites. The location, type and quantity of dredged material deposited in 2012 around the UK coast are shown in Table A1h.7. These relate to 66 licences issued in 2012 for such disposal. One additional licence was issued for the deposit of fish waste, amounting to 2,000 tonnes.

**Table A1h.7: Marine disposal around the UK, 2012**

| Origin                     | Dredging operation type |             | Total quantity (tonnes, dry weight) |
|----------------------------|-------------------------|-------------|-------------------------------------|
|                            | Capital                 | Maintenance |                                     |
| <b>Regional Sea 1</b>      |                         |             |                                     |
| Cromarty Firth             | x                       |             | 32,707                              |
|                            |                         | x           | 0 <sup>1</sup>                      |
| Moray Firth                |                         | x           | 11,024                              |
| Macduff, North Sea         |                         | x           | 1,042                               |
| Boddam                     |                         | x           | 0 <sup>1</sup>                      |
| Dee                        | x                       |             | 343,440                             |
|                            |                         | x           | 125,145                             |
| Montrose                   |                         | x           | 0 <sup>1</sup>                      |
| Angus coast                |                         | x           | 2,443                               |
| Firth of Tay               |                         | x           | 20,170                              |
| Firth Of Forth             | x                       |             | 0 <sup>1</sup>                      |
| Fife coast                 | x                       |             | 0 <sup>1</sup>                      |
| Leith                      |                         | x           | 0 <sup>1</sup>                      |
| Firth Of Forth             |                         | x           | 739,282                             |
| Fife coast, Firth Of Forth | x                       |             | 0 <sup>1</sup>                      |
| Tyne                       | x                       |             | 0 <sup>1</sup>                      |
|                            |                         | x           | 208,334                             |
| Wear                       |                         | x           | 65,842                              |
| Durham coast, Tyne         |                         | x           | 3,746                               |
| Tees/Hartlepool            | x                       |             | 0 <sup>1</sup>                      |
|                            |                         | x           | 540,243                             |
| Esk                        |                         | x           | 38,337                              |
| North Yorkshire coast      |                         | x           | 4,069                               |
| <b>Regional Sea 2</b>      |                         |             |                                     |
| Bridlington                |                         | x           | 3,069                               |
| Humber                     | x                       |             | 0 <sup>1</sup>                      |
|                            |                         | x           | 1,108,679                           |
| Humber, Lincolnshire Coast |                         | x           | 2,149,126                           |



| Origin  | Dredging operation type |             | Total quantity<br>(tonnes, dry weight) |
|---|-------------------------|-------------|--|
|   | Capital                 | Maintenance |  |
| Great Ouse, Norfolk coast   |                         | x           | 35,619                                 |
| Yare  |                         | x           | 4,410                                  |
| Norfolk coast   |                         | x           | 6,574                                  |
| Lowestoft/Waveney   |                         | x           | 49,418                                 |
| Stour/Orwell  |                         | x           | 24,423                                 |
|   | x                       |             | 0 <sup>1</sup>                         |
| Kent coast, Medway, Stour/Orwell. Suffolk, coast                                |                         | x           | 1,061,242                              |
| Essex coast   | x                       |             | 69,758                                 |
| Maldon  |                         | x           | 969                                    |
| Kent coast, Medway  |                         | x           | 46,122                                 |
| Kent coast  |                         | x           | 14,935                                 |
| Avon/Severn estuary, Humber, Norfolk coast, Poole, Sussex coast, Thames         |                         | x           | 121                                    |
| <b>Regional Sea 3</b>   |                         |             |  |
| Dover   |                         | x           | 93,703                                 |
| Sussex coast  |                         | x           | 13,959                                 |
| Exe, Teign  |                         | x           | 37,612                                 |
| Ouse, Sussex  |                         | x           | 230,257                                |
| Sussex coast  |                         | x           | 15,347                                 |
| Adur  |                         | x           | 44,865                                 |
| Chichester harbour, Southampton water/ Portsmouth                               |                         | x           | 245                                    |
| Langstone Harbour, Medina, Southampton water/ Portsmouth                        | x                       |             | 15,836                                 |
| Chichester harbour, IOW coast, Southampton water/ Portsmouth, Langstone Harbour |                         | x           | 673,123                                |
| Ryde, IOW coast   |                         | x           | 1,718                                  |
| Southampton water/ Portsmouth   | x                       |             | 287,123                                |
| Lymington, Southampton water/ Portsmouth, Yar                                   |                         | x           | 7,029                                  |
| Southampton water/ Portsmouth, Yar  |                         | x           | 0 <sup>1</sup>                         |
| Christchurch Harbour, Poole   | x                       |             | 29,805                                 |
| Poole   |                         | x           | 29,002                                 |
| <b>Regional Sea 4</b>   |                         |             |  |
| Camel   |                         | x           | 1,835                                  |
| Washford  |                         | x           | 562                                    |
| Avon/Severn estuary   |                         | x           | 424,456                                |
| Avon  | x                       |             | 0 <sup>1</sup>                         |
| Avon, Swansea   |                         | x           | 822,001                                |
| Usk   |                         | x           | 95,017                                 |
| Milford Haven   |                         | x           | 1,024                                  |
| Plym, Tamar/ Plymouth Sound   | x                       |             | 39,012                                 |
| Tamar/ Plymouth Sound   |                         | x           | 8,111                                  |
| Fowey   |                         | x           | 1,977                                  |
| Fal   | x                       |             | 0 <sup>1</sup>                         |
|   |                         | x           | 2,266                                  |
| <b>Regional Sea 6</b>   |                         |             |  |
| Conwy/Deganwy   |                         | x           | 2,322                                  |

| Origin                | Dredging operation type |             | Total quantity<br>(tonnes, dry weight) |
|-----------------------|-------------------------|-------------|--|
|                       | Capital                 | Maintenance |  |
|                       |                         | x           | 8,249                                  |
| Devonshire coast      |                         | x           | 8,751                                  |
| Dee                   |                         | x           | 0 <sup>1</sup>                         |
| Mersey                |                         | x           | 1,709,034                              |
|                       | x                       |             | 0 <sup>1</sup>                         |
| Wyre                  |                         | x           | 17,369                                 |
| Lune                  |                         | x           | 2,652                                  |
| Irish Sea             | x                       |             | 0 <sup>1</sup>                         |
| Lancashire coast      |                         | x           | 214,431                                |
| Cumbrian coast        |                         | x           | 922,603                                |
| Rhins coast           | x                       |             | 4,722                                  |
| IOM waters            |                         | x           | 0 <sup>1</sup>                         |
| Lagan, Lough, NI      | x                       |             | 844,135                                |
| Lagan                 |                         | x           | 0 <sup>1</sup>                         |
| Kilkeel               |                         | x           | 6,076                                  |
| Carlingford Lough     |                         | x           | 2,364                                  |
| Clyde, Firth of Clyde |                         | x           | 202,379                                |
| Firth of Clyde        |                         | x           | 44,717                                 |
| Clyde                 | x                       |             | 22,171                                 |
| <b>Regional Sea 7</b> |                         |             |  |
| Argyll coast          | x                       |             | 19,703                                 |
| <b>Regional Sea 8</b> |                         |             |  |
| Pentland Firth        | x                       |             | 337,926                                |
| Kirkwall              |                         | x           | 0 <sup>1</sup>                         |
| Orkney                | x                       |             | 0 <sup>1</sup>                         |
| Stromness             |                         | x           | 0 <sup>1</sup>                         |
| Shetland coast        |                         | x           | 42,592                                 |

Source: OSPAR (2014)

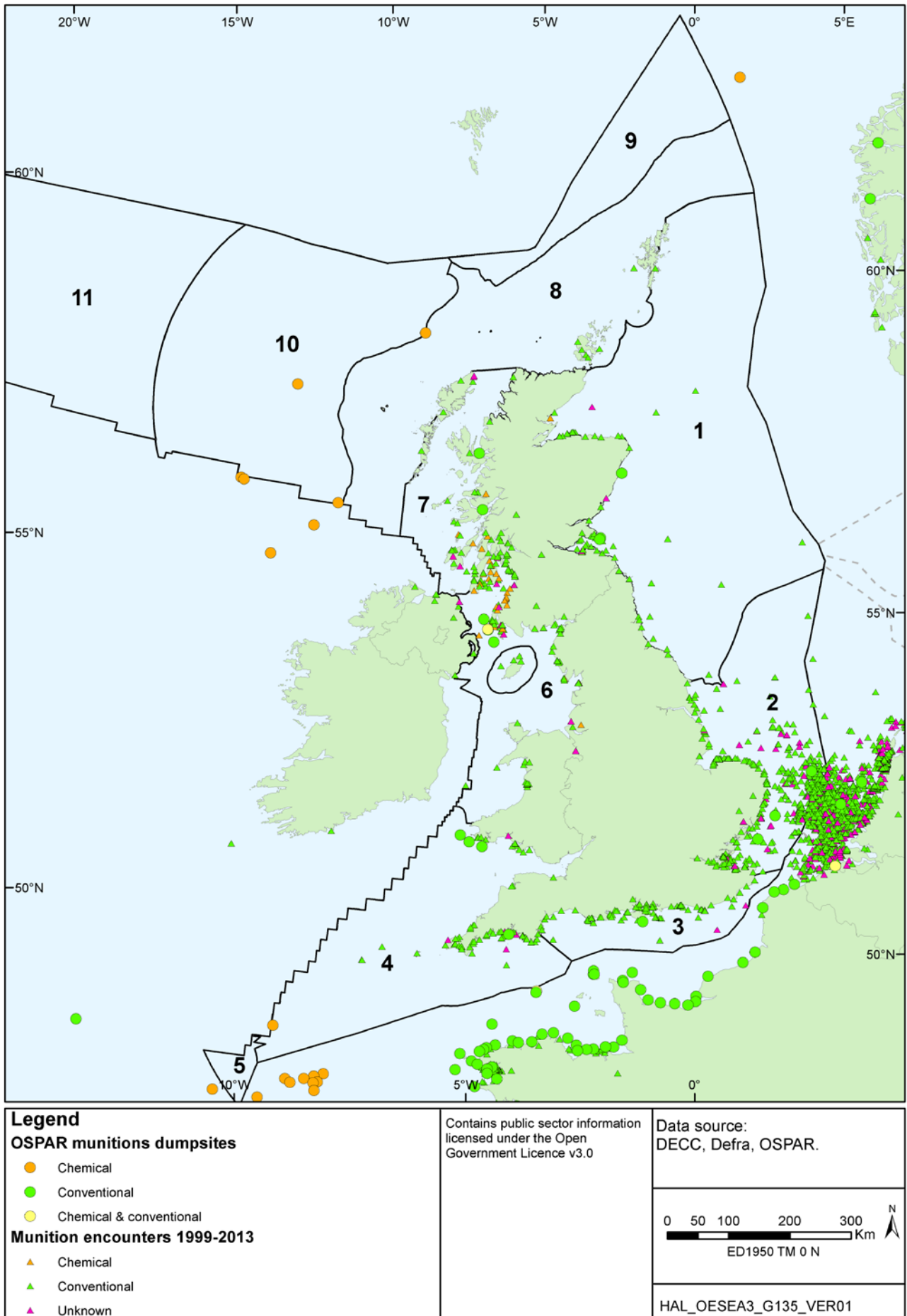
Notes: <sup>1</sup>Indicates where licence(s) have been issued but no deposits have been made

### A1h.13.2 Munitions dumping

Chemical weapons and munitions have been dumped at sea since the end of the First World War. The extent of this dumping is uncertain and remediation technically challenging. OSPAR began a programme of work to establish the extent of this dumping and encounters with such material in 2004. This has revealed a total of 148 sites, and 1,879 encounters have taken place since 2004. The majority of encounters were by fishermen (58%). Munitions dumping sites and encounters since 2004 are shown in Figure A1h.25. The OSPAR Recommendation 2010/20 requires Contracting Parties to report annually to the OSPAR Commission encounters with conventional and chemical munitions.

The potential hazard posed by dumped munitions varies by type, for instance chemical munitions may have broken open when being dumped or corroded over time leading to the agent to leak out. Some may break down and dissolve (e.g. nerve agents) while others may be insoluble and pose risks on recovery (e.g. mustard gas). Phosphorous devices pose particular risk when disturbed, as they are buoyant and may float to the sea surface posing risks to seafarers or the public should they be washed ashore (OSPAR 2010).

Figure A1h.25: Munitions dumping sites and encounters



## A1h.14 Tourism and recreation

### A1h.14.1 UK context

The tourism industry is socially and economically important to the UK and the coast in particular has been a popular destination for British holidaymakers of all age groups. From large traditional seaside resorts to small-scale coastal attractions, this sector makes an important contribution to the local, regional and national character of the coast.

In 2014 the British public made a total of 114 million domestic overnight trips, spending £22.7 billion. Of these, there were 92.6 million domestic overnight tourism trips in England with spending of £18.1 billion (the number of domestic overnight trips in England has decreased by an average of 0.6% per year since 2010 although annual spend has increased by 3.6% per year); in Scotland, 12.5 million overnight trips were made in 2014 with spend of £2.9 billion (the number of domestic overnight trips has increased by 1.1% per year since 2010 with spend increasing by 3.8% per year), and in Wales there were 10 million overnight trips with £1.7 billion spend (the number of domestic overnight trips has increased by 3.8% per year since 2010 with spend increasing by 5.3% per year). With respect to the British total, over 23 million (20%) overnight trips were to the seaside with spending of £4.9 billion (22% of the total). In England, 17.6 million domestic overnight trips were made to the seaside (19% of all trips), spending ca. £3.9 billion (21% of total spend). In Wales, the equivalent figures were 4.2 million trips (accounting for 42% of all overnight trips) with £0.7 billion spend (42% of all spend) and in Scotland there was 1.5 million trips (12% of total) with £0.3 billion spend (12% of total spend) (Visit England *et al.* 2015b). Since 2011 Northern Ireland data has been collected separately and specific data on trips to the seaside is not provided. However, in 2014 overnight trips by all visitors to Northern Ireland (domestic and external) stood at 4.5 million, up 11% on 2013. Associated expenditure increased by 4% (to £0.8 billion in 2014) (NISRA 2015a).

In addition in 2014, there were in excess of 144 million day visits made by the British public to the seaside/coast (9% of all day trips), generating a further £4.8 billion spend (9% of total). There were 123 million day trips to the seaside/coast in England (9% of total), spending ca. £4 billion (9% of total); 12 million seaside/coastal day trips were made in Scotland (9% of total), with spending of £0.4 billion (8% of total); and in Wales, 9 million day trips were made to the seaside/coast (10% of total), spending £0.4 billion (ca. 17% of total) (Visit England *et al.* 2015a).

In 2014 overseas residents made 34.4 million visits to the UK, 5.2% higher than in 2013 with spending from visits to the UK reaching £21.8 billion. Holidays remain the main reason for visits to the UK, accounting for 13.6 million visits, a rise of 7.2% compared with 2013. A record 17.4 million overnight visits to London were made by overseas residents in 2014, an increase of 0.6 million (3.5%) from 2013, and £11.8 billion was spent on these visits. Overnight visits to the rest of England grew by 5.0% to 14.2 million. Visits to Scotland and Wales also continued to rise in 2014, with Scottish visits up 11.5% to 2.7 million and Welsh up 7.2% to 0.9 million (ONS 2015b).

Tourism Direct Gross Value Added (TDGVA) is a measure of the importance of tourism in the UK economy and is based on how the expenditure of tourists drives the output of the tourism industries and other sectors. TDGVA remained flat between 2008 and 2010 but grew significantly in both 2011 and 2012 and levelled off in 2013. In monetary terms, and measured in current prices, TDGVA stood at £49 billion between 2008 and 2010 and increased to £53 billion in 2011. ONS estimates reveal a rise in the value of tourism for both 2012 and 2013 to £56 billion based on this measure. The growth rates for the years 2011-2013 were 8.6%, 5.7% and -0.1% respectively (ONS 2014). Data from the Business Register and Employment Survey (BRES) indicates that in 2012 tourism industries accounted for 10.1% of those employed in

Great Britain and England, with similar figures for Scotland (10.2%) and Wales (10.7%)<sup>23</sup>. Many coastal counties or unitary authorities have greater levels of tourism related employment (see Figure A1h.27 below).

The ONS recently published the results of a spatial classification of areas in England and Wales to group areas that have similar tourism characteristics (ONS 2015a). Using data for 2011-2013 across a number of themes (employment and industry, domestic day visits, domestic overnight tourism and inbound tourism), 5 distinct clusters of counties and unitary authorities were described (Figure A1h.26).

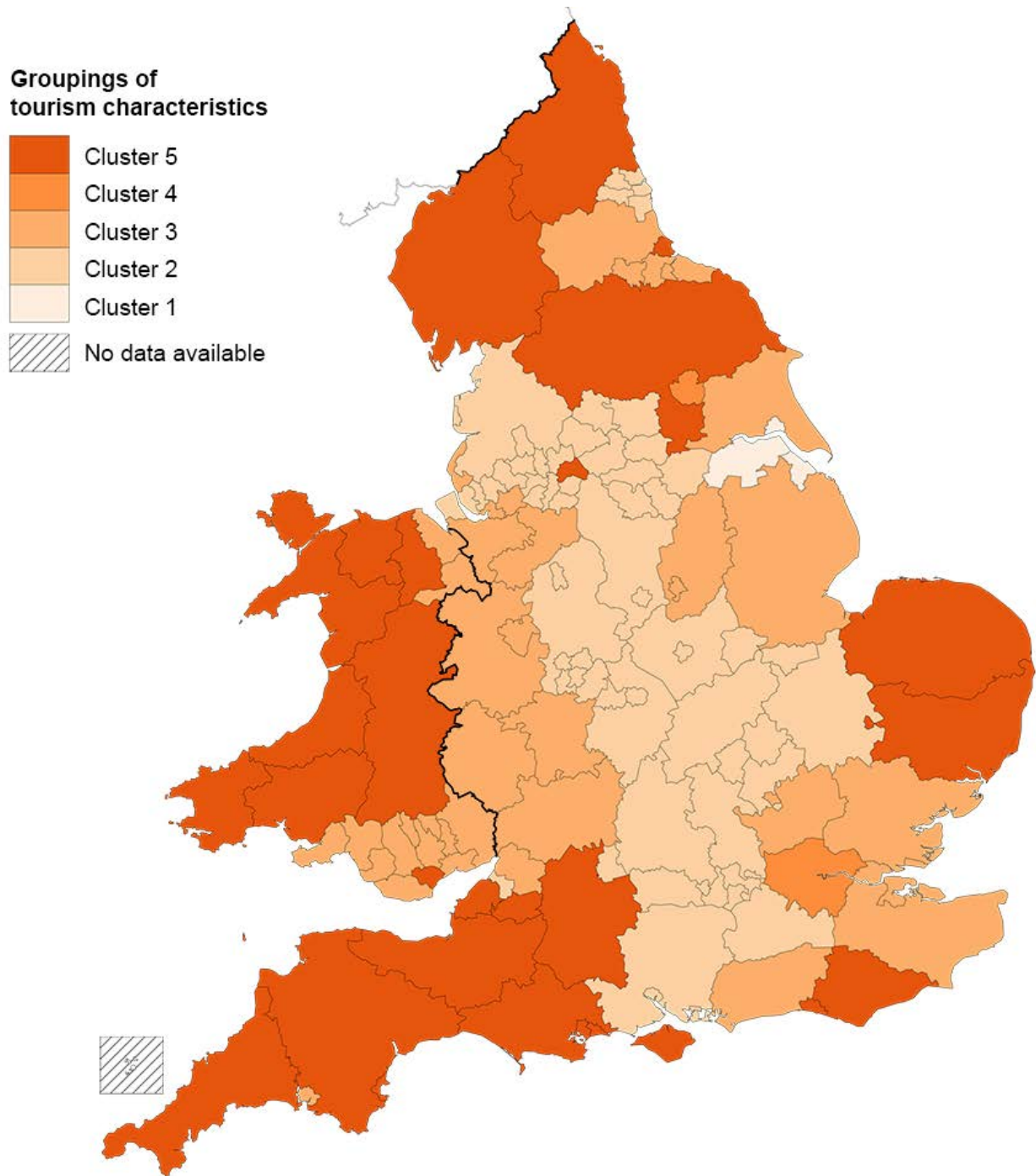
Of most relevance to OESEA3 are those areas grouped within cluster 5 (includes mid, north and west Wales, south-west England, with parts of East Anglia, the north, the Isle of Wight and east Sussex) as many of these are coastal and include the more traditional holiday destinations in England and Wales. Within this cluster there is a higher percentage of nights stayed for holiday and visiting friends and relatives purposes (compared to business, studying or 'other' purposes), which is mostly consistent with inbound visitors. Also, there is a higher than average expenditure per trip, which in rural areas would imply longer stays (on holidays, for example) and a higher percentage of jobs in accommodation for visitors. There are also higher percentages of day visits spent exploring an area or participating in an outdoor leisure activity, also both tourist and holiday activities. Tourism with a holiday purpose is both prevalent and of high importance in these locations, so the areas in cluster 5 are also labelled as 'holiday hotspots'. Figure A1h.27 highlights the percentage of tourism enterprises and the percentage of main jobs in tourism industries (2011-2013 average) for these holiday hotspots. As shown, Gwynedd in north-west Wales had the highest percentage of main jobs in tourism (14.9%) followed by the Isle of Anglesey (14.0%). Torbay in Devon had the highest percentage of tourism enterprises (16.2%) followed by the Isle of Wight (15.5%) with Poole the lowest of these areas (8.0%) (ONS 2015a).

The UK Marine Policy Statement (HM Government 2011) indicated that the sea provides a variety of tourism and recreational opportunities which vary from area to area but will include pleasure boating, sailing, recreational diving (including diving on wrecks), sea angling, kayaking and surfing, as well as exploration of underwater and coastal heritage assets. The coast also provides inspiration for a range of artistic and cultural activities and food-based tourism. There is also growing interest in eco-tourism and wildlife experiences. All these activities can generate a considerable amount of income for the economy and can be a mainstay for many coastal towns, supporting their quality of life, and providing health and well being benefits, with many local businesses relying on the marine environment for their livelihoods.

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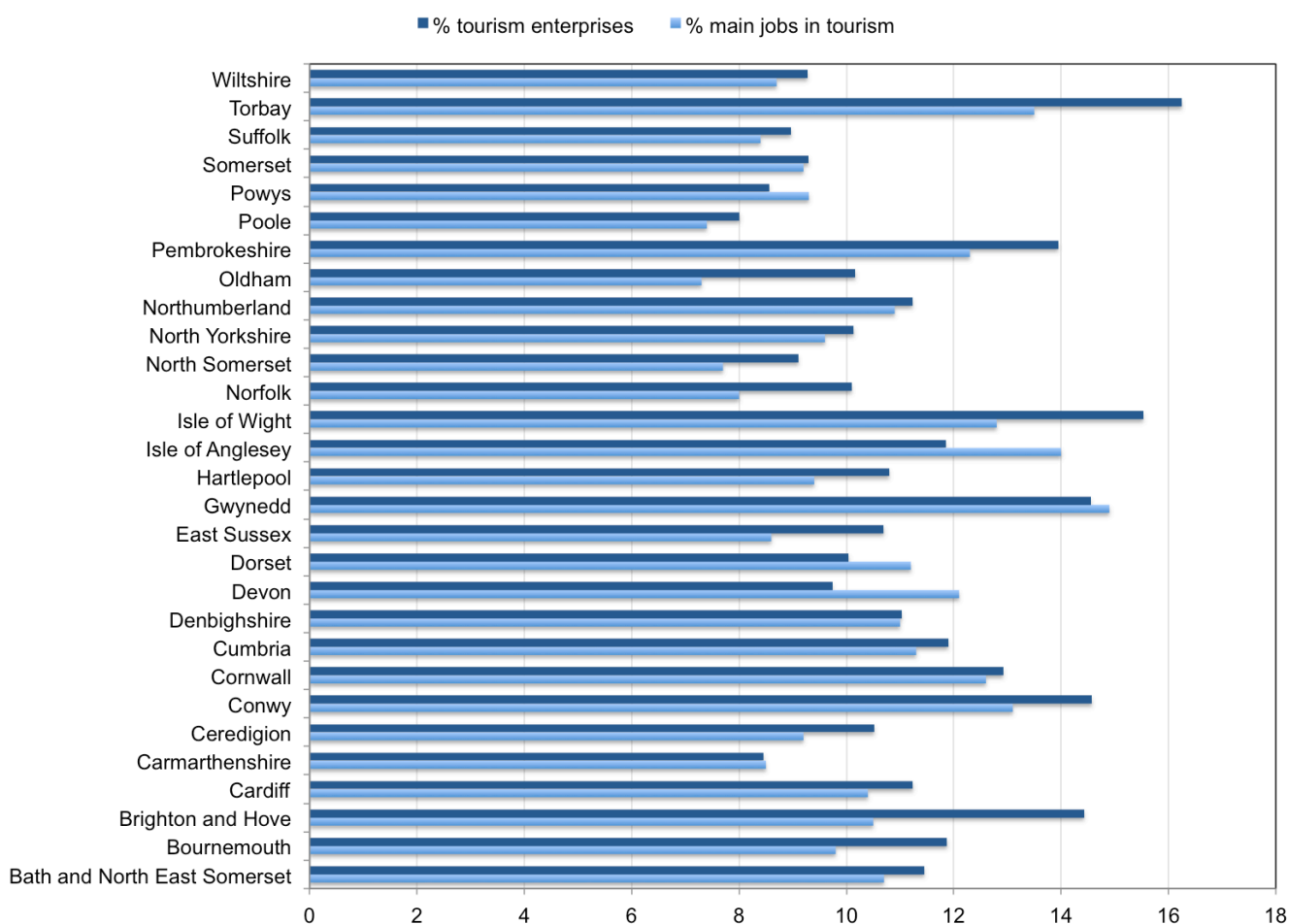
<sup>23</sup> [https://www.visitengland.com/sites/default/files/ons\\_employment\\_worksheet\\_for\\_website.xlsx](https://www.visitengland.com/sites/default/files/ons_employment_worksheet_for_website.xlsx)

**Figure A1h.26: Cluster analysis showing areas that share similar tourism characteristics by county and unitary authority, 2011 to 2013**



Source: ONS (2015a).

**Figure A1h.27: The percentage of main jobs in the tourism industry and the percentage of tourism enterprises for 'holiday hotspots' in cluster 5**



Source: Annual Population Survey (APS), Inter Departmental Business Register (IDBR) - Office for National Statistics

The East inshore and offshore marine plans (HM Government 2014) recognised that tourism and recreation were important contributors to the local economy and sources of income for coastal communities. Relevant policies include:

- Policy TR1 - Proposals for development should demonstrate that during construction and operation, in order of preference:
  - a) they will not adversely impact tourism and recreation activities
  - b) how, if there are adverse impacts on tourism and recreation activities, they will minimise them
  - c) how, if the adverse impacts cannot be minimised, they will be mitigated
  - d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts
- Policy TR2 - Proposals that require static objects in the East marine plan areas, should demonstrate, in order of preference:

- a) that they will not adversely impact on recreational boating routes
- b) how, if there are adverse impacts on recreational boating routes, they will minimise them
- c) how, if the adverse impacts cannot be minimised, they will be mitigated
- d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts

Relevant objectives of Scotland's National Marine Plan (Scottish Government 2015) in terms of recreation and tourism include: to position Scotland as a world-class sustainable coastal and marine tourism and recreation destination through the sustainable development of coastal and marine recreation activities and industries in Scotland; protection and enhancement of the unique, natural resources which attract visitors and which are relied upon for recreational activities, and continued and improved access to marine and coastal resources for tourism activities and recreational use.

The economic importance of the Scottish marine tourism industry was highlighted by a recently published strategic framework for Scotland's marine tourism sector with the aim of developing the growth of sailing tourism in Scotland from £101 million of visitor expenditure to £145m by 2020, and to increase the overall economic value of the marine tourism sector from £360m to over £450m by 2020 (Scottish Tourism Alliance 2014).

The watersports participation survey for 2014 (Arkenford 2015) estimated that ca. 27% of the UK population (or 13 million people) participated in watersports. The most popular activities in 2014 were the same as in previous years: spending general leisure time at the beach, coastal walking and outdoor swimming. Participation rates in any watersports activities among Northern Ireland residents were far higher (63%) than elsewhere in the UK (e.g. Wales/south west England (33.6%), south-east England (26.5%), northern England (24%) and Scotland (24.5%), particularly with respect to coastal walking and spending time at the beach (Arkenford 2015).

The Wales Activity Mapping (WAM) project investigated the type, amount and distribution of recreational activities carried out on the south-west Wales coastline (included Pembrokeshire, Carmarthenshire, Swansea, Neath Port Talbot and Bridgend), including information on relevant infrastructure and management issues. An interactive GIS mapping system of the uses and potential uses of the area is provided on the project website (<http://www.walesactivitymapping.org.uk/>).

A similar GIS-based project to model marine recreational potential in England was commissioned by the MMO (2014a). Previous projects to gather spatial evidence of marine recreation at the national and East Plan and South Plan areas (MMO 2012, MMO 2013a), highlighted gaps in data availability as well as low confidence in some existing spatial data that detailed where marine recreation occurred. The rationale was that predictive models would allow the recreation sector to be more fully represented in current Marine Plan development and marine management generally. In the long term observational data of suitable quality will be favoured to predicted data. The models were developed for 12 recreational activities through a process of stakeholder consultation, spatial analysis and stakeholder validation. Model predictions demonstrated that vessel based activities were broadly successful with key controls governed by access to infrastructure, such as marinas, slipways and moorings. The more near shore, beach focused, activities such as surfing and windsurfing were more sensitive to the input data, with critical dependency on a 'land access' parameter formed in the model which



categorised ease of access to roads and footpaths. These activities also require accurate environmental data at high resolutions to provide suitable model outputs, e.g. wind speed and wave height (MMO 2014a).

#### A1h.14.2 Bathing waters, Blue Flag beaches and marinas

Bathing water quality in the UK has improved steadily between 1988 and 2014, largely as a result of improvements to the sewerage system by water companies. Latterly, variations from year to year have related to weather conditions, as combined sewer overflows operate more frequently during wet weather, diffuse pollution from urban and agricultural sources has increased, and in poor summers there is less sunlight to kill off bacteria in water (Defra 2015).

New standards introduced this year are not directly comparable to those produced prior to 2015. This year the UK administrations have implemented the new standards and classifications assessment under the Bathing Water Directive (2006/7/EC). The 2006 Directive replaced the 1976 Directive and updated the standards, based on recommendations from the World Health Organisation (WHO). There are a number of significant differences to how bathing waters are now assessed:

- The new annual classifications are: Excellent – the highest, cleanest class; Good – generally good water quality; Sufficient – the water quality meets the minimum standard; and Poor – the water quality has not met the minimum standard.
- *Escherichia coli* and Intestinal enterococci are now the only parameters measured. These are assessed against the Directive's standards to produce a classification for each bathing water. The old assessment was based on 80% of the samples of bacterial parameters passing the set levels.
- Classifications are now based on a rolling data set of samples. In 2015 the results are made from up to four years' worth of results from 2012 to 2015. They are combined to provide an indication of what you might expect the water quality to be. However it should be noted that water quality can vary depending on a range of variables such as the weather. The old assessment was based on one year's data.
- At coastal waters the new standards are approximately twice as stringent as the previous standards. A direct comparison is difficult as they are now based on a different type of statistical assessment – a percentile assessment.

In 2015, out of the 624 UK bathing waters measured:

- 595 (95.4%) met at least the minimum standard of the European Bathing Water Directive.
- 377 (60.4%) met the excellent standard
- 29 (4.6%) met the poor standard

Figure A1h.28 indicates the location of bathing waters around the UK coast for 2015 in relation to each Regional Sea.

In addition to bathing waters, Blue Flag beaches and Marinas are located along the UK coast (see Figure A1h.28). Criteria for their successful selection are exhaustive and attention is brought to the Blue Flag website (<http://www.blueflag.org/menu/criteria/beaches>) which provides this information. In brief, beach and marina designations are subject to 33 and 24 criteria respectively covering aspects of:

- Environmental education and information
- Water quality
- Environmental management
- Safety and services

Some of these criteria are imperative while others are provided as guidance, and some are not applicable in all geographic areas. Blue Flags are awarded on a seasonal basis, and may be withdrawn if criteria are not met during the season or the conditions change.

### **A1h.14.3 National trails, coastal paths and long distance routes**

There is a network of National Trails in the UK (Figure A1h.29), many of which traverse areas of distinctive coastline, often coinciding with National Parks or Areas of Outstanding Natural Beauty (AONB). These are major attractions for an increasing number of outdoor enthusiasts intent on walking part or the entirety of a trail, often camping along the way.

Under the Marine and Coastal Access Act 2009, a new continuous National Trail will be completed around the English coastline. The England Coast Path is expected to be completed in 2020 (see Section A1h.35 below for an overview of the path's progress). Completed sections are shown on Figure A1h.29. The 1,400km long Wales Coast Path was completed in 2012 (see Figure A1h.29). Scotland has 26 Great Trails (<http://www.scotlandsgreattrails.org.uk/>) some of which have coastal stretches (see Figure A1h.29). There are also a number of coastal paths proposed as part of the National Walking and Cycling Network and progress in their development (as of July 2015) can be found here (<http://www.snh.gov.uk/docs/A1694041.pdf>). Northern Ireland has a number of long distance walks with the Causeway Coast Way of most relevance (see Figure A1h.29).

Figure A1h.28 – UK bathing waters and Blue Flag sites (2015)

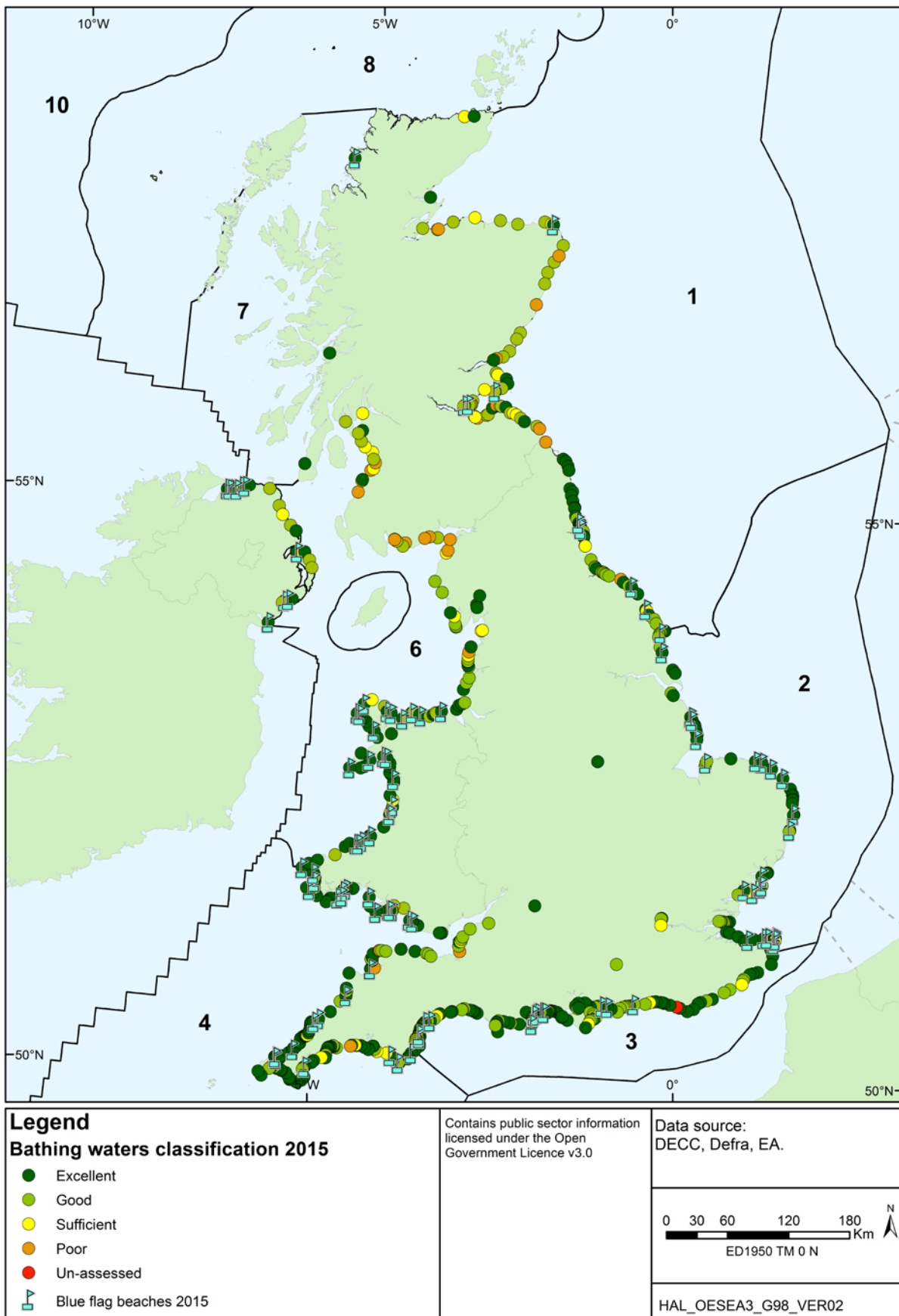
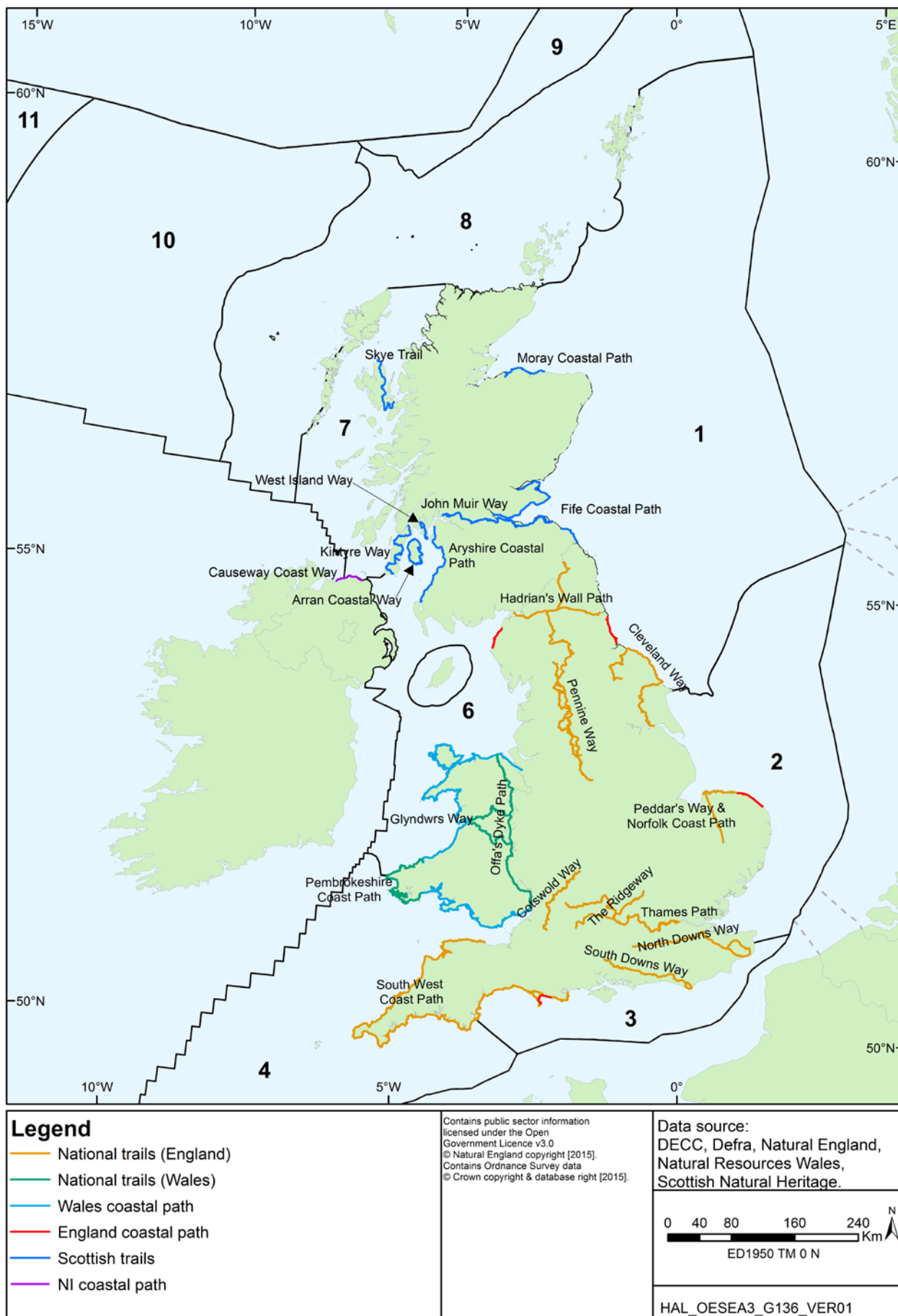


Figure A1h.29: National trails, coastal paths and long distance routes



## A1h.14.4 Notable features by region

### A1h.14.4.1 Features of Regional Seas 1 & 2

There were almost 8 million (average of 3 years 2012-2014) domestic overnight trips to the Scottish counties which border Regional Sea 1, with associated spending of £1.85 billion (Visit England *et al.* 2015b). 67 million (average 2012-2014) domestic day visits were taken to the region, worth £2.4 billion (Visit England *et al.* 2015a). Edinburgh (2.3 million), the Highland (1.8 million) region, Perth and Kinross and Aberdeen (both ca. 0.7 million) received the most overnight visits (Visit England *et al.* 2015b). With respect to day visits, 21% of those made to the north of Scotland were to the seaside or coastal destination with lower proportions for the east (5%) and south (7%) of Scotland (Visit England *et al.* 2015a). In 2012, employment in tourism industries was highest in Perth and Kinross (16.1% of total), Highland and Orkney (both 15%)<sup>24</sup>.

The Scotland Visitor Survey conducted in July to October of 2011 and 2012 for Visit Scotland indicated that 55% of those surveyed chose Scotland for its scenery/landscape<sup>25</sup>. The coastal zone is an important resource for this key industry. There are numerous coastal nature conservation areas along the coastline of Shetland, Orkney and the mainland. Examples include the Dornoch Firth, Loch of Strathbeg, Sands of Forvie, Fowlsheugh, St. Cyrus, Montrose Basin, Eden Estuary, Aberlady Bay and the Firth of Forth Islands.

Within Regional Sea 1 particular developments highlight the local importance of wildlife based attractions, for example:

- The Scottish Dolphin Centre at Spey Bay received 92,835 visits in 2014 (Visit Scotland 2015).
- The North Berwick Seabird centre received 273,507 visits in 2014 (Visit Scotland 2015).
- Direct tourism expenditure reliant solely on the presence of the east of Scotland bottlenose dolphin population was estimated to be at least £4 million in 2010, providing approximately 202 Full Time Equivalent jobs (Davies *et al.* 2010).

A report for the Scottish Government by the International Centre for Tourism and Hospitality Research, Bournemouth University estimated the net economic impact of wildlife tourism in Scotland as £65 million, with 2,763 FTE jobs in existence because of the activities of wildlife tourism (ICTHR 2010). Net economic impact was highest in the Highlands and Islands region (£32 million and 1,386 FTE jobs). In the same year, an SNH commissioned study (Bryden *et al.* 2010) used a wider definition of the wildlife sector (to also include those who enjoy wildlife as only part of their holiday), to estimate the value to the economy of wildlife tourism as £127 million per year.

The north-eastern coast of Scotland has little formal coastal activity, however, historical and cultural sites such as Dunnottar Castle in Aberdeenshire, Culross in Fife and the Fisheries Museum at Anstruther are to be found along the region's coastline. Dolphin watching occurs at several locations within the Moray Firth, from Cromarty to Nairn. There are many coastal paths in the area, for example around Sandside Bay, John o' Groats and Duncansby Head.

<sup>24</sup> [https://www.visitengland.com/sites/default/files/ons\\_employment\\_worksheet\\_for\\_website.xlsx](https://www.visitengland.com/sites/default/files/ons_employment_worksheet_for_website.xlsx)

<sup>25</sup> [http://www.visitscotland.org/research\\_and\\_statistics/visitor\\_research/all\\_markets/scotland\\_visitor\\_survey.aspx](http://www.visitscotland.org/research_and_statistics/visitor_research/all_markets/scotland_visitor_survey.aspx)

The many coastal golf courses in the area, some of which are recognised internationally e.g. St. Andrews, Carnoustie and Muirfield are of great significance as an attraction for overseas visitors. Golf courses, like historical and archaeological sites, also tend to have a longer 'season', being less dependent on summer weather conditions.

A number of beaches have European Blue Flag status (see Figure A1h.28 above) although the number of beaches with the award increases further south. Many old and relatively underused harbours have developed small-scale marinas and sailing centres e.g. Whitehills near Banff and Peterhead (Aberdeenshire). The coastline and nearshore area of the region provides a variety of opportunities for other water-based sports and recreational activities including sport fishing, wind-surfing, sailing and diving. There is no official coastal footpath around the region but the Fife Coastal Footpath stretches from North Queensferry in the south for 150km to the Tay Bridge in the north and attracts many walkers annually and the Moray Coast Trail stretches for approximately 50 miles between Findhorn and Cullen. The east coast of Scotland also contains several of the UK's prime wildfowling areas – Montrose Basin, the Tay and Eden Estuaries and several sections of the Firth of Forth<sup>26</sup>.

Across the border into England, tourism is not a major land use or coastal activity in the northern section, where the largest centres are Berwick and Holy Island. The north-east represented the lowest proportion of all English regions for domestic trips in 2014, 4% of overnight trips (3.7 million) and 3% (£0.6 billion) of overnight spending, and 5% of volume (63 million trips) and spending (£2.3 billion) for day visits. Of these trips, 23% were to a seaside destination compared to the national average of 32% (Visit England website - [https://www.visitengland.com/sites/default/files/north\\_east\\_2014.pdf](https://www.visitengland.com/sites/default/files/north_east_2014.pdf)).

The wild and unspoilt natural scenery of much of the north-east attracts many tourists in pursuit of open-air leisure activities including walking, bird watching, wildfowling and golf. The region also supports a relatively large surfing community (estimated at 32,695 surfers or 6.54% of the UK total, SAS 2013). Fortresses line much of the coastline such as Tynemouth, Dunstanburgh and Bamburgh Castles. The Christian seat of learning once found at Lindisfarne and the seal colony on the Farne Islands also attract further tourists to the area. Birdwatching is popular in the Lindisfarne National Nature Reserve and Budle Bay. A 55km stretch of the England Coast Path from North Gare to South Bents was opened to the public in 2014 (see Figure A1h.29 above). Further south, the 110km long Cleveland Way National Trail includes the Heritage Coast between Saltburn and Filey (<http://www.nationaltrail.co.uk/cleveland-way>).

In contrast, the central heavily developed area of the coast has only one major tourism centre, at Whitley Bay, which is close to the major conurbations of Tyne & Wear and an important traditional seaside resort. Tourism is a crucial source of income and employment on the stretch of coastline between Staithes and Flamborough Head, which includes the traditional coastal resorts of Whitby, Scarborough and Filey. Scarborough for example was second on the list of the most visited English cities and towns after London for holiday trips by GB residents (1.4 million trips, average 2012-2014)<sup>27</sup>. One in ten overnight trips and day visits in England are to the Yorkshire and the Humber region (9.5 million overnight trips and 131 million day trips worth £1.7 billion and £4.1 billion respectively). Of these trips, 29% were to a seaside destination compared to the national average of 32% (Visit England website - [https://www.visitengland.com/sites/default/files/yorkshire\\_and\\_the\\_humber\\_2014.pdf](https://www.visitengland.com/sites/default/files/yorkshire_and_the_humber_2014.pdf)).

<sup>26</sup> <http://www.esawc.co.uk/>

<sup>27</sup> [https://www.visitengland.com/sites/default/files/top\\_towns\\_2012-14\\_excel\\_0.pdf](https://www.visitengland.com/sites/default/files/top_towns_2012-14_excel_0.pdf)

Many of the area's coastal towns have had a long association with the tourism industry, most notably Mablethorpe, Skegness in Lincolnshire and Great Yarmouth in Norfolk. An average of 2.2 million and 2.8 million overnight domestic trips per annum were made to Lincolnshire and Norfolk between 2012 and 2014, with total spend of £0.4 and £0.6 billion, respectively (Visit England website - [https://www.visitengland.com/sites/default/files/east\\_of\\_england\\_2014.pdf](https://www.visitengland.com/sites/default/files/east_of_england_2014.pdf)). The 150km Peddars Way and Norfolk Coast Path National Trail takes in the coast between Hunstanton and Cromer and a 41km stretch of the England Coast Path from Sea Palling to Weybourne opened in 2014 (see Figure A1h.29 above). These, in addition to many other coastal footpaths and the region's rich wildlife (popular for birdwatching and wildfowling alike) attract further visitors. The north Norfolk coast is also a popular destination for dinghy sailors and windsurfers. The East marine plan evidence and issues report indicated that leisure boating was the most popular and economically valuable part of the marine water sports industry, with 101 Royal Yachting Association (RYA) training areas, 33 RYA marinas, 37 recreational craft marinas and 6 RYA racing areas in the area (MMO 2012).

Coastal areas of Essex and Kent are major areas for tourism with a number of highly developed traditional seaside resorts, particularly Southend-on-Sea, Clacton-on-Sea, Margate and Ramsgate. An average of 1.9 million and 3.2 million overnight domestic trips per annum were made to Essex and Kent between 2012 and 2014, with total spend of £0.2 and £0.5 billion, respectively. In the wider east and south east of England regions, trips to the seaside represented 39% and 36% respectively of all trips taken (Visit England website - [https://www.visitengland.com/sites/default/files/south\\_east\\_2014.pdf](https://www.visitengland.com/sites/default/files/south_east_2014.pdf)). The east of England region has one of the highest participation rates (36.2%) for any watersports activities in the UK as well as any boating activity (11.9%) (Arkenford 2015). Based on the number and distribution of wildfowling clubs from which a wildfowling permit can be obtained<sup>28</sup>, the east and south-east region of England is one of the most important areas in Britain for wildfowling, with shooting taking place on many of the major estuaries including the Humber and Wash.

There are several well used coastal paths in the area that attract many walkers and sightseers; the Suffolk Coastal Path runs for 80km from Lowestoft to Felixstowe, around the Kent coast the Saxon Shore Way runs 262km from Gravesend to Hastings, the North Downs Way (a National Trail) follows the cliff top between Dover and Folkestone and there are many other areas of open public access along sections of the coast.

#### **A1h.14.4.2 Features of Regional Sea 3**

The following description comes primarily from the South Plans analytical report (MMO 2014b) as Regional Sea 3 coincides with the inshore and offshore plan areas. The region's coast is a popular tourist destination with a large number of seaside towns and attractions. The eastern half of the coastline is highly accessible to London and the south-east. This is reflected in the domestic overnight trips and associated spend to the region (e.g. Hampshire (3.5 million trips (average 2012-2014), East Sussex (2.2 million trips, £0.4 billion), West Sussex (1.6 million trips, £0.3 billion), Brighton and Hove (1 million trips, £0.2 billion) and Isle of Wight (1 million trips, £0.2 billion). In the south-east, trips to the seaside represented 36% respectively of all overnight trips taken (Visit England website - [https://www.visitengland.com/sites/default/files/south\\_east\\_2014.pdf](https://www.visitengland.com/sites/default/files/south_east_2014.pdf)). The south-east received 227 million domestic day visits (13% of which were to the seaside/coast), spending £7.6 billion in 2014. The western part of Regional Sea 3 sits within the south-west region which has the largest share of the UK domestic tourism market. For example, Dorset and Devon had an average (2012-2014) of 3.1 million and 4.7 million overnight domestic trips respectively, with

<sup>28</sup> <http://basc.org.uk/wp-content/plugins/download-monitor/download.php?id=806>

total spend of £0.6 and £1 billion respectively. In the south-west region, trips to the seaside represented 54% of all trips taken (Visit England website - [https://www.visitengland.com/sites/default/files/south\\_west\\_2014.pdf](https://www.visitengland.com/sites/default/files/south_west_2014.pdf)).

Wildlife and natural landscapes attract many visitors to the plan areas. Popular destinations include the New Forest National Park (which stretches for 42km from Hurst Spit to Calshot), the South Downs National Park (which stretches for 140km from Winchester to Eastbourne) and the South Devon, East Devon, Dorset, High Weald, Isle of Wight and Kent Downs AONBs. Other designations include sites of special scientific interest and national nature reserves. Many of these marine environments are protected as special areas of conservation (SACs) and special protection areas (SPAs).

The Jurassic Coast, England's only natural World Heritage site (located along the Dorset and East Devon coast), receives over 5 million visitors each year. Other natural heritage attractions include the South West Coast Path (from Minehead in Somerset to Poole Harbour in Dorset with the latter section from Dartmouth to Poole Harbour in Regional Sea 3), the Solent Way (stretching for 97km from Milford on Sea to Emsworth in Hampshire), Berry Head (Devon), Lulworth Cove and Durdle Door (Dorset), The Needles (Isle of Wight), Seven Sisters, Beachy Head (Sussex) and Dungeness (Kent). The first stretch of the England Coast Path, from Rufus Castle on Portland to Lulworth Cove (Weymouth Bay), part of the SW Coast Path opened to the public in June 2012<sup>29</sup>.

The south coast is host to a variety of wildlife watching activities with tourists hoping to see (among other species): whales, dolphins, basking sharks, seals and waterbirds. Most of the boat-based wildlife watching is focused between the coastline of the River Dart and Berry Head, Devon. Wildlife watching is also popular along the Jurassic Coast, Portland Bill and the Isle of Purbeck as well as within natural harbours such as Poole.

Other notable activities related to tourism in the plan areas include the cruise industry, conference trade, heritage tourism (land based and underwater sites), diving and sea angling.

The region has a high recreational value and is very popular for activities including pleasure boating, sailing, diving (including diving on wrecks), sea angling, kayaking, surfing, windsurfing and exploration of underwater and coastal heritage assets (Arkenford 2015). There are also many blue flag beaches (see Figure A1h.28 above) and popular rural beaches such as Studland beach in Dorset which receives one million visitors each year (Fisher Associates 2011).

The marine recreation sector is inherently linked with tourism; many people visit the area to try a new recreational activity or to simply walk on the beach and enjoy the surrounding views. Furthermore, there are many marine and coastal designations (including national parks, areas of outstanding natural beauty and the Jurassic Coast World Heritage Site) which attract visitors to the area. In 2012 the number of people employed by coastal tourism on the south coast was estimated to be over 47,000 people, significantly more than any other marine sector (the next highest being ports and shipping at just below 7,000), indicating the importance of coastal tourism to employment (MMO 2014b).

Leisure boating is the most popular and economically valuable part of the marine water sports industry. The greatest density of Royal Yachting Association clubs and privately owned

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<sup>29</sup> <https://www.gov.uk/government/collections/england-coast-path-portland-to-lulworth>



marinas in the UK lie on the region's coast with the Solent, Isle of Wight, River Dart and Brighton some of the most popular recreational boating areas in the UK. Sailing also takes place at Shoreham and Poole Harbour, the development of the Weymouth and Portland National Sailing Academy (an Olympics 2012 legacy) increasing sailing activity in the area. The presence of recreational boating activities are also common to people on or visiting the south coast, thus adding to the sense of place and character of the area.

The south coast has the greatest number of marinas and berths in the UK, indicating the interest in sailing activities and demand for associated facilities. Coastal marinas in the south-east and south-west contribute an estimated £36 million each year to the economy. Furthermore, many craft moor within estuaries without having a recognised marina, such as the Teign estuary, where there are around 10 free to use, publicly accessible slipways.

There are many international sailing and boating events in the region such as Cowes week, Round the Island race and Southampton Boat Show. These generate revenue for the local economy and attract tourists to the area, approximately £6.4million income is generated for local businesses through tourism expenditure during Cowes week.

Weymouth and Portland are also popular diving sites due to the large number of wrecks and reefs, along with Torbay, Selsey and the Isle of Purbeck.

The region has some of the most popular stretches of coastline for wind and kite surfing despite the optimum conditions being infrequent compared to other areas. Popular sites include Poole Bay, Brighton, Bournemouth, Camber, Eastbourne, Hayling Island, Langstone Harbour, Shoreham and Lancing.

Surfing is popular on the south coast, with hotspots around Hastings, Birling Gap and West Wittering. The Dorset coastline is also popular with surfers due to its sheltered nature. Dorset is also home to Europe's first artificial surf reef at Boscombe. The importance of the region for surfing is highlighted by recent analysis of the economic contribution of domestic surfing to the UK which estimated that south coast surfers spent over £400 million annually or 39% of the UK surfer total (Surfers Against Sewage (SAS) 2013). Paddle sports (canoeing, sea kayaking, stand-up paddle boarding) occur predominantly inshore at locations such as Poole Harbour, Studland Bay, the Dart Estuary, Hamble and Itchen Estuaries, Torbay and the Isle of Purbeck.

The Solent Way, South Downs Way and South West Coast Path are popular with walkers enjoying the views of the coastline and out to sea.

#### **A1h.14.4.3 Features of Regional Seas 4 & 5**

Overnight domestic trips to the south-west region represented 19% of the total of trips to England, and 22% of spend in 2014 – 17.3 million trips and £3.9 billion in spend. There were also 146 million day trips (11% of all day trips in England), with £4.7 billion in spending. Cornwall and the Isles of Scilly had an average of 3.8 million domestic overnight trips (2012-2014), with total spend of £1.1 billion. Over half (54%) of holiday trips to the region were to the seaside (Visit England website - [https://www.visitengland.com/sites/default/files/south\\_west\\_2014.pdf](https://www.visitengland.com/sites/default/files/south_west_2014.pdf)). The southern counties of Wales within Regional Sea 4 received a total of 3.7 million domestic overnight trips with total spend of £0.7 billion, 53 million domestic day trips (£2 billion spend) and 0.6 million overseas visitor trips (£0.2 billion spend). Cardiff (20.6 million), Swansea (9.1 million) and Pembrokeshire (7 million) received the most visits. At a national level, 21% of domestic day trips to Wales

included a coastal location with the Vale of Glamorgan (43%), Pembrokeshire (32%), Bridgend (25%) and Swansea (23%), all above the national average for the proportion of coastal trips (Welsh Government local authority tourism profiles 2010-2012<sup>30</sup>). In 2012 the proportion of employment in tourism industries was highest in the Isles of Scilly (30.6%), Pembrokeshire (19%), Cornwall (17.1%) and North Devon (17.2%)<sup>31</sup>.

Major land- and water-based leisure facilities are concentrated in traditional coastal holiday areas, most of which are in Devon; including Seaton, Sidmouth and Budleigh Salterton, Exmouth and Dawlish on the Exe Estuary, Teignmouth, the Tor Bay area and Salcombe. Beaches are important recreational sites and those with excellent water quality in the region include Blackpool Sands, Slapton Sands, Mill Bay, Thurlestone South, Bigbury-on-Sea North and Challaborough<sup>32</sup>. On the south Wales coast bathing waters with excellent water quality include Portcawl, Langland Bay, Caswell Bay, Tenby, Freshwater West and Marloes Sands to list a few<sup>33</sup>. There are several important coastal nature reserves in the region, popular locations for bird watchers and naturalists. Slapton Ley National Nature Reserve field studies centre and the visitor centre at Dawlish Warren Local Nature Reserve both provide programmes of guided walks and activities. Sites on the Exe Estuary and the inner Salcombe-Kingsbridge Estuary are also popular with bird watchers. The RSPB run 'avocet cruises' on the River Exe in the winter months, when the largest numbers of this important population occur<sup>34</sup>. In south Wales, a wide variety of coastal habitats support important sites for wildfowl and waders including the Severn Estuary, Burry Inlet, Carmarthen Bay and for seabirds, islands such as Skomer, Skokholm and Grassholm.

Several important coastal rock climbing locations exist in the region, for example at Berry Head, and the region hosts the South West Coast Path (see Figure A1h.29 above). The path runs from Minehead in Somerset to Poole Harbour in Dorset (over 1,000km) and attracted almost 9 million users in 2012 (The South West Research Company 2014). Relevant stretches of the Wales Coast Path covers the following different regions: South Wales Coast & Severn Estuary (characterised by city life, industrial heritage, wildlife watching opportunities); Gower & Swansea Bay (busy city of Swansea to the stunning coastline of the Gower Peninsula); Carmarthenshire (estuaries of Tywi, Taf and Gwendraeth), and Pembrokeshire (rugged cliffs, golden beaches and hidden coves)<sup>35</sup>. The Pembrokeshire part of the Wales Coast Path follows the route of the 300km long Pembrokeshire Coast Path National Trail<sup>36</sup>.

There are 17 marinas listed for the south-west region according to the UK sailing, sail cruising and yachting guide (<http://www.bluemoment.com/marinassw.html>) with a further 6 listed in south Wales, primarily in and around Milford Haven (<http://www.bluemoment.com/marinaswales.html>). The south-west region of the Royal Yachting Association (includes Gloucestershire, Wiltshire, Bristol and Avon, Somerset, West Dorset, Devon and Cornwall) supports 27 RYA-affiliated clubs and organisations and 129 RYA-recognised training centres<sup>37</sup>.

<sup>30</sup> <http://gov.wales/statistics-and-research/local-authority-tourism-profiles/?lang=en>

<sup>31</sup> [https://www.visitengland.com/sites/default/files/ons\\_employment\\_worksheet\\_for\\_website.xlsx](https://www.visitengland.com/sites/default/files/ons_employment_worksheet_for_website.xlsx)

<sup>32</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/474258/2015-bathing-water-classifications.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/474258/2015-bathing-water-classifications.pdf)

<sup>33</sup> <http://gov.wales/docs/desh/publications/151102-bathing-water-results-2015-en.pdf>

<sup>34</sup> <http://www.rspb.org.uk/community/ourwork/b/southwest/archive/2010/10/27/exe-estuary-rspb-avocet-cruises.aspx>

<sup>35</sup> <http://www.walescoastpath.gov.uk/media/1131/0-wales-coast-path.pdf>

<sup>36</sup> [http://nt.pcnpa.org.uk/website/sitefiles/nt\\_page.asp?PageID=2](http://nt.pcnpa.org.uk/website/sitefiles/nt_page.asp?PageID=2)

<sup>37</sup> <http://www.rya.org.uk/regions/southwest/about/Pages/RyAintheSouthWest.aspx>

The south-west of England (35.6%) and Wales (30.8%) were among those regions with the highest rates of participation in watersports activities in 2014 (Arkenford 2015). Water-based activities of note in the region include:

- Water skiing, in the Exe and Teign Estuaries, Salcombe, Thurlestone, Jennycliff Bay and Cawsand Bay
- Windsurfing at Exmouth, Dawlish, Teignmouth, Compass Cove, Blackpool Sands, Slapton Sands, Salcombe, Bigbury Bay, Wembury Bay and Plymouth Sound
- Coastal rowing in sheltered estuaries including Exeter, Dartmouth and Torquay
- Sea canoeing at Axmouth, Exeter, Exmouth, Paignton and Plymouth
- Scuba diving at Fort Bovisand, is one of the country's leading diver training schools

The south-west is an important area for surfing with Cornwall and Devon supporting a large number of surfing spots<sup>38</sup> and surfers (estimated at over 110,000 by Surfers Against Sewage (2013). SAS (2013) estimated that these surfers were responsible for spend of over £620 million, representing over 60% of the UK total. Pembrokeshire and the Gower Peninsula are the main areas for surfing on the south Wales coast with Cardiff and Swansea supporting relatively large numbers of surfers (over 39,000 and 12,000 respectively).

Wildfowling takes place on a number of the area's estuaries including the Taw and Torridge, Camel, Exe and Teign<sup>39</sup>.

#### A1h.14.4.4 Features of Regional Sea 6

In 2014, there were almost 13 million domestic overnight trips to the north-west of England region, with associated spending of £2.5 billion, representing 14% of the English total. 160 million tourism day visits were taken each year to the region, worth £5.4 billion, equating to 12% of England's day visit market. Only 24% of holiday trips to the region were to the seaside as opposed to the English average of 32%. The most popular places in the north-west were Blackpool (1.3 million trips, £0.3 billion spend, average 2012-2014) Liverpool (1.4 million domestic overnight trips, £0.3 billion spend) and Cumbria (3.5 million trips, £0.8 billion spend) (Visit England website - [https://www.visitengland.com/sites/default/files/north\\_west\\_2014.pdf](https://www.visitengland.com/sites/default/files/north_west_2014.pdf)). The Welsh counties within Regional Sea 6 received a total of 4.2 million domestic overnight trips with total spend of £0.6 billion, 27 million domestic day trips (£0.8 billion spend) and 0.3 million overseas visitor trips (£0.08 billion spend). Gwynedd (7.9 million), Conwy (7.8 million) and Denbighshire (5.5 million) received the most visits. At a national level, 21% of domestic day trips to Wales included a coastal location with all of the counties with the exception of Flintshire well above this figure (e.g. Isle of Anglesey (62%), Conwy (51%), Denbighshire (50%), Gwynedd (37%) and Ceredigion (36%) (Welsh Government local authority tourism profiles 2010-2012<sup>40</sup>). There were approximately 2.4 million domestic overnight visits to the Scottish counties adjacent to Regional Sea 6 in 2014, spending almost £0.5 billion. Argyll and Bute (0.8 million) and Dumfries and Galloway (0.7 million) received the most overnight trips (Visit England *et al.* 2015b). There were also 22 million day trips to these counties with spend of £0.65 billion with Ayrshire and Renfrewshire in addition to Dumfries and Galloway and Argyll and Bute, the most popular for domestic day trips. Only 8% of day trips to the west of Scotland had a seaside or coastal destination (Visit England *et al.* 2015a). In 2014 there were approximately 3.5 million

<sup>38</sup> <http://magicseaweed.com/UK-Ireland-Surf-Forecast/1/>

<sup>39</sup> <https://basc.org.uk/wp-content/plugins/download-monitor/download.php?id=806>

<sup>40</sup> <http://gov.wales/statistics-and-research/local-authority-tourism-profiles/?lang=en>

overnight trips to the Northern Ireland counties adjacent to Regional Sea 6 with spend of almost £0.6 billion. Belfast (1.2 million), the Causeway Coast and Glens (0.8 million) and Newry, Mourne and Down (0.6 million) received the most visits.

The north Wales and Lancashire coasts are dominated by traditional seaside resorts, while Cumbria and Dumfries and Galloway are important for more active leisure pursuits. Tourism provides significant income for the region and is a major employer. For example, in many of the relevant Welsh counties, tourism industries were responsible for a large proportion of total employment in 2012: Conwy (19.7%), Pembrokeshire (19%), Anglesey (18%), Gwynedd (17.3%) and Ceredigion (14.4%)<sup>41</sup>. Similarly, in other parts of the region the tourism industry is a significant employer: South Lakeland (24.6%), Blackpool (19.6%), Allerdale (16.8%) and South Ayrshire (14.9%). The most recent Northern Ireland Census of Employment figures indicated a 3% increase in employee jobs in tourism related industries between 2011 and 2013 with around one in ten of all employee jobs in tourism related industries. North Down and Ards and Causeway Coast and Glens local government districts both have over 12% of local employment in the tourism industry (NISRA 2015a).

Much of the west Wales coast of Dyfed and Gwynedd is rugged and undeveloped, but there are significant tourist areas. These include: Aberporth, New Quay, Aberaeron, Aberystwyth, Borth, Tywyn, Barmouth, Harlech, Porthmadog, Criccieth, Pwllheli and Abersoch. The beaches of Caernarfon Bay and Anglesey have all attracted leisure developments. A major and regionally important tourist area is located at Llandudno on Conwy Bay. This resort, along with Colwyn Bay to the east serves many visitors from the industrial towns of north-west England, and is a significant traditional seaside recreational area. Great Orme is a popular Country Park and attracts many visitors, particularly for walking.

As indicated in the summary for Regional Seas 4 and 5 above, participation in watersports activities in 2014 was relatively high in Wales (30.8%) with the north-west of England amongst the lowest (18.4%). By contrast, participation rates in Northern Ireland were the highest in the UK (63.3%). Spending general leisure time at the beach and coastal walking represented the most popular activities, particularly in Northern Ireland with participation in these activities much lower in the north-west (Arkenford 2015). An RYA mapping tool indicates that there are approximately 10 RYA clubs on the coast of Northern Ireland with another 10 associated with Strangford Lough<sup>42</sup>.

There are a number of surf spots primarily on the north and west coast of Wales and SAS (2013) estimated that there were approximately 13,000 surfers in the region.

According to the distribution of wildfowling clubs from which a wildfowling permit can be obtained<sup>43</sup>, there are a number of areas which support wildfowling clubs including the southern Solway, the River Kent estuary, the Mersey, Ribble, Wyre and Lune estuaries.

#### **A1h.14.4.5 Features of Regional Seas 7 & 8**

There were ca. 2.8 million (average 2012-2014) domestic overnight trips to the Scottish regions adjacent to Regional Seas 7 and 8, with associated spending of £0.7 billion. The Highland region (1.8 million trips) was the most popular with Argyll and Bute and Eilean Siar (the Western Isles) receiving 0.8 million and 0.1 million overnight trips respectively (Visit England *et al.*

<sup>41</sup> [https://www.visitengland.com/sites/default/files/ons\\_employment\\_worksheet\\_for\\_website.xlsx](https://www.visitengland.com/sites/default/files/ons_employment_worksheet_for_website.xlsx)

<sup>42</sup> <http://www.rya.org.uk/wheresmynearest/Pages/directory.aspx#map/t-1>

<sup>43</sup> <http://basc.org.uk/wp-content/plugins/download-monitor/download.php?id=806>

2015b). 11.5 million tourism day visits were taken each year (average 2012-2014) to the relevant Scottish regions, worth £0.5 billion. In the north of Scotland 21% of day trips were to the seaside/coast (Visit England *et al.* 2015a). As described for Regional Sea 6, the Causeway Coast and Glens region of Northern Ireland received 0.8 million overnight visitors with £0.1 billion spend (NISRA 2015b).

The unspoilt coastal environment of Regional Seas 7 and 8 and the wild natural scenery attract tourists in pursuit of a wide range of activities and interests including walking, bird and cetacean watching, wildfowling, sailing, fishing, diving and the maritime history of the region. Visitor surveys for the relevant coastal regions of Scotland highlight the importance of the scenery and landscape in attracting tourists to the region<sup>44</sup>.

Foremost attractions in Shetland include the Fair Isle bird observatory, the National Nature Reserve on the Isle of Noss, Fetlar Nature Reserve and Sumburgh Head RSPB Nature Reserve. Wildlife interests are also important in Orkney and include a popular bird observatory at North Ronaldsay and several popular RSPB and Scottish Wildlife Trust reserves. Scapa Flow is a focus for waterskiing, windsurfing, motorised watersports and wreck diving, while there are a number of coastal paths on the north coast of Scotland, including those at Duncansby Head, John O'Groats and Sandside Bay.

The relative remoteness of the Northern Highlands and Western Isles means that they receive fewer tourists than south-west Scotland and the coast of Northern Ireland. Most of the region's tourism and leisure infrastructure is concentrated to the south and east of the Firth of Clyde, one of the most intensively-used areas for coastal recreation in Scotland. Yachting takes place in most areas throughout the isles, but most activity is concentrated in the south. The RYA mapping function<sup>45</sup> indicates that there are 9 sailing clubs on Shetland and 3 on Orkney with approximately 30 sailing clubs along the west coast of mainland Scotland, mostly in the south.

The north coast of Northern Ireland has a developed tourist infrastructure and a number of coastal attractions. The Causeway Coast Way, for example, takes in attractions like the Giant's Causeway, Dunluce Castle ruins, and the Carrick-a-rede Rope Bridge. The Giant's Causeway World Heritage Site was Northern Ireland's top visitor destination in 2014 with 0.8 million visitors (NISRA 2015a). Beaches are used in the summer months, most of which are rural in nature and a number held Blue Flag awards in 2015 including Downhill strand, Magillan Strand, Castlerock. Mill Strand (Portrush) and the Strand Portstewart<sup>46</sup>. Other popular coastal recreational activities include golf, sea angling, swimming, surfing, canoeing, windsurfing and scuba diving.

#### **A1h.14.4.6 Evolution of the baseline**

The Visit Britain forecast<sup>47</sup> for visits for the full year 2015 was 35.4m visits, an increase of 2.8% on 2014. Their forecast for spending by visitors in 2015 was £22.0bn, a 0.7% increase on 2014. For 2016, Visit Britain forecast that there will be 36.7 million visits, an increase of 3.8% on 2015; and £22.9bn in visitor spending, an increase of 4.2% on 2015. However there are a number of risks which could affect visitor numbers:

<sup>44</sup> [http://www.visitscotland.org/research\\_and\\_statistics/visitor\\_research/all\\_markets/scotland\\_visitor\\_survey.aspx](http://www.visitscotland.org/research_and_statistics/visitor_research/all_markets/scotland_visitor_survey.aspx)

<sup>45</sup> <http://www.rya.org.uk/wheresmynearest/Pages/directory.aspx#map/t-1>

<sup>46</sup> [http://www.thebeachguide.co.uk/best-beaches/blue\\_flag.htm](http://www.thebeachguide.co.uk/best-beaches/blue_flag.htm)

<sup>47</sup> <https://www.visitbritain.org/2015-forecast>

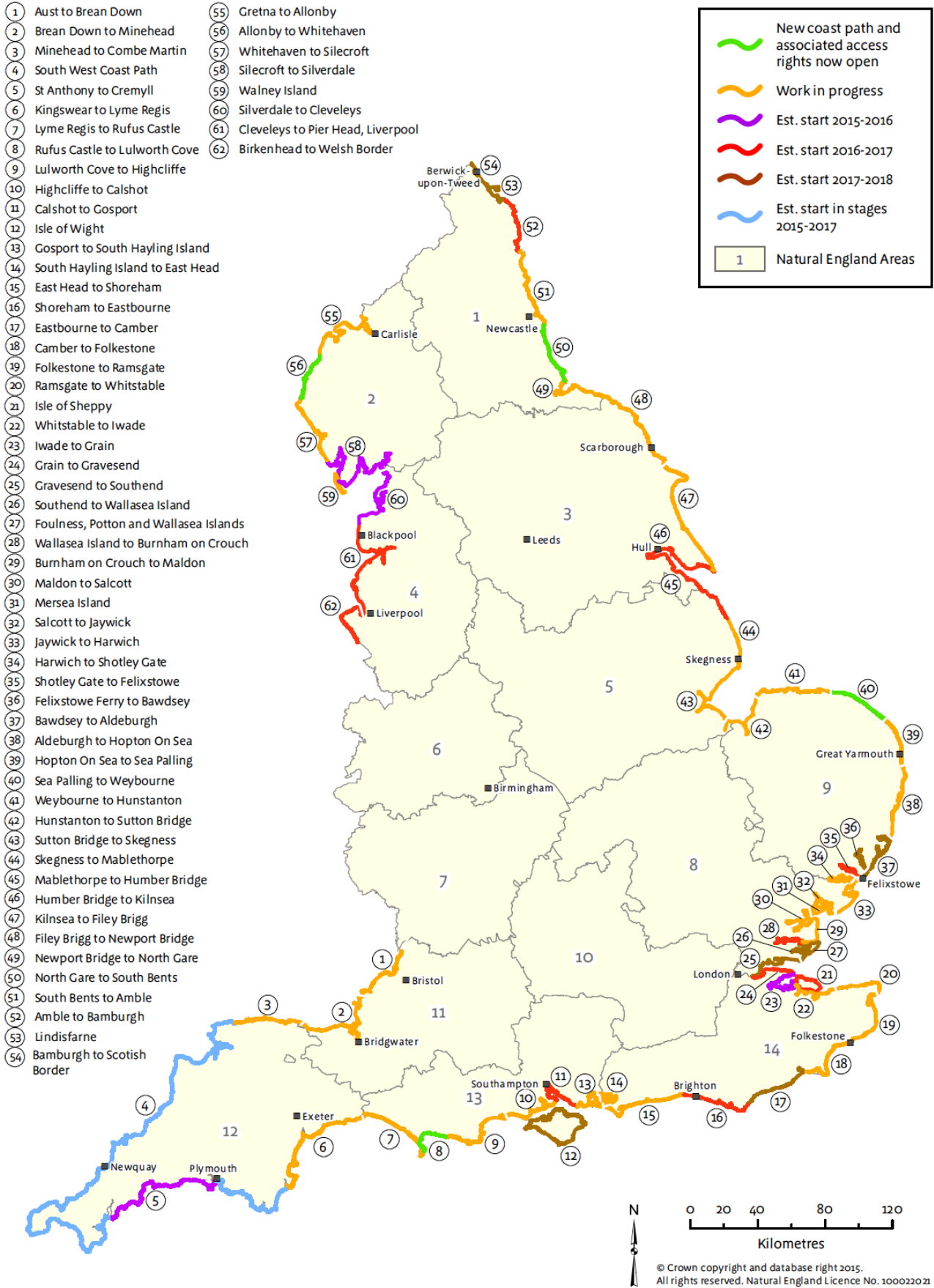
- The wider global economic outlook remains uncertain. In 2015, the Chinese economy slowed, the Eurozone saw a period of deflation, the oil price continued to fall and some major emerging markets experienced recession. In 2016, a number of emerging markets are expected to continue to see weak growth although China and India are assumed to be among the world's fastest-growing economies.
- Exchange rates have been volatile in recent years. These not only colour value perceptions of destinations but affect visitors' budgets. In 2015, the pound rose in value against many major currencies, one reason we expect spending to have grown at a slower rate than visit numbers. For the 2016 forecast, the Euro is assumed to be broadly stable against the Pound in 2016 while the US dollar is expected to appreciate slightly.
- The global price of oil fell in late 2015. This is an important indicator as it not only affects the cost of transportation but real disposable incomes for consumers around the world. At the time the forecast was produced the oil price was above \$45/barrel; if the oil price remains much below \$40 throughout 2016 then this would boost disposable incomes for visitors from many, though not all, markets.
- It is assumed that there will be no unforeseen major events that significantly disrupt travel to Britain, e.g. related to geopolitics, health scares or natural disasters. Events in late 2015 underline that geopolitical/security developments remain a risk.

In their assessment of domestic leisure tourism trends for the next decade, Visit England (2013) indicated that the recent downturn had provided an unexpected boost for domestic tourism as consumers swapped overseas trips for domestic ones. Given the likely slow recovery and economic impact that the recession has had, the report indicates that this trend may continue at least over the next decade.

Natural England expects to complete work on the England Coast Path in 2020. Figure A1h.30 below provides an overview of progress which shows:

- the stretches that Natural England is currently working on
- the stretches that are open
- when work on new stretches is likely to start

Figure A1h.30: Provisional timings and stretches of the English coastal path



### A1h.14.4.7 Environmental issues

A marine strategic scoping exercise (Welsh Government 2015) to inform the development of the Welsh National Marine Plan identified a number of relevant environmental issues with respect to tourism and recreation which are likely to apply to all coastal areas of the UK.

Increased levels of recreational activities have the potential to increase the risk of negative effects on the marine environment; however, the scale and the impact of recreational activities vary considerably, change rapidly and the impacts are, therefore, hard to define and challenging to manage. For example, experience in Pembrokeshire suggests that marine and coastal recreational activity is increasingly being provided through small individual, mobile enterprises that make extensive use of social media for promotion purposes (as opposed to the larger outdoor and often residential recreation centres and businesses of the past), which can create significant challenges in terms of managing frequency, levels and impacts (social and environmental) of recreational use along the coast. As with tourism, recreational activities rely on the benefits of healthy marine environments, coasts and landscapes. A balance is, therefore, needed to retain both the level of recreational activities to support socio-economic benefits to the area and promoting good environmental status.

It is inevitable that recreational activities (hotspots) overlap with sites of designated and significant landscapes, historic heritage, nature conservation and other key interests along the coastline (Welsh Government 2015).

The East marine plan (HM Government 2014) highlighted that it was important to recognise that, apart from recreational sailing, the majority of tourism and recreation activities occur on the coastline and in the inshore area e.g. surfing. Therefore this sector is spatially constrained. Tourism and recreation rely on the preservation of the historic environment and heritage assets, a healthy marine environment including good water quality, clean beaches, abundant wildlife and a healthy ecosystem to attract people. Issues identified through the development of the East marine plans include the potential for displacement of tourism and recreation due to increases in new activities and the cumulative effect of other activities.

## A1h.15 Recreational sea angling

### A1h.15.1 UK context

Sea angling is a leisure activity and an important contributor to coastal tourism. Key regions for angling include south west England, Northumberland, Pembrokeshire, the Firth of Clyde, Argyll and the Western Isles, the Solway Firth and the East Grampian coast (British Marine Federation *et al.* 2009; Land Use Consultants 2007; CCW 2009). The Sea Angling 2012 survey (Armstrong *et al.* 2013) estimated that 2.2% of the adult population of Great Britain (*i.e.* excluding Northern Ireland) went sea angling in 2012. This represents approximately 1.1 million people – 884,000 from England, 76,000 from Wales and 125,000 from Scotland, spending a total of almost 4 million days fishing each year. Survey data from 2005 estimated there to be 5,000 recreational sea anglers in Northern Ireland (PriceWaterhouseCoopers 2007), while in 2014, 2% of over 600 respondents surveyed claimed to participate in sea angling (AFBI 2014). These anglers make a significant contribution to the economy, with English sea anglers spending £1.23 billion on the pastime in 2012. Taking indirect effects into account, this is estimated to support £2.1 billion total spending, 23,600 jobs and £980 million gross value added (Armstrong *et al.* 2013).

Of almost 4 million days of sea angling recorded in the survey, over 70% were conducted by shore anglers, although they only caught 43% of the fish. Angling from boats, either private or chartered, accounted for the remainder. Anglers fishing from boats are more successful than



their shore-based counterparts, catching an average of five fish per day, compared to two fish per day from the shore.

The most common species caught are mackerel and whiting, which together accounted for 46% of catch reported in England in 2012. Bass, dogfish, dab and cod accounted for another 26% and the remaining 28% was made up of a variety of species, the most commonly caught being pollack, plaice, smoothhound, flounder, bib, wrasse, seabream and a selection of skates and rays. Shore anglers released 75% of the fish they caught. Total annual catch estimates of bass and cod, a requirement of the EU Data Collection Framework, are shown in Table A1h.8.

**Table A1h.8 – Annual catch estimates of bass and cod by recreational anglers**

| Annual catch (tonnes) |       | Shore      | Private/rental boats | Charter boats | Total       |
|-----------------------|-------|------------|----------------------|---------------|-------------|
| Bass                  | Total | 98t – 143t | 194t – 546t          | 44t           | 380t – 690t |
|                       | Kept  | 38t – 56t  | 142t – 367t          | 31t           | 230t – 440t |
| Cod                   | Total | 95t – 138t | 172t – 595t          | 175t          | 480t – 870t |
|                       | Kept  | 75t – 109t | 158t – 582t          | 159t          | 430t – 820t |

*Note: Figures for shore and private boats represent extremes of range of estimates from different approaches to analysing the data*

The Sea Angling 2012 survey identified 399 charter boats in England, of which 210 were based at ports along the south coast, 144 at North Sea ports and the remaining 45 at Bristol Channel and Irish Sea ports. Charter Boats UK website<sup>48</sup> identifies 38 charter boats based in Wales, 13 based in Scotland and 5 based in Northern Ireland (although this is not likely to be a full complement – the website only holds records of 208 boats from England). Boat anglers typically returned approximately 50% of fish they caught. Elasmobranch species were nearly always released, although there were no catches of large pelagic sharks (mako, porbeagle or blue) reported possibly due to specialist shark angling boats either being missed by, or declining to participate in, the survey. Shark angling in the UK is coordinated by the Shark Angling Club of Great Britain (SACGB). The recreational blue shark fishery is conducted between June and September of the Cornish coast. Here, six charter vessels catch and release between 200-600 blue sharks annually (Mitchell *et al.* 2014).

#### **A1h.15.1.1 Evolution of the baseline**

The latest Watersports and Leisure Participation Survey 2009, based on a survey of 12,683 adults, estimated that there were 1.3 million active sea anglers in the UK (British Marine Federation *et al.* 2009), while a survey by Drew Associates (2004) estimated there were 1.1 million participants in recreational sea angling in England and Wales alone. These figures are higher than those estimated by Armstrong *et al.* (2013), which was based on 12,619 face-to-face interviews. The size of the surveys are comparable, and it does perhaps indicate a slight decline in sea angling, although the numbers are of a similar scale. A marine and recreation land use audit (CCW 2009) reported that angling had declined in recent years due to reductions in fish stocks – this decline seems to have continued.

#### **A1h.15.1.2 Environmental issues**

Recreational angling from the shore may conflict with other coastal activities and as with commercial fisheries, albeit to a much lesser extent, there are concerns about the over-exploitation of fish stocks. Digging for lugworms and crabs to use as bait can cause damage

<sup>48</sup> <http://www.charterboats-uk.co.uk/unitedkingdom/>

from mechanical harvesting, a localized decline in the target invertebrate species, habitat damage and disturbance and the removal of food sources for birds and other predators (Pawson *et al.* 2007). Bait is often collected locally and may be an important secondary industry in an angling region, with estimates of the value ranging from £25m-£90m annually (Defra 2010).

## A1h.16 Fisheries

### A1h.16.1 UK context

The UK fishing industry operates throughout UK waters, from the shoreline to the national boundaries. The livelihoods of fishermen depend on their ability to make optimum use of prime fishing grounds and to adapt to changing circumstances to maximise profit. Consequently they are vulnerable to being displaced by other users. This section provides an overview of the UK fishing industry, followed by a more detailed look at specific fishing activity within each Regional Sea. The data used in this report were obtained largely from the Marine Management Organisation (MMO) and the Scottish Government, who collect Vessel Monitoring System (VMS) data and landings and logbook data. This information is used to generate maps describing the distribution of fishing effort and landings around the UK, allowing detailed examination of fishing activity within each Regional Sea. Data has been presented using the most recently available complete set, in most cases from 2013 or 2014. Some of the tables show an average of data over several years.

The UK fishing industry maintains an important position in the UK economy, particularly in remote coastal regions such as parts of Scotland, where the industry can support up to a quarter of all jobs (PMSU 2004). In 2014, there were 11,845 working fishermen in the UK (of which 82% were full time), operating 6,383 vessels (MMO 2015). These vessels landed 756,000 tonnes of sea-fish and shellfish in 2014 (450,000 tonnes into UK ports), with a total value of £861 million (£615 million into UK ports) (MMO 2015, Seafish 2015a). On top of this, fish processing supported over 19,500 jobs in the UK in 2014 (Seafish 2015b). The UK is a net importer of seafood, with 63% of UK demand in 2014 supplied through imports (MMO 2015).

### A1h.16.2 Fishing ports and vessels

There are over 350 ports around the UK coast supporting active fishing vessels. Vessels range in size from small day boats of just a few metres in length, to large pelagic and demersal trawlers, able to fish for weeks at a time and store large quantities of catch. Smaller vessels make up an inshore fleet that is both active and also very important to the economy of many coastal areas. For this baseline, vessels have been split into two groups: >10m and <10m. The <10m fleet comprises almost 79% of the total UK fleet. Vessels operating in the inshore fishery are considered to be day boats, typically completing and returning from a fishing port within a day. Discussion with stakeholders indicates that most inshore fisheries take place within 25nm of shore. Inshore fisheries may be particularly vulnerable to spatial exclusion as these smaller vessels are unable to travel further afield to fish new grounds. Figures A1h.31 and 32 illustrate the distribution of these two groups of vessels around the UK coast. Smaller vessels are distributed relatively evenly around the coast, with particularly large concentrations along the south and northeast coasts of England and the west of Scotland, where inshore fisheries are particularly important. Larger vessels are more abundant in ports on the northeast coast of Scotland, the Devon/Cornwall peninsula and Northern Ireland. Figure A1h.33 shows the division of the fleet by vessel size from ports within each Regional Sea. The specific features of each Regional Sea will be discussed in the relevant section.

Ports were ranked by the total weight of fish and shellfish landed at them in 2013. Landings at the top fifty UK ports have been detailed in the relevant Regional Sea section.

Figure A1h.31: The distribution of UK vessels <10m at UK administrative ports in 2013

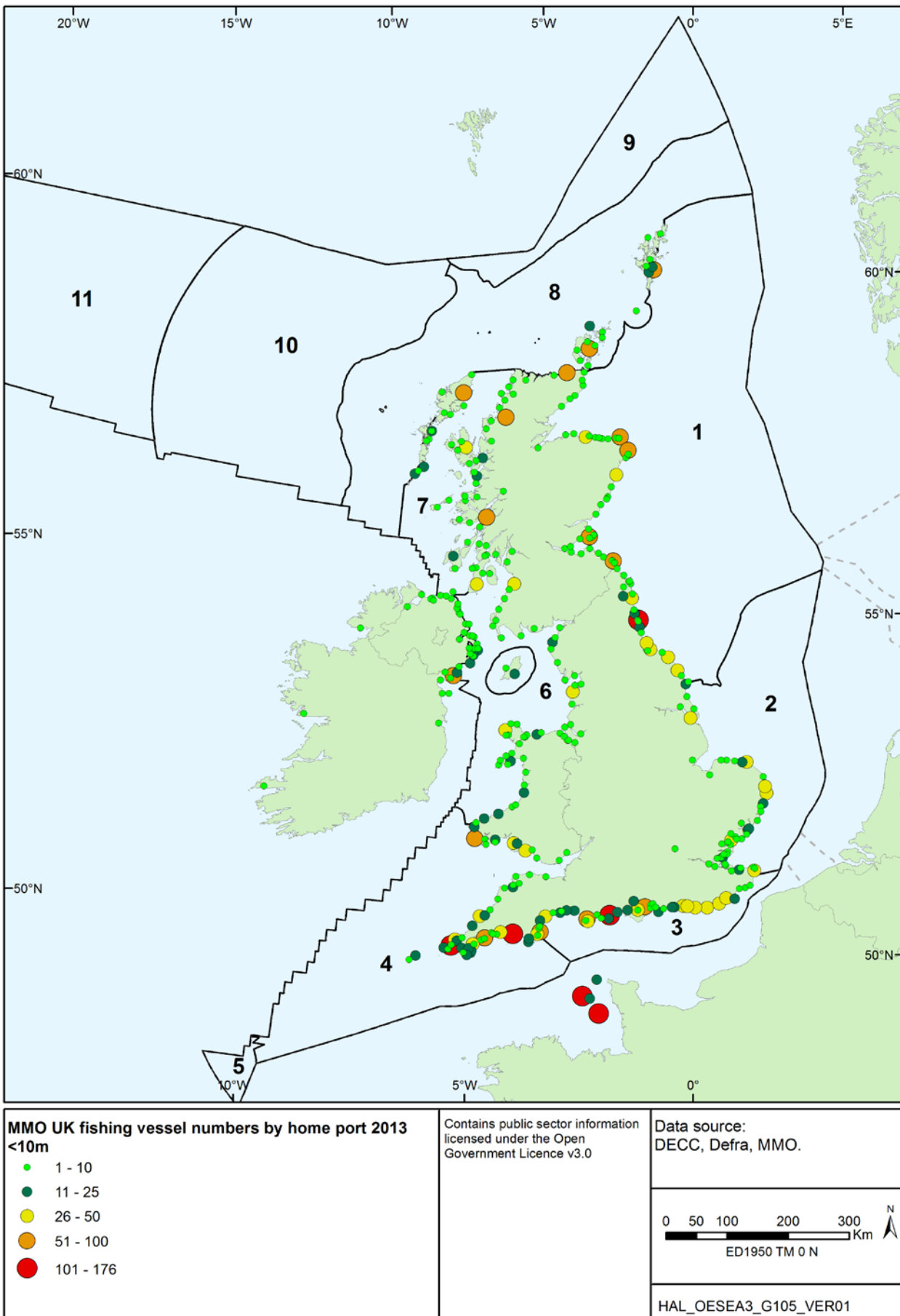
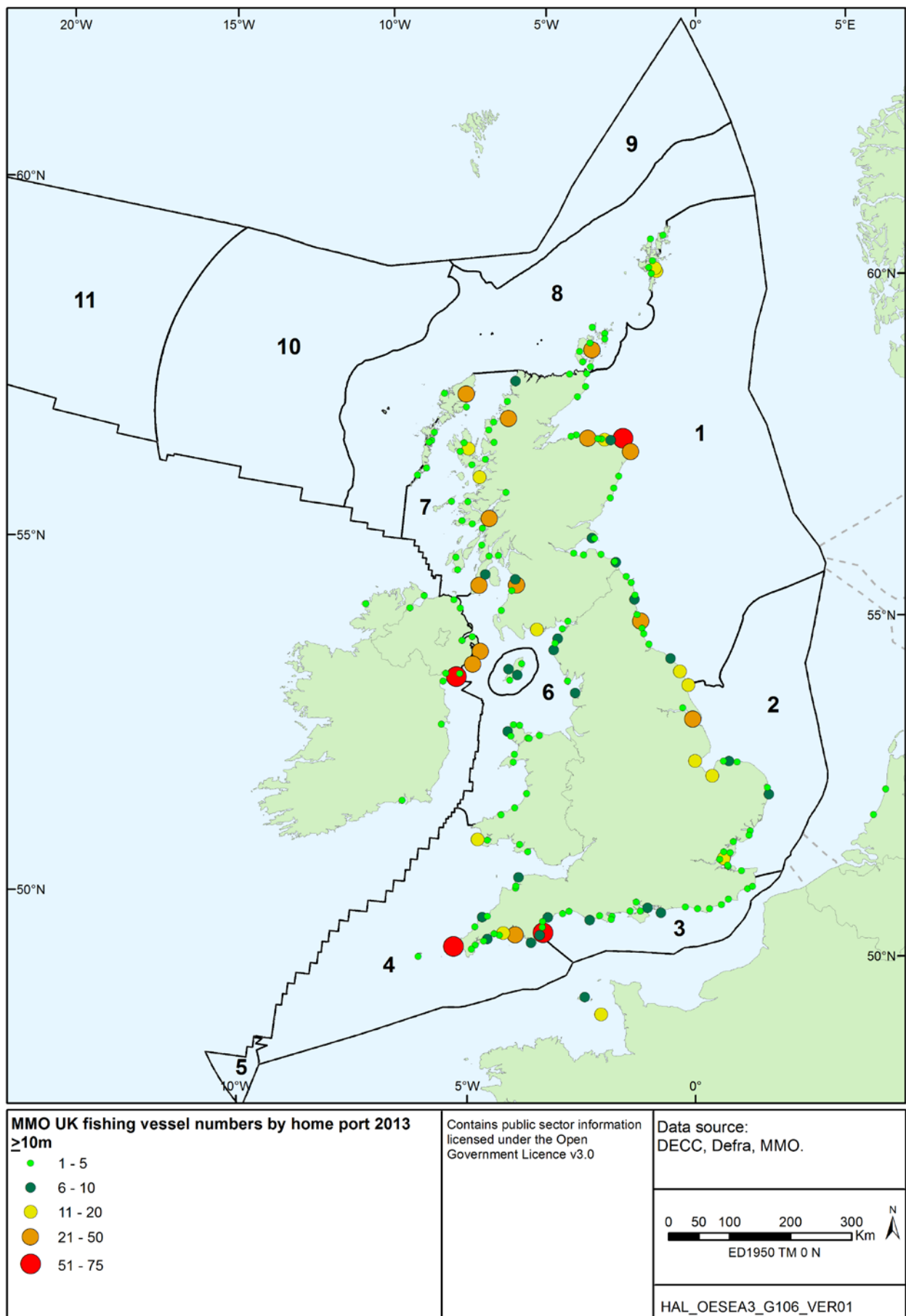
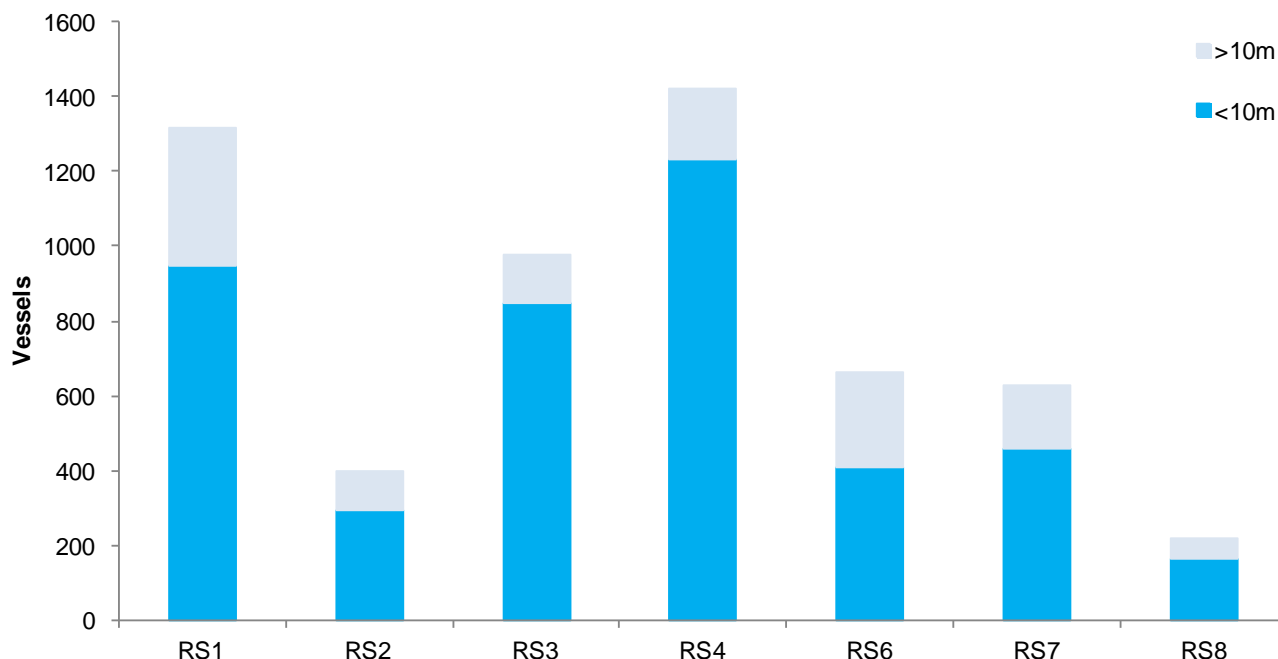


Figure A1h.32: The distribution of UK vessels >10m at administrative ports in UK in 2013



**Figure A1h.33: The number of fishing vessels based in each coastal Regional Sea in 2014**

Source: MMO vessel statistics<sup>49</sup>

### A1h.16.3 Fisheries management

Fishing carried out within 200 nautical miles of the UK coast is managed by the European Union under the Common Fisheries Policy (CFP). The main method of management is the implementation of Total Allowable Catches (TACs) for certain species in designated areas (ICES areas), divided between fleets into quotas based on historical fishing records. The EU can also impose technical restrictions on fishing gear, such as minimum mesh size or maximum engine power. Advice from scientific bodies such as ICES (International Council for the Exploration of the Sea) is considered in the management process, as is the input of regional bodies such as Regional Advisory Councils (RACs). Three RACs operate within UK waters – the North Sea RAC, the North Western Waters RAC and the South Western Waters RAC. As well as this, the inshore waters (within 6 nautical miles of the high mean water mark) of England are under the jurisdiction of ten Inshore Fisheries and Conservation Authorities (IFCAs), which were established in 2011 to replace Sea Fisheries Committees (SFCs). The Welsh Government has full responsibility for the management and enforcement of sea fisheries in Wales, advised by three Inshore Fisheries Groups representing north, mid and south Wales. In Scotland, fisheries management is controlled by Marine Scotland, who work in conjunction with six, non-statutory, Inshore Fisheries Groups (IFGs). These bodies are able to impose closed areas and technical measures within their local region. From April 2016, the six IFGs will be reduced to five, with the East Coast IFG and Moray Firth and North Coast IFG merging to form the North and East Coast IFG and the North West and South West IFGs merging to form the West Coast IFG, in addition to the Outer Hebrides IFG, the Orkney Management Group and the Shetland Shellfish Management Organisation (Figure A1h.34). Salmon and sea trout are managed by the Environment Agency which also exercises the powers of an IFCA in many of the estuaries of England and Wales. UK registered vessels have exclusive access to all waters within 6 nautical miles of the mean high water mark. UK territorial waters extend out to 12nm

<sup>49</sup> <https://www.gov.uk/government/collections/uk-vessel-lists>

from the coast, but in the region between 6-12nm, those countries with historical claims maintain fishing rights. Belgium, Germany, France, the Republic of Ireland and the Netherlands all hold claims to fishing rights at various locations in UK waters.

## A1h.16.4 Distribution of fishing effort

### A1h.16.4.1 VMS and logbook data

Total fishing effort is not evenly distributed around the UK coast, although it plays an important role in all coastal communities. VMS is a satellite based method of monitoring the position and movements of vessels in UK waters. Figure A1h.35 shows the average annual density of UK vessels in 2013, split by gear type in Figures A1h.36 and 37. Figure A1h.38 shows the distribution of foreign vessels in UK waters, between 2005 and 2007. Although this data is several years old, it provides a fair representation of the current situation. This data shows shelf areas to the north and west of Scotland, along with the western English Channel and the Irish Sea waters around the Isle of Man to be amongst the most heavily fished in the UK. The collection of VMS data however, is only mandatory for vessels over 15m in length (implementation of VMS on vessels over 12m was planned for 2012, but has been delayed) and therefore activity of smaller vessels operating inshore is likely to be under-represented. It should also be noted that extraction of the data used to generate this map was carried out by individual ICES area, resulting in difficulty tracking vessels across boundaries. Abrupt changes in density (such as that seen in Regional Sea 8) at these boundaries are an artefact of this.

In order to gain a better understanding of the fishing activities of small inshore vessels, landings data from 2013 as reported by MMO were used to derive maps of fishing activity (Figure A1h.43 and 44), which were split by species group (Figure A1h.45). Information obtained from fishermen's logbooks allowed fishing effort (measured by total days fished) around the UK in 2014 to be split out by season (Figure A1h.39). It is clear that most fishing activity takes place in coastal waters, for both static (such as pots, traps and gillnets) and mobile gears (such as trawls and dredges). Total fishing effort is generally greater among vessels using mobile gears. There is little seasonal variation in fishing effort, although many fisheries are seasonal, because many fishermen will target different species throughout the year. It should be noted that skippers of vessels <10m are not obliged to complete logbooks, although many now do. Both datasets show similar patterns of distribution, although logbook data emphasises effort around the coast, due to the higher proportion of small vessels included.

### A1h.16.5 Gears and landings

Fisheries may be broken down simply into the following sectors: demersal, pelagic and shellfish. The shellfish sector is typically the most valuable in the UK, with crabs, lobsters, *Nephrops* and scallops all high value catch. Pelagic fish are usually caught in large numbers but at low values. The average annual price per tonne for shellfish species landed in the UK in 2014 was £1,957, compared with £1,795 for demersal species and £646 for pelagic species (MMO 2015). Figure A1h.40 shows the average value of selected species landed into the UK. Sole is the highest value catch (£6,937 per tonne), while lemon sole (£3,369/tonne), *Nephrops* (£3,240/tonne) and squid (£3,185/tonne) are also valuable species.

Figure A1h.34: UK fisheries management and top 50 ports by landings in 2013

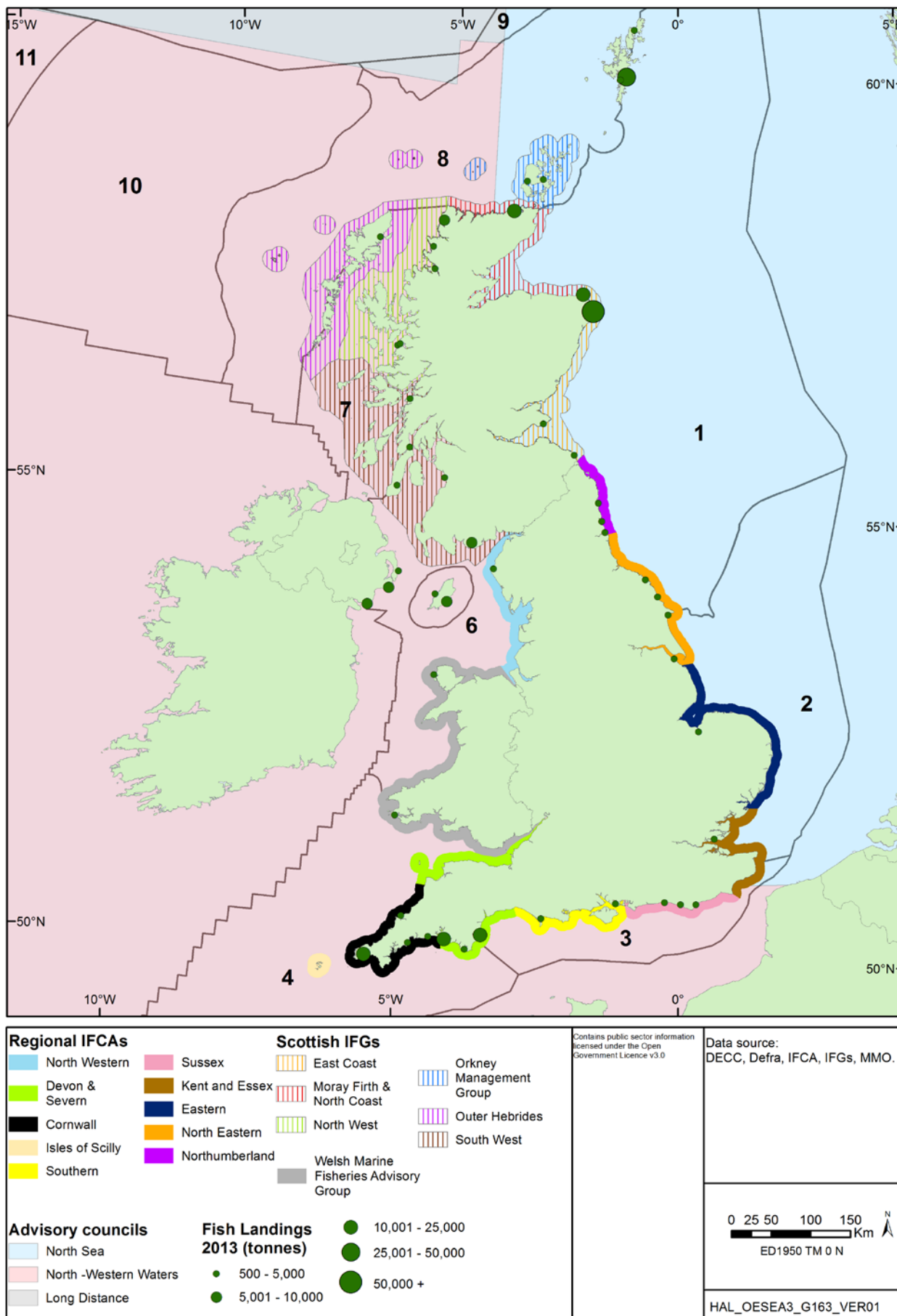


Figure A1h.35: Total fishing effort of UK vessels >15m length in 2013

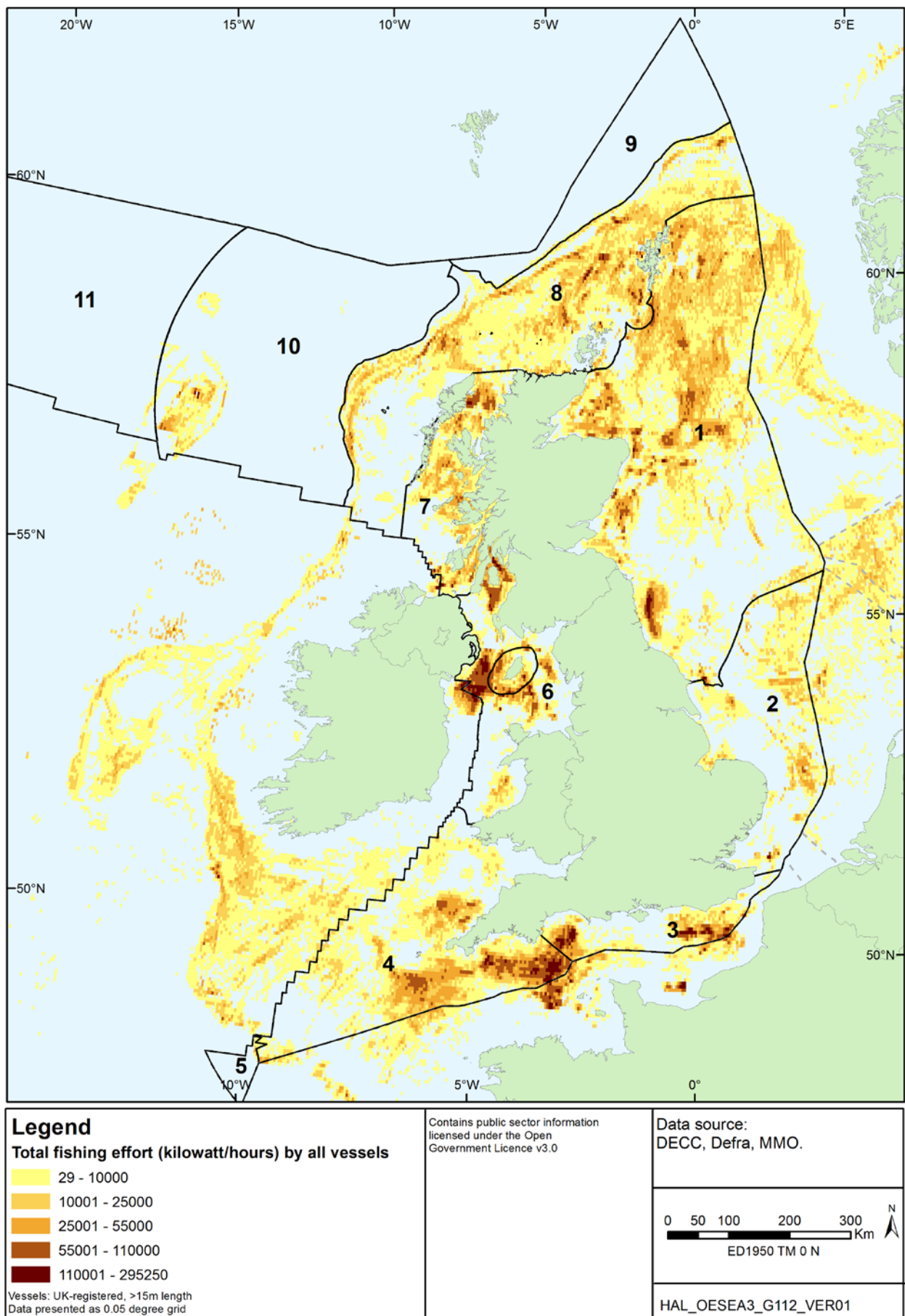




Figure A1h.36: Total fishing effort by UK vessels using mobile gears in 2013

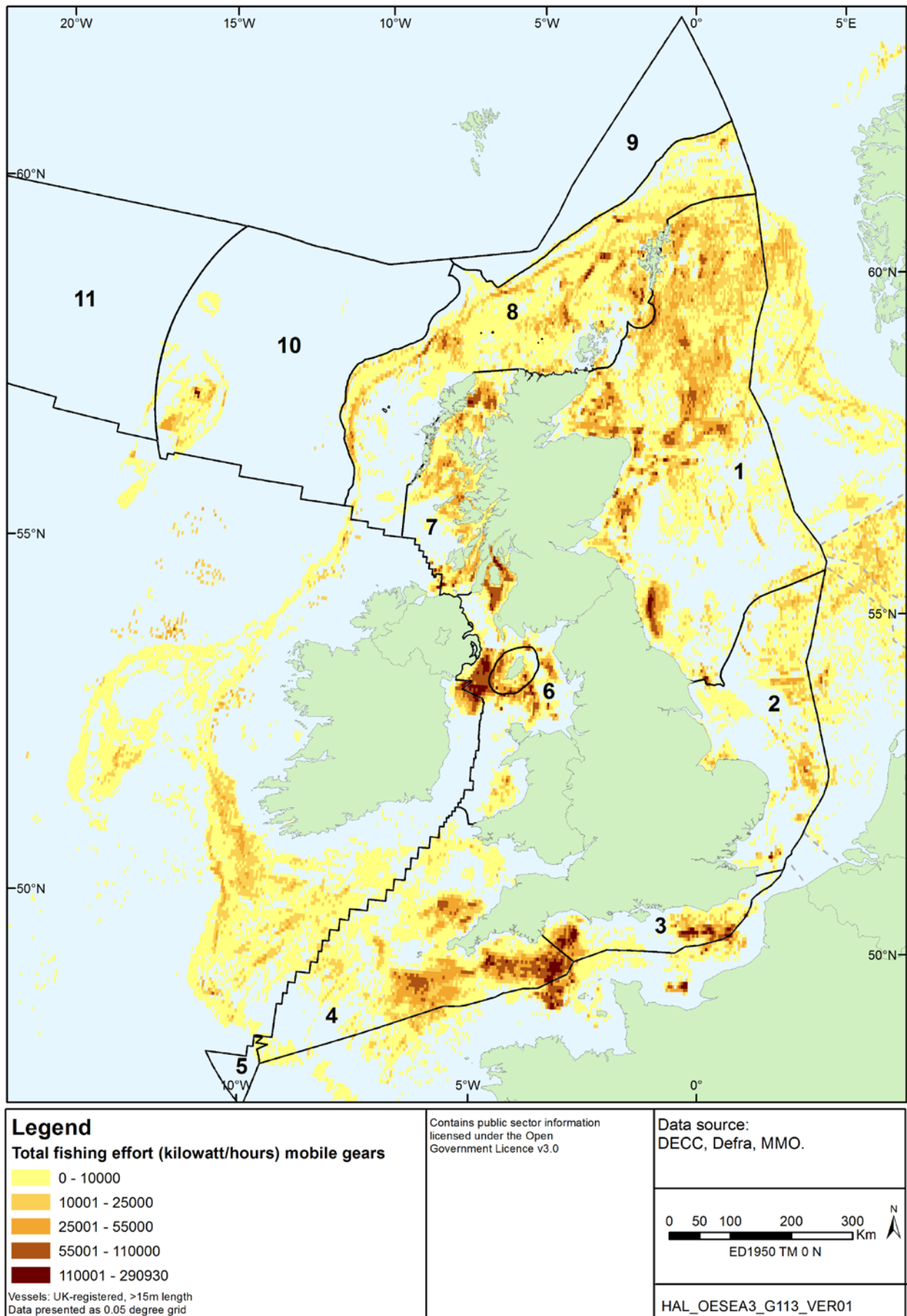


Figure A1h.37: Total fishing effort by UK vessels using static gears in 2013

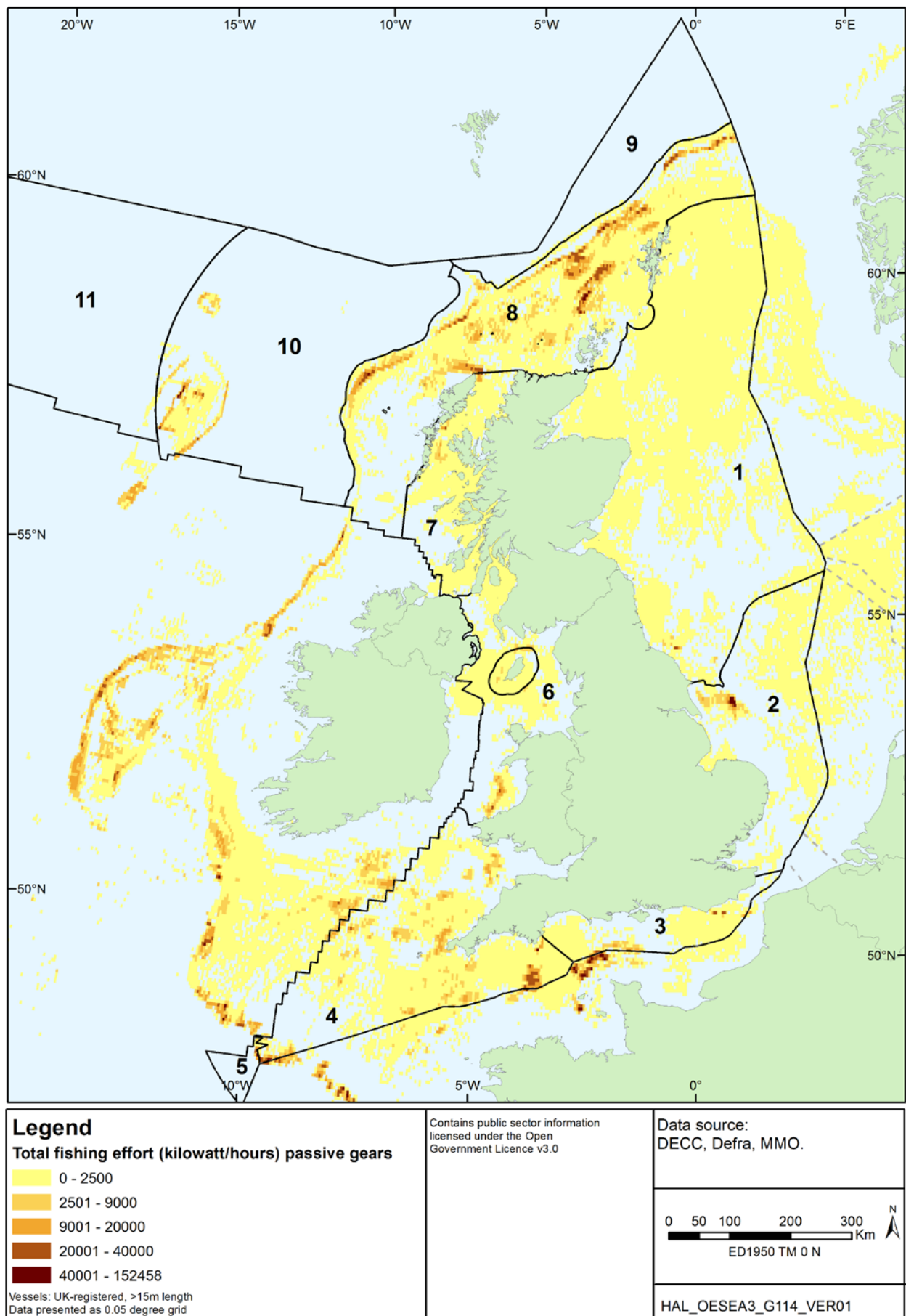
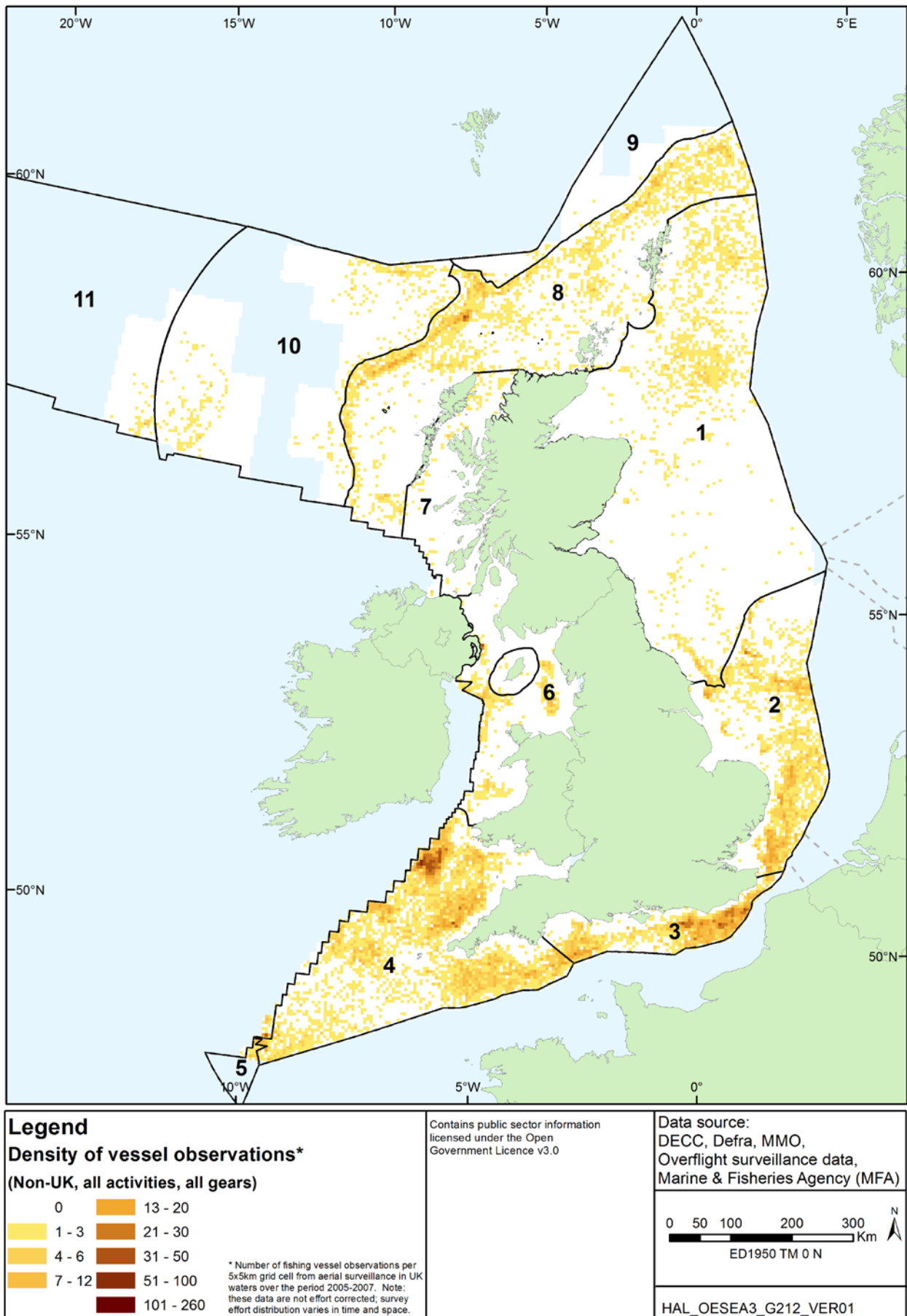
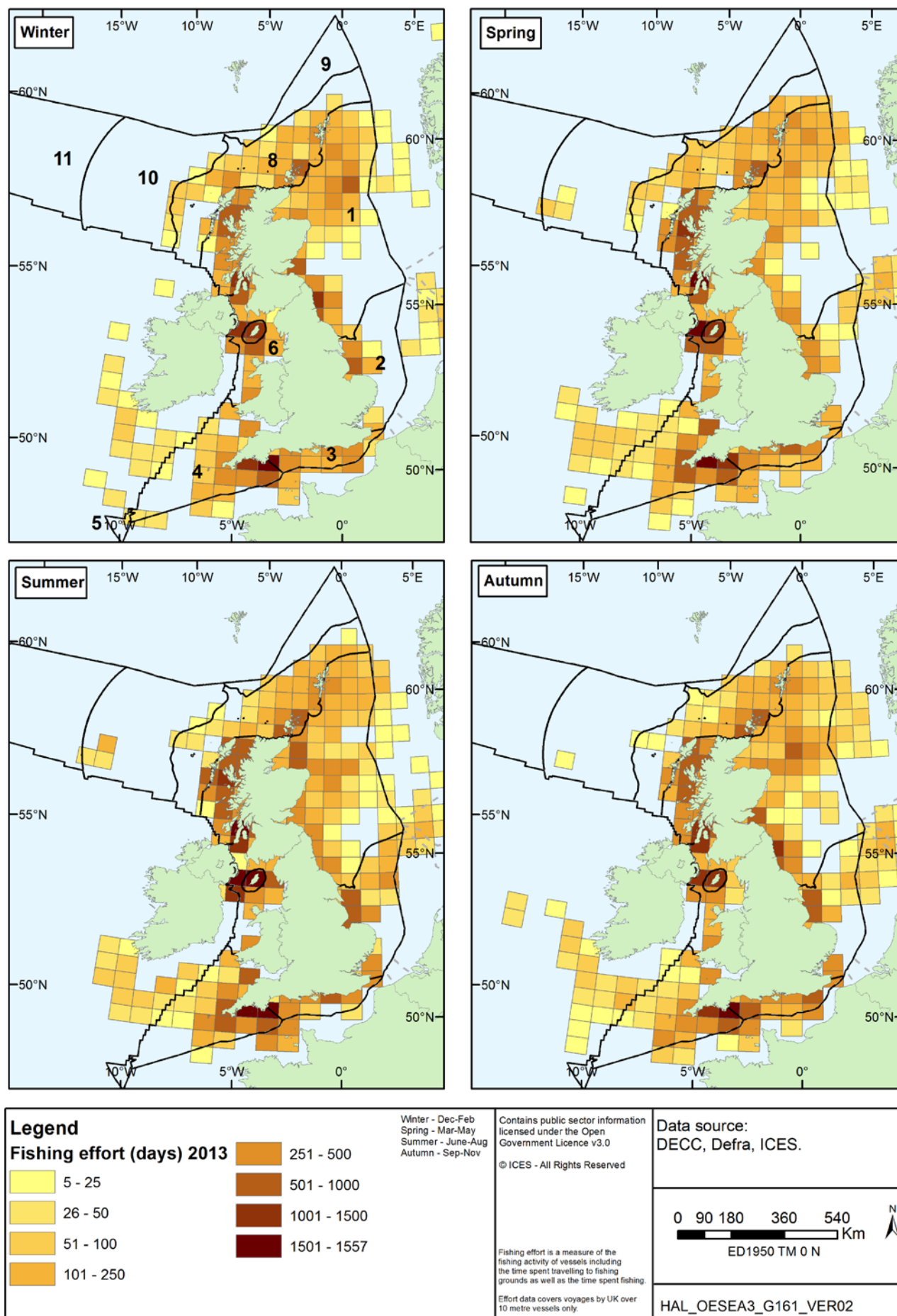
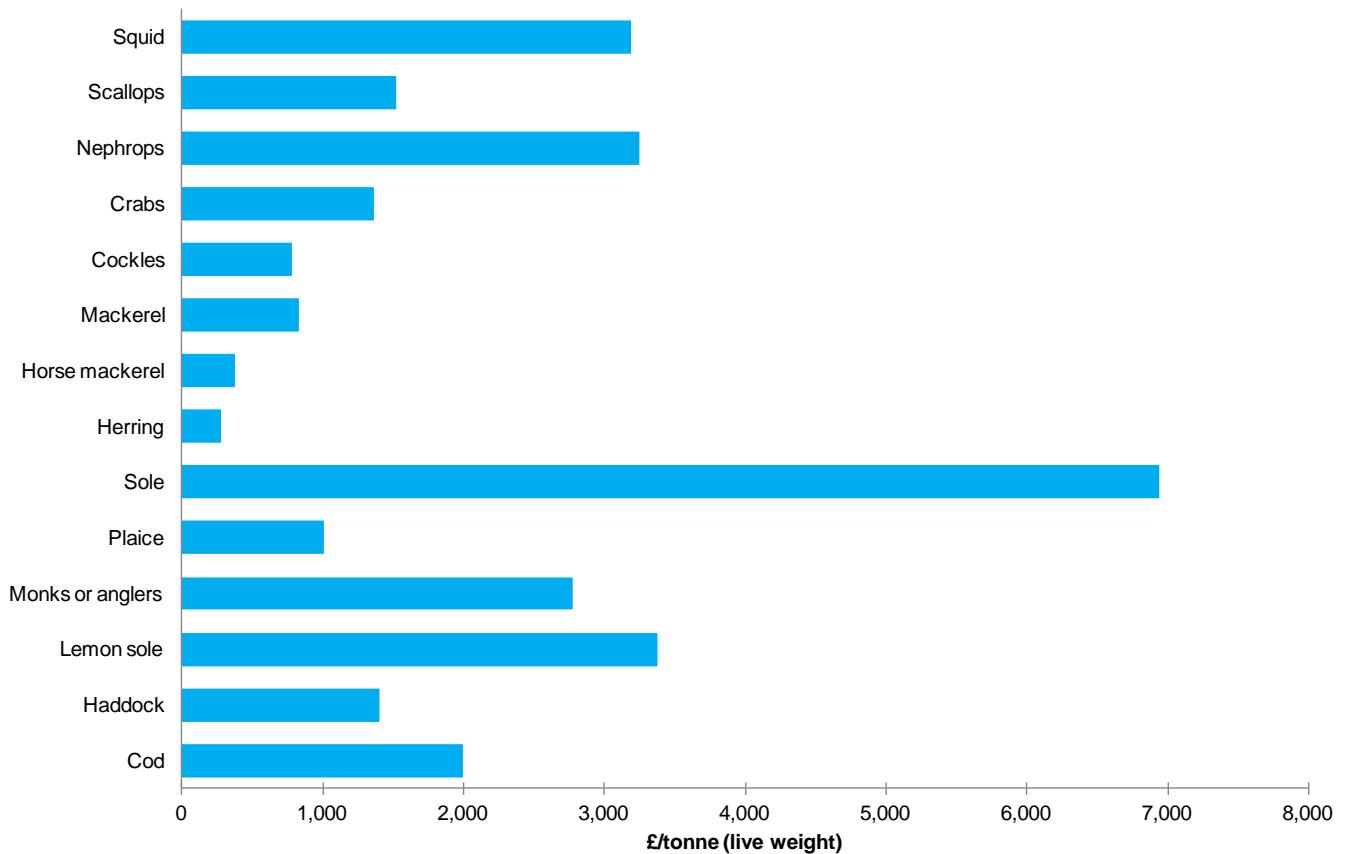


Figure A1h.38: Total fishing effort by foreign vessels using static gears, 2005-2007



**Figure A1h.39: Density of fishing effort by UK vessels in 2013 by season, derived from logbook data**



**Figure A1h.40: Average value per tonne of selected species landed into the UK in 2014**

Source: MMO data<sup>50</sup>

### A1h.16.5.1 Demersal fisheries

Demersal fish are those species living on or close to the seabed, such as gadoids and flatfish. They are usually caught with demersal trawls, most commonly otter trawls or beam trawls, although other methods such as gill netting or long-lining may be used. These are static methods of fishing in which a net or hooked line is laid, left and recovered following a set period of fishing. Demersal fisheries are generally mixed, with catch compositions varying considerably from haul to haul. Consequently, demersal stocks are difficult to manage as the target species may only make up a small percentage of total catch. The largest component of the UK demersal catch is haddock, with cod, monkfish, saithe and whiting also important (Table A1h.9). Haddock, cod and monkfish comprise almost half the total landed value, although the most valuable species per tonne is the sole. Note, the figures in Table A1h.9 are only UK landings by UK boats. Total catches of some species such as sandeels are much more important than the table suggests with most are caught by non-UK vessels. Annual North Sea landings of sandeels over the last decade have been around 1 million tonnes (Marine Scotland website<sup>51</sup>) and a good proportion of this is presumably from UK waters.

<sup>50</sup> <https://www.gov.uk/government/statistical-data-sets/uk-sea-fisheries-annual-statistics-report-2014>

<sup>51</sup> <http://www.gov.scot/Topics/marine/marine-environment/species/fish/sandeels>

**Table A1h.9: Average annual demersal landings into the UK by UK vessels, 2010-2014**

| Species         | Landed weight ('000 tonnes) | Landed value (£ million) |
|-----------------|-----------------------------|--------------------------|
| Bass            | 0.8                         | 5.8                      |
| Brill           | 0.3                         | 1.6                      |
| Cod             | 13.4                        | 26.9                     |
| Dogfish         | 0.6                         | 0.1                      |
| Gurnard         | 1.5                         | 1.0                      |
| Haddock         | 33.6                        | 39.9                     |
| Hake            | 6.8                         | 14.4                     |
| Halibut         | 0.1                         | 0.7                      |
| Lemon Sole      | 2.2                         | 6.9                      |
| Ling            | 4.2                         | 5.7                      |
| Megrim          | 3.5                         | 9.4                      |
| Monkfish        | 11.1                        | 34.3                     |
| Plaice          | 3.4                         | 3.7                      |
| Pollack (Lythe) | 1.8                         | 3.7                      |
| Saithe          | 12.3                        | 11.6                     |
| Sandeels        | ..                          | ..                       |
| Skates and Rays | 2.6                         | 3.4                      |
| Sole            | 1.8                         | 13.9                     |
| Turbot          | 0.5                         | 3.8                      |
| Whiting         | 10.5                        | 11.1                     |
| Witch           | 0.8                         | 1.0                      |
| Other Demersal  | 4.2                         | 5.9                      |
| <b>Total</b>    | <b>115.8</b>                | <b>204.8</b>             |

Source: MMO data<sup>50</sup>

### A1h.16.5.2 Pelagic fisheries

Pelagic fish such as herring and mackerel typically form large shoals in open water which can be targeted relatively easily by pelagic trawlers. Consequently, pelagic hauls are usually fairly “clean” with little bycatch. Pelagic fisheries may also include industrial fisheries which target low value, small pelagic species such as blue whiting and sprat for use in products such as fishmeal and fish oil. More mackerel is landed in the UK than any other species, and it comprises over half of all pelagic landings (Table A1h.10). It is also by far the most valuable pelagic stock, typically comprising about 80% of the total pelagic value. The smaller pelagic species are very low value and these are primarily targeted by industrial trawlers.

**Table A1h.10: Average annual pelagic landings into the UK by UK vessels, 2010-2014**

| Species        | Landed weight ('000 tonnes) | Landed value (£ million) |
|----------------|-----------------------------|--------------------------|
| Blue whiting   | 6.1                         | 1.3                      |
| Herring        | 36.2                        | 13.7                     |
| Horse mackerel | 5.8                         | 1.9                      |
| Mackerel       | 93.7                        | 85.6                     |
| Sardines       | 3.4                         | 0.9                      |
| Other pelagic  | 5.5                         | 1.4                      |
| <b>Total</b>   | <b>150.8</b>                | <b>104.8</b>             |

Source: MMO data<sup>50</sup>

### A1h.16.5.3 Shellfish fisheries

Shellfish fisheries target a number of molluscs (bivalves and gastropods) and crustaceans (such as crabs or *Nephrops*). Shellfish are caught using a variety of methods including dredges, trawls, static gears and by hand picking – see Table A1h.13. The shellfish sector is the most valuable in the UK, with total landings in 2014 worth £270 million. *Nephrops*, crabs, scallops and whelks comprised the greatest proportion of the UK landed shellfish catch in 2014, with the most valuable being *Nephrops*, scallops and crabs (Table A1h.11). Squid and lobsters are also very valuable per tonne, but do not represent a large proportion of the shellfish catch.

**Table A1h.11: Average annual shellfish landings into the UK by UK vessels, 2010-2014**

| Species            | Landed weight ('000 tonnes) | Landed value (£ million) |
|--------------------|-----------------------------|--------------------------|
| Cockles            | 5.4                         | 3.8                      |
| Crabs              | 29.4                        | 39.1                     |
| Cuttlefish         | 3.8                         | 8.0                      |
| Lobsters           | 3.1                         | 30.7                     |
| Mussels            | 1.1                         | 0.2                      |
| Nephrops           | 32.7                        | 100.2                    |
| Scallops           | 47.4                        | 61.2                     |
| Shrimps and Prawns | 0.8                         | 1.8                      |
| Squid              | 2.6                         | 8.9                      |
| Whelks             | 16.9                        | 11.9                     |
| Other shellfish    | 2.0                         | 5.1                      |
| <b>Total</b>       | <b>145.2</b>                | <b>270.8</b>             |

Source: MMO data<sup>50</sup>

### A1h.16.5.4 Regional distribution of fisheries

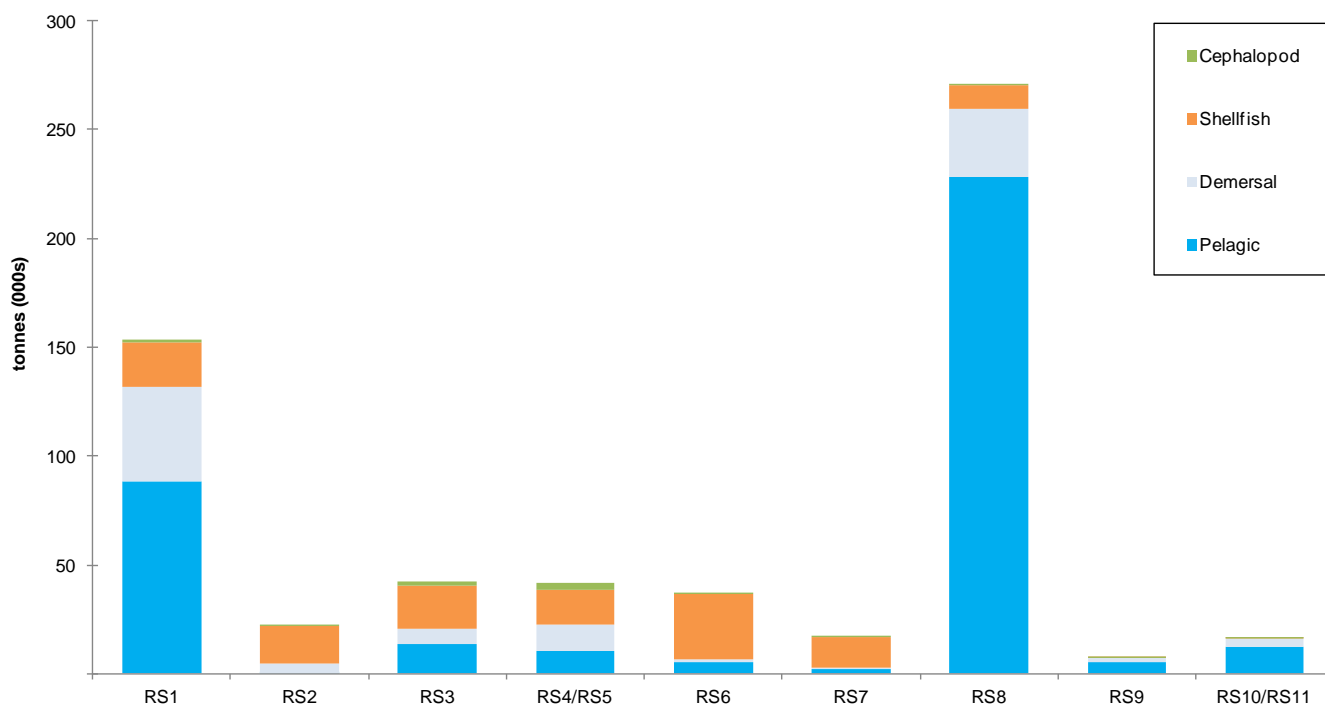
Data in Table A1h.12 and Figures A1h.41 and 42 show the landings from ICES areas relevant to each Regional Sea. This offers an indication of the main patterns in the breakdown of fisheries by species group. Landings are greater from Regional Seas with large offshore fisheries around the north of the UK (RS 1 and 8), with pelagic species important in these regions. In areas where fishing activity is generally coastal, such as Regional Seas 2 and 3, landings are lower and shellfish dominate. These figures are further discussed in later sections. It is important to note that these figures are estimates based on areas roughly corresponding with Regional Sea areas, and only include information on UK vessels.

**Table A1h.12: Mean annual landings in 2014 from areas comprising ICES statistical rectangles overlapping with Regional Seas**

| RS    | Area <sup>1</sup> | Total               |                    | Demersal |        | Pelagic |        | Cephalopods |       | Shellfish |        |
|-------|-------------------|---------------------|--------------------|----------|--------|---------|--------|-------------|-------|-----------|--------|
|       |                   | Weight <sup>2</sup> | Value <sup>3</sup> | Weight   | Value  | Weight  | Value  | Weight      | Value | Weight    | Value  |
| 1     | 181.55            | 153.83              | 186.81             | 43.48    | 69.59  | 88.32   | 45.16  | 1.28        | 3.09  | 20.75     | 68.97  |
| 2     | 61.92             | 21.94               | 30.35              | 4.37     | 8.67   | 0.29    | 0.10   | 0.01        | 0.02  | 17.27     | 21.84  |
| 3     | 21.89             | 42.40               | 60.83              | 7.25     | 22.55  | 13.33   | 4.43   | 1.99        | 5.59  | 19.82     | 28.26  |
| 4/5   | 97.22             | 41.56               | 76.03              | 12.46    | 39.42  | 10.22   | 4.40   | 3.01        | 7.49  | 15.88     | 24.72  |
| 6     | 38.23             | 36.67               | 61.66              | 1.20     | 1.51   | 5.28    | 1.64   | 0.01        | 0.02  | 30.17     | 58.49  |
| 7     | 29.87             | 17.15               | 49.26              | 0.51     | 0.74   | 2.34    | 0.56   | 0.01        | 0.01  | 14.30     | 47.95  |
| 8     | 121.52            | 270.88              | 244.01             | 31.19    | 66.28  | 228.51  | 154.44 | 0.24        | 0.74  | 10.95     | 22.55  |
| 9     | 42.75             | 7.24                | 6.40               | 2.12     | 3.63   | 5.11    | 2.76   | 0.00        | 0.01  | 0.00      | 0.00   |
| 10/11 | 294.29            | 17.10               | 25.11              | 3.94     | 9.81   | 12.49   | 12.92  | 0.67        | 2.38  | 0.00      | 0.01   |
| UK    | 889.25            | 608.77              | 740.76             | 106.52   | 222.20 | 365.89  | 226.42 | 7.21        | 19.35 | 129.14    | 272.79 |

Notes: RS = Regional Sea; <sup>1</sup> area covered by ICES statistical rectangles overlapping with Regional Seas, 000s km<sup>2</sup>; <sup>2</sup> weight in 000s tonnes; <sup>3</sup> value in millions GBP.

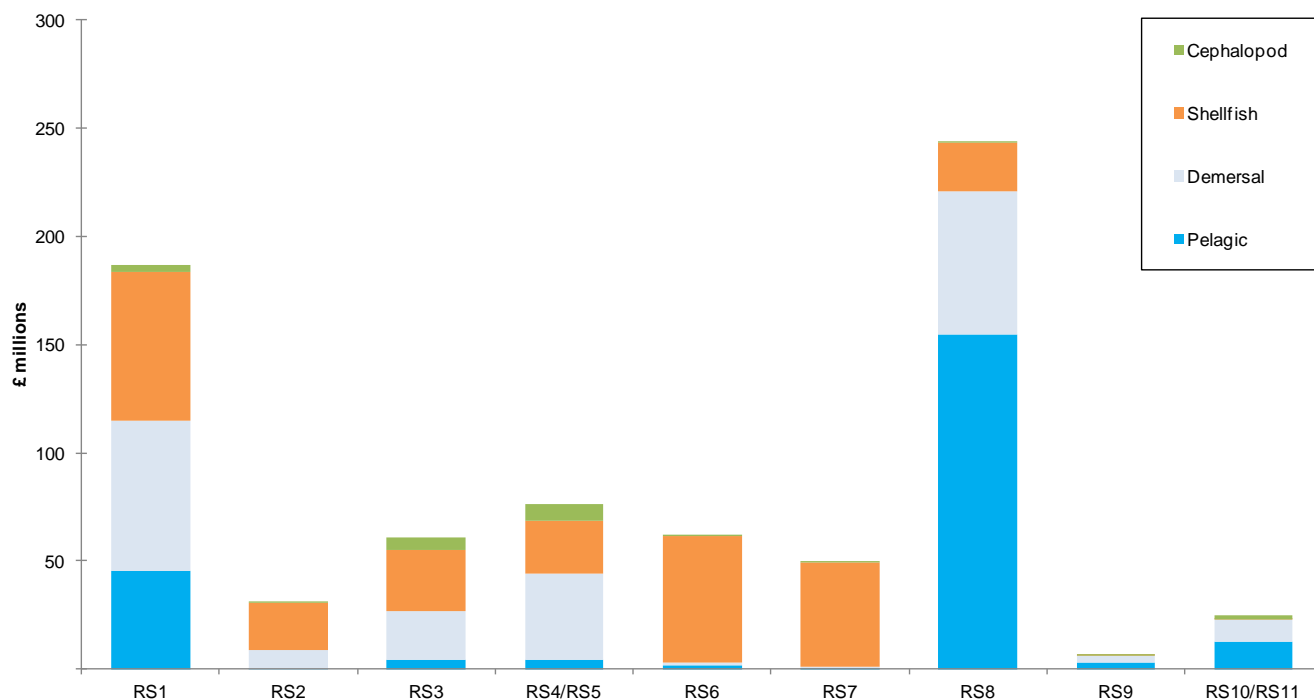
Source: Fisheries Statistics Unit, Scottish Government<sup>52</sup>

**Figure A1h.41: Mean annual landed weight in 2014 by UK vessels by species group**

Source: Fisheries Statistics Unit, Scottish Government<sup>52</sup>

<sup>52</sup> <http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries>



**Figure A1h.42: Mean annual landed value in 2014 by UK by species group**

Source: Fisheries Statistics Unit, Scottish Government<sup>52</sup>

Figure A1h.43 shows the density of landings from waters around the UK. Landings density is generally highest around the coast in southern regions, while to the north, densities are greater further offshore, on the productive continental shelf. A similar pattern may be observed in the density of landings by value (Figure A1h.44). When the landings are divided by species group (Figure A1h.45), it can be seen that demersal landings follow the overall pattern, with particularly high densities around Cornwall and Shetland, while the greatest density of pelagic fishing takes place to the north of Scotland, where herring and mackerel are typically found migrating between spawning and feeding grounds. Shellfish fisheries have a strong coastal distribution, with particularly important areas including the West of Scotland, the Firth of Forth and along the south of England, while the seasonal fisheries for cuttlefish (south Devon and Cornwall) and squid (Moray Firth) are clearly identified.

**Table A1h.13: Summary of the main fishing gear used around the UK**

| Category | Sub-category  | Examples of species                              | Fishing gear  |
|----------|---------------|--|---|
| Demersal | Roundfish     | Cod, whiting, haddock, saithe, pollack, dogfish. | Demersal otter trawl, pair trawl, seine net, gill net, trammel net, longline, handline. |
|          | Flatfish      | Sole, plaice, flounder, turbot, monkfish, rays.  | Beam trawl, demersal otter trawl, seine net, tangle net, trammel net, longline.         |
| Pelagic  | Small pelagic | Mackerel, herring, sprat.                        | Gillnet, pelagic trawl, handline.   |
|          | Large pelagic | Bass, mullet.                                    | Gillnet, pelagic trawl, demersal trawl, beach seine, handlines.                         |

|           |             |   |   |
|-----------|-------------|---|---|
|           | Diadromous  | Salmon, sea trout, eel.   | Gillnet, beach seine (salmonids), trap, hand-held nets, fyke nets (eels).   |
| Shellfish | Crustaceans | Lobsters, crabs, crawfish, <i>Nephrops</i> , shrimp.                                | Pot, tangle nets, beam trawl (shrimp), demersal otter trawl ( <i>Nephrops</i> )   |
|           | Molluscs    | Cockles, mussels, scallops, oysters, clams, whelks, periwinkles, cuttlefish, squid. | Dredges (bivalves), trawls (cephalopods and queen scallops), pots (whelks) hand-gathering (bivalves and gastropods), traps (cuttlefish), jigging (cephalopods). |

Source: Adapted from Walmsley & Pawson (2008)

The dominance of bottom trawls in UK fisheries can be seen in Table A1h.14 and Figure A1h.46, with traps and dredges (predominantly for shellfish) also important. These figures will be examined in greater detail in individual Regional Sea sections. It is important to note that these figures are estimates, based on areas roughly corresponding with Regional Sea areas and only include information on UK vessels.

Figure A1h.43: Liveweight of landings (tonnes) by UK vessels per ICES rectangle in 2013

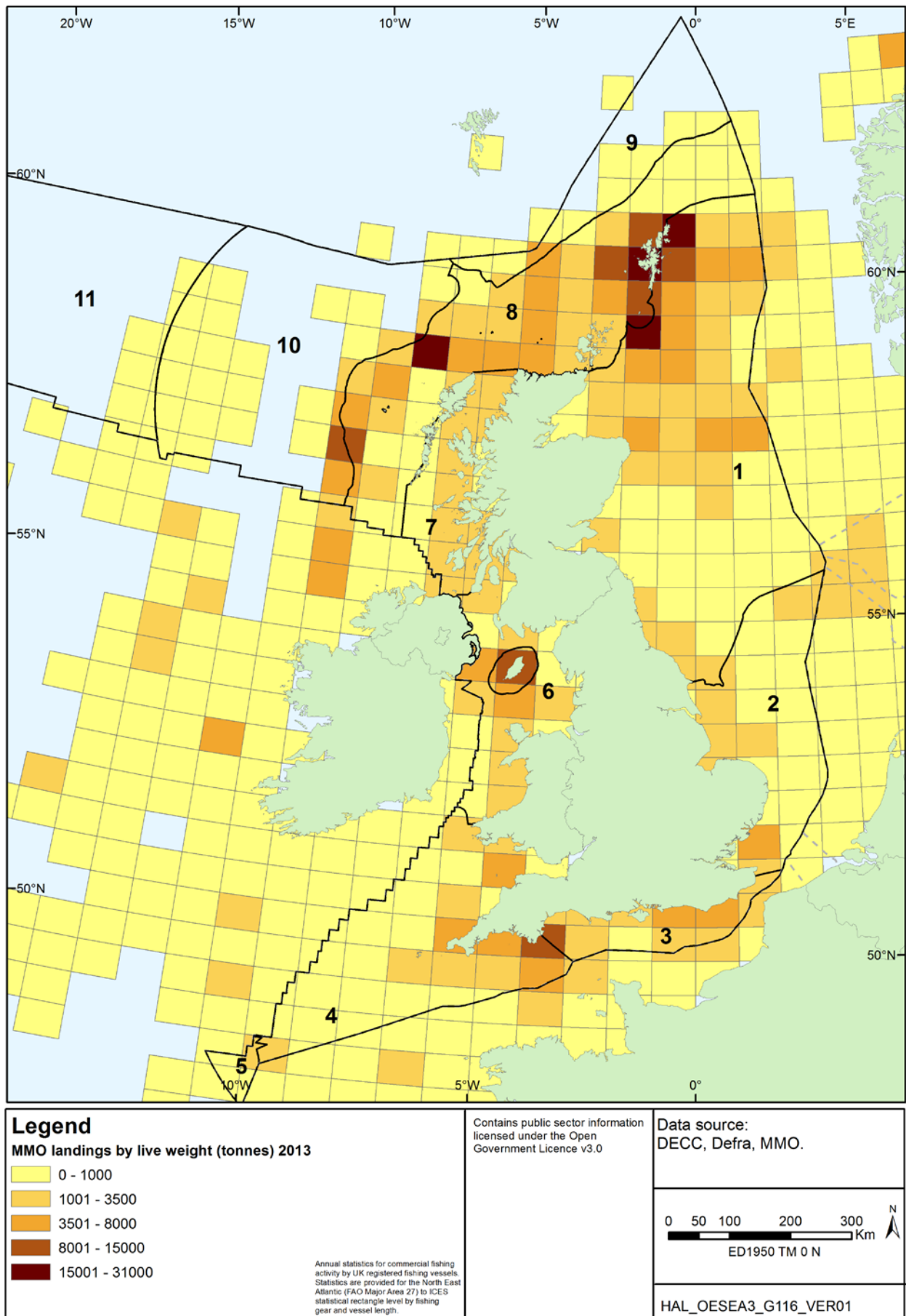


Figure A1h.44: Value of landings (£) by UK vessels per ICES rectangle in 2013

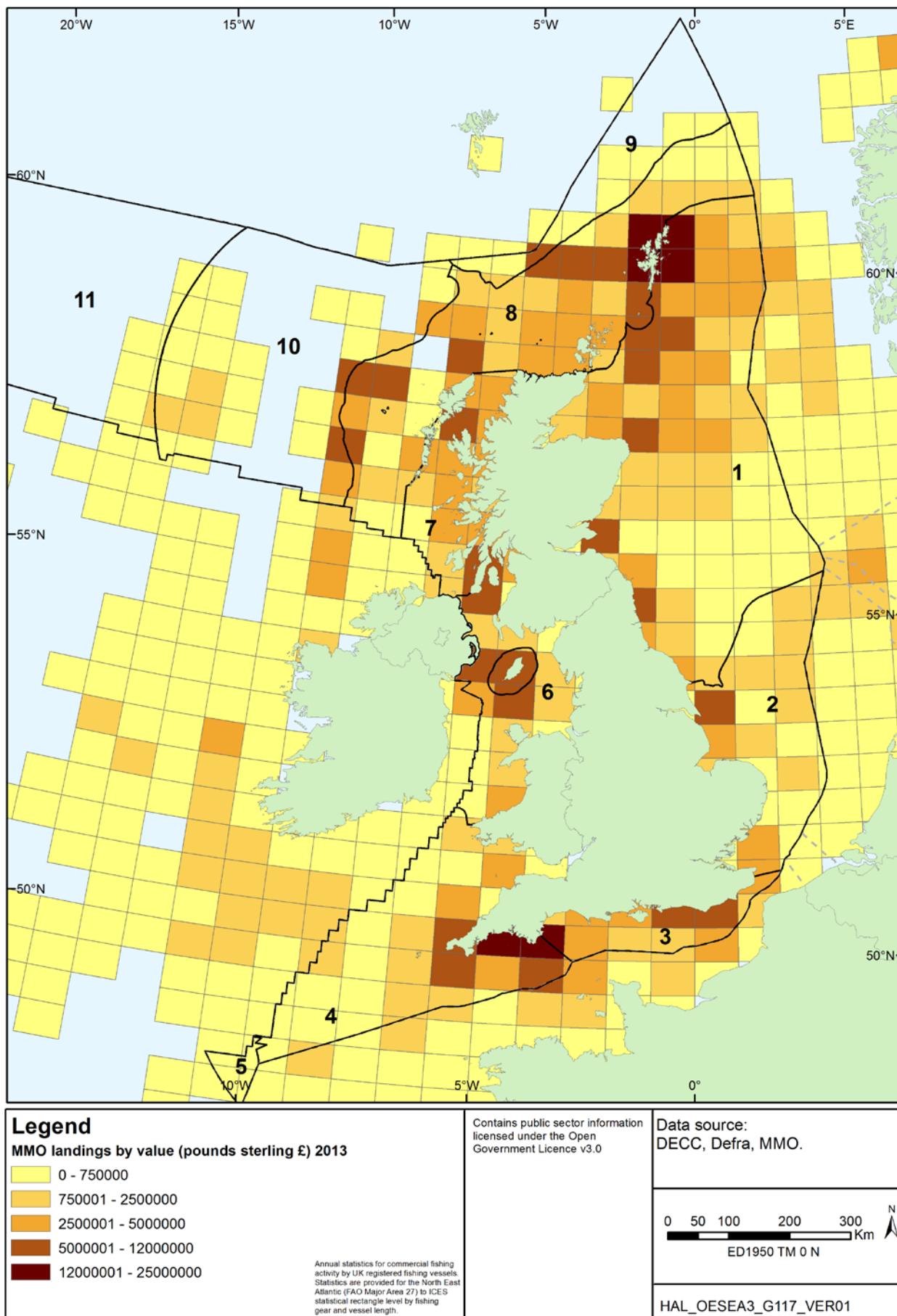
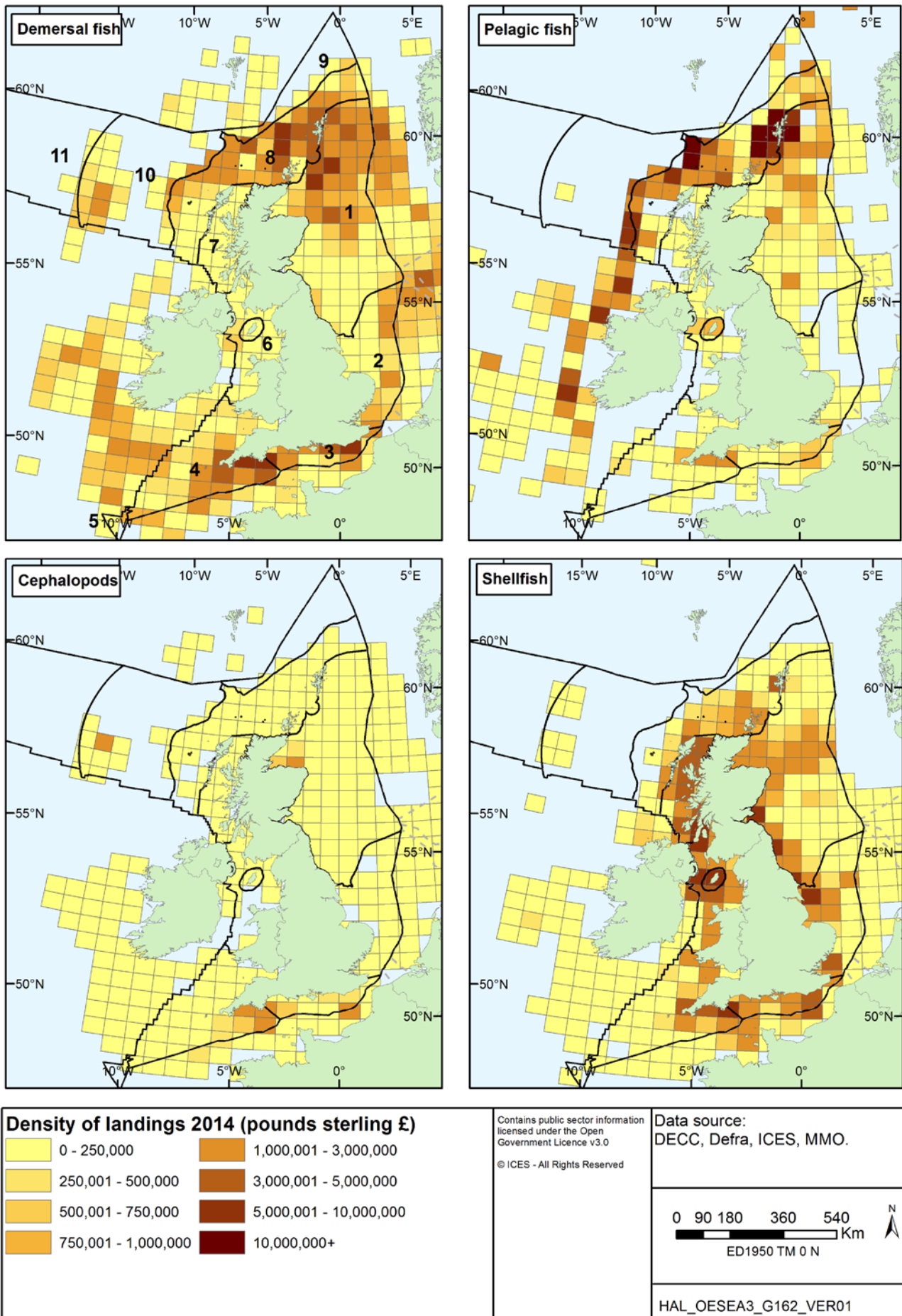


Figure A1h.45: Density of UK landings (value) by species group, 2014

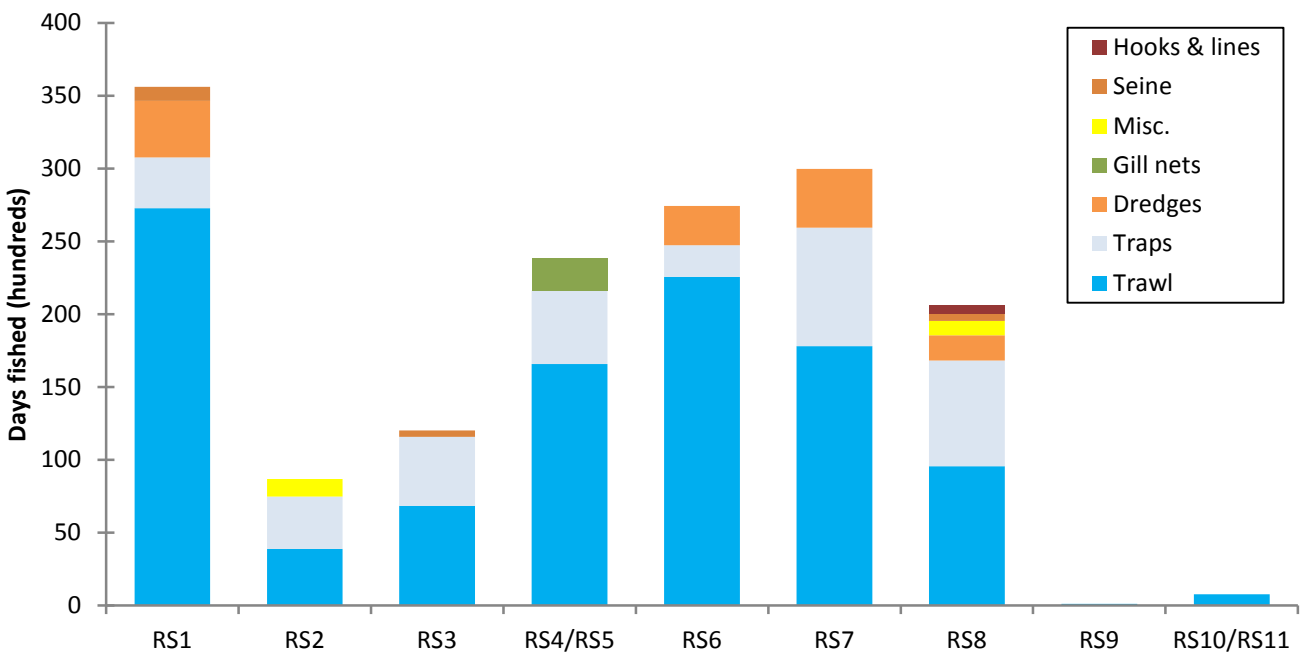


**Table A1h.14: Mean annual days fished in 2013 from areas comprising ICES statistical rectangles overlapping with Regional Seas**

| Days fished (hundreds) by gear category <sup>2</sup> |                   |         |                    |        |                      |                        |               |       |       |
|--|-------------------|---------|--------------------|--------|----------------------|------------------------|---------------|-------|-------|
| RS   | Area <sup>1</sup> | All     | Trawl <sup>3</sup> | Traps  | Dredges <sup>4</sup> | Gill nets <sup>5</sup> | Hooks & lines | Seine | Misc. |
| 1  | 181.55            | 355.97  | 272.68             | 34.93  | 38.74                | 0.0                    | 0.0           | 9.62  | 0.0   |
| 2  | 61.92             | 86.93   | 38.95              | 35.92  | 0.0                  | 0.0                    | 0.0           | 0.0   | 12.06 |
| 3  | 21.89             | 120.27  | 68.46              | 47.44  | 0.0                  | 0.0                    | 0.0           | 4.37  | 0.0   |
| 4/5  | 97.22             | 238.79  | 165.74             | 50.46  | 0.0                  | 22.59                  | 0.0           | 0.0   | 0.0   |
| 6  | 38.23             | 274.18  | 225.70             | 21.56  | 26.93                | 0.0                    | 0.0           | 0.0   | 0.0   |
| 7  | 29.87             | 299.77  | 177.99             | 81.36  | 40.42                | 0.0                    | 0.0           | 0.0   | 0.0   |
| 8  | 121.52            | 206.43  | 95.56              | 72.58  | 17.31                | 0.0                    | 5.76          | 5.21  | 10.01 |
| 9  | 42.75             | 1.06    | 1.06               | 0.0    | 0.0                  | 0.0                    | 0.0           | 0.0   | 0.0   |
| 10/11  | 294.29            | 7.72    | 7.72               | 0.0    | 0.0                  | 0.0                    | 0.0           | 0.0   | 0.0   |
| UK   | 889.25            | 1591.12 | 1053.86            | 344.24 | 123.39               | 22.59                  | 5.76          | 19.20 | 22.07 |

Notes: RS = Regional Sea; <sup>1</sup> area covered by ICES statistical rectangles overlapping with Regional Seas, 000s km<sup>2</sup>; <sup>2</sup> hundreds days; <sup>3</sup> all specified bottom trawls, Nephrops trawls, unspecified trawls; <sup>4</sup> boat & mechanised dredges, pumps; <sup>5</sup> gill and entangle nets (fixed and drift).  
 Source: Fisheries Statistics Unit, Scottish Government<sup>52</sup>

**Figure A1h.46: Mean annual days fished in 2013 by UK vessels by gear type**



Source: Fisheries Statistics Unit, Scottish Government<sup>52</sup>

### A1h.16.6 Features of Regional Sea 1

#### A1h.16.6.1 Summary of fisheries

The central and northern North Sea is the largest Regional Sea area and fishing effort in the area is dominated by demersal trawling for gadoids, plaice and monkfish as well as *Nephrops*.

Twenty four percent of Scottish fishermen (and 10% of UK fishermen) are based in Aberdeenshire, highlighting the importance of the industry to the region (Scottish Government website<sup>52</sup>). The mixed demersal fishery targets cod, haddock, whiting, saithe and monkfish, while a shelf-edge fishery for saithe carried out by Norwegian, French and German vessels is also important. The Fladen Ground in the north of the region and the Farne Deep, a deep water trench 10-20 miles off the northeast coast of England, are particularly productive regions for demersal trawling (Walmsley & Pawson 2008, Northumberland IFCA website<sup>53</sup>). Inshore, gillnets and trammel nets are used to trap cod in winter and plaice (in the summer) and lemon sole are valuable catches. Licensed fisheries for salmon and sea trout exist in the region and drift nets may be used to capture these species (North-eastern IFCA website<sup>54</sup>). A fishery for the veined squid, *Loligo forbesii*, has developed in the Moray Firth over the last 20 years, with fishermen taking advantage of the lack of quota restrictions on this species. The region supports important industrial fisheries for sandeels (central North Sea) and Norway pout (northern North Sea) carried out by Danish, Norwegian and UK vessels (ICES website<sup>55</sup>). The pelagic fleet targets herring at spawning grounds off Shetland in autumn and off the Farne Isles, using purse seiners and pelagic trawls. Extensive and directed mackerel fisheries operate in the north of the region as migrating mackerel return to feeding grounds.

The Fladen Ground is exploited for shellfish as it supports large and valuable populations of both pink shrimp and *Nephrops*. Demersal trawlers also catch *Nephrops* within the Moray Firth, Firth of Forth and the Farne Deep. In coastal regions, baited creels are set for lobsters, brown crabs, velvet crabs and green crabs (Scottish IFGs website<sup>56</sup>). Scallops are exploited in the Moray Firth and to the east of Scotland, while queen scallops, mussels and cockles are also harvested in the region. The main wild mussel fishery is in the Dornoch Firth (Scottish IFGs website<sup>56</sup>). Cockles are predominantly taken from Shetland and Orkney. Whelks and periwinkles are lower value species that are also taken from coasts around the region.

#### **A1h.16.6.2 Ports and vessels**

The northern North Sea supports the largest proportion of vessels >10m (29%) of any UK region, suggesting that offshore fishing grounds are particularly important in the region. Larger vessels tend to be based along the Aberdeenshire coast while vessels <10m are more abundant in the northeast of England. This region contains 10 of the top 50 UK fishing ports (by landed weight), including the biggest four, Peterhead, Lerwick and Fraserburgh). Landings at these largest ports are dominated by pelagic and demersal catch, reflecting the larger vessels that operate from these fisheries (Table A1h.15). Shellfish landings increase in importance in smaller ports, where a greater proportion of smaller boats, working in inshore fisheries, will be found.

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<sup>53</sup> <http://www.nifca.gov.uk/>

<sup>54</sup> <http://www.ne-ifca.gov.uk/>

<sup>55</sup> <http://ices.dk/Pages/default.aspx>

<sup>56</sup> <http://ifgs.org.uk/>

**Table A1h.15: Mean annual landings into key ports in Regional Sea 1, 2010-2014**

| Port          | Vessels<br><10m | Vessels<br>>10m | Demersal<br>(‘000s<br>tonnes) | Demersal<br>(£ million) | Pelagic<br>(‘000s<br>tonnes) | Pelagic<br>(£<br>million) | Shellfish<br>(‘000s<br>tonnes) | Shellfish<br>(£<br>million) |
|---------------|-----------------|-----------------|-------------------------------|-------------------------|------------------------------|---------------------------|--------------------------------|-----------------------------|
| Peterhead     | 56              | 39              | 43.6                          | 61.1                    | 74.8                         | 53.1                      | 3.1                            | 9.7                         |
| Lerwick       | 64              | 22              | 9.7                           | 16.1                    | 38.4                         | 31.0                      | 0.8                            | 1.9                         |
| Fraserburgh   | 85              | 71              | 6.3                           | 8.1                     | 11.7                         | 9.9                       | 7.4                            | 21.8                        |
| Newhaven      | 30              | 2               | 0.5                           | 1.5                     | 0.0                          | 0.0                       | 2.4                            | 3.7                         |
| Scarborough   | 53              | 18              | 0.5                           | 0.7                     | 0.0                          | 0.0                       | 1.1                            | 2.7                         |
| North Shields | 114             | 55              | 1.1                           | 1.2                     | 0.0                          | 0.0                       | 1.5                            | 4.9                         |
| Collafirth    | 0               | 0               | 0.0                           | 0.0                     | 0.4                          | 0.3                       | 0.1                            | 0.1                         |
| Whitby        | 23              | 6               | 0.3                           | 0.4                     | 0.0                          | 0.0                       | 0.8                            | 1.9                         |
| Blyth         | 11              | 3               | 0.5                           | 0.4                     | 0.0                          | 0.0                       | 0.6                            | 1.9                         |
| Pittenweem    | 52              | 9               | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 1.2                            | 3.1                         |

Source: MMO data<sup>50</sup>

### A1h.16.6.3 Distribution of fishing effort

VMS data shows that the majority of fishing effort carried out by larger vessels in the region takes place in offshore areas to the north of the region, particularly around the Fladen Ground. In inshore areas, the Firth of Forth, the Moray Firth and the Farne Deep off the northeast coast of England are sites of high densities of fishing effort, particularly of mobile gears, while static gear fisheries operate along the coastline of the region, particularly in the Firth of Forth. Inshore fisheries in the region show slight seasonal variation, with greater fishing effort in the summer and autumn, particularly in the Moray Firth and off the northeast of England. Similar distributions are shown by landings data which also particularly highlight the disparity in fishing effort between the north of the region and the south. Landings data shows the waters to the south and east of Shetland to produce the most landings and the greatest total landed value.

### A1h.16.6.4 Gears and landings

Shellfish, pelagic and demersal species are all caught in large numbers from the northern North Sea, making the region one of the most productive in UK waters. Catch from the region is dominated by high value whitefish, including cod and monkfish, as well as *Nephrops*. There are significant landings of pelagic species in the region, reflecting the important herring and mackerel stocks that are exploited in the area. In 2014 pelagic species made up 57% of the landed weight, but only 24% of the value. Seventy four percent of the landed value is of shellfish and demersal species. The fishing effort by days fished is dominated by demersal trawls (77%), traps (10%) and dredges (11%), reflecting the importance of demersal and shellfish stocks, although there is also significant use of seine nets in the region. The region is heavily fished by foreign vessels which will not be included in these figures.

## A1h.16.7 Features of Regional Sea 2

### A1h.16.7.1 Summary of fisheries

Fish communities within the southern North Sea are dominated by small benthic groups such as flatfish. Comparisons of catch rates have shown that in general the catchability of these smaller demersal species is greater using beam trawls than otter trawls (ICES-FishMap 2008). Consequently, beam trawling effort is greatest in the southern North Sea, while otter trawling is less frequent in the region. Beam trawl activity is concentrated in the Southern Bight and the fleet mainly targets plaice and sole, with other species such as dab and grey gurnard forming a valuable bycatch. Over 70% of all beam trawling effort in the North Sea is carried out by Dutch vessels operating largely in the southern North Sea, including in UK waters (Piet *et al.* 2007). In recent years, the Dutch fleet has adopted new gear types, such as the pulse trawl, in which the



traditional, dragged tickler chain is replaced by electrical stimulation (van Marlen *et al.* 2014). Nevertheless, fleets exploiting North Sea flatfish have decreased in size in recent years (Poos & Verkempynck 2015). Cod catches are typically highest in the southern North Sea in the 1<sup>st</sup> and 2<sup>nd</sup> quarters of the year. Haddock is only rarely caught in the southern North Sea, during years of very strong recruitment. There are also significant seine and gillnet fisheries for plaice towards the north of the region. Industrial fisheries target the sandeel populations of the southern and central North Sea, with Danish and Norwegian fleets particularly important exploiters of this resource. The fishery is focused on the Dogger Bank and takes place mainly during the summer months (Rogers & Stocks 2001). Skates and rays are an important local fishery in the outer Thames estuary, and bass landings have increased in recent years (Eastern IFCA website<sup>57</sup>). The proximity of the region to the continental coastline means that it is fished by an international fleet, with France and Belgium exercising some historical fishing rights between 6-12 nautical miles (Jones *et al.* 2004).

Pelagic fisheries in the southern North Sea mainly target herring, sprat and horse mackerel. Purse seiners and pelagic trawls are usually used in the herring fishery, with the greatest landings in the 3<sup>rd</sup> quarter. In spring, landings of herring are concentrated off the Lincolnshire and East Anglia coastline (ICES-FishMap 2008) and important feeding grounds for herring are found off Flamborough Head and in the Humber Estuary (Jones *et al.* 2004). Sprat and horse mackerel are also fished along the English coast. Targeted mackerel fishing is prohibited in the southern North Sea throughout the year (ICES-FishMap 2008). Licences to catch salmon and sea trout may be obtained for the River Humber and around the coast of East Anglia. There is no licensed fishery for these species in the Thames Estuary. Fyke nets, eel criggs and pots are used to catch eels from spring to autumn in the Rivers Humber and Thames and in many of the smaller estuaries of East Anglia and Essex (Walmsley & Pawson 2008). Shellfish fisheries are important in the region, particularly in inshore waters where a number of species are harvested from estuaries and bays. In addition to these fisheries, *Nephrops* may be landed from the Dogger Bank, particularly during autumn and winter. Edible crabs and lobsters are also valuable species, typically caught with static gear such as pots or creels, while fisheries for pink and brown shrimps are also prosecuted (Eastern IFCA website<sup>57</sup>). The Humber Estuary is an important site for shrimp trawling and crab and lobster potting, while the Wash is a prime habitat for mussels, cockles and brown shrimp (Eastern IFCA website<sup>57</sup>). An important cockle fishery in the Thames supports both local and visiting vessels. There are also wild and cultivated oyster fisheries along the Essex and north Kent coast (Kent & Essex IFCA website<sup>58</sup>). The whelk fishery has grown in recent years to such an extent that an emergency byelaw was put in place in April 2015 that requires a person to hold a valid permit in order to harvest the stock. The status of this byelaw will be reviewed in 2016 (Eastern IFCA website<sup>57</sup>).

#### **A1h.16.7.2 Ports and vessels**

Seventy four percent of vessels based at ports in the region were <10m, with ports in the region among the smallest, reflecting the importance of inshore fisheries to the region. Ports in the region are concentrated along the Suffolk and Essex coasts, with few ports to the north of the Wash along the Lincolnshire coast. The region contained 8 of the top fifty UK ports by landed weight in 2014, although none of these are in the top 10. With the exception of Grimsby, at which a significant catch of demersal fish is landed, landings at the other ports are almost exclusively of shellfish (Table A1h.16).

<sup>57</sup> <http://www.eastern-ifca.gov.uk/>

<sup>58</sup> <http://www.kentandessex-ifca.gov.uk/>

**Table A1h.16: Mean annual landings into key ports in Regional Sea 2, 2010-2014**

| Port         | Vessels<br><10m | Vessels<br>>10m | Demersal<br>(‘000s<br>tonnes) | Demersal<br>(£ million) | Pelagic<br>(‘000s<br>tonnes) | Pelagic<br>(£<br>million) | Shellfish<br>(‘000s<br>tonnes) | Shellfish<br>(£<br>million) |
|--------------|-----------------|-----------------|-------------------------------|-------------------------|------------------------------|---------------------------|--------------------------------|-----------------------------|
| Leigh-on-Sea | 7               | 19              | 0.0                           | 0.1                     | 0.2                          | 0.0                       | 2.4                            | 1.8                         |
| Bridlington  | 15              | 14              | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 3.0                            | 6.2                         |
| Grimsby      | 26              | 28              | 0.5                           | 0.8                     | 0.0                          | 0.0                       | 1.2                            | 2.2                         |
| King’s Lynn  | 4               | 17              | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 1.8                            | 2.0                         |
| Whitstable   | 10              | 4               | 0.1                           | 0.1                     | 0.0                          | 0.0                       | 0.9                            | 0.7                         |
| Eastbourne   | 29              | 3               | 0.2                           | 1.0                     | 0.0                          | 0.0                       | 1.1                            | 1.3                         |
| Boston       | 6               | 12              | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 1.1                            | 0.5                         |
| Wells        | 9               | 2               | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 0.8                            | 0.9                         |

Source: MMO data<sup>50</sup>

### A1h.16.7.3 Distribution of fishing effort

There is relatively little fishing effort recorded by boats supplying VMS data, with the majority of effort concentrated in the north of the region on the Dogger Bank, within the Wash and along the Suffolk coast. Fishing effort is considerably lower in the region than in the northern North Sea and effort is predominantly coastal, both for mobile and static gears. The highest concentration of vessels using mobile gears are active on the Dogger Bank, south of Suffolk and in the Thames Estuary, while static gear activity is at its highest in waters to the north of the Humber Estuary.

### A1h.16.7.4 Gears and landings

UK vessels report a relatively low level of landings, both in weight and value from this Regional Sea (Table A1h.16). Shellfish dominate landings by weight (79%) and contribute approximately 72% of the total value landed. This is reflected in the largely coastal distribution of landings density in the region. High values of landings observed in the Thames estuary and to a lesser extent the Wash may be explained by the high amount of high value shellfish caught in these areas. The most common gear types observed in the region were bottom trawls and traps. The region is heavily fished by foreign vessels which will not be included in these figures.

## A1h.16.8 Features of Regional Sea 3

### A1h.16.8.1 Summary of fisheries

The eastern English Channel represents the smallest of the Regional Seas and its coastal nature means that inshore fisheries are particularly important. Much fishing activity is undertaken by beach boats that set nets out to 6 miles offshore, with most vessels being day boats, particularly to the west of the region where waters are less sheltered (Walmsley & Pawson 2008).

The main demersal fisheries in the region use trammel and gill nets to catch plaice and sole (mainly a spring fishery) and rays, cod and bass (in cooler months) (Sussex IFCA website<sup>59</sup>). The valuable sole fishery is subject to considerable international competition, particularly as Belgium and France have historical fishing rights around the southeast of England. Other demersal species that will be targeted in this way include the valuable turbot and brill, which are

<sup>59</sup> <http://www.sussex-ifca.gov.uk/>

relatively abundant in the summer (Sussex IFCA website<sup>59</sup>, Southern IFCA website<sup>60</sup>). Otter and beam trawls are also used in the region, primarily to target flatfish, although trawlers will also take advantage of high species diversity in the region to land cuttlefish, squid, black bream or red mullet, species which are not subject to quota restrictions and may still attract a high price (Walmsley & Pawson 2008). The cuttlefish fishery is highly seasonal, with cuttlefish moving close to the shore in the summer months (Sussex IFCA website<sup>59</sup>).

The pelagic sector is small in the region. Herring, mackerel and sprat are all caught in small quantities, while a number of bays and estuaries act as nursery grounds for sandeel and bass, supporting small scale industrial and recreational fisheries (Sussex IFCA website<sup>59</sup>). The Beaulieu River, Christchurch Harbour and Poole Harbour all support licensed salmon and sea trout seine net fisheries. Licensed fisheries for eels operate in the region, with fyke nets used to capture yellow eels in summer and silver eels in autumn (Walmsley & Pawson 2008).

The inshore fleet operating in this region is highly adaptable, and many trawlers that have targeted whitefish in the summer months will switch to scallop dredging in the winter. Scallop dredging is a highly opportunistic fishery as the scallop beds in the region are transient, but scallops fetch a high price. Clams, cockles and mussels, which may be harvested by dredging or hand-picking, are landed in the region, while the whelk fishery has increased in importance in recent years (Sussex IFCA website<sup>59</sup>). Crabs and lobsters are important in the region, with lobsters typically found on rocky grounds inshore and brown crabs taken further offshore. Some fleets around the Isle of Wight depend on the lobster fishery, particularly in summer. The region is notable for its oyster fisheries. The Solent provides an example of one of the few healthy and self-regenerating native oyster fisheries, which may be harvested in beam trawls and scallop dredges. A small population of Manila clams in Poole Harbour supports a small fleet (Walmsley & Pawson 2008).

#### A1h.16.8.2 Ports and vessels

There is a very high density of small boats at ports along the coast of the region. Almost 90% of fishing vessels registered at ports in the eastern Channel in 2014 were <10m the largest figures of any Regional Sea. This reflects the inshore nature of many of the fisheries in the region. The region contains 5 of the top 50 UK ports by landed weight: Brixham, Weymouth, Portsmouth, Shoreham and Teignmouth. Landings in these ports are mainly of shellfish species, apart from at Brixham where significant demersal landings are reported (Table A1h.17).

**Table A1h.17: Mean annual landings into key ports in Regional Sea 3, 2010-2014**

| Port              | Vessels<br><10m | Vessels<br>>10m | Demersal<br>(‘000s<br>tonnes) | Demersal<br>(£ million) | Pelagic<br>(‘000s<br>tonnes) | Pelagic<br>(£<br>million) | Shellfish<br>(‘000s<br>tonnes) | Shellfish<br>(£<br>million) |
|-------------------|-----------------|-----------------|-------------------------------|-------------------------|------------------------------|---------------------------|--------------------------------|-----------------------------|
| <b>Brixham</b>    | 70              | 53              | 4.4                           | 11.6                    | 2.3                          | 0.6                       | 6.7                            | 11.7                        |
| <b>Shoreham</b>   | 32              | 4               | 0.6                           | 1.7                     | 0.0                          | 0.0                       | 4.6                            | 7.0                         |
| <b>Teignmouth</b> | 16              | 2               | 0.0                           | 0.1                     | 1.7                          | 0.4                       | 0.1                            | 0.2                         |
| <b>Portsmouth</b> | 45              | 8               | 0.1                           | 0.5                     | 0.1                          | 0.0                       | 1.7                            | 1.9                         |
| <b>Weymouth</b>   | 43              | 4               | 0.1                           | 0.7                     | 0.0                          | 0.0                       | 1.6                            | 2.1                         |

Source: MMO data<sup>50</sup>

<sup>60</sup> <http://www.southern-ifca.gov.uk/>

### **A1h.16.8.3 Distribution of fishing effort**

VMS data show the greatest fishing effort to be in the east of this region, with the greatest density of effort along the Sussex coast. Information extracted from logbooks and landings data indicates significant effort occurs in the west of the region, reflecting the number of smaller vessels operating in these waters that would not contribute to VMS data. The use of static gears concentrated inshore, while mobile gears are in use throughout the region. As in Regional Sea 2, a large number of foreign vessels operate in the region.

### **A1h.16.8.4 Gears and landings**

The largest sector within the region, when measured by landed weight, is shellfish (47%), although there is a valuable demersal sector which contributes approximately 37% of the total landed value in the region. There is a notable cephalopod sector operating in the region which mainly targets cuttlefish (Figure A1h.45). Static gears are particularly important in the region, with traps accounting for 39% of total days fished (Table A1h.14). Beam trawls and seine nets are also well used in the region. The use of static gears in the region may account for the high value of demersal catch in the region, as these fishing methods tend to cause less damage to caught fish than trawling. The region is heavily fished by foreign vessels which will not be included in these figures (Figure A1h.38).

## **A1h.16.9 Regional Seas 4 & 5**

### **A1h.16.9.1 Summary of fisheries**

The southwest of England is one of the main fishing regions in the UK with approximately 20% of working fishermen based in the region (PMSU 2004). Landings are predominantly of shellfish and demersal species, although there is a high value demersal sector, operating particularly out of Plymouth and Newlyn. The pelagic fishery in the region is smaller, but with important seasonal stocks of mackerel (Cornwall IFCA website<sup>61</sup>). Fishing effort and landings density are highest off the southwest peninsula. There is considerable flexibility displayed by the industry in this region. It is common for beam trawlers to switch between targeting whitefish and scallops, depending on demand, restrictions and season, while otter trawlers will switch between demersal and pelagic fishing to take advantage of migrating mackerel and herring (Walmsley & Pawson 2008). In the eastern waters of the region, otter and beam trawlers target sole, plaice, rays, turbot and monkfish in the winter months, while cuttlefish provide an important, non-quota restricted catch. Gill and tangle nets are set around the region to catch a variety of gadoids and flatfish. In Cornish waters, beam trawling for monkfish, megrim, lemon sole and sole represents an important sector and one which has been increasing since the 1980s (Walmsley & Pawson 2008). Otter trawls exploit seasonal fisheries, while gill nets are often set out around the reefs and wrecks of the region. Larger vessels may go out to deeper waters up to 70 miles offshore, to the southwest of Ireland to catch hake, an otherwise infrequent target in UK waters. There is a considerable amount of trawler activity in the Bristol Channel, with substantial international competition for the sole stock. Belgium and France exercise historical fishing rights in the waters of this region (Coates 2005).

Mackerel is an important stock in the region but, due to over-fishing, an extensive protected area around the coast of Cornwall, known as the “Mackerel Box” was set up in which trawling and seining for the species is prohibited (MMO website<sup>62</sup>). As a result, a traditional handline fishery flourishes on both coasts of the region and was one of the first seven UK fisheries to

<sup>61</sup> <http://www.cornwall-ifca.gov.uk/>

<sup>62</sup> <https://www.gov.uk/government/organisations/marine-management-organisation>

have earned Marine Stewardship Council certification as a sustainable fishery (MSC website<sup>63</sup>). The fishery is most active between autumn and spring along the south coast of the region, and over summer off the north coast. Drift nets may be deployed to capture herring and sprat, while sardines (or pilchard) and horse mackerel are targeted by industrial trawlers from as far afield as Scotland and Denmark. Bass is regularly caught in drift nets and gill nets in inshore waters, particularly in nursery areas off the Burry Inlet and Three Rivers off South Wales (Walmsley & Pawson 2008, Devon & Severn IFCA website<sup>64</sup>). Sardines are the target of a specialized Cornish fleet employing purpose built ring nets, typically operating at night.

Potting for lobster and crabs is important in the region. As well as brown crabs, new fisheries for velvet crabs, green crabs and spider crabs are developing in the region (Walmsley & Pawson 2008). Scallops are dredged off the coasts of Cornwall and Devon, but dredging is restricted around the south coast of Wales, by local byelaws. The Burry Inlet and Three Rivers area is the site of an important licensed hand-gathered cockle fishery, while whelk fishing has been growing in importance in Carmarthen Bay since the mid 1990s (Walmsley & Pawson 2008). The development of hydraulic dredging has led to a growing fishery for clams such as razorshells. Cuttlefish and squid are also frequently caught in the region, using pots and jigs in the spring and summer months.

Licensed salmon fisheries operate in the Rivers Exe, Teign, Dart, Taw, Torridge, Fowey, Camel, Tywi, Wye, Taf and Cleddau. Fyke nets are set in most of the large rivers in the region, and dip nets for elvers are used in winter and spring in some rivers on the north coast of Devon (Walmsley & Pawson 2008).

The Isles of Scilly (Regional Sea 5) supports 22 licensed and active fishing vessels, 21 of which use static gear, and the other a small otter trawler. Vessels longer than 11m and weighing more than 10 tonnes are prohibited from fishing within the 6 mile nautical boundary around the islands. Local vessels mainly pot for crustaceans (3,500-5,000 pots are estimated to be in use during the season), or catch mackerel and pollack with nets and hand-lines (Isles of Scilly IFCA website<sup>65</sup>).

#### **A1h.16.9.2 Ports and vessels**

There are more vessels based in this region than in any other, and the area also has a high average number of vessels per port. Vessels <10m make up 87% of the fleet, reflecting the importance of inshore fisheries in the region, although offshore fishing grounds to the southwest of England and the south of Ireland mean that there is a higher proportion of larger vessels based in the west of the region than the east. There are few large ports on the north Devon and south Wales coasts along the Bristol Channel. The easy access to offshore fishing grounds also means a substantial number of large vessels are based in the region. The region contains 6 of the top 50 UK ports (Table A1h.18).

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<sup>63</sup> <https://www.msc.org/>

<sup>64</sup> <http://www.devonandsevernifca.gov.uk/>

<sup>65</sup> <http://www.scillyifca.gov.uk/>

**Table A1h.18: Mean annual landings into key ports in Regional Seas 4 and 5, 2010-2014**

| Port          | Vessels<br><10m | Vessels<br>>10m | Demersal<br>(‘000s<br>tonnes) | Demersal<br>(£ million) | Pelagic<br>(‘000s<br>tonnes) | Pelagic<br>(£<br>million) | Shellfish<br>(‘000s<br>tonnes) | Shellfish<br>(£<br>million) |
|---------------|-----------------|-----------------|-------------------------------|-------------------------|------------------------------|---------------------------|--------------------------------|-----------------------------|
| Newlyn        | 181             | 55              | 6.1                           | 15.9                    | 2.0                          | 0.7                       | 2.3                            | 4.2                         |
| Plymouth      | 195             | 33              | 2.2                           | 5.7                     | 8.2                          | 3.0                       | 3.1                            | 5.6                         |
| Salcombe      | 19              | 6               | 0.0                           | 0.1                     | 0.0                          | 0.0                       | 1.4                            | 2.3                         |
| Milford Haven | 75              | 10              | 1.4                           | 4.2                     | 0.0                          | 0.0                       | 1.6                            | 2.8                         |
| Saundersfoot  | 11              | 1               | 0.0                           | 0.1                     | 0.0                          | 0.0                       | 1.8                            | 1.3                         |
| Falmouth      | 25              | 4               | 0.1                           | 0.3                     | 0.3                          | 0.1                       | 0.6                            | 1.0                         |

Source: MMO data<sup>50</sup>

### A1h.16.9.3 Distribution of fishing effort

VMS records indicate a high density of vessels operating particularly around the south of Devon and Cornwall, as well as in offshore waters to the southwest. Inshore, effort is greatest along the south coast of the region, between the major ports of Exmouth, Plymouth and Falmouth, with this pattern maintained when mobile gears are considered separately. There is also substantial fishing effort using mobile gears in the mouth of the Bristol Channel. Fishing effort using static gears is most abundant in western areas of the peninsula. There is also a high density of fishing effort in deeper waters to the southwest of Wales, particularly of vessels using mobile gears, while static gears are concentrated around the coast. Foreign vessels are widespread beyond territorial waters throughout the region.

### A1h.16.9.4 Gears and landings

Landings from these Regional Seas are dominated by demersal fish and shellfish (with a combined contribution to landings of 68% by weight and 84% by value). There is also a substantial cephalopod fishery (largely for cuttlefish) making up nearly 10% of the total value. Valuable shellfish landings in Carmarthen Bay are evident. A variety of gear types are used in the region, with mobile gears mainly (69% days fishing) (Table A1h.14). There are also significant fishing effort with a number of traps (21%) and gillnets (9%) used, reflecting the large quantities of shellfish landed from the region and the high values of the demersal catch. There is considerable use of longlines and handlines in this region. The demersal catch in the region is of very high value, possible due to the high level of use of selective fishing methods such as line fishing and gillnetting in the region. The region is heavily fished by foreign vessels which will not be included in these figures.

## A1h.16.10 Features of Regional Sea 6

### A1h.16.10.1 Summary of fisheries

Fishing in the Irish Sea is dominated by otter trawlers, beam trawlers, scallop dredgers and potters. Otter trawlers in the region are primarily British, with the remainder Irish, French and Belgian (Mills & Eastwood 2005). These fleets target cod, whiting, plaice and *Nephrops* at grounds to the east and west of the Isle of Man, southwest Wales, the Firth of Clyde and Liverpool Bay. There is a significant summer *Nephrops* fishery off the coast of Whitehaven and a rather larger one in the deeper water between the Isle of Man and Ireland. Beam trawlers in the region are predominantly Belgian, along with UK and French vessels. The fishery is mainly based southwest of the Isle of Man, in Liverpool Bay and Cardigan Bay. Static gears are also used to catch demersal species, and an increasing number of trawlers have switched to using gill, tangle and trammel nets (Walmsley & Pawson 2008). Static netting is mainly used to catch

sole, plaice, flounder, rays, turbot and brill (Walmsley & Pawson 2008). There are licensed fisheries for salmon and sea trout in the region, with a key area for the fishery being the Solway Firth (North-west IFCA website<sup>66</sup>). Pelagic fisheries in the region are limited. Bass is caught with gill nets and handlines from spring to autumn, while some drift netting and pair trawling for herring takes place over autumn and winter, particularly at spawning grounds around the Isle of Man. A limited amount of netting for herring and mackerel takes place and there is an important charter fishery for mackerel.

Scallop dredging and potting, predominantly carried out by UK vessels, are key fisheries in the Irish Sea. Dredging for scallops takes place around Anglesey and the Isle of Man and to a lesser extent, within the Firth of Clyde and Cardigan Bay. Scallop fisheries are closed in coastal areas of the Irish Sea between June and October or November although fishing for queen scallops may be carried out year round. Potting is a particular feature of Cardigan Bay, where lobsters, crabs and prawns are all important fisheries. The lobster fishery operates in the Bay, as well as around the Lleyn Peninsula from April to November. Brown crabs are also caught in pots around the Lleyn Peninsula, while spider crabs and crawfish are developing fisheries in the south of Cardigan Bay (Walmsley & Pawson 2008). Morecambe Bay, the Solway Firth, and the Dee, Ribble and Duddon estuaries are sites of shrimp fishing, while potting for shrimps has increased in Cardigan Bay in recent years, particularly during winter, when it is a substitute for the summer peaking lobster fishery. Shoreline cultivation of mussels, Manila clams and oysters takes place in the region and Morecambe Bay and the Solway Firth support important hand-raked and mechanically dredged cockle fisheries (Mills & Eastwood 2005).

#### **A1h.16.10.2 Ports and vessels**

The coastline around Regional Sea 6 has more ports than any other Regional Sea area, even excluding Manx and Irish ports, although the average number of registered fishing vessels per port is low. Most of the vessels in these ports (62%) are of boats below 10m, although Northern Irish ports tend to have a greater number of larger vessels – Kilkeel has the second largest >10m fleet in the UK. Twelve of the top 50 UK and Manx (Douglas, Peel and Port St Mary) ports by landings are based in Regional Sea 6, with landings at these ports, in common with the rest of the region, dominated by shellfish (although there are significant pelagic landings at Ardglass) (Table A1h.19).

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<sup>66</sup> <http://www.nw-ifca.gov.uk/>

**Table A1h.19: Mean annual landings into key ports in Regional Sea 6, 2010-2014**

| Port                 | Vessels<br><10m | Vessels<br>>10m | Demersal<br>(‘000s<br>tonnes) | Demersal<br>(£ million) | Pelagic<br>(‘000s<br>tonnes) | Pelagic<br>(£<br>million) | Shellfish<br>(‘000s<br>tonnes) | Shellfish<br>(£<br>million) |
|----------------------|-----------------|-----------------|-------------------------------|-------------------------|------------------------------|---------------------------|--------------------------------|-----------------------------|
| <b>Ardglass</b>      | 13              | 28              | 0.1                           | 0.2                     | 5.8                          | 2.9                       | 2.4                            | 4.5                         |
| <b>Kilkeel</b>       | 42              | 60              | 0.7                           | 0.9                     | 0.1                          | 0.1                       | 4.6                            | 7.2                         |
| <b>Kirkcudbright</b> | 4               | 13              | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 3.2                            | 3.9                         |
| <b>Portavogie</b>    | 19              | 30              | 0.3                           | 0.4                     | 0.0                          | 0.0                       | 2.9                            | 5.5                         |
| <b>Holyhead</b>      | 24              | 5               | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 3.2                            | 2.2                         |
| <b>Campbeltown</b>   | 45              | 33              | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 2.1                            | 4.3                         |
| <b>Whitehaven</b>    | 7               | 7               | 0.2                           | 0.3                     | 0.0                          | 0.0                       | 2.0                            | 2.4                         |
| <b>Warrenpoint</b>   | 0               | 0               | 0.0                           | 0.0                     | 0.8                          | 0.6                       | 0.2                            | 0.1                         |
| <b>Troon</b>         | 0               | 6               | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 2.1                            | 3.9                         |
| <b>Douglas</b>       | -               | -               | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 3.4                            | 2.1                         |
| <b>Peel</b>          | -               | -               | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 1.3                            | 1.6                         |
| <b>Port St Mary</b>  | -               | -               | 0.0                           | 0.0                     | 0.0                          | 0.0                       | 0.9                            | 1.1                         |

Source: MMO data<sup>50</sup>

### A1h.16.10.3 Distribution of fishing effort

The distribution of fishing effort in the Irish Sea, as depicted by VMS data, is particularly great in the north of the region with hotspots of fishing activity to the west of the Isle of Man and off the Cumbrian coast at Whitehaven. Significant activity can also be seen in Cardigan Bay and the Solway Firth. This pattern of distribution is mirrored by logbook data, both for all gears and mobile gears. Use of static gear is most frequent in waters around the northwest of Wales. There are relatively few foreign vessels operating in the region.

### A1h.16.10.4 Gears and landings

Shellfish dominate landings in the region making up 82% of landings by weight and 95% by value. The most valuable landings are obtained from waters to the west of the Isle of Man, where important *Nephrops* and gadoid stocks are fished. A greater weight of shellfish is landed from the Irish Sea than from any other Regional Sea, but the value of this catch is not as great as in the northern North Sea, where high value *Nephrops* comprise a larger proportion of the catch. The dominant method fishing method in the Irish Sea is the bottom trawl (82% days fished), with traps and dredges also common.

## A1h.16.11 Features of Regional Sea 7

### A1h.16.11.1 Summary of fisheries

The sheltered, inshore waters of the Minch and adjacent sea lochs make Regional Sea 7 ideal for small day boats. Most of the vessels operating here are small, local boats, although there is a significant number of Northern Irish activity in these inshore waters (Scottish IFGs website<sup>56</sup>). Most fishing in the region is for shellfish, with crabs (edible and velvet), lobsters and whelk caught alongside major fisheries for scallop and *Nephrops*. *Nephrops*, caught by trawls and creels, is the most valuable fisheries in the area, followed by scallop, caught by dredging and, at lesser amounts, by hand. Razorshell is a growing fishery (Scottish IFGs website<sup>56</sup>). There is also a sizeable industrial fishery targeting sandeel, alongside small scale pelagic fisheries for herring and mackerel and demersal fisheries for small flatfish and gadoids, such as cod, haddock and saithe, which use the region as a nursery ground. Salmon and sea trout are also abundant in the rivers and lochs of the west of Scotland and licensed fisheries for these species exist.



### A1h.16.11.2 Ports and vessels

There are over 50 active fishing ports in the region, supporting almost 628 vessels between them (an average of about 12 vessels per port). Of these vessels, 27% are over 10m long, suggesting that although the region is ideal for small day boats, the proximity to the region of the shelf edge and offshore fishing grounds still supports many larger vessels. Five of the top fifty UK ports by landing weight are found within the region. These ports support a number of vessels longer than 10m and landings into these ports are dominated by demersal species (Table A1h.20).

**Table A1h.20: Mean annual landings into key ports in Regional Sea 7, 2010-2014**

| Port                 | Vessels <10m | Vessels >10m | Demersal ('000s tonnes) | Demersal (£ million) | Pelagic ('000s tonnes) | Pelagic (£ million) | Shellfish ('000s tonnes) | Shellfish (£ million) |
|----------------------|--------------|--------------|-------------------------|----------------------|------------------------|---------------------|--------------------------|-----------------------|
| <b>Kinlochbervie</b> | 11           | 5            | 6.6                     | 10.9                 | 0.0                    | 0.0                 | 0.6                      | 1.5                   |
| <b>Ullapool</b>      | 68           | 24           | 3.5                     | 7.4                  | 0.0                    | 0.0                 | 1.8                      | 4.2                   |
| <b>Mallaig</b>       | 20           | 14           | 1.3                     | 2.2                  | 1.0                    | 0.2                 | 2.3                      | 6.8                   |
| <b>Lochinver</b>     | 9            | 17           | 1.8                     | 4.1                  | 0.0                    | 0.0                 | 0.6                      | 2.3                   |
| <b>Oban</b>          | 48           | 26           | 0.0                     | 0.0                  | 0.0                    | 0.0                 | 1.7                      | 4.2                   |

Source: MMO data<sup>50</sup>

### A1h.16.11.3 Distribution of fishing effort

The region is widely fished, with the greatest densities around the northern Hebrides. This distribution may be seen both using data derived from VMS (Figure A1h.35) and logbooks. Static gears are mainly set in sheltered bays and lochs. Very few foreign vessels operate in the region, as much of it is within UK territorial waters. Fishing in this region is slightly seasonal, with the greatest effort recorded in spring.

### A1h.16.11.4 Gears and landings

Landings in the region are dominated by shellfish, which contribute 83% of the weight and 97% of the value of landings, and by pelagic species (41% by weight and 15% by value). Shellfish landings are predominantly of high value *Nephrops* and scallop. Important scallop grounds are found along the east coast of the Isle of Lewis, to the west of the Isle of Skye and along the coast to the south of the region (Mason 1983). The most frequently used gear types are bottom trawls and traps (for *Nephrops*, crabs, lobsters and sandeels), which comprise almost 90% of days fished by UK vessels between them, while dredges are used to harvest scallop. Fishing effort (in terms of days at sea) within this region is greater than all other Regional Seas apart from Regional Sea 1, although the relatively low weight of landings is indicative of the small size of vessel fishing in the area.

## A1h.16.12 Regional Sea 8

### A1h.16.12.1 Summary of fisheries

The seas of the Scottish continental shelf region are heavily fished by both the UK fleet and foreign vessels. There are four main demersal fleets in operation in the region (Gordon 2006):

- Mixed roundfish otter trawl – UK, Irish, French and German vessels target haddock, cod and other gadoids both on the shelf and along the shelf edge.
- *Nephrops* otter trawl – Irish and British vessels use fine mesh nets to target *Nephrops* in offshore areas, usually with a significant bycatch.

- Monkfish, megrim and hake otter trawl – these species are targeted on and around the shelf edge, mainly by UK and French trawlers.
- Saithe otter trawl – predominantly French vessels operating in shelf edge waters to the north of Scotland.

Large and important pelagic fisheries operate in this Regional Sea as both herring and mackerel migrate over the Scottish shelf between spawning and feeding grounds. The west of Scotland herring stock is targeted by UK, Dutch and German vessels, while higher value mackerel is the target of a substantial Irish fleet in the area. Norway pout is targeted by industrial fleets, primarily from Danish vessels (Gordon 2006).

Inshore fisheries in the region are dominated by shellfish harvesting around the coastlines of the Lewis, Harris, Orkney and Shetland.

#### A1h.16.12.2 Ports and vessels

The region does not have an extensive coastline, comprising mainly just the western fringes of the Hebrides, Orkney and Shetland and north of Scotland. Consequently there are relatively few ports and vessels based in the region. In 2014 there were 218 fishing vessels (averaging approximately 8 per port). Approximately 76% of vessels were under 10m in length. Much of the fishing effort in the region is carried out from boats based elsewhere in the UK and abroad. Of the top 50 UK fishing ports, four are based in this region, at Scalloway and Cullivoe in Shetland, Stromness in Orkney and Scrabster. Landings at these ports comprise mainly demersal fish with very few pelagic landings (Table A1h.21).

**Table A1h.21: Mean annual landings into key ports in Regional Sea 8, 2010-2014**

| Port                | Vessels <10m | Vessels >10m | Demersal ('000s tonnes) | Demersal (£ million) | Pelagic ('000s tonnes) | Pelagic (£ million) | Shellfish ('000s tonnes) | Shellfish (£ million) |
|---------------------|--------------|--------------|-------------------------|----------------------|------------------------|---------------------|--------------------------|-----------------------|
| Scrabster           | 54           | 2            | 10.1                    | 19.5                 | 0.0                    | 0.0                 | 2.8                      | 4.7                   |
| Scalloway and Isles | 16           | 4            | 3.4                     | 5.3                  | 0.1                    | 0.0                 | 0.1                      | 0.2                   |
| Cullivoe            | 0            | 0            | 1.5                     | 2.5                  | 0.0                    | 0.0                 | 0.0                      | 0.1                   |
| Stromness           | 1            | 4            | 0.0                     | 0.0                  | 0.0                    | 0.0                 | 1.6                      | 2.4                   |

Source: MMO data<sup>50</sup>

#### A1h.16.12.3 Distribution of fishing effort

The VMS data indicates a high level of fishing effort throughout this region. Logbook-derived data suggests a more uniform distribution across the shelf. Densities of vessels are highest along the shelf edge, with hotspots of activity to the north of the Hebrides and around Orkney and Shetland islands. Most of these vessels were using mobile gears, although a significant amount of static gear usage can be identified around the shelf edge.

#### A1h.16.12.4 Gears and landings

This is the most productive of the Regional Seas, with landings largely comprising pelagic fish (much of which is caught by industrial freeze trawlers) comprising over 84% of the landed weight, and 63% of the value. The importance of pelagic fisheries in this region, particularly off the north of Scotland, is clear in Figure A1h.45. The high efficiency of pelagic fishing means that these landings are achieved despite relatively little fishing effort (in terms of total days at sea) when compared to other Regional Seas, in particular, 1, 4/5, 6 and 7. Traps (35% days

fished) and bottom trawls (46% days fished) are the dominant gear types used in the region, reflected in the high quantities of demersal and shellfish species caught around the shelf. The region is heavily fished by foreign vessels which will not be included in these figures.

### **A1h.16.13 Regional Seas 9, 10 & 11**

#### **A1h.16.13.1 Summary of fisheries**

These regions are entirely non-coastal and too far from shore for small day boats. The fisheries in the region are predominantly demersal, with the Rockall Bank, Hatton Bank and areas around the numerous sea mounts and ridges particularly suitable for large gadoids, monkfish and flatfish. Areas like the Rockall Trough and Faroe Shetland Channel support significant deep sea fisheries. The Rockall Bank is the site of a major targeted demersal trawl fishery for haddock, primarily pursued by Russian vessels operating outside of the European Exclusive Economic Zone (beyond 200 nautical miles from shore) (Gordon 2006). Vessels target deep water species such as blue ling, roundnose grenadier and black scabbardfish around the margins of the Rockall Trough, while French vessels operate a small fishery for deep water sharks (Gordon 2006). Over the Hatton Bank, roundnose grenadier and Baird's slickhead are fished, with many Spanish vessels working in the area. There are also mixed demersal trawls catching monkfish, saithe, cod and haddock within the region. A feature of the demersal fisheries of the region is the use of static methods such as longlines (used by Norwegian vessels targeting ling and tusk) and gill nets (a popular method among Spanish vessels targeting hake). There is concern about the sustainability of deep sea stocks, due to the low fecundity and long life cycles of many of these species. Consequently, numerous closed areas have been set up (Ásmundsson 2015). Trawling is banned in certain areas around the Rockall and Hatton Banks and at the Darwin Mounds (in part because of the presence of fragile coral habitats), directed fishing for orange roughy is not permitted along much of the shelf edge, while a "Haddock Box" where only longlining is permitted, exists near Rockall.

Pelagic fisheries in the region target herring and mackerel, but the most important pelagic fisheries in these waters are industrial fisheries for small, "low value" pelagics, particularly blue whiting (Gordon 2006). Shellfish fisheries in the region are limited, although a developing pot and tangle net fishery for deep water red crabs on the Hatton and Rosemary Banks and along the Wyville Thomson Ridge is developing.

#### **A1h.16.13.2 Distribution of fishing effort**

Fishing effort is sporadic in these Regional Seas, and is mainly concentrated around the Rockall Bank, Rosemary Bank, Wyville Thomson Ridge and shelf edges, the outlines of which can be clearly made out by the distribution of VMS data. Due to the distance offshore, a large number of foreign (non EU) vessels work in the region.

#### **A1h.16.13.3 Gears and landings**

There is relatively little fishing effort in the region and landings into UK ports from these Regional Seas are much lower than from other areas. Most of the landings (by weight) are of low value pelagic species (72% by weight, 50% by value). The main gear types used are trawls. The regions are heavily fished by foreign vessels which will not be included in these figures.

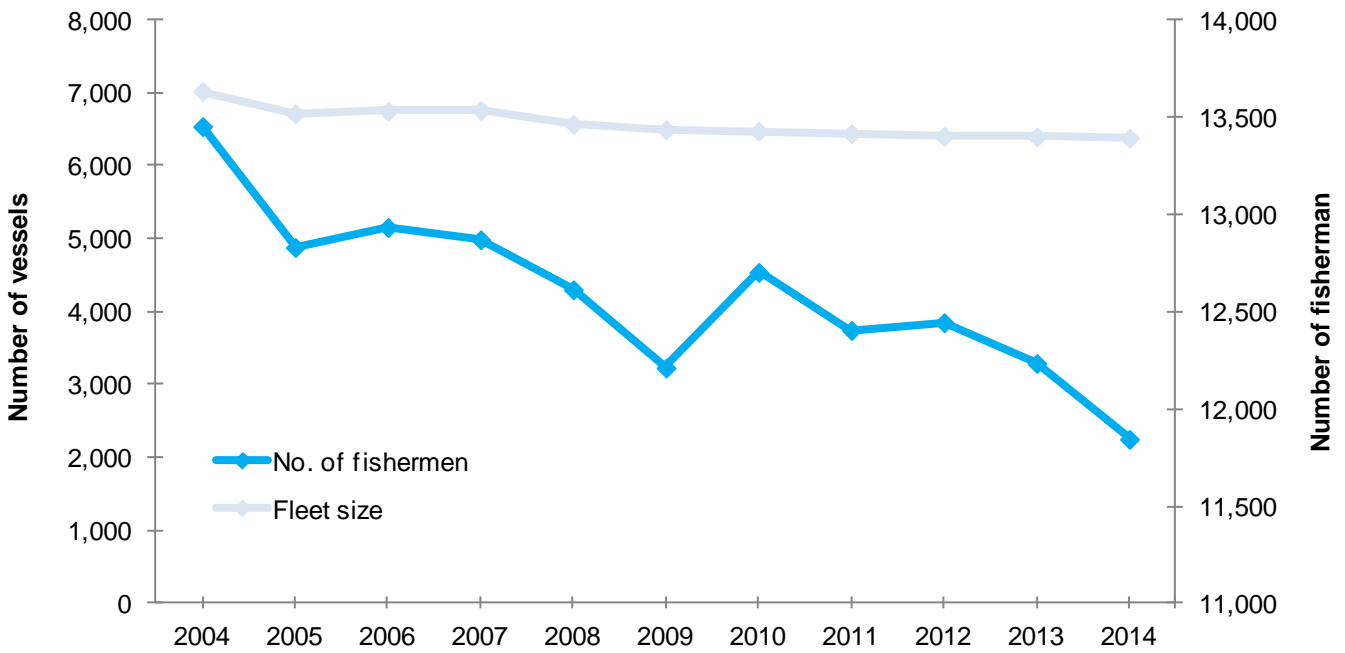
### **A1h.16.14 Evolution of the baseline**

The fishing industry is dynamic with frequent and sometimes unpredictable changes in fish abundance and distribution, climatic conditions, management regulations and fuel costs all affecting activity. Consequently the baseline is rapidly evolving.

### A1h.16.14.1 Trends in the fishing industry

Recent years have seen a decline in the UK fishing industry, with the number of active vessels having declined steadily from 7,022 in 2004 to 6,383 in 2014 (a 9% decrease). Over the same period, the number of working fishermen has decreased from 13,453 to 11,845 (a 12% decrease) – see Figure A1h.47. The rate of this decrease in working fishermen has slowed since the previous 10 year period, although there remains a continued downward trend. The decrease in the ratio of fishing vessels to fishermen (from 1: 1.92 in 2004 to 1: 1.86 in 2014) is suggestive of further mechanization and a relative increase in the use of small inshore vessels.

Figure A1h.47: UK fleet size and numbers of working fishermen, 2004-2014

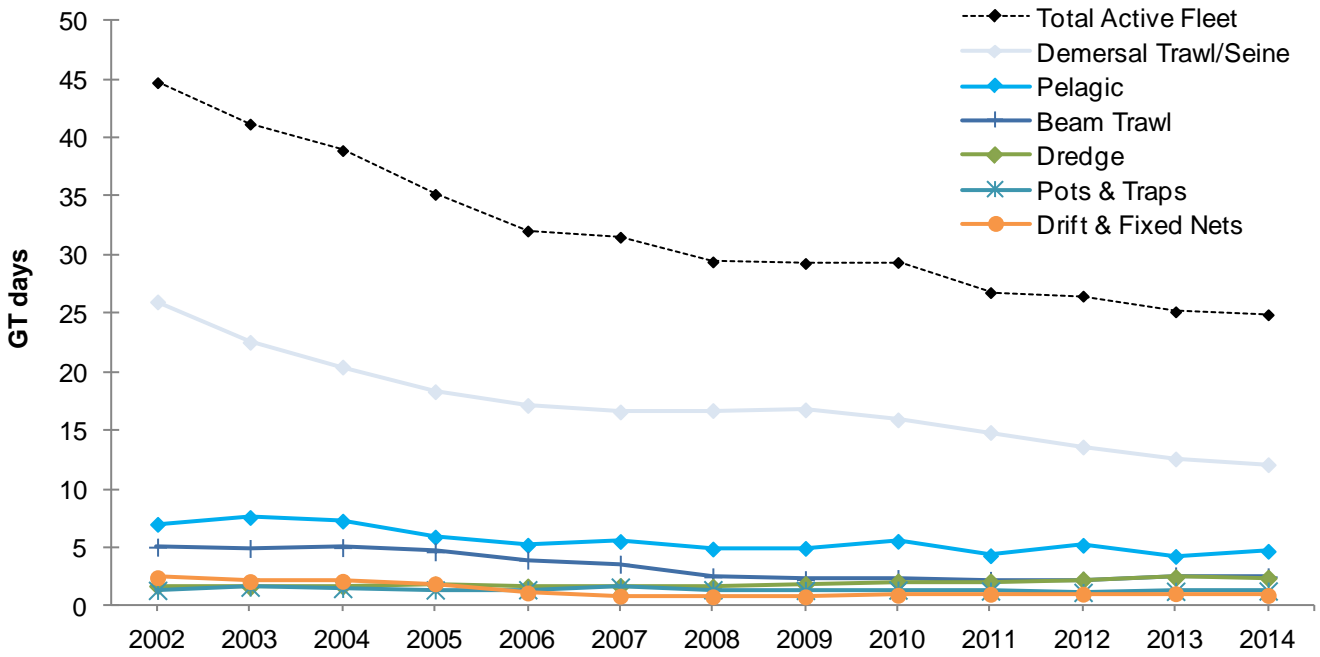


Source: MMO data<sup>50</sup>

### A1h.16.14.2 Trends in gears and landings

The total weight of the UK fleet declined by 44% between 2002 and 2014 (Figure A1h.48 and by 36% between 2004 and 2014). This is a decrease four times as great as the decrease observed in total number of vessels between these years (9% - see Figure A1h.47). This again suggests that the trend in recent years has been towards smaller vessels. The decrease in tonnage in the UK fleet is largely accounted for by a significant decline in the number of vessels employing demersal trawls or seines, which will typically target commercially valuable quota species. As well as the implementation of tighter quotas in many stocks over recent years, the shrinkage in the UK fleet may be due to rising fuel costs, which are limiting profit margins and making the continued running of many boats - particularly older, less efficient models – less viable, and government led decommissioning schemes.

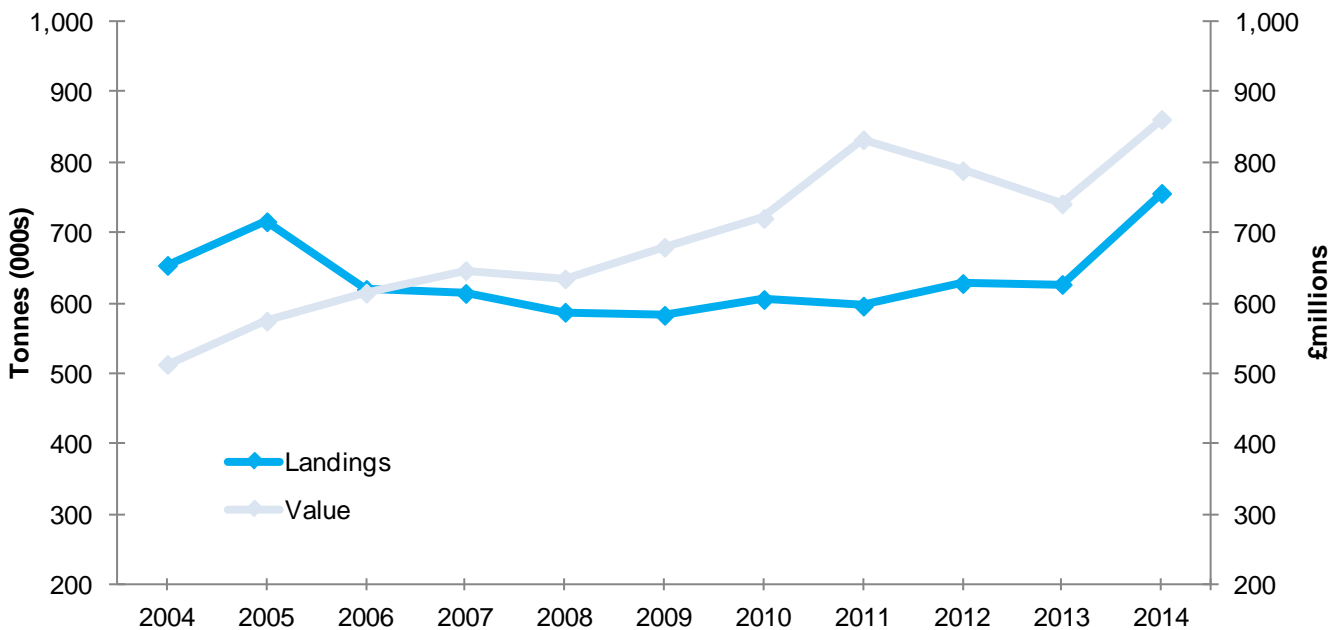
**Figure A1h.48: Fishing effort in GT days for the over 10m UK fishing fleet, 2002 to 2014**



Source: MMO data<sup>50</sup>

Between 2004 and 2014, the total weight of landings by UK vessels increased by 16%. This increase is the result of a higher than typical weight landed in 2014, after a relatively stable set of results reported between 2006 and 2013. The general trend over this period has been one of stability. The value of this catch, however, has increased considerably and steadily, from £513 million in 2004 to £861 million (Figure A1h.49).

**Figure A1h.49: Total UK landings by weight and value, 2004-2014**

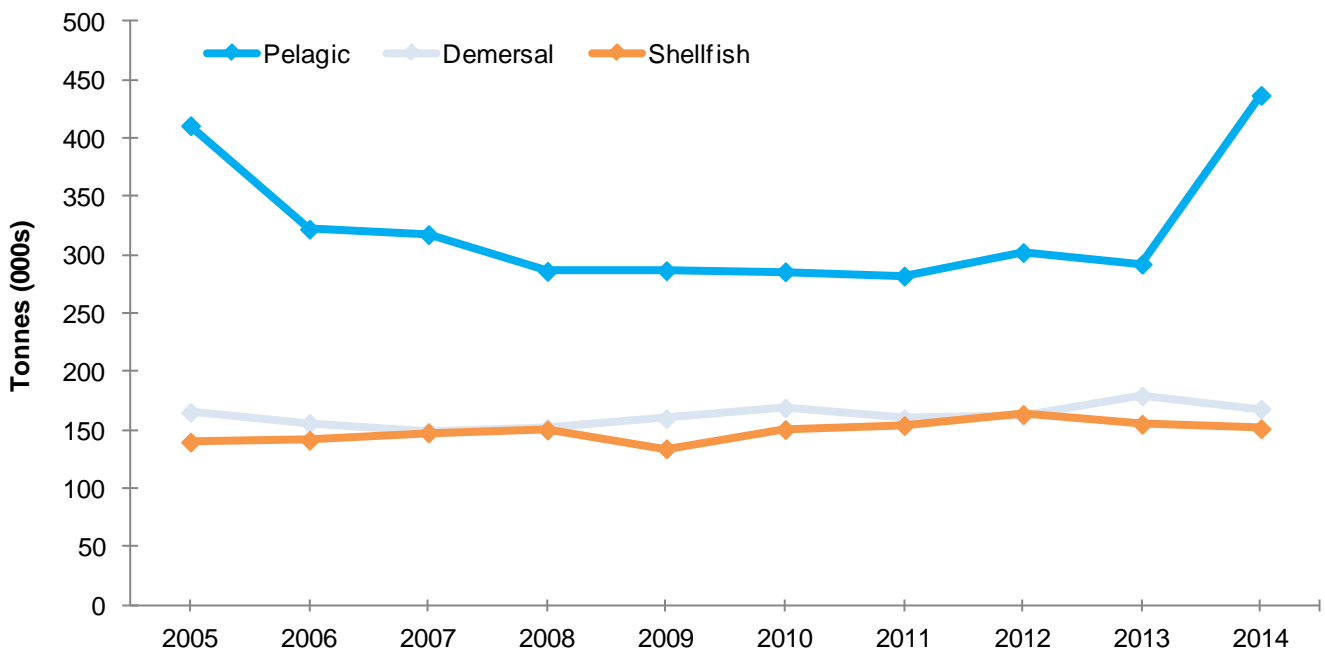


Source: MMO data<sup>50</sup>

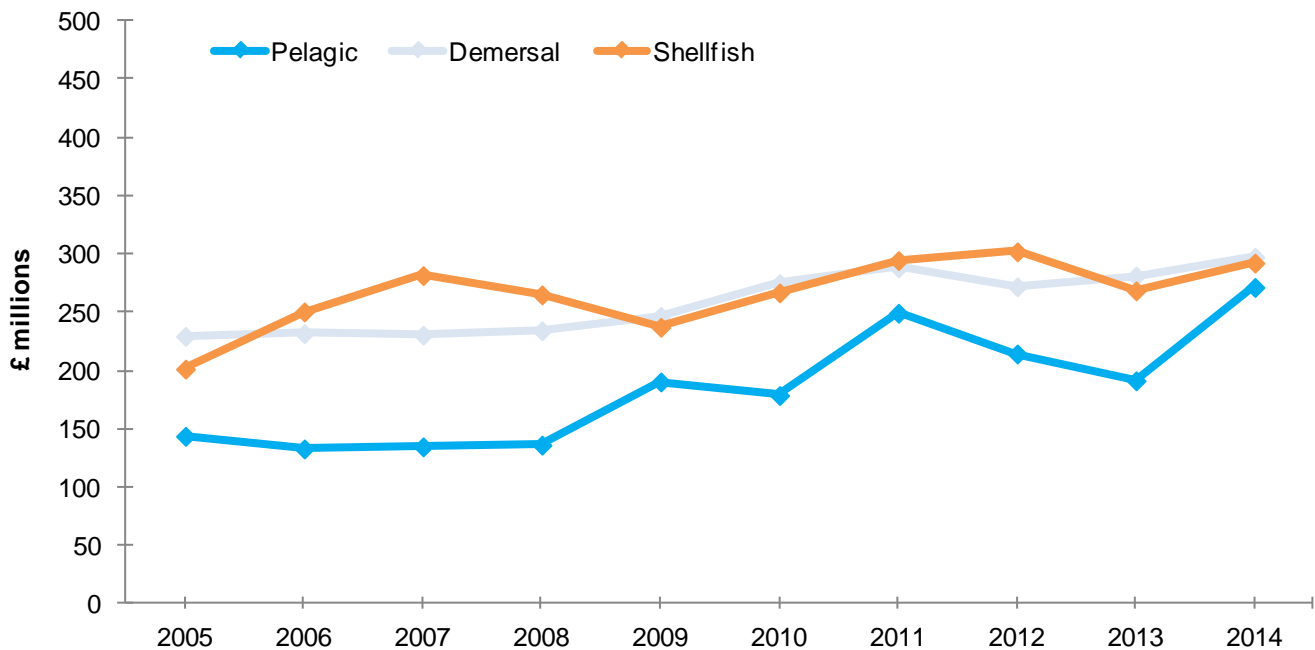
The increase in weight of landings from 2004 to 2014 is due largely to an increase in landings of pelagic species. Shellfish landings have increased slightly over this period (up 8%), while landings of shellfish have remained stable (Figure A1h.50). The sudden increase in pelagic landings (up by 49% from 2013 to 2014) is most likely due to a large increase in the mackerel quota, which resulted in landings of this species rising from 164,000 tonnes in 2013 to 288,000 tonnes in 2014. The total value of all three species types shows a steady rise over this period, with the total value of catch in 2014 split evenly between the three sectors (Figure A1h.51).

Over the last 10-15 years, a number of new fisheries have developed for less traditional food species, particularly for shellfish (whelks and razorshells in the Irish Sea) and cephalopods (squid in the Moray Firth), but also for finfish. This is particularly the case in the southern regions, where species diversity is higher and the abundances of many warm water species are increasing.

**Figure A1h.50: Total UK landings by species type and weight, 2005-2014**



Source: MMO data<sup>50</sup>

**Figure A1h.51: Total UK landings by species type and value, 2005-2014**

Source: MMO data<sup>50</sup>

### A1h.16.14.3 Advances in management

UK fisheries are likely to be subject to substantial changes in coming years as a result of technical developments, economics and changes in management strategy as well as changes in target species abundance, composition and distribution. Over the course of the past century, fishing efficiency has increased with technological advances, increasing the pressure on marine ecosystems as a wider range of environments and species become exploitable. There are two ways of managing fisheries: managing catch or managing effort. Currently, management is focused on catch and is based largely on TACs and national fleet quotas. However, the demersal trawls dominating UK fisheries are characterised by yielding a very mixed catch, so single species quotas do not reflect the true impact of fishing. There is currently a drive to move towards effort management, which will not only limit over-fishing, but also limit some of the negative impacts fishing activity has on the wider environment. Methods of protecting the whole ecosystem in management (the Ecosystem Approach) are increasingly being developed, while discussions between managers and stakeholders (including fishermen) about designing a functional system of Marine Spatial Planning are ongoing. Conflict with other users, such as the wind and renewables industry is resolved, where possible, through negotiation, and compromise, with Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) an important driver of this communication in the UK. The importance of closed areas as a tool for fisheries management was demonstrated by Wright *et al.* (2010), who conclude that temporary area closures, varying in location in relation to the juvenile settlement concentrations may be more beneficial for haddock stocks than permanent closures. A system of “live-closures” was adopted by the EU in 2010, triggered by the proportion of juveniles found in hauls (Commission Regulation (EU) No. 724/2010). The MMO manages live closures within the North Sea, with a list of closed areas available from their website and updated monthly (MMO website<sup>63</sup>).

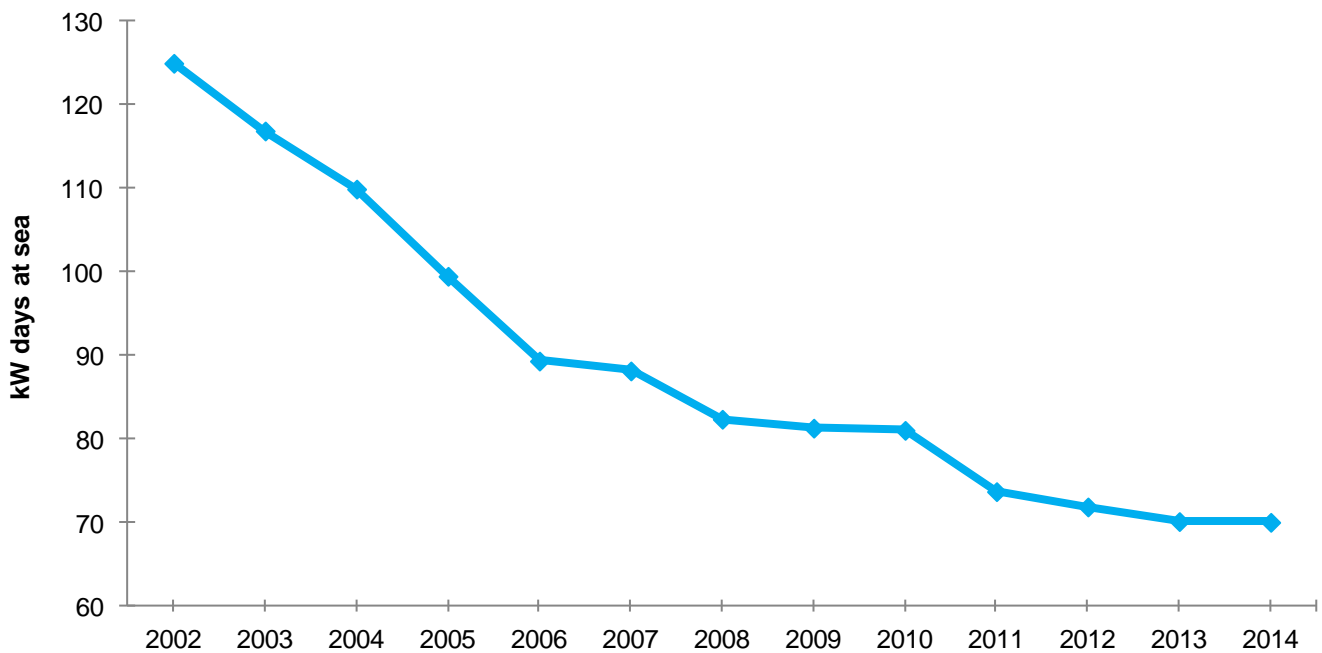
As part of this, measures such as establishing closed areas (including Marine Protected Areas), days at sea limits, reducing vessel power (Figure A1h.52) and limiting capacity through occasional decommissioning schemes are becoming increasingly popular. In addition, there have been a number of technical developments in recent years to decrease levels of bycatch by

allowing the escape of non-target, under-sized or juvenile fish and to prevent the entanglement of cetaceans, seals and turtles in gear. These developments include separator panels, escape panels and square meshed panels in trawl nets to allow non-target and under-sized fish to escape, and acoustic “pingers” to deter predatory marine mammals. A decrease in bycatch will increase the efficiency of fishing, resulting in fewer discards and allowing a reduction in fishing effort. This in turn, is likely to lead to more generous quotas being awarded.

Blythe-Skyrme (2010a) reports a survey of fishermen carried out with the aim of identifying potential ways of mitigating the impact of offshore wind farms on the fishing industry. Twenty-six possible mitigation options were identified, including; options to minimize effects on fishing activities; options to enhance stocks of target species and the associated habitats; options to support existing activities; options to develop new fisheries or other activities. Localised studies, including des Clers *et al.* (2008), Woolmer (2009) and Seafish (2013b) have mapped fishing activity as part of efforts to improve knowledge and understanding of the spatial distribution of inshore fishing, which tends to be missed by studies relying on VMS data. des Clers *et al.* (2008) focuses on inshore fisheries around the coast of Devon and Cornwall, while Woolmer (2009) produced detailed maps of shellfishery activity in small areas on the south coast of England and the north west coast of Wales. Seafish (2013b) mapped fisheries activity around the proposed wind resource zone off the coast of Northern Ireland.

Since 2007 a new EU policy aimed to reduce the number of discards is being implemented. This included the introduction on 1<sup>st</sup> January 2009 of a ban on “high-grading” (the practice of retaining on board only the highest value catch while discarding lower value fish). This will be extended to other parts of the Atlantic in 2010 (OSPAR 2010). The reform of the Common Fisheries Policy in 2013, included a ban on discarding, which came into force in pelagic and industrial fisheries in January 2015 and in demersal fisheries in January 2016, aims to limit this loss.

**Figure A1h.52: UK fishing fleet effort in kW days at sea from 2002-2014**



Source: MMO data<sup>50</sup>



Much work is currently being carried out to improve the effectiveness of strategies used in fisheries management. One of the consequences of this work is a drive to involve fishermen in the decision making process, to make use of their experience and expertise and to improve compliance with regulatory measures. This drive has led to such innovations as the voluntary closed area scheme in Scotland, where fishermen report areas of high abundances of juvenile fish for temporary closure.

Pressure may also be put on the fishing industry by non-governmental organisations such as the Marine Stewardship Council (MSC) who assess fisheries and certify those that are sustainable and with low environmental impact. There are currently more than 20 MSC certified fisheries in UK waters, a significant increase on the 7 certified fisheries listed at the time of the last OESEA (MSC website<sup>64</sup>). These fisheries cover a broad range of species, fishing method and geographical range.

Encouraging these sustainable fisheries in this way, as well as encouraging the public to embrace less traditional food species, will also ease the pressure on key species. The principle of “Balanced Harvest” of fish stocks, aiming to spread catch over the widest possible range of species, stocks and sizes, in proportion to their natural productivity (Garcia *et al.* 2015) would be supported by such a move.

## **A1h.16.15 Environmental issues**

### **A1h.16.15.1 Environmental effects of fishing**

Fishing has a number of direct effects on the marine environment. The most obvious of these is the problem of over-exploiting a fish stock, leading to declines in abundance to the level at which the population becomes unsustainable. Overfishing can lead to problems other than a simple decline in abundance. The act of selectively removing large, predatory species from the community, as commercial fisheries tend to, can lead to marine ecosystems becoming dominated by short-lived organisms from lower trophic levels such as small, planktivorous fish and invertebrates. This phenomenon is known as fishing down the food web (Pauly *et al.* 1998). Data indicate that the biomass of fish from high trophic levels declined by two thirds in the North Atlantic in the second half of the Twentieth Century (Christensen *et al.* 2003). Thurstan *et al.* (2010) showed that over 118 years from 1889-2007, the landings per unit of fishing power in the bottom trawl sector fell by 94%, a demonstration of the scale of the decline in demersal fish stocks since the advent of industrial fishing. Anderson *et al.* (2008) and Perry *et al.* (2010) argue that the de-stabilisation of fish stocks caused by heavy fishing leads to increased fluctuations in abundance and therefore increased vulnerability to natural events. This was also illustrated by Lindegren *et al.* (2010) who demonstrate the increased resilience to environmental change of the Atlantic cod in the Sound separating the North and Baltic Seas, where a trawling ban has been in place since 1932, compared to the neighbouring waters.

The latest Charting Progress report (Defra 2010) states that the majority of UK stocks are still fished well above the levels expected to provide the highest long-term yield, although of 20 indicator stocks, the proportion being harvested sustainably rose from 10% in the early 1990s to about 40% in 2007. Fishing mortality estimates have declined significantly in recent years in 67% of assessed stocks in UK waters, and recent ICES advice suggests a greater degree of optimism about the future of these stocks than has been present for a number of years (leading to an increase in the quotas for both species in 2016). The OSPAR Quality Status Report 2010 (OSPAR 2010) concludes that too many fish stocks are still outside safe biological limits, although there have been significant improvements in a number of stocks. Recent reductions in fishing effort have been partially offset by a more technologically advanced and efficient fleet (OSPAR 2010).

The mixed nature of the demersal trawl fisheries also leads to high numbers of unwanted, low-value or immature fish being caught. These fish would once have been discarded – it has been estimated that for every kilogram of sole caught by beam trawls in the North Sea, up to 14kg of other animals will also be killed (Covey & Laffoley 2002, cited in RCEP 2004). In the North Sea between 2010 and 2012, 40% of all catch was discarded, including 78% of plaice and dabs (IMARES 2014). This represents both a biological and an economic loss. However, a ban on discarding, which came into force in pelagic and industrial fisheries in January 2015, and in demersal fisheries in January 2016, aims to limit this loss. Bycatch may also include larger animals; trawl nets catch and drown cetaceans and seals which are attracted by the shoaling fish, and baited long-lines are known to catch and drown diving seabirds (Løkkeborg 1998). Lost fishing gear can continue to act as a source of animal mortality for many years, a process known as “ghost fishing”.

Fishing can also cause considerable damage to the wider marine environment. Bottom trawling is a destructive method, destroying fragile habitats and organisms and crushing benthic invertebrates such as crustaceans, molluscs and echinoderms. ICES, using VMS data to map of surface abrasion pressure caused by trawls (ICES Advice<sup>67</sup>), found that while the “fishing footprint” appears to have become smaller or remained constant over the past 5 years, the effort becomes more concentrated in certain areas as overall effort declines, particularly in the North Sea (see Section 5.4). In 2013, 43% of the North Sea and 26% of the Celtic Seas were estimated to have been impacted by mobile bottom-contacting gears. Beam trawling is particularly destructive, using tickler chains that penetrate up to 8cm into the sediment (RCEP 2004). Rumohr & Kujawski (2000) found a significant change in epifaunal community between 1912 and 1986 that they linked to trawling activity. They found that between these dates, bivalve abundance had declined, while more motile scavengers, such as crustaceans and gastropods, had increased in abundance, possibly in response to high levels of discards and injured invertebrates. Trawling not only modifies the diversity and structure of benthic communities, but is also likely to affect the productivity of the ecosystem by re-suspending nutrients into the water column in a pulse, which may increase pelagic productivity (RCEP 2004). Scallop dredges are similarly damaging, being of a heavy metal construction, and usually with large teeth or a cutting bar designed to dig scallops out from the sediment, and have been linked to a number of detrimental effects including long term changes in seabed community structure (Bradshaw *et al.* 2002). New technologies and fishing methods such as pulse trawling (where an electric pulse replaces the dragged tickler chain (van Marlen *et al.* 2014) or the hydraulic jet elevator, which uses a system of water jets to dislodge shellfish from the seabed, in place of dredges, will reduce the damage caused by these fisheries as they become more widespread.

Shifts in the benthic community of the North Sea were described by Robinson & Frid (2008), as well as the losses of entire taxa, apparently through damage from trawling over several decades. Atkinson *et al.* (2010) reported that shellfisheries (predominantly cockle and mussel) conflict with waterbirds in the Norfolk Wash region, by removing prey. In conjunction with nutrient inputs in the area, this has resulted in a decline in species of waterbird, including the knot, shelduck and oystercatcher and a change in the assemblage towards one dominated by species which rely more on less heavily exploited prey items, such as worms.

OSPAR (2010) conclude that physical disturbance to benthic habitats has decreased in some areas and increased in others. The North Sea has seen a decrease in the number of hours

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<sup>67</sup> [http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/DCF\\_indicators\\_567.pdf](http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/DCF_indicators_567.pdf)

fished, but effort has moved to areas that were previously relatively lightly fished and undisturbed as a result of closed areas (OSPAR 2010). It is estimated that some areas of the North Sea may take up to 15 years to recover from one pass of a beam trawl, with those areas experiencing low levels of natural disturbance the most sensitive (Hiddink *et al.* 2006). As found by Stelzenmüller *et al.* (2008), fishing pressure is often higher in areas with the least tide stress.

The fishing industry is potentially affected by a number of environmental issues, such as contamination of fish through riverine discharges, algal blooms, pollution originating from shipping or hydrocarbon production, and the effects of climate change on fish distributions.

There is the potential for disruption of spawning aggregations through unmitigated (eg: by timing) seismic surveying or piling activities associated with installation of wind farm foundations and other installations.

The potential exclusion of fishing activity within wind farms is of concern to the industry. It may be particularly problematic for inshore fisheries as day boats may be unable to move further afield to fish new grounds. There is evidence that wind farms may act as artificial reefs, encouraging the abundance of fish and shellfish (Wilhelmsson *et al.* 2006, Reubens *et al.* 2014, Stenberg *et al.* 2015). Due to the difficulties and risks of navigating and operating fishing gear within wind farms, however, fishermen may be unable to take advantage of this, although static gear fisheries in the area may be enhanced and opportunities for shellfish fisheries may become available (Hooper & Austen 2014).

## A1h.17 Mariculture

### A1h.17.1 UK context

Mariculture is the cultivation of marine shellfish, finfish and seaweed within coastal waters. UK mariculture is dominated by Scottish salmon production. In 2009, 81% of all UK aquaculture by weight (*i.e.* including freshwater cultivation) was of Scottish salmon and the sector employed 64% of all UK aquaculture workers (NEF 2014), while 99% of marine finfish cultivation takes place in Scottish waters (Gubbins *et al.* 2013). Marine shellfish and finfish cultivation principally takes place along the west coast of Scotland, the Inner and Outer Hebrides and the Northern Isles where it can play an important role in the economy of rural communities. An indication of the distribution of mariculture around the UK can be seen in Table A1h.22. Although the data used to compile this table is now several years old, it demonstrates the particular importance of finfish mariculture to the north and west of Scotland, and the more even spread of the smaller shellfish farming industry around the UK.

**Table A1h.22 – The distribution value of UK mariculture in 2007**

| Region                         | Farmed finfish value (£million) | Farmed shellfish value (£million) | Total GVA (£million) |
|--------------------------------|---------------------------------|-----------------------------------|----------------------|
| Northern North Sea             | 46.0                            | 0.7                               | 25.7                 |
| Southern North Sea             | 0.0                             | 1.4                               | 0.8                  |
| Eastern Channel                | 0.0                             | 2.3                               | 1.3                  |
| Western Channel and Celtic Sea | 0.0                             | 1.0                               | 0.6                  |
| Irish Sea                      | 17.9                            | 7.4                               | 13.9                 |
| Minches and Western Scotland   | 153.3                           | 7.5                               | 88.4                 |
| Scottish Continental Shelf     | 109.8                           | 2.6                               | 61.8                 |
| Atlantic NW Approaches         | 0.0                             | 0.0                               | 0.0                  |
| <b>Total</b>                   | <b>327.0</b>                    | <b>22.9</b>                       | <b>193.0</b>         |

Source: Defra (2010)

The principal species cultivated is salmon, with smaller numbers of other species such as Arctic char, rainbow trout (only Scotland reports cultivation of seawater grown rainbow trout) halibut, cod, sea bass, turbot and lemon sole also farmed. Total UK shellfish production in 2012 was 27,360 tonnes, with an estimated value of £33 million. Shellfish production is dominated by the common mussel (*Mytilus edulis*), which accounts for 95% of tonnage and 82% of value, and Pacific oyster (*Crassostrea gigas*) (4% and 15%), with smaller quantities of king scallop (*Pecten maximus*), queen scallop (*Aequipecten opercularis*), native oyster (*Ostrea edulis*), razor shells (*Ensis* spp.) and common cockle (*Cerastoderma edule*) harvested (Ellis *et al.* 2015). Mussels and oysters are grown on the seabed, or suspended from floating platforms on ropes or racks.

### A1h.17.1.1 Scotland

Scotland, the third biggest producer of farmed Atlantic salmon in the world, and the largest in the EU (Scottish Salmon Producer's Organisation 2015), produced 179,022 tonnes of salmon in 2014, the highest ever level of production recorded in the country (Munro & Wallace 2015a). The farm gate value of salmon farming was £677 million in 2013 (Scottish Salmon Producers Organisation 2015). Scotland also has a successful shellfish farming industry worth in excess of £8 million per annum (Ellis *et al.* 2015). The principal species cultivated are salmon and rainbow trout (33% seawater production), with smaller numbers of other species such as Arctic char, brown trout, halibut, cod, sea trout also farmed.

Sites in Scotland are principally located around the west and northern coasts, in Regional Seas 7, 8, and in the northern sections of Regional Seas 1 and 6. Of the 2014 total (179,022 tonnes), 76,305 tonnes was mature salmon, with the rest being made up of 0-year fish (fish harvested in year of input - 720 tonnes), grilse (fish harvested in January to August of first year - 46,686 tonnes) and pre-salmon (fish harvested in September to December of first year - 55,311 tonnes). All salmon were produced in seawater cages in 2014. Some farms specialize in ova and smolt production. In 2014 the northwest, west and the Western Isles of Scotland were the main ova and smolt producing areas and employed the greatest number of staff (Table A1h.23).

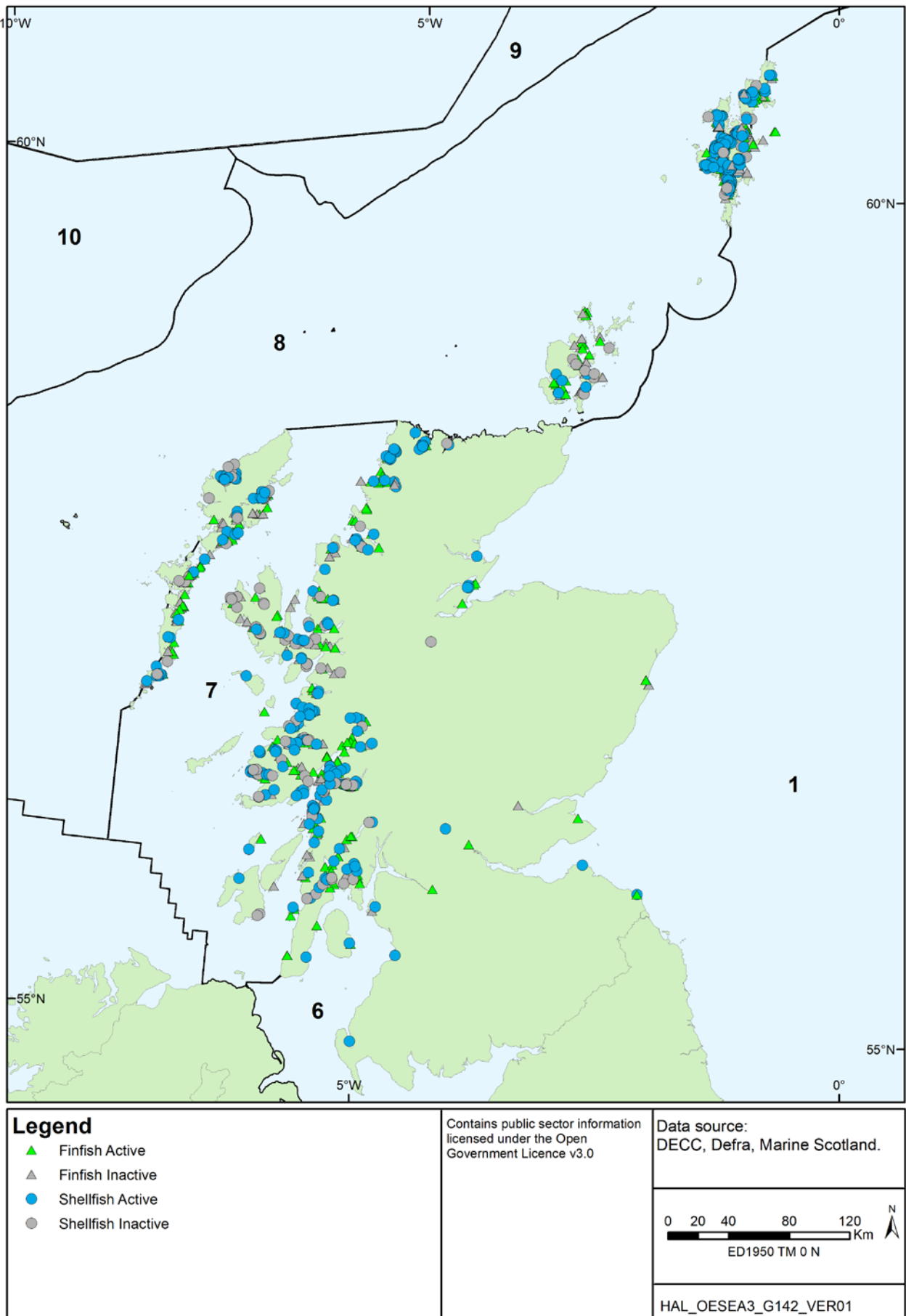
**Table A1h.23 –Salmon production in Scotland by region**

| Region        | Staff employed 2014 |     | Ova laid down to hatch (000s) | Smolt production (000s) | Annual production (tonnes) | Grilse (tonnes) | Pre-salmon (tonnes) | Salmon (tonnes) |
|---------------|---------------------|-----|-------------------------------|-------------------------|----------------------------|-----------------|---------------------|-----------------|
|               | F/T                 | P/T |                               |                         |                            |                 |                     |                 |
| North west    | 464                 | 80  | 35,737                        | 29,090                  | 50,873                     | 26,440          | 8,731               | 15,191          |
| Orkney        | 92                  | 7   | 105                           | 142                     | 13,029                     | 980             | 5,045               | 7,004           |
| Shetland      | 261                 | 39  | 7,172                         | 1,272                   | 46,369                     | 6,196           | 17,604              | 22,569          |
| South West    | 332                 | 40  | 16,712                        | 9,264                   | 34,976                     | 4,278           | 10,476              | 20,013          |
| Western Isles | 273                 | 32  | 4,535                         | 3,655                   | 33,775                     | 8,792           | 13,455              | 11,528          |
| East & South  | 13                  | 1   | 6,576                         | 1,611                   | 0                          | 0               | 0                   | 0               |
| All Scotland  | 1,435               | 199 | 70,837                        | 45,004                  | 179,022                    | 46,686          | 55,311              | 76,305          |

Source: Munro & Wallace (2015a)

Marine rainbow trout production also increased to 1,941 tonnes. Over 90% of this total was produced directly for the table (with the remainder used for the re-stocking of angling waters). For other species, total production was approximately 120 tonnes, with brown trout and halibut accounting for 95% of this total. There was no reported production of Arctic char in 2014, while cod was produced by a single company. Lumpsumsuckers (*Cyclopterus lumpus*) and wrasse are farmed for use as biological parasite controls in the salmon industry (Munro & Wallace 2015a).

Figure A1h.53 – Location of finfish and shellfish farms in Scotland



In 2014, shellfish production in Scotland was dominated by the common mussel and Pacific oyster, with smaller quantities of king scallop, queen scallop and native oyster. The Food Standards Agency has classified shellfish production areas in the UK. Areas designated for Scotland in 2014-2015 are summarised in Table A1h.24.

**Table A1h.24 – Summary of shellfish farming by production area**

| Local Authority Area        | Number of production areas | Number of beds | Species cultivated <sup>#</sup>                               |
|-----------------------------|----------------------------|----------------|---|
| <b>Regional Sea 1</b>       |                            |                |   |
| Fife Council                | 3                          | 4              | Razors, surf clams  |
| Ross & Cromarty             | 5                          | 7              | Mussel, Pacific oyster, king scallop                          |
| Shetland Islands Council    | 47                         | 88             | Mussel  |
| <b>Regional Sea 6</b>       |                            |                |   |
| Dumfries & Galloway         | 2                          | 3              | Native oyster, razors   |
| North Ayrshire Council      | 3                          | 3              | Razors, Pacific oyster, mussel                                |
| South Ayrshire Council      | 2                          | 2              | Razors  |
| <b>Regional Sea 7</b>       |                            |                |   |
| Argyll & Bute               | 36                         | 50             | Mussel, Pacific oyster, razors, queen scallop, common cockles |
| Lewis & Harris              | 18                         | 29             | Mussel, common cockles, Pacific oyster                        |
| Uist & Barra                | 7                          | 7              | Mussel, common cockles, Pacific oyster                        |
| Highland Council – Lochaber | 12                         | 14             | Mussel, Pacific oyster, native oyster                         |
| Skye & Lochalsh             | 5                          | 6              | Mussel, Pacific oyster, common cockles, king scallop          |
| Sutherland                  | 7                          | 17             | Mussel, Pacific oyster, razors                                |
| <b>Regional Sea 8</b>       |                            |                |   |
| Orkney Islands Council      | 1                          | 1              | Razors  |

Notes: <sup>#</sup> species cultivated at majority of the beds listed first  
Source: Food Standards Scotland website<sup>68</sup>

Regional Sea 7 (the Minch) and Shetland (straddling Regional Seas 1 and 8) have the greatest number of production areas and beds in Scotland. The west coast also cultivates a diverse range of species.

In 2014, mussel production was 7,683 tonnes, the highest level of mussel production ever recorded in Scotland. The greatest contribution in regional mussel production was from Shetland, accounting for 5,919 tonnes (77% of the total). Pacific oyster production was 271 tonnes, all produced on the west coast, 58% of which were produced in the Strathclyde region. Small quantities of native oyster (19 tonnes), queen scallop (1 tonne) and king scallop (6 tonnes) were produced in 2014, all from west coast sites.

The total value for all shellfish species cultivated in Scotland in 2014 was estimated to be over £10.5 million (Munro & Wallace 2015b). In 2014, there were 144 active shellfish farming businesses in operation, operating 344 active and 165 producing farms.

Small scale seaweed harvesting is found around Scotland, including in Orkney and Argyll.

<sup>68</sup> <http://www.foodstandards.gov.scot/shellfish-harvesting-classifications-scotland-2014-15>

### A1h.17.1.2 England and Wales

In England and Wales in 2012 there were estimated to be 278 finfish enterprises, of which only 11 were engaged in marine fish (salmon or sea bass) farming, and 77 shellfish farming businesses (Seafish 2013a). One marine finfish enterprise, based in Anglesey, employed 28 people and produced 190 tonnes of sea bass in 2012. The remaining 10 marine finfish businesses were small scale, employing 38 people and producing 4 tonnes of salmon between them (Ellis *et al.* 2015). Shellfish farming is of much greater significance in England and Wales. Wales produces the highest tonnage of the UK nations, producing 8,999 tonnes of mussels (33% of the UK total) in 2012, ahead of England, which produces 6,915 tonnes (25% of the UK total). England also produced 850 tonnes of Pacific oyster and 86 tonnes of native oyster in 2012.

Shellfish Production Areas are scattered throughout Regional Seas 1, 2, 3, 4 and 6 (Food Standards Agency website<sup>69</sup>). Only one production area, at Holy Island, is present in Regional Sea 1, cultivating Pacific oyster. Only 23 production areas are located in Regional Seas 2 and 3, though they support 94 and 27 beds respectively, making them regionally very important. The Wash, Thames Estuary and the North Kent Coast are among the most important areas within Regional Sea 2, and Poole Harbour is important within Regional Sea 3.

Regional Sea 4 contains the most production areas (20), with 70 beds. The production areas at the Fal and Taw estuaries are important production areas in the region. Principal species cultivated within Regional Sea 4 include mussel and Pacific oyster, with smaller numbers of native oyster and cockles (Burry Inlet) also grown. Some 13 production areas with over 45 beds are found in Regional Sea 6, with mussel being the most common species cultivated. Morecambe Bay, Menai and Conwy are the among the most important production areas in the region.

Within the Food Standards Agency classification, there are also beds for the cultivation of other species including Manila clam (*Tapes philippinarum*) (North Kent Coast, Exe), hard clam (*Mercenaria mercenaria*) (Colne, Roach, Langstone Harbour, Southampton Water and Solent) and surf clam (*Spisula solida*) (Start Bay).

### A1h.17.1.3 Northern Ireland

The mariculture sector in Northern Ireland is predominately based on shellfish: at present there are 80 licensed farms (covering 90 sites), 48 of which are licensed for shellfish cultivation (47 marine and 1 land based sites) and 32 for the cultivation of finfish (30 inland and 2 marine). The main species cultivated are mussels and pacific oysters, with a small quantity of native oysters and clams also grown. Salmon and brown trout are the main finfish species cultivated (DARDNI website<sup>70</sup>). The mariculture industry in 2012 produced 4,920 tonnes of shellfish valued at £5.34 million and a small amount of salmon, employing some 73 full-time and 40 part-time staff (Ellis *et al.* 2015).

Northern Ireland also has a healthy shellfish industry and beds are located at Belfast Lough (14 beds), Carlingford Lough (10), Dundrum Bay (3), Killough (1), Larne Lough (3), Lough Foyle (4) and Strangford Lough (4). Principal species cultivated at these sites are mussels and oysters.

<sup>69</sup> <https://www.food.gov.uk/enforcement/monitoring/shellfish/shellharvestareas>

<sup>70</sup> <https://www.dardni.gov.uk/articles/introduction-aquaculture>

There are currently a small number of local companies operating in Northern Ireland which harvest living seaweed for a variety of uses, including food, cosmetics, horticulture and seaweed baths.

#### **A1h.17.1.4 Evolution of the baseline**

Aquaculture and mariculture around the UK is a growing industry. Salmon production in Scotland increased from about 130,000 tonnes in 2007 to 179,000 tonnes in 2014, with the 2014 production figures representing a 10% increase since 2013. Scottish mussel production increased substantially over the past two decades, from approximately 1,300 tonnes in 1998 to 4,900 in 2007, rising again to 7,700 in 2014. The industry is generally small-scale and rural, however, and thus vulnerable to events – the salmon production in England in 2012 comprises seven businesses, all of which employed fewer than 10 people. Queen scallop production in Scotland has fallen by 45% since 2013, with poor spat settlement reported as a significant reason for this, while production of king scallops increased by 20%. Some effort is being put into rearing new species. A number of small-scale seaweed cultivation enterprises are developing around the coast, while in England and Wales, efforts to cultivate crustaceans, such as lobster and crayfish are being made.

Climate change may have effects on mariculture in years to come. The potential effects are described by Gubbins *et al.* (2013) and include thermal stress for cold-water species, increased incidence of disease, increased storminess increasing damage to farms and fish escapes, and ocean acidification potentially having a detrimental effect on mollusc larvae development. Perhaps of more current concern is the increased incidence of harmful algal blooms, containing phytoplankton species such as *Karenia mikimotoi*, which may be toxic to the enclosed fish (Davidson *et al.* 2009). Increasing abundances of jellyfish species, such as *Pelagia noctiluca* which has been known to kill entire stocks of salmon (Doyle *et al.* 2008), has been linked to the twin effects of climate change and overfishing (Lynam *et al.* 2011).

#### **A1h.17.1.5 Environmental issues**

Key environmental issues associated with mariculture include the introduction of nutrients or chemicals into the local environment. Accumulations of faecal matter or uneaten feed may de-oxygenate the local seabed and alter the benthic community as well as increasing phytoplankton levels, potentially causing eutrophication and harmful algal blooms (Defra 2010). Disinfectants and antibiotics may have toxic or other harmful effects on benthic fauna and consequently in the UK their use is regulated (Defra 2010). High concentrations of animals at farms may also lead to outbreaks of disease which may be spread to the wild population. For example, increased densities of larval sea lice are associated with salmonid farming, leading to increased incidence of infection among wild fish (Defra 2010). In an attempt to counter parasites without using chemical solutions, a small number of businesses have begun breeding various wrasse species and lumpsuckers for use as biological parasite controls. The first full-scale trials of control of sea lice infection using wrasse was undertaken in 2014, with encouraging early results (Scottish Salmon Producer's Organisation 2015). Disease, such as enteric redmouth disease (ERD) can affect fish kept at high densities. Vaccination, carried out as a bath treatment of juveniles, was used on 10 million fish, at 10 sites in Scotland in 2014 (Munro & Wallace 2015a).

Mariculture has been implicated in the introduction of non-native species into the UK. It is believed that up to half of all non-native marine algal species have been introduced through mariculture, for example the brown seaweed *Sargassum muticum* originally from Japan. The escape of farmed fish and consequent interbreeding with wild stocks may lead to a loss of genetic diversity and potentially naturally selected adaptations (for example, the ability of salmon to find a "home river" for spawning), potentially resulting in reduced population fitness



(Defra 2010). In 2014, there were 10 incidents resulting in the loss of 184,613 fish from salmon sites, while in 2015, 16,005 seawater stage Atlantic salmon were reported to have escaped from farms in Scotland (Scotland's Aquaculture website<sup>71</sup>).

A significant (but declining) proportion of wild caught fish is used as fishmeal, often used in the aquaculture industry. These fisheries target small ecological keystone species, such as anchovy, sardine and sandeel and are typically unsustainable. The reduction of the reliance of the aquaculture and mariculture industries on wild fish in feeds is an ongoing process, to maximise the environmental benefits of mariculture over capture fisheries (FAO 2014).

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<sup>71</sup> [http://aquaculture.scotland.gov.uk/data/fish\\_escapes.aspx](http://aquaculture.scotland.gov.uk/data/fish_escapes.aspx)

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