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# Marine Scotland

## Development of a Deep Sea Marine Reserve West of Scotland

## APPENDIX A

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# Appendix A Sector Context, Assumptions and Assessment Methods

This appendix provides an overview of existing and potential future activity for the various marine sectors in Scotland that have been scoped in to the assessment and outlines the methods used to assess the impacts of potential deep sea marine reserves on each sector. The sectors are:

- Commercial Fisheries;
- Military Activities;
- Oil and Gas;
- Power Interconnectors;
- Seabed mining; and
- Telecom Cables.

# A.1 Commercial Fisheries

## A.1.1 Sector Definition

For the purpose of this study, commercial fisheries relate to all commercial fishing activity within Scottish waters and include the subsequent handling and processing of catches. In this study, commercial fishing activity includes wild salmon and sea trout fisheries.

## A.1.2 Overview of Existing Activity

Information sources used in the assessment are listed in Table A1.

**Table A1 Commercial fisheries information sources**

| Scale | Information Available | Date | Source |
|---|---|---|---|
| Scotland | Vessel monitoring system (VMS) data for over-12m vessels 2013-17. Individual pings with associated landings values from landings returns, broken down by gear type | 2013-2017 | Marine Scotland |
| Scotland | Volume and value of landings by ICES rectangle | 2013-2017 | Marine Scotland |
| Scotland | Summary of fishing activity in Scotland | 2005-09 | Baxter et al. 2011 |
| Scotland | Scottish Sea Fisheries Statistics | 2016, 2017 | Marine Scotland, 2017; Marine Scotland, 2018 |
| UK Fleet | Economic performance of fleet segments | 2013-2017 | Seafish, 2017 |
| Scotland | Scottish Input-Output multipliers | 2015 | Scottish Government, 2018 |
| UK | Seafood Processing Industry Report | 2016 | Seafish, 2016 |

Location and intensity of activity

*Fish Catching Activities*

Scotland is one of the largest sea fishing nations in Europe. In 2017, Scottish-based vessels landed 466,000 tonnes of fish and shellfish into the UK and abroad, with a value of £560 million[1]. Compared to 2016, this represents a 1% decrease in value in

[1] Scottish Government, 2018. Scottish Sea Fisheries Statistics 2017. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018

real terms and a 3 % increase in the quantity landed[2]. From 2007 to 2017, Scottish landings represented 64 % of the quantity, and 57 % of the value, of all landings by UK vessels into the UK and abroad[3].

In 2017, 341,000 tonnes of fish and shellfish were landed into Scotland with a value of £505 million. This represents a 2% decrease in both tonnage and in real value since 2016[4].

The overall trend over the last ten years has been of increasing value of landings, with a significant increase in volume of landings in 2014 from the pelagic sector (Figure A1).

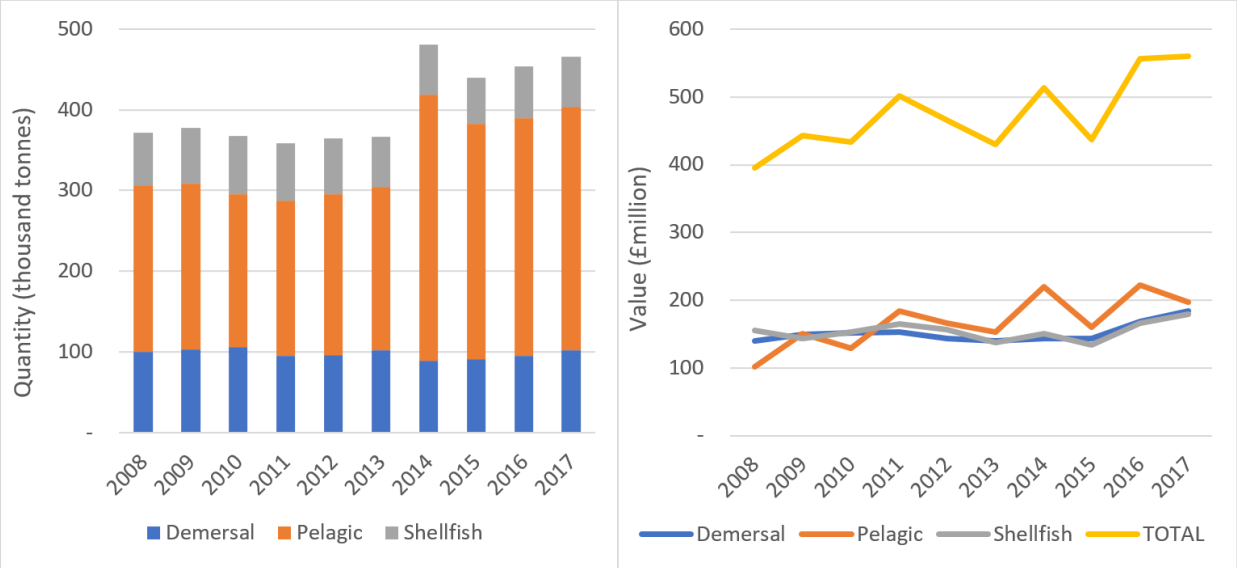


**Figure A1 Trends in volume of landings (left) and value of landings (right) by Scottish vessels to the UK and abroad**

The pelagic species mackerel and herring are of particular importance to the Scottish fleet and in 2017, these species (together with blue whiting and horse mackerel) made up 65% by volume and 35% (£197 million) of the total value of landings made by Scottish vessels. Demersal species (including haddock, monkfish and cod) represented 22% by volume and 33% by value of landings by Scottish vessels, with a total value of £184 million. Shellfish landings (including Nephrops, scallops and crabs) represented 13% by volume and 32% by value of all landings by Scottish vessels with a total value of £180 million[5] (Figure A2).

[2] Marine Scotland, 2017. Scottish Sea Fisheries Statistics 2016. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018.

[3] MMO, 2018. UK Sea Fisheries Statistics, 2017. Available at: https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2017. Accessed 22/10/2018.

[4] Scottish Government, 2018. Scottish Sea Fisheries Statistics 2017. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018

[5] Scottish Government, 2018. Ibid.

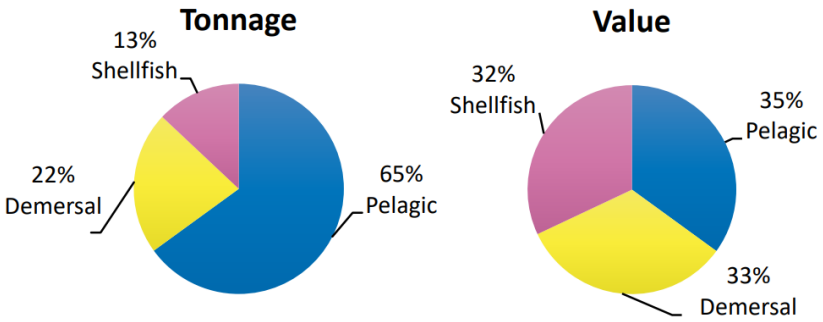


**Figure A2 Quantity and value of landings by Scottish vessels, by species type (2017)**

Source: Marine Scotland, 2018.

In terms of species, mackerel is the single most valuable species to the Scottish fishing industry at £162 million (29% of the total value of Scottish landings in 2017), followed by Nephrops at £75 million (13% of the total value of Scottish landings in 2017). Haddock (£42 million), scallops (£40 million) and monkfish (£36 million) were the next most valuable species landed by Scottish vessels in 2017[6].

Pelagic fishing is important for the offshore of north Scotland, north-east Scotland and Shetland. Demersal fishing is most valuable for the offshore areas of the north Scotland, north-east Scotland, Shetland and along the continental shelf edge. Shellfish is particularly important (from a value perspective), particularly offshore areas of the north-east and east regions. Figure A3 shows the distribution of the value of demersal, pelagic and shellfish landings by the UK fleet, by ICES rectangle in 2017.

The value of landings from UK vessels over-15m is shown in Figure A4. Areas along the continental shelf edge, North Sea and inshore areas are particularly important for the UK fleet, whereas areas within the proposed deep sea marine reserve areas are not key fishing areas in Scottish waters.

A number of other nationalities fish within the proposed deep sea marine reserve areas (Figure A5), including German, Faroese, Norwegian, Dutch, Danish, French and Spanish.

In 2017, 60% of the total value and 74% of the total volume of landings by Scottish vessels were landed into Scottish ports. Peterhead, Shetland and Fraserburgh are the most important Scottish ports by value of landings (including landings from UK and non-UK vessels) (Figure A6). Around 4% by value was landed into ports in the rest of the UK, and 22% by value was landed abroad. The majority of landings abroad were landed into Norway, and nearly all of these landings were pelagic species (predominantly mackerel)[7]. Other key countries for landings abroad were to Ireland (mainly pelagics), Denmark (mainly pelagics), the Netherlands and Spain (mainly demersals)[8].

[6] Scottish Government, 2018. Ibid.

[7] Marine Scotland, 2017. Scottish Sea Fisheries Statistics 2016. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018.

[8] Scottish Government, 2018. Scottish Sea Fisheries Statistics 2017. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries.

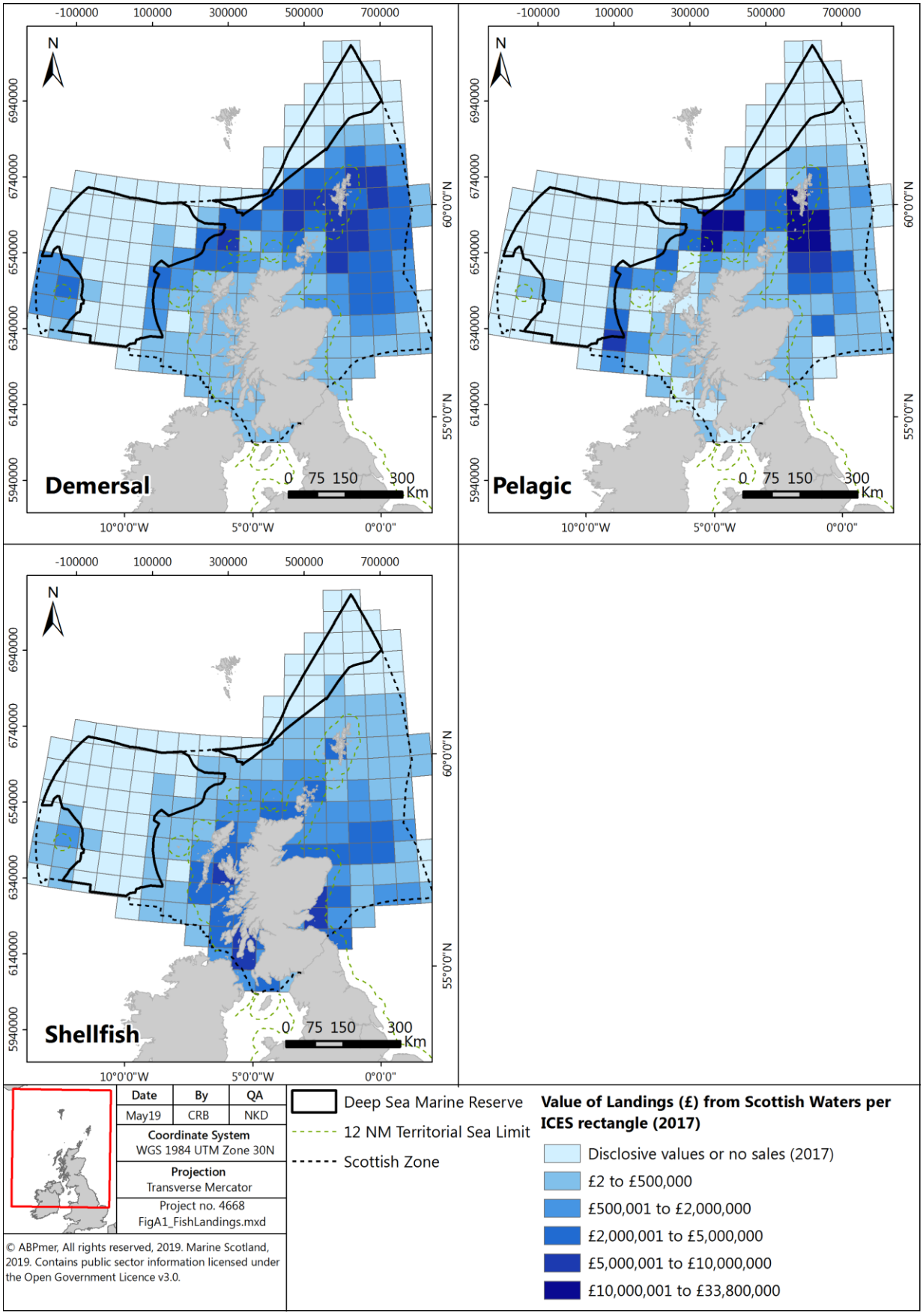


**Figure A3 Value of demersal, pelagic and shellfish landings from UK vessels by ICES rectangle, 2017**

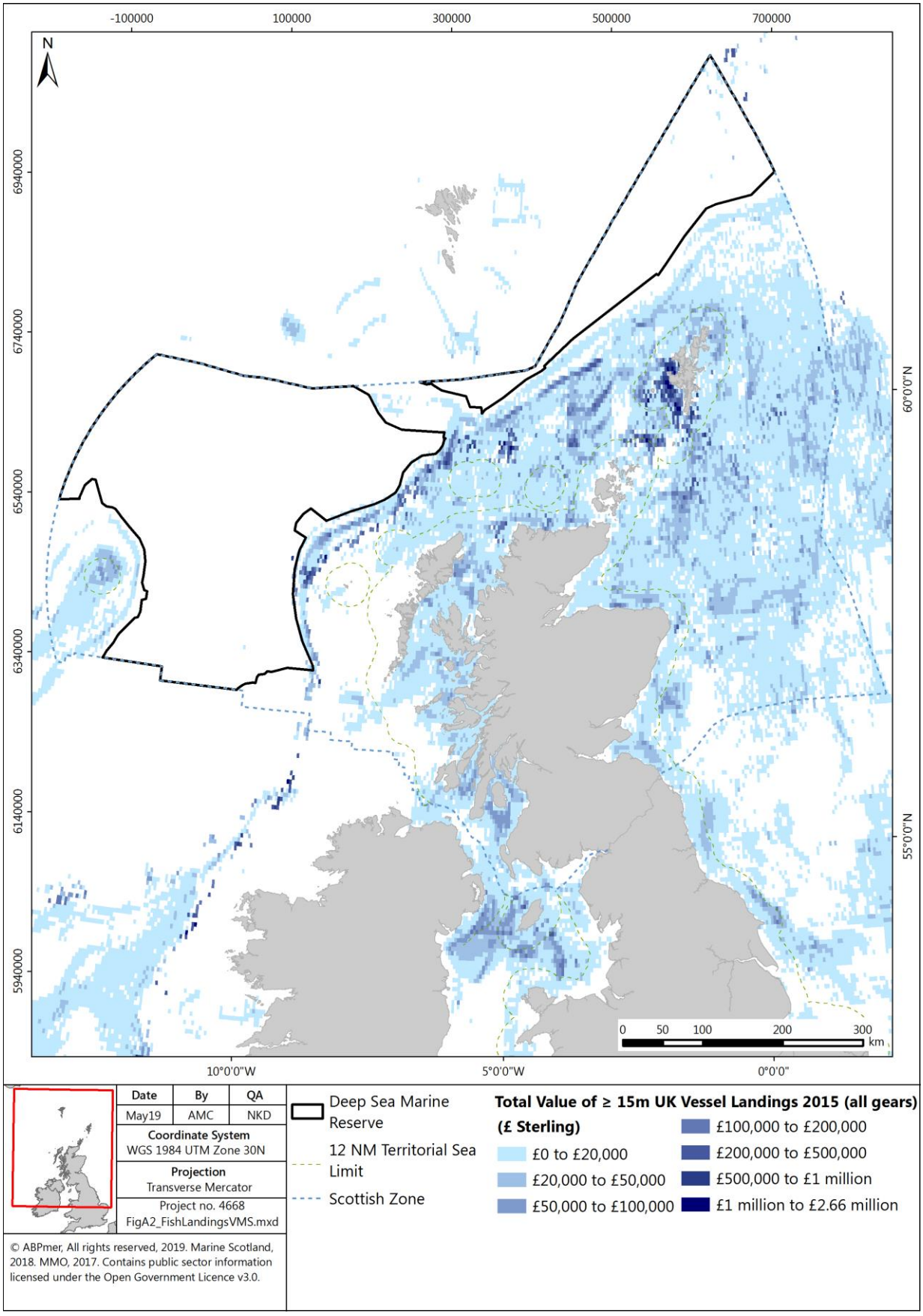


**Figure A4 Value of landings from over-15 m UK vessels**

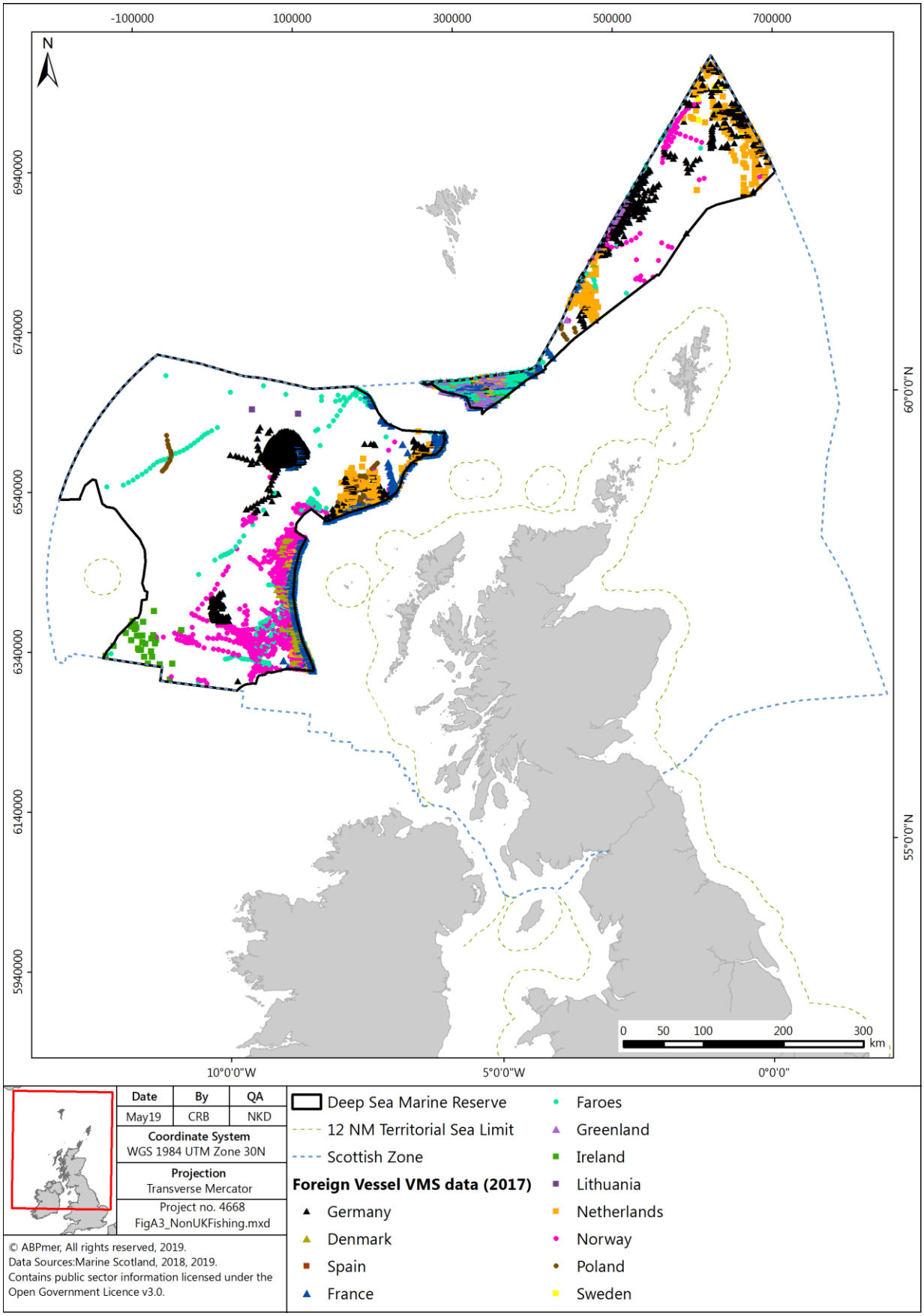


**Figure A5 Activity of non-UK fishing vessels (VMS pings)**

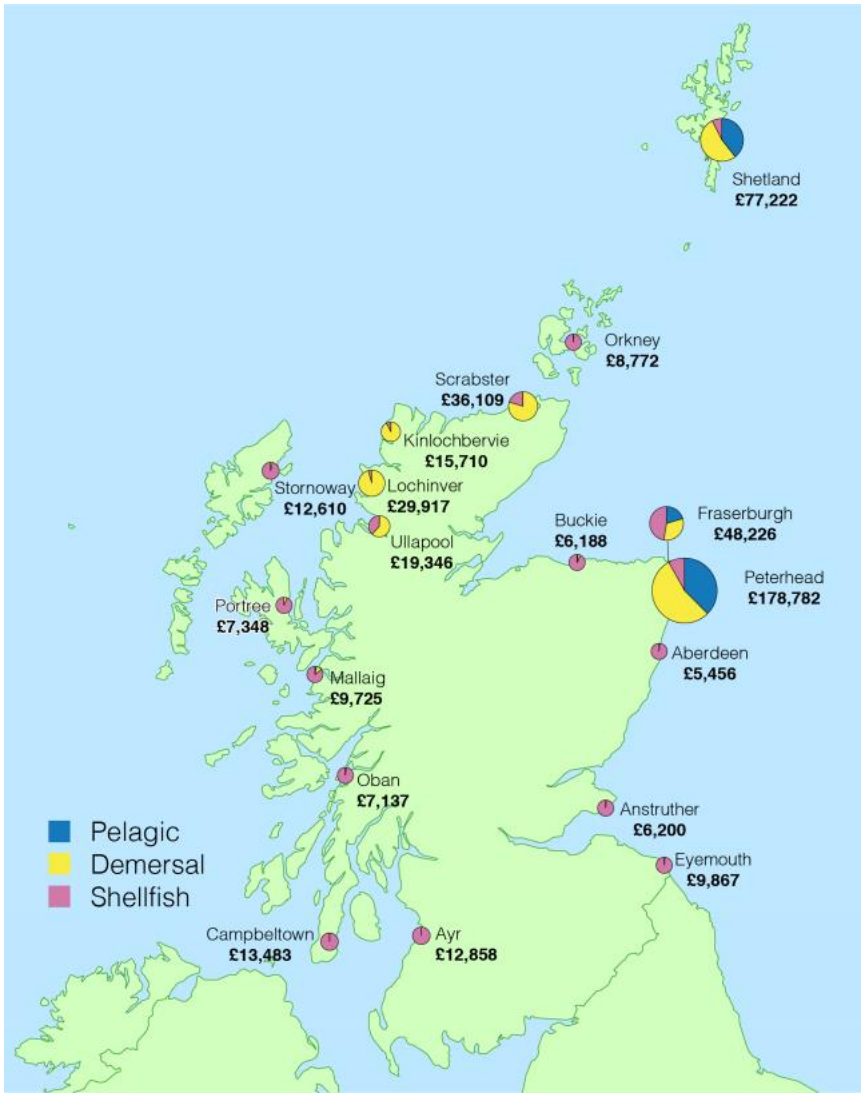


**Figure A6 Value of landings into Scotland in 2017 by all vessels by district. Source: Scottish Government, 2018**

Of particular relevance to the proposed deep sea marine reserve areas are the ports in the north and north-east of Scotland, particularly Peterhead and Fraserburgh for vessels fishing in the assessed Faroe-Shetland reserve and, for those fishing in the proposed West of Scotland reserve; Peterhead, Fraserburgh, Lerwick, Ullapool and Kinlochbervie, as well as ports outside of Scotland such as North Shields, Londonderry, Skaagen and Hantsholm.

A variety of sizes of vessel participate in the Scottish fishing industry, from the 70 metre pelagic trawlers to the under-10 metre inshore creelers. There were 2,065 active Scottish-based vessels in 2017, including 1,503 vessels of fleet ten metres and under in length (73%) and 562 vessels over ten metres in length[9]. The over-ten metre fleet comprised 569 vessels in 2016[10]. The Scottish fleet is dominated (72%) by vessels with

[9] Scottish Government, 2018. Scottish Sea Fisheries Statistics 2017. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018

[10] Marine Scotland, 2017. Scottish Sea Fisheries Statistics 2016. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018.

a length of ten metre and under[11]. These fleets generally operate in inshore waters and therefore, their activity does not overlap with the deep sea marine reserve area. Fraserburgh, Stornoway and Shetland were the districts with the highest numbers of registered vessels (Figure A7).

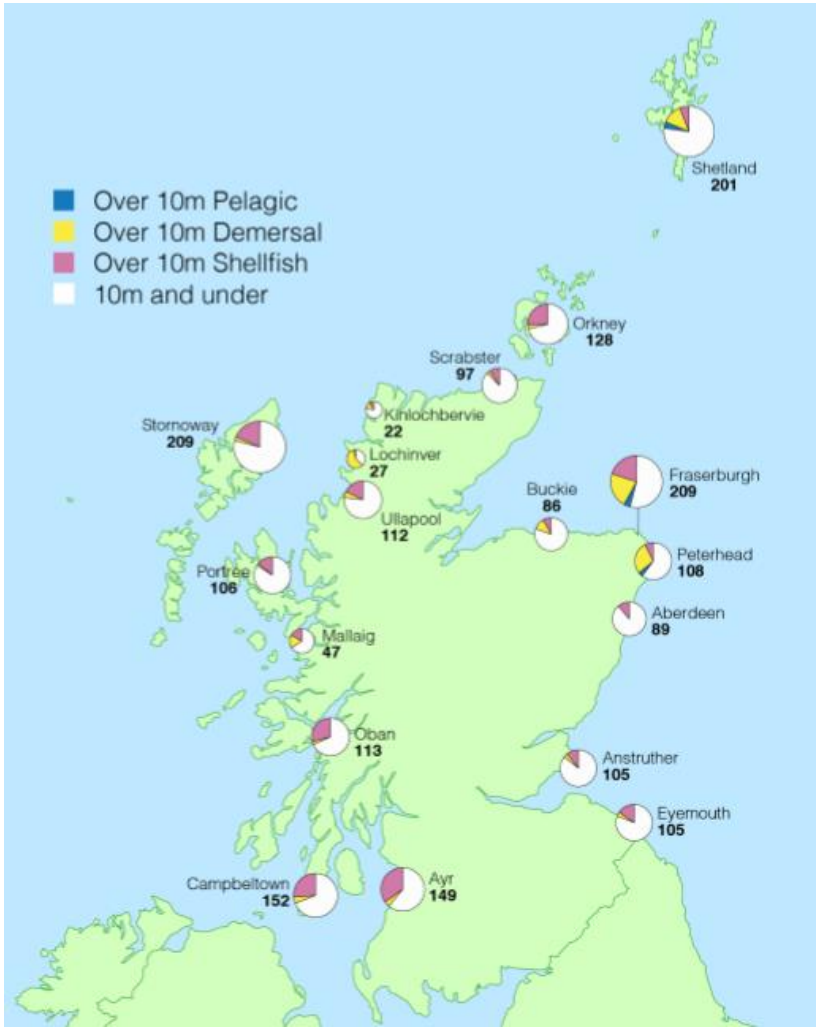


**Figure A7 Number of vessels in the Scottish fleet by district by vessel length and main fishing method. Source: Scottish Government, 2018**

Fishing in the assessed deep sea marine reserve areas

In recent years, several legal instruments have been implemented into the area covered by the assessed deep sea marine reserve areas. These measures have impacted the types of commercial fisheries being conducted in these areas.

These key regulations include:

- Council Regulation (EC) 2016/2336 (which came into force 1st January 2017), prohibits fishing using bottom trawls at depths greater than 800 m. The use of bottom gears will be subject to an evaluation after 13 January 2021. Article 9 of

[11] Marine Scotland, 2017. Scottish Sea Fisheries Statistics 2016. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018.

this regulation will limit damage to VMEs by restricting bottom trawling between 400-800 m. These VME habitats will be defined in due course[12];

- Council Regulation (EC) 41/2007 banned the use of gillnets by EU vessels at depths greater than 600 m in divisions 6.a-b, 7.b-c, 7.j-k and Subarea 12. In addition, it limited bycatch of deep-water sharks to 5% in the hake and monkfish gillnet fisheries and to 10% in bottom longline fisheries that target black scabbardfish[13];
- Council Regulation (EU) 2018/2025 introduced TAC limits for a number of deep-water species that occur in the deep sea marine reserve area. TACs are assessed every two years under the CFP and were recently set in January 2019;
- The first EU TACs for deep water sharks were set in 2005 but has remained as a zero TAC since 2010. Bycatches are still permitted (as discussed above)[14], with 7 tonnes permitted as bycatch in fisheries for black scabbardfish using longlines. However, no directed fisheries are permitted under this quota[15];
- TACs for other deep-sea species include black scabbardfish, alfonsino, roundnose grenadier and red seabream;
- Council Regulation (EC) 2018/46 sets a deep sea fisheries discard plan, as a result of the landing obligation, which outlines the technical measures required for gear types and the species that are exempt from the landings obligation;
- Council Regulation (EU) 2018/120 prohibits targeting, retaining, transhipping or landing certain deep-sea sharks in the areas intersecting the deep sea marine reserve.
- Regulations to limit fishing impacts on seamounts: within the deep sea marine reserve there are seamounts with depths less than 800m and therefore, are not covered by Council Regulation (EC) 2016/2336. These include Rockall Bank, Anton Dohrn Seamount, Rosemary Bank, Rockall Rise, and slopes of Outer Bailey, Bailey's Bank and the Wyville Thomson Ridge. The assessed deep sea marine reserve areas are in two distinct biogeographic areas, the Rockall Trough to south of the Wyville Thomson Ridge and the Faroe-Shetland Channel to the north[16]. These areas are subject to the regulations discussed above, and the following:

[12] REGULATION (EU) 2016/2336 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 December 2016. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32016R2336&from=EN#ntr5-L_2016354EN.01000101-E0005

[13] ICES. 2018. Report of the Working Group on Elasmobranch Fishes (WGEF), 19–28 June 2018, Lisbon, Portugal. ICES CM 2018/ACOM:16. 1306 pp.

[14] ICES. 2018. Report of the Working Group on the Biology and Assessment of Deep-sea Fisheries Resources (WGDEEP), 11–18 April 2018, ICES HQ, Copenhagen, Denmark. ICES CM 2018/ACOM:14. 771 pp. 8

[15] EU Commission 2019. COUNCIL REGULATION (EU) 2018/2025 of 17 December 2018 fixing for 2019 and 2020 the fishing opportunities for Union fishing vessels for certain deep-sea fish stocks.

[16] Priede, I.G. 2018. Deep-sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough. ISSN 0963-8091

- Rosemary Bank and the edge of the Scottish continental shelf: spawning aggregations of blue ling are protected from March to May (EC Regulation No. 43/2009)[17];
- Anton Dohrn Seamount SAC: There are no measures currently in place but fisheries management measures are being established[18]. The proposed measures prohibit all demersal fishing gears from the SAC[19] and therefore, the costs for Anton Dohrn will not be included in this assessment.
- North-East Faroe-Shetland Channel MPA: there are currently no measures in place[20]. Draft measures for this MPA have been proposed for this site[21].

There is currently no depth restriction on the longlining fleet and no spatial restrictions in place[22]. The longlining effort is largely managed through TACs, gear restrictions and bycatch allowances (see above).

Various factors (including new regulations and species depletions[23]) have caused changes to the fisheries occurring in the deep sea marine reserve area in recent years. The impacts of these regulations on the various commercial fishing fleets in the region are discussed below.

*Bottom trawl fleets*

Prior to the EU ban on deep-sea trawling, within the assessed deep sea marine reserve areas, commercial fisheries included: black scabbardfish, birdbeak dogfish, orange roughy, rabbit fish, blue ling, roundnose grenadier and anglerfish[24].

VMS data for UK vessels show that demersal fishing activity did not occur at a significant level in either of the assessed deep sea marine reserve areas since 2017[25]. Demersal trawling occurs on the slope between at depths less than 800m depth. Council Regulation (EU) 2016/2336 currently does not restrict demersal trawling in this depth, although restrictions in shallower waters may be introduced to protect vulnerable marine ecosystems (VMEs).

[17] Priede, I.G. 2018 ibid.

[18] MCCIP. 2018. Climate change and marine conservation: Supporting management in a changing environment. Available at: http://www.mccip.org.uk/media/1810/mccip-coral-gardens-report-card_second-run_v5.pdf

[19] Marine Scotland. 2016. North Western Waters Proposal. Available at: https://fiskeristyrelsen.dk/media/9069/north-western-waters-proposal.pdf

[20] JNCC. 2018. North-East Faroe-Shetland Channel MPA. Available at: http://jncc.defra.gov.uk/page-6483 [Accessed on 04/02/2019]

[21] ICES. 2018. New information regarding the impact of fisheries on other components of the ecosystem. Published 28 June 2018. Available at: https://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/vme.eu.pdf

[22] ICES. 2018. EU request for ICES to provide advice on a revision of the contribution of TACs to fisheries management and stock conservation for selected deep-water stocks. Published 2 July 2018. Version 2: 20 September 2018. https://doi.org/10.17895/ices.pub.4493

[23] Priede, I.G. (2018) Deep-sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough

[24] ICES (2017b). Report of the Working Group on the Biology and Assessment of Deep-sea Fisheries Resources (WGDEEP), 24 April–1 May 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:14. 702 pp.

[25] UK VMS ping data provided by Marine Scotland.

Since the bottom trawling fleet has largely been removed from the area due to Council Regulation 2016/2336, the UK bottom trawl fleet is unlikely to incur further management measures or cost impacts as a result of the establishment of a deep sea marine reserve.

Recent research that evaluated the likely costs and displacement effect on various fleets that fish in areas to be designated as SAC and MPAs agreed with these findings. Estimates suggested that displacement of bottom trawling fleets was likely to be low in many of the sites, as the EU had recently prohibited bottom trawling (through Council Regulation 2016/2336) for much of the area[26]. The deep-sea bottom trawling regulation, and other regulations such as the Blue Ling spawning area, have caused some fleets to be displaced to shallower waters[27,28].

Council Regulation (EC) 2016/2336 also prohibited other EU vessels from bottom trawling below 800m. Typically, the non-UK demersal trawl fleets that have fished in the proposed reserve areas include:

- Spanish (targeting smoothheads, roundnose grenadier and blue ling and *C. coelolepies*)[29];
- French[30] (targeting black scabbardfish[31], Roundnose grenadier[32], Blue Ling[33]);
- Portuguese (catching redbream[34]); and
- Other nationalities (catching saithe, haddock, anglerfish and hake[35], roundnose grenadier, blue ling, Greenland halibut[36]).

[26] Marine Scotland. 2017. North Western Waters Proposal – Annexes. Available at: https://www2.gov.scot/Resource/0051/00516438.pdf

[27] ICES. 2018. Blue ling (Molva dypterygia) in subareas 6–7 and Division 5.b (Celtic Seas, English Channel, and Faroes grounds). Published 7 June 2018

[28] ICES. 2018. Roundnose grenadier (Coryphaenoides rupestris) in subareas 6 and 7 and divisions 5.b and 12.b (Celtic Seas and the English Channel, Faroes grounds, and western Hatton Bank). Published 7 June 2018. Available at: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/rng.27.5b6712b.pdf

[29] ICES. 2018. Report of the Working Group on the Biology and Assessment of Deep-sea Fisheries Resources (WGDEEP), 11–18 April 2018, ICES HQ, Copenhagen, Denmark. ICES CM 2018/ACOM:14. 771 pp. 8

[30] EU Commission 2019. COUNCIL REGULATION (EU) 2018/2025 of 17 December 2018 fixing for 2019 and 2020 the fishing opportunities for Union fishing vessels for certain deep-sea fish stocks.

[31] ICES. 2018. Report of the Working Group on the Biology and Assessment of Deep-sea Fisheries Resources (WGDEEP), 11–18 April 2018, ICES HQ, Copenhagen, Denmark. ICES CM 2018/ACOM:14. 771 pp. 8

[32] ICES. 2018. Roundnose grenadier (Coryphaenoides rupestris) in subareas 6 and 7 and divisions 5.b and 12.b (Celtic Seas and the English Channel, Faroes grounds, and western Hatton Bank). Published 7 June 2018. Available at: http://ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/rng.27.5b6712b.pdf

[33] ICES. 2018. Blue ling (Molva dypterygia) in subareas 6–7 and Division 5.b (Celtic Seas, English Channel, and Faroes grounds). Published 7 June 2018

[34] ICES. 2018. Red (= blackspot) seabream (Pagellus bogaraveo) in subareas 6, 7, and 8 (Celtic Seas and the English Channel, Bay of Biscay). Published 3 June 2016. Available at: http://ices.dk/sites/pub/Publication%20Reports/Advice/2016/2016/sbr-678.pdf

[35] ICES. 2018. Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations. Published 30 November 2018. Available at: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/CelticSeasEcoregion_FisheriesOverviews.pdf

[36] Priede, I.G. (2018) Deep-sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough. ISSN 0963-8091

Since the majority of the deep sea marine reserve covers waters with depths greater than 800m, bottom trawling is already prohibited across much of the area. Therefore, non-UK bottom trawl fleets are unlikely to incur further management measures or cost impacts as a result of the establishment of a deep sea marine reserve.

Whilst the majority of the deep sea marine reserve is off limits for bottom trawling, there are important seamounts within the deep sea marine reserve that create shallower waters, and therefore, provide potential grounds for bottom trawling.

The likelihood of displacement of these trawl fisheries to other gear types within the deep sea marine reserve, is limited: for example, roughnose grenadier is generally found at depths of 800 to 1550m in the Rockall Trough[37]. Therefore, the species could not be targeted using gillnets due to the deep-water gillnet ban, and they are difficult to catch using longlines as they are not generally attracted to bait[38]. Similarly, the likelihood for many of these traditionally commercial fisheries to re-emerge during the assessment period, is low, as many are EU prohibited species (Council Regulation (EU) 2018/2025) or have low biomass levels[39] with very long recovery periods[40].

Given that the depth of the deep sea marine reserve area and the current fishing restrictions, the bottom trawl fisheries have already been displaced from much of the area, the bottom trawl fleet is unlikely to incur significant cost impacts as a result of the establishment of a deep sea marine reserve.

*Gillnet fleets*

Similar to the EU ban for deep sea trawling, an EU ban on deep-water gillnets below 600 m, has meant that bottom-set gillnet fisheries have ceased in many of the previous fishing locations (e.g. Rosemary Bank[41]) within the deep sea marine reserve. Therefore, gillnet fisheries at depths greater than 600m are already excluded from the deep sea marine reserve and therefore, the fleet is unlikely to incur further significant management measures or cost impacts, as a result of the establishment of a deep sea marine reserve.

However, gill net fisheries are permitted at depths shallower than 600m, as long as they comply with the other relevant regulations. The main gillnet fisheries in the deep sea marine reserve are conducted around Rockall Rise. Commercial species caught in this area include hake[42], anglerfish, cod, skates and rays and tusk[43]. The main pelagic

[37] Priede, I.G. 2018. Deep-sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough

[38] Priede, I.G. 2018. Ibid.

[39] ICES. 2018. Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations. Published 30 November 2018. https://doi.org/10.17895/ices.pub.4640

[40] Priede, I.G. 2018. Ibid.

[41] JNCC. 2014. Scottish MPA Project Management Options Paper: Rosemary Bank seamount nature conservation Marine Protected Area. Available at: http://jncc.defra.gov.uk/PDF/Rosemary_Bank_Seamount_Management_Options_Paper_v4_0.pdf

[42] ICES. 2018. Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations. Published 30 November 2018. Available at: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/CelticSeasEcoregion_FisheriesOverviews.pdf.

[43] ICES. 2018. Ibid.

species include mackerel and herring, benthic species include hake and anglerfish, gadoids include saithe and haddock and shellfish include brown crab[44].

Recent VMS data show UK fleets fishing using set nets has declined from 2013 to 2017. There have been no VMS pings for set net fishing since 2013 in the assessed Faroe Shetland area and activity has been variable in the proposed West of Scotland area[45], where set net activity has almost been exclusively concentrated on the Rockall Rise seamount.

*Longline fleets*

There are no regulations that restrict longline fisheries by depth.

According to VMS data, some UK hook and line activity has existed in both proposed deep sea reserve areas throughout the time series, which are highly variable. No activity has been recorded in the proposed West of Scotland reserve since 2014. In 2013 and 2014, there was some hook and line fishing over Rosemary Bank seamount, corroborated by previous studies[46]. Some hook and line activity was recorded in the assessed Faroe Shetland area in 2016[47]. Hook and line activity was generally focused on the slope of the deep sea marine reserves.

Longline activity is directed towards demersal species[48,49]. The non-UK longline fleets in the deep sea marine reserve include:

- Irish (targeting ling and tusk);
- Portugal (targeting Alfonsinos[50], redbream[51] and leafscale gulper shark and Portuguese dogfish[52]); and
- Spanish (targeting hake, ling, blue ling)[53]

[44] ICES. 2018. Ibid.

[45] UK VMS ping data provided by Marine Scotland.

[46] Marine Scotland. 2015. Final Business and Regulatory Impact Assessment: Scottish Nature Conservation Marine Protected Area (MPA) Project, Socio-Economic Analysis, Rosemary Bank Seamount (RBS). Available at: https://www2.gov.scot/Resource/0045/00456448.pdf.

[47] MMO. 2018. VMS ping data.

[48] ICES. 2018. Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations. Published 30 November 2018. Available at: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/CelticSeasEcoregion_FisheriesOverviews.pdf.

[49] ICES. 2018. Greater North Sea Ecoregion – Fisheries overview. Published 4 July 2017. DOI: 10.17895/ices.pub.3116. Available at: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2017/2017/Greater_North_Sea_Ecoregion_Fisheries_Overview.pdf.

[50] ICES. 2018. Alfonsinos (Beryx spp.) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters). Published 7 June 2018. Available at: http://ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/alf.27.nea.pdf.

[51] ICES. 2018. Red (= blackspot) seabream (Pagellus bogaraveo) in subareas 6, 7, and 8 (Celtic Seas and the English Channel, Bay of Biscay). Published 3 June 2016. Available at: http://ices.dk/sites/pub/Publication%20Reports/Advice/2016/2016/sbr-678.pdf.

[52] Priede, I.G. 2018. Deep-sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough. ISSN 0963-8091.

[53] ICES. 2018. Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations. Published 30 November 2018. Available at:

- French (targeting hake, ling, blue ling)[54]
- Norwegian (targeting ling)[55].

*Pot and trap fleets*

Whilst VMS data does not indicate any potting activity in the proposed reserve areas, previous studies have observed potting activity by the over-15m fleet around the edge of the Rosemary Bank seamount[56].

*Pelagic trawl and surrounding net fleets*

There are no depth restrictions for pelagic fleets in the deep sea marine reserve. Pelagic fleets in this area largely target mackerel and herring[57].

According to VMS ping data, UK mid-water trawling activity between 2013 and 2017 has fluctuated in recent years. UK mid-water trawling activity in the proposed reserve areas is mostly near the slope of the proposed West of Scotland reserve. According to VMS ping data, UK surrounding net activity only occurred in 2015, which largely occurred in the assessed Faroe-Shetland area.

*Wild Salmon and Sea Trout*

Scotland is famous for its wild salmon *Salmo salar* and sea trout *Salmo trutta*. These fish hatch in rivers, migrate to sea then return as adults to spawn. Marine migrations in salmon are generally more extensive than those of sea trout.[58]

All salmon fishing and sea trout fishing rights in Scotland, including in the sea, are private, heritable titles, which may be held separately from any land. They fall into one of three broad categories:

- Fixed engine fisheries - are restricted to the coast and must be set outside estuary limits;

http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/CelticSeasEcoregion_FisheriesOverviews.pdf.

[54] ICES. 2018. Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations. Published 30 November 2018. Available at: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/CelticSeasEcoregion_FisheriesOverviews.pdf.

[55] ICES. 2018. Ling (Molva molva) in subareas 6–9, 12, and 14, and in divisions 3.a and 4.a (Northeast Atlantic and Arctic Ocean). Version 2: 17 April 2018. Available at: http://ices.dk/sites/pub/Publication%20Reports/Advice/2017/2017/lin.27.3a4a6-91214.pdf.

[56] Marine Scotland. 2015. Final Business and Regulatory Impact Assessment: Scottish Nature Conservation Marine Protected Area (MPA) Project, Socio-Economic Analysis, Rosemary Bank Seamount (RBS). Available at: https://www2.gov.scot/Resource/0045/00456448.pdf.

[57] ICES. 2018. Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations. Published 30 November 2018. Available at: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/CelticSeasEcoregion_FisheriesOverviews.pdf. https://doi.org/10.17895/ices.pub.4640.

[58] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh.

- Net and coble fisheries - generally operate in estuaries and the lower reaches of rivers; and
- Rod and line fisheries - generally operate within rivers and above tidal limits.

Salmon and sea trout fishing takes place within estuaries or on the coast, and no management measures or cost impacts are anticipated for wild salmon and sea trout fisheries as a result of the establishment of a deep sea marine reserve in Scottish waters.

Economic value and employment

*Fish Catching Activities*

In 2017, 4,799 fishers were working on Scottish-based vessels, which was a slight decline from 4,823 in 2016[59]. This represented 0.2% of the total Scottish labour force[60], and 6% of the marine economy employment[61]. Employment in fishing accounts for a higher percentage of overall employment in island communities (Shetland, Orkney and Na h-Eileanan Siar local authorities) and in Argyll and Bute, where it exceeded 2% and 1%, respectively[62], highlighting the importance of fishing to these communities. Some 3,932 of these were regularly employed, 861 were irregularly employed (formerly referred to as part-time) and 6 were crofters[63]. Aberdeenshire had the highest number of fishermen at 1,183[64].

In 2016, fishing generated £296 million GVA, accounting for 0.2% of the overall Scottish economy, and 8% of the marine economy. From 2015 to 2016 the GVA from fishing (adjusted to 2016 prices) increased by 34%, while the longer-term trend from 2008 to 2016 showed that fishing GVA increased by 63%.[65] The highest GVA by district was generated in Aberdeenshire (£131 million), the Shetland Islands (£72 million), Highland (£30 million) and Argyll and Bute (£14 million).[66]

Although commercial fishing makes a relatively low contribution to Scotland's overall GDP and labour force, fisheries employment is highly concentrated into relatively few areas, and for these areas the fisheries sector is considerably more important than for Scotland as a whole. It is a particularly important socio-economic activity in remote coastal regions in Scotland. In the Western Isles, Orkney and Shetland region, for example, employment in fishing as a percentage of the labour force was 2.8% in 2016[67].

[59] Scottish Government, 2018. Scottish Sea Fisheries Statistics 2017. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries.

[60] ibid

[61] Marine Scotland, 2018. Scotland's Marine Economic Statistics. Published by The Scottish Government, October 2018. 77 pages. Available at: https://www.gov.scot/Resource/0054/00542012.pdf. Accessed 22/10/18.

[62] Scottish Government, 2018. Ibid.

[63] Marine Scotland, 2017. Scottish Sea Fisheries Statistics 2016. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018.

[64] Scottish Government, 2018. Ibid.

[65] Marine Scotland, 2018. Scotland's Marine Economic Statistics. Published by The Scottish Government, October 2018. 77 pages. Available at: https://www.gov.scot/Resource/0054/00542012.pdf. Accessed 22/10/18.

[66] Marine Scotland, 2018. Ibid.

[67] Marine Scotland, 2017. Scottish Sea Fisheries Statistics 2016. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018.

*Fish Processing Activities*

There were 152 fish processing sites in Scotland in 2016 (for the processing of saltwater (sea fish) and salmon & freshwater fish)[68]. The majority of these (39%) were in the Grampian region, with 23% in Highlands and Islands, and the remainder in 'Other Scotland'. This provided 8,380 full-time equivalent (FTE) jobs in Scotland, a decline of 12% since 2008. GVA of the sector was £341 million in 2014.

The fishing industry, together with aquaculture production and imported fish, provide inputs to the processing industry.

The majority of catches from Proposed West of Scotland reserve are landed into Peterhead. The majority of catches from the assessed Faroe-Shetland reserve are landed into Kinlochbervie, Peterhead and Scrabster[69].

**Table A2. Output, GVA and employment for fishing and processing for Scotland and the rest of UK**

| | Sector | Scotland | Rest of UK | Total | Source |
|---|---|---|---|---|---|
| Output (£m) | Fishing (2017) | 453 | 527 | 980 | MMO, 2018[70] |
| | Processing (2014) | 2,038 | 2,357 | 4,395 | Seafish, 2016[71] |
| GVA (£m) | Fishing (2016) | 296 | 171 | 467 | Marine Scotland, 2018[72] |
| | Processing (2014) | 341 | 435 | 776 | Seafish, 2016[73] |
| Employment | Fishing (2017) | 4,779 | 6,893 | 11,692 | MMO, 2018[74] |
| | Processing (2016) | 8,380 | 9,619 | 17,999 | Seafish, 2016[75] |

[68] Seafish, 2017. 2016 Seafood Processing Industry Report. Available at: http://www.seafish.org/research-economics/industry-economics/processing-sector-statistics. Accessed 22.10.18.

[69] UK VMS ping data provided by Marine Scotland.

[70] MMO.2018. UK sea fisheries statistics 2017.

[71] Seafish, 2016. Seafood Processing Industry Report 2016. Available online at http://www.seafish.org/media/publications/2016_Seafood_Processing_Industry_Report.pdf. Accessed 24 April 2018.

[72] Marine Scotland, 2018. Scotland's Marine Economic Statistics. Available online at https://www.gov.scot/publications/scotlands-marine-economic-statistics/pages/16/. Accessed 10 January 2019.

[73] Seafish, 2016. Ibid.

[74] MMO.2018. UK sea fisheries statistics 2017.

[75] Seafish, 2016. Ibid.

Future trends

*Fish Catching Activities*

Fishing activity changes in response to a number of factors: scientific advice; the location of fish; policy measures such as catch limits (quotas), limits on fishing effort (days spent fishing multiplied by the power of the vessel), the need for possible closures and decommissioning schemes; and profitability. Fishing effort has decreased significantly since the 1990s due to restrictions on fishing activity in order to promote stock recovery[76]. EU controls on Total Allowable Catches (TACs) and fishing effort and decommissioning of vessels in the UK have contributed to reductions in total fishing effort in the international demersal fisheries in the North Sea, West of Scotland and Irish Sea[77] (UKMMAS, 2010). In recent years, stocks have been recovering and quotas have been rising in response.

The Government's White Paper on Fisheries, published on 3 July 2018, sets out the intention for the UK to become an independent coastal state under the United Nations Convention on the Law of the Sea (UNCLOS), with rights and responsibilities to manage the resources in its waters, when it leaves the European Union. This includes the intention to move away from Relative Stability quota shares under the Common Fisheries Policy towards 'a fairer and more scientific method for future TAC shares as a condition of future access'. This implies shares that better reflect the resources in UK waters, and has the potential to result in increased quotas for some species for UK and Scottish vessels. The EU is an important market for Scotland's fish and shellfish landings and Brexit has the potential to impact on tariff and non-tariff measures in seafood trade. However, the outcome of the Brexit process and UK and Scottish fisheries policies post-Brexit remain uncertain. The fisheries sector is currently, and is likely to remain, important to many rural areas in Scotland. Fisheries are potentially impacted by both environmental and anthropogenic factors, including:

- Climate change effects: there are specific changes which have been estimated for deep sea species and environments. The future impacts of climate change on deep-sea ecosystems are summarised by two main drivers: firstly, changes in surface ocean productivity, and secondly, ocean acidification (and physico-chemical changes in water mass structure)[78]. On the UK shelf, calcifying plankton and seafloor invertebrates are vulnerable to climate change impacts and deep-water coral communities in the deep sea marine reserve area are vulnerable to acidification[79]. Climate change may impact the connectivity of coral species. For example, within increasing temperatures, coral larvae development rates are estimated to increase, reducing their dispersal distance, thus reducing

[76] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh.

[77] UKMMAS, 2010. Charting Progress 2: Productive Seas Evidence Group Feeder Report. Published by Defra on behalf of UKMMAS.

[78] Hughes, D.J. and B. E. Narayanaswamy. 2013. Impacts of climate change on deep-sea habitats, MCCIP Science Review, 204-210, doi:10.14465/2013.arc21.204-210

[79] Science Advisory Council. 2018. Recommendations to inform a UK Ocean Acidification Monitoring Strategy. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730461/defra-sac-oa-report-2018.pdf.

connectivity, recruitment success between areas and impacting species diversity[80]. These impacts can disrupt ecosystem services and function[81]. Commercial fisheries are also impacted, as climate change impacts important factors such as food availability and recruitment: many species have moved to deeper and more northerly waters[82]. In particular, deep-water species typically are slow-growing and therefore, may be unable to adapt to rapidly changing environments[83]. However, new opportunities for commercial fisheries may occur, for example for mackerel and cephalopod fisheries[84];

- Anthropogenic effects such as permanent structures, dumping at sea, oil and chemical spills, and the effects of the fisheries themselves, which may impact on the habitats where the fish live; and
- Profitability and political effects.

### A.1.3 Assumptions on Future Activity

The baseline review identified uncertainty around future trends for commercial fisheries. Future policies and the response to those policies remain difficult to predict therefore this assessment has assumed that the location and intensity of commercial fisheries activities do not change significantly over the period of the assessment. This assumption is consistent with that adopted for the socio-economic impact assessment of nature conservation MPAs and fisheries management in inshore SACs and MPAs remained constant over the 20-year timeframe of the assessment, due to the lack of micro-scale (inshore and SACs) forecasts of future activity with the analysis of the socio-economic impacts of Nature Conservation MPAs in Scottish offshore waters[85,86,87].

Whilst fishing effort has been concentrated on the Rockall Rise area of the Proposed West of Scotland reserve, new regulations may prohibit fishing in this area in the future. Council Regulation 2016/2336 Article 9 prohibits bottom fishing gears operating in waters with depths 400-800m where VMEs have been established. ICES have

[80] MCCIP. 2018. Climate change and marine conservation: Supporting management in a changing environment. Available at: http://www.mccip.org.uk/media/1810/mccip-coral-gardens-report-card_second-run_v5.pdf

[81] Doggett, M., Baldock, B. & Goudge, H. 2018. A review of the distribution and ecological importance of seabed communities in the deep waters surrounding Scotland. JNCC Report No. 625, JNCC, Peterborough, ISSN 0963-8091.

[82] Pinnegar, J. K., Garrett, A., Simpson, S.D., Engelhard, G.H. and van der Kooij, J. 2017. Fisheries. MCCIP Science Review 2017, 73-99, doi:10.14465/2017.arc10.007-fis

[83] Doggett, M., Baldock, B. & Goudge, H. 2018. A review of the distribution and ecological importance of seabed communities in the deep waters surrounding Scotland. JNCC Report No. 625, JNCC, Peterborough, ISSN 0963-8091.

[84] Pinnegar, J. K., Garrett, A., Simpson, S.D., Engelhard, G.H. and van der Kooij, J. 2017. Ibid.

[85] Marine Scotland, 2013. Planning Scotland's Seas: 2013 - The Scottish Marine Protected Area Project – Developing the Evidence Base tor Impact Assessments and the Sustainability Appraisal Final Report.

[86] ABPmer & eftec, 2015. The Scottish Marine Protected Area Project Second Iteration of Site Proposals – Developing the Evidence Base for Impact Assessments: Final Report. Report to Marine Scotland, September, 2015.

[87] Marine Scotland, 2018. Proposed Inshore MPA/SAC Fisheries Management Measures – Phase 2. Socio-Economic Impact Assessment. October 2018. Report prepared by ABPmer & eftec for the Scottish Government.

identified several VMEs in late 2018, e.g. in the Rockall Rise area [88] but these are not yet established in regulations. Therefore, it is assumed that these areas can still be fished by bottom gears unless specified in the regulations.

### A.1.4 Potential Interactions with the proposed deep sea marine reserve areas and features

The principal impacts to proposed MPA features from commercial fisheries activity include:

- Habitat damage as a result of gears coming into contact with the seabed; and
- Population impacts on deep-sea species (which are often relatively more susceptible to overfishing due to their life-history characteristics).

Habitat damage principally relates to mobile bottom contact gear. Longline gear, set nets and pots and traps may interact with the seabed. Their impact is less than that produced by mobile bottom gear[89] but has been shown to damage coral species[90].

### A.1.5 Potential Management Scenarios

The following management scenarios have been identified by Marine Scotland as potentially being required to support the achievement of conservation objectives in the proposed deep sea marine reserve areas:

- Lower: Designation with existing fisheries management and with consenting as normal.
- Intermediate: Designation with no extractive activities that affect the seabed. This includes no demersal fishing (mobile and static gears).
- Upper: Designation with no extractive activities that affect the seabed or in the water column. This includes all demersal and pelagic fishing.

Where the proposed deep sea marine reserve areas overlap with existing designated sites, it is possible that existing or planned management measures will contribute to achievement of the conservation objectives. The site assessments (Appendix C) provide further information on how these assumptions have been applied to individual sites.

[88] ICES. 2018. Report of the ICES/NAFO Joint Working Group on Deep-water Ecology (WGDEC). Available at: http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2018/WGDEC/WGDEC_2018.pdf.

[89] Marine Scotland. 2018. Priority Marine Feature (PMF) - fisheries management review: Cold-water coral reefs. Available at: https://consult.gov.scot/marine-scotland/priority-marine-features/supporting_documents/Review%20of%20PMFs%20outside%20the%20Scottish%20MPA%20network%20%20FINAL%20%20Coldwater%20coral%20reefs.pdf.

[90] Marine Scotland. 2018. Ibid.

### A.1.6 Assessment Methods

Exclusion of fishing gears

Recent regulations have resulted in changes to fishing activities in the deep sea marine reserve. In particular, EU regulation 2016/2336 prohibits bottom trawling below 800m and therefore, only data collected after the EU Regulation 2016/2336 (that came into force on 1 January 2017), has been used to determine the economic impact on demersal trawling fleets.

The value of landings produced from areas that are now prohibited from fishing activities (from previous pieces of legislation)[91], or have been identified for management measures[92], are not costed in the assessment.

Assessment of the cost to the commercial fisheries sector of restriction of fishing activities is in terms of the direct GVA associated with the loss of the value of landings from the area. This was estimated for the over-12m UK vessels. Under-12m vessels were excluded from the analysis as the distance from land and the physical characteristics of the waters in the proposed deep sea marine reserve severely limit the likelihood of under-12m vessels fishing in these waters. For non-UK vessels it was not possible to estimate the value of landings affected due to the lack of landings data. In lieu of these data and so that the fishing industries in relevant countries can be further consulted if required, VMS ping data were used to identify the nationalities of vessels likely to be affected and identify their location of fishing. Where possible, these data were paired with previous studies (such as the Rosemary Bank Seamount MPA Management Options Paper) to determine the likely fishing gear used and if those fishing methods are still permitted considering any new legislation (such as Council Regulation (EC) 2016/2336).

Step 1: Estimating the costs arising from proposed management measures – value of landings affected.

For over-12 m vessels, Vessel Monitoring System (VMS) ping data linked to landings records were used. Recorded landings in a day were allocated across all VMS fishing pings on that day, where a ‘fishing ping’ has been defined as one where the average speed since the previous ping is greater than zero and up to and including 5 knots for all gear types. VMS ping data were extracted by Marine Scotland and are estimates of landings value by area of capture. The ping data were then intersected with the management areas to calculate the value affected for each gear type.

Landings values were uprated to 2019 values using predicted GDP deflators and averaged over five years (2013-2017) to provide annual average values over the period.

The deep sea marine reserve areas are beyond 12 nm and overlap with areas where non-UK vessels fish. This includes EU vessels fishing under the CFP, as well as Faroese and Norwegian vessels fishing under access arrangements. The datasets

[91] E.g. demersal gears in Rosemary Bank NC MPA.

[92] E.g. mobile demersal gears in the shallower part of the proposed Faroe-Shetland Channel reserve, which have been costed previously under the North-East Faroe-Shetland Channel NC MPA.

used to estimate the value of landings affected included all UK-registered vessels. Impacts are attributed to Scottish vessels and Scottish ports through the analysis of Home port and Port of landing. Value of landings were not available for non-UK vessels, however, non-UK vessels pings were used to determine where non-UK fishing activity occurred in relation to the deep sea marine reserve areas and the nationalities that may be impacted,

A displacement test[93] was not applied, for consistency with other SEIA assessments of commercial fisheries in MPAs – other assessments have applied the displacement test under the lower scenario, however as the lower scenario measures assessed did not result in the loss of any landings value in any of the proposed deep sea marine reserve areas, the displacement test was not applied.

Step 2: Convert value of landings to direct GVA impact. The average annual value of landings affected was converted to direct GVA for each fleet segment using segment-specific ratios of GVA as a proportion of fishing turnover calculated from economic data from Seafish[94] and the Social, Technical and Economic Committee on Fisheries (STECF)[95] (Table A3).

**Table A3. GVA as a percentage of fishing income for each fleet segment[96]**

| Fleet segment | GVA % |
|---|---|
| **Over-12 m** | |
| Beam trawl | 14.9% |
| Demersal trawl | 41.3% |
| Demersal seine | 46.7% |
| Lines | 41.7% |
| Midwater trawl | 65.1% |
| Pots | 52.4% |
| Set nets | 54.3% |
| Mechanical & suction dredges | 44.5% |

Step 3: Calculate indirect and induced GVA, and employment effects. The reduction in direct and indirect GVA (i.e. reduction in GVA generated by the sector and its supply chain) was estimated by applying the Type I GVA multiplier for sea fishing from the

[93] An assessment of the potential for displacement of fishing effort, and therefore for additional landings to be made in other areas (and potential for additional impacts in other areas).

[94] Seafish, 2018. Seafish fleet economic performance dataset 2007 - 2017. Available online at https://www.seafish.org/article/industry-economics. Downloaded 04.02.2019.

[95] STECF, 2018. The 2018 Annual Economic Report on the EU Fishing Fleet (STECF 18-07). Scientific, Technical and Economic Committee for Fisheries. Available online at https://stecf.jrc.ec.europa.eu/reports/economic. Accessed 06.03.2019.

[96] GVA percentages for each fleet segment were calculated as averages from relevant fleet segments from the Seafish economic data, based on vessel size, gear type and area in which they fish, to be relevant to the areas of the proposed deep sea marine reserve areas.

Scottish Government's Input-Output Tables and Multipliers[97]. The reduction in direct, indirect and induced GVA (i.e. reduction in GVA generated by the sector and its supply chain and the knock-on impacts of a change in household consumption) was estimated by applying the Type II GVA multiplier for sea fishing from the Scottish Government's Input-Output Tables and Multipliers[98]. Reductions in direct and indirect employment, and in direct, indirect and induced employment, were estimated by applying the Type I and Type II employment effects, respectively, for sea fishing from the Scottish Input-Output Tables and Multipliers.

Step 4: Calculate the present value of impacts over the assessment period. The average annual value of landings affected is assumed to be constant throughout the 20-year period of the assessment. Costs are calculated in 2019 prices, discounted over the assessment period at a rate of 3.5%[99].

Step 5: Disclosure analysis. It is not permitted, for reasons of confidentiality, to disclose data on annual landings values that represent five or fewer vessels. In these cases, the value of affected gear types were aggregated together for presentation of results.

Step 6: Identify and document other non-quantified costs and benefits. Other costs and benefits that may arise from the management measures, but that have not been quantified, were identified and recorded in the Site Reports (Appendix C).

Another supply chain that is highly relevant to commercial fishing vessels is that which the vessels input to, that is, the supply of fish to processing facilities and to the wholesale and retail trades. Impacts on this sector are explicitly considered in the social and distributional assessment in relation to the landings to ports and how this might change the supply for the processing sector. The potential impacts on GVA and employment in the processing sector have not been quantified separately. This is because the relevant multipliers link the sector back to its inputs, which include the commercial fishing sector. Therefore, estimating the reduction in the processing sector would also estimate the reduction in the commercial fisheries sector as an indirect effect and hence would result in double counting. Additionally, raw material may be imported for processing. The dependence of the processing sector on local landings varies by sector and region, and therefore the impact of a reduction in landings on the processing sector is affected by this level of dependence and the potential for import substitution.

### A.1.7 Limitations

- VMS pings occur at least every two hours, and therefore do not provide a complete picture of fishing activity. However, by using data over a five-year period this limitation is minimised. Recorded landings in a day were allocated across all VMS fishing pings on that day, where a ‘fishing ping’ has been defined

[97] Scottish Government, 2017. Input-Output Tables 1998-2014 (Latest year 2014), revised 26 July 2017. Available at http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/Input-Output.

[98] Scottish Government, 2017. Ibid.

[99] 3.5% rate used based on HM Treasury Green Book Guidance (2017). Discounting is the technique of applying a discount rate to convert future monetary amounts to their equivalent value in today’s terms, (based on the premise that people prefer to receive benefits in the present rather than in the future).

as one where the average speed since the previous ping is greater than zero and up to 5 knots for all gear types. VMS ping data were extracted by Marine Scotland and are estimates of landings value by area of capture. However, vessels may not be fishing where they emit pings at these speeds. For example, pelagic trawling can occur above 5 knots[100]. Therefore, some fishing activity may not be accounted for and under-estimated. Conversely, some recorded VMS pings are collected for vessels reportedly travelling at speeds between 0-5 knots that are not fishing, for example, there may be technical problems in the data or where weather may significantly reduce steaming speeds[101,102], or when the vessel is engaging in other activities such as searching or the soak-time of the gear[103], which may result in over estimating the landings values from fishing pings. Therefore, the process of averaging landings data across pings may result in landings values being over- or under-estimated for individual pings.

- The extent to which displacement of fishing activity will occur (rather than loss of the value of landings), and the nature of displacement (areas or gear types to which effort might be displaced) is uncertain. The knock-on impacts in terms of environmental impacts, impacts on vessels affected and impacts on other vessels, are also uncertain. For the intermediate and upper estimate, it was assumed that the value of landings affected would be lost. However, in practice it is likely that at least part of the effort would be displaced, and this could result in additional environmental impacts, impacts on the vessels displaced, and on other vessels.
- As the value of future landings cannot be forecast, it is assumed that the value of landings is constant over time. The average value of landings per year estimated for each site is therefore assumed to be the same in each of the 20 years covered by the IA. In reality, it is likely that the value of landings in each site would fluctuate over time, depending on regulations, quotas, and environmental influences, and hence the estimated loss in landings may underestimate or overestimate the true future value of landings. As the GVA and employment estimates are based on the value of affected landings the same limitation applies.
- Fishing patterns may have changed compared to the period from which data were used for the assessment (2013–2017).
- The quantification of cost impacts to the sector is restricted to UK vessels, as data on non-UK vessels were not available to allow assessment of impacts.

[100] ICES. 2016. Interim Report of the Working Group on Spatial Fisheries Data (WGSFD), 17–20 May 2016, Brest, France. ICES CM 2016/SSGEPI:18. 244 pp.

[101] Stohs, S.M. and Sippel, T., 2017. Analysis of increasing the required VMS ping rate for the California drift gillnet fishery. Southwest Fisheries Science Center, National Marine Fisheries Service, NOAA, La Jolla, CA.. DOI:10.7289/V5/TM-SWFSC-570

[102] ICES. 2016. Interim Report of the Working Group on Spatial Fisheries Data (WGSFD), 17–20 May 2016, Brest, France. ICES CM 2016/SSGEPI:18. 244 pp.

[103] Marzuki, M.I. 2017. VMS data analyses and modeling for the monitoring and surveillance of Indonesian fisheries. Computer Vision and Pattern Recognition [cs.CV]. Ecole nationale supérieure Mines-Télécom Atlantique, 2017. English. ffNNT : 2017IMTA0012ff. fftel-01801769f

# A.2 Military Activities

## A.2.1 Sector Definition

The military defence sector makes use of the Scottish coastline for the location of bases and training and use of the sea for training, test and evaluation activities and the surveillance and monitoring of waters to detect and respond to potential threats. In this assessment, military interests comprise the use of the coast and seas by the Royal Navy (submarine bases, jetties and exercise areas), Army (training camps and firing ranges), Royal Air Force (bases, coastal Air Weapon Ranges and Danger Areas) and Ministry of Defence (MOD) (Defence Test and Evaluation Ranges to trial weapon systems)[104].

## A.2.2 Overview of Existing Activity

A list of sources to inform the writing of this baseline is provided in Table A4.

**Table A4 Military activities information sources**

| Scale | Information Available | Date | Source |
|---|---|---|---|
| Scotland | Scottish Naval Exercise Areas Information | 2010 | https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=518 |
| Scotland | Defence Analytical Services and Advice. DASA Quad Service. 4 | 2010 | www.dasa.mod.uk/ |
| Scotland | Military Employment by Region | 2017 | MOD, 2017 Quarterly Location Statistics |
| UK | Military Practice Areas | Current | Oceanwise / UKHO |
| UK | Military low flying zones | 2014 | UK Military Airfields Guide |
| UK | Munitions Disposal Sites (Chemical, Radioactive, Disused) | 1945–1956 (Radioactive – no dates) | https://marinescotland.atkinsgeospatial.com/nmpi/ |
| UK | MOD Regional Expenditure with UK Industry and Commerce and Supported Employment | 2013–2018 | UK Defence Statistics, MOD |
| UK | Military ports owned by MOD | 2010 | Charting Progress 2 |

[104] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh.

Location and intensity of activity

Military activities occur in both inshore and offshore waters around the Scottish coast. All coastal military locations and the full area available for military training and other defence activities are shown in Figure A8. MOD strategic interests relevant to the scoping area are to:

- Retain the capability to store, maintain and deploy the deterrent;
- Free navigation for surface and subsurface naval vessels for national defence;
- Safeguarding of navigational routes and nationally critical infrastructure;
- Safeguard the usage of designated Danger Areas and Exercise Areas for military training and defence test & evaluation purposes; and
- Retain strategic maritime infrastructure, installations and coastal MOD facilities.

Activities relating to maritime transport are mainly associated with naval bases and the only naval base in Scotland is Her Majesty's Naval Base (HMNB) Clyde at Faslane. Sea training is carried out within defined military practice and exercise (PEXA) training areas. Although the PEXA cover large areas of sea, military exercises cover only a proportion of these areas at any one time and are restricted temporally to a number of weeks per year.

Two major NATO training exercises (Joint Warrior exercises) also take place each year, typically in April and October. The training exercise stretches from the Irish Sea, north to Cape Wrath and east to the Moray Firth.

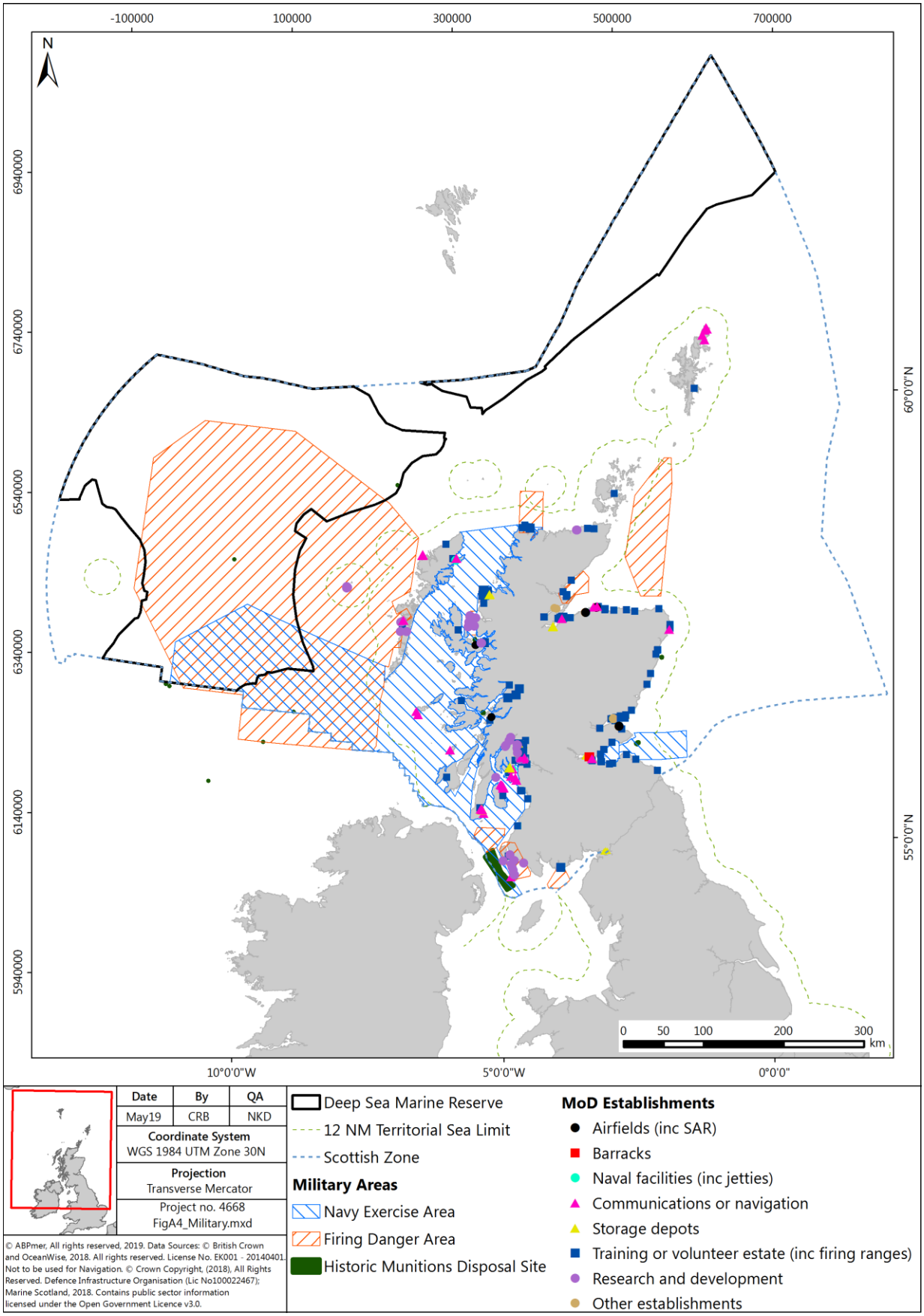


**Figure A8 Military assets and practice areas in Scottish waters**

Economic value and employment

Defence activities do not generate a tangible output and therefore cannot be valued. However, information is available on the expenditure within relevant departments, e.g. the Commander-in-Chief (C-in-C) Navy Command which is responsible for the operation, resourcing and personnel training of ships, submarines and aircraft[105].

The MOD employs people throughout the UK in support of its operations in the marine environment, including HM naval bases, MOD ranges and coastal estates. Gross Value Added (GVA) of UK military activity in the sea was estimated to be approximately £400 million in 2012[106]. Marine activities and hence the location of the value to the economy are mainly related to the location of the naval bases and exercise areas.

In 2016/17, the UK military defence expenditure in Scotland was £1,592 million, supporting 10,500 jobs in Scottish Industry, with an increasing trend from 2013/14 onwards[107].

In terms of direct employment, at October 2017, there were 9,970 military (armed forces) personnel and 3,970 civilian personnel based in Scotland. The armed forces comprised 4,050 Navy, 4,190 Army and 1,730 Royal Air Force (RAF) personnel[108].

Future trends

Specific defence projects may provide significant employment opportunities. For example, with respect to future aircraft carriers, building the hull sections and outfitting the vessels has provided work for about 10,000 people, including 3,500 at the two Clyde yards and 1,600 at Rosyth, Fife at the project's peak[109]. Further investment is planned for Scottish military bases, including a significant investment programme to prepare the HM Naval Base Clyde's waterfront for the Dreadnought class submarines.

Owing to the confidential nature of military defence activities it is difficult to assess likely future trends, however future employment will be governed by spending priorities within the MOD.

[105] United Kingdom Marine Monitoring and Assessment Strategy (UKMMAS), 2010. Charting Progress 2 Feeder Report Productive Seas. Department for Environment Food and Rural Affairs on behalf of UKMMAS (Eds. Saunders, J. and McKie, J.) 472pp Available online: http://chartingprogress.defra.gov.uk/

[106] Marine Science Co-ordination Committee (2015) Economic value and employment in the UK of activities carried out in the marine environment.

[107] MOD, (2017). MOD Expenditure with UK Industry in Current Prices: Breakdown by Region.

[108] MOD, 20175. Quarterly Location Statistics(QLS) 1 October 2017. Available online: https://www.gov.uk/government/statistics/location-of-uk-regular-service-and-civilian-personnel-quarterly-statistics-2017

[109] United Kingdom Marine Monitoring and Assessment Strategy (UKMMAS), 2010. Charting Progress 2 Feeder Report Productive Seas. Department for Environment Food and Rural Affairs on behalf of UKMMAS (Eds. Saunders, J. and McKie, J.) 472pp Available online: http://chartingprogress.defra.gov.uk/

### A.2.3 Assumptions on Future Activity

In the absence of information on future activity levels, it is assumed current locations and levels of usage will continue throughout the period of the assessment.

### A.2.4 Potential Interactions with deep sea marine reserve Features

There are no military areas that overlap with the Faroe-Shetland Channel reserve, however, there are several military areas that overlap with the proposed West of Scotland reserve, including:

- There are 27 danger areas that are used as military practice areas;
- There is one PEXA military exercise area.

Many of the activities of the MOD have the potential to interact with deep sea marine reserve features. Underwater noise associated with sonar use and military weapons trials may impact fish and marine mammals. There is also wider potential for visual and noise disturbance to these features during exercises. Weapons trials may cause surface and sub-surface abrasion to the seabed habitat and species, in some cases resulting in a direct loss of habitat. Associated synthetic pollutants may also enter the water column. Of lesser concern is the death or injury of mobile species by collision with military vessels, and the possible introduction or translocation of non-indigenous species[110].

Despite the potential for such interactions with features proposed for designation, the infrequency of military activities and existing MOD procedures should ensure that environmental impacts are minimised.

### A.2.5 Potential Management Scenarios

The following management scenarios have been identified by Marine Scotland as potentially being required to support the achievement of conservation objectives in specific deep sea marine reserves:

- Lower: Designation as an MPA with consenting as normal.
- Intermediate: Designation as an MPA with no extractive activities that affect the seabed.
- Upper: Designation as an MPA with no extractive activities that affect the seabed or the water column.

The management scenarios are not expected to impact on Military activities directly, however, there will be a need for the MOD to update its Marine Environment and Sustainability Assessment Tool (MESAT) (and other MOD environmental tools) and to subsequently maintain and comply with these updates.

[110] JNCC and NE, 2011. General advice on assessing potential impacts of and mitigation for human activities on MCZ features, using existing regulation and legislation. Advice from the Joint Nature Conservation Committee and Natural England to the Regional MCZ Projects. June 2011. 107pp.

### A.2.6 Assessment Methods

Revisions to MESAT

The costs to MOD have been assessed at a national level. It has been assumed that the following costs are incurred:

- Initial revision of MESAT (and other MOD environmental tools) and additions to electronic charting by the Hydrographic Office are estimated to cost £28,000 (at 2019 prices) based on an estimate of £25k at 2012 prices[111]. This cost would be incurred in 2020; and
- Additional annual maintenance costs are estimated to be £5,600 (at 2019 prices) based on an estimate of £5k at 2012 prices[112]. This cost would be incurred annually from 2021.

Compliance with MESAT revisions

As MOD is operational throughout Scottish waters and as MPAs are likely to be extensive and have varied management measures, it has been assumed that consideration of MPAs will be undertaken as part of planning for all MOD maritime activities. It has been estimated that the costs to MOD will be £11,100 per year from 2020 for four years, reducing to £5,600 p.a. subsequently (at 2019 prices)[113].

### A.2.7 Limitations

- Uncertainty concerning the location and scale of current or future activity;
- MESAT revisions and updates may be implemented in conjunction with revisions for other proposed MPAs and therefore actual costs may be lower.

[111] Defra, 2012. Designation of Marine Conservation Zones in English Inshore Waters and English and Welsh Offshore Waters. Impact Assessment. IA No: Defra 1475. December 2012

[112] Defra, 2012. Ibid.

[113] Defra, 2012. Designation of Marine Conservation Zones in English Inshore Waters and English and Welsh Offshore Waters. Impact Assessment. IA No: Defra 1475. December 2012

# A.3 Oil and Gas

## A.3.1 Sector Definition

This sector relates to the extraction of oil and gas in the sub-sea environment largely from offshore reserves. Oil reserves include both oil and the liquids and liquefied products obtained from gas fields, gas-condensate fields and from the associated gas in oil fields. Gas reserves are the quantity of gas expected to be available for sale from dry gas fields, gas-condensate fields and oil fields with associated gas. For this assessment, activity within this sector includes exploration, production, interconnectors and gas storage (i.e. the 'upstream' oil and gas sector).

## A.3.2 Overview of Existing Activity

Information sources used in the assessment are listed in Table A5.

**Table A5 Oil and gas information sources**

| Scale | Information Available | Date | Source |
|---|---|---|---|
| Scotland | Revenues and production from Scottish sea areas (2015-2018). Oil, gas and NGL production and revenue (2015-2018) for all Scottish waters and regional breakdown | 2015-2018 | Scottish Government[114,115] |
| Scotland | Platforms, existing pipelines and wells interactive maps | Current | National Marine Plan interactive (NMPi) |
| UK | Offshore licence areas around the UK, all blocks/rounds data, hydrocarbon fields, significant discoveries and wells Presented through multiple interactive maps | Current | Oil & Gas Authority (OGA) |
| UK | Decommissioning of offshore installations and pipelines | Current | Department for Business, Energy and Industrial Strategy (BEIS)[116] |

[114]Scottish Government, 2018a. Oil and Gas Production Statistics [online] Available at: https://www.gov.scot/Resource/0054/00540203.pdf.

[115] Scottish Government 2018b. Energy in Scotland 2018 [online] Available at: https://gov.scot/Resource/0053/00531701.pdf.

[116] BEIS, 2018a. Oil and gas: decommissioning of offshore installations and pipelines [online] Available from: https://www.gov.uk/guidance/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines

| Scale | Information Available | Date | Source |
|---|---|---|---|
| UK | Annual economic, workforce and decommissioning reports | 2018 | Oil and Gas UK[117,118,119] |
| UK | Digest of UK Energy Statistics | 2018 | BEIS[120] |

Location and intensity of activity

There is extensive infrastructure associated with oil and gas developments in Scottish waters, including seabed and platform mounted production facilities and networks of pipelines bringing oil and gas ashore for processing[121] (Figure A10). It is estimated that there is approximately 12,800 km of oil and gas pipeline in Scottish waters with the majority of pipelines outwith the 12 NM limit (i.e. offshore). Virtually all hydrocarbon fields, platforms, pipelines and infrastructure occur within the central and northern North Sea and to the west of Shetland. There is the potential for significant new development to occur west of Shetland, particularly associated with the Laggan-Tormore fields. Total has made a large gas discovery at Glendronach field which is estimated to have a capacity of around one trillion cubic feet of gas. It could be developed quickly and at a low cost by tying the field to existing infrastructure at the Edradour field nearby[122].

Information on the production of oil, natural gas liquids (NGL) and gas from Scottish sea areas between 2014 and 2018 are provided by The Scottish Government[123] and are shown in Table A6. Scottish and UK oil and gas production has declined rapidly between the turn of the century and 2013. Production levelled off during 2014 and then increased significantly during 2015, following several years of substantial investment in the development of new and existing fields. Since 2015, total oil and gas production has been relatively stable[123,114].

[117] Oil and Gas UK. 2018a. Economic Report 2018. Available at: https://oilandgasuk.cld.bz/Economic-Report-2018.

[118] Oil and Gas UK. 2018b. Workforce Report 2018. Available at: https://oilandgasuk.cld.bz/Workforce-Report-2018.

[119] Oil and Gas UK. 2018c. Business Outlook 2018. Available at: cld.bz/c41vNPt/2/.

[120] BEIS, 2018b. Digest of United Kingdom energy statistics 2018. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736148/DUKES_2018.pdf.

[121] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh.

[122] Talal Husseini. 2018. Total males major offshore UK gas discovery in West of Shetland. Available at https://www.offshore-technology.com/news/total-uk-gas-discovery/. Accessed 16/10/2018.

[123] Scottish Government, 2018a. Oil and Gas Production Statistics [online] Available at: https://www.gov.scot/Resource/0054/00540203.pdf.

**Table A6 Annual oil and gas production and revenues from Scotland[124] and the percentage change from previous year (Scottish Government, 2018)**

| **Production (millions of tonnes of oil equivalent)** | **2014** | **2015** | **2016** | **2017** |
|---|---|---|---|---|
| Crude oil | 38.6 *(-2.3%)* | 44.7 *(+15.7 %)* | 45.9 *(+2.8%)* | 45.1 *(-1.8%)* |
| NGL | 2.4 *(+13%)* | 2.5 *(+6.7%)* | 3.3 *(+31.9%)* | 3.7 *(+9.4%)* |
| Natural Gas | 19.0 *(+4.8%)* | 22.5 *(+18.5%)* | 26.0 *(+15.6%)* | 24.9 *(-4.2)* |
| Total | 60.0 *(-1.6%)* | 69.7 *(+15.1%)* | 75.3 *(+4.4%)* | 73.7 *(-1.1%)* |
| **Revenue (£m)** | **2014** | **2015** | **2016** | **2017** |
| Crude oil and NGL | 16,979 *(-14.8%)* | 12,384 *(-27.1%)* | 11,787 *(-4.8%)* | 14,923 *(+26.6%)* |
| Natural Gas | 3,346 *(-15.4%)* | 4,061 *(+21.4%)* | 3,505 *(-13.7%)* | 3,901 *(+11.3%)* |
| Total | 20,326 *(-14.9%)* | 16,445 *(-19.1%)* | 15,293 *(-7%)* | 18,824 *(+23.1%)* |

* mtoe = million tonnes of oil equivalent.

The 2018 Oil and Gas UK Economic Report[125] provides a current indication of oil and gas production in the UK. The report summarises industry performance up to August 2018. It highlights the re-stabilisation of the sector after the recent downturn in the oil price, with more investment in the sector in the first eight months of 2018, than the entirety of 2016 and 2017. Decommissioning activities are now a significant activity with over £1 billion spent annually since 2013 and nearly £2 billion spent in 2017. Production efficiency has increased barrels of oil equivalent per day (boepd) by 16% from 2014-2017, with an approximate 1.7 million boepd in the first half of 2018.

### A.3.3 Economic value and employment

The oil and gas industry is the principal source of fuel and power for Scotland, meeting approximately 90% of the primary energy need in Scotland in 2015[126]. Information on the total revenue from oil, NGL and gas is provided in Table A6. The total revenue from oil, NGL and gas progressively decreased between 2014 and 2016 before increasing in 2017 and the beginning of 2018. It was estimated that the oil and gas industry was worth £9.2 billion to the Scottish economy in 2016[127] with a GVA of £1.6 billion[128].

[124] Scotland includes Scottish Adjacent Waters.

[125] Oil and Gas UK. 2018a. Economic Report 2018. Available at: https://oilandgasuk.cld.bz/Economic-Report-2018.

[126] Scottish Government, 2017. Scottish Energy Strategy: The future of energy in Scotland [online] Available at: https://www.gov.scot/Resource/0052/00529523.pdf.

[127] Scottish Government 2018b. Energy in Scotland 2018 [online] Available at: https://gov.scot/Resource/0053/00531701.pdf.

[128] Scottish Government. 2018c. Scotland's Marine Economic Statistics. Available at: https://www2.gov.scot/Topics/marine/Publications/TopicSheets/tslist/economy.

However, the Scottish oil and gas sector has recently experienced a significant decline in production revenue and previous years have been more lucrative. Brent prices of crude oil collapsed in the second half of 2014; prices fell from $110 per barrel (bbl) in mid-year to $55/bbl at the end of December 2014 and even traded below $40/bbl in 2016. It has been progressively increasing since early 2016, and the average in 2017 was $54/bbl and the first half of 2018 trading at $70/bbl[125]. More recently, oil prices have reached just over $80/bbl[129]. This increase in barrel price has increased the total revenue of the Scottish sector in 2017 even with a slight decrease in production. In financial year 2017-18, the sales value of oil and gas produced in Scotland was estimated at £20 billion [125].

The industry is still a major employer even after a large cut in workforce due to the downturn in the sector in 2014. It is estimated that in 2018 the sector will increase the total jobs it supports for the first time since 2014. The oil and gas industry currently supports around 283,000 jobs across the UK, including 36,800 directly employed by oil and gas companies and major contractors, of which 19,700 are in Scotland[130]. Around 127,000 people are employed in the wider supply chain and 119,700 people are in jobs induced by the economic activities of employees. About 39% of the jobs supported by the sector are located in Scotland, not only in major cities such as Aberdeen but across the whole of Scotland including remote areas of the country[131].

Future trends

Scotland's Energy Strategy[132] has set the ambitious target of 50% of Scotland's energy consumption from renewable sources by 2030. In 2016, 54% of Scotland's electricity needs were met from renewables. This could potentially have a knock-on effect for the oil and gas industry with less demand for oil in Scotland, however, currently the majority of Scottish oil products are exported, and this demand is expected to increase[133].

The 2018 Market Outlook[134], suggests that there is unknown oil demand beyond 2020. An increase in demand up to then is predicted, but after 2020, different scenarios could see the demand increase, stabilise or reduce. Due to these unknown demands the future trends are harder to predict.

In the Scottish Government's Energy Strategy[135], two scenarios are hypothesised ("an electric future" and "a hydrogen future"), with both predicting a reduction in the amount of oil and natural gas needed within Scotland as a switch to more renewable forms of energy takes place. Under "an electric future", 40% of Scotland's energy flow would be from oil and natural gas, down from the 2015 baseline of nearly 90%. Under "a hydrogen future", just 18% of Scotland's energy flow would come from oil, and no

[129] Hinson, S., Sutherland, N., Priestley, S., Bolton, P., Booth, L. 2018. Future of the UK oil and gas industry. House of Commons Library. Number CDP 2018/0210.

[130] Hinson, S., Sutherland, N., Priestley, S., Bolton, P., Booth, L. 2018. Ibid.

[131] Oil and Gas UK. 2018b. Workforce Report 2018. Available at: https://oilandgasuk.cld.bz/Workforce-Report-2018.

[132] Scottish Government, 2017. Scottish Energy Strategy: The future of energy in Scotland [online] Available at: https://www.gov.scot/Resource/0052/00529523.pdf.

[133] Oil and Gas UK. 2018a. Economic Report 2018. Available at: https://oilandgasuk.cld.bz/Economic-Report-2018.

[134] Oil and Gas UK. 2018c. Business Outlook 2018. Available at: cld.bz/c41vNPt/2/.

[135] Scottish Government, 2017. Scottish Energy Strategy: The future of energy in Scotland [online] Available at: https://www.gov.scot/Resource/0052/00529523.pdf.

natural gas would be used. There is no prediction made about the amount of export expected for the sector as a whole[136].

Up to the end of 2016, 43.5 billion barrels of oil equivalent (boe) had been recovered from the UK Continental Shelf (UKCS), with further proven and probable reserves of 5.7 billion boe and 7.4 billion boe respectively in discovered undeveloped resources[137]. This estimation does not take into account any new exploration success that could occur. At current rates of extraction this could sustain the industry for approximately 20 years[137], with no new investment, which is currently unlikely.

Figure A9 shows oil and gas production levels in recent years and OGA's March 2018 projections[138]. An annual 5% decrease in oil and gas production from 2018 to 2050 is projected under several scenarios. However, the reduction in overall production is countered with a projected increase in gross revenues by exploiting new markets and increasing efficiency of capture[139].

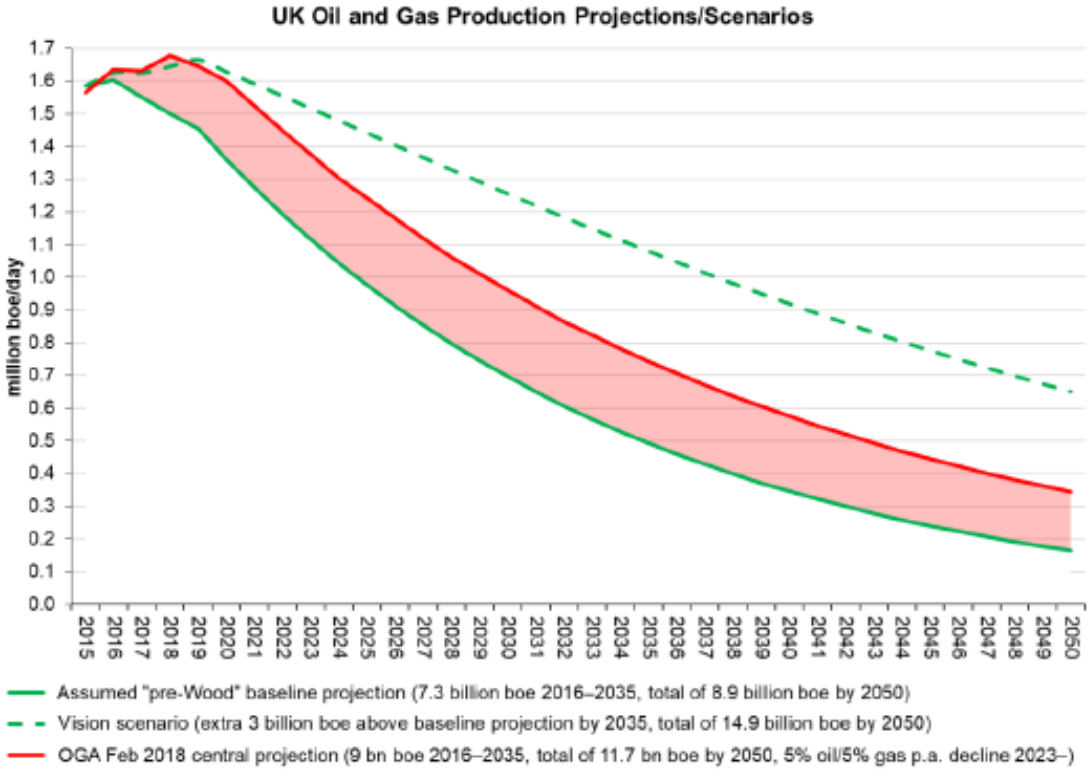


**Figure A9 Actual and Projected UK Oil and Gas Production 1998-2019**

[136] Scottish Government, 2017. Ibid.

[137] Oil and Gas Authority. 2017a. UK Oil and Gas Reserves and Resources - as at end 2016. Available at: https://www.ogauthority.co.uk/media/4425/uk-reserves-and-resources-v1.pdf.

[138] Oil and Gas Authority. 2018. Projections of UK Oil and Gas Production and Expenditure. Available at: https://www.ogauthority.co.uk/media/4647/projections-of-uk-oil-and-gas-production-and-expenditure-march-2018.pdf.

[139] Oil and Gas Authority. 2017b. Vision 2035. Available at: https://www.ogauthority.co.uk/media/3196/vision-2035-overview-january-2017.pdf.

Decommissioning is forecast to occur at 214 fields across the UKCS from 2017 to 2025, with 45 of these in Scottish waters[140]. The expanding decommissioning industry is estimated to be worth £17 billion between 2017 and 2025, with £1.7 billion to £2 billion spent annually (for years 2017 to 2020)[141]. The largest category of expenditure is well plugging and abandonment at 49 per cent (£8.3 billion). Some depleted oil and gas fields, and oil and gas infrastructure, may potentially be used in the emerging CCS sector (see section A.3).

Whilst it is more likely that there will be extraction activities in the Faroe-Shetland marine reserve (due to existing infrastructure nearby), the OGA are currently overseeing studies into the exploration potential of the West of Scotland reserve, using existing seismic data[142].

### A.3.4 Assumptions on Future Activity

Future oil and gas development depends on the presence of exploitable resources and the economic viability of development.

Information on proposed front-end development activity (resource surveys and exploration/appraisal wells) is available from awards made under OGA's oil and gas licensing rounds. However, it is difficult to anticipate the extent to which this front-end activity might subsequently lead to development projects. Furthermore, information from recent and current licensing rounds provides a relatively short-term view of future activity. OGA initiated a 31st licensing round in the first quarter of 2019 and awards are expected to be announced in the second quarter. On 23rd May 2018, OGA announced the first awards under the 30th licensing round. There is some overlap between the deep sea marine reserve areas and the 29th round (five sites intersecting the western deep sea marine reserve and five sites intersecting the north-eastern deep sea marine reserve), 30th licensing round (28 sites intersecting the north-eastern deep sea marine reserve) and the 31st offshore blocks on offer and the proposed deep sea marine reserve areas[143].

There are several gas discovery sites that intersect the deep sea marine reserve area[144]. Due to these developments and the significant development of the nearby Clair field[145], there is potential for both exploration and extraction activities, and their associated pipelines to cross the proposed deep sea marine reserve areas.

It has been assumed that no new gas storage sites and no new gas interconnector projects are developed in waters off Scotland within the assessment period.

[140] Oil and Gas Authority. 2017. Decommissioning Insight 2017. Available at: https://cld.bz/BoPAqso/4/.

[141] Hinson, S., Sutherland, N., Priestley, S., Bolton, P., Booth, L. 2018. Future of the UK oil and gas industry. House of Commons Library. Number CDP 2018/0210.

[142] Oil and Gas Authority. 2018. Call to Explore. Available at: https://www.ogauthority.co.uk/media/5251/oga-prospex-keynote-presentation-121218-call-to-explore.pdf.

[143] OGA. 2018. Offshore Licensing Rounds. Available at: https://www.ogauthority.co.uk/licensing-consents/licensing-rounds/offshore-licensing-rounds/#tabs. Accessed on 29th January 2019.

[144] Marine Scotland. NMPI. Available at: https://marinescotland.atkinsgeospatial.com/nmpi/. [Accessed 11/02/2019]

[145] Offshore Energy Today. 2018. BP boosts Clair stake after closing ConocoPhillips deal. 21st December 2018. Available at: https://www.offshoreenergytoday.com/bp-boosts-clair-stake-after-closing-conocophillips-deal/.

### A.3.5 Potential Interactions with deep sea marine reserve features

Infrastructure for the exploration and drilling for oil and gas may interact with the deep sea marine reserve features in a number of ways. The installation of drilling infrastructure and drilling activities will have direct impacts on local benthic features. Benthic species may suffer lethal effects of surface and sub-surface abrasion and penetration. Disturbance and smothering may occur with the dispersion and deposition of drill cuttings, although this is dependent on hydrodynamic conditions and the particle size of the drill cuttings. Noise disturbance may also result from drilling activities.

Once installed, the presence of drilling infrastructure has the potential to interrupt hydrodynamic processes and change local patterns of sediment erosion and deposition. Scour protection to avoid potentially adverse impacts associated with erosion may involve replacing the original soft sediment on the seabed with a rocky substrate, inducing changes in habitat and community structure. Once in place, drilling infrastructure may potentially result in death or injury by collision of mobile species[146] .

Trenching and burying of pipelines for the transport of oil and gas causes short-term disturbance to the benthic habitat along the route of the pipeline, after which the seabed would be re-colonised (although it is noted that recovery times will vary dependent on the habitat present). Concrete mattresses may be utilised to stabilise pipelines, resulting in a permanent loss of soft sediment habitat and a shift to hard substrate[147].

Oil spills can impact all habitat types, and areas of low wave energy are more vulnerable than high energy areas that can naturally disperse oil quickly. In addition to oil pollution, discharges of formation water, crude oil and other production chemicals may affect the surrounding environment if not managed in accordance with best practice.

The Laggan-Tormore is expected to be a significant area for gas extraction[148]. The gas field will have a pipeline to the new gas processing terminal (the Shetland Gas Plant). Other planned pipelines that deliver gas through pipelines to the Shetland Gas Plant (such as Rosebank) have small seabed footprints but may impact features in the area such as deep sea sponge aggregations[149]. Though these pipelines do not currently overlap with the deep sea marine reserve, there are both discoveries and licensing blocks and rounds that overlap with the deep sea marine reserve[150], which may lead to further pipeline development.

[146] JNCC and NE, 2011. General advice on assessing potential impacts of and mitigation for human activities on MCZ features, using existing regulation and legislation. Advice from the Joint Nature Conservation Committee and Natural England to the Regional MCZ Projects. June 2011. 107pp.

[147] JNCC and NE, 2011. General advice on assessing potential impacts of and mitigation for human activities on MCZ features, using existing regulation and legislation. Advice from the Joint Nature Conservation Committee and Natural England to the Regional MCZ Projects. June 2011. 107pp.

[148] Total. 2019. Greater Laggan: Pioneering Exploration in the Atlantic Margin. Available at: https://www.total.uk/greater-laggan-pioneering-exploration-atlantic-margin. Accessed on 07/02/2019.

[149] Chevron. 2013. Rosebank Project Environmental Statement. Available at: https://www.iema.net/assets/nts/Xodus/Rosebank_Project_NTS_May_2013.pdf.

[150] Marine Scotland. NMPI. Available at: https://marinescotland.atkinsgeospatial.com/nmpi/. Accessed 11/02/2019.

It should be noted that potential environmental impacts are managed through the licensing/regulatory system; for example, geological surveys as part of oil and gas industry operations are regulated by BEIS.

### A.3.6 Potential Management Scenarios

The following management scenarios have been identified by Marine Scotland as potentially being required to support the achievement of conservation objectives in the deep sea marine reserve:

- Lower: Designation as an MPA with consenting as normal. Additional assessment costs will be incurred for licence applications.
- Intermediate: Designation as an MPA with no extractive activities that affect the seabed, i.e. no consenting of oil and gas activities.
- Upper: Designation as an MPA with no extractive activities that affect the seabed or the water column, i.e. no consenting of oil and gas activities.

No potential management measures have been identified in relation to decommissioning and it has therefore been assumed that the designations will not impose significant cost impacts on this activity. There are considerable overlaps of oil and gas licensed blocks and licensing rounds, particularly with the most recent (31$^{st}$) licensing round. Table A7 shows the number of overlapping licensing rounds and blocks in each of the deep sea marine reserve areas. Licensing Rounds are offshore blocks that are offered under each licensing round and licensing blocks are offshore areas that are already subject to a licence.

**Table A7 Number of available blocks that overlap the deep sea marine reserve. Source (Marine Scotland).**

| Licensing Rounds/Blocks | West of Scotland reserve | Faroe-Shetland channel reserve |
|---|---|---|
| 29th Licensing Round | 5 | 5 |
| 30th Licensing Round | 0 | 28 |
| 31st Licensing Round | 505 | 116 |
| Licensing Blocks | 3 | 16 |

### A.3.7 Assessment Methods

<u>Additional assessment of the impact of the development proposal on deep sea marine reserve features</u>

Under the intermediate and upper management scenarios, oil and gas extraction will not be consented, therefore it is assumed that there will be no licence applications and therefore no additional assessment costs. The refusal of consent for extraction will create an opportunity cost associated with potential oil and gas reserves that cannot readily be exploited. It has not been possible to quantify these potential impacts; however, it is recognised that unquantified costs may be significant.

To determine the likely costs to the lower management scenario, the number of additional assessments required to conduct oil and gas activities in both reserves and the years in which they are required, need to be quantified.

It has been assumed that an additional cost of £5,600 (at 2019 prices) will be incurred to provide information to the regulator concerning the potential impact of new oil and gas projects on protected features, as required under the Marine Scotland Act. This information would either be reported within the EIA if required, or as a separate MPA assessment.

The guidance notes for oil and gas surveys and shallow drilling (2005) state that an EIA is required for the following activities:

- Seismic surveys in sensitive sea areas such as Cardigan Bay, the English Channel, the Moray Firth, the St George's Channel and deep-water areas to the west and north of the United Kingdom.
- High resolution seismic site surveys, in sensitive areas as in bullet 1, above.
- Any other survey using airguns, waterguns or vibroseis in sensitive areas as in bullet 1, above.
- Any survey or shallow drilling that could have an effect on the integrity of a relevant site or other sensitive area, e.g. shallow drilling operations on a shallow sandbank habitat or seabed sampling operations near a reef habitat[151].

BEIS (2019) states that "under the EIA Regulations an application for consent for projects for which an ES will be required includes those where consent is sought for the getting of 500 tonnes or more of oil per day or 500,000 $m^3$ or more of gas per day otherwise than as a by-product of the drilling or the testing of any well; consent is sought for the construction of a pipe-line for the conveyance of petroleum". In addition, BEIS state that "applications for EIA Directions that an ES need not be prepared will be considered on a case-by-case basis, and whether the applications are approved or rejected will depend on a number of factors including the nature, timing and location of the project, the environmental sensitivity of the area and, most importantly, whether it is considered likely that the proposals will have any significant adverse impact."[152]. Therefore, it has been assumed here that EIAs will be required for these activities as the area in question is a proposed protected area. This is corroborated by Oil&Gas UK whom suggest that "in general, projects in near shore or sensitive areas will be expected to require an ES"[153]

[151] Offshore Environment & Decommissioning. 2005. Guidance notes for oil and gas surveys and shallow drilling Petroleum operations notice no. 14a and 14b. Aberdeen. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/50000/3606-PON14a_guide_110906.pdf.

[152] BEIS. 2019. BEIS Offshore Petroleum Regulator for Environment and Decommissioning The Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999 (as amended) – A Guide. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/778899/OPRED_EIA_Guidance_2019_Revision_5_-_14Feb19.pdf.

[153] Oil&GasUK. 2018. Environmental Impact Assessment – Offshore. Available at: https://oilandgasukenvironmentallegislation.co.uk/contents/topic_files/offshore/eia.htm.

Oil and gas licences specify the duration of time permitted to undertake exploration and extraction. These deadlines were used to estimate the years in which each activity (such as geophysical surveys or drilling) were likely to occur and hence, when the EIA was required.

The “Innovate” licence comprises three terms: the Initial term (which covers exploration; Second term (which covers the appraisal and field development planning); and the Third term (which covers development and production). The lengths of the first two terms are flexible, with a maximum duration of 9 and 6 years respectively. The Third Term is granted for 18 years with potential extensions.

There are three Phases during the Initial Term:

- Phase A: For carrying out Geotechnical Studies and Geophysical Data Purchase and Reprocessing;
- Phase B: For Shooting New Seismic and acquiring other Geophysical Data (i.e. proprietary data);
- Phase C: For Drilling Exploration and/or Appraisal wells[154].

To determine the likely costs to the lower management scenario, the number of licensing blocks with the potential for exploitation during the assessment period, that lie within the deep sea marine reserves, need to be quantified.

There are 19 licensed blocks that overlap with the deep sea marine reserves. The majority of these licences have been partially or fully relinquished and therefore are not expected to be taken forward for further exploration or extraction, and no additional assessment costs would therefore be incurred. Six of the licensed blocks are still open, with their licences remaining[155]. However, only two have an ‘undeveloped discovery’ located within the licensed block, and therefore have potential to progress during the assessment period Figure A10:

- Licence number 2138, with undeveloped discovery number 154/01- 1 in the proposed West of Scotland reserve; and
- Licence number 2323, with undeveloped discovery number 204/28-1 in the proposed Faroe-Shetland Channel reserve.

The number of active licensed blocks and licence blocks awarded under the 29th and 30th licensing rounds, that overlap with ‘undeveloped discoveries’, are as follows:

[154] BEIS. 2018. Offshore oil and gas licensing 30th seaward round. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/705285/30th_Round_AA_Southern_North_Sea.pdf

[155] OGA. 2019. Open data: OGA Licence Relinquishments ETRS89. Available at: https://data-ogauthority.opendata.arcgis.com/datasets/ef764e5db2154a5dbcca32e7f9e0e9e3_0/data?geometry=-43.707%2C47.586%2C68.793%2C64.441&orderBy=LICNO&where=LICNO%20%3E%3D%202214%20AND%20LICNO%20%3C%3D%202214

- In the assessed Faroe-Shetland reserve, there are two 'undeveloped discoveries' that overlap with licensing blocks that were awarded under the 30th licensing round[156];
- In the proposed West of Scotland reserve, there are no 'undeveloped discoveries' that overlap with an active licensed block.

It is assumed that these four blocks will complete the Initial term by 2028 (up to 9 years duration from 2019 start date), and will complete the Second term during the assessment period. It is further assumed that 50% of them proceed to the Third term within the assessment period (with the cost for additional assessment assumed to fall in 2038). Given the proximity to existing oil and gas infrastructure, it is assumed that the licensed block and one licensing block in the assessed Faroe-Shetland reserve proceed to the Third term, and the licensed block in West of Scotland reserve does not proceed to the Third term.

Cost of uncertainty and delays

The designation of the deep sea marine reserves has the potential to increase the time taken to determine licence applications and to negatively affect investor confidence. It has not been possible to quantify these potential impacts.

The deep waters that occur in the deep sea marine reserve are considered as an area of importance for a variety of species. The deep sea marine reserve has the potential to increase the mitigation measures required and timeframes for conducting geophysical surveys.

### A.3.8 Limitations

- Uncertainty concerning the location, scale and timing of future development activity, particularly in later years of the assessment period; and
- Uncertainty concerning the cost impact of project delays associated with additional assessment requirements.

[156] Oil and Gas Authority data 2019.

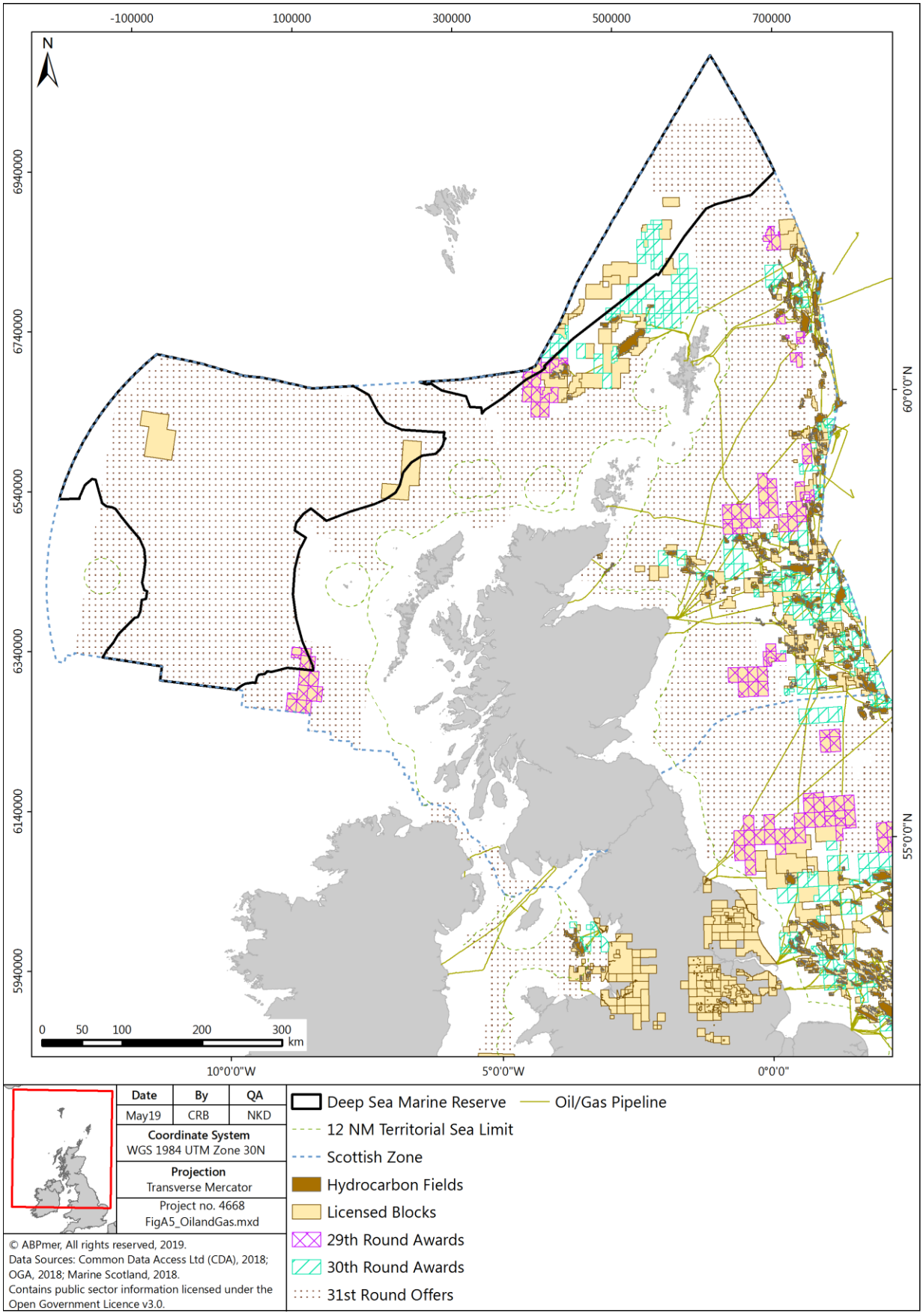


**Figure A10 Current and potential oil and gas infrastructure in Scottish waters**

# A.4 Power Interconnectors and Transmission Lines

## A.4.1 Sector Definition

This sector is concerned with the transmission of power through submarine cables, including international, national and inter-island links. This assessment excludes power cables to/from individual developments (e.g. power supplies to oil and gas installations, export cables from offshore wind farms).

Overview of Existing Activity

A list of sources to inform the writing of this baseline is provided in Table A8.

**Table A8 Power interconnectors and transmission lines information sources**

| Scale | Information Available | Date | Source |
|---|---|---|---|
| Scotland | UK Transmission network, including interconnectors | Current | Ofgem website https://www.ofgem.gov.uk/electricity/transmissionnetworks/electricity-interconnectors |
| Scotland/ UK | Power interconnectors and Transmission Lines | Current | KIS-ORCA |
| Scotland | Power cables (submarine electricity cables) | 2010 | Baxter et al. (2011) |
| Scotland | Future power interconnector cables and transmission lines | Current | ENSG, 2014 |
| UK | Future Projections for the National Electricity Transmission System | Current | National Grid |
| Scotland | Potential future subsea cable developments / reinforcements | 2014 | National Planning Framework for Scotland 3 (Scottish Government, 2014) |
| UK | Interactive Map | 2018 | 4COffshore |

Location and intensity of activity

There are no interconnectors or transmission network cables currently intersecting the deep sea marine reserve. The approximately 900 km of submarine power cables in

Scottish waters[157] are predominately located between the island communities and the national grid infrastructure[158].

Economic value and employment

There is no agreed methodology for calculating the economic value of subsea power cables. In the absence of information on economic value, the capacity of interconnector cables may be used as an indicator of both value and activity[159].

Future trends

The United Kingdom Marine Monitoring and Assessment Strategy[160] reported that over the period 2007-12 the Office of the Gas and Electricity Markets (Ofgem) provided for capital investment of up to £4.3 billion in the electricity transmission network, an increase of 160% over the previous 5-year price control period, with much of this investment planned for Scotland.

The Scottish National Planning Framework 3[161] identifies 'electricity grid reinforcements' as a key development essential to the delivery of the spatial strategy and to realise the potential benefits to Scottish regions. The strategic grid reinforcements are essential to provide the transmission capacity necessary to realise the potential of Scotland's renewable energy sources, maintain long-term security of electricity supply and support sustainable economic development.

The only known future power interconnector in the area relevant to the proposed deep sea marine reserve area is IceLink[162] which is expected to be in operation by 2025[163]. The interconnector is currently in the feasibility stage and is planned to be 1,500 km in length, between Iceland and Scotland, with a capacity of 1,200 MW[162]. Whilst IceLink is not planned to intersect either deep sea marine reserve, it's proposed route lies very close to the boundary of the assessed Faroe-Shetland reserve and therefore, could, after further planning, be moved into the reserve area, or may require additional assessment of its potential impact on MPA features due to its proximity to the proposed reserve.

The Electricity Ten Year Statement is produced every year by National Grid in its role as Transmission Owner and System Operator. Its purpose is to illustrate what the future National Electricity Transmission System could look like, and describe how it could operate, under a range of plausible Future Energy Scenarios. The most recent report in

[157] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh.

[158] United Kingdom Marine Monitoring and Assessment Strategy (UKMMAS), 2010. Charting Progress 2 Feeder Report Productive Seas. Department for Environment Food and Rural Affairs on behalf of UKMMAS (Eds. Saunders, J. and McKie, J.) 472pp. Available online: http://chartingprogress.defra.gov.uk.

[159] United Kingdom Marine Monitoring and Assessment Strategy (UKMMAS), 2010. Charting Progress 2 Feeder Report Productive Seas. Department for Environment Food and Rural Affairs on behalf of UKMMAS (Eds. Saunders, J. and McKie, J.) 472pp Available online: http://chartingprogress.defra. gov.uk/

[160] United Kingdom Marine Monitoring and Assessment Strategy (UKMMAS), 2010. Ibid.

[161] Scottish Government, 2014. National Planning Framework for Scotland 3.

[162] 4COffshore. 2018. Interactive map. Available at: https://www.4coffshore.com/offshorewind/. [Accessed on 29th January 2019].

[163] Askja Energy. 2018. IceLink interconnector in operation by 2025. Available at: https://askjaenergy.com/2018/04/17/icelink-in-operation-by-2025/. Accessed on 07/02/2019.

2018[164] concluded that within Scotland the anticipated increase in renewable generation will increase requirements for power transfer across boundaries within Scotland and cross-borders. The Network Options Assessment[165] has identified 12 critical options that are recommended to be taken forwards with delivery during the 2020s.

### A.4.2 Assumptions on Future Activity

It has been assumed that the IceLink interconnector will be operational by 2025[166]. Whilst IceLink is not planned to intersect either proposed deep sea marine reserve, it lies very close to the boundary of the assessed Faroe-Shetland reserve and therefore, could, after further planning, be moved into the reserve area or may require additional assessment due to its proximity.

### A.4.3 Potential Interactions with proposed deep sea marine reserve features

The installation and operation of submarine power cables will have similar effects on deep sea marine reserve areas and their features as that of telecom cables. If cables are buried, this generally involves the use of jetting or a plough, disturbing the local seabed area and producing temporary sediment plumes. Sediment may also be removed from the seabed. Otherwise, cables may be laid on the surface of the seabed. The overall disturbance is likely to include the impact to deep-sea sea bed habitat and electromagnetic fields (for elasmobranchs and diadromous fish)[167].

The potential impacts of submarine power cable installation on overall ecosystem impacts are likely to be short-term and the impacts on the seabed will remain local[168]. JNCC and Natural England state that in most cases the installation of cables has no significant impact on marine features in an area[169].

Deep-sea species that are vulnerable to electromagnetic fields include a variety of species that are found within the proposed deep sea marine reserve, such as elasmobranch species, ratfishes, eels and grunts and mammals, molluscs and crustaceans. These species can be affected in various ways, including their predator/prey interactions, behavioural effects (including avoidance/attraction), navigation/orientation and physiological and developmental effects. Important data gaps exist, particularly regarding the impact of cables on crustacea[170].

[164] National Grid. 2018. Electricity Ten Year Statement. Available at: https://www.nationalgrideso.com/sites/eso/files/documents/ETYS_2018_Document_v1.pdf.

[165] National Grid. 2018. Network options Assessment 2017/2018.

[166] Askja Energy. 2018. IceLink interconnector in operation by 2025. Available at: https://askjaenergy.com/2018/04/17/icelink-in-operation-by-2025/. Accessed on 07/02/2019.

[167] Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N., Carlier, A. 2018. A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. Renewable and Sustainable Energy Reviews. 96, pp.380-391.

[168] Taormina, B., *et al.* 2018. Ibid.

[169] Taormina, B., *et al.* 2018. Ibid.

[170] Taormina, B., *et al.* 2018. Ibid.

Taormina *et al*. estimated the extent of impact of laid-down cables on seabed disturbance to be of 'low'. However, cables laid in deep sea environments can be particularly problematic for deep-sea species (which are generally more sensitive to damage given their life-history characteristics)[171].

Other important risks that are identified include a risk of visual or noise disturbance of fish, marine mammals or birds. There is also some potential for collision risk and entanglement risk (particularly when ghost fishing gear is entangled with cables). Operational cables on or under the seabed may also generate heat, leading to localised warming of the seabed and there are considerable knowledge gaps regarding this issue[172].

In order to maintain the cables, it is expected that there is a requirement to regularly survey power interconnectors, therefore there is potential for survey vessels, and noise emitting survey equipment to cause disturbance to fish and marine mammals.

### A.4.4 Potential Management Scenarios

The following management scenarios have been identified by Marine Scotland as potentially being required to support the achievement of conservation objectives in the deep sea marine reserve:

- Lower: Designation as an MPA with consenting as normal. Additional assessment costs will be incurred for licence applications.
- Intermediate: Designation as an MPA with no extractive activities that affect the seabed. Power interconnectors are exempt. Additional assessment costs will be incurred for licence applications.
- Upper: Designation as an MPA with no extractive activities that affect the seabed or the water column. Power interconnectors are exempt. Additional assessment costs will be incurred for licence applications.

### A.4.5 Assessment Methods

<u>Additional assessment to inform marine licensing</u>

It has been assumed that an additional cost of £5,600 (at 2019 prices) will be incurred to provide information to the regulator concerning the potential impact of new interconnector projects on protected features, as required under the Marine Scotland Act. This information would either be reported within the EIA if required, or as a separate MPA assessment. The assumed assessment dates for individual cables are identified in Table 3 of each relevant site impact assessment (see Appendix C).

[171] Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N., Carlier, A. 2018. A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. Renewable and Sustainable Energy Reviews. 96, pp.380-391.

[172] Taormina, B., *et al.* 2018. Ibid.

The proposed route of the IceLink interconnector, which is currently in the feasibility stage, lies on the boundary of the proposed Faroe Shetland reserve. Due to its proximity, it is assumed to require additional assessment to determine its potential impact on the proposed deep sea marine reserve features.

Cost of uncertainty and delays

The designation of deep sea marine reserves has the potential to increase the time taken to determine licence applications and to negatively affect investor confidence. It has not been possible to quantify these potential impacts.

### A.4.6 Limitations

- The precise route and timing of applications for the IceLink interconnector are uncertain.

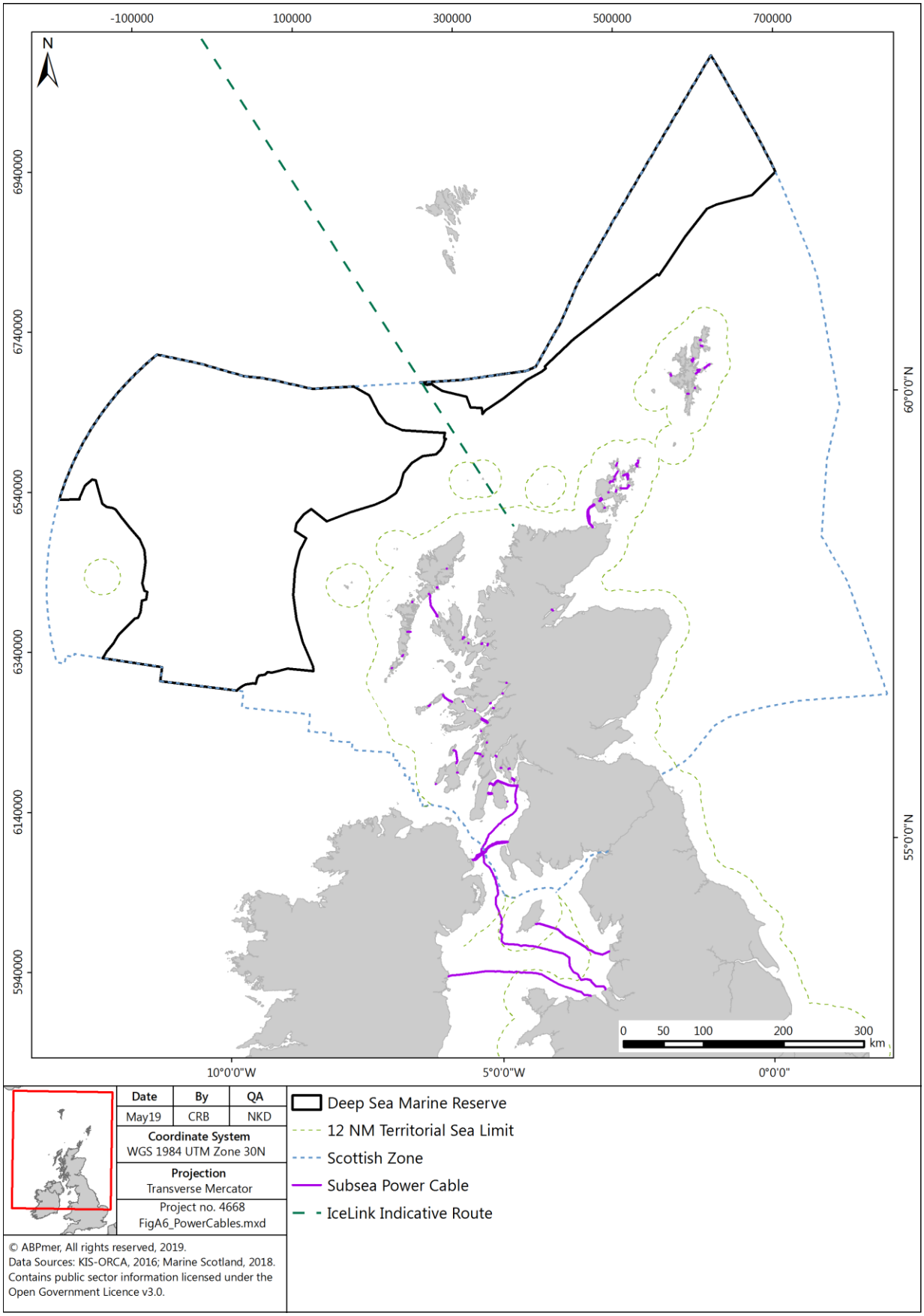


**Figure A11 Current and potential power interconnectors and transmission network in Scottish waters**

# A.5 Seabed Mining

## A.5.1 Sector Definition

This sector relates to the extraction of minerals from the seabed and novel chemicals derived from the genetic diversity of marine life[174]. This can include seabed mining in the deep sea, which is defined as oceans that are more than 500m deep[174]. Valuable minerals can be found at or near the surface of the seabed with a potential to yield economic benefits.

## A.5.2 Overview of Existing Activity

A list of sources to inform the writing of this baseline is provided in Table A9.

**Table A9 Seabed mining information sources**

| Scale | Information Available | Date | Source |
|---|---|---|---|
| UK | National mining opportunities | 2015 | Houses of Parliament |
| UK | UK mining opportunities and potential environmental impacts and mitigation | 2019 | House of Commons Environmental Audit Committee |
| UK | Economic opportunities of deep sea mining in UK EEZ | 2018 | Government Office for Science |
| Scotland | Pressures to deep sea habitats in Scottish waters | 2012 | Marine Scotland |
| Scotland | Mining impacts on Scottish seabeds | 2018 | JNCC |

Intensity of activity

There has been a recent interest in the deep sea due to the increasing demand for metals, decreasing supply from land-based sources and advances in the relevant technology[174].

There is currently no deep sea mining in UK waters. It is expected that UK waters contain deposits of interest, however, these have not been formally identified yet. Instead, deposits have been identified in UK Overseas Territories[173] and mining

[173] Houses of Parliament .2015. Deep sea Mining. The Parliamentary Office of Science and Technology, POSTnote 508. London. Available at: http://researchbriefings.files.parliament.uk/documents/POST-PN-0508/POST-PN-0508.pdf.

opportunities are expected to be developed and exploration could begin over the following decade[174].

Economic value and employment

Currently, there is no known seabed mining planned or occurring in UK waters. Defining the economic opportunities for future mining opportunities is difficult, given the lack of current planning in place in UK waters[174].

Future trends

The UK government recently considered deep sea mining as an emerging sector. Seabed mining is estimated to be worth £40 billion to the UK over the next 30 years, however, the majority of economic opportunities are expected to occur in Areas Beyond National Jurisdiction (ABNJ)[174]. Any exploration or related activities in the high seas (or in ABNJ) are regulated at an international level by an organisation that was established under UNCLOS, the International Seabed Authority (ISA). ISA is developing regulations to limit exploitation[174].

Production inside the UK's domestic EEZ is not expected to be able to support significant commercial interest as it is currently unknown if the UK harbours sufficient mineral deposits[175]. Doggett *et al*.[176] suggested that two areas (which lie in the proposed deep sea marine reserve area) are either not expected to be subject to mining, as they do not harbour the geological structures associated with seabed mining (north-east of the Wyville-Thomson Ridge, called SEA4), or there is no current plan known for seabed mining (the area west of Scotland called SEA7)[177].

Similarly, the British Geological Survey (BGS) concluded that seabed mining potential for offshore coal is uncertain. Offshore coal mining is considered unlikely in the near future, due to the significant development costs (because to its depth and distance from the shore). The BGS considers that the UK Continental Shelf is considered to contain a wide range of minerals, however, there is a lack of data regarding the existence, location and properties of offshore metallic minerals[178]. However, several types of minerals have been identified in Scottish waters, with potential commercial opportunities. Some of these have been found close to the deep sea marine reserve to impact exploration or mining activities. These metallic minerals include sediments

[174] House of Commons Environmental Audit Committee .2019. Sustainable Seas: Fourteenth Report of Session 2017–19. Available at: https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/980/980.pdf

[175] Government Office for Science. Foresight Future of the Sea: A Report from the Government Chief Scientific Adviser. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/706956/foresight-future-of-the-sea-report.pdf Accessed 8 April 2019.

[176] Doggett, M., Baldock, L. & Goudge, H. 2018. A review of the distribution and ecological importance of seabed communities in the deep waters surrounding Scotland. JNCC Report No. 625, JNCC, Peterborough, ISSN 0963-8091.

[177] Doggett, M., Baldock, L. & Goudge, H. 2018. A review of the distribution and ecological importance of seabed communities in the deep waters surrounding Scotland. JNCC Report No. 625, JNCC, Peterborough, ISSN 0963-8091.

[178] Green, S., Campbell, E., Bide, T.P., Balson, P.S., Mankelow, J.M., Shaw, R.A. and Walters, A.S. 2013. The Mineral Resources of Scottish Waters and the Central North Sea. British Geological Survey Minerals and Waste Programme Open Report, OR/13/013. 19 pages. Available online at http://nora.nerc.ac.uk/id/eprint/502151/1/OR13013.pdf. Accessed 4th April 2019.

containing titanium minerals such as rutile and ilmenite, which may be found off north-east Scotland and the Sea of the Hebrides. Placer-type deposits of heavy minerals have been found off Shetland and high concentrations of heavy metals may also exist off the west of the Outer Hebrides (Figure A12)[179].

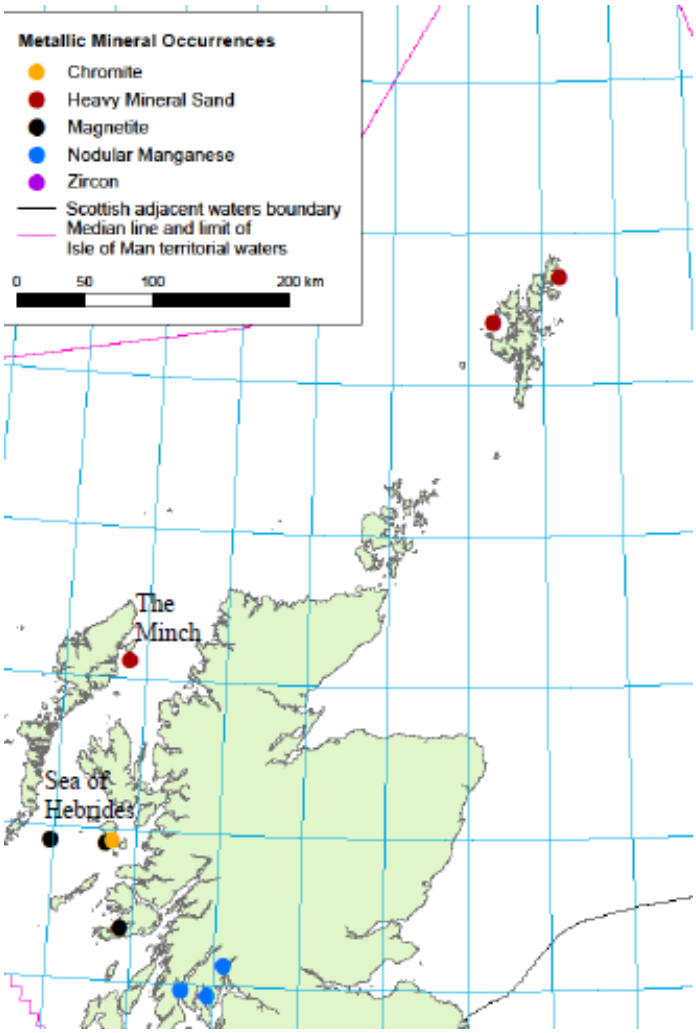


**Figure A12 Map of metallic mineral occurrences within Scottish waters. Source: Green *et al*.[178].**

More recently, in areas close to the deep sea marine reserve, zircon, garnet and staurolite-rich heavy mineral suites have been identified in the Clair Field (Figure A13). These deposits may be present north of the Clair group, but have not been explored yet[180].

[179] Green, S., Campbell, E., Bide, T. P., Balson, P. S., Mankelow, J.M., Shaw, R. A. and Walters, A. S. 2013. The Mineral Resources of Welsh waters and the Irish Sea. British Geological Survey Open Report, OR/13/013. 25pp.

[180] Morton, A., and McGill, P. 2018. Correlation of Hydrocarbon Reservoir Sandstones Using Heavy Mineral Provenance Signatures: Examples from the North Sea and Adjacent Areas. Minerals, 8(12), pp: 564. DOI:10.3390/min8120564. Available online at https://www.mdpi.com/2075-163X/8/12/564. Accessed 06.03.2019.

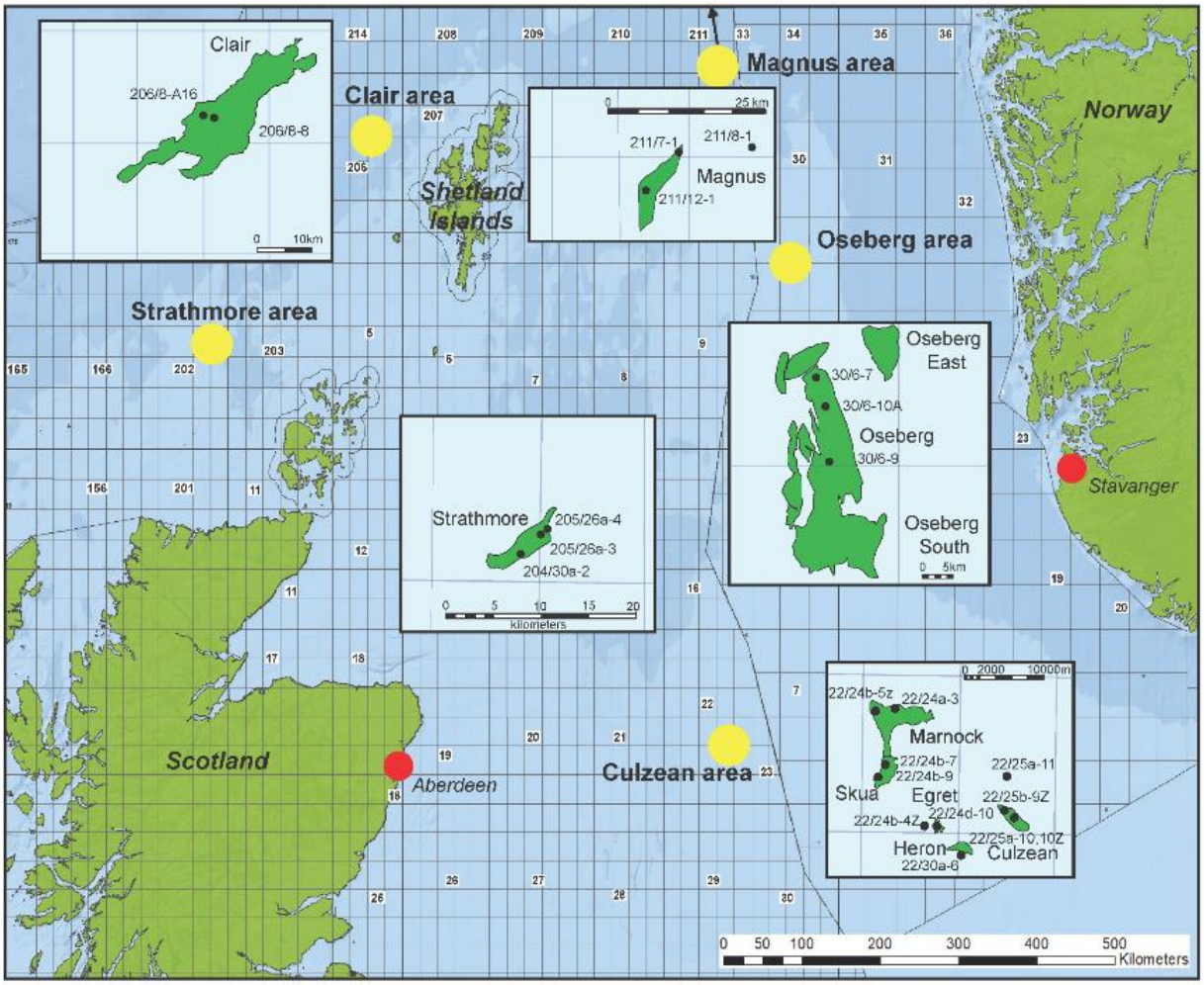


**Figure A13 Location map of the North Sea and west of Shetland areas showing the oil and gas fields discussed in this paper. Numbers are the UK and Norwegian quadrants[181].**

Assumptions on Future Activity

Future extraction levels are unknown within the EEZ and any activity is expected to be limited but there are potential mineral exploration sites near the deep sea marine reserve. Therefore, it is assumed that there may be some exploration nearer to the end of the assessment period within the area assessed Faroe-Shetland reserve.

## A.5.3 Potential Interactions with the proposed deep sea reserve

The House of Commons Environmental Audit Committee stated that any exploration and activities would require an Environmental Impact Assessment due to the potential risk to seabed habitats. The Committee paper states that “deep sea mining would have catastrophic impacts on habitats and species on seafloor sites and there is little

[181] Morton, A., and McGill, P. 2018. Correlation of Hydrocarbon Reservoir Sandstones Using Heavy Mineral Provenance Signatures: Examples from the North Sea and Adjacent Areas. Minerals, 8(12), pp: 564. DOI:10.3390/min8120564.

evidence that mitigation measures such as setting aside areas of the seabed will work to mitigate the damage"[182].

The potential impacts of mining can include creating sediment plumes, which can smother or have toxic effects on benthic organisms, reducing habitats, and disrupting species dispersal and the recovery rates are expected to be very slow. The impacts of mining in these habitats is largely unknown[183]. In Scottish waters, the deep sea habitats that are expected to be vulnerable to seabed mining include seamount communities (such as Rosemary Bank, which support sharks, rays are commercial fisheries) and offshore deep sea muds (found in depths between 200-500m, supporting burrowing species such as Nephrops)[184]. Seabed mining is deemed as one of the main anthropogenic activities with the potential to impact deep sea communities in Scottish waters[185].

The ISA is currently developing regulations to advise further seabed mining activities. A draft set of regulations were produced in 2017. The UK is currently a member state within the ISA[186]. Mitigation measures may include avoiding hydrothermal vents[182].

However, a better baseline of seabed biodiversity is required prior to commencing seabed mining activities[186].

### A.5.4 Potential Management Scenarios

The following management scenarios have been identified by Marine Scotland as potentially being required to support the achievement of conservation objectives in specific deep sea marine reserves (see Appendix D: Management Scenarios):

- Lower: Designation as an MPA with consenting as normal. Additional assessment costs will be incurred for licence applications.
- Intermediate: Designation as an MPA with no extractive activities that affect the seabed, i.e. no consenting of seabed mining activities.
- Upper: Designation as an MPA with no extractive activities that affect the seabed or the water column, i.e. no consenting of seabed mining activities.

### A.5.5 Assessment Methods

The timing and location of any future mining developments is unknown. However, the Government Office for Science recently suggested that commercial exploitation in the

[182] House of Commons Environmental Audit Committee .2019. Sustainable Seas: Fourteenth Report of Session 2017–19. Available at: https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/980/980.pdf

[183] Government Office for Science. Foresight Future of the Sea: A Report from the Government Chief Scientific Adviser. Available at:

[184] Marine Scotland. 2012. Scotland's Marine Atlas: Information for The National Marine Plan. Available at: https://www2.gov.scot/Publications/2011/03/16182005/49. [Accessed on 29th January 2019].

[185] Doggett, M., Baldock, L. & Goudge, H. 2018. A review of the distribution and ecological importance of seabed communities in the deep waters surrounding Scotland. JNCC Report No. 625, JNCC, Peterborough, ISSN 0963-8091.

[186] Government Office for Science. Foresight Future of the Sea: A Report from the Government Chief Scientific Adviser. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/706956/foresight-future-of-the-sea-report.pdf

UK EEZ is uncertain. For the purposes of this assessment, it is assumed that seabed mining is unlikely to occur in the short-term but exploration activities may occur towards the end of the assessment period.

Additional assessment to inform marine licensing

It has been assumed that an additional cost of £5,600 (at 2019 prices) will be incurred to provide information to the regulator for any licence applications concerning the potential impact of mining on protected features (based on Marine Scotland (2013)[187] uprated to 2019 prices), as required under the Marine Scotland Act. This information would either be reported within the EIA if required, or as a separate MPA assessment.

Mining within UK waters has been considered as unlikely, given the exploration costs, however, given that there are potential opportunities in UK waters, it has been assumed that one exploration licence application will be made at the end of the assessment period. This application is only considered likely to occur in the assessed Faroe-Shetland reserve, due to the potential mineral deposits found in this area.

Since both the intermediate and upper potential management scenarios require that no extractive activities may be conducted that impact the seabed within the deep sea marine reserve, 'intermediate' and 'upper' level management scenarios would preclude seabed mining in the area. This would represent an opportunity cost that cannot be quantified.

### A.5.6 Limitations

- The potential for domestic UK EEZ seabed exploration and mining activities is unknown;
- The timing and location of any exploration activities is unknown.

[187] Marine Scotland, 2013. Planning Scotland's Seas: 2013 - The Scottish Marine Protected Area Project – Developing the Evidence Base tor Impact Assessments and the Sustainability Appraisal Final Report.

# A.6 Telecommunication Cables

## A.6.1 Sector Definition

This sector relates to fibre optic submarine telecommunication cables, which carry telephone calls, internet connections and data as part of national and international data transfer networks utilised for the majority of international communication transmissions.

## A.6.2 Overview of Existing Activity

A list of sources to inform the writing of this baseline is provided in Table A10.

**Table A10 Telecommunications information sources**

| Scale | Information Available | Date | Source |
|---|---|---|---|
| Scotland | All telecom cables mapping on an interactive map | Current | KIS-ORCA |
| UK | An economic and social evaluation of the subsea cables | 2015 | Elliott, *et al.* 2016[188] |
| UK | Socio-economic importance and trends | 2008 | Pugh, (2008)[189] |

Distribution level and intensity of activity

Telecommunication cables within the Scottish continental shelf include fibre optic international cable links and domestic inter-island cables which are mainly copper wire. There are 88 active cables in Scottish waters, spanning over 4,000 km of international cables and 600 km of inshore cables[190] (Figure A14). An international network passes north and south of Shetland connecting Europe to North America, Faroe Islands, Iceland and Greenland, while networks connecting Scotland and Northern Ireland occur in waters off the west and south-west of Scotland. Cables also connect the Scottish mainland and island communities.

There are six cables currently transecting the assessed Faroe-Shetland reserve with a total length of intersecting cables approximately 587 km. They are (with the length of the cable within the proposed reserve area in brackets):

- Danice (139 km);
- Cantat 3 (148 km);

[188] Elliott, C., Al-Tabbaa, O., Semeyutin, A. and Tchouamou Njoya, E., 2016. An Economic and Social Evaluation of the UK Subsea Cables Industry. University of Huddersfield. A report commissioned by Subsea Cables UK and The Crown Estate.

[189] Pugh, D. 2008. Socio-economic Indicators of Marine-related Activities in the UK economy. The Crown Estate, 68pp.

[190] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B.and, Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh.

- Shefa 2 (35 km);
- Farice (201 km);
- Tat 14 (40 km); and
- Atlantic crossing 1 (23 km).

There are two cables currently transecting the proposed West of Scotland reserve with a total length of intersecting cables approximately 876 km. They are:

- Tat 14 (488 km); and
- Atlantic crossing 1 (387 km).

Economic value and employment

The overall UK telecoms and communications sector has recently been estimated to contribute approximately £45 billion to the economy and employ approximately 250,000 people across 8,000 companies[191]. A further preliminary estimate of the economic value of the UK telecommunications subsea cables industry to the digital economy values it at £62.8 billion per annum[192]. Defining the employment of the telecommunication sector within the marine environment alone is difficult given that that much of the sector is related to onshore activity. However, the only known estimate that has been published estimates that about 26,750 jobs in the UK telecommunications sector are marine-related[193].

Future trends

Increasing use of the internet and in e-commerce has led both to an increasing demand for communication cables and for faster services which has meant that the capacity of cables has also grown[194]. According to the European Subsea Cables Association (ESCA) around 97% of international trans-ocean traffic is carried by cable, hence, submarine cables will be vital for the foreseeable future. However, there is little information available on the extent to which new cables will be laid in Scottish waters[195].

Assumptions on Future Activity

It is assumed that future activity in UK waters is limited to replacing existing telecom cables which were designed with a lifespan of 25 years, but with increasing latency of the cable from increasing consumer demand for data the lifespan may be reduced.

[191] Department for International Trade. 2014. Communications industry in the UK: investment opportunities. February 2014. Available at https://www.gov.uk/government/publications/communications-industry-in-the-uk-investment-opportunities/communications-industry-in-the-uk-investment-opportunities.

[192] Elliott, C., Al-Tabbaa, O., Semeyutin, A. and Tchouamou Njoya, E., 2016. An Economic and Social Evaluation of the UK Subsea Cables Industry. University of Huddersfield. A report commissioned by Subsea Cables UK and The Crown Estate.

[193] Pugh, D. 2008. Socio-economic Indicators of Marine-related Activities in the UK economy. The Crown Estate, 68pp.

[194] AECOM and ABPmer, 2015. ISLES spatial planning and sustainability appraisal. Irish Scottish links on energy study: ISLES II: Towards implementation.

[195] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B.and, Moffat, C.F., (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh.

Table A11 shows the initial operation date of cables that intersect the deep sea marine reserves and their assumed year of replacement.

**Table A11 Year of operation and assumed replacement date for telecommunication cables that intersect the deep sea marine reserves**

| Cable | Operation date | Year of replacement |
|---|---|---|
| ATLANTIC CROSSING 1 | 1999 | 2024 |
| DANICE | 2009 | 2034 |
| CANTAT 3 | 1994 | 2019 |
| SHEFA-2 | 2008 | 2033 |
| TAT 14 | 2001 | 2026 |
| FARICE | 2004 | 2029 |

There are no EIAs costs required for maintenance of cables. As per Article 34 of the 2011 Exempted Activities Order states, a licence is not required for a deposit, removal or works activity to carry out emergency inspection or repair works to any cable or pipeline[196].

### A.6.3 Potential Interactions with the proposed deep-sea reserve

Telecom installations overlap with deep sea marine reserve areas. At the depth of the deep sea marine reserve, they will be laid on top of the seabed at these depths[197]. The effects of this on the seabed and related species are anticipated to be similar to those associated with interconnector cables and have been discussed in Section A.4.3.

The potential impacts of telecom cable installation and use are likely to be short-term and the impacts on the seabed will remain local. JNCC and Natural England state that in most cases the installation of cables has no significant impact on marine features in an area[198].

### A.6.4 Potential Management Scenarios

The following management scenarios have been identified by Marine Scotland as potentially being required to support the achievement of conservation objectives in specific deep sea marine reserves (see Appendix D: Management Scenarios):

- Lower: Designation as an MPA with consenting as normal. Additional assessment costs will be incurred for licence applications.

[196] MMO. 2018. Marine Licensing exempted activities. Available at: https://www.gov.uk/government/publications/marine-licensing-exempted-activities/marine-licensing-exempted-activities.

[197] Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N., Carlier, A. 2018. A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. Renewable and Sustainable Energy Reviews. 96, pp.380-391.

- Intermediate: Designation as an MPA with no extractive activities that affect the seabed. Cables are exempt. Additional assessment costs will be incurred for licence applications.
- Upper: Designation as an MPA with no extractive activities that affect the seabed or in the water column. Cables are exempt. Additional assessment costs will be incurred for licence applications.

### A.6.5 Assessment Methods

The timing and location of telecom cable replacements is uncertain. For the purposes of this assessment, it is assumed that cables will require replacement after 25 years.

Additional assessment to inform marine licensing

A licence is not required for cables to be placed in offshore waters. However, assessments may be required to place cables in the marine reserves, depending on the management scenario. It has been assumed that an additional cost of £5,600 (at 2019 prices) will be incurred to provide information to the regulator concerning the potential impact of replacement telecom cable projects on protected features (based on Marine Scotland (2013)[199] uprated to 2019 prices), as required under the Marine Scotland Act. This information would either be reported within the EIA if required, or as a separate MPA assessment. It has been assumed that the cost of these assessments is incurred in the year that cable replacement is required (see Table A11). Where the same cable overlaps with both marine reserves, it is assumed that only one assessment will be required at the time of replacement.

### A.6.6 Limitations

- The number and location of new telecom cables is uncertain; and
- The timing and location of cable replacements is uncertain.

[199] Marine Scotland, 2013. Planning Scotland's Seas: 2013 - The Scottish Marine Protected Area Project – Developing the Evidence Base tor Impact Assessments and the Sustainability Appraisal Final Report.

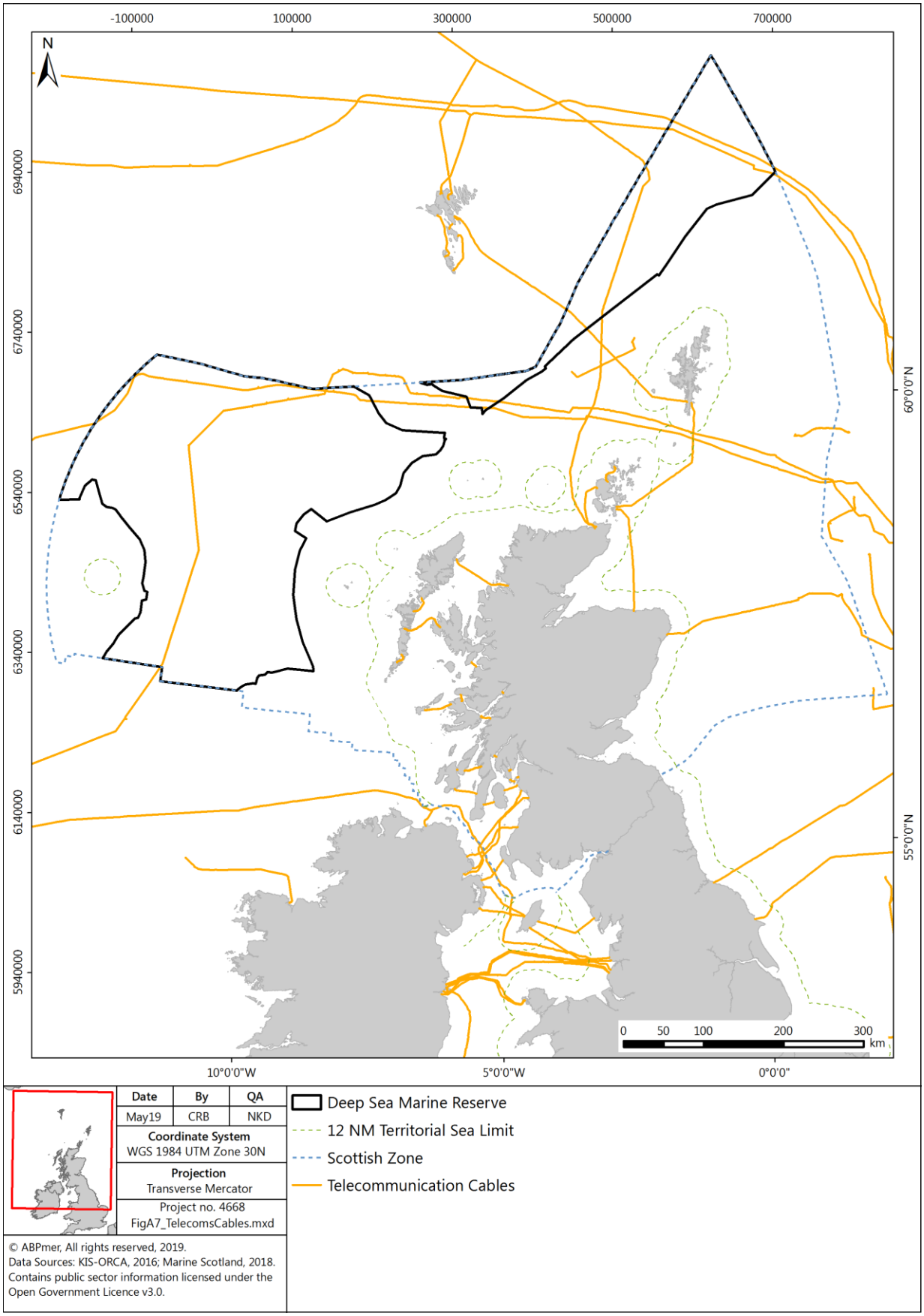


**Figure A14 Telecommunication cables in Scottish waters**