Revised Nomination proforma for the "North Atlantic Current and Evlanov Sea basin" MPA in the OSPAR Maritime Area

(Region V, Wider Atlantic)

***Versioning**: On agreement of an Extraordinary Meeting of the OSPAR Commission held on the 17 November 2022, this proposed revision of the Nomination Proforma has been made available for public consultation from 1 December 2022 – 28 February 2023. This revised version follows the substantial evidence compilation and revision work as set out in the 'Roadmap for further development of the North Atlantic Current and Evlanov Sea basin MPA' (OSPAR Agreement 2021-08).*

Yellow highlights indicate revisions to the nomination proforma, published in 2020 as OSPAR publication 771.

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Acknowledgements

The first version of this Background Document published in 2020 was developed by the OSPAR Intersessional Correspondence Group on Marine Protected Areas, The original analysis of seabird tracking data that consitututed the main scientific basis of the report was completed by OSPAR Observer BirdLife International after an initial technical workshop in 2016 in Reykjavik, Iceland (collaborators listed in Annex 1). . Information collected through a wide and inclusive process of seeking views from competent authorities and stakeholders on draft versions of the nomination proforma was incorporated. The original nomination proforma also took into account a review by the International Council for the Exploration of the Sea (ICES). The following contributors were also acknowledged in the original proforma: Tammy Davies, Maria Dias, Janos Hennicke, Pia Norling, Charlotte Marshall, Carole Semichon and Lena Avellan.

This 2022 revision of the background document has been prepared by the OSPAR Co-leads of the NACES MPA Roadmap, and the Changing Oceans Research Group, the University of Edinburgh (Professor Murray Roberts, Dr Lea-Anne Henry, Dr Anna Gebruk and Jason Cleland). Additional contributions and evidence for pelagic and benthic ecosystems were collected through an OSPAR expert workshop in 2022 (collaborators listed in Annex 1). At the start of the Roadmap process, contributions were compiled by the Global Ocean Biodiversity Initiative (GOBI) Secretariat and data contributors of the 2022 OSPAR expert workshop. The Ocean Biodiversity Information System was used to compile an extensive occurrence list of species within the NACES MPA (**Annex 8**), figures of species richness based on OBIS data created by Pieter Provoost. The species lists for cephalopods (**Annex 9**), mesopelagic fish (**Annex 10**) and gelatinous zooplankton (**Annex 11**), and other data, were compiled on the basis of contributions from the National University of Ireland, Galway (Sheena Fennell and Brynn Devine), Queen's University Belfast (Jonathan Houghton), and University College Cork (Damien Haberlin). More information was sourced from the NE and NW Atlantic regional Ecologically or Biologically Significant marine Area (EBSA) workshops, the Milne Seamount Cluster Background Document, MAR-ECO (a Census of Life field project), ECOMAR, EU ATLAS project, EU iAtlantic project, the International Seabed Authority (ISA) Regional Environmental Management Plan (REMP) process, the EU Atlantic Regional Environmental Management Plan project (Weaver, 2022) and its predecessor, the SEMPIA project. Information from the IceDivA2 SO286 expedition in November – December 2021 was also considered thanks to Chief Scientist Saskia Brix and James Taylor (from Senckenberg). New multibeam data from the NOAA Okeanos Explorer Voyage to the Ridge 2022 were included; Global Fishing Watch data were visualised by BirdLife International.

Executive Summary

The North Atlantic Current and Evlanov Sea basin Marine Protected Area (NACES MPA, the Site) represents a marine area of the deep-sea and open ocean habitats that support seabirds, cetaceans, fish including sharks, marine reptiles, and numerous benthic features. The Site encompasses a globally unique location; it is a region of year-round vigorous horizontal and vertical mixing where waters from the tropical/subtropical Atlantic encounter waters from the subpolar Atlantic and Arctic Ocean, promoting enhanced primary productivity, which help to support this biodiversity. The Site is bounded in the north by the Charlie-Gibbs Fracture Zone (CGFZ), to the west by the Flemish Cap and the Grand Banks of Newfoundland, to the east by the Mid-Atlantic Ridge (MAR), and to the south by the Azores.

In 2003, the OSPAR Commission agreed to establish a network of Marine Protected Areas (MPAs) with the aim that this should become an ecologically coherent network of well-managed sites. OSPAR agreed that the OSPAR Network of MPAs should comprise sites that are established as MPAs within the jurisdiction of OSPAR Contracting Parties as well as sites in the maritime area outside the jurisdiction of the Contracting Parties (areas beyond national jurisdiction, ABNJ). In the OSPAR Biodiversity and Ecosystems Strategy, OSPAR agreed to identify, on the basis of reports from Contracting Parties and observer organisations, possible components of the OSPAR Network in ABNJ in order to achieve the purposes of the network.

Data on seabird distribution and habitat use collected over the last decade in the North-East Atlantic and the lack of OSPAR MPAs in areas beyond national jurisdiction with conservation objectives focusing on highly mobile species initially justified a systematic review to identify potentially important sites in the open ocean for seabirds. This review resulted in a nomination proforma for the NACES MPA published in 2020 (OSPAR publication p00771). An MPA for site (the North Atlantic Current and Evlanov Sea basin Marine Protected Area) was agreed at the OSPAR Ministerial Meeting in 2021 (OSPAR Decision 2021/01) with Recommendation 2021/01 establishing management measures for the MPA. At the time, the Site was recognised as the most important foraging ground for seabirds within the OSPAR maritime area in terms of seabird species diversity and abundance. OSPAR Contracting Parties also agreed a roadmap (OSPAR Agreement 2021-08) for an evidence review process to consider the further development of protection for the deep-sea ecosystem at the NACES MPA. The roadmap expressed an intention by the OSPAR Commission to enhance the protection by including additional OSPAR listed features and the seabed, ocean floor and subsoil thereof in the scope of the NACES MPA as supported by the review process. Appendix 1 of Recommendation 2021/1 highlights seamounts (an OSPAR Threatened and/or Declining Habitat) and seamount-like features and associated communities, abyssal plain and deep-sea trenches, additional birds (black-legged kittiwake, thick-billed murre, Audubon’s shearwater), blue whale, leatherback turtle, bluefin tuna and basking shark. Other species of interest include seabirds, cetaceans, elasmobranchs, mesopelagic fish and cephalopods.

This revised Background Document makes available the information which has been compiled through this evidence review process and will be evaluated within the OSPAR framework to guide further development of protection at the NACES MPA. This document also includes a proposal for revision of the conservation objectives that were adopted for the NACES MPA In 2021. This information will form the basis for future consideration by OSPAR of the possible revision of the OSPAR Decision on the designation of the NACES MPA and the OSPAR Recommendation on the management of an NACES MPA.

A General information

Introduction and background

Within the North-East Atlantic, a number of countries have made significant progress in identifying important sites for pelagic marine species in the coastal and inshore waters and designated these as Marine Protected Areas (MPAs) (JNCC 2017; Ramirez et al. 2017). A few countries have also begun designating MPAs in offshore areas within their Exclusive Economic Zones (EEZs) (JNCC 2017; Ramirez et al. 2017). In comparison, the identification and designation of MPAs within ABNJ has been recognised as important and an ongoing gap in the global network of MPAs (Game et al. 2009; Scales et al. 2014). This is in part due to the existing gap in global governance models for the conservation and sustainable use of biodiversity beyond national jurisdiction. However, the few regional seas initiatives with ABNJ under their geographical coverage area, such as the OSPAR Convention, have been leading the way in protecting species and habitats in the high seas through area-based measures. In the North-East Atlantic, OSPAR has to date designated seven MPAs in ABNJ, with a particular focus on benthic habitats and communities (OSPAR 2017). The OSPAR Commission also recognises the roles of relevant bodies, in line with their respective mandates in collectively designing and implementing measures that contribute to biodiversity conservation and sustainable management of activities in ABNJ. These bodies include the North-East Atlantic Fisheries Commission (NEAFC), the International Maritime Organisation (IMO), and the International Seabed Authority (ISA), and involve measures such as Particularly Sensitive Sea Areas (PSSAs) and fisheries closures relating to Vulnerable Marine Ecosystems (VMEs; the central portal for North Atlantic data was set up by the Joint International Council for the Exploration of the Sea (ICES)/North Atlantic Fisheries Organisation (NAFO) Working Group on Deep-water Ecology (WGDEC)) (De Santo 2018).

The Ecological Coherence Assessment of the OSPAR MPA network first recognised the lack of ABNJ sites as a significant gap and for seabirds in particular (OSPAR 2013). Whilst the current network of ABNJ MPAs includes pelagic species as features of specific sites (e.g., seabirds in the Charlie Gibbs Fracture Zone and Milne Seamount MPAs), the boundaries and proposed management of the sites were based on conservation objectives for benthic communities and habitats (OSPAR 2010a-f). However, in contrast to benthic species, many pelagic species such as seabirds, basking sharks, bluefin tuna, blue whales, and oceanic turtles, are highly mobile, meaning their protection needs to consider wider connectivity. These animals can range long distances over many years within and across ocean basins to forage, migrate and breed (Arregui et al. 2018; Eckert 2006; Egevang et al. 2010; Gore et al. 2008; Lalire and Gaspar 2019; Lascelles et al. 2012; Lesage et al. 2017; Scales et al. 2014; Skomal et al. 2009; Walli et al. 2009). Despite their mobility, some pelagic species exhibit more spatially restricted movements during key life stages, often occurring predictably and consistently within defined areas, which makes the identification of ‘hotspots’ and subsequent site-based conservation feasible (Doherty et al. 2017; Grecian et al. 2016; Hooker et al. 1999; Lascelles et al. 2012; Malakoff 2004; Miller et al. 2015; Nordstrom et al. 2020; Queiroz et al. 2016; Ronconi et al. 2012; Scott et al. 2012; Szesciorka et al. 2020; Young et al. 2015).

Tracking data can provide information on species distribution, and also insights into behaviour and how oceanic species are utilising the environment from the surface through the water column to the deep seafloor. Satellite telemetry has been applied in many studies to track taxa that have wide geographical ranges, such as highly migratory fish, cetaceans, sharks, and oceanic turtles (Block et al. 2005; Fossette et al. 2010; Gales et al. 2010; Gore et al. 2008; Lesage et al. 2017). Data can then be integrated and used to model the movement of taxa under different scenarios, to determine environmental drivers; and to inform conservation and management at regional and global scales (Braun et al. 2018; Ferreira et al. 2021; Pérez-Jorge et al. 2020). For example, Block et al. (2005) showed, through electronic tagging of 772 Atlantic bluefin tuna individuals, that western and eastern Atlantic stocks use distinct breeding areas; but have overlapping foraging areas with greater mixing than was previously believed. This study provided useful information to managers after stock assessment models by the International Commission for the Conservation of Atlantic Tunas (ICCAT), which assumed low mixing between western and eastern Atlantic bluefin tuna (*Thunnus thynnus*) populations, were used to set quotas that resulted in overfishing.

Another example where tracking has been successful is with sharks. Telemetry has been used in at least 48 shark studies between 1984 and 2010 and has revealed previously unknown behaviours (Hammerschlag et al. 2011). For example, Gore et al. (2008) used pop-up satellite archival tags (PSAT) to track the movement of 2 basking sharks (*Cetorhinus maximus*) and provided the first conclusive evidence that basking sharks use the deep mid-ocean, with a record maximum dive depth of 1,264 m. Extensive transequatorial migrations were also recorded in Skomal et al. (2009), which demonstrated that basking sharks have winter residences; highlighting the need for conservation efforts throughout the species range. The diel patterns of these sharks (recorded with PSAT tags, or similar), as with other filter-feeding sharks, have been linked to oceanography and prey availability, thus informing the identification of certain key areas for protection (Dewar et al. 2018).

Aspects of ocean-scale migratory biology remain largely unknown for enigmatic taxa such as marine turtles; but several studies have analysed post-nesting movements and submerging patterns through the use of archival tags (Eckert et al. 2006; Godley et al. 2003). Cetaceans, particularly baleen whales, have lagged behind other marine taxa in satellite telemetry-based study, due in part to their elusive behaviour and the difficulty of attaching subdermal tags (Gales et al. 2010). However, studies have demonstrated that certain behaviours, such as area-restricted search (ARS) behaviour (which often indicates foraging) in blue whales (*Balaenoptera musculus*), increase near seamounts, upwelling systems, and in middle latitudes; thus, linking migratory species' behaviour to specific features that can be protected using area-based management measures (Clark et al. 2010; Lesage et al. 2017; Möller et al. 2020; Silva et al. 2013). Notably, tracking data have been used to underpin the designation of EBSAs under the Convention on Biological Diversity (CBD); and of 200 potential sites meeting CBD criteria in 2014, around 80% of these relied on marine migratory species data (Kot et al. 2014).

The large number of remote tracking studies on seabirds make them one of the best-known groups of marine animals in terms of at-sea distribution and habitat use. Approximately 40% of all seabird species globally have been the target of a tracking study and from these species about 60% have been studied from more than one colony (Birdlife International 2016b). Many species have also been studied for long periods of time - up to 20 years (e.g., Dias et al. 2011; Wakefield et al. 2015; Weimerskirch et al. 2014) - revealing patterns of spatial consistency in site use that justify the identification of stable 'hotspots', and thus the implementation of site-based conservation measures (Lascelles et al. 2012; Lascelles et al. 2016). Additionally, as apex predators, seabirds are established indicators of pelagic biodiversity and ecosystem health (Croxall et al. 2012; Einoder 2009; Furness and Camphuysen 1997; Harding et al. 2006; Mallory et al. 2006; Ronconi et al. 2012; Thompson et al. 2012; Weimerskirch et al. 2003).

Due to the advances of tracking technology in data quality and quantity over the last decades, tracking data of mobile marine species are now recognized as a key tool for the identification of, e.g., Important Bird and Biodiversity Areas - IBAs (e.g., Dias et al. 2017; Lascelles et al. 2016; Soanes et al. 2016). Based on robust, standardised scientific criteria, marine IBAs have been extensively used to inform MPA designation and marine spatial planning processes around the world (e.g., Augé et al. 2015; Lascelles et al. 2012) and have formed the backbone of marine Special Protection Areas (SPAs) for birds across the EU, and the MPAs of many OSPAR Contracting Parties (Kukkala et al. 2016; Lascelles et al. 2016; Ramirez et al. 2017). Marine IBAs can also be important areas for other species and habitats: the current IBA network, delineated for seabirds, overlaps with the global distributions of approximately 80-100% of all cartilaginous fish, corals, lobsters, mangroves, seagrasses, and marine bony fish. Of particular relevance to the nomination proforma, this demonstrates the role of seabirds as ‘umbrella species’ indicating a highly productive marine ecosystem supporting many for other taxa and thus of great ecological significance (Butchart et al. 2015; Kukkala et al. 2016).

At the OSPAR Ministerial Meeting in 2021, a new high seas MPA was designated primarily for the protection of seabird species. The North Atlantic Current and Evlanov Sea basin (NACES) MPA is an important transition zone where large oceanic gyres meet, resulting in upwelling nutrients and mixing of water masses, and with mesoscale eddies that concentrate mesopelagic fish, cephalopods and other micronekton, making it an area where biodiversity is often high. It covers nearly 600,000 km^2 and protects a vitally important area for seabirds. Based on tracking data, the Site was found to be an important feeding and foraging area and is used both by seabirds breeding on the coasts of the North-East Atlantic, and by those migrating across the globe or nesting in other parts of the world. Specifically, the Site is an important foraging ground for the OSPAR listed species blacklegged kittiwake, thick-billed murre, and Audubon’s shearwater. At the same time as the Ministerial Meeting in 2021, the OSPAR Commission agreed a Roadmap for further development of the MPA (OSPAR Agreement 2021-08) to widen the conservation objectives to apply to species and habitats located through the water column down to the seabed, and thus include a range of other OSPAR-listed and ecologically important species and habitats for consideration, in addition to seabirds.

This nomination proforma for the NACES MPA considers information on all species and habitats (including biogenic habitats) listed by OSPAR as Threatened and/or Declining or considered as important. These are reviewed in Chapter B - blue whale (*Balaenoptera musculus*), leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), bluefin tuna (*Thunnus thynnus*), basking shark (*Cetorhinus maximus*), coral gardens, deep-sea sponge aggregations, and seamounts. Other species of interest include more cetaceans (whales and dolphins), other marine turtles, cephalopods (squids and octopuses), eel species (e.g., European eel, *Anguilla anguilla*), elasmobranchs (e.g., sharks, rays and skates), gelatinous zooplankton (e.g., medusae, tunicates, salps), other pelagic fish (e.g., bigeye tuna, *Thunnus obesus*; ocean sunfish, *Mola mola*), mesopelagic fish (e.g., bristlemouths and lantern fish) and micro- and mesozooplankton species. Other habitats of interest include abyssal hills and plains, escarpments, fracture zones, knolls, pillow lava, ridges, and the Northwest Atlantic Mid-Ocean Channel (also referred to as the Northwest Atlantic Mid-Ocean Canyon; Heezen et al. 1969) (NAMOC). Coral gardens and deep-sea sponge aggregations are likely to occur in the Site, based on expert opinion and predictive models (**Table 3**). Notably, the proforma provides information on key ecological processes supporting the integrity of marine ecosystems from the surface to the seafloor. A large body of scientific research explicitly links upper-ocean properties and dynamics to the ecology and biogeochemistry at the seafloor, which can underpin a strong *a priori* case for surface to seabed protection within MPAs based on a precautionary approach (O’Leary and Roberts 2018).

Summary of Methodology & Results underpinning the nomination

Seabirds

The scientific case underpinning the identification of the NACES MPA as important to seabirds is based on analysis of seabird tracking data. Analysing seabird tracking data is a recognized tool for the identification of marine Important Bird and Biodiversity Areas, in this case the method published in Lascelles et al. (2016) has been used. This approach for identifying Important Bird and Biodiversity Areas (IBAs) has been widely applied globally (e.g., Dias et al. 2017; Soanes et al. 2016).

Remote tracking data allows for observations of the movement of individual seabirds in vast and remote areas where it is unfeasible to directly observe animals through constant effort, e.g., through ship-based surveys. It is never possible to track all seabirds at a colony, and so representativeness of the data needs to be evaluated to enable inferences to be made at the population level (Lindberg and Walker 2007). Only representative samples were used in this analysis, in line with the IBA approach (Lascelles at al. 2016).

Data and analytical approaches were discussed and agreed at a scientific workshop held in Reykjavik in June 2016 where BirdLife International sought collaboration with marine scientists working with Atlantic seabirds and other taxonomic groups across the region (**Annex 1**). This included the sharing and compilation of tracking datasets for 23 species collected from 105 colonies, corresponding to 2,188 tracked seabird individuals - the first time this quantity of data had been brought together in any fora. The analysis used all available seabird tracking data that overlapped with the OSPAR maritime area (as identified with tracking data, including birds breeding in the South Atlantic). The data used in the analysis underpinning the nomination are available in the BirdLife Seabird Tracking Database[1] by request to the data owners.

Broadly, the analytical approach followed two key steps: 1) identify IBAs for each individual species following standardized procedures (Dias et al. 2017; Lascelles et al. 2016), and 2) combine the layers for individual species to identify the areas of highest overall density of seabirds and species richness. A full description of the methodology is included in Annex 3, and a summary of the analytical steps are as follows:

a) The 'core-use area' (an area of intensive or most concentrated use) of each individual bird during a single breeding stage (e.g., incubation, winter) was identified using kernel density analysis (Wood et al. 2000) and selecting a threshold of 50% utilization distribution (e.g., Ramirez et al. 2008; Soanes et al. 2016); **Figures A4.1-1 - A4.1-21**.

b) The 'core-use areas' of individual birds were then overlapped to identify areas of higher concentration of birds from the same region or Large Marine Ecosystem (LMEs[2]). The number of birds using each grid cell (resolution = 0.2°) was then estimated based on the percentage of birds from each LME using the cell multiplied by the number of birds breeding in each LME (**Annex 4**, **Figures A4.2-1 - A4.2-21**). These analyses were conducted separately for each year-quarter (based on the life cycle of each individual population, and information provided by researchers).

c) Species maps were combined to produce: i) richness maps based on presence/absence (1/0), with OSPAR listed threatened and/or declining species and other threatened species given a higher weighting (3 and 2 respectively) and ii) overall density maps (i.e., density of all species combined). Both the richness and density maps were then combined for the final map (detailed methods described in **Annex 3**; see maps in **Annex 4.3.**).

d) A boundary around the most important area for seabirds in the OSPAR ABNJ areas was then drawn around the 15% highest values (based on density and richness). The 15% value was selected because it provided good coverage of the Black-legged kittiwakes - an OSPAR listed seabird species recently uplisted to Vulnerable (International Union for Conservation of Nature (IUCN) Red List) due to rapid population declines (BirdLife International 2018), and also encompassed the Northwest Corner and several seamounts.

e) This boundary was then smoothed and simplified (Ramirez et al. 2008) following advice from OSPAR Heads of Delegation to exclude areas of overlap with extended continental shelf claims, and to aim for a simple shape that can support effective delivery of management outcomes. All IBA and OSPAR MPA criteria were checked against the final delineation.

f) It was also tested if including additional data for more individuals would alter the location of the IBA. Additional data was provided by SeaTrack on Black-legged Kittiwakes (details in **Table A3.4**). There were

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[1] http://www.seabirdtracking.org

[2] http://www.lme.noaa.gov

no discernible differences in location, but the additional data did increase the estimates for the number of birds using the area, further confirming the importance of this area for Black-legged Kittiwakes.

The area with the highest abundance of seabirds and highest species richness forms the basis of the MPA. Seabird tracking data demonstrate 22 seabird species using the MPA (**Table 1**), with an estimated maximum of 2.9 to 5 million seabirds throughout different seasons. The number of birds estimated to be using the Site was extrapolated based on an understanding of the representativeness of the tracked individuals for the population to which they belong, as recommended by leading seabird experts who attended the workshop in 2016 (**Annex 1**). Within Europe, North America, and European Overseas Territories, seabird populations are some of the best studied in the world and the colony population estimates are robust, reducing errors in the extrapolated abundance estimates. The numbers of birds reported as using the Site are estimates based on best available scientific knowledge and the uncertainty is reflected in the range provided: maximum of 2.9 to 5 million seabirds (**Table 2**). Even within this margin of error, there is certainty that there are considerable numbers of seabirds regularly using the Site.

The identified Site qualifies as a globally Important Bird and Biodiversity Area. The complex oceanography of the Site creates higher primary productivity and concentrations of zooplankton and biomass that are likely to support the high levels of biodiversity and abundance of the Site. Species underpinning the nomination included OSPAR listed Threatened and /or Declining species (black-legged kittiwake *Rissa tridactyla*, thick-billed murre *Uria lomvia* and Audubon's shearwater *Puffinus lherminieri baroli*), as well as seabirds that are globally and regionally threatened (International Union for Conservation of Nature - IUCN Red List) and/or listed in the Convention on Migratory Species (CMS), the African Eurasian Waterbird Agreement (AEWA) and the EU Birds Directive.

Remote tracking enables behaviours to be inferred (Buchin et al. 2010) and there has been considerable effort in interpreting and validating foraging behaviour (e.g., Weimerskirch et al. 2005; Knell and Codling 2012; Bicknell et al. 2016; Bennison et al. 2018), which has led to major advances in the understanding of species' ecology (Nathan et al. 2008). Foraging sites are considered for the management and protection of seabird species (Lascelles et al. 2016) and tracking data have been widely used to inform conservation policy and management, including identifying MPAs (reviewed in Hays et al. 2019).

Seabird foraging at the Site has been identified via kernel density estimates and First Passage Time Analysis, widely considered the best approach for determining foraging behaviour (e.g., Bennison et al. 2018). Importantly the results show that birds from different colonies congregate in this area (e.g., black-legged kittiwakes coming from Norway, Iceland, UK, Faroe, Denmark; thick-billed murres from Canada, Greenland, Iceland; Atlantic puffins from Iceland, UK, Ireland, and long-tailed jaeger from Greenland, Norway, Sweden). Many of the seabirds using the Site are flying considerable distances, which is an energetically costly behaviour that they simply would not undertake if the benefit of resources (food) at the Site was not higher than the cost of traveling to the Site. The scientific case of the Site being an important stopover area for refuelling during migration and/or a wintering area has furthermore been confirmed by several, independent studies conducted by different teams of researchers working with various seabird species of the Atlantic (see references in **Annex 6**). Such studies have revealed that seabirds use this area to take advantage of the abundance of mesopelagic fishes and squids as an important and abundant food resource (Dias et al. 2012). The overall level of uncertainty around the conclusion that the Site is important for large numbers of foraging seabirds can be considered low, given the very large sample sizes (unique in this type of analysis), a robust and recognised approach, and expert elicitation.

Notably, the findings of the tracking data analysis underpinning the proposal were validated on an independent dataset, collected *in-situ* during a multi-disciplinary cruise carried out between 6th June to 2nd July 2017, under the auspices of the UK Natural Environment Research Council (NERC) - Cruise DY080 -

Distribution and Ecology of Seabirds in the Sub-Polar Frontal Zone of the Northwest Atlantic (**Annex 5**). Seabird foraging at the Site has been verified by single species studies (**Annex 6**).

Pelagic mobile species

The scientific case underpinning the identification of the NACES MPA as important to pelagic mobile species is based on a combination of *in-situ* studies, dispersion models with observed recruitment, and tracking data.

Fennell and Rose (2015) conducted the first major study of the Deep Scattering Layer (DSL - a horizontal zone of micronekton, which are smaller pelagic organisms usually between 2-10 cm in length) in and around NACES on *RV Celtic Explorer* cruises from Ireland to the Grand Banks in the springs of 2012, 2013 and 2014. The centre of an eddy feature within NACES, west of the Evlanov Seamount, was recorded, and other centres near the NACES boundary. During 2013 and 2014, a total of 8 fishing sets were carried out during daylight hours using a trawl with a small mesh liner. The catches contained jellyfish, decapods, cephalopods, and mesopelagic fish. Notably, this study used an echo sounder at 38 kHz, and in 2014 recorded among the highest DSL densities worldwide (<7,000 m^2 nautical $mile^{-2}$), demonstrating the Site as a global hotspot for mesopelagic fish. These higher densities were found to be related to warm temperatures, positive sea anomalies, and a positive North Atlantic Oscillation.

Another set of *RV Celtic Explorer* cruises were conducted in the springs of 2015 and 2016 with a focus on sampling within western Atlantic eddies. Taite et al. (2020) determined the occurrence of paralarval cephalopods at differing depths in the DSL within warm-core mesoscale eddies in and around NACES from cruise data collected in 2015 and 2016. The cephalopods were captured using a vertically-deployed ringnet and a trawl with a graded mesh. There were a total of 31 tows in 2015, and 21 tows in 2016, across various stations in NACES. The sampling yielded a total of 26 species across 15 families (**Annex 9**). The number of cephalopod specimens captured per tow were higher inside the eddy (>24 per tow) compared to outside the eddy (>10 per tow). Not only does this study show that warm-core eddies help to concentrate cephalopods, but it also found that several tropical species located in the NACES Site were at their northernmost ranges and outside their previously known distributions.

During the same cruises in 2015 and 2016, Devine et al. (2021) used a herring trawl with a mesh cod-end liner; and a total of 17 trawls were conducted within NACES. The sampling yielded 4,660 fish specimens, representing at least 101 species across 35 families (**Annex 10**). The Myctophidae (lanternfish) and Stomiidae (barbeled dragonfishes) comprised >50% of the total catch. The assemblages showed distinct differences inside and outside the warm-core eddies sampled; and the majority of taxa were only captured inside the eddies. These results confirmed the area as a mesopelagic fish hotspot.

Wieczorek et al. (2018) also conducted 8 trawls in and around NACES and captured 280 fish, 233 of which were examined for the presence of microplastics in the gut. Overall, 73% of examined fish contained plastics in their stomachs, mainly methyl cellulose and polyethylene; and water samples were also taken at ca. 3 m depth, showing 14 microplastic fragments per 100 litres of water, mainly composed of polyethylene fibres.

For the April 2015 cruise; Haberlin (2018) sampled meso-zooplankton, including gelatinous zooplankton, across 6 stations located in NACES (stations 9-14). A total of 54 zooplankton taxa were identified from samples taken across a warm-core eddy, including 41 gelatinous species and 25 siphonophores (**Annex 11**). Multinet samples yielded 31 zooplankton taxa with densities of 0-1,677 individuals per 1,000 m^3 (excluding the highly abundant appendicularians). The mean gelatinous abundance across all depths and stations was 456 $\pm$ 410 individuals per 1,000 m^3. The dominant species was often *Salpa fusiformis*. A scaled ordination of the community assemblage indicated two clusters of samples (9-10) and (11-13), and an ANOSIM (analysis of similarity) test showed the communities between stations were significant outside and inside the eddy. Larger zooplankton species such as *Phronima* spp., euphausiids and hyperiids tended to be found inside the eddy. Temperature, current velocity, and turbidity were the most influential variables on these patterns, based on a multivariate analysis statistical test (ADONIS). Trawl nets captured 21 species, which were all jellyfish taxa, except for *Phronima* spp., which were observed in empty salp bodies. The trawled species were not standardised and remained as simple counts. Plankton nets captured at least 24 macro-zooplankton species, mainly siphonophores and hydromedusae. *Salpa fusiformis*, *Phialopsis diagenesis* and *Beroe* species tended to be located outside the eddy core and *Rhopalonema velatum* was more abundant inside the eddy core. These data were recorded across all sample stations in NACES; however, given the limited sampling effort here, these are likely to be underestimates for the Site. The study showed there was a 12-fold decrease in the abundance of gelatinous zooplankton species inside a warm-core eddy compared to outside, suggesting these species may aggregate on the edges of eddy features rather than the cores.

As part of the North Atlantic Aerosols and Marine Ecosystems Study (NAAMES) program, Della Penna and Gaube (2019, 2020) characterised several eddy features located within NACES in November 2015 (NAAMES 1), May 2016 (NAAMES 2), September 2017 (NAAMES 3), and March/April 2018 (NAAMES 4). These included eddy features with cyclonic and anticyclonic polarities, with both strong and weak retention inside cores and on the periphery (Della Penna and Gaube 2019). Micronekton tows were conducted within NACES across 4 stations in May 2016 in an anticyclonic eddy, and across 3 stations in September 2017 (1 in mode-water, 1 in cyclone eddy, 1 outside the eddy). The sampling yielded a total of at least 28 identified species, as well as multiple species of jellyfish, chaetognaths (predatory worms) halocyprids (ostracods), euphausiids (krill) and juvenile myctophid fish (**Annex 12**). Fish included those in the family Sternoptychidae (hatchetfishes), Stomiidae (dragonfish) and Gonostomatidae (bristlemouths), as well as amphipods and planktonic radiolarians. Several micronekton species occurred in eddy stations in NACES (e.g., NAAMES 3, Station 4; -39.129 N, 48.638 W) with strong retention (retentive surface of 12,200 km^2) (Della Penna and Gaube 2020). The findings of this study were consistent with those of Fennell and Rose (2015) and confirmed that eddies likely isolate mesopelagic communities from those in ambient waters. These results also confirm findings in Judkins and Haedrich (2018) for the 140 species found in the Northwest Atlantic Subarctic region tows, several of which took place in NACES between 1963 and 1974.

Another study output from the NAAMES program includes Morison et al. (2019), which involved sampling microzooplankton at a station located in NACES (Station 4; 47.355 N, -38.313 W) in May 2016. Water was sampled within the first 5 m of the water column and microzooplanton were enumerated. The major taxa were dinoflagellates and ciliates, and the initial concentration was 3,590 cells per litre. Microzooplanton contained equal proportions of dinoflagellates (48%), mostly *Gymnodinium* spp. and *Gyrodinium* spp., and ciliates (52%), mostly *Lohmaniella oviformis* (44%) (**Annex 13**). The initial abundance was low compared to global measurements in Irigoien et al. (2004, 2005) but increased over time, with ciliates *Strobilidium* spp. and *Strombidium* spp. appearing later. Morison et al. (2020) sampled 4 stations, 3 of which were north of NACES and 1 of which was within NACES (station 4). The samples collected within NACES displayed by far the most diverse mesozooplankton assemblages, which were dominated by small copepods such as *Paracalanus* spp., and also included *C. finmarchicus*, *Metridia lucens*, *Pseudocalanus* spp., *Pleuromamma* sp. and unidentified copepodites, as well as other mesozooplanton (**Annex 13**). This may explain in part the convergence of various taxa that feed on these zooplankton in the NACES area (whales and mesopelagic fish) and predators of mesopelagic fish such as seabirds and sharks. These results reveal a decoupling of mesozooplankton predator-prey dynamics, which lead to pulses of biomass accumulation, that may then lead on to a patchiness in the North Atlantic spring bloom.

The efforts of Haberlin (2018), Wieczorek et al. (2018), Taite et al. (2020), Devine et al. (2021), Della Penna and Gaube (2019, 2020) and Morison et al. (2019, 2020) validate both the oceanographic and biological observations made by Fennell and Rose (2015) and highlight the NACES area as unique within the North

Atlantic; but possibly also, with respect to the dense DSLs recorded, globally. Notably, several of the eddy locations mentioned in this study coincide with locations/routes of OSPAR-listed species shown to occur in the Site from tracking data.

In addition to *in situ* studies, there are dispersion models that include observed recruitment. Baltazar-Soares et al. (2014) used a high-resolution ocean model to study the effect of mesoscale currents on European eel (*Anguilla anguilla*) leptocephali (eel larvae) dispersal from 1960 to 2005, estimated yearly. They correlated predicted recruitment from ocean dispersal models with observed recruitment. The model displayed a realistic simulation with strong predictive power on the annual fluctuations of observed eel recruitment. The NACES Site was found to be an important part of the trajectory of eel larvae from Sargasso Sea spawning grounds through the OSPAR Maritime Area and onwards to European continental waters.

Furthermore, as would be expected at a mesopelagic fish hotspot with high primary productivity, a diversity of pelagic mobile marine species including cetaceans, marine reptiles, tuna, and oceanic sharks, occur in the Site, and for some it represents a critical node in their ranges and migrations. Methods for determining this come from a combination of observations (e.g., cruise sightings of cetaceans and turtles), telemetry data, and OBIS records (often based on human observation and telemetry). Tracking studies overall provide strong results to underpin this nomination, for example, long-range horizontal movements of blue whale (*Balaenoptera musculus*), sei whale (*B. borealis*), fin whale (*Balaenoptera physalus*), leatherback turtles (*Dermochelys coriacea*), Atlantic bluefin tuna (*Thunnus thynnus)* and basking shark (*Cetorhinus maximus*).

Cetaceans

Kernel density maps for sei whale (*Balaenoptera borealis*) (**Annex 6**) based on a limited sample of telemetry data drawn from the Azores (Prieto et al. 2014) and Labrador (Olsen et al. 2009) provide evidence of the importance of a migratory corridor for this species. The data suggest the Site is a critical point for sei whale in 'part of a complex migration process that can involve longitudinal movements between the two sides of the ocean basin in addition to expected latitudinal movements' (Prieto et al. 2014). These and other data were further explored by Pérez-Jorge et al. (2020), which used tracking and modelling to show blue, fin, and sei whales all passing through the Site, with whales migrating towards more productive areas in northerly latitudes, being constrained by water depth and eddy kinetic energy. Notably, the findings from these tracking data have been verified by *in-situ* data during the DY080 cruise, during which 37 fin whales, 5 humpback whales, 3 blue whales, and a sei whale were sighted (as well as 16 other unidentified whales within these species; **Table 4**). Tracking data also confirmed the presence of West Greenland harbour porpoises (*Phocoena phocoena*) moving offshore, and at least one individual even as far as into NACES, with individuals diving deep enough to feed on mesopelagic fish (Nielsen et al. 2018).

Marine turtles

Ocean Biodiversity Information System (OBIS[3]) records show 5 marine turtle species have entered the NACES Site: the IUCN Red List Globally Vulnerable (VU) loggerhead turtle (*Caretta caretta*), Endangered (EN) green turtle (*Chelonia mydas*), Vulnerable (VU) leatherback turtle (*Dermochelys coriacea*), Critically Endangered (CR) hawksbill turtle (*Eretmochelys imbricata*) and Critically Endangered (CR) Kemp's ridley turtle (*Lepidochelys kempii*) (**Annex 8**). Several of the OSPAR-listed loggerheads in these records were tracked and shown within the Site between 2003-2016, mainly juveniles and male subadults. Hays et al. (2004) used Satellite Relay Data Loggers (SDLRs) and the location of transmitters were determined using the Argos system. The study recorded wide-ranging, extensive pan-oceanic tracks of leatherbacks, including passage within the Site (**Annex 7**).

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[3] https://obis.org

Atlantic bluefin tuna

Archival tags used by Walli et al. (2009) determined four spatially confined regions for Atlantic bluefin tuna (*Thunnus thynnus*) in the North Atlantic. Combining these data with MiCO tracks suggest the NACES MPA Site represents critical foraging habitat with abundant prey available (**Figure 8**; **Annex 7**). The data also show higher residency (days spent in the area per 10 km^2; **Figure 9**) in and around the Site, with bluefin tuna diving depths closely correlated to the depth of the thermocline (Walli et al. 2009).

Oceanic sharks

Routes taken by basking sharks (*Cetorhinus maximus*) show movements in and around the Site, with Gore et al. (2008) finding sharks making use of the deep-water habitats here (**Figure 10**). Satellite transmitter tracking data also show movements of blue shark, shortfin mako shark, tiger shark, and white shark in or adjacent to the Site (Queiroz et al. 2016; Skomal et al. 2017; **Annex 7**). Blue sharks and mako sharks dive very deep, observed down to 1740 m, and white shark behaviour in the area (within 200 and 600 m water depth) suggest these sharks may be diving into the mesopelagic zone to forage (Skomal et al. 2017), likely due to the high abundance of mesopelagic fish and cephalopods recorded in the NACES Site and nearby waters (Devine et al. 2021; Fennell and Rose 2015; Taite et al. 2020; **Annex 9** and **10**). There are also data that show sharks feeding on cephalopods that live near the seafloor but also vertically migrate each day (Vedor et al. 2021).

The NACES MPA largely overlaps with the proposal for the North-Atlantic Current and mid-Atlantic sub-polar frontal system Ecologically or Biologically Significant marine Area (EBSA). OSPAR's specific recommendation from the Ecological Coherence Assessment report (OSPAR 2013) was to take forward any data collection work within potential EBSAs described in the OSPAR Maritime Area including seamounts, spawning grounds, and pelagic fronts, and areas of high productivity, species richness or high taxonomic diversity, to further the consideration of these areas as potential MPAs in ABNJ. Much of the data and information on these features, some of which have been mentioned, were compiled for the overlapping EBSA description under the Convention on Biological Diversity (CBD) and support the nomination. Notably, the EBSA description focusses on pelagic mobile species, e.g., it refers to tracking studies for blue whales (*Balaenoptera musculus*) and several other species mentioned above as passing through the Site on long migratory movements.

The Census of Marine Life field project MAR-ECO and the ECOMAR programme (Priede et al. 2013) were additional sources of data and information, and today still represent the most comprehensive study of the ecology of the Mid Atlantic Ridge and the CGFZ, but notably those programme study areas do not entirely overlap with the NACES MPA. The NAAMES programme involved several direct samples within the NACES Site. The available evidence from such programmes, publications, and OBIS records, suggests there are high concentrations of many pelagic species, a very dense DSL with a high diversity of mesopelagic fish, concentrations of cephalopods in eddy cores, and other higher trophic predators within NACES (**Annex 8**).

Benthic habitats and demersal fish

The scientific case underpinning the identification of the NACES MPA as important to benthic habitats and demersal fish is based on a combination of *in-situ* studies (e.g., IceDivA2 and multibeam data) and modelling (e.g., geomorphology and seabed lithology).

Data compiled in the seamount assessment show numerous seamounts in the Site boundary, mostly in the Milne Seamount Complex MPA, and also approximately another 15 or so that exist outside the boundary of Milne Seamount Complex MPA but elsewhere within the boundary of the NACES MPA (Harris et al. 2014; Yesson et al. 2011; **Figure 3** and **12**). Maps of predicted bathymetry for the Site are based on the General Bathymetric Chart of the Oceans (GEBCO) 2021 gridded bathymetry and associated products (**Annex 7**). Bathymetric tracks for multibeam data collected by German research expeditions (1995-2021; **Figure 17**), along with the geomorphology model by Harris et al. (2014; **Figure 15**) and sediment lithology model by Dutkiewicz et al. (2015; **Figure 16**) indicate benthic geodiversity and a variety of features of interest within the Site boundary. These include abyssal plains, hills, and basins, as well as escarpments, ridges, knolls, pillow lava (observed in the Mount Doom area which, before IceDivA2, was thought to be an area of abyssal plain), fracture zones (West Thulean Rise and a section of the Charlie-Gibbs Fracture Zone running across the north of the Site); and the Northwest Atlantic Mid-Ocean Channel (**Figure 15**).

Potential areas worthy of further consideration include the Evlanov Seamount itself and the very northern part of the Site, which includes a section of the Charlie-Gibbs Fracture Zone and West-Thulean Rise and a number of seamounts and knolls, including a newly mapped seamount on the northern margin of the area (**Figure 13** and **15**). Ecological connections between the Milne Seamount Cluster MPA and other seamount-associated communities are possible, though data are currently lacking.

During the IceDivA2 (Icelandic marine Animals meet Diversity along latitudinal gradients in the deep sea of the Atlantic 2) expedition the ca. 49.5M-year old caldera within the Site (named 'Mount Doom'), with two smaller structures nearby, was surveyed with multibeam bathymetry (**Figure 13**). The peak of the caldera was located at 2,354 m depth with the base situated at 3,666 m. During the dive from the peak downward, two primary habitats were observed: sedimented plains and steep rock facies. The topography was relatively flat until sharp vertical drops of up to 100 m were reached. Each habitat harboured different fish, such as *Coryphaenoides* spp. and Macrouridae, and benthic communities with high biological diversity (**Figure 18**). The cephalopod *Grimpoteuthis* sp. was observed, and egg cases deposited by a deep-sea skate or shark, which indicate a spawning ground for this species. Notably, deep-sea sponges (**Figure 18)** and soft corals were recorded on Mount Doom and could indicate nearby suitable habitat in the NACES Site too.

These data products are also used as variables to predict suitable cold-water coral habitats in the Site. Highly suitable habitat for reef-building corals and black corals is predicted to occur on all seamounts of the NACES MPA (**Annex 7**). Reef-building corals and black corals are widely considered as one of the top conservation priorities globally. While the predicted reefs inside the NACES MPA are all in quite deep water (>1,500 m), such deep-water reefs are known to be highly biodiverse. Reef-building, deep-water corals and black corals are considered to be indicator species of vulnerable marine ecosystems (VMEs) by several regional fishery management organisations including the NEAFC and the ICCAT. Maps of predicted habitat suitability of reef-building deep-water corals in and around the NACES MPA are already published (Davies and Guinotte 2011) as well as habitat suitability for black corals (Yesson et al. 2016) (**Figures 22** and **23**).

1. Proposed name of MPA

North Atlantic Current and Evlanov Sea basin MPA (NACES MPA)

2. Aim of MPA (conservation objective)

***Conservation* vision[4]:**

Maintenance and, where appropriate, restoration of seabird populations, marine biodiversity and the integrity of the various ecosystems and their functions and processes within the North Atlantic Current and Evlanov Sea basin MPA (NACES MPA).

***Method* to achieve the vision:**

Cooperation between competent authorities, stakeholder participation, scientific progress and public learning are essential prerequisites to realize the vision and to establish a Marine Protected Area at this site subject to adequate regulations, good governance, and sustainable utilization. Long-term research and monitoring provide a detailed understanding of the biodiversity, ecosystem processes and oceanography and any threats to seabirds and to the marine ecosystems of the Site. Best available scientific knowledge and the precautionary principle form the basis for conservation.

***General* conservation objectives[5,6]:**

1. To protect and conserve the seabirds, marine biodiversity, habitats, ecosystems, and their processes and functions of the North Atlantic Current and Evlanov Sea basin MPA.
2. To prevent loss of biodiversity, and promote its recovery where practicable, so as to maintain the natural richness and resilience of the ecosystems and habitats to enable populations of seabirds and other species to maintain or recover natural population densities.
3. To **prevent** degradation of, and damage to, habitats and ecological processes including the bentho-pelagic coupling, nutrient fluxes, and connectivity, in order to maintain the structure and functions of marine ecosystems in the North Atlantic Current and Evlanov Sea basin MPA.
4. To **provide** a refuge for seabirds, to **maintain** migration corridors and freedom of movement for highly migratory and wide-ranging species, and to **protect** seafloor habitats including seamounts and abyssal plains from human activities that would have negative impacts on biodiversity and ecosystems.
5. To **increase** ecological understanding of the ecosystem and inform the effective management of the North Atlantic Current and Evlanov Sea basin MPA.

Specific *conservation* objectives[7]*:*

Pelagic wide-ranging and/or migratory species

a. To maintain or restore populations of pelagic seabirds and other pelagic wide-ranging and/or migratory species, including cetaceans, marine reptiles, cephalopods and fish, particularly globally

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[4] The conservation vision describes a desired long-term conservation condition and function for the ecosystems in the entire MPA. The vision aims to encourage relevant stakeholders to collaborate and contribute to reach objectives set for the area

[5] Conservation objectives are meant to realize the vision. Conservation objectives are related to the entire MPA or, if it is decided to subdivide, for a zone or subdivision of the area, respectively.

[6] It is recognised that climate change may have effects in the area, and that the MPA may serve as a reference site to study these effects

[7] Specific Conservation Objectives shall relate to a particular feature and define the conditions required to satisfy the general conservation objectives. Each of these specific conservation objectives will have to be supported by more management orientated, achievable, measurable and time bound targets

and/or regionally threatened species, using the Site, by preventing, minimizing or mitigating (see **Table 1**):

i. *direct* current and emerging pressures and human activities negatively affecting the seabirds and the other species, including from fisheries (incidental by-catch), disturbance from shipping and extractive activities, and pollution, occurring in the North Atlantic Current and Evlanov Sea basin MPA.

ii. *indirect* current and emerging pressures and human activities negatively affecting the seabirds and other species, including fisheries (prey removal), disturbance from shipping and extractive activities, and pollution, occurring in the North Atlantic Current and Evlanov Sea basin MPA.

b. To conserve (and restore where appropriate) the pelagic ecosystems, including their functions, biodiversity, processes, and trophic linkages, in order to support the resident, visiting and migratory species using the Site see table 1.

c. To prevent deterioration of the environmental quality of the North Atlantic Current and Evlanov Sea basin MPA from levels characteristic of the ambient ecosystems, and where degradation from these levels occur, if applicable, to recover environmental quality to levels characteristic of the ambient ecosystems.

Benthic habitats and species

a. To conserve the seafloor features occurring at the site that are essential to support integrity of functions of the marine ecosystems, namely, abyssal plains, abyssal hills, basins, fracture zones, pillow lava, knolls, and seamounts.

b. To protect, maintain, and restore where appropriate:

i. The benthic organisms and biogenic habitats, including threatened and/or declining species and habitats such as deep-sea sponge aggregations, and coral gardens.

ii. The habitats listed in **Table 1**, including abyssal plain, seamounts and deep-sea elasmobranch spawning grounds.

The list of pelagic and benthic species and habitats considered under the specific conservation objectives is presented in **Table 1** below.

It is recognised that table 1 includes species that are subject to management by relevant international organisations and bodies. Where the OSPAR Commission considers that action is desirable in relation to such a question, it shall draw that question to the attention of the authority or international body competent for that question. The inclusion of such species in this list must be read in this context.

Table 1[8]. List of habitats and resident, visiting and migratory species of ecological significance in NACES MPA. Note that species and habitats that are also included in the OSPAR List of threatened and/or declining species are indicated with an X in the right-hand column. Table ordered alphabetically by the scientific name within taxonomic groups.

Common Name	**Scientific Name**	**Species/habitat listed as threatened and/or declining by OSPAR**
	Seabirds	
Razorbill	*Alca torda*	
Little Auk	*Alle alle*	
Bulwer's Petrel	*Bulweria bulwerii*	
Cory's Shearwater	*Calonectris borealis*	

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[8] This table includes species that are subject to management by relevant international organisations and bodies. Where the OSPAR Commission considers that action is desirable in relation to such a question, it shall draw that question to the attention of the authority or international body competent for that question. The inclusion of such species in this list must be read in this context

Atlantic Puffin	*Fratercula arctica*	
Northern Fulmar	*Fulmarus glacialis*	
Leach's Storm Petrel	*Oceanodroma leucorhoa*	
Bermuda Petrel	*Pterodroma cahow*	
Desertas Petrel	*Pterodroma deserta*	
Zino's Petrel	*Pterodroma madeira*	
Great Shearwater	*Puffinus gravis*	
Sooty Shearwater	*Puffinus griseus*	
Audubon's Shearwater	*Puffinus lherminieri baroli*	**x**[5]
Manx Shearwater	*Puffinus puffinus*	
Black-legged Kittiwake	*Rissa tridactyla*	x
Long-tailed Jaeger	*Stercorarius longicaudus*	
South Polar Skua	*Stercorarius maccormicki*	
Arctic tern	*Sterna paradisaea*	
Great Skua	*Stercorarius skua*	
Common Murre	*Uria aalge*	
Thick-billed Murre	*Uria lomvia*	x
Sabine's gull	*Xema sabini*	
	Cetaceans	
Sei whale	*Balaenoptera borealis*	
Blue whale	*Balaenoptera musculus*	x
Fin whale	*Balaenoptera physalus*	
Short-beaked dolphin	*Delphinus delphis*	
Pilot whale	*Globicephala melas*	
Risso's dolphin	*Grampus griseus*	
Northern Bottlenose Whale	*Hyperoodon ampullatus*	
White-sided dolphin	*Lagenorhynchus acutus*	
Humpback whale	*Megaptera novaeangliae*	
Sperm whale	*Physeter macrocephalus*	
Harbour porpoise	*Phocoena phocoena*	x[6]
Striped dolphin	*Stenella coeruleoalba*	
	Marine reptiles	
Loggerhead turtle	*Caretta caretta*	x
Green sea turtle	*Chelonia mydas*	
Leatherback turtle	*Dermochelys coriacea*	x
Hawksbill turtle	*Eretmochelys imbricata*	
Kemp's Ridley	*Lepidochelys kempii*	
	Fish	
Thorny Skate	*Amblyraja radiata*	
European eel	*Anguilla anguilla*	x[7]
American Eel	*Anguilla rostrata*	
Basking shark	*Cetorhinus maximus*	x
Grenadiers	*Coryphaenoides* spp.	
Atlantic Cod[8]	*Gadus morhua*	
Shortfin mako shark	*Isurus oxyrinchus*	
Mesopelagic fish (>100 species)	Full list of species of mesopelagic fish available in **Annex 10**	
Ocean Sunfish	*Mola mola*	
Blue shark	*Prionace glauca*	
Scalloped Hammerhead	*Sphyrna lewini*	
Bigeye Tuna	*Thunnus obesus*	
Bluefin tuna	*Thunnus thynnus*	x
	Cephalopods	

Paralarval cephalopods (>25 species)	Full list of cephalopod species available in **Annex 9**	
Dumbo octopus	*Grimpoteuthis* sp.	
Atlantic gonate squid	*Gonatus steenstrupi*	
Atlantic cranch squid	*Teuthowenia megalops*	
Habitats		
Abyssal plains		
Abyssal hills		
Basins		
Coral gardens		x
Deep-sea elasmobranch spawning grounds		
Deep-sea sponge aggregations		x
Escarpments		
Fracture zones		
Knolls		
Northwest Atlantic Mid-Ocean Channel		
Pillow lava		
Ridges		
Seamounts		x

3. Status of the location

The NACES MPA has been designed to be located beyond the limits of national jurisdiction of the coastal states in the OSPAR Maritime Area and outside the areas of extended continental shelf claim submissions.

The international legal regime that is applicable to the Site is comprised of, inter alia, the United Nations Convention on the Law of the Sea (UNCLOS), the OSPAR Convention, the North East Atlantic Fisheries Commission, the International Commission for the Conservation of Atlantic Tunas, International Seabed Authority, International Maritime Organisation (IMO), conventions and other rules of international law. This regime contains, among other things, rights and obligations for states on the utilization, protection and preservation of the marine environment and the utilization and conservation of marine living resources and biodiversity as well as specifications of the competence of relevant international organizations.

4. Marine region

The site is within the OSPAR Region V; Wider Atlantic.

5. Biogeographic region

The Site is located at the dynamic interface between three different biogeographic provinces. Under Dinter's (2001) classification of pelagic biogeography this includes the cool temperate waters province, the warm temperate waters and the cold Arctic waters and the Atlantic (Deep Sea) and North Atlantic Abyssal Province.

In Spalding et al. (2012) the 'Pelagic Provinces of the World' classification identifies the Site as straddling the North Central Atlantic Province, The North Atlantic Current Province and the Subarctic Atlantic. The region falls within the Northern Coldwater Realm (North Atlantic Gyre), and the Atlantic Warm-water Realm (Western boundary).

Using Longhurst (2010) biogeographical provinces the Site is at the meeting point of the North Atlantic Drift Province, the Atlantic Arctic Province, the Gulf Stream Province and bordering the NW Atlantic Shelves Province.

Recent efforts to understand the benthic biogeography at the Site suggests that the NACES MPA is located in the 'Boreal Northwest Atlantic' (previously Northern Atlantic Boreal, BY2, in Watling et al. 2013) as defined by Watling et al. (2022). Costello et al. (2017) found 12 offshore deep-sea realms (the Site would be located in Realm 18, 'Offshore & NW Atlantic'); however, the study was two-dimensional and did not distinguish between faunas through the water column in bathyal, abyssal, and hadal depths.

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6. Location

The coordinates of the Site are 41 N-53˚ N, 32˚ W-42˚ W and fully detailed in **Annex 2**.

The Site is located within the area beyond national jurisdiction within the OSPAR Maritime Area (**Figure 1**).

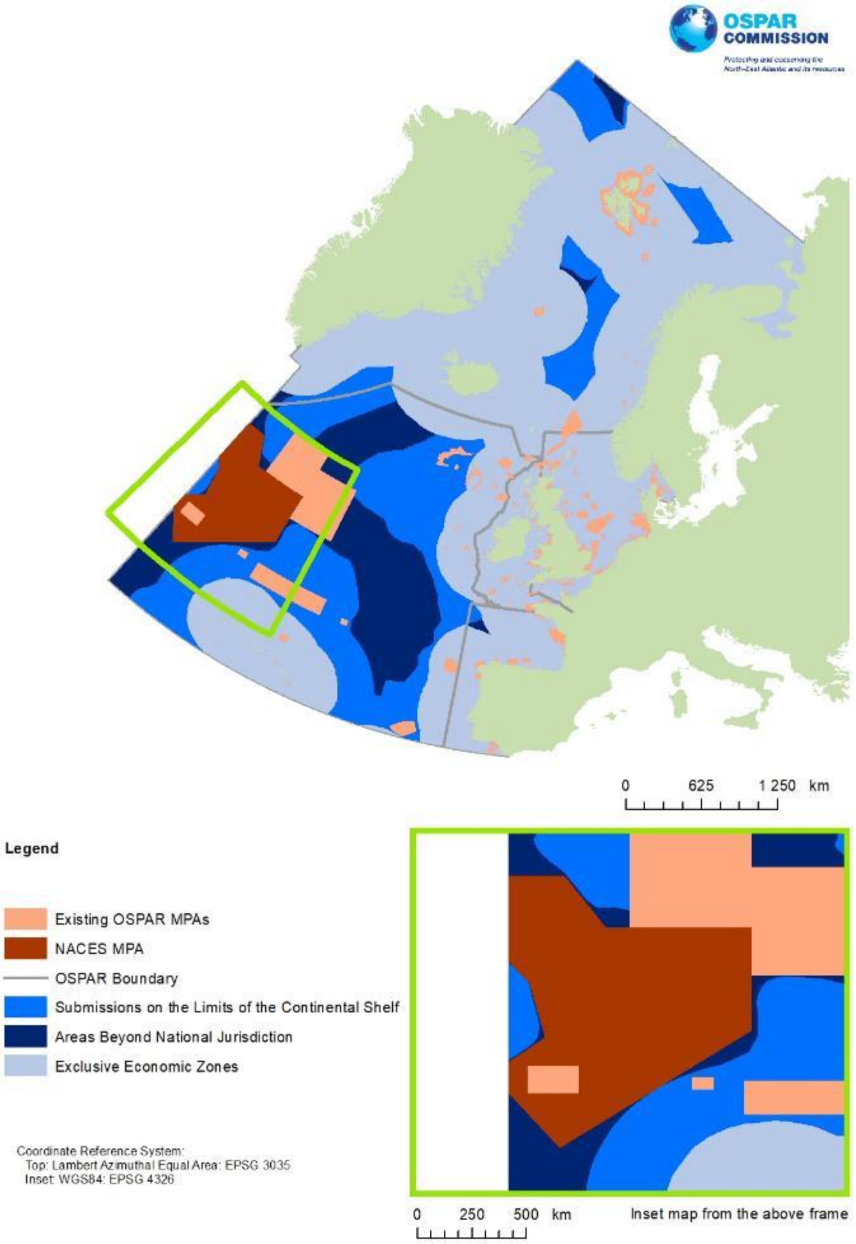

Figure ***1****. Location of the Site within the OSPAR ABNJ and the existing network of OSPAR MPAs.*

7. Size

The NACES MPA covers 595 196 km^2.

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8. Characteristics of the area

This section of the nomination proforma provides a general description of the Site. It provides information about features of direct relevance to the conservation objective as well as providing a broader context of the area where these habitats and features occur, and of habitat use by the species (bathymetry, oceanography, biodiversity, bentho-pelagic coupling).

Bathymetry

The Site is bounded in the north by the Charlie-Gibbs Fracture Zone, to the west by the Flemish Cap and the Grand Banks of Newfoundland, to the east by the Mid-Atlantic Ridge and to the south by the Azores (**Figure 1**).

The Site includes the Northwest Atlantic Mid-Ocean Channel, a depositional-erosional feature that extends from the Labrador Sea to the Sohm Abyssal Plain (Heezen et al. 1969; Hesse et al. 1987). In the south-west the area is characterised by an abyssal plain, >4,000 m deep. To the north and east the area shoals towards the CGFZ and Mid-Atlantic Ridge. Here the bathymetry is more complex, with narrow canyons and seamounts but also escarpments and fracture zones (**Figure 2**).

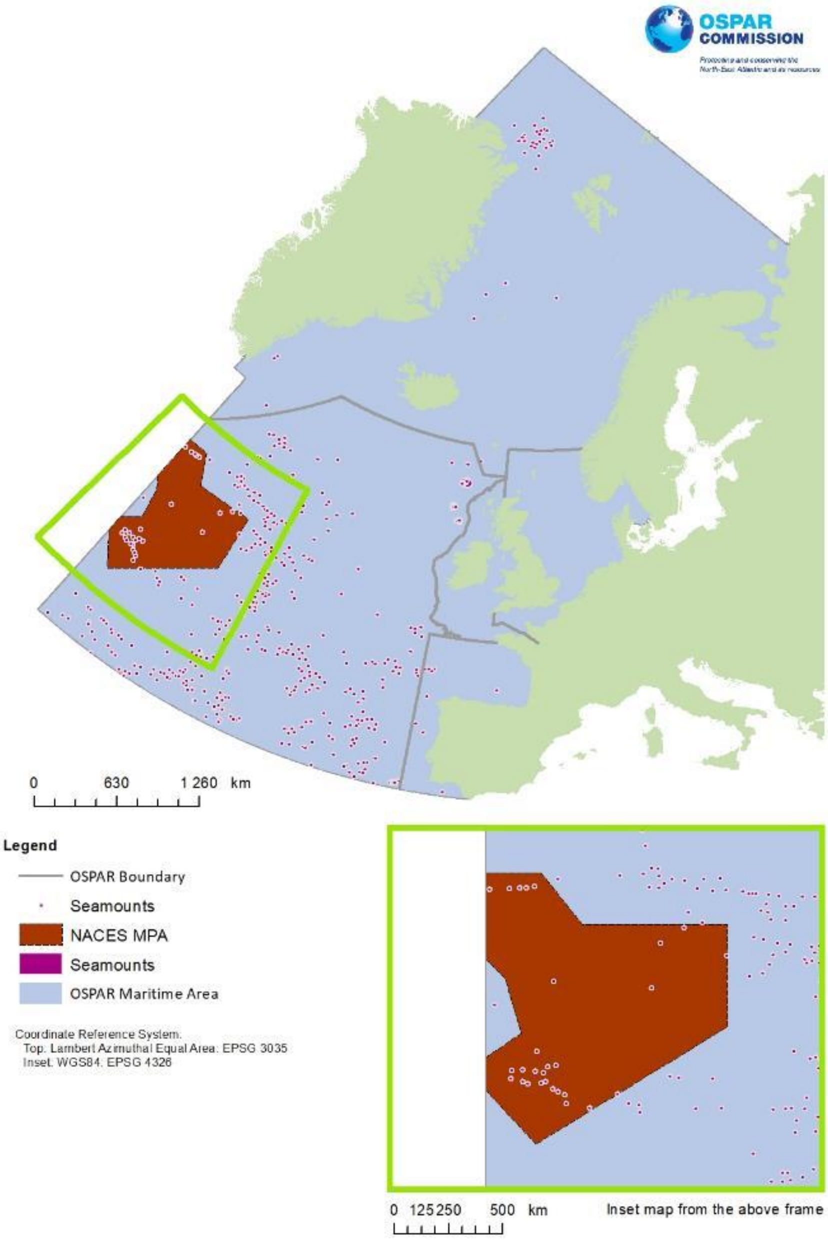

Figure 2. *Map of the NACES MPA including location of known bathymetric features (seamounts). This is based on the definition of seamounts in Kim and Wessel (2011), which includes 18 volcanic constructs <1,000 m; however, the OSPAR 2008-07 definition deems seamounts as >1,000 m, so several 'seamount' points on this map are defined as knolls elsewhere in the proforma - both are ecologically-similar structures.*

There are at least 30 seamounts (defined as a seamount where the feature's crest rises >1,000 m above the seafloor as in OSPAR Agreement 2008-07, and defined as a knoll when <1,000 m high – both are ecologically similar) within the NACES MPA boundary, including the Evlanov Seamount near the centre of the Site (Harris et al. 2014; Kim and Wessel 2011; Morato et al. 2016), the Milne Seamount Complex to the southwest corner of the Site (**Figure 3**) and the Mount Doom seamount in the northwest of the Site (**Figure 13**).

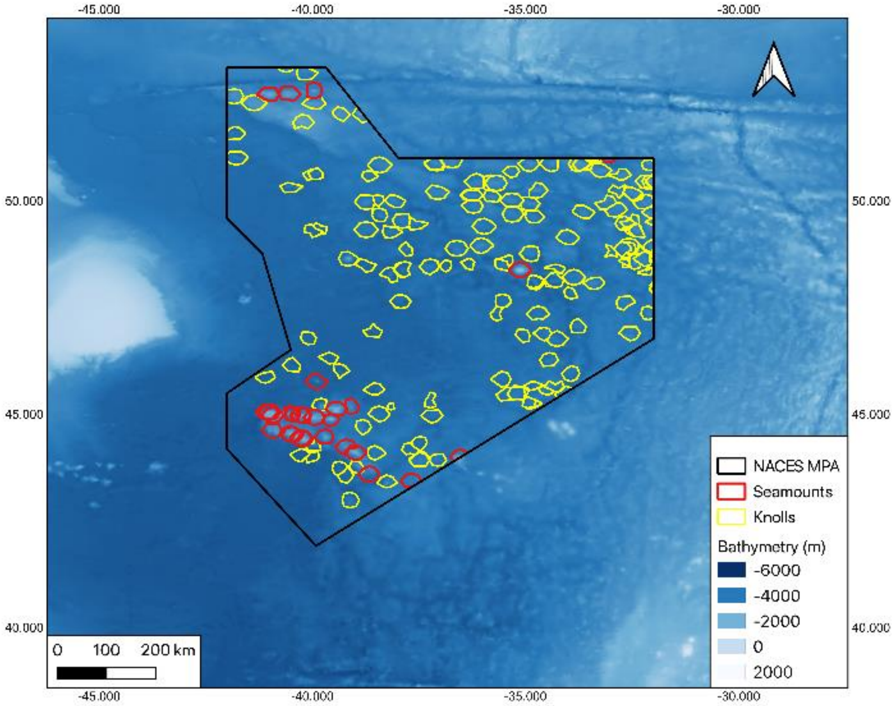

Figure 3. *Seamounts >1,000 m high (red) and knolls <1,000 m high (yellow) base areas (Yesson et al. 2011) in the Site. Background relief: GEBCO (2022). This map excludes the recently discovered Mount Doom.*

Oceanography

The NACES MPA encompasses a globally unique location; a region of year-round vigorous horizontal and vertical mixing where waters from the tropical/subtropical Atlantic encounter water from the subpolar Atlantic and from the Arctic Ocean, promoting enhanced primary productivity and diversity (**Figure 4**, and see **Annex 7** for maps of ocean climatology compiled for the EBSA description of Area 14).

The area is dominated by the formation zone of the North Atlantic Current (NAC), which grows out of the Gulf Stream extension. In this location, the Gulf Stream has carried warm tropical water to a higher latitude than any other western boundary current (Rossby 1996). After travelling along the eastern edge of the Grand Banks, the Gulf Stream turns eastwards at the 'North West Corner' (Dutkiewicz et al. 2001; Lazier 1994) and spreads into the broad frontal zone of the NAC.

The NAC is a transition zone and also part of the cold subpolar gyre (large-scale wind-driven cyclonic recirculation north of 47°N) and the warm, saline, and nutrient-depleted anticyclonic subtropical gyre to the south. It has a wide banded structure with distinct water types that get progressively cooler and fresher from south to north separated by the three branches and their density fronts. The fronts are associated with vigorous vertical velocities (bringing nutrients to the surface) and some horizontal exchange, especially southward from the subpolar region (Dutkiewicz et al. 2001). Density contrasts across the fronts lead to instability and the development of eddies (Volkov 2005). Regions of intense mesoscale activity such as eddies, and especially extensive frontal zones, have been identified along the NAC, including the area associated with the Charlie Gibbs Fracture Zone (Miller et al. 2013). Eddy centres have been recorded west of the Evlanov Seamount in 2012, 2013 and 2014, and the proximity of these centres corresponded to higher peaks in the Deep Scattering Layer (DSL) within the Site, found to be one of the densest recorded worldwide for 2014 (Fennell and Rose 2015). Della Penna and Gaube (2019, 2020) also reported on an eddy core feature within NACES displaying strong retention and a retentive surface of 8,500 km^2, and an eddy periphery with a retentive surface of 12,200 km^2. Eddies may enhance and concentrate primary production and therefore represent an important habitat for oceanic higher predators such as seabirds (Bost et al. 2009; Fennel and

Rose 2015; Godø et al. 2012; Haney 1986; Oschlies and Garcon 1998). The combination of localised high intensity mixing in the eddies results in patchy, but high surface productivity at fine scales (Vecchione et al. 2015). South of 52° N the eastward-flowing eddies ranging over the MPA potentially act as temporary barriers for dispersal of plankton and other pelagic fauna, and restricting their movement, and that of their associated predators, out of this zone (Priede et al. 2013; Vecchione et al. 2015). Notably, eddy features sampled within NACES were found to contain different mesopelagic communities inside the eddies than outside in ambient waters, supporting the hypothesis that these eddies restrict pelagic fauna (Della Penna and Gaube 2020).

The situation of the Site between two gyres, similar to the Kuroshio-Oyashio system in the North Pacific, means gyre expansion may impact bottom waters. This expansion is influenced by the Atlantic Meridional Overturning Circulation (AMOC), which is formed when near-surface currents advect subtropical waters into Atlantic subpolar regions. The waters cool and sink and return southward along abyssal basins, redistributing heat, freshwater and carbon (Fraser and Cunningham 2021). During strong-AMOC periods the subpolar gyre shrinks, and the subtropical gyre expands – the reverse is true when the AMOC is weak. This could have sustained impacts on bottom waters and benthic ecosystems (de Toma et al. 2022; Johnson et al. 2020).

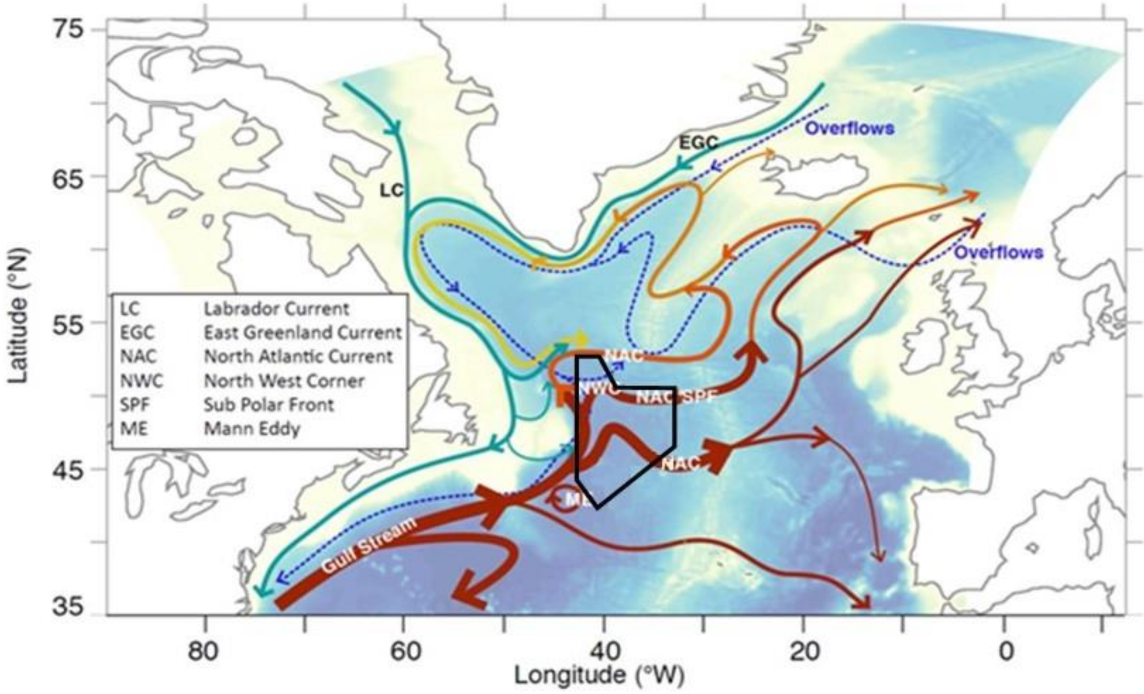

Figure 4. *Schematic diagram of the large-scale circulation of the northern North Atlantic (adapted from: Daniault et al. 2016). The NACES MPA encloses the three branches of the North Atlantic (NAC) that form as the Gulf Stream turns eastward at the North West Corner (NWC). The progressive change of colour from red to yellow indicates cooling and freshening (through interaction with the atmosphere) of the major water masses carried by the subpolar currents. The shallow, cold and fresh East Greenland Current (EGC) and Labrador Current carry nutrient-rich Arctic-origin water into the subpolar region. The dashed blue lines indicate the deep pathways of cold and dense overflow waters.*

As well as benefiting from mixing between the subpolar and tropical/subtropical water the NACES MPA uniquely receives influence from a remote third ocean, the Arctic. Arctic water that is very cold, very fresh and high in nutrients is carried in the North Atlantic by the East Greenland Current and the Labrador Current (Azetsu-Scott et al. 2012; Dickson et al. 2007). Much of this Arctic water leaves the shallow shelf along several pathways near the Flemish Cap and Grand Banks, joining the NAC circulation and bringing nutrient-rich waters into the Site all year round (Fratantoni and McCartney 2010). Below the Gulf Stream and the formation zone of the NAC branches, the deep western boundary current carrying cold, dense "overflows" moves southward following the seafloor topography. This, along with an intermediate layer of water from the Labrador Sea, also recirculates away from the boundary at the 'North West Corner' (Bower et al. 2009).

Subpolar frontal regions are known to be hotspots for higher predators, due to enhanced production at lower trophic levels caused by the mixing of different water masses (Hyrenbach et al. 2007; Polovina et al. 2001). Primary and secondary production is high in the SAF (Acha et al. 2015; Beaugrand et al. 2002) but the distribution of lower trophic level production and therefore higher predators may be more tightly constrained here than in other oceans due to bathymetric steering of the NAC branches.

Biodiversity

The globally unique oceanographic features of the Site mean that it straddles several biogeographical regions (Letessier et al. 2012), including the warm North Central Atlantic Province, Gulf Stream Province, North Atlantic Current Province and the cold Subarctic Atlantic Province (Spalding et al. 2012). Moreover, ecological theory suggests that diversity in the area will be high because the NAC zone is an ecotone - a transitional boundary between the different biomes (Beaugrand et al. 2002). Due to habitat complexity, ecotones often have higher diversity than any one of their constituent biogeographical regions. Furthermore, frontal zones are considered to be hotspots of overlap between critical habitat and any type of anthropogenic activity concentrated over a particular area, such as fisheries. As such, frontal zones actually represent tractable conservation units, in that area-based management measures could be highly effective in protecting this biodiversity (Scales et al. 2014).

The OBIS Biodiversity maps below (**Figure 5** and **6**) provide the number of OBIS species records available for the wider OSPAR Maritime Area and for the NACES Site (as of July 2022) as well as the Hurlbert's ES(50) index of diversity, which shows the expected number of distinct species in a random sample of 50 observations within a hexagon cell. The number of species records available in shallow (<100 m) waters across the OSPAR Maritime Area is higher than in deep (>100 m) waters, where much less sampling effort has been applied (**Figure 5**). However, despite this lack of sampling, the species richness in the deep sea is known to be among the highest recorded for any marine habitat (Grassle and Maciolek 1992; Hessler and Sanders 1967).

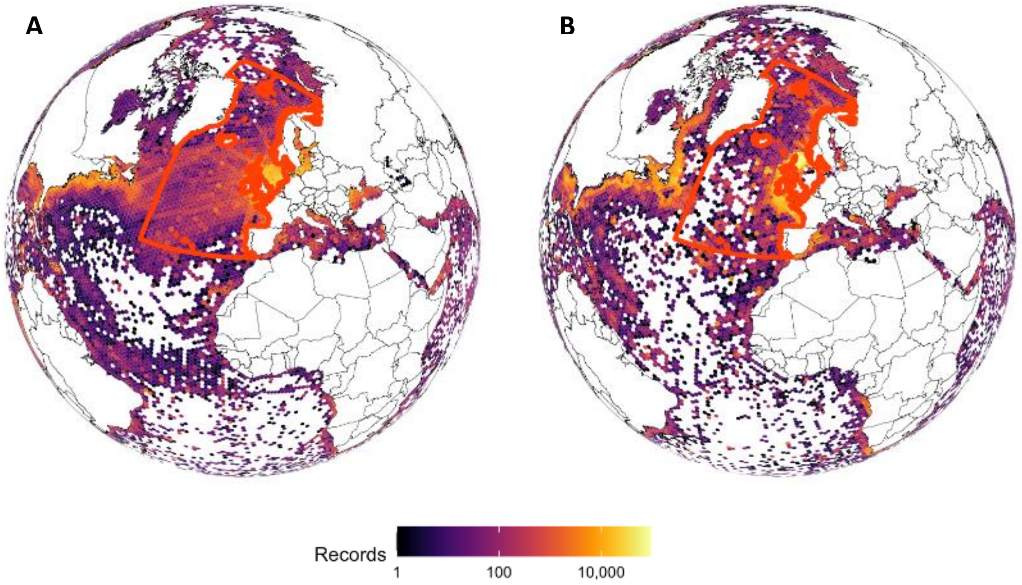

Figure 5. ***(A)*** *OBIS 2022 species records in shallow (<100 m) waters within the OSPAR Maritime Area.* ***(B)*** *OBIS 2022 species records in deep (>100 m) waters within the OSPAR Maritime Area. White marine areas show where there are no records due to lack of sampling. OBIS records combine multiple data sources, but not all, so these figures underestimate the actual number of records available in literature and other sources. Figure created by Pieter Provoost, Intergovernmental Oceanographic Commission of UNESCO.*

There are 350 distinct species recorded in OBIS for within the NACES Site, across both shallow and deep waters. **Figure 6** shows areas of higher species richness at the east of the Site, as well as near the fracture zones in the north and around the Milne Seamount Complex. It is expected that species richness will be higher in areas where substrate is patchy (mixture of soft and hard; **Figure 15**) (Riehl et al. 2020). Based on OBIS records, species richness appears to be lower in the NACES MPA than in surrounding waters, particularly those that are closer to the continental shelf, but this is misleading because the sampling effort is much higher in coastal, shallow waters (**Figure 6**). It is important to note that **Figure 6** displays the current state of knowledge based on OBIS database records specifically, but these are underestimations of the actual data currently available. There are several studies in the scientific literature for NACES and these record >150 additional species that are not currently found in the OBIS database (**Annexes 9**, **10**, **11**, **12** and **13**), with data from other sources not yet extracted specifically for the Site (e.g., Judkins and Haedrich 2018).

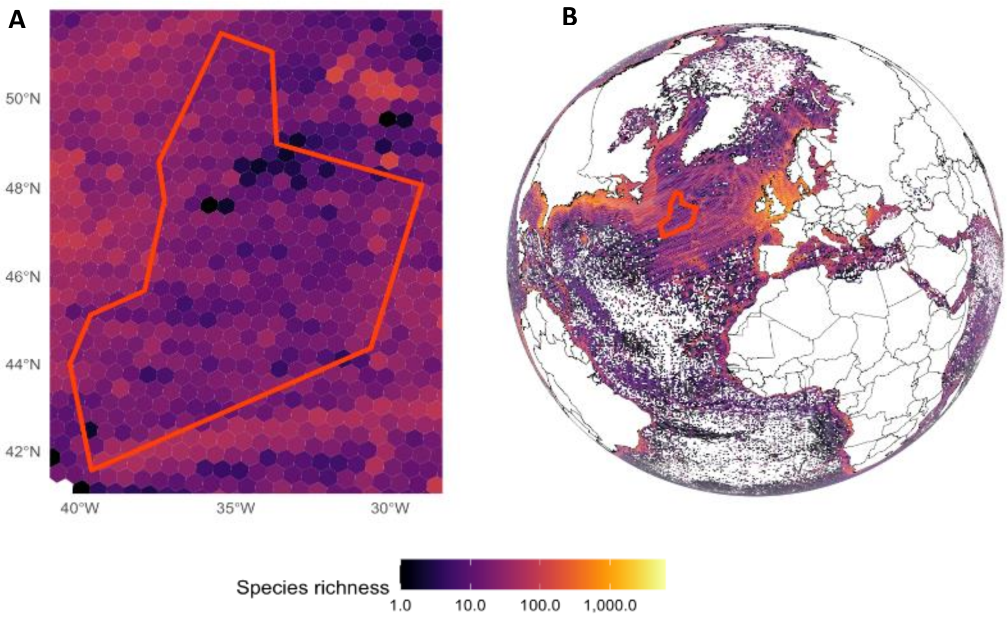

Figure 6. *OBIS species richness calculated based on Hurlbert's ES(50) index of diversity, which is based on the estimated number of distinct species from a random sample of 50 observations, within each hexagon. (A) OBIS species richness zoomed to the NACES Site, based on records of 350 species listed in OBIS, with patches of higher species richness in the eastern and northern areas of the Site, for example (B) OBIS species richness for NACES and the wider Atlantic, showing higher species richness in coastal areas and along the Mid-Atlantic Ridge, where sampling effort is higher. These are underestimates of actual species richness and are based on OBIS records alone. Figure created by Pieter Provoost, Intergovernmental Oceanographic Commission of UNESCO.*

Based on *in-situ* samples and telemetry data, the Site contains a diverse assemblage of micro- and mesozooplankton, relative to areas further north of the Site (Morison et al. 2019, 2020), >5 species of shark (Gore et al. 2008; Skomal et al. 2017; Vedor et al. 2021), >10 species of cetacean (Neilsen et al. 2018; Wakefield 2018), at least 23 species of seabird, >25 species of paralarval cephalopods (Taite et al. 2020), >30 species of micronekton across various phyla (Della Penna and Gaube 2020), >40 species of gelatinous zooplankton (Haberlin 2018), and >100 species of mesopelagic fish (Devine et al. 2021; Judkins and Haedrich 2018) with one of the densest DSL layers recorded worldwide in 2014 (Fennell and Rose 2015). In addition, a high benthic species diversity was observed during the IceDivA2 expedition. These data, based on relatively low levels of sampling effort compared with other marine environments, suggest a particularly high biodiversity in the Site (see **Annexes 8**, **9**, **10**, **11**, **12** and **13** for full lists of recorded species and taxa).

B Selection criteria

a. Ecological criteria/considerations

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1. Threatened and/or declining species and habitats

Seabirds

The NACES MPA includes the important foraging grounds of three OSPAR listed threatened and declining seabird species (OSPAR Agreement 2008-6, **Table 1**, **Annexes 3** and **4**): the Black-legged kittiwake, *Rissa tridactyla* (**Annex 4**, **Figure A4.2-12**), the thick-billed murre *Uria lomvia* (**Annex 4**, **Figure A4.2-12**) and the Audubon's shearwater *Puffinus lherminieri baroli* (previously little shearwater) (**Annex 4**, **Figure A4.2-1**).

Black-legged Kittiwake

The Black-legged kittiwake is listed by OSPAR in Regions I and II (OSPAR Agreement 2008-6). OSPAR has recommended the development of MPAs specifically for this species as a management measure (OSPAR 2009a). The NACES MPA includes the foraging grounds for the black-legged kittiwake (**Annex 4**, **Figure A4.1-12**) tracked from seven different Large Marine Ecosystems across the OSPAR Maritime Area: Barents Sea, Faroe Plateau, Iceland Shelf and Sea, Norwegian Sea, West Spitsbergen, North Sea, and Celtic-Biscay Sea. The Site is an Important Bird and Biodiversity area for this species, being used by an estimated 1.3 million birds, especially during the non-breeding stage (**Annex 4**, **Figure A4.2-12**). Usage of the Site by the black-legged kittiwake was demonstrated to occur year-round to varying degrees with the highest densities between October and March (i.e. quarters 1 and 4, non-breeding period). High numbers (ca. 650,000 individuals) were also estimated to occur during quarter 3 (July-September, corresponding to the end of the breeding season and migration) (**Annex 4**, **Figure A4.2-12**). The north-west sector of the Site (close to the oceanographic feature the 'North-west corner') appears to be the most important for this species throughout the year. Marked declines have been observed in Norway, Greenland and the UK (BirdLife International 2015; OSPAR 2009a; Thorvaldsen et al. 2015). The European population of black-legged kittiwake (which includes all OSPAR Regions) is currently estimated at 1.7 million to 2.2 million pairs (3.4 - 4.4 million mature individuals), and has been listed as 'Vulnerable' in the European Red List Assessment (BirdLife International 2015).

The most significant threats to this species are the impact of overfishing of forage fish, and declines in prey availability caused by human induced ecosystem changes and climate change; and the species may also be susceptible to incidental by-catch in fisheries (BirdLife International 2016a).

The black-legged kittiwake is a highly pelagic species, particularly in the non-breeding season when it usually remains out of sight of land (Burger et al. 2013). Oceanic prey species include mesopelagic fish such as myctophids and invertebrates, including squid, euphausiids, amphipods and polychaetes (Hatch 2013; Paredes et al. 2014). The black-legged kittiwake has been found to be associated with the presence and abundance of the copepod *C. finmarchicus* - a key species within the Atlantic trophic food web (Frederiksen et al. 2012), and occurring in high densities to the north and west of the MPA (Fort et al. 2012; Helaouët and Beaugrand 2007). Myctophid fish species are particularly abundant near fronts and high intensity eddies, which are present within the Site (Paredes et al. 2014).

Audubon's (Baroli) Shearwater

The Audubon's Shearwater- Baroli sub-species (*Puffinus lherminieri baroli*) was previously classified as the little shearwater (*Puffinus assimilis baroli*) and is now recognised within the *lherminieiri* complex as one of three sub-species (Carboneras et al. 2016). The species was included on the OSPAR List of threatened and/or declining species and habitats based on taxonomical information available at the time as little shearwater (Agreement 2008-6). The species is listed in OSPAR Region V (OSPAR Agreement 2008-6). OSPAR has recommended the development of MPAs specifically for this species as a management measure (OSPAR 2009b).

The foraging grounds of individuals tracked from colonies within the Canary Current LME overlap with the boundaries of the Site (**Annex 4**, **Figure A4.1-1**). The NACES MPA is an Important Bird and Biodiversity area for this species, with significant numbers (up to ~743 individuals) of birds estimated to use the area in July-September (**Annex 4**, **Figure A4.2-1**) in a relatively small area close to the north-east boundary with the Charlie-Gibbs Fracture Zone South MPA. Lower numbers (~278 individuals) are estimated to use the area during the transition between non-breeding and pre-breeding period of October-December (**Annex 4**, **Figure A4.2-1**) and the lowest numbers (~60 individuals) estimated during chick rearing and start of migration (April-June). In Europe, the species is considered Near Threatened (BirdLife International 2015). Population estimates for this sub-species are 2,900-3,800 pairs, or 5,900-7,600 mature individuals (BirdLife International 2015). The global population of the Audubon's Shearwater is estimated to be more than 20,000 mature individuals. It was listed by OSPAR as a Threatened and Declining Species in 2003 based on the decline in population, the importance of the OSPAR region for its population, and its sensitivity to threats (including oil spills and predation).

Within the OSPAR area, an estimated 15-22% of the *P. l. baroli* sub-species is estimated to breed - essentially the colonies in the Azores (OSPAR 2009b). The remaining population breeds in the islands of Madeira and Canaries. In comparison to many of the summer breeding seabird species, the Baroli Shearwater sub-species breeds in the Northern hemisphere winter and early spring. The *P. l. baroli* sub-species remains in the North Atlantic area almost year-round (Neves et al. 2012; OSPAR 2009b).

The Audubon's shearwater (including all sub-species) is a surface feeder, diving to depths of ~14m and targeting small fish (e.g., *Phycidae* spp), cephalopods and crustaceans, during both the day and night (Neves et al. 2012; Paiva et al. 2016). Cephalopods have been found to be the most common prey during the breeding stage, and birds may target juvenile cephalopods - including deep water species when they move to the surface waters during twilight and night time (Neves et al. 2012). Within the Canary Current and OSPAR Region, the sub-species appears to forage in very deep oceanic areas and have large home ranges, with indications that birds from different colonies are segregating at sea and using different foraging strategies (Fagundes et al. 2016; Neves et al. 2012; Paiva et al. 2016). During the non-breeding season, individuals can range up to 2500km from the colony (Neves et al. 2012; Paiva et al. 2016), with previous research finding that birds breeding on the Azores and on Cima Islet in Madeira regularly disperse and forage within the Mid-Atlantic Ridge region (Fagundes et al. 2016; Paiva et al. 2016).

Thick-billed murre

The thick-billed murre is listed as a threatened and/or declining species by OSPAR in Region I (OSPAR Agreement 2008-6), due to its regional importance in the North-East Atlantic, its population decline and its sensitivity (as a long-lived species with delayed reproduction) and susceptibility to threats such as hunting, oil spills, incidental by-catch in gill nets and loss of habitat and prey in relation to unsustainable fishing practices and climate change (Frederiksen et al. 2016; Irons et al. 2008; OSPAR 2009c).

Within the ABNJ of the OSPAR maritime area some of the most important foraging grounds overlap with the NACES MPA boundaries year-round (**Annex 4**, **Figure A4.1-21**). During spring, birds from Arctic Canada and Iceland use the Site, whilst birds from Arctic Canada, north-west Greenland and Iceland used the area during the non-breeding season (October-March) (**Annex 4**, **Figure A4.1-21**). Within the Site, significant numbers of

Thick-billed murres use the area, with ca. 144,000-161,000 birds in winter (quarters 1 and 4), ca. 50,000 in summer/autumn (quarter 3), and the lowest number (which corresponds to the breeding season) in spring/summer (quarter 2) ca. 13,000 (**Annex 4**, **Figure A4.2-21**). In winter, spring, and autumn the highest concentrations are using the western boundary of the NACES MPA, closest to the Flemish Cap. In summer, Icelandic birds are concentrated within the centre of the Site corresponding to the Mid-Atlantic ridge (**Annex 4**, **Figure A4.2-21**). An analysis of tracking data of 320 individuals from multiple colonies also demonstrated the use of the area corresponding to the NACES MPA during the non-breeding period (with highest use from birds tracked from colonies in Canada, Spitsbergen, north-west Greenland and Iceland) (Frederiksen et al. 2016).

The European population of thick-billed murre is listed as Least Concern (BirdLife International 2015) and is estimated at ca. 2.3 million mature individuals, with colonies across the OSPAR Region I (Faroe Islands, Greenland, Iceland, Norway, Svalbard and Jan Mayen, Russia (BirdLife International 2015). Despite its listing as Least Concern, significant declines of breeding populations have occurred in Svalbard, Norway, Iceland and Greenland (Descamps et al. 2013; Fauchald et al. 2015; Garðarsson et al. 2016).

During the breeding season, thick-billed murre feeds on a variety of fish species including capelin, sandeel and cod (Gaston 1985) as well as amphipods, and euphausiids (Mehlum and Gabrielsen 1993). During the non-breeding season, the diet includes forage fish (Capelin remaining an important species), squid, euphausiids (*Thysanoessa* spp, *Meganyctiphanes norvegica*) and amphipods (Falk and Durinck 1993; Orben et al. 2015; Renner et al. 2012). Thick-billed murre are capable of extremely deep dives up to 200m and are able to forage during both day-time and night-time (Croll et al. 1992).

Flying is very energetically costly for thick-billed murre, making them susceptible to changes in prey distribution – particularly in the horizontal plane rather than vertically in the water column (Croll et al. 1992; Orben 2014). Adult survival has been linked to oceanographic conditions during winter with improved survival following winters with lower Arctic Oscillation indices, more ice and cooler sea surface temperatures (SST) (Smith and Gaston 2012).

Research from at-sea surveys and tracking suggests that thick-billed murres are broadly distributed across the North Atlantic during winter, from off west Greenland to offshore of Newfoundland and Labrador and south to the United States, and around Iceland, with birds from different colonies and sexes demonstrating differing migration strategies (Frederiksen et al. 2016; Gaston et al. 2011).

Cetaceans

Blue whale

The Blue whale (*Balaenoptera musculus*) is listed by OSPAR as under threat and/or in decline in Regions I, II, III, IV, and V (OSPAR Agreement 2008-6). This is due in part to a severe depletion in the population, as a result of historic whaling activities, to an estimated 600 to 1,500 individuals in the central North Atlantic (Sears and Perrin 2009). The species is also classed as Endangered (EN) under the IUCN Red List. There is a general lack of information on this species globally. Satellite tagging data are few and restricted to specific areas, for example in the northeast Atlantic, and primary migration routes are not yet known.

A study by Jossey et al. (2021) used whole genome sequencing and found high genetic diversity for North Atlantic blue whales, suggesting there is a single population characterised by random mating within the breeding population. Pike et al. (2009) provided evidence of a significant positive trend in blue whale abundance in the waters near Iceland, though sightings were rare for the Northeast Atlantic. Blue whales in the North Atlantic are likely to make persistent annual migrations between lower latitude breeding grounds in winter and high latitude feeding grounds in summer (Nieukirk et al. 2004; Silva et al. 2013).

The EBSA description (referred to above) notes tracking studies for blue whales (and other species, see below) passing through the Site on long migratory movements (from the Azores to foraging areas in eastern Greenland and western Iceland) and remaining in the area for prolonged periods, suggesting foraging behaviour. **Figure 7** shows blue whale movements and inferred behaviours near the NACES Site. Pérez-Jorge et al. (2020) modelled habitat preferences of blue whales in the North Atlantic and found that this consists of a latitudinal band between 36°N to 50°N with potential areas in the northern parts of the NACES Site. Lesage et al. (2017) also identified that deep ocean structures, such as seamounts and underwater canyons, may be important foraging habitats for blue whales.

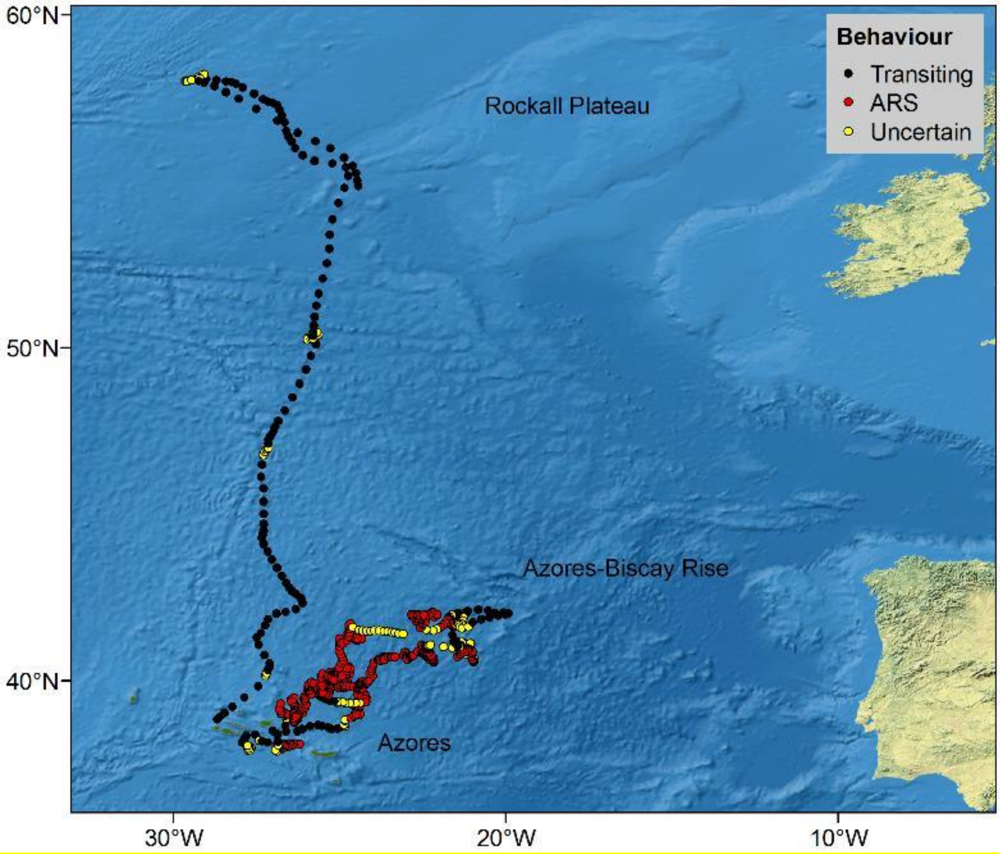

Figure 7. *Blue whale (Balaenoptera musculus) hierarchical switching state-space model derived locations showing inferred behavioural nodes, cited from Silva et al. (2013). NACES is located at 41˚ N-53˚ N, 32˚ W-42˚ W.*

The species is protected by the Bern Convention (Annex III) and Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Convention on Migratory Species (CMS); however, populations remain at risk. Ship strikes pose a threat to blue whales, which have been shown to perform a slow and shallow dive in response to (but no horizontal avoidance away from) oncoming ships (McKenna et al. 2015). The behavioural responses of blue whales to low and mid-frequency acoustic disturbances, which arise from seismic survey or military sonar, could lead to a cessation of foraging and avoidance behaviours (Goldbogen et al. 2013; Pirotta et al. 2021). Though reports of entanglement of blue whales are rare, Ramp et al. (2021) found prominent scarring around the tail and caudal peduncle of several individuals in the Gulf of St. Lawrence, suggesting entanglement may be a more considerable pressure on blue whale populations in some areas than reporting data suggest, though fishing activity in NACES is low relative to regions nearer the Newfoundland coast. The main threat to Atlantic blue whale populations is likely the severe depletion of their main food source, krill, with a 50% decline in surface krill abundance over a 60-year period in response to ocean warming; and the potential that krill populations will undergo 'habitat squeeze' *in-situ* rather than shifting northwards to cooler waters (Edwards et al. 2021).

Marine reptiles

Leatherback turtle

The Leatherback turtle (*Dermochelys coriacea*) is listed by OSPAR as under threat and/or in decline in Regions I, II, III, IV, and V (OSPAR Agreement 2008-6). The Atlantic is part of the species' natural foraging range, and the abundance of food in the Northeast Atlantic has made it an important high-use area for mature turtles (Doyle et al. 2008; Eckert et al. 2006). The species displays strong fidelity for nesting sites; but disperses across the North Atlantic at the end of the breeding season (Fossette et al. 2010). These movements are unpredictable due to the marked plasticity in leatherback behaviour (Dodge et al. 2014; Hays et al. 2004). The global abundance of leatherback turtles is unknown, with no estimates recorded for the OSPAR Maritime Area. However, severe declines in Pacific populations have raised concerns over populations in the Atlantic, which is considered to be the last stronghold for the species (Crowder 2000; Lewison et al. 2004).

The northerly distribution limit of leatherback turtles follows the 15°C isotherm, which has moved northwards by over 300 km over 17 years (McMahon and Hays 2006). Hays et al. (2004) recorded wide-ranging extensive pan-oceanic tracks including passage within the Site. See **Annex 7** for a MiCO project output for Leatherback turtle records. Studies have also explored post-nesting movements and submergence patterns of leatherback turtles (Eckert et al. 2006; Godley et al. 2003). There have been recorded changes in turtle dive patterns, which can be in response to sea surface temperatures, where turtles dive to deeper, colder waters to regulate their body temperature, and do so more regularly in regions where sea surface temperatures are higher, or where turtles perform more wiggle dives when foraging, which tends to occur over longer time periods in cool-temperate regions (Okuyama et al. 2021).

Leatherback turtles are under threat from the impacts of oil spills, entanglement in fishing lines and gear, and the sometimes-fatal ingestion of plastic bags (Frasier et al. 2020; Lewison et al. 2014; Mrosovsky et al. 2009). Trash was observed floating across the Site at several locations during the DY080 cruise (Wakefield 2018). Leatherback turtles have a known association with mesoscale oceanographic features such as frontal systems (Hays et al. 2006) and eddies (Doyle et al. 2008). Given the presence of eddies with strong retention in NACES (Della Penna and Gaube 2019; Fennel and Rose 2015), distinct assemblages of cephalopods (Taite et al. 2020) and mesopelagic fish (Devine et al. 2021) inside versus outside eddies, and diverse assemblages of jellyfish taxa (Haberlin 2018) on the peripheries of an eddy located west of the Evlanov Seamount in NACES during the study period, there is expected to be a high potential for association of leatherbacks in the Site.

Loggerhead turtle

Loggerhead turtles (*Caretta caretta*) are listed as Threatened and/or Declining in OSPAR Regions IV & V. The species is listed as Globally Vulnerable (VU) under the IUCN Red List. The western North Atlantic hosts the largest nesting assemblage of loggerhead turtles in the world (Philips et al. 2021). Hatchlings from eastern Florida enter the ocean and become entrained in the Subtropical Gyre (Bjorndal 2003), then continue on to perform one of the longest marine migrations, circling round the entire North Atlantic basin before returning to the US coast, using a 'magnetic map' (Bjorndal et al. 2003; Bolten et al. 1998; Lohmann et al. 2012; Monzón-Argüello et al. 2009). Part of their habitat includes the waters around the Grand Banks.

Telemetry data in OBIS show the occurrence of loggerhead turtles within the NACES Site, primarily juveniles and male subadults (2003-2016) (**Annex 8**). Their presence in the Site may be explained, in part, by advection via the Gulf Stream but also the presence of the frontal zone and mesoscale eddies (Browning et al. 2021; Eckert et al. 2008). Young loggerheads are often associated with frontal zones, downwellings, and eddies (Eckert et al. 2008; Pierpoint 2000). Though the journey of young loggerheads from the western Atlantic to the eastern Atlantic is often a result of passive advection through currents, Chambault et al. (2021) studied immature loggerheads that displayed active swimming behaviour into the inner cores of anticyclonic eddies around the Azores. During their first year, loggerheads tend to remain at the surface (Mansfield et al. 2014) until they reach a straight carapace length exceeding 34 cm, at which time they tend to spend the majority of their time diving (Freitas et al. 2018; Howell et al. 2010).

The main threats to loggerheads in the oceanic zone of the North Atlantic include fisheries bycatch at the juvenile stage (particularly trawl, longline and gillnet), plastic pollution and ingestion of other marine debris, incidental entanglement in fishing gear, and petroleum contamination, for example from oil spills (Bolten et al. 2011). Trash was observed floating across the Site at several locations during the DY080 cruise, which may contribute to this (Wakefield 2018). Due to the complex population structure of loggerheads, there is a need for different management strategies at each life stage (Bowen et al. 2005).

Fish species

Atlantic Bluefin Tuna

Atlantic Bluefin tuna (*Thunnus thynnus*) is listed by OSPAR as Threatened and/or Declining in Region V (OSPAR Agreement 2008-6), though it occurs in all five OSPAR regions. Adult bluefin tuna are important predators in pelagic systems, preying upon cephalopods and crustaceans when juveniles; and mainly fish, such as anchovy, bluefish, mackerel, sardine, and sprat when adults (Fromentin and Powers 2005). Jellyfish, salps, and in some areas, sponges, (Chase 2002) are included in their diet, thus, population declines would have cascading effects on species at lower trophic levels (Rooker et al. 2007). Virtual population analyses estimate a decline of 74.2% in the spawning population level in 1957 to that of 2007 (OSPAR 2014a). Overexploitation of mature fish and high fishing pressure on smaller fish had been the largest threat to Atlantic bluefin tuna stocks; but the ICCAT enforced minimum size regulations in 2006, which have potentially had positive outcomes for younger individuals in Atlantic Bluefin tuna populations.

ICCAT currently manages Atlantic Bluefin tuna as two separate stocks – western and eastern Atlantic – but a study by Block et al. (2005) demonstrated there is some mixing between these two stocks, particularly in foraging grounds, though spawning grounds probably remain separate. Bluefin tuna are a highly migratory species and have been shown to move from the west coast of Ireland to the Central Atlantic (Stokesbury et al. 2007), while some individuals have made trans-Atlantic round trips from the Bay of Biscay to the eastern coast of the United States (Arregui et al. 2018). Using an archival tag methodology, Walli et al. (2009) determined four spatially confined regions for Bluefin tuna in the North Atlantic, with a high utilisation distribution for the NACES Site in spring, summer, and autumn months; suggesting the Site represents critical foraging habitat with abundant prey available, and correlating diving depth to the depth of the thermocline. **Figure 8** below shows the utilisation distributions across the trans-Atlantic movement pattern, and **Figure 9** demonstrates the kernel density grid, of bluefin tuna from Walli et al. (2009).

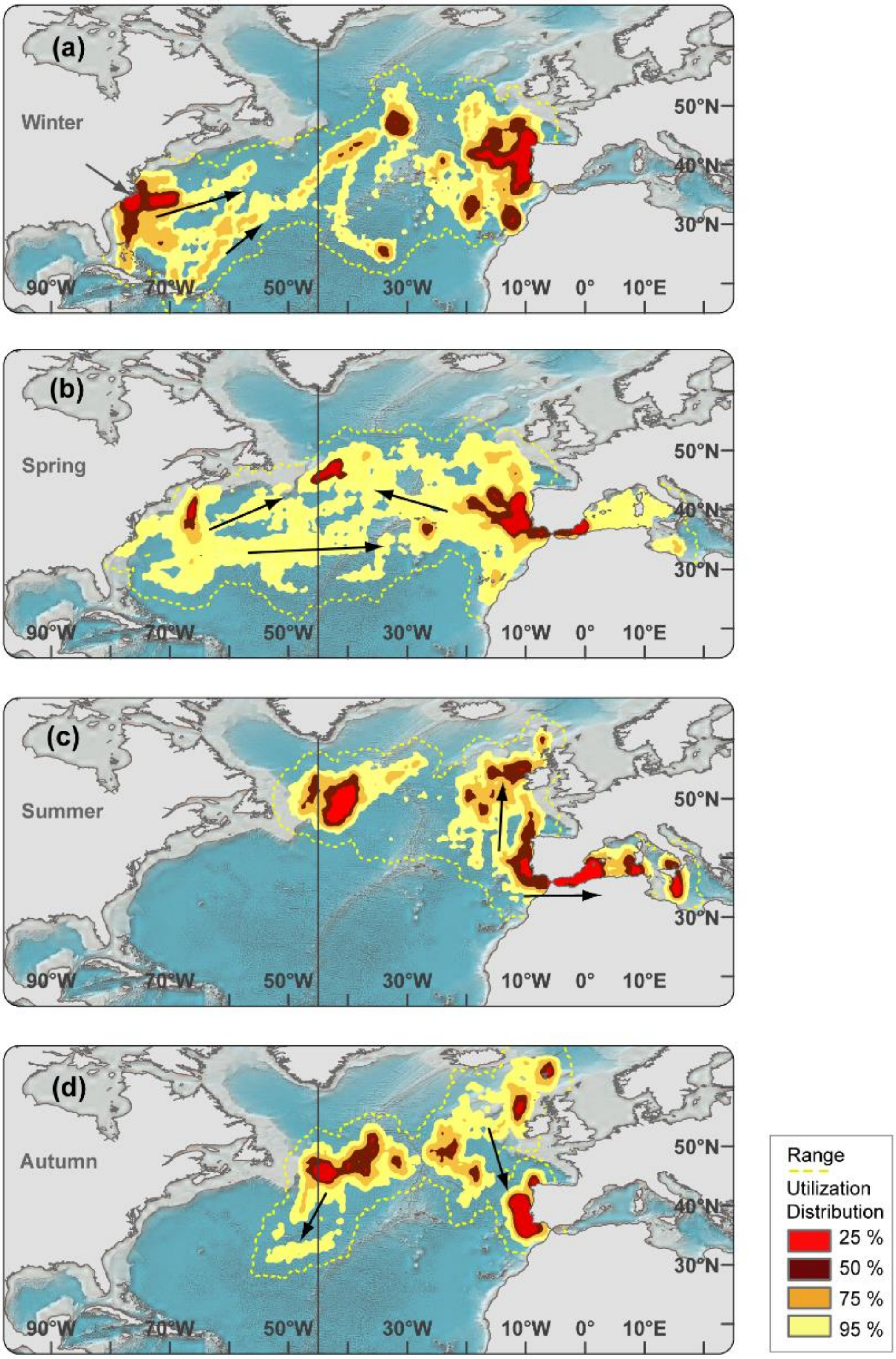

Figure 8. *Atlantic Bluefin tuna (Thunnus thynnus) foraging area hotspot analysis (seasonal utilisation distributions) in the trans-Atlantic movement pattern cited from Walli et al. (2009). Black arrows show the general direction of tuna movements. NACES is located at 41˚ N-53˚ N, 32˚ W-42˚ W.*

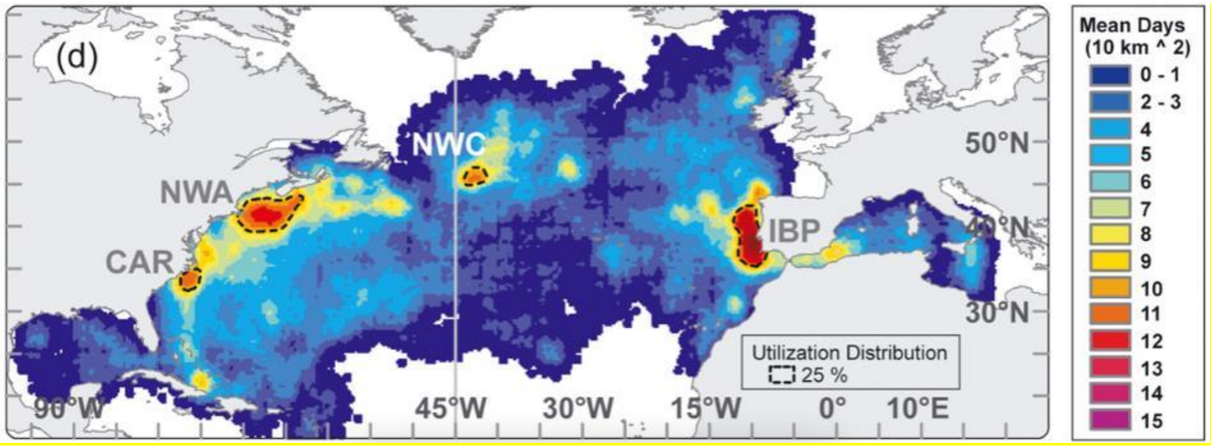

Figure 9. *Normalised kernel density grid based on estimates of the continuous density of tuna migrating across the Atlantic (1996-2006; 106 individuals). Kernel density estimates provided an index of tuna residence probability per unit area based on randomly resampled geolocations for each tracked individual. The number of daily geolocations for each tracked bluefin tuna individual was weighted by the number of bluefin tuna individuals tracked per unit area. Black dotted lines outline 25% utilisation distributions, showing regions of high residency throughout the North Atlantic. CAR = North Carolia coast, NWA = Northwest Atlantic, NWC = Northwestern Corner, IBP = Iberian Peninsula. The NWC hotspot shows high residency in NACES as does part of the yellow area at ca. 48˚ N, 32˚ W, which is located 41˚ N-53˚ N, 32˚ W-42˚ W. From Walli et al. (2009). Cited from GOBI (2022).*

The restriction of Atlantic food webs as a result of ocean warming may cause the species to shift spatial distributions and increase their site fidelity to new areas (Galuardi et al. 2010; Mackenzie et al. 2014).

Vella (2005) found associations between Atlantic bluefin tuna and short-beaked dolphins around the Maltese Islands, potentially linked to prey availability; and a study by Bauer et al. (2015), for the Mediterranean Sea, found a co-occurrence of Atlantic bluefin tuna with striped dolphins and fin whales. The densities, presence, and core sightings of Atlantic bluefin tuna and striped dolphins were found to be correlated, suggesting the feeding activities of Atlantic bluefin tuna attract this species of dolphin and potentially others. The core sightings during this study were mainly in areas of high mesoscale activity such as eddies and oceanic fronts.

Basking shark

Basking shark (*Cetorhinus maximus*) is listed by OSPAR as Threatened and/or Declining in Regions I, II, III, IV, and V (OSPAR Agreement 2008-6). The species are often observed in waters around the British Isles, the Republic of Ireland and North America and are most associated with temperate continental shelf areas (Gore et al. 2008; Johnston et al. 2019). The western European shelf area is a basking shark hotspot due to high zooplankton abundance in the spring and summer months (Bloomfield and Solandt 2008). Trans-Atlantic movements do not appear to follow a defined migratory corridor: basking sharks disperse widely throughout oceanic waters during the autumn and winter months, from Canada through to Gabon (e.g., Gore et al. 2008; Doherty et al. 2017). Similar broad dispersal has been recorded for the coasts of North America (Braun et al. 2018). Though basking sharks show some fidelity to coastal hotspots (Doherty et al. 2017), their movements are ranging and do not follow the migratory paradigm associated with many marine vertebrates.

The abundance of basking sharks across the globe or in the OSPAR Maritime region remains unknown, though Sims and Reid (2002) estimated a removal of over 80,000 individuals from the North-East Atlantic population over a 50-year period. This was due to fishery activity, and despite the collapse of basking shark fisheries, there were no signs of population recovery by 2005 (Fowler 2005). However, since 2005, studies have shown a potential recovery, though small, in larger sharks (more than 6 m in length) (Solandt and Chassin 2014).

Despite the paucity of data available for basking shark movements in the Northwest Atlantic, a study by Gore et al. (2008) presented evidence of the tracking of two animals undertaking a transatlantic migration and making use of deep-water habitats, with geolocations for one of the individuals inside the NACES Site, particularly during August (**Figure 10**). Such long-distance movements are likely associated with continual foraging. For example, Johnston et al. (2022) shows that basking sharks often dive into the mesopelagic zone (ca. 200-700 m) in the early morning, then return to shallow waters (ca. 0-300 m) in the afternoon. The distinct periodicity of these vertical migrations suggests these behaviours follow a daily cycle, which mirrors the vertical distribution of mesopelagic scattering layers of both fish and zooplankton (ca. 400-600 m during the day) in the North Atlantic (Klevjer et al. 2016), similar to the distribution patterns of mesopelagic fish recorded for the DSL located in the NACES Site (Fennell and Rose 2015).

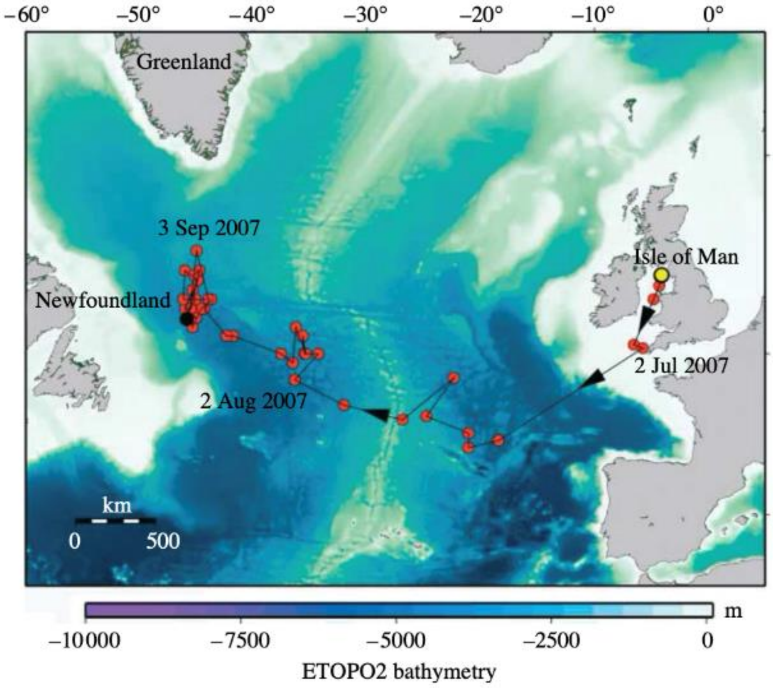

Figure 10. *Basking shark track, with geolocations through the NACES MPA, superimposed on seabed bathymetry, cited from Gore et al. (2008). Yellow circle denotes site of the tag deployment; black circle denotes the tag pop-off; red circles denote geolocations; and arrows, the general direction of travel. NACES is located at 41˚ N-53˚ N, 32˚ W-42˚ W.*

Skomal et al. (2009) demonstrated basking sharks also occur in tropical and equatorial regions. **Figure 11** shows the known basking shark distribution range.

Current threats for basking shark populations moving through and using the NACES Site include collisions due to shipping activities across the Site (**Figure 30**), incidental captures, and bycatch deaths (though fishing activity is low relative to other areas near the Newfoundland coast, for example; **Figure 29**). There are also potentially toxicological impacts of microplastics - which are known to occur in the surface waters of the NACES MPA and are potentially retained by the presence of mesoscale eddies (Wieczorek et al. 2018) - as found in Mediterranean basking sharks (Fossi et al. 2014). Additionally, the impacts of ocean warming on plankton bloom/fish recruitment coupling pose a threat to basking shark populations (Beaugrand et al. 2002; Doyle et al. 2005; Speedie et al. 2008; Valeiras et al. 2001).

The basking shark is listed in CITES Appendix II (originally Appendix III in 2000, but upgraded in 2002) as well as UNCLOS, the Bern Convention, the Barcelona Convention and the Bonn Convention on Migratory Species (CMS). The species is also listed as Endangered (EN) in the North-East Atlantic in the IUCN Red List.

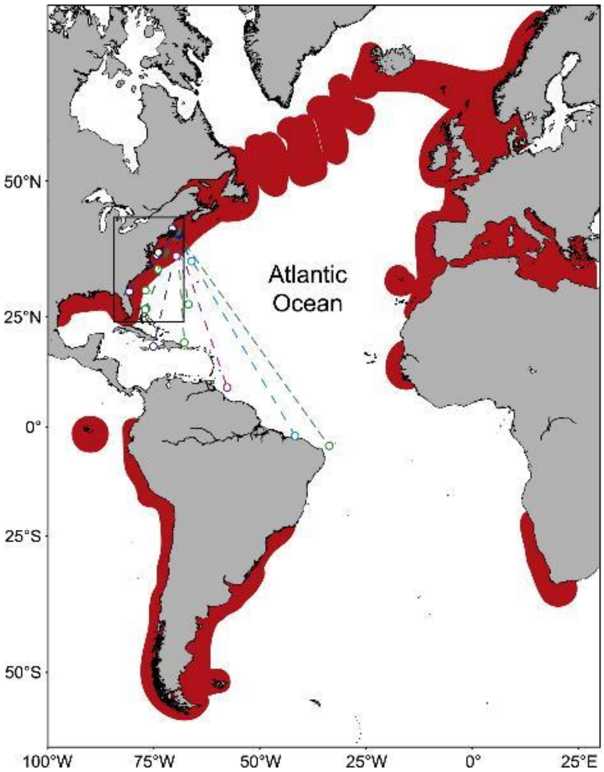

Figure 11. *Basking shark (Cetorhinus maximus) known distribution range, including part of the NACES MPA (located at 41˚ N-53˚ N, 32˚ W-42˚ W.) cited from (Skomal et al., 2009).*

Identifying priority areas for marine vertebrate conservation is complex because basking sharks, like many species of conservation concern, are highly mobile, inhabit dynamic habitats and are difficult to monitor (Scales et al. 2014). Miller et al. (2015) revealed that surface frontal activity is a predictor of basking shark presence in the north-east Atlantic, both over seasonal timescales and in near real-time. These insights have clear implications for understanding the preferred habitats of basking sharks in the context of anthropogenic threat management and marine spatial planning in the region. As with leatherback turtles, Earth Observation data that identify mesoscale oceanographic features could be incorporated into a monitoring framework (Scales et al. 2014) for the NACES MPA.

Benthic habitats (including biogenic habitats)

Coral gardens

Coral gardens are relatively dense aggregations of colonies or individuals of one or more coral species. Coral gardens are listed as Threatened and/or Declining habitat by OSPAR (2010j). In addition to reef-forming hard corals (e.g., *Lophelia, Solenosmilia*), coral gardens often include coral species from different taxonomic groups (black corals, leather corals, sea pens, etc), as well as other associated fauna, including crinoids, sponges, brittle stars, basket stars, and other species.

Coral gardens occur in OSPAR regions I, II, IV, and V (OSPAR 2010j). Habitat suitability modelling of reef framework-building species of cold-water corals show potential for reef-building corals to occur in the Site, likely *Solenosmilia variabilis* at these depths (**Figure 22;** Davies and Guinotte 2011). Based on expert opinion and habitat suitability, coral gardens are likely to occur in the Site, although observational data from the Site are pending.

Deep-sea sponge aggregations

Deep-sea sponge aggregations, defined as dense groups of deep-sea sponges, primarily formed by the Hexactinellida and Demospongiae classes, are listed by OSPAR as Threatened and/or Declining, and occur in Regions I, III, IV, and V (OSPAR 2010k).

Similar to cold-water coral reefs, the presence of large sponges adds a three-dimensional structure to the seafloor, thus increasing habitat complexity and attracting an invertebrate and fish fauna at least twice as rich as that on surrounding gravel or soft bottom substrates as the three-dimensional structures created by the forming species allow other organisms to access food from elevated areas and to receive protection from physical factors (Buhl-Mortensen et al. 2010). Deep-sea sponge aggregations are often associated with coral grounds and are likely to occur at the Site.

Seamounts

Seamounts are listed by OSPAR as Threatened and/or Declining, and occur in Regions I, IV, and V (OSPAR Agreement 2008-6; **Figure 12**). Seamounts in OSPAR Region V support biologically diverse ecosystems and often span multiple water masses, each with a distinct benthic fauna (Henry et al. 2014). Region V seamounts are also often hotspots for pelagic productivity and diversity (Morato et al. 2008; Morato et al. 2016) and can act as stepping stones for the dispersal of deep-sea corals, which have a very low level of endemism (<3%) in the Northeast Atlantic (Lima et al. 2020). Watling et al. (2022) also demonstrated evidence that anthozoan larvae may transit large distances from one seamount, across the deep ocean, to another.

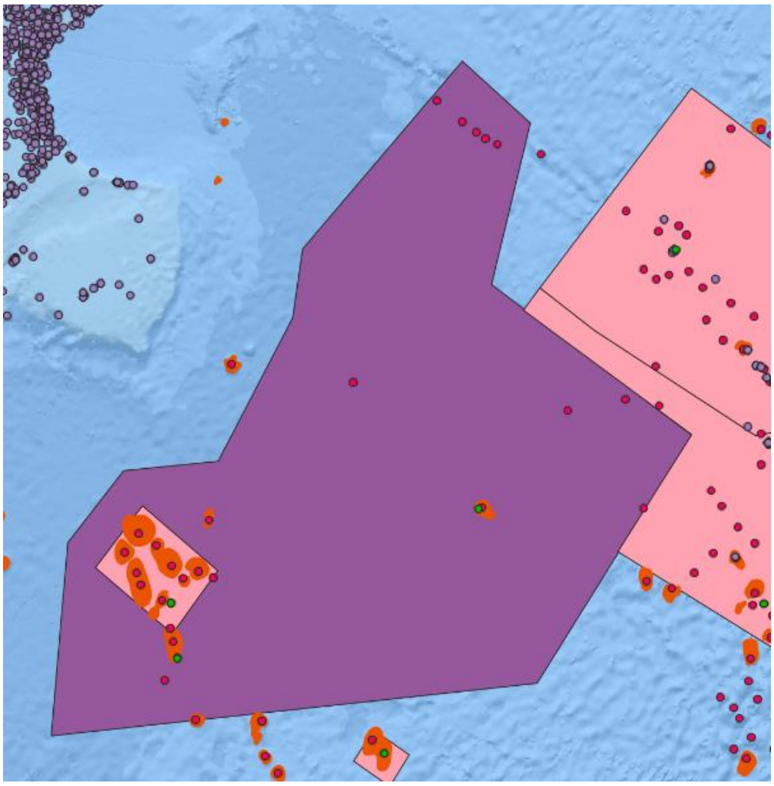

Figure 12. *Red dots are seamounts, compiled during OSPAR's Threatened and/or Declining habitats assessment that took place in 2021. Green dots are seamounts from the Geonames database, orange polygons are seamounts from the Harris et al. (2014) map. The NACES MPA is the purple polygon, and the OSPAR MPAs in ODIMS are shown in pink. Figure created by Oisín Callery, National University of Ireland, Galway.*

There are at least 30 seamounts within the NACES MPA boundary, including the Evlanov Seamount near the centre of the Site (Kim and Wessel 2011; Morato et al. 2016) and the Milne Seamount Complex to the southwest corner of the Site (**Figure 3**). These range from 1,161 m down to 3,199 m water depth at the base, with basal areas ranging from 661 km^2 to 1,122 km^2. The height of seamount features is estimated to range from 1,089 m to 2,749 m (Harris et al. 2014). Large pelagic fish including tuna and shark have been recorded within the Site (OBIS 2022). Larger seamount features may be important for highly migratory species (as navigational aids) and as foraging sites for predators. This may apply to such features in association with the Milne Seamount Cluster within the Site and the adjacent Corner Rise and New England Seamounts to the west of the Site.

Besides the numerous seamounts documented through multibeam surveys and on GEBCO 2021, the IceDivA2 expedition surveyed the ca. 49.5M-year-old caldera within the NACES Site at a seamount feature named 'Mount Doom', with the peak situated at 2,354 m and the base at 3,666 m water depth. Two smaller, younger structures were also found nearby (**Figure 13**). The seamount was found in an area previously thought to be abyssal plain, which suggests there could be even more seamount features located within the Site that are currently in areas recorded as abyssal plains or hills.

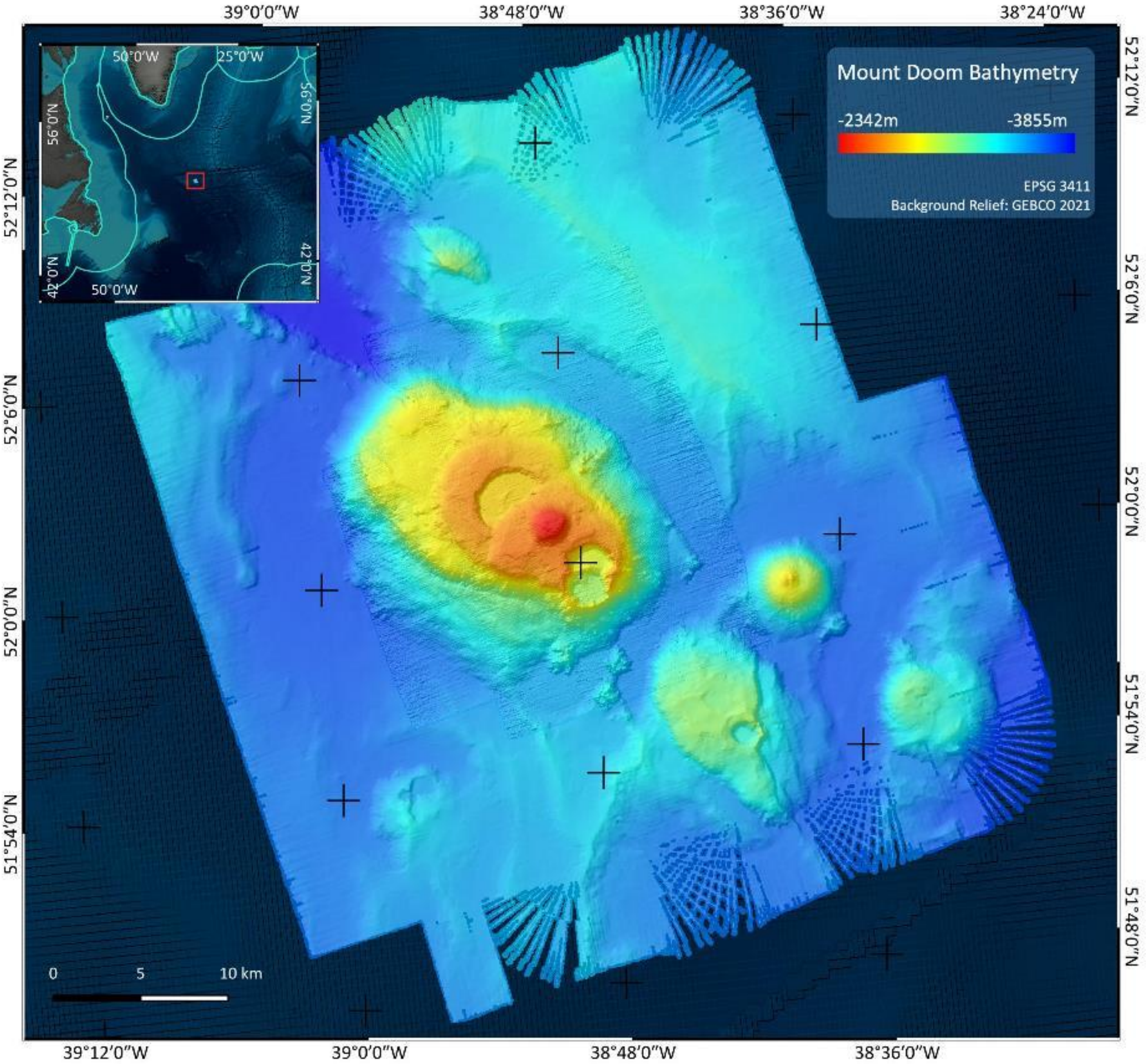

Figure 13. *Bathymetry of the 'Mount Doom' seamount and smaller structures surveyed during IceDivA2 expedition in the NACES MPA. Image courtesy of IceDivA2 expedition/James Taylor/Senckenberg Research Institute.*

2. Important species and habitats (other than OSPAR listed species and habitats)

Seabirds

The available evidence demonstrates that the NACES MPA is used by numerous seabird species not listed by OSPAR. Studies based on tracking data (results of BirdLife International's analyses and published information) show that the Site is particularly important as foraging grounds for 19 non-OSPAR listed seabird species (**Annexes 4**, **5** and **6**). In addition, the existing scientific evidence and preliminary information from the recent NERC (DY080) research cruise has confirmed the use of the area by several non-OSPAR listed species, 14 of which are threatened at regional and/or global level (**Table 2**) and many are particularly vulnerable to human impacts (Croxall et al. 2012).

Seabird tracking data has also identified the high use by 18 non-OSPAR listed seabirds within the boundary of the NACES MPA, with the area qualifying as a marine Important Bird and Biodiversity area in each case. Seabirds from different functional groups were all found to be using the Site, including Shearwaters and Fulmar, Petrels and Storm-petrels, Gulls/Terns and Skuas and Alcids.

The seabird tracking analysis presented in the proforma indicates that the NACES MPA is consistently used by significant numbers of between 9-22 different seabird species in all seasons (**Table 2**, **Annex 4**). Leach's Storm Petrel was also noted to have high use of the area from literature and the research cruise. The highest number of birds (ca. 4.4 to 5 million individuals), using the Site is estimated to occur during winter between October-March, when the area is used by large numbers of Alcid species. Large numbers of birds (ca. 2.9 to 3.3 million individuals) are also using the Site during spring and summer (April-September), and this period also had the highest diversity of seabird species (n=21; **Table 2**, **Annex 4**).

A description of the use of the NACES MPA by species family groups is provided in the subsequent pages.

Table *2.* *Seabird species and estimated maximum number of individuals (max inds) using the NACES MPA based on analysis of tracking data and divided by year quarters. * = OSPAR listed threatened and declining species. See also* ***Annex 4****,* ***Table A3.2****. Leach's Storm Petrel was also noted to have high use of the area from literature and the research cruise.*

Species name	**Biogeographic population** (max mature birds)	**Q1**	**Q2**	**Q3**	**Q4**
		Jan-March (max ind)	**April-June** (max ind)	**July-Sept** (max ind)	**Oct-Dec** (max ind)
*Audubon's Shearwater	4,084		62	743	278
Cory's Shearwater	503,430	69,685	20,358	40,085	59,442
Great Shearwater	8,000,000		1,564,472	1,819,681	
Manx Shearwater	982,510		71,827	167	
Sooty Shearwater	600,000		368,627	338,562	
Northern Fulmar	756,210	154,024	70,506	86,893	154,024
Bermuda Petrel	142			65	22
Bulwer's Petrel	100,000			1,418	
Desertas Petrel	340		12	53	13
Zino's Petrel	160	15	21	21	15
*Black-legged Kittiwake	3,822,882	1,327,050	63,650	664,577	1,366,342
Sabine's gull	3,000		375		
Arctic Tern	165,000			65,529	82,500
Great Skua	10,800	1,1964	1,309	2,618	2,945
Long-tailed Jaeger	72,856	27,766	34,765	46,131	4,482
South Polar Skua	1,542		999	1,054	

Species name	**Biogeographic population** (max mature birds)	**Q1**	**Q2**	**Q3**	**Q4**
		Jan-March (max ind)	**April-June** (max ind)	**July-Sept** (max ind)	**Oct-Dec** (max ind)
Atlantic Puffin	5,121,612	936,713	506,057	257,030	1,079,091
Common Murre	1,392,408		71,406	35,703	
Little Auk	7,000,000	2,333,333	129,630		1,555,556
Razorbill	626,944		26,123		
*Thick-billed Murre	2,589,888	156,867	50,625	13,619	144,309
Total		**5,031,734**	**2,980,824**	**3,373,948**	**4,449,020**

Shearwaters and Fulmar

The NACES MPA is frequently used by five species of shearwaters - Audubon's shearwater (see above – OSPAR listed species), Cory's shearwater, Manx shearwater, great shearwater and sooty shearwater, and also by the Northern Fulmar. The available evidence on the ecology of these species and their foraging grounds in the high-seas suggests that shearwaters are probably utilising the high abundance of mesopelagic fishes and cephalopods available here, including by shifting their daily activity patterns to respond to the higher abundance of these prey during the night period (Dias et al. 2012c). Tracking studies with Manx shearwaters and Cory's shearwaters have shown that the area is also intensively used as a stopover during their long distance migration between the breeding areas (located in the North Atlantic) and non-breeding areas located in the South Atlantic (Dias et al. 2012a; Guilford et al. 2009), with some birds detouring more than 5,000 km from their main migratory pathway to spend between 15 and 31 days foraging in the region of the NACES MPA before heading south (Dias et al. 2012a; **Annex 6**, **Figures A6.1**-**2**), showing the importance of the site as refuelling area. At-sea surveys in June 2017 also confirmed the use of the Site by 4 shearwater species (**Annex 5**, **Figure A5.4**).

Cory's shearwaters are North Atlantic breeders (Azores and Canary Current LMEs); high numbers of birds visit the area all-year round, but the Site is particularly important during the non-breeding season (quarters 1 and 4, with ca. 69,000 and 59,000 birds, respectively), and late breeding (quarter 3, with maximum abundances reaching 40,000 individuals; **Table 2**, **Annex 4**, **Figure A4.2-2**).

A very high number of northern fulmars (coming from the North Sea LME) was also estimated to use the area all year round, with maximum abundances of more than 70,000 (reaching more than 150,000 during the winter months – quarters 1 and 4; **Table 2**, **Annex 4**, **Figure A4.2-6**). During the DY080 survey large numbers of birds were found in the northern sector of the MPA (**Annex 5**, **Figure A5.4**), particularly north of the Subpolar Front (a finding consistent with Boertmann 2014). The Manx shearwater is also a North Atlantic breeder; birds from colonies located in the Celtic-Biscay Shelf and from the Iceland Shelf and Sea LMEs visit the area especially during the quarter 2 (breeding period), with an estimated maximum abundance of ca. 70,000 individuals within the MPA (**Table 2**, **Annex 4**, **Figure A4.2-4**).

The Site is also used by important numbers of sooty and great shearwaters, migrant species breeding in South Atlantic Islands (studied individuals were tracked from the Falkland and Tristan da Cunha archipelagos, respectively), that visit the Site as a wintering area during April-September. The highest use by Great Shearwaters occurred in Quarter 3 (July-September) when an estimated 1.8 million birds used the area, whilst 1.5 million birds were estimated to use the site during Quarter 2 (April-June) (**Table 2**, **Annex 4**, **Figure A4.2-3**). The evidence of use is further supported by birds tagged during the DY080 research cruise. Ten birds, tagged with GPS transmitters at the end of June 2017, moved from the shelf area into the NACES MPA area during July/August. The sooty shearwater demonstrated the highest usage during Quarter 2 (ca. 360,000 individuals estimated) and Quarter 3 (ca. 330,000 individuals) (**Table 2**, **Annex 4**, **Figure A4.2-5**).

Petrels and storm-petrels

The NACES MPA is an important foraging area for several species of small petrels and storm-petrels, all highly pelagic and mostly nocturnal species (Dias et al. 2015; Dias et al. 2016; Ramírez et al. 2013) that are also probably feeding upon mesopelagic species that are highly abundant at the sea surface of deep waters during the night (Dias et al. 2016; Waap et al. 2017). Tracking data have shown the occurrence of three globally threatened species of gadflies – including the Endangered Bermuda petrel *Pterodroma cahow* and Zino's petrel *Pterodroma madeira,* and the Vulnerable Desertas petrel, and of the Bulwer's petrel. At-sea surveys conducted in June 2017 (DY080 NERC research cruise) also revealed the presence of storm petrels (Wilson's Storm-petrel, Leach's Storm-petrels and several unidentified Hydrobatidae/Oceanitidae sp.; see **Annex 5**, **Table A5.1** and **Figure A5.4**).

Small petrels are usually able to fly very long distances to find food, even during the breeding period, when restricted by colony attendance (e.g., Dias et al. 2016). Very recent studies, carried out with more accurate devices (GPS loggers) deployed on Desertas petrels, revealed that most birds travel more than 2,000 km from the colony, located in Desertas (Madeira), to forage in the NACES MPA during the incubation period (Granadeiro and Catry *in prep*; see **Annex 6**, **Figure A6.5**). The fact that these birds travel such long distances during a single incubation trip to target the waters of the NACES MPA indicates the value of the area for this Vulnerable species. BirdLife International's analyses and other studies (e.g., Ramírez et al. 2013) also suggest that the area is particularly important during the breeding season of these species (especially quarter 3: July-September; **Table 2** and **Annex 4**, **Figure A4.2-9**).

The Endangered and very rare Bermuda petrel, breeding on Nonsuch Island (January-June) in Bermuda, has a population estimate of 250 individuals after being re-discovered in the 1950s (BirdLife International 2016a). Tracking studies have indicated that these birds are capable of dispersing across the North Atlantic, with some individuals recorded off Ireland (Madeiros et al. 2013). The analysis of existing tracking data indicated that the birds used the site and surrounding area as foraging grounds from Spring (April) through to winter (December). High use of the NACES MPA occurred during the non-breeding summer period (July-September, quarter 3), particularly in the southern section, suggesting that this site is an important foraging ground for the global population of this species (**Annex 4**, **Figure A4.2-7**).

Both Zino's petrel and Bulwer's petrel occur more marginally in the Site, with usage predominantly in the eastern sector (**Annex 4**, **Figure A4.2-8** and **Figure A4.2-10**).

Alcids

The NACES MPA is an important foraging ground for at least 5 auk species, including the thick-billed murre (OSPAR-listed- see section above), the Atlantic puffin, common murre, little auk and razorbill (**Table 2** and **Annex 4**, **Figures A4.1-17** - **A4.1-21**). The highest abundance of auk species within the boundaries of the NACES MPA appears to be in the winter months when large numbers of Atlantic puffin and little auk use the area (**Table 2**, **Annex 4**, **Figures A4.2-17** - **A4.2-21**).

Atlantic puffins, which breed across much of the OSPAR maritime area (Greenland, Iceland, Faroes, UK, Norway and France) are currently experiencing dramatic population declines in many of their major colonies. Lack of breeding success has been linked to climatic changes and human pressure on forage fish (e.g., Sand eel) in shelf waters surrounding their colonies (BirdLife International 2017). Major mortality of adult puffins is occurring in the Atlantic during the winter, which suggests that stable food supplies are critically important during this time (Harris et al. 2015). The species is known to be highly dispersive during winter and can use several wintering sites (Fayet et al. 2016). Studies from birds wintering off the Faroe Islands found their diet included small mesopelagic fish (lanternfish, etc.), crustaceans including euphausiids, and juveniles of larger species (forkbeards, goby, lumpsucker, etc.) and squid (Falk et al. 1992; Harris et al. 2015).

The Atlantic puffin, tracked from the Iceland Shelf and Sea LME and the Celtic-Biscay Shelf LMEs use the NACES MPA year-round, with birds from the North Sea LME using the area in winter and summer/autumn (**Annex 4**, **Figure A4.2-17**).

Little auks have a pan-Arctic breeding distribution, with the largest colonies found in east and north-west Greenland and in Spitsbergen (Stempniewicz 2001). Given the extremely large population size this species is considered an important component in marine ecosystems in relation to transfer of energy and organic matter (Fort et al. 2010a; Karnovsky and Hunt 2002; Mehlum and Gabrielsen 1995). The species has high energy demands (Fort et al. 2010b; Harding et al. 2006) and feeds almost exclusively on zooplankton, *Calanus* copepods in summer (Fort et al. 2010b), and krill (e.g., *Meganyctiphanes norvegica*, and *Thysanoessa raschii*) amphipods (*Themisto* spp.) and young capelin (*Mallotus villosus*) in winter (Rosing-Asvid et al. 2013). Existing studies have already highlighted the importance of the region offshore of Newfoundland for this species, estimating that millions of little auks are over-wintering in this area (Fort et al. 2013; Mosbech et al. 2012). Post-breeding little auks from Greenland move to staging areas in the Davis Strait and the Greenland Sea where they are likely to be moulting (Mosbech et al. 2012), before leaving in October to fly ~2,000-3,000 km to the waters around the NACES MPA where many spend three to four months (Fort et al. 2013). During the summer/autumn (July-September), little auks are not present within the Site or the mid-Atlantic region, as they complete chick-rearing and depart for their moulting/staging grounds (Fort et al. 2013)(**Table 2**). Based on the available tracking data, the most important winter foraging grounds for this species coincide with the boundaries of the NACES MPA and the region of the Charlie-Gibbs Fracture Zone and western boundary of the OSPAR region (quarter 1, **Annex 4**, **Figure A4.1-19**), Within the boundaries of the MPA the highest densities in winter of little auk (ca. 1.2-2.3 million mature individuals) occurs in the north-west of the site (quarter 1), with a move to the eastern boundary over the Mid-Atlantic ridge during spring (**Annex 4**, **Figure A4.2-19**).

The highest diversity of alcids in the NACES MPA occurs in spring and summer months (April-September) when the common murre and razorbill tracked from colonies in the Iceland Sea and Shelf LME are also present. For these two species from this LME the mid-Atlantic provides more marginal foraging grounds than shelf waters and offshore areas closer to colonies (**Annex 4**, **Figures A4.1-18** and **A4.1-20**). Within the boundary of the NACES MPA the two species appear to use a patchy and more spatially restricted areas within the boundary of the NACES MPA. In spring (April-June, quarter 2) Razorbills (ca. 25,000-26,000 mature individuals) are concentrated in the south (close to the Milne Seamount MPA) and the north-eastern boundary (**Table 2**, **Annex 4**, **Figure A4.20**). The common murre use the Site in both spring and summer, with the highest numbers in April-June (ca. 71,000 mature individuals) (**Table 3**, **Annex 4**, **Figure A4.2-20**).

Skuas, jaegers, terns and gulls

The NACES MPA is an important site for trans-equatorial migrants from the southern and northern hemispheres, such as the south polar skua, and the long-tailed jaeger and the Arctic tern, respectively (Egevang et al. 2010; Gilg et al. 2013; Sittler et al. 2011; van Bemmelen et al. 2017; Weimerskirch et al. 2015; **Annex 4**, **Figures A4.1-11** - **A4.1-16**, **Annex 6**, **Figures A6.6**-**8**). The Site is used as a main staging site by long-tailed jaegers from Sweden, Greenland and Svalbard for one to three weeks in their southbound and northbound migrations (Gilg et al. 2013; Sittler et al. 2011; van Bemmelen et al. 2017; **Annex 6**, **Figure A6.7**); and for one week (birds tracked from the Netherlands) to one month (birds tracked from Greenland and Iceland) for Arctic Terns (**Annex 6**, **Figure A6.6**). The Site is also used as an important wintering ground for south polar skuas (**Annex 6**, **Figure A6.8**).

Although studies of at-sea foraging behaviour of these species in high-seas foraging grounds are scarce, de Korte (1985) has shown that long-tailed jaegers arrived in their breeding grounds in spring with maximum fat reserves, suggesting the importance of the North Atlantic foraging grounds associated with the Site as a refuelling site. The staging area probably also allows the long-tailed jaegers to restore fat reserves after the demanding breeding season before heading to the southern hemisphere (Sittler et al. 2011). Similarly, activity level of south polar skuas during the non-breeding season was reported to be low, suggesting that they spend little time trying to find food (less than 20% of their daytime in flight) possibly because of the good quality of the foraging grounds (Weimerskirch et al. 2015). Isotopic similarity indicated that south polar skuas feed on the same prey as terns and shearwaters or, more likely, they kleptoparasite these birds (Weimerskirch et al. 2015). Long-tailed jaegers possibly also feed by kleptoparasitism, and are often associated with the Sabine's gull *Xema sabini* and Arctic Tern (both species occurring in the MPA) during both migration periods and on wintering grounds (Gilg et al. 2013). They can likely also feed by themselves through surface pecking, because they are not deep divers and rely on mechanisms that bring zooplankton or fish to the surface (van Bemmelen et al. 2017).

Great skuas are endemic to the Northeast Atlantic, breeding in colonies from western Scotland to Svalbard, Norway. Birds coming from the Iceland Shelf and Sea LME used the MPA all year-round, ranging from a maximum of 2,945 mature individuals during quarter 4 to 1,309 mature individuals during quarter 2 (**Annex 4**, **Figure A4.2-14**). The use of the Site as a wintering area for great skuas is also in accordance with data presented in Magnusdottir et al. (2012) for Icelandic and Norwegian birds.

Arctic terns occupied the Site before departing to their wintering region during summer/autumn quarter 3 (July-September, with ca. 65,000 mature individuals) and quarter 4 (October-December, with ca. 82,500 mature individuals) (**Annex 4**, **Figure A4.2-11**). High numbers of long-tailed jaegers used the area all year-round (with ca. 27,766 (January-March), 34,765 (April-June), and 46,131 (July-September)) but with decreased numbers and only for the Greenland LME (there was no overlap during this quarter with birds tracked from Norwegian Sea and Barents Sea LME) during quarter 4 (October-December), when birds are in their wintering grounds (maximum of 4,482 mature individuals) (**Table 2**, **Annex 4**, **Figure A4.2-15**). The MPA was used by ca. 1,054 mature individuals of south polar skua from South Shetland Islands LME as their main wintering ground (April-September) (**Table 2**, **Annex 4**, **Figure A4.2-16**). The Site was also occupied by the Sabine's gull during April-June (maximum of 375 mature individuals) (**Annex 4**, **Figure A4.2-13**).

The presence of skuas, jaegers, terns, and gulls in the NACES MPA has also been confirmed by the recent NERC at-sea survey (DY080 - see **Annex 5**, **Table A5.1** and **Figure A5.4**), carried out during June 2017, supporting the evidence collected using tracking data. The at-sea survey showed that the Site is used by the Arctic (*Stercorarius parasiticus*) and pomarine (*S. pomarinus*) jaegers, and by great black-backed gull (*Larus marinus*), species that lack tracking data.

Cetaceans

Tracking studies for Globally Endangered (EN) sei whale (*Balaenoptera borealis*) and Vulnerable (VU) fin whales (*Balaenoptera physalus*) have recorded animals moving through the Site, with fin whales in particular stopping for periods to forage (similar to the blue whale behaviour noted above). For the northwest Atlantic, mesoscale fronts and eddies, such as those found in the Site, aggregate micronekton and zooplankton. Baleen whales are strongly associated with these areas (Kaschner et al. 2012; Roberts et al. 2016). A study by Pérez-Jorge et al. (2020) provided a detailed investigation into the spatial-temporal distribution of both sei and fin whales. The model for sei whales showed a clear habitat preference for subpolar waters, particularly those above 45°N, from May to August. Several of these preferred areas are within the eastern area of the Site and may be associated with the distribution of their main prey item *Calanus finmarchicus* (Sigurjónsson and Vikingsson 1997). Fin whales showed a clear habitat preference for the south-west of the Irminger Sea and the east coast of Greenland in March, with an increased probability of occurrence around 45°N, including within part of the Site, in June and July. The distribution of fin whales was strongly influenced by eddy kinetic energy (EKE) as a measure of mesoscale activity (Pérez-Jorge et al. 2020), which has been shown as linked to fin whale presence (Scales et al. 2017). Fin whales also have a broader diet than sei or blue whales, feeding on zooplankton but also several small schooling fish (Sigurjónsson and Vikingsson 1997). These predicted distributions were strongly associated with the availability of prey and variables linked to productivity (Pérez-Jorge et al. 2020).

Sightings during research expeditions (2004, 2008, 2013 and 2018) confirm a relatively high diversity of cetaceans (Wakefield 2018) as did the recent DY080 cruise to the Site in June 2018, which recorded at least 10 species of cetaceans in June alone (**Table 4**; **Table A5.2**). For a single survey, there was a very high number of sightings for Endangered fin whales (37 individuals); and the presence of at least 5 humpback whales, 3 blue whales, and a sei whale (an additional 16 individuals were unidentified; but were either blue, fin, or sei whales). These sightings were in several locations spread across the NACES MPA and verify the tagging and species distribution modelling data for blue, fin, and sei whales in Pérez-Jorge et al. (2020, **Figure 14**).

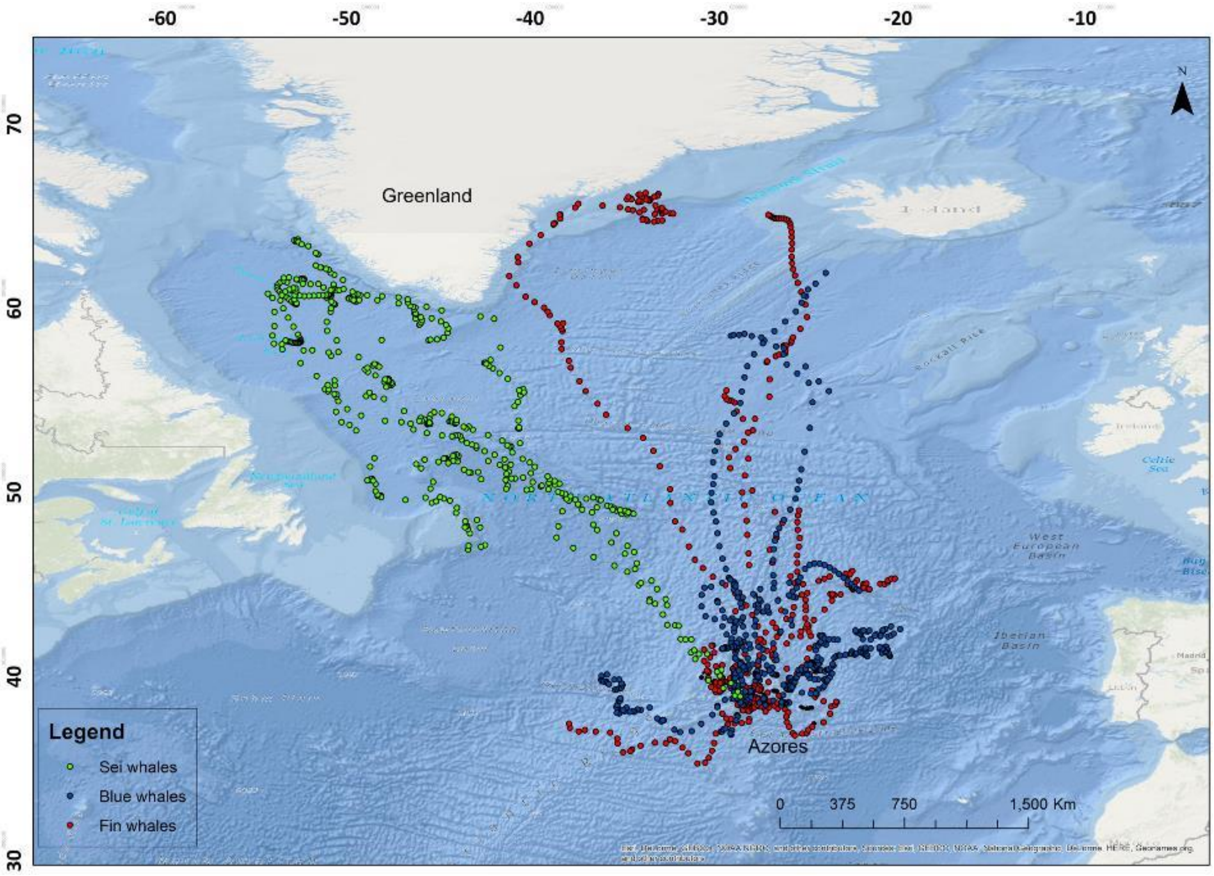

Figure 14. *Blue, fin, and sei whale positions from tagging and SDM data, cited from Pérez-Jorge et al. (2020). NACES (located at 41˚ N-53˚ N, 32˚ W-42˚ W) forms an important part of the sei whale migration route, with blue and fin whales present in the Site also.*

Cetaceans are known to migrate from wintering grounds in the Azores, via the Charlie-Gibbs Fracture Zone, to highly productive feeding areas in the Labrador Sea. A kernel density map for sei whale (*Balaenoptera borealis*), developed by Dr Mike Tetley for the NW Atlantic EBSA Workshop in 2014, based on a limited sample of telemetry data drawn from the Azores (Prieto et al. 2014) and Labrador (Olsen et al. 2009) provides evidence of the importance of a migratory corridor for this species. The data suggest the Site is a critical point in 'part of a complex migration process that can involve longitudinal movements between the two sides of the ocean basin in addition to expected latitudinal movements' (Prieto et al., 2014). See **Annex 7** for maps of cetacean records (from OBIS) and other products on cetacean movements, positions, and kernel density.

In addition to these data, 30 West Greenland harbour porpoises (*Phocoena phocoena*) were tracked, some of which displayed long-range movements over open ocean areas at >2,500 m water depth, reaching as far as within the NACES Site in May and June. The porpoises dived to average maximum depths of 248 m, with the deepest dive at 410 m; deep enough to feed on mesopelagic fish (Nielsen et al. 2018). The records within NACES coincide with boreal spring, which would be the same time that higher nutrient supply rates in deep waters limit the concentration of iron (Fe) (Moore et al. 2013) and lead to conditions found in the most productive open ocean systems (Longhurst 2010). The species is listed as OSPAR Threatened and/or Declining, though not for Region V.

Sharks

A number of shark species besides basking shark have been observed in the MPA (**Annex 8**). For example, blue sharks (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*) have been confirmed in the Site; the former through fisheries catch statistics but also through tagging and telemetry studies. Mature males, females and juveniles tagged in the UK have been recaptured by fishers in the MPA (Mead 2017). There are also data that show sharks feeding on cephalopods that live near the seafloor but these also vertically migrate each day (Vedor et al. 2021). Blue sharks tracked by satellite tags also show them utilising the eddies in the region very close to the MPA in order to exploit mesopelagic prey (Braun et al. 2019). See **Annex 7** for maps of sharks movements and geolocations. Satellite transmitter tracking data are increasingly showing movements of many more species into or just outside the NACES MPA besides blue shark and shortfin mako, including tiger shark (*Galeocerda cuvier*) and great white shark (*Carcharidon carcharius*) (Queiroz et al. 2016), with OCEARCH records also indicating a large male white shark transiting from as far as the Gulf of Mexico to the NACES Site[9]). Notably with shortfin mako, these sharks are listed as Endangered (EN) in the IUCN Red list and listed in CITES Appendix II (2019) as well as UNCLOS, the Bern Convention and the CMS. It is also included in Food and Agriculture Organisation of the United Nations (FAO)'s International Action Plan for the Conservation and Management of Sharks (IPOA-Sharks) and Memorandum of Understanding on the Conservation of Migratory Sharks (Sharks MOU) within the framework of the Bonn Convention. Shortfin mako shark are particularly overfished in the North Atlantic and Mediterranean.

Atlantic bluefin fisheries, which are active across the North Atlantic, often have sharks as common bycatch species. For Atlantic bluefin tuna trips by Chinese pelagic longline vessels between 2010 and 2018 studied by Pan et al. (2022), sharks accounted for 64.45% of bycatch (out of 3,455 caught individuals) with the most common species being blue sharks, then shortfin mako. ICCAT produced a recommendation on the conservation of the North Atlantic stock of shortfin mako bycatch, based on a 90% probability that stocks were being overfished, agreeing that in 2022 and 2023, all retentions of these sharks are prohibited for the North Atlantic (ICCAT 2021a; a review of results from a tool evaluating the interactions of tuna fisheries with cephalopods, crustaceans, ctenophores, marine turtles, marine mammals and seabirds is due to be conducted and discussed at a joint meeting in 2023 (ICCAT 2021b)).

European eel

The European eel (*Anguilla anguilla;* **Table 1**) has been recorded spawning in the Sargasso Sea, which is likely their primary spawning ground (Aarestrup et al. 2009). Newly hatched leptocephali (eel larvae), led by magnetic fields (Nasibett-Jones et al. 2017), move to and drift with the Gulf Stream and the North Atlantic Current to European coasts, where they transform into glass eels (Aarestrup et al. 2009; Bonhommeau et al. 2009). As much as between 80 and 100% of eel larvae pass through the OSPAR Maritime Area (OSPAR 2010h)

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[9] https://exhibit.ocearch.org/tracker/detail/george; last accessed 24 July 2022

to coastal areas and continental waters. Here, they account for a significant proportion of faunal biomass, are a key component of fish communities, and play an important role in transporting organic matter from marine to continental freshwater environments (Moriarty and Dekker 1997; Solomon and Ahmed 2017).

There has been a large-scale collapse of European eel populations since the 1980s, likely due to a range of factors such as parasitism, inaccessible freshwater habitats, a lack of spawners, pollution from dioxin-like contaminants and overfishing (Dekker 2003; Laffaille et al. 2005; Palstra et al. 2006). European fisheries and anglers were at one stage estimated to take an annual catch of as much as 30,000 tons of eels across all life stages (Moriarty and Dekker 1997). The species showed a negative correlation between high North Atlantic Oscillation (NAO) and recruitment (Durif et al 2011); and climate change has also caused fluctuations in food availability that threaten larvae stocks (Miller et al 2009).

The recruitment level is at ca. 1% of the 1960 level, and so the species has been classified as Critically Endangered (CR) on the IUCN Red List. The species had been listed as OSPAR Threatened and/or Declining in all OSPAR Regions where it occurs (OSPAR 2010h); though Region V has subsequently not been included as a regions where it occurs and therefore not included in the OSPAR Recommendation 2014/15 (OSPAR 2014b).

OBIS records confirm occurrence of the species within the NACES Site (**Annex 8**). Further to this, Baltazar-Soares et al. (2014) used a high-resolution ocean model to study the effect of mesoscale currents on the dispersal of European eel leptocephali from 1960 to 2005, estimated yearly. They correlated predicted recruitment from ocean dispersal models with observed recruitment. The model displayed a realistic simulation with strong predictive power on the annual fluctuations of observed eel recruitment. The NACES Site was found to be an important part of the trajectory of eel larvae from the Sargasso Sea spawning grounds, through the OSPAR Maritime Area, to the European continental waters. A model by Chang et al. (2020) located a potential spawning area above the MAR, resulting in the distribution of eel larvae in the NACES Site, particularly for northwestward swimming larvae.

Atlantic cod

The Atlantic cod (*Gadus morhua;* **Table 1**) is a benthopelagic fish species that occurs in coastal and offshore waters down to 600 m depth (OSPAR 2014c). The North Atlantic population has been divided up into separate stocks, based on genetics and for management purposes. The North-western stock (nearest the Site) has significant genetic heterogeneity (Beacham et al. 2002). The presence of Atlantic cod, likely from this stock, has been shown for within the NACES Site, based on OBIS records (**Annex 8**).

The species is an important food source for thick-billed murres (*Uria lomvia*) during their breeding season (Gaston 1985) and was also once an important part of the diet of Leach's storm-petrels in certain regions of the Northwest Atlantic during the 1970s, but this likely shifted due to the subsequent collapse of stocks (Hedd et al. 2009). The zooplankton *C. finmarchicus* is a key prey item of Atlantic cod, particularly during larval and early juvenile life stages (Heath and Lough 2007), but sudden shifts in the availability of these zooplankton may have contributed to population collapses in the 1970s and 1980s. The abundance of Atlantic cod in West Greenland waters had peaked in the 1940s and 1950s but a period of rapid cooling in the North Atlantic (related to the AMOC) in the 1960s (Buch et al. 1994) was followed by below-average temperatures in the 1970s and 1980s, which led to shifts in zooplankton abundance and distribution, and thus the eventual collapse of major Atlantic cod fish stocks in West Greenland and northern Newfoundland waters (Drinkwater and Kristiansen 2018, and references therein). Not only this, but fisheries-driven collapses occurred from the 1980s and had a cascading effect on lower trophic levels (Frank et al. 2007).

The species is now considered as Globally Vulnerable (VU) in the IUCN Red List and is an OSPAR Threated and/or Declining species in Regions II and III, though it occurs in Regions I-V. The species does show a high variability in reproductive strategies in response to changing environmental conditions. However, the effects of ocean acidification on Atlantic cod larval survival could mean as much as a doubling of mortality rates for individuals within the first 25 days of hatching at the end of the century compared to those of the present day (Stiasny et al. 2016).

Mesopelagic fish

Mesopelagic fish are a major source of biomass in the oceans, and important prey items for higher trophic predators, including seabirds (Gjøsaeter and Kawaguchi 1980; Harris et al. 2015; Paredes et al. 2014; Waap et al. 2017). Mesopelagic fish prey on gelatinous zooplankton, and they in turn are preyed on by larger fish, such as redfish and the OSPAR-listed Atlantic bluefin tuna; and by squid, cetaceans, and seabirds (Granadeiro et al. 1998; Granadeiro et al. 2002; Waap et al. 2017). These small fish are particularly associated near fronts and eddies, such as those occurring within the MPA (Paredes et al. 2014). Mesopelagic fish are also one of the main components of the Deep Scattering Layer (DSL), a horizontal zone of micronekton. Within the areas investigated by the MAR-ECO/ECOMAR projects, mesopelagic species such as the goiter blacksmelt (*Bathylagus euryops*) and lanternfish (myctophids) were found in the highest abundance at the Subpolar Front and CGFZ, with a tendency to be distributed in the upper surface layers (Sweetman et al. 2013). The study examined pelagic fish along the MAR and concluded that goiter blacksmelt appear to be an important species in the oceanic food web of the North Atlantic. See **Annex 7** for maps of mesopelagic fish records.

The NACES Site is a known hotspot for mesopelagic fish in the Atlantic but also worldwide (Fennell and Rose 2015). Eddy centres have been recorded within and near the boundary of the NACES Site (eddy centres within the Site were located west of the Evlanov Seamount) by Fennell and Rose (2015). This study was conducted over 2012, 2013 and 2014, and caught DSL fish belonging to families such as Bramidae (pomfret), Myctophidae (lanternfish) and Stomiidae (barbeled dragonfishes), as well as jellyfish taxa. Similar species were caught in NACES in 2015 (on a much smaller scale so as to examine their guts for microplastics) by Wieczorek et al. (2018). The DSLs for 2014 were found to be one of the densest recorded (>7,000m^2 nautical mile^{-2}) worldwide, particularly when compared to those in Irigoien et al. (2014) (Fennell and Rose 2015). These higher densities were related to warm temperatures, positive sea anomalies, and a positive NAO. The presence of Atlantic Pomfret (*Brama brama*) in the catches also suggests that large pelagic fishes feed on the concentration of organisms located in the DSL (Fennell and Rose 2015).

For these same regions within and near the boundary of the NACES Site, Devine et al. (2021) used a mid-water herring trawl and oceanographic sampling, aboard the *RV Celtic Explorer* (Spring 2015/16), to characterise mesopelagic fish assemblages along transects through warm-core eddies in the northwest Atlantic. Of the 23 transects, 17 were located within the NACES Site, and the sampling yielded 4,660 fish specimens, representing at least 101 species across 35 families in the Site. The Myctophidae and Stomiidae comprised >50% of the total catch in 2015 and 2016 combined. The diurnal vertical migrations of mesopelagic fish also mean they play a key role in speeding up the process by which carbon and nutrients are transported to deeper areas. Given NACES is a hotspot for mesopelagic fish, this form of downward carbon flux is expected to be more pronounced than elsewhere in the North Atlantic (Irigoien et al. 2014).

Further to this, Della Penna and Gaube (2020) conducted micronekton tows within NACES across 4 stations in 2016 and 3 stations in 2017. Sampling yielded a total of at least 28 identified species in the Site (**Annex 12**), including myctophids such as hatchetfish, dragonfish and bristlemouths, as well as amphipods and multiple species of jellyfish, chaetognaths (predatory worms), halocyprids (ostracods), euphausiids and unidentified juvenile myctophids. Several micronekton species occurred in eddy stations in NACES with moderate to strong retention (e.g., NAAMES 3, Station 4; -39.129 N, 48.638 W; strong retention and a retentive surface of 12,200 km^2) (Della Penna and Gaube 2020). The findings of this study verify those of Fennell and Rose (2015) and confirm that the eddies in this region likely isolate mesopelagic communities from those in ambient waters. Historical data from Judkins and Haedrich (2018) for between 1963 and 1974 found 140 species of DSL micronekton fish faunas in Northwest Atlantic Subarctic region tows, several of which took place in the NACES Site.

The presence of microplastics within mesopelagic fish in and around the NACES Site has been documented. Wieczorek et al. (2018) conducted a study where 3 trawls between 300 and 350 m, and 5 between 500 and 650 m, within or near the NACES Site, were hauled. The gut contents of a total of 233 mesopelagic fish were examined. Across all fish, 73% contained plastics, with *G. denudatym*, *S. beanie* and *L. macdonaldi* having the highest frequency of occurrence. Methyl cellulose (34%), polyethylene (34%; a common constituent of fish nets) and nylon (10%) were the most common types of microplastic located in the gut. Water samples were also taken at 3 m depth for each trawl site, collecting on average 14 microplastic fragments per 100 litres of water. The water samples were mainly polyethylene (40%), methyl cellulose (18%) and alginic acid (13%). The ingestion of microplastics by mesopelagic fish occurs through direct consumption or indirectly, through consumption of a prey item that contains microplastics, such as a copepod or euphausiid. The ingestion of these microplastics may hinder carbon cycling and, given the diurnal vertical migrations of these fish, transport the plastics into deeper waters (Lusher et al. 2016). Tuna and swordfish prey on mesopelagic fish, and given these species are commercially important, this has implications for human health (Scott and Tibbo 1968; Varela et al. 2013).

Cephalopods

The abundance and distribution of cephalopods in the western North Atlantic has been documented for the area south of the CGFZ as part of MARECO/ECOMAR projects (Vecchione et al. 2010). Abundant species included the oceanic cephalopod species *Teuthowenia megalops, Gonatus streenstrupi, Grimpotheuthis discovery*. The importance of cephalopods in the diet of some Atlantic seabirds is well documented, for example in Audubon's shearwater, *Puffinus lherminieri baroli*, Cory's shearwater, *Calonectris borealis*, Manx shearwater, *Puffinus puffinus* and Bulwer's petrel *Bulweria bulwerii* (Den Hartog and Clarke 1996; Neves et al. 2012; Petry et al. 2008; Waap et al. 2017). Other species such as Desertas petrel, *Pterodroma deserta* and Atlantic puffin *Fratercula arctica* are also known to prey on squid (Harris et al. 2015; Ramos et al. 2016).

Erickson et al. (2017) showed the influence of the Florida Current and Gulf Stream in increasing the abundance and diversity of cephalopods in the western North Atlantic region. Taite et al. (2020) is the first study to focus on the influence of warm-core mesoscale eddies on the diversity of paralarval cephalopods in the northwest Atlantic. There were 31 sample sites in 2015 and 21 sample sites in 2016 within the NACES Site, each located across warm-core anticyclonic eddies. Samples were mostly taken between 300 and 600 m water depth; and a total of 26 species across 15 families were collected from 214 specimens within the Site. The number of cephalopod specimens per tow was fewer outside the eddy (<10 per tow) compared to inside the eddy (>24 per tow). These warm-core eddies help to concentrate cephalopods; for example, tropical species such as *H. dagamensis* occur within the NACES Site at their northernmost ranges, likely transported via the Gulf Stream and into the North Atlantic Current within Western North Atlantic Central Water (located in the upper 500 m of the eddy) and finally concentrated in the eddy feature where the water is warm and saline (Taite et al. 2020). Several other species (*A. morissi, B. lyromma, C. mega, C. scabra and P. gemmata*) were collected outside their known distributions, further north than previously recorded. The abundance and diversity of species in this study suggest cephalopods are concentrated within the area. Several of the species found represent a known food source for the seabird, whale and shark species using the area. See **Annex 7** for OBIS maps of cephalopods records.

Benthic habitats

Seamount-like features and associated communities / Abyssal Plain and fracture zones

Abyssal systems cover ca. 54% of the Earth's surface according to Gage and Tyler (1991) or 65-75% according to Watling et al. (2013). The abyssal seafloor occurs between 3,501 and 6,500 m water depth according to Ramirez-Llodra et al. (2010). This includes basins, plains, and rolling hills, dotted with seamounts and knolls, which are subdivided in the North Atlantic by the Mid-Atlantic Ridge and various oceanic trenches. Abyssal plains have a slope <1:1,000; hills are small elevations between >300 and <1,000 m above the seafloor and generally irregular of shape; and mountains are >1,000 m and include knolls, ridges, and other features with positive relief (Harris et al. 2014; IHO 2019). Abyssal plains, hills and mountains comprise ca. 22.9%, 36.8% and 15.6% of the North Atlantic Ocean basin area, respectively (Harris et al. 2014). Abyssal plain sediments tend to be fine-grained with coarser grains on abyssal hills (Stefanoudis et al. 2016). The thickness of sediment in the Atlantic can be several kilometres deep and is on average higher than in the Pacific Ocean (Straume et al. 2019).

These seafloor habitats host epibenthic (on or above the sediment) and infaunal (within the sediment) communities with several hundred macro- and megafaunal species on a scale of a few square kilometres, and even higher densities for meiofauna (Sanders 1968). The abundance and diversity of these benthic organisms largely depends on the supply of phytodetritus, which is their main food source (Witte et al. 2003), as well as temperature (Yasuhara and Danovaro 2016), and habitat heterogeneity; provided by a mix of hard and soft substrate (Durden et al. 2015; Riehl et al. 2020). North Atlantic habitat structures are often biogenic, for example burrows and mounds and the shells of giant protozoans. Hard substrate is provided by escarpments, ridges, pillow lava, fracture zones and canyons, supporting faunal assemblages distinct from those in softer sediments (Gage and Tyler 1991). These hard/rocky areas support connectivity and high biodiversity by enabling animals to disperse between patches (Priede et al. 2022). A recent study along the Vema Fracture Zone in the equatorial Atlantic estimates that the abyssal seafloor is even more heterogenous than previously thought, with around 260,000 km^2 of abyssal rock patches estimated to occur along Atlantic fracture zones alone (Riehl et al. 2020). The recent IceDivA2 expedition in the NACES Site found the 'Mount Doom' seamount, and other younger structures, in an area that (based on available multibeam data) was expected to be abyssal plain habitat. This demonstrates that the broadscale bathymetric terrain data currently available underestimates both larger features (e.g., seamounts) and small-scale habitat heterogeneity (rock patches) within the Site. Even subtle changes in abyssal terrain can significantly impact benthic faunal biomass and community composition, with as little as a 2 m change in water depth (Durden et al. 2020).

The seafloor within the NACES MPA contains a high geodiversity with abyssal plains, hills, mountains and basins, as well as escarpments, ridges, knolls, pillow lava (observed in the Mount Doom area), fracture zones (West Thulean Rise and Charlie-Gibbs Fracture Zone); and the Northwest Atlantic Mid-Ocean Channel (**Figure 15**).

Basins are depressions in the seafloor that tend to be equidimensional in plan (IHO 2019) and can be divided into large basins (>800 km^2) and small basins (<800 km^2). These cover 40.1% of the area in the North Atlantic Ocean basin (17,955,140 km^2) according to Harris et al. (2014); however, other features may occur within these areas. The depressions are filled with North Atlantic Deep Water, for example, or other deep, cold, and dense water masses moving southward. For NACES, there are ca. 17 distinct areas defined as large basins and ca. 20 small basins (Harris et al. 2014; **Figure 15**). The basins within NACES range from 3,800 m to 4,600 m water depth and extend from 155 km^2 to as much as 4,780 km^2 area (Harris et al. 2014; **Figure 15**).

Basin features are often separated by ridges: isolated, elongated, and narrow elevations with steep sides and varying complexity (IHO 2019), sometimes classified as restricted to features >1,000 m in relief; and are less common in the North Atlantic than in the North and South Pacific Oceans (Harris et al. 2014). Cold-water corals have been found on the flanks of ridges, potentially due to their slope and how this impacts the local acceleration of water flow (Mortensen et al. 2008). There are at least 4 distinct ridges in the Site, identified by Harris et al. (2014), covering an estimated combined area of ca. 9,600 km^2 (individual ridges ranged from 872 km^2 to 4,400 km^2 area).

Escarpments (also referred to as 'scarps') are elongated, linear, steep slopes where the seafloor dips at an angle >5° (Harris et al. 2014; IHO 2019). The escarpments located in NACES range from 121 km^2 to 3,040 km^2 area (Harris et al. 2014; **Figure 15**). The Gorda Escarpment off California was found to be a reproductive hotspot for cephalopods and deep-sea fish, particularly near the crest (Drazen et al. 2003) and the 34 or so escarpments estimated within the NACES Site could provide similar hotspots for the paralarval cephalopod species recorded in Taite et al. (2020).

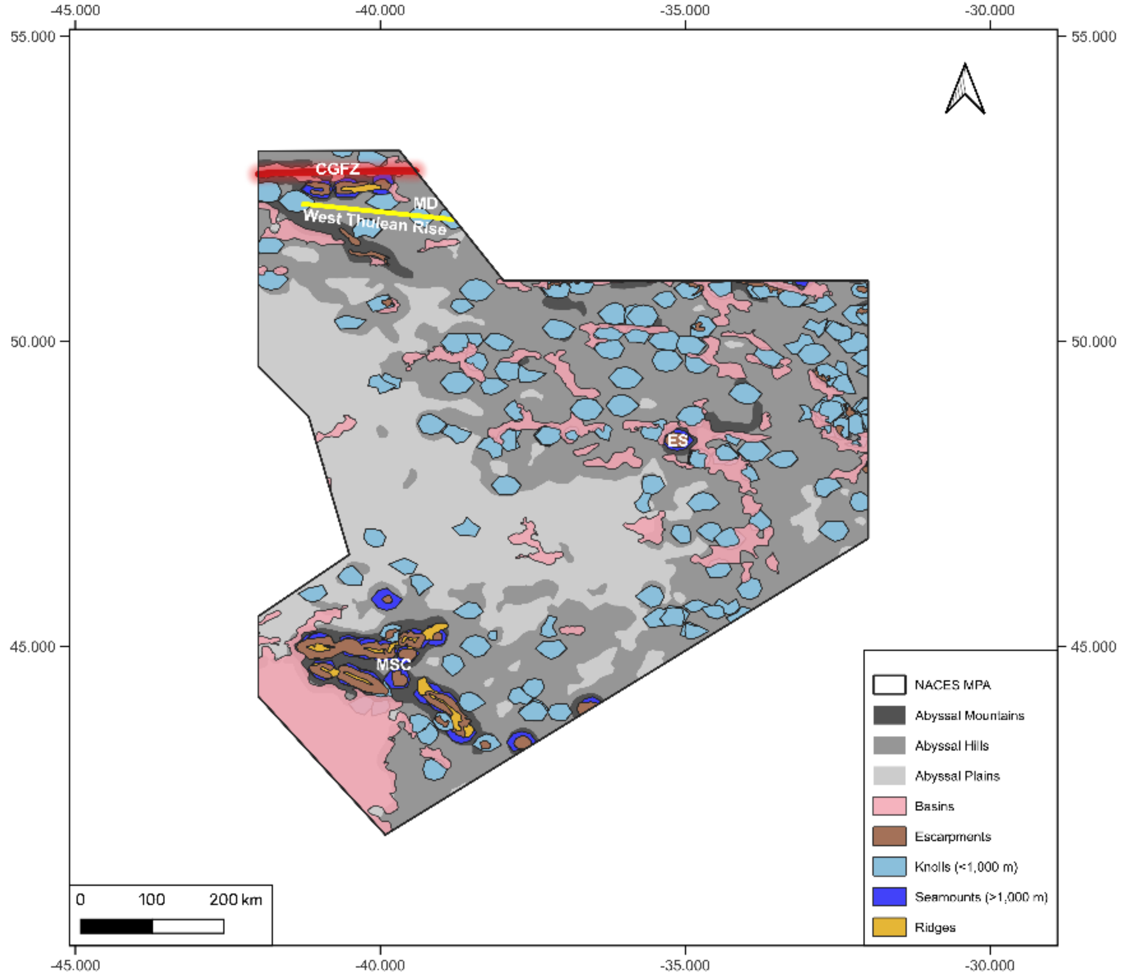

Figure 15. *Geodiversity in the NACES MPA based on current available data. Labels are for the Milne Seamount Complex MSC), Evlanov Seamount (ES), Mount Doom (MD) and the Charlie-Gibbs Fracture Zone (CGFZ). Not every feature is visible due to multiple overlays; but layers are presented to show the maximum area for each feature. Abyssal mountains include seamounts and other structures >1,000 m in height, for example guyots. CFZA and West Thulean Rise data from IHO-IOC GEBCO Gazetteer of Undersea Feature Names https://www.gebco.net/; Seamounts and knolls (ecologically-similar features with different heights) data from Yesson et al. (2011); all other geomorphic feature data from Harris et al. (2014). Submarine canyons are present along the North Atlantic Mid-Ocean Channel but the southern part that runs through the Site is not available on mapping tools such as GEBCO.*

Submarine canyon features are located along the North Atlantic Mid-Ocean Channel (NAMOC), which runs from the Labrador Sea through NACES and southwards to the Sohm Abyssal Plain (Hesse et al. 1987; Stoner et al. 1996). Canyons can impact local upwelling patterns, through the interaction of ocean currents and internal waves, and enhance primary productivity; and the effect of this extends through the food chain to include birds and marine mammals (Hickey 1995). Cetacean feeding grounds and demersal fisheries are often located above submarine canyons due to this increased productivity (Hooker et al. 1999). The canyons located within the NACES region do not have a significant landward extension, so should be treated as separate canyon features to those that do (Williams et al. 2009).

Knolls have a rounded profile and are ecologically-similar features to seamounts, but their elevations are <1,000 m (as opposed to >1,000 m for seamounts; OSPAR Agreement 2008-07) above the surrounding relief (IHO 2019). These features have been recorded throughout the NACES Site (see **Annex 7**) and provide hard substrate that, like the Orphan Knoll west of the Site, could support many species such as antipatharian corals, sponges, sea anemones, holothurians, and several deep-sea fishes (Wudrick et al. 2020). These range from 2,321 m down to 4,592 m water depth at the base, with basal areas from 170 km^2 to 1,154 km^2. The height of these features are estimated as between 245 m and 1,000 m (Harris et al. 2014; **Figure 15**).

Pillow lava was observed in the Mount Doom area on the IceDivA2 expedition in the Site. These hard structures have also been observed in Orphan Knoll, with images showing the basaltic pillows covered in hexactinellids (glass sponges), crinoids, zoanthids and *Chrysogorgia* spp. corals (Meredyk 2017).

Fracture zones are long and narrow zones formed by the movement of tectonic plates and characterised by escarpments, ridges, or troughs (IHO 2019). These linear features are located in NACES with the Charlie-Gibbs Fracture Zone (>2,000 km long) and the West Thulean Rise, both stretching across the northern part of the Site. Habitat suitability of cold-water corals appears to increase at both these fracture zones (Davies and Guinotte 2011). The CGFZ is a major transform fault, reaching ca. 4,500 m depth in some areas (Felley et al. 2008), with records of local species richness of rare species (Gebruk and Krylova 2013). The abyssal depressions, which include canyons and trenches, trap organic matter that attract very dense aggregations of holothurians (Billett 1991; Gebruk and Krylova 2013). Importantly, the CGFZ is the only deep-sea connection between fauna in the north-east and north-west Atlantic basins, with important biogeographic shifts observed between assemblages north and south of the CGFZ (Gebruk et al. 2010). Cephalopod data from the MARECO/ECOMAR programme indicate the highest diversity and abundance occurring south of the CGFZ (Vecchione et al. 2010). Given the location of the NACES Site, bounded by the CGFZ to the north and the Mid-Atlantic Ridge to the east, assemblages within the Site could contain species of biogeographic importance.

The underlying sediments in the North Atlantic Ocean basins are also essential in, for example, carbon burial, carbon remineralisation and nutrient cycling (Cai et al. 2000; Canfield et al. 1993). The sediment lithologies as characterised by Dutkiewicz et al. (2015) within the NACES MPA are predominantly calcareous ooze and clay (over which the Milne seamount complex largely occurs) with an area of sand and fine-grained sand in the central-north region. Therefore, the Site has a mixture of siliciclastic, transitional, and biogenic sediments (**Figure 16**).

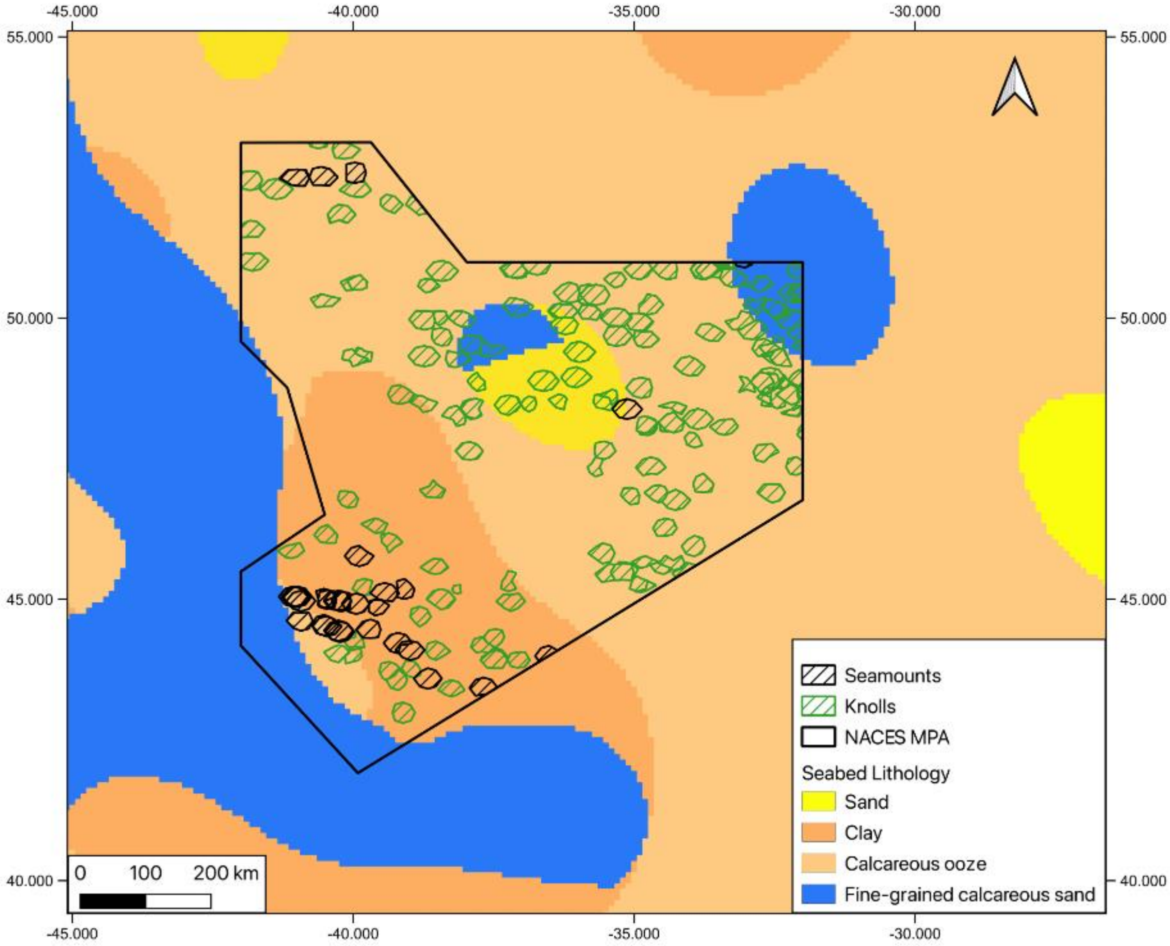

Figure 16. *Major seabed lithologies for the NACES Site based on samples from original cruise reports, created using data from Dutkiewicz et al. (2015).*

The IceDivA2 expedition surveyed the 'Mount Doom' seamount and adjacent habitats in the area. Sedimented plains and steep rock facies were both observed, with multibeam echosounder backscatter showing flat topography punctuated by sharp vertical drops of up to 100 m (**Figure 17**). Multiple samples were taken at the base with a box core, epibenthic sledge, and a camera tow.

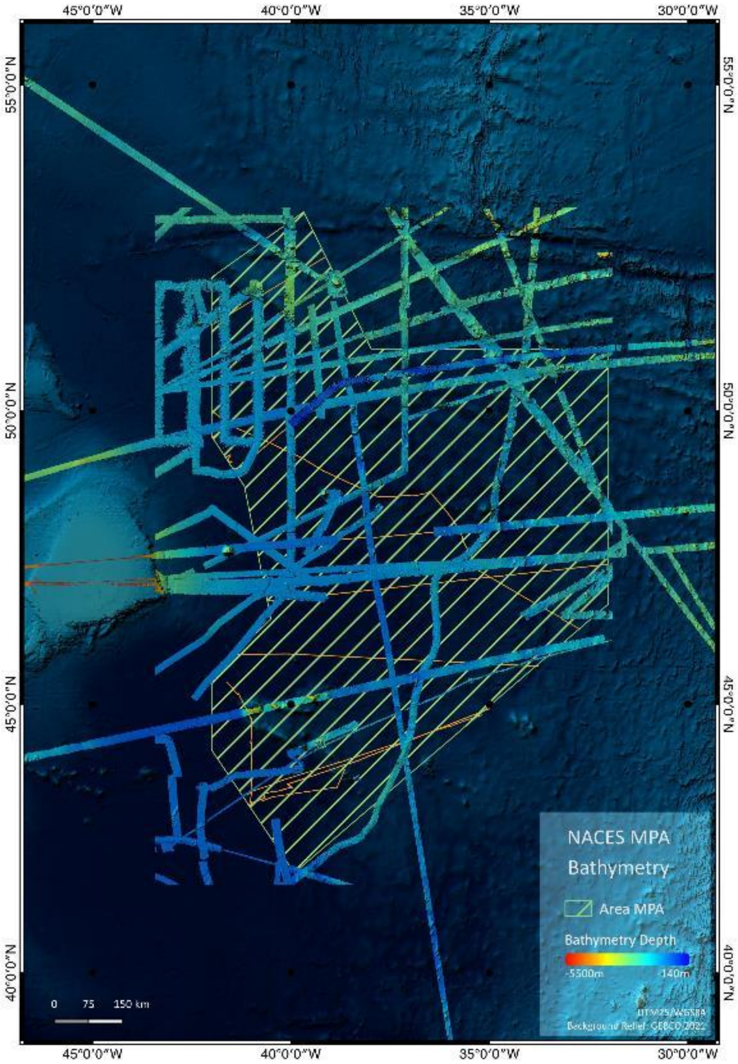

Figure 17. *Bathymetric tracks for multibeam data collected by German research expeditions (1995-2021) across the NACES MPA, including IceDivA2 tracks of the Mount Doom area. Images courtesy of GEOMAR/Mia Schumacher/IceDivA2 expedition/James Taylor/Senckenberg Research Institute.*

Each habitat harboured different communities, and these were comprised of taxonomically diverse groups of benthic and demersal species (**Figure 18**) including macrourid fish, brachyuran crabs, ophiuroids, holothurians, stalked crinoids, crustaceans, pycnogonids, a variety of biogenic formations/tracks in the sediment, presumably from sipunculid worms, and many ‘mermaid’s purses’ (the egg cases of deep-sea skates or sharks). The vertical drops host deep-sea sponge aggregations with a high abundance of glass sponges and demosponges such as *Geodia* spp., which were anchored to hard substrate. At least 2 new species of isopod were discovered, and many more species are yet to be identified and described. The base of the caldera presented a classic abyssal plain habitat with gravel patches of volcanic material from the caldera and large aggregations of holothurians, as well as solitary large holothurians, tube forming polychaetes, pycnogonids, stalked crinoids, and *Grimpoteuthis* sp. (“Dumbo”) octopus.

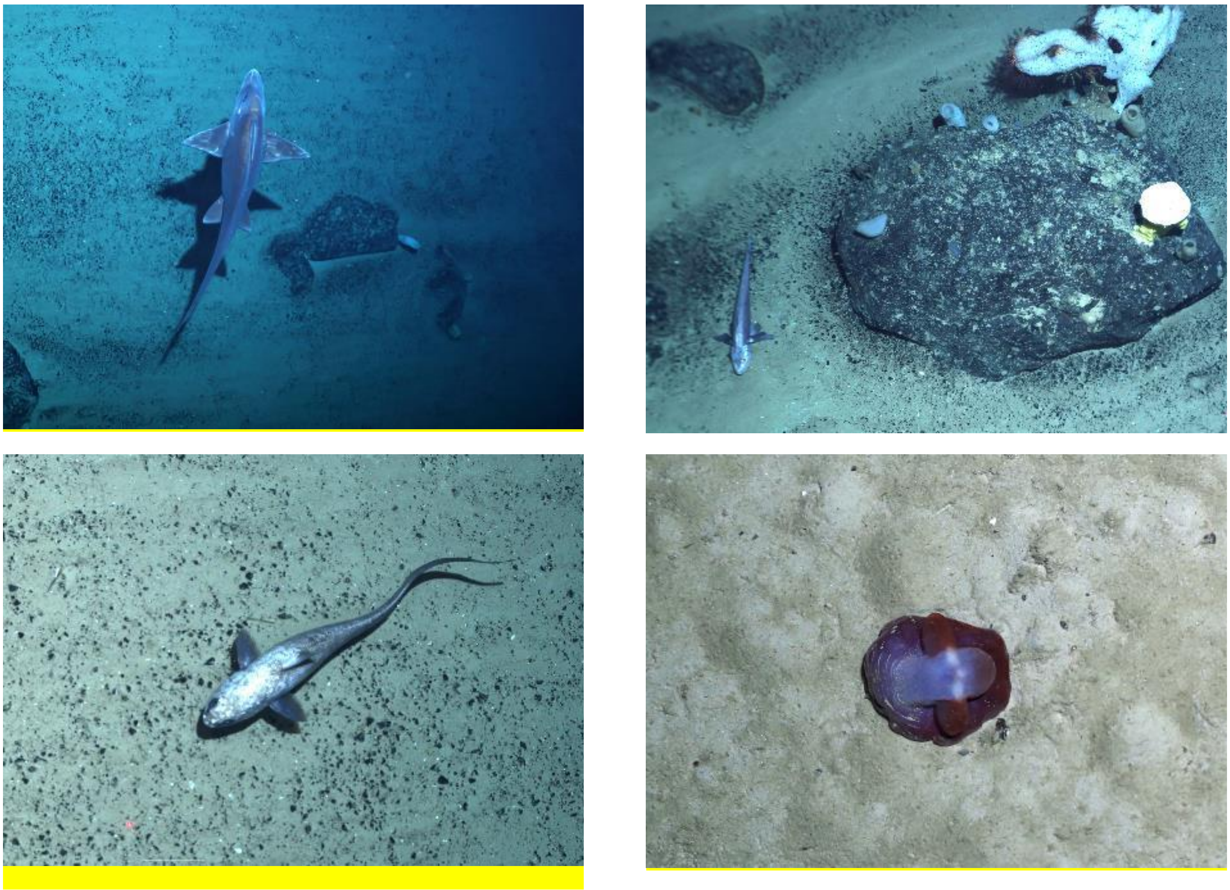

Figure 18. *Examples of fauna and habitats from the Mount Doom region within the NACES MPA Site – (1) Upper left - Hydrolagus sp.; (2) Upper right - Bathysaurus sp.; (3) Lower left – Coryphaenoides sp.; (4) Lower right - Grimpoteuthis sp. Images courtesy IceDivA2 expedition/James Taylor/Senckenberg Research Institute.*

Several demersal fish species, such as grenadiers and *Bathysaurus* spp., were observed across both soft and hard substrate habitats. Grenadiers (also referred to as 'rattails') are deep-sea fishes belonging to the family Macrouridae, and the *Coryphaenoides* spp. (**Figure 18**) contain several of the larger species in this family. Though several species are superficially similar, they have different life histories and behaviours (Ritchie et al. 2013, and references therein). For example, *C. armatus* tend to inhabit the lower slopes of abyssal plains between 2,000 and 4,700 m (Merrett and Haedrich 1997) whereas *C. rupestris* tend to occur between 700 and 1,800 m. Bergstad et al. (2010) showed that *C. rupestris* from the MAR have a diet composed primarily of cephalopods when small, with pelagic shrimps becoming an increasingly significant source as the fish increase in size, while other species within the genera do not depend so much on cephalopods. In the North Atlantic, *Coryphaenoides* spp. have been captured in high amounts, mainly as bycatch (Devine et al. 2012). Between 1977 and 2002 in the Porcupine Abyssal Plain, *C. rupestris* was one of the main bottom trawl fishery targets, and populations for several *Coryphaenoides* species showed a decrease in abundance in their shallow range, which resulted in declines at the deeper end of their depth range (Priede et al. 2011). Recent bottom trawl activity is not recorded for the NACES Site and, due to their elusive behaviours, little is known about the species in this area. The genus *Bathysaurus* spp. contains two species, *B. ferox* and *B. mollis*, and both are circumglobal but cryptic species. The former tends to occur at depths of 1,000 to 2,500 m with preferred water temperatures of 3 to 4°C, while the latter is mostly found at 2,500 to 4,500 m in temperatures of 2 to 3°C. Both species predominantly feed on other fish (Sulak et al. 1985). A 2010 study on *B. ferox* in the eastern Flemish Cap and Orphan Seamount found the species at all five dive locations with 12 individuals observed in total. All individuals were observed resting on the seafloor over either fine grain sediments or boulder fields, sometimes with sparse sponges, as in **Figure 18** (Devine et al. 2020).

3. Ecological significance

The NACES MPA is a unique site in the high seas of the North-East Atlantic, encompassing an area of complex oceanography and high species richness and density of pelagic seabirds, cetaceans, sharks, mesopelagic fish and cephalopods, and seamount communities visiting or inhabiting the Site year-round (e.g., **Annex 4**).

Much of the evidence underpinning the Site's nomination, evidence which also supported much of the Site to be included as part of an EBSA description under the CBD (**Annex 7**), relates to the highly complex oceanographic and hydrographic dynamics in the region, including high surface primary productivity, multiple frontal zones, and persistent eddies (see details in **Part A**, **Section 8**, "*Characteristics of the area"*). Recent GEBCO 2021 bathymetry and scientific multibeam surveys also now reveal a high geodiversity of bathymetric features throughout the Site (see details in **Part A**, **Section 8**, "*Characteristics of the area"*).

The product of this regional oceanography, the Site's geodiverse bathymetry, and the high probability of interactions between the two is a Site characterised by high biological diversity. Bentho-pelagic coupling from the sea surface to the seafloor and upwards from the seafloor and surface is important to sustaining the occurrence of suspension-feeding deep-sea sponges and corals, why so many migratory marine species visit the Site, why some species are spawning there, and why the Site might even be considered an important migration corridor. The latter has considerable ecological significance, with the World Wildlife Fund recently declaring "Blue corridors are migration superhighways that allow marine megafauna to move between these critical habitat areas and are essential for their survival" (Johnson et al. 2022).

Oceanography at the Site and its ecological significance

The Site is characterised by being located at a biogeographic ecotone, in an area with intense mesoscale oceanographic activity with near stationary eddies and many thermal fronts aligned in zonal bands (Read et al. 2010). The banded zonal fronts are associated with vertical velocities bringing nutrients to the surface, concentrated by eddies (Dutkiewicz et al. 2001). This dynamic phenomenon creates patchy high surface productivity and consequently higher prey availability for oceanic higher predators. Mesoscale eddies concentrate mesopelagic fish and cephalopods in the Site (Devine et al. 2021; Taite et al. 2020), and this links up through the food chain to cetaceans and seabird species that converge and feed in the Site (see 'Bentho-pelagic coupling and ecological significance at the Site' within this section). Eddy centres are located within the NACES Site, and these are related to the Deep Scattering Layer (DSL). Mesoscale eddies have been described as "oases in the desert" (Godø et al. 2012); however, Fennell and Rose (2015) propose that the eddies in and near the NACES Site concentrate DSL entrained organisms (e.g., mesopelagic fish and squid) and move these species northwards, acting as "buses" rather than fixed "oases". Notably, for 2014, the Site displayed one of the highest DSL densities recorded worldwide, confirming NACES as a hotspot for mesopelagic fish (Fennell and Rose 2015). Broad scale remote sensing of the region near the NACES MPA shows the frontal zone and the Charlie-Gibbs Fracture Zone (CGFZ), part of which runs across the north of the NACES Site, are subject to large scale phytoplankton blooms during spring and summer (Taylor and Ferrari 2011); and with much higher chlorophyll in the 48°-52° N range, in which part of the NACES MPA is situated, relative to adjacent waters (Gaard et al. 2008; Pelegrí et al. 2006; Vecchione et al. 2015).

Biogeographic ecotone and persistent frontal zones

Notably, the NACES MPA is situated within the subpolar frontal zone, which is considered to be a "biogeographic ecotone": representing a transition zone between cold, polar seas and the warmer central Atlantic waters (Beaugrand et al. 2002). The region is therefore ecologically important, providing habitat for both cold and warm adapted species at the extreme end of their ranges (Acha et al. 2015; Beaugrand et al. 2002). Previous studies have indicated the importance of the Subpolar Front and the CGFZ in relation to heightened primary productivity, copepod and euphausiid biomass and biodiversity and mesopelagic fish

(Pelegrí et al. 2006; Priede et al. 2013). The frontal zone is stable throughout the year, suggesting that the NACES MPA provides a stable and predictable source of food for species throughout the water column.

Fronts and high energy eddies are known to aggregate primary productivity and zooplankton, providing a temporally and spatially reliable foraging zone for higher trophic level predators such as seabirds (Scales et al. 2014) but also other top predators and species feeding at lower trophic levels such as baleen whales and basking sharks. These features can also help to fuel species throughout the water column (see more detailed section later, "Bentho-pelagic coupling and its likely ecologically significance at the Site". But briefly for example, when these features occur over seamounts, prey such as zooplankton can become entrained over the abrupt topography ("topographic blockage"), rendering them more accessible for mesopelagic and demersal fish as well as top predators (Dias et al. 2016; Morato et al. 2016; Sweetman et al. 2013). The ecological significance of such oceanographic features to a wide variety of species at the Site are outlined next. In relation to zooplankton communities, the available evidence suggests that the MPA corresponds to a region with a high abundance of gelatinous zooplankton, copepods, and euphausiids (Gaard et al. 2008; Letessier et al. 2011; Vecchione et al. 2015). Haberlin (2018) sampled various meso-zooplankton across 6 stations located in the NACES Site, and recorded a total of 54 zooplankton taxa, including 41 gelatinous species (**Annex 10**). The mean gelatinous abundance (across all stations, inside and outside NACES) was 456 ± 410 individuals per 1,000 m^3.

The combination of XBT and CTD profiles resulted in a high-resolution section through the warm-core eddy across which samples were taken, revealing a core of >14°C from the surface to ca. 300 m depth, and a 10°C isotherm reaching from ca. 300 m to ca. 800 m depth. Below 600 m depth, the temperature continued to decrease from 10 to <4°C (although the eddy appeared asymmetric in shape). The dominant species outside the eddy were *Salpa fusiformis* and *Chuniphyes multidentata*. Diphyid siphonophores were highly abundant at >900 individuals per 1,000 m^3 outside the eddy at station 10. Larger zooplankton such as *Phronima* spp., euphausiids and hyperiids tended to be found inside the eddy. This study revealed a 12-fold decrease in the abundance of gelatinous zooplankton within a warm core eddy compared with the adjacent cold water, with the greatest abundance and diversity in the middle sample depths, outside the eddy. The significant change in community composition is driven by decreases in almost all zooplankton taxa, with the exception of large crustaceans, amphipods, euphausiids and hyperiids. The zooplankton communities appear to be divided into three distinct groups (1) a warm surface-water group, mainly composed of appendicularians, copepods, foraminiferans and ostracods (2) an eddy-core group that overlaps with group 1, but has a much lower abundance of taxa, except large predatory crustaceans and (3) a cold-water group dominated by siphonophores, and also including tunicates and rare hydromedusae (note that these groups do not mean there is a strict *spatial* separation between taxa).

The greater abundance of taxa outside the eddy may in fact indicate there is higher primary production on areas in NACES that are outside eddies (Alldredge and Madin 1982; Holland 2016). This has important implications for biogeochmical cycling within NACES, as gelatinous taxa can divert nutrients away from the standard bottom-up trophic pathways (Condon et al. 2011; Pitt et al. 2013). Gelatinous taxa also excrete mucus that contains carbon and nitrogen, which can be used by microbes and phytoplankton, thus increase the biomass stored within microbial foodwebs (Condon et al. 2011; Pitt et al. 2013). Many of the higher-level taxa found in this study are mutual predators with longer generation times, which can retirn biomass and nutrients in mid-trophic levels and reduce the turnover of biogenic carbon often concentrated in lower trophic levels (Robison 2004). There is accumulating evidence that gelatinous zooplankton (salps, pyrosomes, jellies) can contribute significantly to biological carbon cycling and that their carcasses can have marked effects on seafloor ecosystems (Sweetman and Chapman 2015). For example, salps and pyrosomes in particular (pelagic tunicates) often play a major role in carbon sequestration and are key components of marine food webs as prey for >200 species including fish, sea turtles, and crustaceans (Henschke et al. 2016) including the OSPAR-listed leatherbacks, which are found in the NACES MPA. The ecological significance of these animals warrants further consideration because of their incredibly high densities in some areas (Doyle et al. 2014). For example, blooms of *Salpa aspera* off the coast of North America were estimated to span 100,000 km^2 (Madin et al., 2006). Henshke et al. (2016) calculated that an average salp aggregation can export 100–7,000 mg C/m^2 out of the euphotic zone in a single month. Salps can provide up to 10 times more carbon transfer to the seafloor than areas without salp swarms (Phillips et al. 2009). In the Scotia Sea, salp fecal pellets constitute 12% of total zooplankton fecal pellets and 20% of the carbon content reaching the seafloor (Manno et al. 2015). Relevant to the NACES MPA is that bentho-pelagic coupling can result in such trophic aggregations, wherein salp and pyrosome aggregations in the upper water column can indicate foraging areas for higher level trophic levels including mesopelagic fish and seabirds.

Copepods, such as *Calanus finmarchicus,* are found in high concentrations close to the Flemish Cap (Helaouet and Beaugrand, 2007; see Figure 1b for Flemish Cap location to the west of the MPA), the CGFZ/Subpolar front and the western boundary of the proposed area ~40˚ W (the 'North west Corner') whilst *C. hyperboreus* is relatively abundant in the subpolar frontal zone. Both species are important prey for gelatinous zooplankton, mesopelagic fish, and some seabird species (e.g., Little Auk, *Alle alle*) and are often associated with high seabird numbers in the North Atlantic as indicators of abundant food (Frederiksen et al. 2013; Karnovsky et al. 2008). Euphausiids are also abundant across the region and are important prey for mesopelagic fish, cetaceans and seabirds, including thick-billed murre, little auk and black-legged kittiwake (Mehlum and Gabrielsen 1993).

The broad region surrounding the MPA, including the CGFZ, the Mid-Atlantic Ridge, the Grand Banks and Labrador Current are indeed very well known to be important foraging areas for apex predators, based on at-sea surveys, fishery records and tracking studies. For example, Northern fulmars have been found to regularly commute from Orkney to forage on the mid-Atlantic ridge and in the Site (Edwards et al. 2013). Historical data and at-sea surveys have also consistently identified the region offshore of Newfoundland as high in seabird abundance and diversity (Bennison and Jessopp 2015; Boertmann and Mosbech 1998; Brooks 1934; Huettmann and Diamond 2006; Jespersen 1924; Jespersen 1930; McKittrick 1931; Priede et al. 2013; Sage 1968; Wynne-Edwards 1935). More recently, a research trip in 2006 (Boertmann 2014) found a dramatic and high density of seabirds beginning at 50˚ N in the area overlapping the proposed area. The ECOMAR surveys also found high seabird and cetacean abundance around transects over the subpolar front and CGFZ (Priede et al. 2013) and information provided by researchers engaged in this cruise during the OSPAR process of seeking views of other competent authorities and stakeholders also supports a high abundance of seabirds and cetaceans (**Annex 6**, **Figures A6.4**, **A6.5**, **A6.16**).

Telemetry studies have demonstrated that the mid-Atlantic region where the Site is located is used as a foraging, migratory and staging area for at least 25 pelagic species, including seabirds, elasmobranchs (e.g., blue and mako shark and the OSPAR listed basking shark) and fish, and that an additional 17 pelagic species have been observed in the Site (**Annexes 5** & **6**; Bogdanova et al. 2011; Dias et al. 2012c; Edwards et al. 2016; Egevang et al. 2010; Frederiksen et al. 2016; Frederiksen et al. 2012; Gilg et al. 2013; Hedd et al. 2012; Kopp et al. 2011; Queiroz et al. 2016; Sittler et al. 2011; Torres et al. 2015; Walli et al. 2009). In addition, at least 10 cetacean species, including the OSPAR listed blue whale and 9 non-OSPAR listed species have been recorded in the MPA through at-sea surveys and tracking data. The nine non-OSPAR listed species includes medium and large baleen whales (humpback, fin and sei), deep diving odontocetes (Sperm and pilot whales) and dolphins (common, striped, Atlantic white-sided) (Doksæter et al. 2008; Prieto et al. 2014; Silva et al. 2014; Silva et al. 2013; Waring et al. 2008; Annexes **Table A5.2**, **Figures A5.7**, **A6.11-12**). The OSPAR listed leatherback turtle also occurs in the area. A high abundance of large predators is a key element to a healthy ocean, and the loss of megafauna can lead to trophic downgrading, which negatively impacts nutrient cycling as well as disturbance regimes and species invasions (Lewison et al. 2014).

Table 3. Species and habitats observed at the Site, with sources of scientific evidence. Where further tracking or observation data were provided during the 'seeking views' process, this has been noted in the table. IUCN Red List status at European and Global level: DD=Data Deficient, LC=Least Concern, NT=Near Threatened, VU=Vulnerable, EN=Endangered, CR=Critically Endangered. * = OSPAR listed species.

Common Name, Scientific Name, Red List status (European/Global)		**Evidence**					
		Tracking data	**Cruise DY080**	**IceDivA2 cruise**	**Scientific literature**	**Expert opinions**	**OBIS database records**
Evidence of high use of the area in the Site	Razorbill, *Alca torda* (NT/NT)	x					
	Little Auk, *Alle alle* (LC/LC)	x			x		x
	Bulwer's Petrel, *Bulweria bulwerii* (LC/LC)	x	x				
	Cory's Shearwater *Calonectris borealis* (LC/LC)	x	x		x	x	
	Atlantic Puffin, *Fratercula arctica* (EN/VU)	x			x		x
	Northern Fulmar, *Fulmarus glacialis* (EN, LC)	x	x		x	x	x
	Leach's Storm Petrel, *Oceanodroma leucorhoa* (LC/VU)		x		x		x
	Bermuda Petrel, *Pterodroma cahow* (-/EN)	x					
	Desertas Petrel, *Pterodroma deserta* (VU/VU)	x			x	x	
	Zino's Petrel, *Pterodroma madeira* (EN/EN)	x				x	
	Great Shearwater, *Puffinus gravis* (-/LC)	x	x		x	x	x
	Sooty Shearwater, *Puffinus griseus* (-/NT)	x	x			x	x
	*Audubon's Shearwater, *Puffinus lherminieri baroli* (NT/LC)	x			x	x	
	Manx Shearwater, *Puffinus puffinus* (LC/LC)	x	x				x
	*Black-legged Kittiwake, *Rissa tridactyla* (VU/VU)	x			x		x
	Long-tailed Jaeger, *Stercorarius longicaudus* (LC/LC)	x			x	x	x
	South Polar Skua, *Stercorarius maccormicki* (-/LC)	x	x		x	x	x
	Arctic Tern, *Sterna paradisaea* (LC/LC)	x	x		x	x	x
	Great Skua, *Stercorarius skua* (LC/LC)	x					x
	Common Murre, *Uria aalge* (NT/LC)	x					
	*Thick-billed Murre, *Uria lomvia* (LC/LC)	x					x
	Sabine's gull, *Xema sabini* (LC/LC)	x					x

Common Name, Scientific Name, Red List status (European/Global)		**Evidence**					
		Tracking data	**Cruise DY080**	**IceDivA2 cruise**	**Scientific literature**	**Expert opinions**	**OBIS database records**
	Seabirds						
Presence recorded within Site (no evidence on use of the Site)	Great Black-backed Gull, *Larus marinus* (LC/LC)		x				
	Northern Gannet, *Morus bassanus* (LC/LC)		x				x
	Wilson's storm petrel, *Oceanites oceanicus* (LC/LC)		x				x
	Arctic Jaegar, *Stercorarius parasiticus* (LC/LC)		x				x
	Pomarine Jaegar, *Stercorarius pomarinus* (LC/LC)		x				x
	Cetaceans						
	Sei Whale, *Balaenoptera borealis* (EN/EN)	x	x		x		x
	*Blue Whale, *Balaenoptera musculus* (EN/EN)		x		x		
	Fin Whale, *Balaenoptera physalus* (NT/EN)		x		x	x	x
	Short-beaked Common Dolphin, *Delphinus delphis* (DD/LC)		x		x	x	x
	Pilot Whale *Globicephala melas* (DD/DD)		x		x	x	x
	Risso's Dolphin, *Grampus griseus* (DD/LC)		x				x
	Northern Bottlenose Whale, *Hyperoodon ampullatus* (DD/NT)						x
	White-sided Dolphin, *Lagenorhynchus acutus* (LC/LC)		x		x		x
	Humpback Whale, *Megaptera novaeangliae* (LC/LC)		x				
	Sperm Whale, *Physeter macrocephalus* (VU/VU)		x		x	x	x
	Harbour Porpoise, Phocoena phocoena (LC/LC)				x		
	Striped Dolphin, *Stenella coeruleoalba* (DD/LC)		x		x	x	x
	Marine reptiles						
	*Loggerheard Turtle, *Caretta caretta* (LC/VU)	x			x		x
	Green Turtle, *Chelonia mydas* (-/EN)						x
	*Leatherback Turtle, *Dermochelys coriacea* (LC/VU)	x			x		x
	Hawksbill Turtle, *Eretmochelys imbricata* (-/CR)						x
	Kemp's Ridley, *Lepidochelys kempii* (-/CR)						x
	Fish						
	Thorny Skate, *Amblyraja radiata* (LC/VU)						x
	European Eel, *Anguilla anguilla* (CR/CR)				x		x
	American Eel, *Anguilla rostrata* (-/EN)						x

Common Name, Scientific Name, Red List status (European/Global)		**Evidence**					
		Tracking data	**Cruise DY080**	**IceDivA2 cruise**	**Scientific literature**	**Expert opinions**	**OBIS database records**
	*Basking Shark, *Cetorhinus maximus* (EN/VU)	x			x		
	Grenadiers, *Coryphaenoides* spp.			x			
	Atlantic Cod, *Gadus morhua* (LC/VU)						x
	Shortfin Mako Shark, *Isurus oxyrinchus* (EN)	x			x		
	Ocean Sunfish, *Mola mola* (DD/VU)		x				x
	Blue Shark, *Prionace glauca* (NT/NT)	x			x	x	x
	Scalloped Hammerhead, *Sphyrna lewini* (DD/CR)						x
	Bigeye Tuna, *Thunnus obesus* (-/VU)						x
	*Atlantic Bluefin Tuna, *Thunnus thynnus* (NT/EN)	x			x		x
	Mesopelagic fish (>100 species; **Annex 10**)				x		x
	Cephalopods						
	Dumbo octopus, *Grimpoteuthis* sp.				x		x
	Atlantic gonate squid, *Gonatus steenstrupi* (-/LC)				x		x
	Atlantic cranch squid, *Teuthowenia megalops* (-/LC)				x		x
	Paralarval cephalopods (>25 species; **Annex 9**)				x		x
Benthic habitats occurring within the Site							
	Abyssal plains			x	x		
	Abyssal hills			x	x		
	Basins			x	x		
	Coral gardens				x	x	
	Deep-sea elasmobranch spawning grounds			x			
	Deep-sea sponge aggregations			x	x	x	
	Escarpments				x		
	Fracture zones				x		
	Knolls				x		
	Northwest Atlantic Mid-Ocean Channel				x		
	Pillow lava			x			
	Ridges				x		
	*Seamounts, associated features, and communities			x	x		

Seabird foraging grounds

The oceanographic features outlined above are ecologically significant as foraging grounds for many seabird species including those listed by OSPAR as Threatened and/or Declining. The NACES MPA is also an Important Bird and Biodiversity Area (IBA) and the most important pelagic foraging ground in the ABNJ of the OSPAR maritime jurisdiction for at least 22 seabird species. The Site is used by an estimated 2.9-5 million seabirds (**Table 2**, **Annex 4**, **Figures A4.1-1** -**A4.1-21**). Long term datasets from around the Atlantic (OSPAR Marine Area, Canada and South Atlantic) demonstrates that the Site is used by species across different seasons and years (**Annexes 4**, **5**, and **6**). The analysis of seabird tracking data, and previously published findings, support that the Site is used as a foraging ground by several pelagic species and by individuals from different colonies, during the same time periods (**Figure 19**, **Annex 4**). The highest concentrations of seabirds occurred during the winter period (October-March), when large numbers of deep diving Alcids (e.g., Little Auk, Atlantic Puffin, Thick-billed Murre) and Black-legged Kittiwake and Northern Fulmar use the area. Significant numbers of seabirds also use the Site during spring and summer- ca. 2.9-3 million individuals.

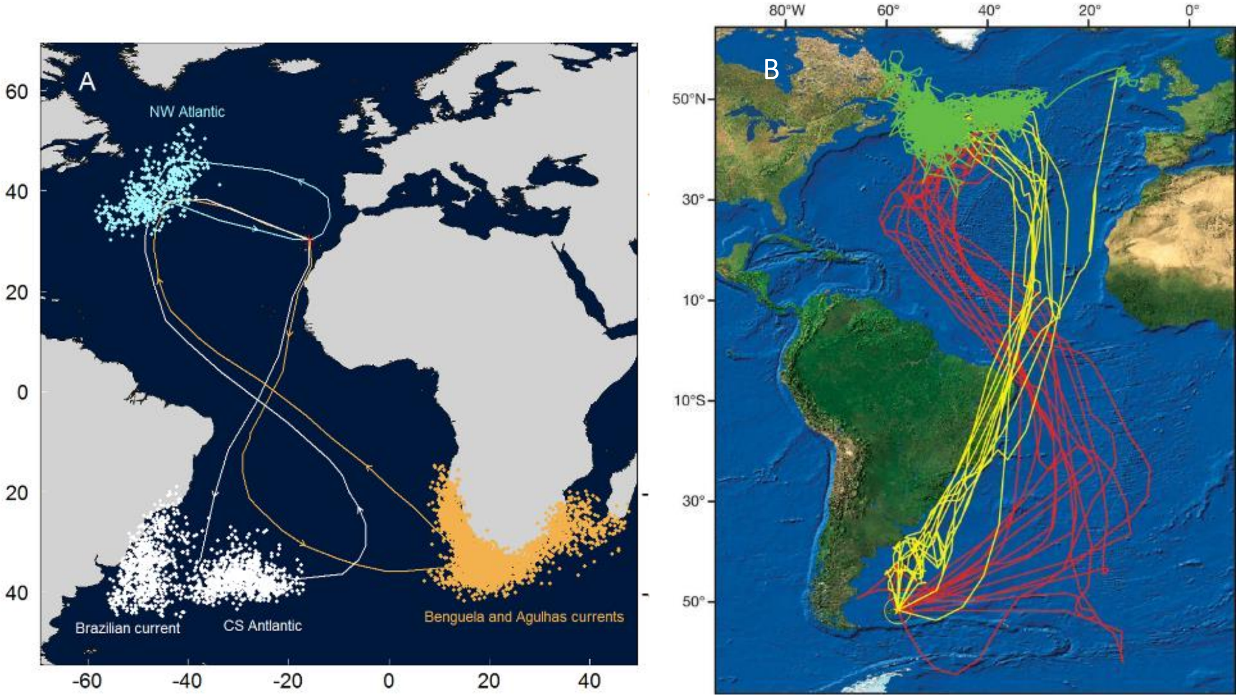

Figure 19. *Example tracks of seabirds migrating to the proposed MPA: A) Cory's Shearwater from the Selvagem Grande colony (Madeira Archipelago, Portugal), with the wintering areas in the NW Atlantic shown in blue (Dias et al. 2012b), and B) Sooty Shearwaters that breed in the Falklands Islands and complete trans-equatorial migration to the proposed MPA (main staging and non-breeding areas shown in green) (Hedd et al. 2012).*

The available evidence suggests that the ecosystems at the Site correspond to a region with a high abundance of prey species for high trophic level predators, including prey species such as copepods, gelatinous zooplankton and euphausiids (Gaard et al. 2008; Haberlin 2018; Letessier et al. 2011; Vecchione et al. 2015). The copepod *C. finmarchicus,* a key species within the Atlantic trophic food web (Frederiksen et al. 2013), occurs in high densities within the NACES MPA (Fort et al. 2012; Helaouët and Beaugrand 2007). Euphausiids are also abundant across the region and are important prey for mesopelagic fish and seabirds such as Thick-billed Murre, Little Auk and Black-legged Kittiwake (Mehlum and Gabrielsen 1993).

Seabird use during non-breeding period

Many Atlantic seabirds use the ecosystems of the ABNJ during both the breeding and non-breeding period. However, high seas areas are known to be particularly relevant for seabirds during their non-breeding stage, both as a staging area during migration and as a final non-breeding destination (e.g., Bogdanova et al. 2011; Dias et al. 2011; Egevang et al. 2010; Fort et al. 2013; Frederiksen et al. 2012; Harris et al. 2010).

The non-breeding (winter) period is an important stage of a seabirds life cycle, when they typically recover from the energetically demanding breeding period and prepare for the subsequent breeding season. The winter period is also when adult survival is most at risk, and it has been suggested to account for the highest mortality of Atlantic seabirds (Daunt et al. 2006; Fort et al. 2010a; Harris et al. 2010). Winter “seabird wrecks”, when thousands of birds die from starvation due to unfavourable conditions on non-breeding foraging grounds, are well documented along the Atlantic coast (Fort et al. 2015; Fort et al. 2009; Frederiksen et al. 2012). Protecting seabird species in high sea areas is therefore critical for their long-term persistence.

Taking the above into consideration, the Site was also found to be ecologically significant in that it is an extremely important as a key staging area for highly migratory seabirds, including both Northern and Southern Hemisphere breeders. For many of the long-distance migrants the Site is likely used during both the outward and return journeys and plays an important role as stopovers, in restoring fat reserves before migration is resumed.

Foraging, residency, spawning, migration corridors for other highly mobile marine species

The Site also has ecological significance to at least 10 cetacean species, as confirmed during the DY080 cruise (June 2017; **Table 4**) for foraging, possible longer-term habitat use, aggregation spots, and possible migration corridors. Overall, the Site appears to be used by at least 42 different high trophic level species, including some of the smallest seabirds, up to the giant blue whale and representing a wide range of feeding ecologies and ecological niches- from krill specialists to those foraging on mesopelagic fish and squid and jellyfish.

Table 4. *Cetacean sightings during the DY080 cruise in June 2017.*

	Total cruise		**Within MPA boundary**	
Species	**Number of sightings**	**Total number of animals**	**Number of sightings**	**Total number of animals**
Baleen whales				
Blue whale, *Balaenoptera musculus* (EN)	5	7	2	3
Fin whale, *Balaenoptera physalus* (EN)	39	70	13	37
Sei whale, *Balaenoptera borealis* (EN)	7	10	1	1
Humpback whale, *Megaptera novaeangliae* (LC)	37	40	5	5
Blue, fin or sei whale	46	51	13	16
Humpback whale or sperm whale	3	3	1	1
Unidentified “large” whale	21	22	1	1
Odontocetes				
Sperm whale, *Physeter macrocephalus* (VU)	7	8	3	3
Pilot whale *Globicephala* spp. (DD)	7	159	6	139
Common dolphin, *Delphinus* spp. (DD/LC)	34	391	15	131
Risso’s dolphin, *Grampus griseus* (LC)\	1	10	1	10
Striped dolphin *Stenella coeruleoalba (LC)*	3	157	3	157
White-sided dolphin, *Lagenorhynchus acutus* (LC)	3	28	3	28

Species	**Total cruise**		**Within MPA boundary**	
	Number of sightings	**Total number of animals**	**Number of sightings**	**Total number of animals**
“Patterned” dolphin	6	26	3	13
Unidentified dolphin	20	109	15	97
Total	250	1102	87	644

Leatherback turtles – unlike other marine turtle species with highly varied dispersal patterns – have been shown to travel within a persistent migration corridor between Costa Rica and the South Pacific Gyre (Shillinger et al. 2008). Given that the Atlantic is the last stronghold for leatherbacks and there is a presence of leatherbacks in the Site with pan-oceanic tracks recorded by Hays et al. (2014), it is possible the NACES MPA could cover part of a migration route between the west and east Atlantic. Leatherback turtles have a known association with frontal zones (Hays et al. 2006) and mesoscale eddies (Doyle et al. 2008).

Cephalopods are also potentially concentrated within the boundary and broader region of the MPA, with studies from the MARECO/ECOMAR programme indicating the highest diversity and abundance occurring south of the CGFZ (Vecchione et al. 2010).

Mesopelagic fish species such as the goiter blacksmelt (*Bathylagus euryops*) are abundant in the Mid-Atlantic Ridge region with highest abundance at the Subpolar Front and the CGFZ (Sweetman et al. 2013). These fish prey on gelatinous zooplankton and copepods such as those sampled within NACES by Haberlin (2018). They in turn are preyed on by larger fish, and top predators such as seabirds (Granadeiro et al. 2002; Waap et al. 2017). Another abundant mesopelagic group of fish, the lanternfish (myctophids), have been found in high abundance across the Subpolar Front boundary. These small fish are particularly associated near fronts and eddies, such as those occurring within the NACES MPA (Paredes et al. 2014). Myctophids are key prey for squid, cetaceans and seabirds (Harris et al. 2015; Paredes et al. 2014; Waap et al. 2017). The importance of this area as a foraging and staging ground for seabirds suggests that the complex oceanographic and biological conditions provide a reliable source of food during key life stages and energetically demanding periods.

The NACES Site is a known hotspot for mesopelagic fish in the Atlantic but also worldwide (Fennell and Rose 2015). Devine et al. (2021) found >100 species of fish across 35 families. The glacier lantern fish (*Benthosema glaciale*) was the most abundant, accounting for around 37% of all fish specimens trawled within NACES sampling stations in 2015. This may be due to the presence of *Calanus finmarchichus*, one of its main food sources (Dypvik et al. 2012). The glacier lanternfish is also an important part of the diet of Leach’s storm petrel (*Oceanodroma leucorhoa*) in the Northwest Atlantic (Hedd et al. 2009), which is among the many seabirds occurring at the Site. The lancet fish (*Notoscopelus kroyeri*) was also among the most abundant species for the study in NACES (420 specimens for 2015 and 2016 combined). This is an important prey item for the short-beaked dolphin (*Delphinus delphis*) in the Bay of Biscay (constituting >31% of stomach food composition by mass across 63 dolphins; Pusineri et al. 2006) as is the spotted barracudina (*Arctozenus risso*; Spitz et al. 2010), with 201 specimens trawled within NACES in 2015 and 2016 studies combined. The mesoscale hydrographic features present through the NACES Site influenced the mesopelagic fish communities studied in Devine et al. (2021), with distinct assemblages inside and outside eddies. The majority of taxa were only captured inside the eddies, including several juvenile stages, suggesting the warm-core eddies at the Site could provide an aggregative structure in, what would otherwise be, a low heterogeneity pelagic environment. Other studies confirm that eddies support higher concentrations of early life history stages of mesopelagic fish species than the surrounding waters (Contreras-Catala et al. 2012; Muhling et al. 2007). Studies on ichthyoplankton show that mesoscale eddies have a significant impact on larval distributions and assemblages (Atwood et al. 2010; Muhling et al. 2007; Sanchez-Velasco et al. 2013). Frontal zones may also act as a biogeographic barrier to certain species (Netburn and Koslow 2018; Sutton et al. 2013).

Bentho-pelagic coupling and its ecological significance at the Site

Interactions between ocean currents, seafloor topography, and species ecology and behaviour promote a myriad of biophysical processes that can entrain and advect nutrients, enrich productivity, entrain, retain, or attract organisms, and transport particulate matter and energy downstream (Cascão et al. 2019 and references therein), e.g., particle retention over seamounts via Taylor caps (where an isolated region of water is trapped over the crest of a seamount and is stratified) and Taylor columns (where water is trapped over the crest of a seamount and is unstratified), as well as eddy dispersal of particles downstream from seamounts, are well-studied processes. It is considered likely that the NACES MPA is also characterised by such interactions given the numerous underfloor features such as seamounts, canyons and ridges, and abyssal plain systems in the Site, backed up by many examples from ecologically similar areas. These biophysical processes are ecologically significant to the Site and likely critical to explaining the high biological diversity in the Site, with life in open ocean pelagic systems intrinsically linked to the deep-sea and the seafloor through downward flux of organic matter and upwelling of nutrients from the depths of the ocean, driving primary production at the surface. Besides nutrients and other particles and energy reaching these depths, early results from the IceDivA2 expedition also show that anthropogenic matter (plastics) have reached the deep seafloor from the surface in the NACES Site. As no process-based studies have been conducted yet in the Site, examples from ecological similar areas have been used to illustrate the ecological significance of these interactions. Examples of surface to seafloor mechanisms of bentho-pelagic coupling are provided; for the upward coupling exchange route, particular examples from seamounts, abyssal plains, and canyons have been used from ecologically similar areas because of the abundance and coverage of these geological features in the NACES Site.

To begin, two well-studied biologically-mediated processes of bentho-pelagic coupling that link different zones of the ocean are diurnal vertical migration (DVM) and reproductive life stages, both of which are occurring at the NACES Site.

Diurnal vertical migration (DVM)

One important biological process that connects the deep ocean to the pelagic ecosystem is DVM of organisms, such as zooplankton and other mesopelagic fauna. DVM is a pattern of movement from several hundred metres deep to surface waters at dusk, returning to deeper waters at dawn where migrating organisms avoid surface predation during daylight. In terms of biomass, this is the largest daily migration on Earth (Hays 2003). This migration is an important basis of the marine food web, particularly in open ocean areas such as this Site, by making deep-dwelling organisms available as prey to predators such as seabirds (Regular et al. 2010). Peak seabird foraging is at dawn and dusk, corresponding with DVM. Studies have shown that seabirds are able to alter their feeding behaviour, including time and dive depth, in response to prey availability, as a result of DVM. For example, Cory's Shearwaters have been found to alter their foraging strategy in relation to oceanographic variables, most likely to fully exploit the DVM prey (Dias et al. 2012c), and Thick-billed Murres alter their dive depth to exploit amphipods and sand lace (Elliott and Gaston 2014). Sperm whales also track mesopelagic squid during their entire DVM cycle (Chambault et al. 2021), transferring energy throughout the water column upwards and downwards.

DVM also links the water column and the benthos (bentho-pelagic coupling) as many holoplankton organisms perform diel and ontogenetic migrations covering the whole water column, connecting sea surface and sea floor. Interactions between DVM and the occurrence of internal waves over seamounts has also been suggested as a mechanism for aggregating fish larvae and higher trophic level predators in areas and periods of energetic internal tides, thus providing a dynamic environment for larval and organic matter transport (Mohn et al. 2021). At certain depths, due to a downward migration, these species may come close to the sediment and provide a food source for benthic invertebrates including by depositing faecal pellets.

Reproductive life stages

A second but often overlooked biological process linking the seafloor to the surface is reproduction. Some benthic organisms reproduce via planktotrophic larvae (meroplankton), which are early life stages that can swim and migrate up to 2,000 m above the seafloor and spend days to weeks to months in the epiplagic zone (**Figure 21**, e.g., molluscs from vent fields, Kim et al. 2022). Here, meroplankton can become retained for longer due to ocean current interactions around seamounts (Denda et al. 2017), and where they can become part of the pelagic ecosystem food chain.

Remineralisation and its role in global carbon cycles

Beyond biologically mediated processes involved in bentho-pelagic coupling, there are many physical processes by which coupling can occur. The deep-sea is the largest habitat on Earth and accommodates a very high biodiversity (Brandt et al. 2007; Danovaro et al. 2008; Grassle 1996; Ramirez-Llodra et al. 2011; Woolley et al. 2016) that is closely linked to the pelagic zone. This zone is usually subdivided by the amount of sunlight (photic and aphotic) or depth: epipelagic (0-200 m); mesopelagic (200-1,000 m), bathypelagic (1,000-4,000 m), abyssopelagic (4,000-6,000 m) (**Figure 20**).

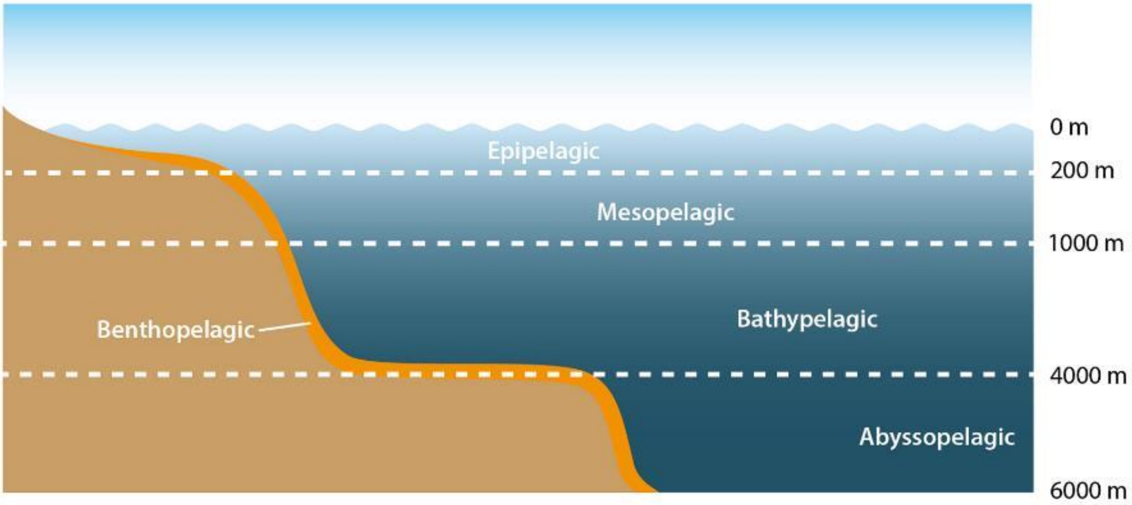

Figure 20. *Division of the open ocean into vertical layers on the basis of light penetration (epipelagic) and depth zones. The bentho-pelagic zone connects the water column and the benthos. After Hobday et al. (2011).*

Ultimately, detritus from the epipelagic zone sinks through the water column and provides much of the food for organisms in deeper ocean layers (Drazen et al. 2020). These different zones and the seafloor are linked by biophysical processes, including remineralisation and sequestration of nutrients and carbon (**Figure 21**).

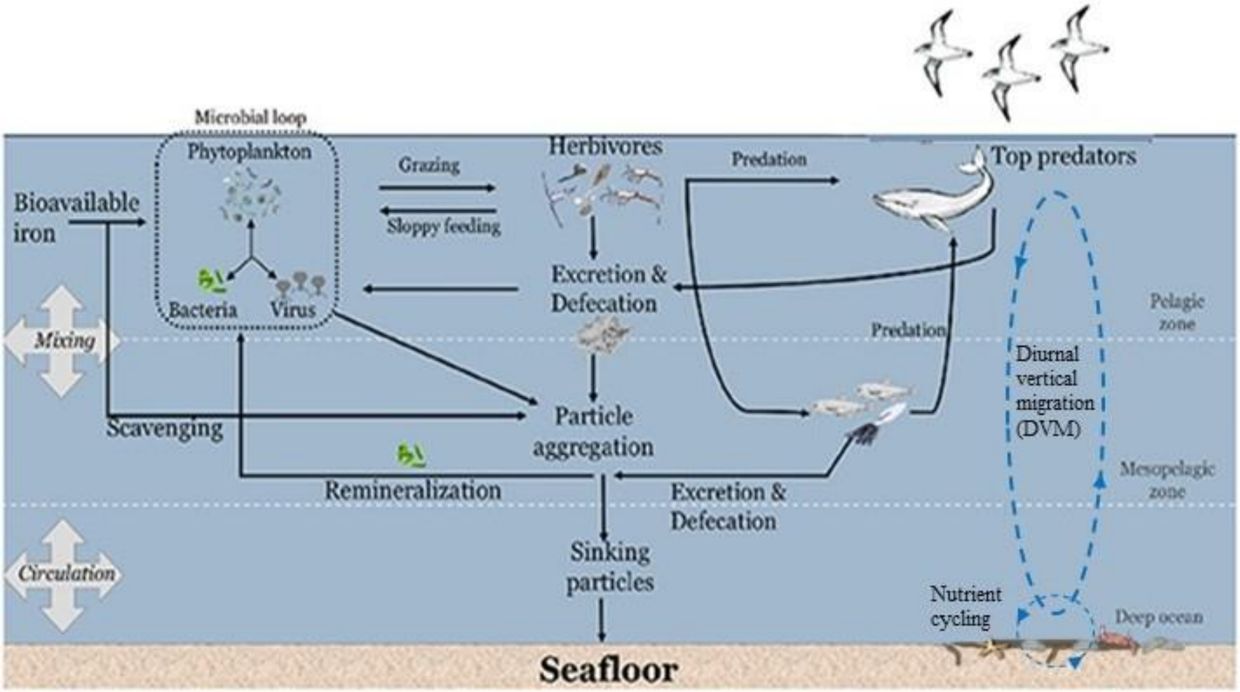

Figure 21. *Simplified conceptual diagram of the linkages between the seafloor, water column (including diurnal vertical migration), and top predators. Figure adapted from: (Ratnarajah et al. 2018).*

Remineralisation is the breaking down of organic carbon to smaller organics and eventually dissolved inorganic carbon. Rates of remineralisation from the surface to the seafloor vary across depth zones (**Figure 21**; Chen et al. 2021). It has been suggested that the Porcupine Abyssal Plain (PAP), located at a similar latitude east of the Mid Atlantic Ridge, could provide an ecologically similar comparison to the abyssal plain in the NACES Site (GOBI 2022) and here it provides insights of possible remineralisation rates at the NACES Site. At the PAP, temporal changes in faunal assemblages and food web structures have been well explored and offer insights into linkages between the sea surface and abyssal plain (e.g., Billett et al. 2001; Gooday 1996; Hartman et al. 2021; Howell et al. 2002; Iken et al. 2001). Frigstad et al. (2015) studied the link between surface production and particle flux at 3,000 m water depth. The proportion of carbon fixed by photosynthesis that was exported from surface waters to below the euphotic zone (export flux) was ca. 15%, but the transfer efficiency (the ratio of deep particular organic dissolved carbon to the export flux) was only 4%. This suggests a large proportion of particulate organic carbon is remineralised before it reaches the deep seabed, which is roughly what has been estimated as the transfer efficiency at 50°N (Henson et al. 2012). Although remineralisation rates in the deep-sea are lower than that measured in coastal and continental areas, amounts of remineralised organic carbon can account for up to 50% of global benthic carbon due to the vast area covered by the deep-sea biome (Chen et al. 2021; Glud 2008). Given that the NACES Site is a convergence zone with sustained high levels of primary productivity and feeding activities compared to the PAP, the concentration of particulate organic matter (POM) and transfer efficiency may be just as high or higher.

Oceanographic interactions with seafloor topography

Besides sinking of detritus from the epipelagic and nutrient and carbon remineralisation, interactions between oceanography and seafloor topography encourage other types of biophysical processes that link the surface to the seafloor including both downward bentho-pelagic coupling and upward.

Downward coupling – life in the deeper pelagic zone depends on energy flux from the upper water layers. This zone is characterized by a stable environment, to which zooplankton, other pelagic invertebrates, of which many are gelatinous, and mesopelagic fish are specifically adapted (Ramirez-Llodra et al. 2011). Zooplankton including gelatinous mesopelagic prey such as pyrosomes, salps, jellyfish and fish larvae provide a trophic pathway to larger meso- and bentho-pelagic organisms such as myctophyid fish and cephalopods (Bulman and Fulton 2015; Drazen et al. 2020; Hudson et al. 2014), e.g., mesopelgic fish provide a trophic "subsidy" to bathypelagic fish (Sutton et al. 2010). Mesopelagic fauna show a marked spatial variability closely linked to bathymetry, and are the dominant component of food webs in deep, open oceanic water (Pusch et al. 2004). Here, deep-diving top marine predators such as beaked whales may also substantially contribute to nutrient cycling and energy flow back to the seafloor because these animals can not only access the surface, but they exploit habitats and food in the meso- and bathypelagic realms (Braun et al. 2022). At the seafloor, the vertical sinking of organic matter from the surface but also from the mesopelagic realm can then play a vital role in sustaining deep-sea benthos (Tecchio et al. 2013).

Upward coupling – studies on upward coupling have shown that physical processes and deep faunal communities themselves have a pivotal role to play wherein benthic, demersal and bentho-pelagic species sustain upward energy flows towards the pelagic domain (Ricci et al. 2022). The upward coupling from seafloor to water column is an integral part of the marine biochemical cycles of the marine environment and crucial to the functioning of marine ecosystems (Dale et al. 2017; Griffiths et al. 2017). Scientific evidence even suggests that pelagic seabirds foraging at the sea surface specifically target areas with strong upward benthic-pelagic coupling as the superjacent waters provide increased prey availability (Wakefield at al. 2012). For example, mesopelagic myctophid fish may be globally important to seabirds and carbon flow more generally (Watanuki and Thiebot 2018).

In terms of the actual physical processes by which this upward coupling can occur, resuspension and diffusion are examples, whereby organic matter and nutrients (e.g., phosphorus, nitrogen, silicate) from the seafloor (re-)enter the overlaying water column and thereby the functional linkages and trophic webs of the demersal and pelagic waters (e.g., Dale et al. 2017; Griffiths et al. 2017; Mussap and Zavatarelli 2017; Rogers 2018). An example comparable to the NACES MPA can be drawn from seamounts in the Kuroshio Current, a western boundary current comparable to the Gulf Stream. Here, vertical mixing due to flow-topography interactions over the seamounts transport dissolved inorganic nutrients into oligotrophic surface waters, which create high productivity hotspots (Acabado et al. 2021 and references therein). Diffusive mechanisms are physical means by which nitrate then "billows" upwards from the interactions with the seamount and nutrients are transported downstream. This process explains the otherwise paradoxical situation of high production in an oligotrophic environment (Acabado et al. 2021). Another example from the Schulz Bank seamount in OSPAR Region I is that the flow-topographic interaction is transmitted hundreds of metres above the seamount summit and detected in the pelagic microbial communities in the water column (Busch et al. 2020).

Resuspension can also occur during benthic storms. These can occur over abyssal plains when bottom currents exceed critical bed shear stress and erode seafloor sediments, and thus in the NACES MPA, where much of the seafloor is abyssal plain, are likely to be of ecological significance to the Site. Benthic storms supply particulate matter to the benthic nepheloid layer. This is a turbid layer near the seafloor (Ewing and Thorndike 1965; Hogg et al. 1986; Wright et al. 2013) that tends to range between 150 and 1,500 m in thickness, with average suspended matter concentrations of 0.01-0.5 mg L^{-1} (Hernández-Molina et al. 2008). Nepheloid clouds have a significant impact on the abundance and diversity of seabed biota, but even when these are weak, benthic storms may be important in creating and maintaining strong nepheloid layers (Harris 2014). Benthic storms are very strong events where they occur and significantly contribute to the bottom energy dissipation rate. This dissipation rate is an important sink of global wind power input, and therefore benthic storms can have a large influence on the global energy balance (Arbic et al. 2009; Schubert et al. 2018; Sen et al. 2008). For the western North Atlantic, benthic storms and high particulate matter concentrations within the nepheloid layer are associated with the position of the meanders and rings of the Gulf Stream (Gardner et al. 2017). Their likelihood of occurrence increases when deep eddy kinetic energy (EKE) is higher (Gardner et al. 2017). Notably, the NACES Site is in an area of relatively high EKE (GOBI 2022; **Annex 7**). High resolution ocean models of near-bottom absolute velocity suggest that the NACES Site experiences some of the strongest benthic storm events in the North Atlantic (Schubert et al. 2018).

Another process by which resuspension can occur is through topographic Rossby waves, which are low frequency vorticity waves that tend to occur <1,000 m water depth, requiring a sloping bottom, and affect bottom current variability (Hamilton 2009; Thompson 1977). The potential source of these waves is summarised in Gardner et al. (2017, and references therein), where it is suggested that Rossby waves could cause turbid benthic events that resuspend sediment. These resuspension events, if channelled into upwellings, for example through canyons, could create hotspots and areas of elevated food web complexity (Fernandez-Arcaya et al. 2017; Ross et al. 2015). Though this has not yet been studied, benthic storm events could also transfer larvae further up into the water column and increase species' dispersal distances (Gary et al. 2020).

The NAMOC that extends 3,200 km from the northern Labrador Sea to the Sohm Abyssal Plain also provides important avenues for sediment flows (Chough and Hesse 1976) and the currents funnelled through submarine canyons likely fuel higher levels of primary productivity (Ryan et al. 2005). This upwelling of nutrients can lead to higher diversity and increased complexity of food webs such as swarms of euphausiids (krill) (Ross et al. 2015), and myctophids such as *Benthosema glaciale* (Hudson et al. 2014), both of which attract aggregations of predators and both of which were found in relatively high numbers in the NACES Site (Devine et al. 2021). Euphausiids and myctophids are also important prey species for the black-legged kittiwake, for example (Hatch 2013; Paredes et al. 2014): expanding this across the range of seabirds that feed on mesopelagic fish, this demonstrates how abyssal features that channel nutrients upwards can support species at higher trophic levels in the NACES Site all the way to the sea surface.

Well-studied mechanisms of upward benthic-pelagic coupling at seamounts, so numerous in the NACES MPA, illustrate that seamounts can stir and mix deeper waters by generating lee waves and topographic wake vortices and even impact on ocean overturning circulation (Mashayek et al. 2021; Turnewitsch et al. 2013; Turnewitsch et al. 2016). Internal tides and waves breaking on any sloping seafloor in general can be a large source of turbulent mixing, which can be detected at least 250 m above the seafloor (van Haren 2019) and which have been observed to enhance diapycnal mixing eight-fold over the mid-Atlantic ridge (Tuerena et al. 2019). Internal waves and tides can supply oxygen from above and below towards the depths where seamount macrofauna are most abundant, e.g., at Condor Seamount off the Azores (van Haren et al. 2017). Such processes can increase biological productivity that supports high abundances of animals such as sessile filter feeders and demersal fish but also mesopelagic fish including sharks, turtles, marine mammals and seabirds (Clark et al. 2012). For example, pelagic seabirds target seamounts for foraging, likely targeting profitable prey resources associated with these features (e.g., Dias et al. 2016; Scheffer et al. 2016). Dolphins and sperm whales also both forage around seamounts, and for example, more often at the Atlantic versus Irving Seamounts in the northeast Atlantic because of the more persistent oceanographic features and enhanced productivity around the former (Romagosa et al. 2020).

Targeted multidisciplinary research to elucidate the full range and importance of bentho-pelagic coupling mechanisms, the roles of the fronts and eddies and their interactions with seamounts in the NACES MPA should be supported by OSPAR Contracting Parties. It is highly likely that basin-scale circulation of the AMOC may also substantially influence the deep-water and near-bottom circulation (e.g., intensified bottom currents during periods of strong AMOC), causing changes in bottom conditions that may persist for several years and that may alter connectivity patterns and expose sessile benthic ecosystems to sustained changes

(Johnson et al. 2020). It is also highly likely that bentho-pelagic coupling from the sea surface downwards to the seabed in organic carbon fluxes derived from primary production is very important. It is also equally highly likely, based on studies from ecologically similar areas, that upwards bentho-pelagic coupling is ecologically significant to the NACES MPA, e.g., the summit of Evlanov Seamount rises to 1,230 m water depth (see Table 2.1.1 in ICES WGDEC 2006 by Hall-Spencer et al.), making that linkage even closer to the surface.

4. High natural biological diversity

Based on a refreshed compilation of species occurrence using multiple sources, the NACES Site was found to encompass an area where high concentrations of a range of different groups of animals naturally converge.

Analysis of seabird tracking data found the Site to have globally important concentrations of seabirds (qualifying as an IBA) and the highest seabird species richness within the Area Beyond National Jurisdiction of the OSPAR maritime area (**Annex 4-3**). The NACES MPA had the highest seabird diversity during spring and summer, when 22 seabird species were present during the same season. Species richness was also high during quarter 4, with 12-15 seabird species using the Site.

As an indication of the biodiversity of the ecosystems at the site, in addition to seabird diversity, existing research indicates that at least 10 cetacean species use the Site (Doksæter et al. 2008; Waring et al. 2008; **Annex 5**). The DY080 cruise crossing the Site in June 2017 alone recorded sightings of at least 10 species (**Table 4**; **Table A5.2**). Four of these 10 species were baleen whale, including Blue whale (*Balaenoptera musculus*), Fin whale (*Balaenoptera physalus*), Sei whale (*Balaenoptera borealis*), and Humpback whale (*Megaptera novaeangliae*). The other six species were odontocetes, and included Sperm whale (*Physeter microcephalus*), Pilot whale (*Globicephala* spp.), Common dolphin (*Delphinus* spp.), Risso's dolphin (*Grampus griseus*), Striped dolphin (*Stenella coeruleoalba*) and White-sided dolphin (*Lagenorhynchus acutus*).

The Site is a known hotspot for mesopelagic fish with >100 species recorded (Fennell and Rose 2015; Devine et al. 2021) and hosts a high diversity of cephalopods (Taite et al. 2020), gelatinous zooplankton (Haberlin 2018), micronekton species across multiple taxonomic groups (e.g., annelids, chaetognaths, molluscs and radiolarians; Della Penna and Gaube 2020), along with more diverse assemblages of micro and meso-zooplankton relative to those recorded in waters north of the Site (Morison 2019, 2020). Full species lists from the literature are available in **Annex 9**, **10**, **11**, **12** and **13**.

A total of 350 species of seabirds, cetaceans, marine reptiles, fish, pelagic cephalopods, benthic invertebrates, phytoplankton (e.g., diatoms, dinoflagellates, haptophyta), zooplankton (e.g., copepods, shrimp, ostracods, jellyfish, siphonophores), and mixoplankton (foraminifera) have been recorded within the Site according to OBIS, full list of species available in **Annex 8**. This includes 25 species listed by OSPAR or having Near Threatened, Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) (reviewed in sections B-a-1 and B-a-2 of this nomination proforma). Most of the species recorded in the literature sources previously mentioned (> 150 species) are not included in the OBIS database.

As a depiction of the diverse bathymetry influencing the hydrodynamic conditions in the area, at least 30 seamounts occur within the Site, including the recently discovered Mount Doom seamount (**Figure 3**). Seamounts are generally considered as habitats supporting a high level of seafloor biodiversity, including cold-water coral and sponge reef habitats, due to upwelling and eddies close to the slopes of the seamounts (Clark et al. 2010). As predicted based on expert judgement and published literature, habitat suitability modelling suggests likely occurrences of both reef-framework building scleractinian corals (**Figure 22**), as well as antipatharian black corals (**Figure 23**). Particularly high habitat suitability was detected on the Milne

Seamount Complex and on Evlanov Seamount itself, but also further north towards the fracture zones. The IceDivA2 expedition ground-truthed many occurrences of such fauna as cold-water corals and deep-sea sponges. Based on expert opinion, it is highly likely that the Site contains OSPAR Threatened and/or Declining Habitats such as coral gardens and deep-sea sponge aggregations.

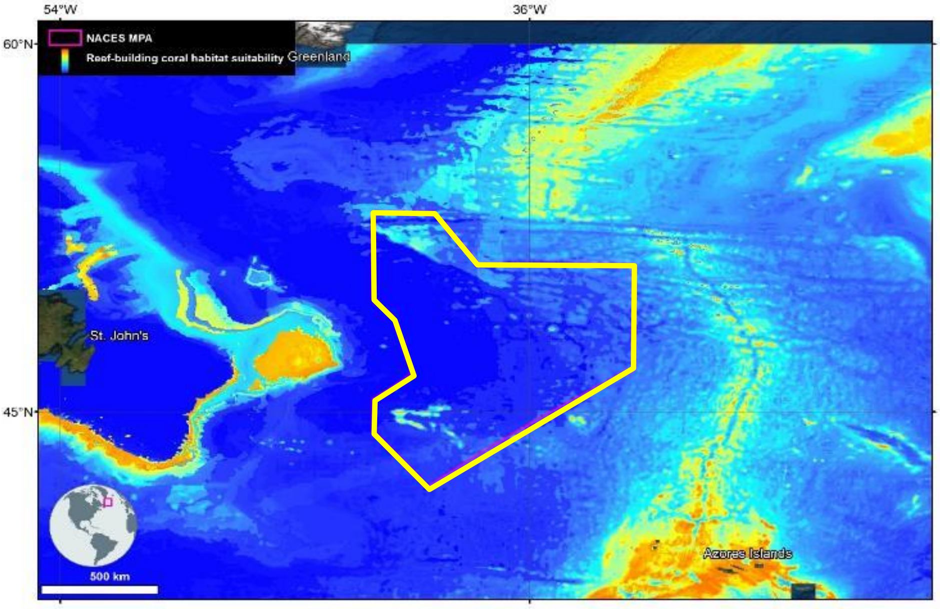

Figure 22. *Habitat suitability modelling of reef framework-building species of cold-water corals Davies and Guinotte (2011), showing potential for reef-building corals to occur in the Site (red-orange indicating highly suitable habitat, blue indicating less suitable habitat).*

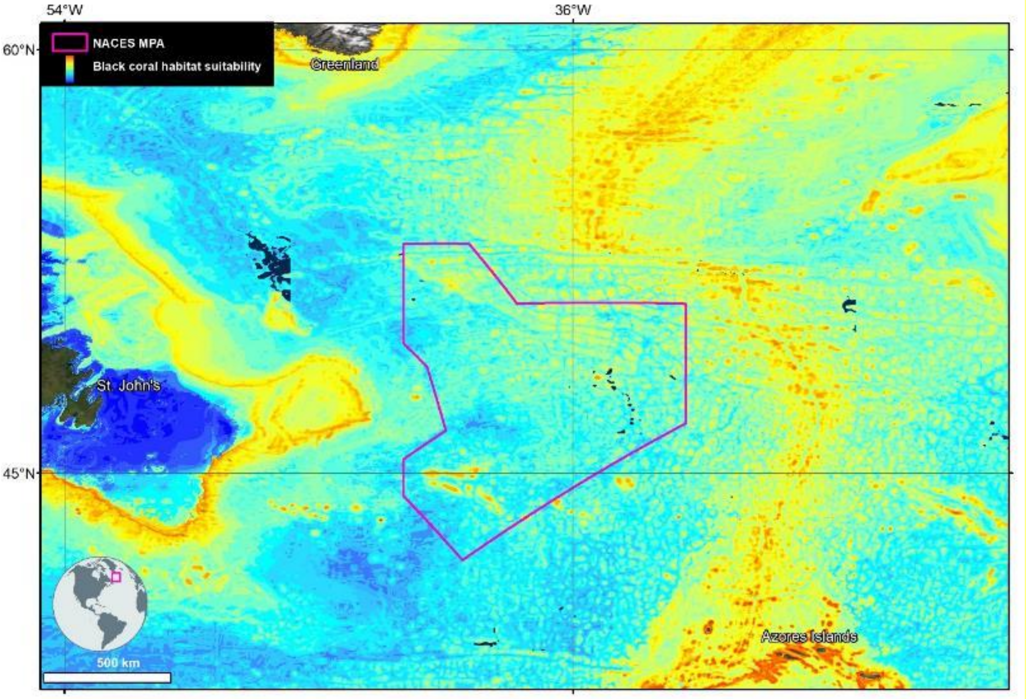

Figure 23. *Habitat suitability modelling of antipatharian cold-water corals, showing potential for these species to occur in the Site (from Yesson et al. 2016; red indicating highly suitable habitat, blue indicating less suitable habitat).*

5. Representativity

Pelagic foraging hotspot

The NACES MPA is the most important high seas foraging ground in the OSPAR maritime area for seabird species. The Site contains a significant proportion of the North Atlantic seabird populations and has the highest species diversity and abundance of seabirds across the entire Area Beyond National Jurisdiction of the OSPAR maritime area (**Annex 4**). Although important pelagic areas have been identified for individual species in the Atlantic previously, there has not been a multi-species analysis on this scale. The multi-species use of the area suggests that the inclusion of the NACES MPA would allow the OSPAR MPA network to achieve greater representativity for multiple seabird species.

The 2013 Ecological Coherence Assessment (OSPAR 2013) found that seabirds are currently not well represented in OSPAR MPAs in the ABNJ. The current OSPAR MPA network includes protected Sites close to land and seabird breeding colonies, which are of high importance during the seabird breeding season. However, a gap remains for sites during non-breeding periods. Protecting areas for all life-history stages is important to ensure representativity and ensure long term persistence of migratory species. The NACES MPA would increase the ecological coherence and representativity of the existing MPA network for seabirds with the inclusion of important foraging grounds of North Atlantic breeding seabirds at multiple points in their life stages and representing birds from colonies around the OSPAR maritime area. The NACES MPA also adds important staging and foraging grounds for South Atlantic and Caribbean breeding seabird species (e.g., Bermuda Petrel, Sooty Shearwater, Great Shearwater and South Polar Skua), an element which is not currently found in any of the OSPAR MPAs in the Area Beyond National Jurisdiction.

Productive frontal zone and deep ocean

The NACES MPA is globally unique in its oceanography, situated at a convergence zone between the cool, polar seas and the warm, central Atlantic. Within the boundary of the NACES MPA successive frontal zones fork out as the Subpolar Front meanders across the mid-Atlantic. The unique oceanographic conditions and complex bathymetry likely drive both primary and secondary diversity and abundance. It is therefore a unique pelagic ecosystem, and a habitat type (highly productive frontal zone) that is not well captured within the current OSPAR MPA network but which this proforma illustrates naturally coincides with an oceanic hotspot of biodiversity. Johnson et al. (2014) highlighted the underrepresentation of the bathyal (200-3,000 m), and particularly the abyssal (3,000-6,000 m), depth zones within the OPSAR Maritime area. Greathead et al. (2020) suggests that failing to consider the benthos in MPA selection and management could have long-term detrimental effects on MPAs and their success, given the important role benthic ecosystems play in offshore marine environments.

Seamounts

The Site contains seamounts and abyssal plains, which are both common in OSPAR Region V. Ecological processes that underpin the high biological diversity associated with OSPAR's other seamounts (rich food supply, bentho-pelagic coupling) are likely highly to occur in the Site. Most seamounts in the OSPAR Maritime region occur in Region V but with 70% of these not yet being included in MPAs or covered by any management measures such as fisheries closures. Thus, inclusion of seamounts in the NACES MPA Site would help achieve ecological coherence in MPAs for seamounts and help increase the level of protection afforded to these Threatened and/or Declining habitats across the whole OSPAR maritime region. Other listed deep-sea habitats are also known to occur on seamounts in OSPAR Region V, including coral gardens, deep-sea sponge aggregations, and *Lophelia pertusa* reefs; thus inclusion of seamounts in the NACES MPA would also strengthen ecological coherence of MPAs in places with these habitats across the OSPAR Maritime Area.

6. Sensitivity

Seabirds

The sensitivity of the seabirds included in **Table 1** is considerable. All seabird species are long-lived and slow reproducing (1-3 eggs once a year), meaning their populations are vulnerable to mortality events and slow to recover. The threatened seabird populations are particularly sensitive to human activities and threats (**Table 5**). The top threats impacting seabirds using the Site are fisheries (incidental by-catch (n=11); overexploitation of prey species (n=9)), followed by changes associated with changing oceanographic conditions (prey availability (n=12); habitat (n=1), extreme weather (n=1)); infrastructure and development (oil spills and surface pollutants (n=9); light pollution/ship strikes (n=7); energy production and mining n=3)).

Illustrating the sensitivity of seabirds to threats, it could be noted that of the 82 seabird species that occur within the European region, 24 are threatened or near threatened (BirdLife International 2015). In the boreal Northeast Atlantic (ca. 55–70°N), many seabird species have had repeated breeding failures and experienced high adult mortality over the last decade, which has resulted in pronounced declines in species such as Atlantic Puffin, Black-legged Kittiwake and Northern Fulmar (Burthe et al. 2012; Cordes et al. 2015; Durant et al. 2003; Grosbois and Thompson 2005; Miles et al. 2015; OSPAR 2017; Wanless et al. 2005). The 2017 OSPAR Intermediate Assessment 2017 concluded that seabirds in the OSPAR region were in trouble, with significant reductions in abundance and continued breeding failures.

The NACES MPA includes the important foraging grounds for seven seabird species, which are considered to be globally or regionally threatened or near-threatened according to IUCN Red List criteria: the Atlantic Puffin (Globally Vulnerable and Endangered in Europe), Bermuda Petrel (globally Endangered), Northern Fulmar (Endangered in Europe), Desertas Petrel (globally Vulnerable) and Zino's Petrel (globally Endangered). An additional three species (Audubon's Shearwater, Razorbill and Common Murre) are considered 'Near Threatened' within Europe. Protection of foraging grounds, ensuring undisturbed access to food sources during critical life stages, is an important means to protect seabirds.

Table 5. Details of the known/likely threats at-sea to all seabird species identified as using the MPA. Table is ordered by OSPAR list of threatened and/or declining species (*), IUCN threatened species, and Least Concern species. BirdLife International (2018) IUCN Red List for birds[10] and Dias et al. in prep.

Species common name	Known/likely threats at sea
*Audubon's Shearwater	Incidental by-catch in pelagic and demersal longline fishing gear and other gears Oil spills and surface pollutants Light pollution/ship strikes
*Black-legged Kittiwake	Climate/oceanographic induced changes to food availability Human induced changes to ecosystem functioning (over-exploitation of prey species) Oil spills and surface pollutants
*Thick-billed Murre	Incidental by-catch in gillnets (Note- depth of dives includes 200 m) Climate induced changes to food availability Oil spills and surface pollutants Human induced changes to ecosystem functioning (over-exploitation of prey species)
Atlantic Puffin	Incidental by-catch in gillnets and longlines Climate/oceanographic induced changes to food availability Human induced changes to ecosystem functioning (over-exploitation of prey species) Extreme weather events

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[10] http://datazone.birdlife.org/species/search

Species common name	**Known/likely threats at sea**
	Habitat displacement – collision with energy production and mining infrastructure
	Oil spills and surface pollutants
Bermuda Petrel	Climate/oceanographic induced changes to food availability
	Light pollution/ship strikes
Common Murre	Incidental by-catch in gillnets and other fishing gear.
	Human induced changes to ecosystem functioning (over-exploitation of prey species)
	Oil spills and surface pollutants
	Climate/oceanographic induced changes to food availability
Desertas Petrel	Climate/oceanographic induced changes to habitat
	Light pollution/ship strikes
Northern Fulmar	Incidental by-catch in demersal longline fishing gear and other gears
	Oil spills and surface pollutants
	Climate/oceanographic induced changes to food availability
	Light pollution/ship strikes
	Human induced changes to ecosystem functioning (over-exploitation)
Razorbill	Incidental by-catch in gillnets and other fishing gear
	Human induced changes to ecosystem functioning (over-exploitation of prey species)
	Climate/oceanographic induced changes to food availability
	Habitat displacement and disturbance - Energy production and mining
	Oil spills and surface pollutants
Zino's Petrel	Climate/oceanographic induced changes to food availability
	Light pollution/ship strikes
Sooty Shearwater	Incidental by-catch in gillnets, trawl, and longline fishing gear
	Human induced changes to ecosystem functioning (over-exploitation of prey species)
	Climate/oceanographic induced changes to food availability
Arctic Tern	Human induced changes to ecosystem functioning (over-exploitation of prey species)
	Climate/oceanographic induced changes to food availability
Bulwer's Petrel	Incidental by-catch in longlines and other pelagic fishing gear
	Oil spills and surface pollutants
Cory's Shearwater	Incidental by-catch in longlines and other pelagic fishing gear
	Light pollution/ship strikes
Great Shearwater	Incidental by-catch in longlines and other pelagic fishing gear
Great Skua	Human induced changes to ecosystem functioning (over-exploitation of prey species)
Little Auk	Incidental by-catch in gillnets and other fishing gear
	Climate/oceanographic induced changes to food availability
	Habitat displacement and disturbance - Energy production and mining
	Oil spills and surface pollutants
Long-tailed Jaeger	Climate/oceanographic induced changes to food availability
Manx Shearwater	Light pollution/ship strikes
Sabine's Gull	Currently no threats documented in literature
South Polar Skua	Currently no threats documented in literature

Cetaceans

The NACES MPA Site is used by at least 10 cetacean species, of which the blue whale is listed by OSPAR as Threatened and/or Declining (OSPAR 2010i). This Background Document explains that many baleen whales including the blue whale have low reproductive rates, and mature late. Thus, recovery of depleted populations takes decades. Baleen whales emit low frequency sound that can travel hundreds of kilometres (Evans 2000), so in the Site, they would be especially sensitive to underwater noise from, e.g., any military naval sonars, any future seismic exploration or deep seabed mining, shipping noise, etc. Whales are especially vulnerable if the zone of influence coincides with feeding or breeding areas and migratory corridors. Whales and dolphins, particularly odonocetes, are also threatened by entanglement in gear, and sub-lethal or mortality from injuries by hooks, the latter which may occur during depredation events wherein cetaceans take prey from baited longlines.

Atlantic Bluefin Tuna

Atlantic Bluefin Tuna (*Thunnus thynnus*) has a slow growth rate and a long lifespan (up to 20 years). Individuals mature late (4-5 years for the eastern stock) making this species more vulnerable and quite sensitive to fishing pressure or other threats for that matter than the more rapidly growing tropical tuna species (ICCAT 2002). Threats such from anthropogenic mercury have been reduced due to a decline in emission rates, for example from land-based gold mining activities, since the early 2000's, which have resulted in lower mercury concentrations in the North Atlantic tuna stocks (Lee et al. 2016). OSPAR's Background Document for Bluefin Tuna (OSPAR 2014a) recognised that the main threat to this species at the time was high fishing pressure. The fishing activity within NACES is low relative to other regions, such as the waters near the Newfoundland coast.

The 2020-2021 assessment of the western Atlantic blue fin tuna stock by the ICCAT (2021c) found the total biomass of the western stock in 2020 was 46% of the biomass in 1974; but with no long-term declining trend in recruitment since 2003. This model also suggested that there is a 100% probability that the 2020 total allowable catch (TAC) (2,350 t) - would not lead to overfishing. The report mentions that an assessment in 2020 suggested the population declined by 11.7% from 2017 to 2020; however, the 2021 assessment suggests there has been a 9% increase for the same time period, based on the use of different evaluation methods. If there has been an increase, it is possible there could be an increase in the TAC to 3,483 t in 2022. It is important to caution, as in the report, that these data and their implications require independent review, due to uncertainties relating to the mixing between stocks, age composition, recruitment, indices of abundance and other factors.

Basking Shark

OSPAR's Background Document on Basking Shark (*Cetorhinus maximus*) recognised the species is highly sensitive to any population changes because of its very low population productivity; estimated at 0.013 – 0.023 (Musik et al. 2000). There is no information on by-catch from fisheries, thus current threats from fishing are unknown. Risks of collisions with vessels also pose threats, as will threats from climate change wherein shifts in the timing and species composition of phytoplankton and zooplankton communities may directly impact the spatial ecology and habitat use of this lower trophic level species.

Leatherback turtle

Leatherback turtles in the NACES MPA Site are sensitive to pelagic fisheries and shipping, with multiple threats posed by bycatch, and plastic ingestion. Trash was observed floating across the Site at several locations during the DY080 cruise (Wakefield 2018). The OSPAR Background Document for Leatherback Turtle (*Dermochelys coriacea*) (OSPAR 2009d) identified the main threats coming from fisheries activity and marine litter, both of which can entangle these animals or lead to ingestion of materials. Leatherbacks are captured in driftnets, trawls, set gill nets, purse seines, and longline fisheries, and can also become entangled in discarded fishing gear or marine litter. Turtle mortality is also associated with ship collisions.

Cephalopods

Persistent organic pollutants such as tributyltin (TBT), polycyclic aromatic hydrocarbons (PAH), diphenyl ether (DPE), polychlorinated biphenyls (PCB), brominated diphenyl ethers (BDE), and other halogenated organic contaminants have all been found in deep-sea squid (Unger et al. 2008) including the same species of gonate and cranch squid found in the NACES MPA.

Coral gardens and deep-sea sponge aggregations

Both coral gardens and deep-sea sponge aggregations provide habitat and refugia for other organisms and are known to enhance local biodiversity by providing structural complexity through their skeletal framework (Auster et al. 2013). Coral gardens can also act as spawning, breeding, and nursery grounds for different species, including elasmobranch fishes (Henry et al. 2016), which likely is also the case in the NACES MPA.

Notably, both coral gardens and deep-sea sponge aggregations are listed as vulnerable marine ecosystems (VME) indicators (FAO 2016) due to their limited resilience and recovery from human exploitation and disturbances of their populations, communities, and habitats (Ramirez-Llodra et al. 2011).

According to OSPAR assessment (OSPAR 2010j), coral gardens are 'very sensitive' to the effects of demersal trawling and longlining, temperature change and acidification; and 'sensitive' to the localised effects of offshore energy–related activities. Whilst threats related to the demersal trawling and offshore energy exploitation are not relevant to the Site, climate-induced changes in seawater acidity, water temperature, and food availability might still occur. Deep-sea sponges are sensitive to increased turbidity and likely pollution (OSPAR 2010k). The dominant species are long-lived, slow growing and therefore slow to recover from impacts.

Mesopelagic fish

Mesopelagic fish play two vital roles in the NACES MPA: as prey for shallower predators (seabirds, shark, tuna for example), and as key nodes in the carbon cycle (Davison et al. 2013; St John et al. 2016; Roberts et al. 2017), respiring at least 10% of primary production in deep water layers (Irigoien et al. 2014). Removal of mesopelagic biomass through fisheries exploitation is therefore highly likely to have knock-on effects on stocks of tuna, swordfish, and pelagic sharks, but also biomass removal will impact on biogeochemical cycles. Such impacts need to be carefully built into any fisheries management plans should plans to exploit mesopelagic stocks emerge in the future by adopting a rigorous ecosystem-based management approach to fisheries. Mesopelagic fish and other mid-water species will also be highly sensitive to deep seabed mining: sensitivities are likely to be high because most deep midwaters have very low concentrations of naturally suspended sediment; sediment plumes from collectors on the seafloor and from midwater discharge could cause significant adverse harm to mesopelagic fish (Drazen et al. 2020). Furthermore, the mesopelagic zone below the surface mixed layer is a key entry point for mercury into open ocean food webs (Blum et al. 2013); thus, discharge of metals and toxins into the mesopelagic zone from deep seabed mining could cause harm to mesopelagic fish and contaminate seafood (Drazen et al. 2020), should mesopelagic stocks be exploited in the NACES MPA. Such potential impacts from deep-sea mining should be incorporated into and addressed through existing and future environmental management regimes of deep-sea mineral resources. Wieczorek et al. (2018) found 73% of mesopelagic fish sampled within or near the NACES Site contained plastics, with *G. denudatym*, *S. beanie* and *L. macdonaldi* having the highest frequency of occurrence. The forensic techniques in this study showed that the microplastic fibres are a real concern and not an artefact, for example of airborne contamination. It is important to note that mesopelagic fish with microplastics in their guts may not experience negative impacts but the transfer of these materials into deeper waters could impact other fish species and benthic organisms, not previously exposed (Lusher et al. 2016).

Table 6. Summary of key threats to non-seabird species and biogenic habitats identified as present in the MPA. Table is ordered alphabetically by ecological group name within examples of species from the group that occur in the MPA. Species listed by OSPAR as threatened and/or declining are marked with asterisk (*). The impact of climatic-change and human induced changes to ecosystem functioning (over-exploitation of prey species) is a threat to all listed species.

Ecological group	**Examples of species**	**Known/likely threats**
Cephalopods	Bobtail squid Dumbo octopus Long-armed squid Reverse jewel squid Wonderful firefly squid	Persistent organic pollutants
Cetaceans	Blue whale* Fin whale Harbour porpoise Humpback whale Pilot whale, Risso's dolphin Sei whale, Sperm whale Short-beaked dolphin	Acoustic disturbance Ship strikes Persistent organic pollutants
Coral gardens*	*Solensomilia* spp.	Climate-induced changes in seawater acidity, water temperature, and food availability
Deep-sea sponge aggregations*	*Geodia* spp.	Climate-induced changes in seawater acidity, water temperature, and food availability Pollution
Eels and eel larvae	American eel European eel Narrownecked oceanic eel	Incidental by-catch/entanglement in longlines and other pelagic fishing gear Pollution (persistent organic pollutants, heavy metals and other endocrine-disrupting compounds)
Filter-feeding sharks	Basking shark*	Incidental by-catch/entanglement in longlines and other pelagic fishing gear Plastic pollution Ship strikes
Gelatinous zooplankton	Common salp Comb jellyfish Giant siphonophore Helmet jellyfish	Plastic pollution
Marine turtles	Green sea turtle Hawksbill turtle Kemp's Ridley turtle Leatherback turtle* Loggerhead turtle*	Incidental by-catch in longlines and other pelagic fishing gear Plastic pollution Persistent organic pollutants Ship strikes
Mesopelagic fish (e.g., bristlemouths and lanternfish)	Elongated bristlemouth Glacier lantern fish Rakery beaconlamp Scaly dragonfish Stout sawplate	Incidental by-catch/entanglement in longlines and other pelagic fishing gear Microplastics Persistent organic pollutants
Micro- and mesozooplankton	*Calanus finmarchicus* *Gymnodinium spp.* *Pleuromamma spp.* *Pseudocalanus spp.* *Strombidium spp.*	Plastic pollution
Other sharks, skates and rays	Blue shark Scalloped hammerhead Shortfin mako shark Thorny skate	Incidental by-catch/entanglement in longlines and other pelagic fishing gear

Ecological group	**Examples of species**	**Known/likely threats**
	White shark	
Pelagic fish	Atlantic bluefin tuna* Atlantic cod Bigeye tuna Ocean sunfish	Incidental by-catch/entanglement in longlines and other pelagic fishing gear Pollution (persistent organic pollutants, mercury contamination)

Seamounts

The biological communities and habitats on seamounts are highly sensitive to commercial fisheries. Although the seamounts currently known to occur in NACES have deep summits and seamount communities are unlikely to be affected by activities such as longline fishing or bottom fisheries, several species located in NACES, such as cetaceans, are known to converge in the water column above seamount features due to the unique oceanography there, and these taxa could be impacted by any fishing activities that take place, though these are low in NACES relative to adjacent waters. Many species of cold-water corals, particularly antipatharian corals, are extremely long-lived, taking centuries to millennia to reach the sizes they are today (Prouty et al. 2011). Recovery of these species will be on the same order and will only be made possible from slow re-growth of individuals or the reproduction, dispersal and recruitment of new corals from neighbouring seamounts or small-scale igneous outcrops. While the use of bottom fishing gear is known to exert the greatest pressure on these communities and habitats, pelagic fisheries occasionally have incidental bycatch of benthic seamount species such as corals. OSPAR's Background Document for Seamounts (OSPAR 2010g) also noted indirect effects of fishing (e.g., sediment re-suspension, discharge of processing waste) and today litter including plastics are found on many seamounts. While commercial fishing is currently the overriding threat to seamount fauna, there is a possibility of impacts from potential deep seabed mining activities to extract ferromanganese crusts from seamounts.

In the NACES MPA Site, threats from fishing that might occur include over-exploitation of easily targeted seamount associated fisheries; unsustainable bycatch of non-target species, including sponges, corals, sea turtles, sharks and cetaceans in long-lines and other pelagic fishing gears; and suspected indirect effects on community structure and ecosystem health through the removal of biomass and key species. Threats from activities other than fishing in the Site include shipping and accidents at sea, either through ship strikes, noise or air pollution but also litter and plastic pollution (observed during the DY080 cruise, Wakefield 2018), the latter which is also lost from fishing vessels too which can entangle marine life and have unknown impacts on the biology of benthic seamount fauna.

7. Naturalness

The general area has a high degree of naturalness, with species and habitats/biotope types assumed to be in still in a very natural state as a result of the lack of recent human-induced disturbance or degradation. There is currently no bottom fisheries in the Site, which would otherwise degrade sensitive seamount habitats. The water column of the Site is not assumed to be pristine, given that both shipping and pelagic fishing activities take place within and in the areas surrounding the Site. Trash was observed floating throughout the Site on the DY080 cruise (Wakefield 2018). The situation of the Site between two gyres and the presence of mesoscale eddies, similar to the Kuroshio-Oyashio system in the North Pacific Ocean, may draw in marine debris and create the conditions that lead to the accumulation and retention of plastic material (Howell et al. 2012). As previously mentioned, 73% of examined mesopelagic fish located in and near the NACES Site were found to contain microplastics is their guts in a study by Wieczorek et al. (2018), and surface water samples showed evidence of at least 14 microplastic fragments per 100 litres of water. More recently, the IceDivA2 expedition at the Mount Doom region within the Site found evidence from a towed zooplankton net of plastics down to ca. 2,000 m water depth.

b. Practical criteria/considerations

1. Potential for restoration

Maintenance and, where appropriate, restoration of biodiversity and the integrity of the marine ecosystems is the conservation vision for the Site. However, for many ecological groups the data are lacking for the baseline state of biodiversity, therefore conducting an assessment to evaluate the baseline condition would be a first and essential step to achieve this vision.

Many seabird populations that use the NACES MPA have declined markedly in recent times (Paleczny et al. 2015). This implies that the number of birds using the Site is probably lower than it would have been prior to the onset of human activity impacts. The potential for improving the status of the seabirds defined in the conservation objectives of the Site is therefore high and realising this restoration potential of the seabirds is contingent in part on appropriate protection of remote foraging sites, including at the Site.

In addition to restoration of the whole spectrum of protected features at the Site due to any identified adverse impacts from human activities, the NACES MPA also aims to protect the ecosystems and biological diversity in the area against any future adverse impacts of human activities.

Currently, there are activities occurring that have potential negative impacts on the features at the Site. However, further data on the activities within the Site are needed to determine whether the features need to be maintained or restored through appropriate management action.

2. Degree of acceptance [CAVEAT: Text in this section is from the 2020 version of the nomination proforma. This text is subject to change based on views and information OSPAR may receive from other actors during consultation on the revised nomination proforma]

[OSPAR Commission agreed to develop this nomination proforma in a transparent, wide and inclusive manner by seeking views on a draft version of the proforma from other competent authorities are relevant stakeholders. Early versions of the nomination proforma were also presented at several international meetings and other competent authorities were invited to provide views and input. Information and views from other competent authorities presented in this section of the nomination proforma are summaries of views provided by these actors through the process of OSPAR seeking their views, as well as through information exchange during meetings under the collective arrangement.[11]

The process of seeking views was run between June-October 2018. The aim of the process was to gather as much information as possible to inform a decision on the designation of the proposed NACES MPA and any recommendations on its future management. Views were invited on the following questions;

(i) Can you provide any additional information of relevance on the 22 species of seabirds and habitats and ecosystems that support the seabird species present in the proposed MPA?

(ii) Can you provide any additional information on current and/or potential future human activities at the site, including their intensity, type and timing?

(iii) Can you provide additional indicative information about potential future management actions within the site to deliver the proposed conservation objectives for the site?

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[11] The text in the nomination proforma has been drafted by the OSPAR task group responsible for developing the nomination proforma based on information provided by other organisations. Thus, the information in the nomination proforma should not be read as official statements by other organisations, but rather as a summary compilation by OSPAR of the information and views provided. The official responses to the seeking views process and other contributions are archived at the OSPAR Secretariat.

Views were provided in response to the process from several competent authorities, other regional stakeholders as well as members of the scientific community. Competent authorities generally noted a low level of activity in the area or none at all, and that further considerations would be needed to inform their potential future processes in respect to any actions. The scientific community expressed a strong support for the nomination proforma identifying an important Site for seabirds.

OSPAR presented an early draft of the nomination proforma to the 2018 meeting under the collective arrangement, with a view to invite dialogue on the ongoing work, invite contributions of relevant information and inform of the timelines for further work. A more developed version of the nomination proforma was again presented by OSPAR to the 2019 meeting under the collective arrangement, inviting dialogue with other competent authorities in particular on the sections in the nomination proforma describing human activities and potential management action. Ongoing work and early versions of the nomination proforma were presented for discussion at the collective arrangement meetings with the aim to ensure early involvement of all relevant stakeholders and awareness of the proposal to support a successful potential future designation and management

Fishing

The **North East Atlantic Fisheries Commission (NEAFC**) regulates (pelagic and bottom) fisheries in the ABNJ in accordance with applicable provisions of *The NEAFC Scheme of Control and Enforcement*[12]. In accordance with NEAFC regulations, regulated bottom fishing only takes place in areas previously fished (spatial information available through ODIMS[13]). The Chair of the Permanent Committee on Management and Science (PECMAS) communicated that there had been very little, if any, fishing activity by vessels regulated by NEAFC at the proposed Site during in past years. PECMAS informed that a limited number of transit voyages crossing the Site by NEAFC regulated fishing vessels had taken place in those past years. In this respect it is furthermore relevant to note that NEAFC has regulations in place for the protection of vulnerable marine ecosystems[14] (spatial information available in ODIMS[15]). NEAFC PECMAS pointed out that the information on fisheries included in the nomination proforma reflected the expertise of the authors and that authorities regulating fisheries, such as NEAFC, have more detailed information. In this regard, PECMAS informed of the perspective of NEAFC that not only is ICES advice on the science underpinning a nomination proforma important, but ICES’ views on the human activity and potential impacts in the area are also needed. All NEAFC decisions on fisheries management are based on science and build on input from ICES.

The **International Commission for the Conservation of Atlantic Tunas (ICCAT)** have noted the ongoing work of OSPAR in developing a nomination proforma and contributed by providing information on fishing activities regulated by ICCAT. The Executive Secretary of ICCAT informed that several fleets, particularly longliners, traditionally operate in the region of the NACES MPA and nearby (at a coarse spatial scale). The primary target of these fleets are temperate tuna species (Northern Albacore, Bigeye Tuna and Atlantic Bluefin tuna), and Swordfish. These fisheries also capture non-target pelagic species, including sharks, and billfish (blue and white marlins). However, overall catches within the low, representing just 1-6% of the total North Atlantic annual catches (ICCAT). It is estimated that between 2.5 to 5 million hooks are deployed annually by longline operations within the Site. This is much lower than in the early 1990’s when fishing effort was much greater (EFFDIS estimates, information provided by ICCAT). All current ICCAT management regulations affecting North Atlantic fish stocks apply for all fishing operations within the Site. There has been no systematic monitoring of seabird by-catch within the fleets operating in the Site. In conclusion, there is a spatial overlap of ICCAT regulated human activities and the Site, at a coarse spatial scale. Closure of fishing in such an area

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[12] https://www.neafc.org/mcs/scheme

[13] https://odims.ospar.org/layers/geonode:vme_bottom_fishing_areas

[14] https://www.neafc.org/system/files/Rec.19-2014_as_amended_by_09_2015_and_10_2018_fulltext-and-map.pdf

[15] https://odims.ospar.org/layers/geonode:ices_eg_VME_Dataset_PublicRecords

would have negative impacts on the fleets operating in the area as well as diminished information becoming available from the area e.g., from observer programmes. Based on currently available information on seabird-fisheries interactions at the Site ICCAT concluded that a complete closure would not be warranted. ICCAT would continue to collect data and share information from the Site.

The North Atlantic Salmon Conservation Organisation (NASCO) noted the ongoing work in OSPAR on developing the nomination proforma and provided information in relation to human activities regulated by the organisation. Under the terms of the NASCO Convention, fishing for Atlantic salmon is prohibited in the identified site, among other areas of the North Atlantic. In addition, information provided to NASCO regularly from surveillance flights and other MCS operations shows that no IUU fishing for Atlantic salmon in the identified site or elsewhere on the high seas in recent years has been detected. The last time IUU fishing for Atlantic salmon was known to occur in the North Atlantic was in the early 1990s, and NASCO took decisive action to eliminate it.

The North Atlantic Marine Mammal Commission (NAMMCO) Scientific Committee has emphasised that there is little information to make an assessment of the importance of the Site for cetaceans, with a particular lack of data for the winter period. If the area is important for birds, this could indicate a level of productivity that may also make it an important area for cetaceans. However, this is not necessarily the case and there is currently no available evidence to indicate this. This conclusion with supporting further details was communicated by the Executive Secretary through a letter to OSPAR.

Science

The NACES MPA has a very high level of support from the scientific community, including seabird, turtle, cetacean and shark ecologists working across the Atlantic from 12 different countries (**Annex 1**). This has been achieved via the expert workshop held in Iceland in June 2016 and regular information exchanges throughout the identification process, the recent NERC DY080 research cruise, the IceDivA2 cruise and planned NOAA Okeanos Explorer cruises. Independent scientists provided views on the draft nomination proforma, and all statements supported the scientific case and the proposed delineation. Further to this, an OSPAR-led online workshop in June 2022 to further the Roadmap for development, facilitated by the University of Edinburgh, involved the coordinated sharing of information on the ecological significance of the NACES MPA from 38 participants; and the data were provided from multiple sources within the scientific community during the post-workshop revisions process (**Annex 1**).

Shipping

Major shipping lines between Canada, USA and Europe pass through the MPA. The degree of acceptance by shipping actors and regulators, including IMO, of the proposal is currently not known but input is being sought.

Tourism

No known tourism activities present at the Site.

Offshore mining and extraction

There are no known exploration or exploitation plans at the site as of yet. Oil and gas activities occur in nearby waters (Canadian Jeanne d'Arc basin). The degree of acceptance by extraction actors and regulators, including ISA, of the proposal is currently not known but input would be welcomed.

Cable laying

The degree of acceptance by actors involved in cable laying and regulation is currently not known but input would be welcomed.

3. Potential for success of management measures [CAVEAT: Text in this section is from the 2020 version of the nomination proforma. This text is subject to change based on views and information OSPAR may receive from other actors during consultation on the revised nomination proforma]

Considering the OSPAR Convention is legally binding only to the Contracting Parties of the OSPAR Convention, and the mandate of the OSPAR Commission is limited to certain human activities within the mandate of OSPAR, effective conservation of the ecosystems and biological diversity at the Site will require collaborative management encompassing all relevant actors and competent authorities with a competency in the region. To date, OSPAR has taken the collective decision to designate seven MPAs in ABNJ of the OSPAR maritime area and has developed channels for disseminating information.

OSPAR and NEAFC have adopted a multilateral agreement, the collective arrangement (OSPAR Agreement 2014-09), which supports successful management of the OSPAR designated Marine Protected Areas in the Area Beyond National Jurisdiction. The collective arrangement establishes a forum for information exchange and dialogue between different competent authorities. The availability of this established mode for interaction between OSPAR and other competent authorities enables successful management of the Site.

Programmes and measures carefully designed and effectively implemented by OSPAR Contracting Parties, individually and/or collectively, and in accordance with the OSPAR Convention, e.g., with regards to awareness raising, information building, marine science or new developments, are expected to be successful in contributing to achieve the general as well as specific conservation objectives set for the NACES MPA.

A research and monitoring plan could be a useful tool in the dialogue and collaboration with relevant actors and competent authorities.

A limited number of human activities are known to occur at the Site, the intensity of the activities are concentrated over some areas of the MPA more than others, and the activities are typically regulated and/or licensed. There is strong potential for success of management through collective arrangements, co-operation, and the programmes and measures implemented by OSPAR Contracting Parties.

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4. Potential damage to the area by human activities [CAVEAT: Text in this section is from the 2020 version of the nomination proforma. This text is subject to change based on views and information OSPAR may receive from other actors during consultation on the revised nomination proforma]

Human uses of the Site

Due to its remote location in an area beyond national jurisdiction and in deep open ocean, the NACES MPA is not easily accessible to current sectors other than fisheries and shipping. The waters within and surrounding the Site are therefore only exposed to a limited range of human uses at present, concentrated over certain areas. The main human uses for the wider region surrounding the Site include fishing, shipping and activities associated with extractive industries such as oil and gas. The activities could potentially be causing damage to the area, the seabirds using it as foraging grounds, as well as cetaceans, elasmobranchs, and marine turtles. The specific actions that are known to occur within the area and the surrounding North Atlantic region are described below.

Fishing

Fishing appears to be less commercially important within the Site compared to adjacent areas. Areas immediately surrounding the Site, to the west (Grand Banks), east, and south appear to be intensively fished. The remoteness of the Site could partly be a reason for the apparent lower fishing activity, but with potential changes in species distribution or fishing patterns, these resources have the potential to be targeted in the future within the boundaries of the Site.

For the original proforma it was noted that the last two years there has been very little if any, fishing activity by NEAFC vessels (PECMAS/NEAFC information provided). Global Fishing Watch data for 2017-2021 suggest the same, relative to areas outside the NACES MPA (**Figure 29**).

ICCAT does have several fleets operating in the region of the proposed MPA. ICCAT catch statistics are documented in grid cells of 5x5 degrees latitude and longitude, nine of which overlap with the NACES MPA boundary (**Figure 24**).

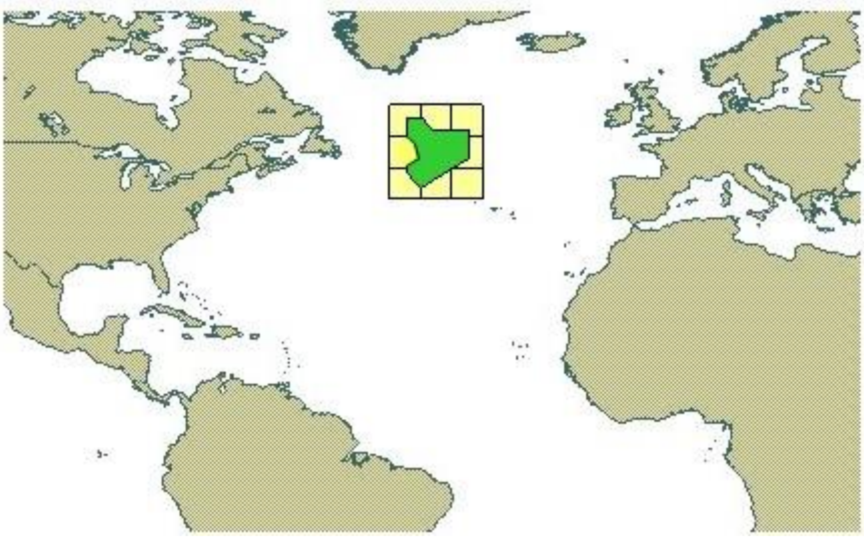

Figure 24. *Geographical overlap of the ICCAT 5x5 lat lon grids with the Site. (Source: ICCAT).*

The primary target of ICCAT fleets are temperate tuna species (Northern Albacore, Bigeye Tuna and Atlantic Bluefin tuna), and Swordfish (**Figure 25**). Capture non-target pelagic species, including sharks and blue- and white marlins, have been documented in these fisheries. The fisheries also have the potential to capture seabirds, however this is poorly documented in the region as there has been no systematic recording of incidental by-catch but this represents a new opportunity for research and collaboration.

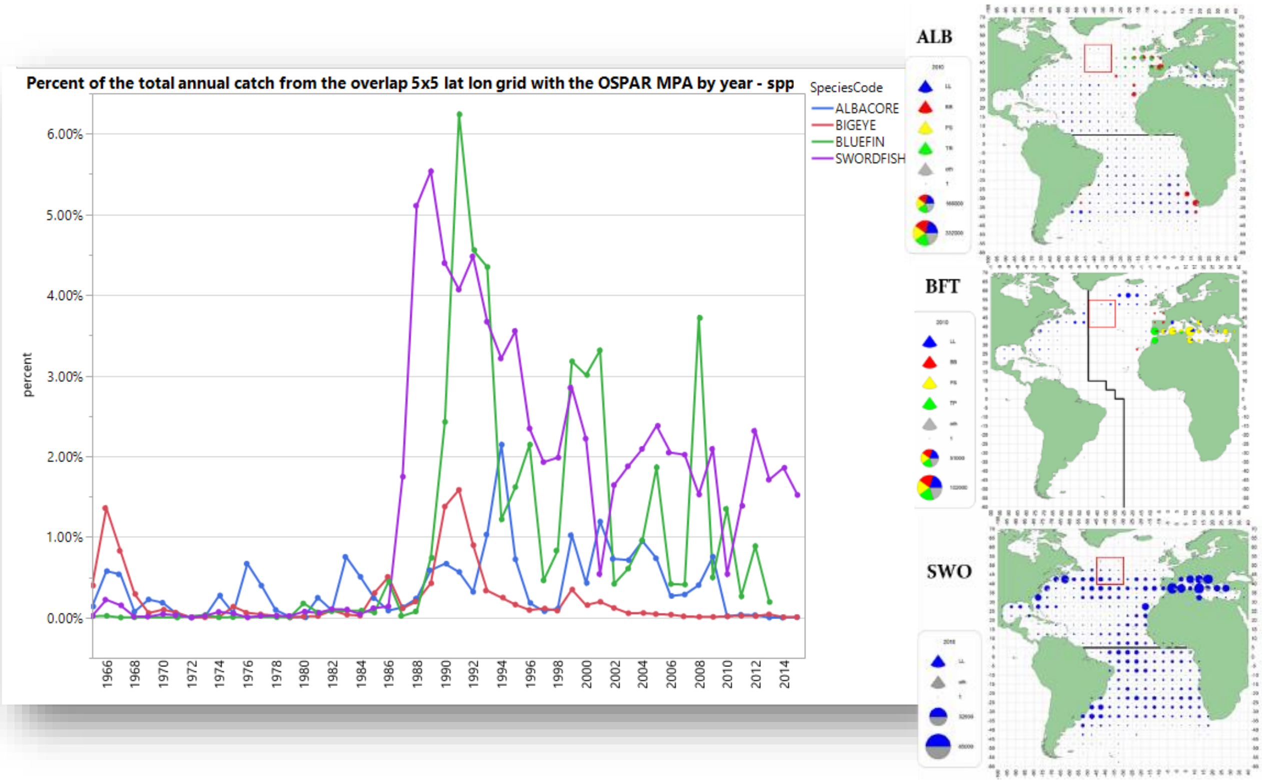

Figure 25. *Percent of total annual catch inside the nine 5x5 lat lon grid that overlap with the Site by year and species for the period 1965-2015. The tree panels on the right illustrate spatial distribution of catches in 2010 for Swordfish, Bluefin tuna and Albacore with an indication of the nine grid cells spatially overlapping with the Site. (Source: ICCAT).*

The ICCAT fleet deploys an estimated 2.5-5 million hooks annually at the Site, however it should be noted that the fishing effort has shifted between geographical areas over the past decades (**Figure 26**).

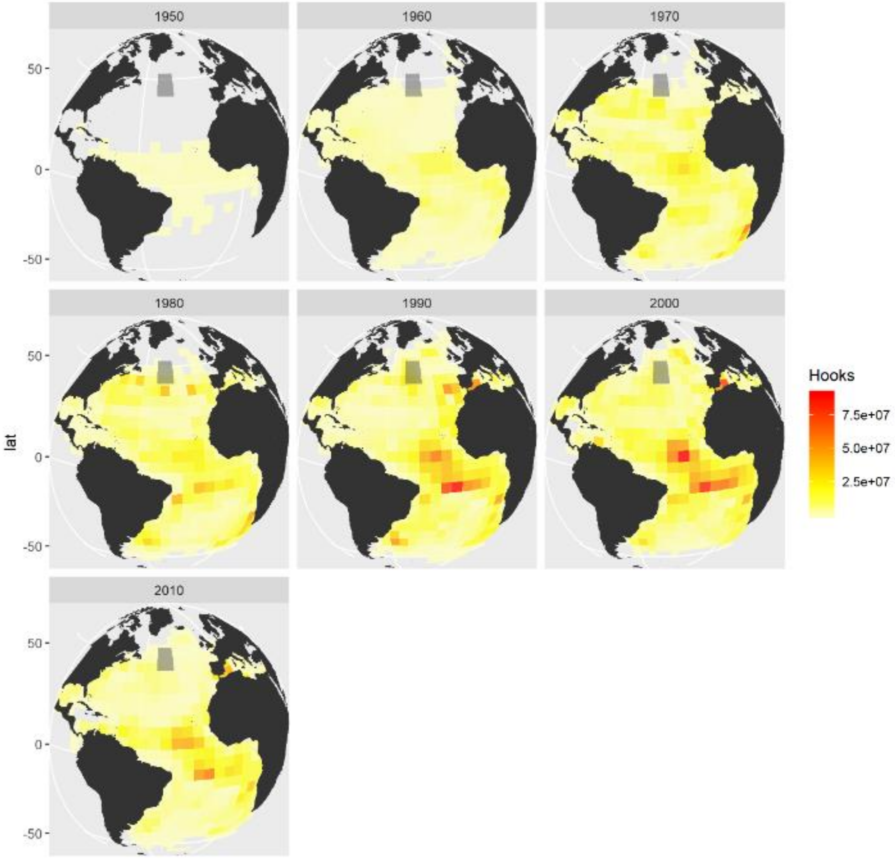

Figure 26. *Total effort (hooks) inside the 5x5 lat lon grids by decade. Grey shaded area identifies the Site. (Source: ICCAT).*

The ICCAT fleet catches from within the catch statistics grid cells which overlap with the Site vary between years and have in the past comprised 1-6% of the total North Atlantic annual catches (**Figure 27**).

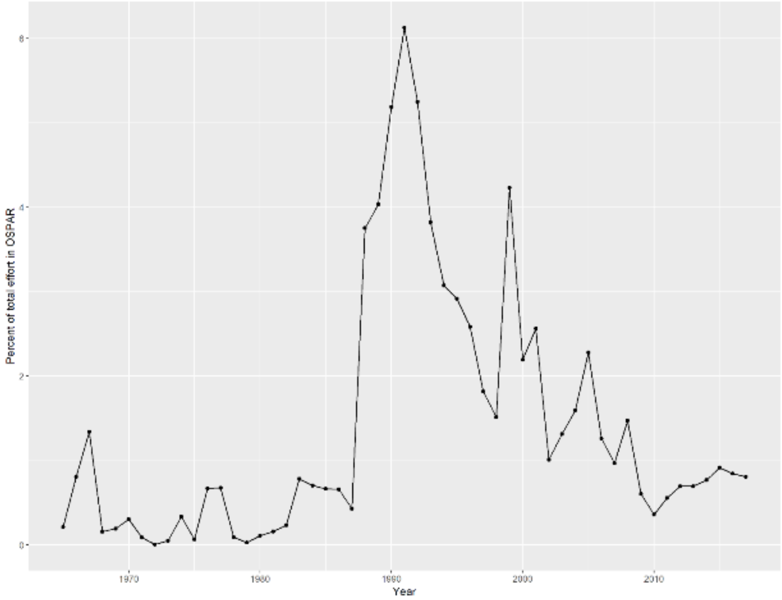

Figure 27. *Percent of annual longline fishing effort inside the 5x5 degree latitude longitude grids that overlap with the Site. Fishing effort distribution estimated from ICCAT TASK II data (note: data before 2000 may be incomplete). (Source: ICCAT).*

Global Fishing Watch uses the automatic identification system (AIS; a vessel tracking system originally designed for collision avoidance) to identify and track apparent fishing activity. The data are processed to identify fishing vessels and provide information on vessel type, including fishing gear type (**Figure 29**). AIS tracking data are calculated based on vessel speeds; however, steaming/transiting activities are also included in the calculation of apparent fishing hours. Therefore, these data should be treated with caution as data likely overestimate the actual fishing effort within the NACES MPA. Nevertheless the data can show areas used by the fisheries sector; engagement with NEAFC and ICCAT are critical to continuing to improve interpretation of these data. AIS information is available for 80% of the fishing that occurs in the high seas, meaning that coverage is good and the data informative for the NACES MPA and other areas in the high seas. To provide a comparison of fishing activity within the NACES MPA and the wider region, data were summarised for the last 5 years (2017-2021) within the NACES MPA and in OSPAR Region V. Though Global Fishing Watch data are available from 2012, the data from 2017 onwards are considered more robust.

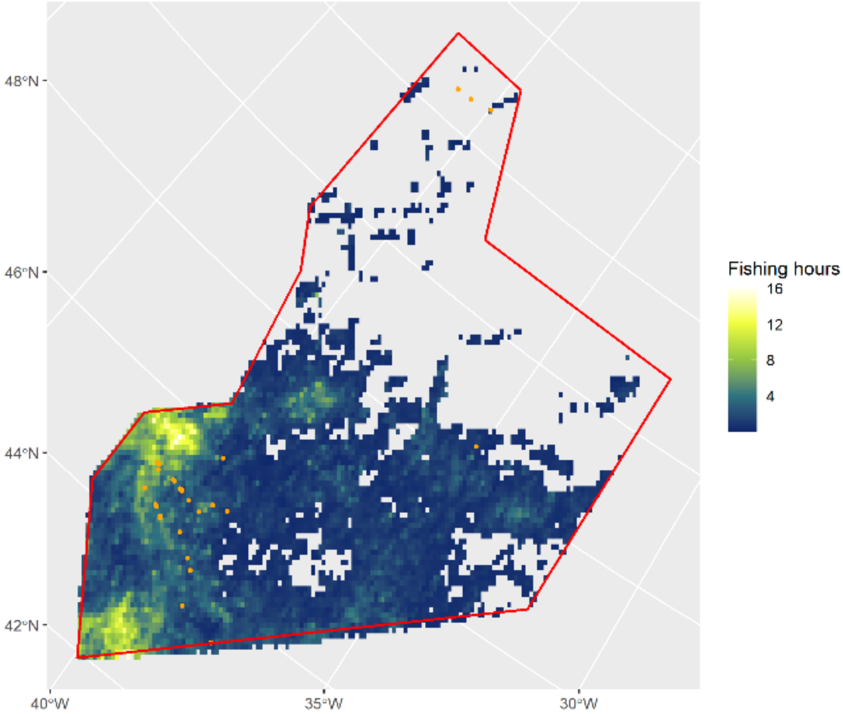

Figure 28. *Average apparent fisheries effort within the NACES MPA, based on automatic identification system data for fishing hours, averaged across years 2017-2021 using Global Fishing Watch. Apparent fishing hours also includes hours of fishing vessels transiting through the Site and thus overestimate actual fishing effort. Orange points denote the location of seamounts, overlapping areas with higher apparent fishing effort. Prepared by BirdLife International.*

Within the NACES MPA, there are three identified fishing gear types found on vessels using or transiting through the Site, with drifting longlines being the primary gear type (**Figure 29**). Reported apparent fishing hours were concentrated in the southern half of the MPA, particularly the southwest over the Milne Seamount Complex and nearby regions, where cetaceans, marine turtles and elasmobranchs may be more likely to converge and feed, given the elevated productivity associated with waters overlying seamounts. In Region V, twelve gear types were identified, with the main gears used identified as drifting longlines, set long lines, and trawlers. Fishing effort is generally low across the NACES MPA as a whole, particularly when compared to the wider region, but within the MPA, there are patches of relatively high apparent fishing effort, mostly occurring within the south-west of the MPA and overlapping with known seamount locations (**Figure 29**).

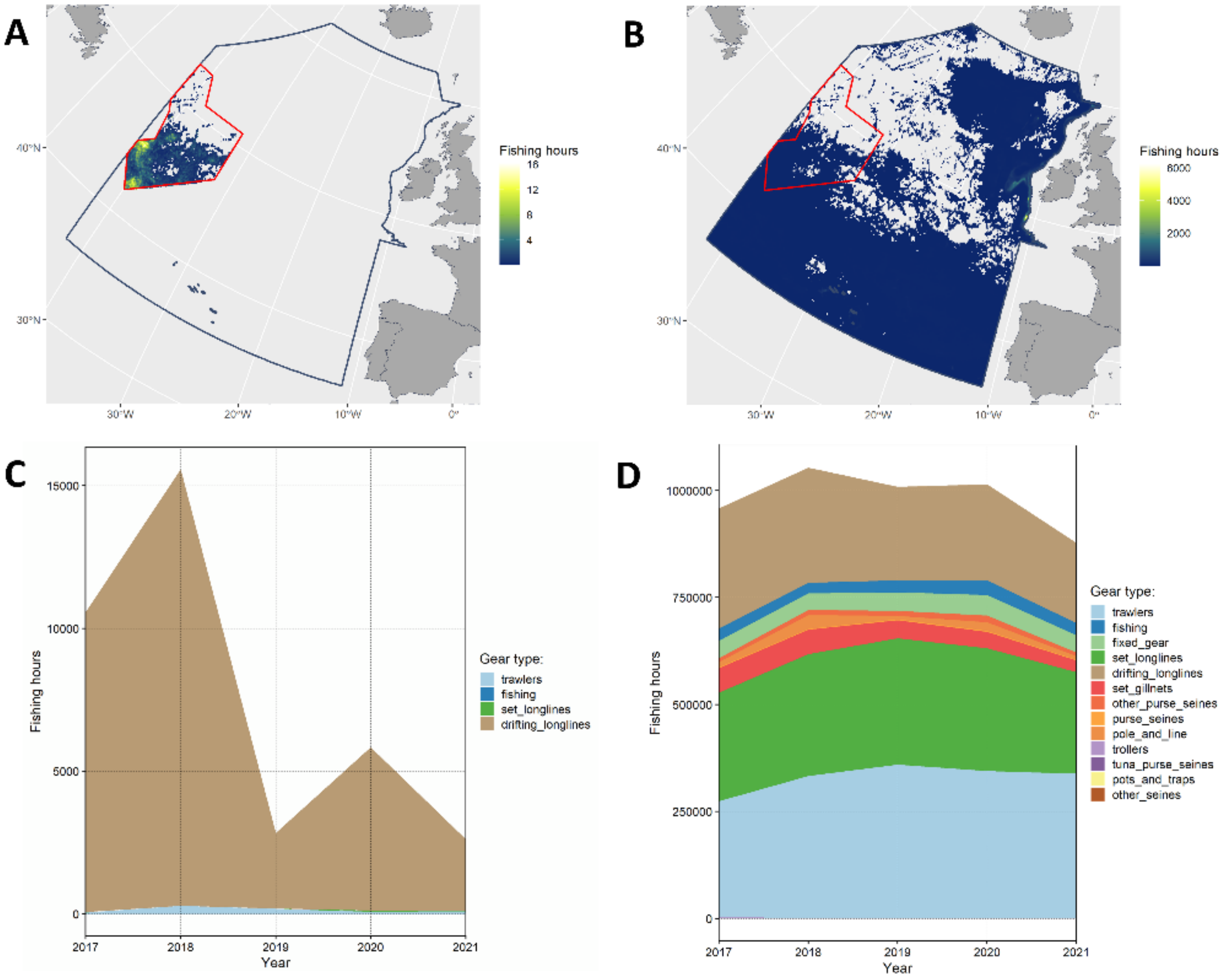

Figure 29. *Average apparent annual fisheries effort within (A) the NACES MPA and (B) OSPAR Region V, averaged across years 2017-2021 and plots of cumulative apparent fisheries effort and fishing gear type for (C) the NACES MPA and (D) OSPAR Region V for years 2017-2021. Apparent fishing hours also include hours spent by fishing vessels transiting through the Site, and thus overestimate actual fishing effort. Prepared by BirdLife International.*

Potential threats to ecosystems and biodiversity at the Site

Fishing activities

Threats to seabirds

It is well known that seabirds are vulnerable to incidental by-catch from fisheries. In particular, large to medium Procellariforms are incidentally by-caught or fatally injured by long-line, gillnet and trawl fisheries in unsustainable numbers in many areas (e.g., Anderson et al. 2011; Žydelis et al. 2013). Incidental by-catch is a known threat to 11 species of seabird using the Site, including the three most abundant bird species Great Shearwaters, Cory's Shearwater and Northern Fulmars (e.g., Anderson et al. 2011; Dunn 2007; Fangel et al. 2015). Any fisheries in the area may therefore cause significant incidental by-catch.

However, there is a major knowledge gap for the North-East Atlantic on incidental by-catch rates and spatial-temporal occurrence because this information has not been documented. Efforts for monitoring seabird incidental by-catch have mostly focused on pelagic longlines and Albatross species in the South Atlantic (e.g Yeh et al. 2013). However, there have been studies on the incidental by-catch risk to other species, including Cory's Shearwaters, Great Shearwaters and Sooty Shearwaters (e.g., Ramos et al. 2013). The knowledge gap on seabird incidental by-catch is even larger for other gear types. In demersal longlining, the hooks are much smaller and pose a threat to smaller seabird species. Demersal fisheries operating in the shelf waters off Ireland are known to catch Great Shearwaters and Northern Fulmar and Black-legged Kittiwake, potentially in very large numbers (Anderson et al. 2011; Dunn 2007; Reid et al. 2008).

Systematic collection of seabird incidental bycatch data is needed to more accurately assess the threat posed to the seabird species (as in **Table 1** and **Table 5**) at the Site and understand the overall impact this threat poses to the populations.

Light pollution from fishing activities can also pose an indirect threat on seabirds, particularly small petrels (Procellariiformes). These birds forage at night on vertically migrating bioluminescent prey and are therefore attracted to light of any kind (Imber 1975). This attraction to anthropogenic light sources at night can cause them to collide with ships and other structures, often causing serious injury or mortality (Black 2005, Montevecchi 2005, Rodríguez et al. 2017). This generally occurs during periods of poor visibility caused by fog or other precipitation because the moisture droplets in the air refract the light and greatly increase the illuminated area. During cruise DY080 at least 13 instances of light induced ship strikes occurred in the proposed MPA over a two-week period, all involving Leach's Petrels (**Annex 5**, **Figure A5.6**).

Threats to pelagic species

Reported apparent fishing hours within the NACES MPA from 2017-2021 indicate fishing levels are likely to be greater in the southern half of the MPA, particularly the southwest over the Milne Seamount Complex and nearby regions (**Figure 28**), relative to other areas in the MPA; where cetaceans, marine turtles and elasmobranchs may be more likely to converge and feed, given the elevated productivity associated with waters overlying seamounts (Dias et al. 2016; Mohn et al. 2021; Morato et al. 2016; Sweetman et al. 2013). This also coincides with an area of high shipping activity within the NACES Site (**Figure 30**). Incidental capture and entanglement in various fishing gears, for example longline and gillnets, cause a high number of cetacean fatalities as well as non-fatal impacts such as stress and injury (Gilman et al. 2007). Though reports of entanglement of species such as blue whales are rare, Ramp et al. (2021) found scarring around the tail and caudal peduncle of several individuals in the Gulf of St. Lawrence, and this suggests entanglement may be a more significant pressure on blue and other whale species' populations than reporting data suggest. Bycatch is a major threat to marine air-breathing megafauna populations and contributes to trophic downgrading, where the loss of megafauna can impact nutrient cycling, species invasions, and disturbance regimes (Lewison et al. 2014). Fisheries bycatch is also considered the highest threat to leatherback populations globally (Wallace et al. 2010). ICCAT produced a recommendation on the conservation of the North Atlantic stock of shortfin mako caught in association with ICCAT fisheries, based on a 90% probability that stocks were being overfished, agreeing that in 2022 and 2023, all retentions of these sharks be prohibited for the North Atlantic (ICCAT 2021a). For all Atlantic bluefin tuna fishing trips by Chinese pelagic longline vessels in the Atlantic between 2010 and 2018, studied by Pan et al. (2022), sharks accounted for 64.45% of bycatch (out of 3,455 caught individuals) with the most common species being blue sharks, then shortfin mako, both of which are species of particular interest in this Site (**Table 1**). A review of results from a tool evaluating interactions between tuna fisheries and cephalopods, crustaceans, ctenophores, marine turtles, marine mammals and seabirds is due to be discussed at a joint meeting in 2023 (ICCAT 2021b). Systematic data collection is needed to assess the threats posed to the pelagic species from fisheries activities at the Site.

Threats to benthic species and habitats

Fishing gear reduces complexity of seafloor habitats, but the extent of these alterations, and their effects are specific to the site and often difficult to estimate. The evidence from fisheries monitoring over several years indicates there is very little, if any, bottom fishing impacts in NACES. Pollution, caused by fishing activities, including lost and damaged gear, can potentially lead to increased pollution of the seafloor ecosystems (e.g., accumulation of microplastics associated with fishing nets, such as the polyethylene fibres found in shallow water samples taken by Wieczorek et al. (2018)). Indeed, with a single survey, the IceDivA2 expedition has documented microplastics in benthos from the NACES MPA.

Shipping/transport routes

The Site is situated within the great circle shipping route between Canada, the USA and Europe. The southern section of the NACES MPA is quite intensively crossed by vessel traffic (**Figure 30**), particularly in the south-eastern sector as ships move into and out of the Gulf of St. Lawrence on their way across the Atlantic. **Figure 30** shows the main activities for 2015 occurred in the southern region over the Milne Seamount Complex, and in the northern region near the CGFZ and over the West Thulean Rise and Mount Doom areas. As mentioned, these areas likely facilitate the oceanographic conditions that support high productivity and lead to convergences of cetacean, elasmobranch, tuna and marine turtle species, for example (e.g., Dias et al. 2016; Mohn et al. 2021; Morato et al. 2016; Sweetman et al. 2013). Shipping routes do appear to intersect with the mapped trajectories of OSPAR-listed species such as the basking shark (Gore et al. 2008; **Figure 10**) and blue whale (Pérez-Jorge et al. 2020; **Figure 14**). It would be expected that these overlaps would increase the risk of ship strikes, underwater noise, and other shipping-associated impacts.

Ship strikes pose a threat to cetaceans, particularly large whales, which have slow and shallow dive responses to oncoming ships (McKenna et al. 2015). Rockwood et al. (2017) suggests that ship strike fatalities make a substantial addition to the natural mortality of blue, humpback and fin whales. Other species at the Site might be at risk of shipping collisions. It has been shown that basking sharks, due to their habit of basking in surface waters, are at risk of ship strikes from commercial shipping (Pirotta et al. 2019). As mentioned for fishing activities, during cruise DY080 at least 13 instances of light induced ship strikes with Leach's Petrels occurred within what is now the NACES MPA over a two-week period (**Annex 5**, **Figure A5.6**).

Underwater noise is shown to have adverse effects on aquatic animals, including temporary hearing impairment, physiological stress, and development deficiencies (Farcas et al. 2016) – these can occur to marine mammals (Southall et al. 2007), as well as fish (McCauley et al. 2003), and invertebrates (Nedelec et al. 2014). Shipping noise, particularly with a propagation level at low frequencies (similar to that of baleen whales), can interfere with whale vocal communication (Tennessen and Parks 2016). Acoustic disturbance from general shipping noise and sonar, particularly mid-frequency military sonar, has shown to cause avoidance behaviours and can lead to the cessation of foraging (Goldbogen et al. 2013; Pirotta et al. 2021). Right whales have been found to increase the amplitude of their calls (Parks et al. 2011), and fin whales; to modify their song characteristics (Castellote et al. 2012) in response to acoustic disturbances.

Shipping activities can cause disturbance to seabirds through displacement from foraging grounds and resting habitats (e.g., Schwemmer et al. 2011). Light pollution on ships at night can cause seabirds to collide with vessels (e.g., Merkel and Johansen 2011). There is also a higher risk of marine pollution in shipping lanes, both from accidental spills and operational discharges, which can pose a large risk to marine ecosystems and habitats at all levels (**Table 5**, **Table 6**).

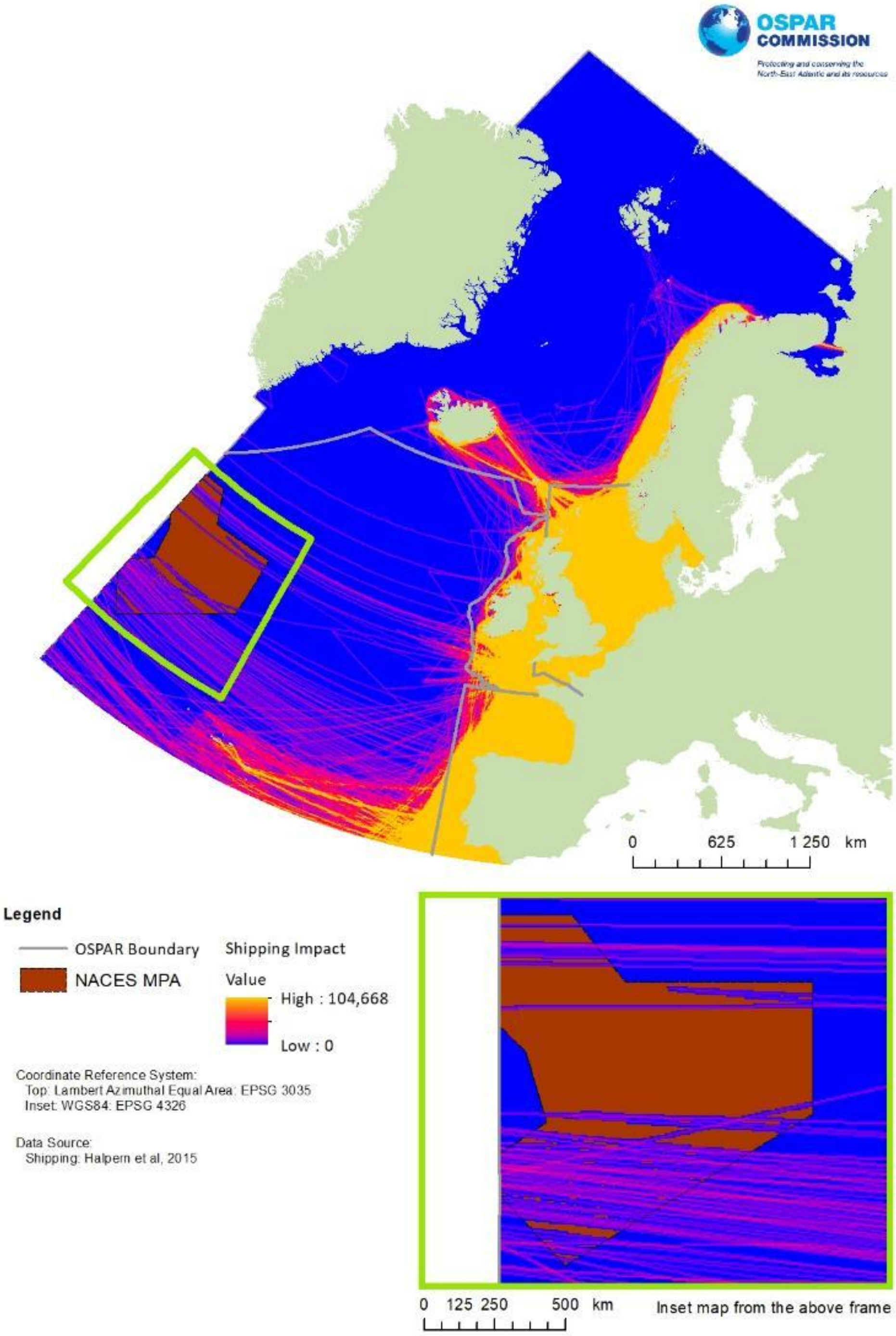

Figure 30. *Shipping activity within the NACES MPA. Shipping data from Halpern et al. 2015.*

Extractive industries

The NACES MPA does not overlap any current direct oil and gas activity, nor are there any current exploration licenses (**Figure 31**). The Jeanne d'Arc Basin off the Newfoundland coast contains the Hibernia oil field, with the Hebron oil platform currently operational[16]. The oil field is located in close proximity to the Flemish Cap, which itself is not distant from the western boundary of the NACES MPA. The complex oceanography of this

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[16] Jeanne d'Arc Region:Significant Discovery Areas http://www.cnlopb.ca/pdfs/maps/jdasda.pdf?lbisphpreq=1

region means that any oil spill occurring on the Grand Banks and Flemish Cap could potentially move into the NACES MPA. Oil spills can have lethal effects on leatherback turtles, for example (Frasier et al. 2020).

Offshore hydrocarbon drilling and production platforms can impact marine biodiversity and ecosystems, for example sea birds; through attraction and collision with the structure, incineration in the flare, and the intermittent presence of oil on the water (which can cause oiling of the birds and lead to mortality, or ingestion of contaminated prey) (Wiese et al. 2001). The *Deep Horizon* oil spill may have impacted the 2010 class of the western Atlantic bluefin tuna stock (Campagna et al. 2011). This species avoids areas of high turbidity when migrating, so sediment plumes from extraction machinery could disrupt their migration routes.

Contamination threats related to accidents are relevant for all elements of marine ecosystems. The occurrence of benthic storms, slope failure, internal waves, and upwelling, can re-suspend tailings from extraction activities and transport fine particles, including chemical contaminants, to surface layers (Ramirez-Llodra et al. 2015). Deep seabed mining could also introduce metal contamination through sediment plumes from the collectors or from discharges through the water column, all of which pose significant threats not only to seabirds but to the mesopelagic and benthic ecosystems as well (Drazen et al. 2020). Modelling studies examining deep-sea mine tailing plume dispersal show that plumes from polymetallic seafloor massive sulphide mining around the Azores would persist for up to six months, disperse up to 20 km through 800 m of the water column, and cover up to 150 km^2, reaching many areas that support VMEs and fishing activities (Morato et al. 2022). Studies to examine the impacts on cold-water corals, sponges, vent mussels and their pelagic larvae are needed to expand and build upon early results that show how exposure to mining waste has severe toxic effects leading to significant mortality in deep-sea habitat-forming octocorals (Carreiro-Silva et al. in press 2022). Underwater noise from deep seabed mining is conservatively estimated to be able to reach 500 km away from the source (Williams et al. 2022). Sensitivities to noise have not been studied most species beyond marine mammals; with many benthic species relying on sound and vibrations over their lifetimes, they are also likely relatively vulnerable to noise from human activities with currently unpredictable outcomes due to a lack of research (Williams et al. 2022).

5. Scientific value

The NACES MPA is a unique site in the North-East Atlantic, oceanographically as well as ecologically. It demonstrates a high abundance and diversity of seabirds, and non-seabird taxa, including cetaceans, turtles, elasmobranchs and fish are also known to occur at the site. The Site encompasses important foraging areas for threatened seabird species.

The NACES MPA encloses a globally unique location; a region of year-round vigorous horizontal and vertical mixing where waters from the tropical/subtropical Atlantic encounter water from the subpolar Atlantic and from the Arctic Ocean, promoting enhanced primary productivity and diversity.

The interaction between the unique oceanographic setting, the deep bathymetry and the ecology- from benthic, mesopelagic and pelagic species- remains poorly understood, and offers excellent opportunities for innovative scientific research.

Due to the knowledge gaps associated with the area, a Research and Monitoring Plan (see section C) is proposed to enable an evaluation of the attributes of the NACES MPA relative to its specific objectives, and to improve understanding of these attributes. In addition, it could include identification of a number of elements for scientific research consistent with the objectives of the MPA, and a monitoring plan that will help evaluate the extent to which these objectives are being achieved.

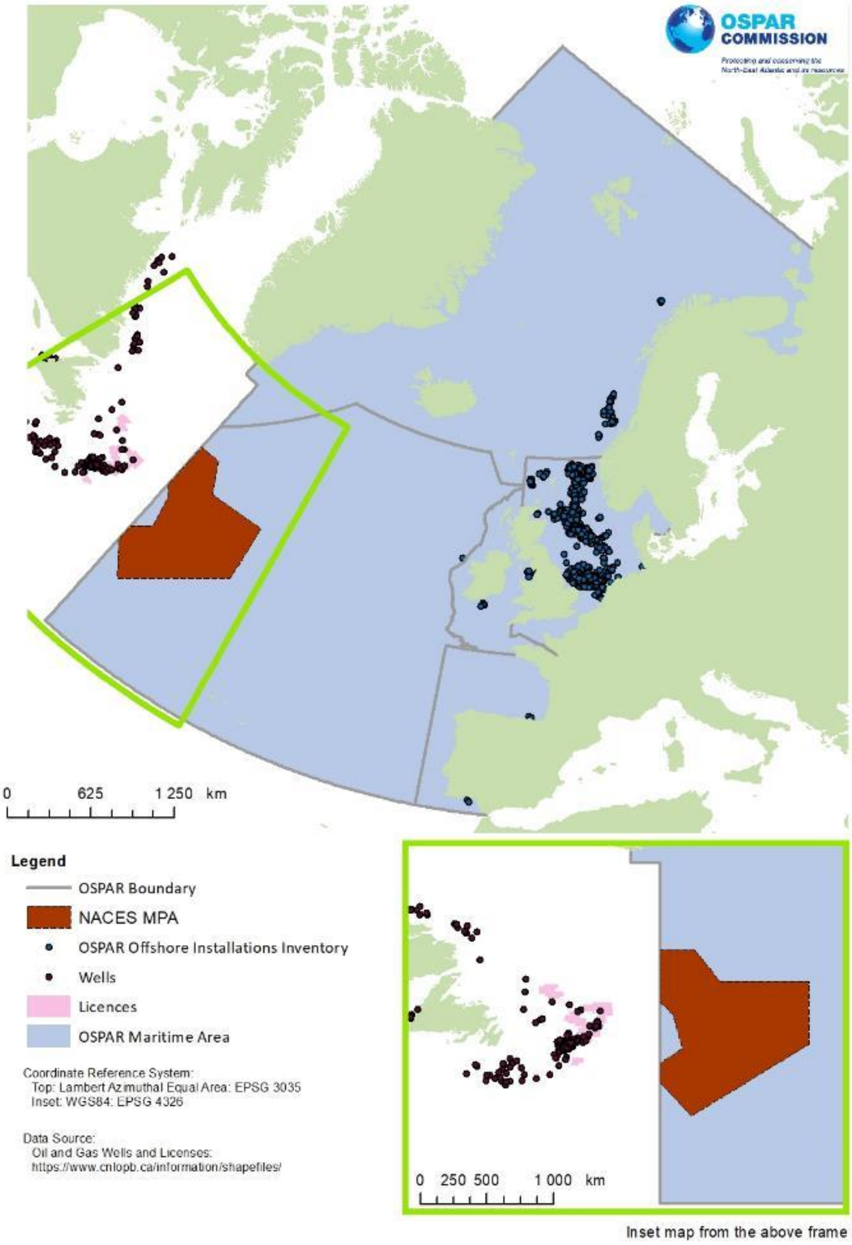

Figure 31. *Oil and gas licences and wells off Newfoundland and Labrador, Canada to the west of the NACES MPA boundary. Data source: Canada-Newfoundland and Labrador Offshore Petroleum Board.*

C. Proposed management and protection status [CAVEAT: Text is subject to change during the revision process]

1. Proposed management

A management plan should be developed. Management of the NACES MPA should be based on the best available scientific knowledge, seeking a sound balance between use and preservation, respecting that any protective measures shall not prevent sustainable use, provided that this is not contrary to the conservation objectives and existing legal frameworks.

Effective conservation of seabirds, marine reptiles, fish, cephalopods, cetaceans and the range of benthic and pelagic habitats and ecosystems, including their biodiversity, processes and trophic linkages that support them needs collaborative management. In cases, where the OSPAR Commission considers that action is desirable in relation to a question within the mandate of another authority or competent body, it is to draw that question to the attention of the authority or international body competent for that question.

Threatened and/or declining species and habitats

With respect to the three OSPAR listed seabird species using the Site, a number of measures that refer to the designation of an MPA and proposed management actions have been agreed by OSPAR through adoption of OSPAR Recommendations. The Recommendations recognise that protection of the listed bird species would require management measures to be taken at breeding sites as well as measures which would contribute to protection of other life stages. Management actions taken at the Site would be to protect the marine habitats of species.

The 'OSPAR Recommendation 2011/5 on furthering the protection and conservation of the Black-legged kittiwake' notes, among other issues, that the species is particularly sensitive to decline in the availability of key prey species and recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Measures of relevance in relation to the proposed conservation objectives referred to in this nomination proforma include:

- §3.1 c. consider whether any sites within its jurisdiction justify selection as Marine Protected Areas for the protection of populations of and critical habitats for the Black-legged kittiwake;
- §3.1 d. in accordance with OSPAR Recommendation 2003/3 as amended by OSPAR Recommendation 2010/2, report to the OSPAR Commission on sites selected for inclusion as components of the OSPAR Network of Marine Protected Areas and develop appropriate management plans and measures that include the conservation of the Black-legged kittiwake;
- §3.1 e. promote monitoring and assessment programmes for the Black-legged kittiwake and contribute to the development of a data collation strategy;
- §3.1 f. raise awareness of the status and threats to the Black-legged kittiwake among management authorities, users of the marine environment and the general public;
- §3.2 c. bring to the attention of relevant competent authorities the status of and threats to the Black-legged kittiwake.

The 'OSPAR Recommendation 2011/3 on furthering the protection and conservation of the Little shearwater' notes among other issues the significant loss of suitable breeding habitat in Region V for the species, and recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Measures of relevance in relation to the proposed conservation objectives referred to in this nomination proforma include:

- §3.1 c. consider whether any sites within its jurisdiction justify selection as Marine Protected Areas for the protection of populations of and critical habitats for the Little shearwater;
- §3.1 d. in accordance with OSPAR Recommendation 2003/3 as amended by OSPAR Recommendation 2001/2, report to the OSPAR Commission on sites selected for inclusion as components of the OSPAR Network of Marine Protected Areas and develop appropriate management plans and measures that include the conservation of the Little shearwater;
- §3.1 e. promote monitoring and assessment programmes for the Little shearwater and contribute to the development of a data collation strategy;
- §3.2 a. (i) regular reporting at-sea sightings in the Bay of Biscay and ore northern waters, including any information on identification of main feeding areas where possible;
- §3.2 c. bring to the attention of relevant competent authorities the status of and threats to the Little shearwater, and the need for (ii) further research on possible effects of light pollution.

The 'OSPAR Recommendation 2011/7 on furthering the protection and conservation of the Thick-billed murre' notes among other issues the significant decline suffered by the species and its particular vulnerability to climate change, and recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Measures of relevance in relation to the proposed conservation objectives referred to in this nomination proforma include:

- §3.1 c. consider whether any sites within its jurisdiction justify selection as Marine Protected Areas for the protection of populations of and critical habitats for the Thick-billed murre;
- §3.1 d. in accordance with OSPAR Recommendation 2003/3 as amended by OSPAR Recommendation 2010/2, report to the OSPAR Commission on sites selected for inclusion as components of the OSPAR Network of Marine Protected Areas and develop appropriate management plans and measures that include the conservation of the Thick-billed murre;
- §3.1 e. promote monitoring and assessment programmes for the Thick-billed murre and contribute to the development of a data collation strategy;
- §3.1 g. support, promote and cooperate with the Arctic Council Conservation of Arctic Flora and Fauna (CAFF) 'Circumpolar Murre Banding Programme';
- §3.2 a. develop and implement a monitoring and assessment strategy and data collection tools to promote and coordinate the collection of information on distribution, status of, threats to and impacts on the species … (iii) regular reporting on mortality of this species through fisheries bycatch (including where possible data on geographical location of bycatch, and types of gear involved), oil pollution and hunting.

The Arctic Council has an International Murre Conservation Strategy and Action Plan, which includes this species (CAFF 1996). The CAFF Action Plan and the OSPAR recommended measures include the identification and designation of MPAs for this species (CAFF 1996; OSPAR 2009c).

With regard to Blue whale, Leatherback turtle, Loggerhead turtle and Basking shark listed by OSPAR as threatened and/or declining that are recorded within the North Atlantic Current and Evlanov Sea basin MPA

(**Annex 8**), management measures should comprise actions as outlined several recommendations. There is no OSPAR recommendation for Bluefin tuna (*Thunnus thynnus*).

The 'OSPAR Recommendation 2013/09 on furthering the protection and conservation of the North Atlantic blue whale (*Balaenoptera musculus*) in the OSPAR maritime area' recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Programmes and measures relevant to the conservation objectives of this proforma include:

- §3.1a. developing and implementing a monitoring and assessment strategy, as part of a multi-species programme, in the OSPAR maritime area to promote and coordinate the collection of information on distribution, migration, species status and threats/impacts, using as appropriate information from other competent authorities, including:
    - I. the regular monitoring of occurrence at known important feeding areas;
    - II. the establishment of a tagging scheme to elucidate migrational behaviour and habitat use;
    - III. the supply of information on ship strikes to relevant reporting systems for ship strikes of large whales with a view to improving information on the scale of this occurrence and possibly identifying critical areas or seasons for such events, as well as information on mitigation actions taken;
    - IV. the monitoring of entanglements, exposure to noise and other impacts from human activity;
    - V. further data collection, such as biopsies, to monitor reproductive rates and impacts from pollution and chemical contamination as well as to identify populations affinities;
    - VI. the collation of information available in a central records database;
- §3.1b. developing, within the competence of OSPAR, effective mitigation actions against further anthropogenic threats to blue whale populations and incorporate them into appropriate measures for the protection of this species;
- §3.1c. whether any of the key areas justify selection as marine protected areas for the protection of the North Atlantic blue whale populations and whether such areas may become a component of the OSPAR MPA network;
- §3.1d. raising awareness of status and threats to the Atlantic blue whale among both relevant management authorities and general public, (this may include a brochure and accompanying web site that lists all OSPAR Listed species and habitats, the threats they face, and the conservation measures agreed by OSPAR);
- §3.1e. in accordance with Article 4 of Annex V of the OSPAR Convention, or where coordination and cooperation with other international organisations and bodies is appropriate, draw the question of strengthening the protection of North Atlantic blue whale to the attention of the authority or international body competent for that question, and encourage that authority or international body to take appropriate measures, drawing upon the actions and measures suggested in the background document (OSPAR publication 2010/495), to address the threats such as from ship strikes and noise in areas where there may be a significant adverse impact on North Atlantic blue whale from these activities where this is necessary for their conservation and recovery.

The 'OSPAR Recommendation 2013/06 on furthering the protection and conservation of the leatherback turtle (*Dermochelys coriacea*) in the OSPAR maritime area' recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Programmes and measures of relevance in relation to the proposed conservation objectives referred to in this nomination proforma include:

- §3.1a the possibility to introduce legislation, where appropriate, to protect the leatherback turtle;
- §3.1b. reviewing existing management measures taken at national level, to assess whether these existing management measures for the protection of the leatherback turtle are effective and determine whether further measures are needed to address the key threats;
- §3.1c. promoting appropriate action in order to reduce the direct and indirect effects of pollution from oil and other pollutants (e.g., tar, chemicals) that may affect the leatherback turtle;
- §3.1d. taking into account the natural range and protection requirements of the leatherback turtle, developing and implementing an appropriate monitoring and assessment programme for the leatherback turtle, including where appropriate:
    I. ensuring that the data on mortality of this species through fisheries bycatch is made available (including any data on geographical location of bycatch, and types of fisheries and fishing techniques involved);
    II. development of observer programmes;
    III. development of sightings and/or stranding reporting networks;
- §3.1e. developing and implementing the actions and measures necessary to prevent the significant decline of the population range of the leatherback turtle;
- §3.1f. whether any of the key areas justify selection as marine protected areas for the protection of leatherback turtle populations and whether such areas may become a component of the OSPAR MPA network;
- §3.1g. supporting and implementing OSPAR Recommendation 2010/18 on the prevention of significant acute oil pollution from offshore drilling activities and OSPAR Recommendation 2010/19 on the reduction of marine litter through the implementation of fishing for litter initiatives and other relevant initiatives;
- §3.1h. raising awareness of the status of and threats to the leatherback turtle among relevant management authorities, fishermen, other relevant sectors and the general public;
- §3.1i. where appropriate, establishing information campaigns concerning the identification, conservation and legal status of this threatened species, particularly addressing commercial and recreational fishermen and fisheries observers;
- §3.1j. improving communication and information exchanges between leatherback turtle researchers and authorities;
- §3.1k. supporting further research on nesting populations, including those located in the overseas territories of Contracting Parties, that are the source of the leatherback turtle population entering the OSPAR maritime area;
- §3.1l. acting for the fulfilment of the purpose of this recommendation within the framework of other competent organisations and bodies.

It also called for acting collectively within the framework of the OSPAR Commission, with the aim of promoting an ecosystem-based approach, whereby each Contracting Parties should:

- §3.2a. develop and implement an appropriate monitoring strategy, leading to the periodic assessment of the status of the leatherback turtle, taking into account existing work and measures developed by the relevant competent authorities, including Regional Fisheries Management Organisations (RFMOs), to promote and coordinate the collection of information on distribution, status of, threats to and impacts on the species, that can contribute to the implementation of the Marine Strategy Framework Directive, including where appropriate:
    - I. development of a protocol for assessing causes of mortality;
    - II. development of further research to determine the source populations of leatherback turtles in the OSPAR maritime area, and further knowledge of the status and distribution of this species in the OSPAR maritime area, with the identification of additional key areas for monitoring and protection;
    - III. development of further research into the causes of decline, especially the link to sea turtles mortality and fisheries;
- §3.2b. continue to support the work of the International Council for the Exploration of the Seas (ICES) Working Group on bycatch of protected species with reference to the leatherback turtle;
- §3.2c. develop relevant measures for preventing and reducing impact on leatherback turtles of entanglement in and ingestion of marine litter - in particular plastic bags, pollution and collision;
- §3.2d. in accordance with Article 4 of Annex V of the OSPAR Convention, or where coordination and cooperation with other international organisations and bodies is appropriate, draw the question of strengthening the protection of leatherback turtle to the attention of the authority or international body competent for that question, and encourage that authority or international body to take appropriate measures, drawing upon the actions and measures suggested in the background document (OSPAR publication 2009/421), to address the threats such as:
    - I. bycatch mortality from fishing, including low survival rates through handling, where there may be a significant adverse impact on leatherback turtle from these activities,
    - II. entanglement in and ingestion of marine litter, in particular plastic bags,
    - III. pollution and collision; where this is necessary for their conservation and recovery.

The ‘OSPAR Recommendation 2013/07 on furthering the protection and conservation of the loggerhead turtle (*Caretta caretta*) in the OSPAR maritime area’ recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Programmes and measures relevant to the conservation objectives of this proforma include:

- §3.1a. the possibility to introduce legislation, where appropriate, to protect the loggerhead turtle;
- §3.1b. reviewing existing management measures taken at national level, to assess whether these existing management measures for the protection of the loggerhead turtle are effective and determine whether further measures are needed to address the key threats;
- §3.1c. promoting appropriate action in order to reduce the direct and indirect effects of pollution from oil and other pollutants (e.g., tar, chemicals) that may affect the loggerhead turtle;
- §3.1d. taking into account the natural range and protection requirements of the loggerhead turtle developing and implementing an appropriate monitoring and assessment programme for the loggerhead turtle, including where appropriate:

  I. ensuring that the data from regular reporting on mortality of this species through fisheries bycatch is made available (including any data on geographical location of bycatch, and types of fisheries and fishing techniques involved);
  II. development of observer programmes;
  III. development of sightings and/or stranding reporting networks;

- §3.1e. developing and implementing the actions and measures necessary to prevent the significant decline of the population range of the loggerhead turtle;
- §3.1f. supporting and implementing OSPAR Recommendation 2010/18 on the prevention of significant acute oil pollution from offshore drilling activities and OSPAR Recommendation 2010/19 on the reduction of marine litter through the implementation of fishing for litter initiatives and other relevant initiatives;
- §3.1g. whether any of the key areas justify selection as marine protected areas for the protection of loggerhead turtle populations and whether such areas may become a component of the OSPAR MPA network
- §3.1h. raising awareness of the status of and threats to the loggerhead turtle among relevant management authorities, fishermen, other relevant sectors and the general public;
- §3.1i. where appropriate, establishing information campaigns concerning the identification, conservation and legal status of this threatened species, particularly addressing commercial and recreational fishermen and fisheries observers;
- §3.1j. improving communication and information exchanges between loggerhead turtle researchers and authorities;
- §3.1k. supporting further research on nesting populations, including those located in the overseas territories of Contracting Parties, that are the source of the loggerhead turtle population entering the OSPAR maritime area;
- §3.1l. acting for the fulfilment of the purpose of this recommendation within the framework of other competent organisations and bodies.

It also called for acting collectively within the framework of the OSPAR Commission, with the aim of promoting an ecosystem-based approach, whereby each Contracting Parties should:

- §3.2a. develop and implement an appropriate monitoring strategy, leading to the periodic assessment of the status of the leatherback turtle, taking into account existing work and measures developed by the relevant competent authorities, including Regional Fisheries Management Organisations (RFMOs), to promote and coordinate the collection of information on distribution, status of, threats to and impacts on the species, that can contribute to the implementation of the Marine Strategy Framework Directive, including where appropriate:
  I. development of a protocol for assessing causes of mortality;
  II. development of further research to determine the source populations of leatherback turtles in the OSPAR maritime area, and further knowledge of the status and distribution of this species in the OSPAR maritime area, with the identification of additional key areas for monitoring and protection;

  - III. development of further research into the causes of decline, especially the link to sea turtles mortality and fisheries;

- §3.2b. continue to support the work of the International Council for the Exploration of the Seas (ICES) Working Group on bycatch of protected species with reference to the leatherback turtle;
- §3.2c. develop relevant measures for preventing and reducing impact on leatherback turtles of entanglement in and ingestion of marine litter - in particular plastic bags, pollution and collision;
- §3.2d. in accordance with Article 4 of Annex V of the OSPAR Convention, or where coordination and cooperation with other international organisations and bodies is appropriate, draw the question of strengthening the protection of leatherback turtle to the attention of the authority or international body competent for that question, and encourage that authority or international body to take appropriate measures, drawing upon the actions and measures suggested in the background document (OSPAR publication 2009/421), to address the threats such as:
  - I. bycatch mortality from fishing, including low survival rates through handling, where there may be a significant adverse impact on leatherback turtle from these activities,
  - II. entanglement in and ingestion of marine litter, in particular plastic bags,
  - III. pollution and collision; where this is necessary for their conservation and recovery.

The 'OSPAR Recommendation 2010/06 on furthering the protection and restoration of the common skate species complex, the white skate, the angel shark and the basking shark in the OSPAR maritime area' recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Programmes and measures of relevance in relation to the proposed conservation objectives referred to in this nomination proforma include:

- §3.1a. consider the introduction of national legislation to protect the common skate species complex, the white skate, the angel shark and the basking shark in all their life stages;
- §3.1b. take relevant conservation measures in key areas where significant numbers of these species still occur;
- §3.1c. consider, and where appropriate, set up information campaigns about the identification, conservation and legal status of these threatened species, particularly targeting commercial and recreational fishermen and fisheries observers. These campaigns should include requests and incentives for reporting observations and incidental catches of these species, including information about size and condition of the fish, location and date, in order to reveal areas where these species and critical habitats for different life stages still occur;
- §3.1d. consider whether any sites within its jurisdiction justify selection as Marine Protected Areas for the protection of relict populations of, and critical habitats for, common skate species complex, the white skate, the angel shark and the basking shark, and;
- §3.1e. in accordance with OSPAR Recommendation 2003/3 as amended by OSPAR Recommendation 2010/2, report to the OSPAR Commission on sites selected for inclusion as components of the OSPAR Network of Marine Protected Areas and develop appropriate management plans and measures;
- §3.1f. follow Shark Plans adopted within the framework of the FAO International Plan of Action for the Conservation and Management of Sharks;
- §3.1g. where relevant, promote monitoring of basking sharks within whale observation programmes.

It also called for acting collectively within the framework of the OSPAR Commission, with the aim of promoting an ecosystem-based approach, whereby each Contracting Parties should:

- §3.2a. request ICES to provide regular advice on the distribution, biology, conservation and management measures and research needs for these species;
- §3.2b. promote the inclusion of the common skate, the white skate, the angel shark and the basking shark as protected species in European and international biodiversity conventions, taking into account the OSPAR Regions for which threats and/or decline have been indicated in the OSPAR List of threatened and/or declining species and habitats (OSPAR Agreement 2008-6);
- §3.2c. in accordance with Annex V of the OSPAR Convention, encourage authorities competent for fisheries management:
    - I. to assist industry with the development of techniques and equipment to facilitate the safe release of these species from commercial fishing gears and monitor their condition at the time of their release and discard survival;
    - II. to promote studies of the distribution and spatial dynamics of these species, for example through electronic tagging studies, and the use of fishery-independent studies to monitor population trends;
    - III. to take relevant conservation measures in key areas where significant numbers of these species would still occur.

The 'OSPAR Recommendation 2010/09 on furthering the protection and restoration of coral gardens in the OSPAR Maritime Area' recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Programmes and measures of relevance in relation to the proposed conservation objectives referred to in this nomination proforma include:

- §3.1a. consider the introduction of national legislation to protect coral gardens;
- §3.1b. assess whether existing management measures for the protection of coral gardens are effective and determine what further measures are needed to address the key threats;
- §3.1c. investigate systematically the distribution, quality and extent of coral gardens by means of seabed habitat surveys and monitoring in order to complete the knowledge base and provide indicators for the state and recovery of the habitat;
- §3.1d. seek ways and means to broaden the information base on the occurrence of coral gardens by involving commercial fishermen, and integrating environmental and fisheries research;
- §3.1e. improve access to fishing distribution, frequency and intensity data at the appropriate spatial resolution for nature conservation purposes;
- §3.1f. report any existing and new data on the distribution, quality and extent of coral gardens habitat to the OSPAR habitat mapping database;
- §3.1g. consider whether any sites within its jurisdiction justify selection as marine protected areas for the conservation and recovery of coral gardens, and;
- §3.1h. in accordance with OSPAR Recommendation 2003/3 as amended by OSPAR Recommendation 2010/2, report to the OSPAR Commission on sites selected for inclusion as components of the OSPAR Network of Marine Protected Areas and develop appropriate management plans and measures;
- §3.1i. address any significant adverse impacts on coral gardens arising from human activities in waters under its jurisdiction, where necessary, by working with appropriate international competent authorities.

It also called for acting collectively within the framework of the OSPAR Commission, with the aim of promoting an ecosystem-based approach, whereby each Contracting Parties should:

- §3.2a. improve the OSPAR habitat mapping database, and publish regularly updated quality assessments and distribution records;
- §3.2b. communicate the current knowledge base on coral gardens to OSPAR Contracting Parties, stakeholders and other international competent authorities;
- §3.2c. in accordance with Annex V of the OSPAR Convention, draw relevant issues to the attention of authorities competent for fisheries management, including issues such as:
    - I. requests for closing to fishing further areas where there may be a significant adverse impact on Coral gardens from fishing, where this is necessary and scientifically relevant for their preservation and conservation;
    - II. encouraging commercial fishermen to report incidental by-catches of coral garden species, including information about location and date, to competent authorities in order to reveal areas where the habitat occurs;
    - III. considering coral gardens as a subset of Vulnerable Marine Ecosystems (VME) subject to conservation measures as given in United Nations General Assembly resolutions 61/105 and 64/72 on Sustainable fisheries, and UN Food and Agriculture Organisation International Guidelines for the management of deep sea fisheries in the high seas.

The ‘OSPAR Recommendation 2010/10 on furthering the protection and restoration of deep-sea sponge aggregations in the OSPAR Maritime Area’ recommends management action to be taken by each Contracting Party and measures to be taken by Contracting Parties acting collectively within the framework of the OSPAR Commission. Programmes and measures of relevance in relation to the proposed conservation objectives referred to in this nomination proforma include:

§3.1a. consider the introduction of national legislation to protect deep-sea sponge aggregations;

§3.1b. assess whether existing management measures for the protection of deep-sea sponge aggregations are effective and determine what further measures are needed to address the key threats;

§3.1c. investigate systematically the distribution, quality and extent of deep-sea sponge aggregations by means of deepwater habitat surveys and monitoring in order to complete the knowledge base and provide indicators for the state and recovery of the habitat;

§3.1d. seek ways and means to broaden the information base on the occurrence of deep-sea sponge aggregations by involving commercial fishermen, and integrating environmental and fisheries research;

§3.1e. improve access to fishing distribution, frequency and intensity data at the appropriate spatial resolution for nature conservation purposes;

§3.1f. report any existing and new data on the distribution, quality and extent of deep-sea sponge aggregations to the OSPAR habitat mapping database;

§3.1g. consider whether any sites within its jurisdiction justify selection as marine protected areas for the conservation and recovery of deep-sea sponge aggregations, and;

§3.1h. in accordance with OSPAR Recommendation 2003/3 as amended by OSPAR Recommendation 2010/2, report to the OSPAR Commission sites selected for inclusion as components of the OSPAR Network of Marine Protected Areas and develop appropriate management plans and measures;

§3.1i. address any significant adverse impacts on deep-sea sponge aggregations arising from human activities in waters under its jurisdiction, where necessary, by working with appropriate international competent authorities.

It also called for acting collectively within the framework of the OSPAR Commission, with the aim of promoting an ecosystem-based approach, whereby each Contracting Parties should:

- §3.2a. improve the OSPAR habitat mapping database, and publish regularly updated quality assessments and distribution records;
- §3.2b. communicate the current knowledge base on deep-sea sponge aggregations to OSPAR Contracting Parties, stakeholders and other international competent authorities;
- §3.2c. in accordance with Annex V of the OSPAR Convention, draw relevant issues to the attention of authorities competent for fisheries management, including issues such as:
    - I. requests for closing to fishing further areas where there may be a significant adverse impact on deep-sea sponge aggregations from fishing, where this is necessary and scientifically relevant for their preservation and conservation;
    - II. encouraging commercial fishermen to report incidental by-catches of deep sea sponge aggregations species, including information about location and date, to competent authorities in order to reveal areas where the habitat occurs;
    - III. considering coral gardens as a subset of Vulnerable Marine Ecosystems (VME) subject to conservation measures as given in United Nations General Assembly resolutions 61/105 and 64/72 on Sustainable fisheries, and UN Food and Agriculture Organisation International Guidelines for the management of deep sea fisheries in the high seas.

With regard to seamounts listed by OSPAR as threatened and/or declining that occur within the North Atlantic Current and Evlanov Sea basin MPA, management measures should comprise actions as outlined in 'OSPAR Recommendation 2014/09 on furthering the protection and conservation of *seamounts* in Regions I, IV and V of the OSPAR maritime area'. A series of programmes and measures for each Contracting Party were outlined in Recommendation 2014/09 for seamounts including:

- §3.1a. the possibility to introduce legislation to protect seamounts in the OSPAR maritime area;
- §3.1b. giving priority to the adoption of conservation measures for those seamounts where a high level of biodiversity, endemism, as well as where threatened and/or declining species and habitats are recorded;
- §3.1c. assessing whether existing management measures for the protection of seamounts are effective and determine whether further measures are needed to address the key threats;
- §3.1d. investigating the distribution, quality and extent of seamounts by means of deepwater habitat surveys and monitoring in order to complete the knowledge base and provide indicators for the state and recovery of the habitat;
- §3.1e. seeking ways and means to broaden the knowledge base on the occurrence of, and threats to, seamounts by involving relevant actors including inter alia maritime sectors concerned and by gathering additional knowledge from sources such as national planning authorities, environmental impact assessments, post development monitoring and marine research;
- §3.1f. whether any sites justify selection and designation as marine protected areas for the conservation and recovery of seamounts and their associated habitats and species and whether such areas may become a component of the OSPAR network of marine protected areas;

- §3.1g. where appropriate, addressing and minimising adverse impacts on seamounts arising from human activities in areas under its national jurisdiction;
- §3.1h. raising awareness of the importance of seamounts among relevant management authorities, relevant actors, including industry sectors and the general public;
- §3.1i. acting for the fulfilment of the purpose of this recommendation within the framework of relevant competent authorities.

It also called for acting collectively within the framework of the OSPAR Commission, with the aim of promoting an ecosystem-based approach, whereby each Contracting Parties should:

- §3.2a. improve the OSPAR habitat mapping database content, in relation to North-East Atlantic seamounts distribution; and publish regularly updated quality assessments and distribution records;
- §3.2b. communicate the current knowledge base on seamounts to OSPAR Contracting Parties, stakeholders and other competent international bodies;
- §3.2c. improve knowledge of species and habitats supported by seamounts located within the OSPAR maritime area, and evaluate a possible inclusion of these biological communities in the OSPAR List of Threatened and/or Declining Species and Habitats (OSPAR Agreement 2008-6);
- §3.2d. in accordance with Article 4 of Annex V of the OSPAR Convention, or where coordination and cooperation with other international organisations and bodies is appropriate, draw the question of strengthening the protection of Seamounts to the attention of the authority or international body competent for that question, and encourage that authority or international body to take appropriate measures, drawing upon the actions and measures suggested in the OSPAR background document (OSPAR publication 2010/492) to address threats such as from fishing with bottom contacting gear and mineral extraction, in areas where there may be a significant adverse impact on Seamounts and their associated communities from these activities, where this is necessary for the conservation and recovery of Seamounts.

Human activities

Cooperation with other competent authorities is a prerequisite for achieving the conservation objectives of the NACES MPA. OSPAR could draw to the attention of relevant competent organisations instances where human activities may constitute a threat for seabirds, marine reptiles, fish, cephalopods, cetaceans and the range of benthic and pelagic habitats and ecosystems at the Site and with achieving the conservation objectives. An ongoing dialogue between OSPAR and other competent authorities could support effective management of the Site in the long term, by bringing the conservation objectives of the NACES MPA to the attention of a wide audience. An ongoing dialogue could be enabled through the forum of the collective arrangement (OSPAR Agreement 2014-09). Activities associated with any extractive industry could have a negative impact on seabirds, marine reptiles, fish, cephalopods, cetaceans and the range of benthic and pelagic habitats and ecosystems including through direct mortality (collision with infrastructure), and reduced access to food resources, including through disturbance, increased noise, displacement, and increases in water turbidity (e.g., sediment plumes (Miller et al. 2018)). OSPAR could bring this to the attention of competent authorities.

The following actual or potential pressures from human activities within the boundary of the NACES MPA or the broader region might need management action:

a. Fishing using fixed and mobile gears
    - including possible seabird by-catch or collision due to light pollution

- b. Vessel traffic
    - including possible discharges, pollution, noise, light
- c. Seabed mining or other extractive activities
    - including possible discharges, pollution, noise
    - including acute pollution events at the site, especially during the winter season.
- d. Cable laying
    - It is unlikely that cable laying activities would constitute a sustained and major threat to the biodiversity and ecosystems of the Site, no particular management actions appear to be needed at present.
- e. Marine scientific research
    - It is unlikely that marine scientific research would constitute a sustained and major threat to biodiversity and ecosystems of the Site. Seabirds would most likely be impacted from marine research activities associated with vessel traffic (as detailed above), and disturbance (e.g., exploration) of the seafloor and resultant increased water turbidity.

Research and monitoring plan

A Research and Monitoring plan could be established which would identify scientific research and monitoring activities to inform the management of the Site, guide scientists and coordinate research. This could include Best Practices to minimise any impacts on the biodiversity and ecosystems, in particular the seabirds, marine reptiles, fish, cephalopods, cetaceans and the range of benthic and pelagic habitats and ecosystems at the Site. The plan could build on the OSPAR code of conduct for responsible marine research in the deep seas and high seas of the OSPAR Maritime Area (Agreement 2008-1).

The research and monitoring activities which could be described in a Research and Monitoring plan could include:

1. Scientific research pursuant to MPA objectives to;
    - a. evaluate the attributes of the MPA relative to its specific objectives, and to enhance understanding of these attributes;
    - b. provide new information about the features within the MPA, including benthic biodiversity and taxonomy.
2. Long-term monitoring of the protected features to determine any trends over time to;
    - a. inform management activities undertaken within the MPA;
    - b. inform management activities undertaken at other locations affecting the protected features;
    - c. inform whether the status of the protected features are changing;
    - d. inform evaluations of whether the MPA conservation objectives are being achieved.
3. Other data- and information collection consistent with the specific MPA objectives to;
    - a. inform management actions on human activities taking place at the Site or in its vicinity.

An activity could be a regular multi-disciplinary research cruise to the Site. Such a cruise could cover the following activities;

1. Monitoring of oceanography and/climatic changes;
2. Collection of information on trophic dynamics and predator/prey distribution;
3. Monitoring of adult and non-breeding or juvenile seabirds, cetaceans, marine reptiles and fish including sharks using of telemetry or tagging;
4. Repeat video and image monitoring of benthic habitats on the seamounts and abyssal features

5. Collection of baseline data on benthic biodiversity (species richness, community structure) to inform future assessments of change and MPA effectiveness

A Research and Monitoring Plan could also outline the mode by which OSPAR could engage with other competent organisations with an aim to increase the knowledgebase of any interactions between human activities and biodiversity and ecosystems at the Site. Such interactions could for example aim to explore if monitoring of multi-taxa incidental bycatch in fisheries (through on-board observer programmes and log book reporting) could provide information on potential interactions between pelagic species and fisheries at the Site. Bycatch observer programmes on board fishing vessels could be a source of scientific information on interactions between fishing vessels and seabirds at the site, which could form a knowledge basis for further action. Another example could include interactions with other competent authorities to collect information on interactions between seabirds and shipping vessels crossing the site and any ballast discharge within the site could provide relevant information for future action, and OSPAR could bring this to the attention of the competent authorities.

2. Any existing or proposed legal status

I National legal status (e.g., nature reserve, national park):

Not applicable as the area is beyond national jurisdiction.

II Other international legal status (e.g., Natura 2000, Ramsar):

OSPAR Decision 2021/01 established the North Atlantic Current and Evlanov Sea basin MPA with the goal of protecting and conserving seabirds and the ecosystems of the waters superjacent to the seabed including their biodiversity and processes that support those populations in accordance with the conservation objectives set out in OSPAR Recommendation 2021/1 on the Management of the North Atlantic Current and Evlanov Sea basin MPA. This Decision may be amended on the basis of this revised nomination proforma, including through amendment of the conservation scope of NACES MPA.

Presented by:

Contracting Party:

Date:

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Annexes of the nomination proforma for the “North Atlantic Current and Evlanov Sea basin” MPA in the OSPAR Maritime Area (Region V, Wider Atlantic)

List of Annexes

Annex 1. List of collaborators participating in the identification of the North Atlantic Current and Evlanov Sea basin MPA.

The list includes data providers, providers of technical advice & participants in 2016 BirdLife workshop in Reykjavik Iceland and 2022 OSPAR workshop (online)

Name	**Affiliation**	**Country- affiliation of institute/organisation**	**Direct data providers**	**Attendance at 2016 workshop**	**Attendance at 2022 workshop**	**Data providers for revised proforma**
Arnthor Gardarsson	University of Iceland	Iceland	*	*		
Aevar Petersen	Independent researcher, affiliation with Aarhus University	Denmark	*			
Alice Belin	European Commission	European Commission			*	
Ana Bertoldi Carneiro	BirdLife International	UK		*		
Anders Mosbech	National Environmental Research Institute, Department of Arctic Environment	Denmark	*			
Andrew Westgate	University of North Carolina Wilmington	US	*			
Antonio Teixeira	DGRM – Portugal	Portugal			*	
Antony Gaston	National Wildlife Research Centre	Canada	*			
Anna Gebruk	University of Edinburgh	UK			*	
Anna Metaxas	Dalhousie University	Canada			*	
Anne Helene Tandberg	University of Bergen	Norway			*	
Annette Fayet	University of Oxford	UK	*			
April Hedd	Memorial University of Newfoundland	Canada	*			
Barbara Middleton	OSPAR Comission	OSPAR Comission			*	
Ben Lascelles	BirdLife International	UK		*		
Benjamin Metzger	BirdLife Malta	Malta	*			
Bergur Olsen	Faroe Marine Research Institute	Faroe Islands	*			
Berta Ramiro Sanchez	Muséum National d'Histoire Naturelle	France			*	*
Børge Moe	Norwegian Institute for Polar Research	Norway	*	*		
Bruna Campos	BirdLife International	Belgium		*		
Brynn Devine	Oceans North	Canada				*
Carsten Egevang	Greenland Institute of Natural Resources	Greenland/Denmark	*			
Carolina Hazin	BirdLife International	UK		*		
Christian Mohn	Aarhus University	Denmark			*	*
Christopher Barrio	Seascape Consultants	UK			*	

Name	Affiliation	Country- affiliation of institute/organisation	Direct data providers	Attendance at 2016 workshop	Attendance at 2022 workshop	Data providers for revised proforma
Claire Lacey	SMRU	UK	*			
Claire Maudet	French ecology ministry	France			*	
Damien Haberlin	University College Cork	Ireland				*
Darius Campbell	NEAFC	UK			*	*
David Gremillet	Centre d'Ecologie Fonctionnelle et Evolutive - CNRS	France	*			
David Santillo	Greenpeace	UK			*	
David Simms	Marine Biological Association of the United Kingdom	UK	*			
Deryk Shaw	Fair Isle Bird Observatory	UK	*			
Dick van Oevelen	NIOZ Royal Netherlands Institute for Sea Research, Utrecht University	Netherlands				*
Ellen Magnusdottir	University of Iceland	Iceland	*			
Eirik Drabløs Pettersen	Ministry of Climate and Energy	Norway			*	
Erpur Snær Hansen	South Iceland Nature Research Centre	Iceland	*	*		
Euan Dunn	Royal Society for Protection of Birds	UK		*		
Ewan Wakefield	University of Durham	UK	*	*	*	
Flemming Merkel	Aarhus University	Denmark	*			
Francis Daunt	Centre for Ecology & Hydrology, NERC	UK	*			
Francis Zino	Museu de Historia Natural do Funchal, Madeira	Portugal	*			
George Wolff	University of Liverpool	UK				*
Greg Robertson	Environment Canada Centre	Canada	*			
Guilherme Bortolotto De	SMRU	UK	*			
H. Grant Gilchrist	National Wildlife Research Centre in Ottawa (Environment Canada)	Canada	*			
Hallvard Strøm	Norwegian Institute for Polar Research	Norway				
Hans-Ulrich Peter	Friedrich Schiller University Jena Institute of Ecology	Germany	*			
Hannah Hood	JNCC	UK			*	
Hólmfríður Arnardóttir	Fuglavernd (BL Iceland)	Iceland		*		
Ib K Petersen	Aarhus University	Denmark				
Ingvar Sigurosson	South Iceland Nature Research Centre	Iceland	*			
Iain Stenhouse	Biodiversity Research Institute	USA	*			

Name	Affiliation	Country- affiliation of institute/organisation	Direct data providers	Attendance at 2016 workshop	Attendance at 2022 workshop	Data providers for revised proforma
Ian Cleasby	University of Sheffield	UK	*			
Ivan Ramirez	BirdLife International	UK	*			
Jacques Villemot	RSPB	UK			*	
Jacob González-Solís	University of Barcelona	Spain	*			
Jaime Albino Ramos	University of Coimbra	Portugal	*			
James Taylor	Senkenberg	Germany			*	*
Jan Esefeld	Friedrich Schiller University Jena	Germany	*			
Jannie Fries Linnebjerg	Lund University	Sweden	*			
Janos Hennicke	NABU (BirdLife Germany)	Germany		*	*	
Jason Cleland	University of Edinburgh	UK			*	*
Jaya Scott	University of Edinburgh	UK			*	
Jeremy Madeiros	Department	Bermuda/UK	*			
Jerome Fort	LIENSs - CNRS UMR	France	*			
Jez Blackburn	British Trust for Ornithology	UK	*			
Joana Beja	VLIZ (EMODnet Biology)	Belgium			*	
Joel Bried	University of the Azores	Azores/Portugal	*			
Johannes Krietsch	Max Planck Institute for Ornithology	Germany	*			
Johannes Lang	Institut für Tierökologie und Naturbildung	Germany	*			
Jóhannis Danielsen	University of the Faroe Islands	Faroe Islands		*		
Jonathan Green	University of Liverpool	UK	*			
Jonathan Houghton	Queen’s University Belfast	UK				*
Jose Manuel Arcos	SEO/BirdLife, Spain	Spain	*			
Jose Pedro Granadeiro	Department of Animal Biology, University of Lisbon	Portugal	*	*		
Justine Dossa	BirdLife International	Senegal	*			
Keith C. Hamer	University of Leeds	UK	*			
Kirsten Carter	RSPB	UK			*	
Lara Salvany	ICES	Denmark			*	
Laura McFarlane Tranquilla	Memorial University of Newfoundland	Canada	*			
Lea-Anne Henry	University of Edinburgh	UK			*	*
Lena Avellan	OSPAR Comission	OSPAR Comission			*	
Lorraine Chivers	Independent research	UK	*			
Louise Soanes	University of Liverpool	UK	*			

Name	**Affiliation**	**Country- affiliation of institute/organisation**	**Direct data providers**	**Attendance at 2016 workshop**	**Attendance at 2022 workshop**	**Data providers for revised proforma**
Mandy Shailer	Department of Environment and Natural Resources, Bermuda Government	Bermuda/UK	*			
Manuel Biscoito	Museu de História Natural do Funchal	Portugal	*			
Marguerite Tarzia	BirdLife International	UK		*		
Maria Bogdanova	Centre for Ecology & Hydrology, NERC	UK	*			
Maria Dias	BirdLife International	UK	*	*		
Marie-Louise Krawak	Ministry of Environment, Denmark	Denmark			*	
Mark Jessopp	University College Cork	Ireland	*			
Mark Mallory	Acadia University	Canada	*			
Matthias Kopp	FSU Jena	Germany	*			
Mia Schumacher	Geomar	Germany			*	*
Michail Papadoyannakis	European Commission	European Commission			*	
Michael P. Harris	Centre for Ecology & Hydrology	UK	*			
Mike James	Department of Fisheries & Oceans, Canada	Canada	*			
Morten Frederiksen	Aarhus University	Denmark	*	*		
Murray Roberts	University of Edinburgh	UK			*	*
Nadya Ramirez-Martinez	SMRU	UK	*			
Niels Martin Schmidt	Aarhus University	Denmark	*			
Nuno Quieroz	Marine Biological Association	UK	*			
Nuno Simão	University of Durham	UK				
Oisin Callery	University of Galway	Ireland				*
Oliver Padget	University of Oxford	UK	*			
Olivier Gilg	University of Bourgogne, CNRS	France	*			
Oliver Ó Cadhla	Department of Housing, Local Government and Heritage	Ireland			*	*
Paloma Carvalho	University of Manitoba	Canada		*		
Paul Thompson	University of Aberdeen	UK	*			
Paulo Catry	ISPA, Instituto Universitário	Portugal	*			
Peter Ryan	Percy FitzPatrick Institute of African Ornithology, University of Cape Town	South Africa	*			
Penny Holliday	National Oceanography Centre	UK				
Phil Atkinson	British Trust for Ornithology	UK	*			

Name	Affiliation	Country- affiliation of institute/organisation	Direct data providers	Attendance at 2016 workshop	Attendance at 2022 workshop	Data providers for revised proforma
Pia Norling	Swedish Agency for Marine and Water Management	Sweden			*	
Pieter Provoost	Intergovernmental Oceanographic Commission of UNESCO	UNESCO				*
Rachel Davies	School of Biology, University of Leeds	UK	*			
Randi Rotjan	Boston University	USA			*	*
Rebecca Ross	Institute of Marine Research	Norway			*	
Richard Cuthbert	RSPB	UK	*			
Richard Emmerson	Swedish Agency for Marine and Water Management	Sweden			*	
Richard Phillips	British Antarctic Survey	UK	*			
Robert W Furness	University of Glasgow	UK	*			
Robert van Bemmelen	Wageningen University	Netherlands	*			
Robert Ronconi	Acadia University, Nova Scotia	Canada	*			
Robin Freeman	School of Biology, University of Leeds	UK	*			
Ross Compton	Energeo Alliance	UK			*	
Rui Prieto	University of the Azores	Portugal	*			
Roland Gauvain	Alderney Wildlife Trust	UK	*			
Sabine Gollner	Royal NIOZ	Netherlands			*	
Sarah Blanchard	JNCC	UK			*	
Sarah Wanless	Centre for Ecology & Hydrology, NERC	UK	*			
Saskia Brix	Senkenberg	Germany			*	*
Sheena Fennell	National University of Ireland, Galway	Ireland				*
Signe Christensen-	Norwegian University of Science and	Norway	*			
Scott Eckert	Principia College	US	*			
Þorkell Lindberg Þórarinsson	Northeast Iceland Nature Research Centre	Iceland	*	*		
Tammy Davis	BirdLife International	UK			*	*
Tim Guilford	University of Oxford	UK	*	*		
Thierry Boulinier	CNRS	France	*			
Thomas Dahlgren	University of Gothenburg	Sweden				*
Tom Grove	University of Edinburgh	UK				*
Tycho Anker-Nilssen	Norwegian Institute for Nature Research	Norway				
Vegard Brathen	Norwegian Institute for Nature Research	Norway	*			

Name	Affiliation	Country- affiliation of institute/organisation	Direct data providers	Attendance at 2016 workshop	Attendance at 2022 workshop	Data providers for revised proforma
Veronica Neves	University of the Azores	Azores/Portugal	*			
Vitor Paiva	MARE - Marine and Environmental	Portugal	*	*		
Wanfei Qui	International Seabed Authority	China			*	*
William Roche	Inland Fisheries Ireland	Ireland				*
William Montevecchi	Memorial University of Newfoundland	Canada	*			
Yann Kolbeinsson	Northeast Iceland Nature Research	Iceland	*			
Yuri Krasnov	Murmansk Marine	Russia	*			

Annex 2. Geographic coordinates of North Atlantic Current and Evlanov Sea basin MPA- boundary.

The coordinates are as specified in the OSPAR Decision 2021/01.

Point	Longitude	Latitude
1	-39.681	53.122
2	-37.979	50.996
3	-31.998	50.994
4	-31.999	46.765
5	-39.916	41.911
6	-42.000	44.180
7	-42.000	45.492
8	-40.506	46.504
9	-41.173	48.762
10	-42.001	49.588
11	-42.000	53.118
12	-39.681	53.122

Annex 3. Methodology of identification of the most important areas for seabirds.

Identification of the most important areas for seabirds is OSPAR high-seas region

Prepared by: Ana Carneiro and Maria Dias, BirdLife International.

August 2017, and updated February 2019

This document presents the methodological steps undertaken to identify the boundaries of marine Important Bird and Biodiversity Areas (IBAs) as candidate sites for a Marine Protected Area within the OSPAR Maritime Area that are beyond the Exclusive Economic Zones (EEZ) of Contracting Parties (i.e. beyond 200 nautical miles). A marine IBA is any area that meets the criteria to be considered of key conservation importance as foraging ground, resting area or migratory corridor for a seabird species (Fishpool & Evans 2001, Lascelles et al. 2016). Examples of marine IBAs are foraging and rafting areas around breeding colonies, non-breeding concentrations, migratory bottlenecks and feeding areas for pelagic species (BirdLife International 2010). Within the area of analysis (the OSPAR ABNJ), the latter three are of particular relevance.

The possible criteria that can be applied to identify marine IBAs are:

- Global Criterion A1: Sites known or thought regularly to hold significant numbers of a globally threatened species, or other species of global conservation concern (i.e. classified as Vulnerable, Endangered or Critically Endangered; BirdLife International 2017);
- Global Criterion A4: Sites holding >1% of the global or, in some cases, biogeographic population of a seabird. For European species, the 1% was calculated based on the total number of mature individuals breeding in Europe (BirdLife International 2015). For species breeding outside of Europe (e.g., Sooty Shearwater, Great Shearwater, Bermuda Petrel), the 1% was based on the global population.
- European Criterion B1: The site is known or thought to hold ≥ 1% of a distinct population of a seabird species.
- European Criterion B2. Species with an unfavourable conservation status in Europe. The site is one of the most important for a species with an unfavourable conservation status in Europe and for which the site-protection approach is thought to be appropriate.
- European Criterion B3. Species with a favourable conservation status in Europe. The site is one of the most important in the country for a species with a favourable conservation status in Europe but concentrated in Europe and for which the site-protection approach is thought to be appropriate.

Definitions:

Quarter 1 (Q1): Jan-Mar, Quarter 2 (Q2): Apr-Jun, Quarter 3 (Q3): Jul-Sep, Quarter 4 (Q4): Oct-Dec.

Resolution for the spatial analyses: 0.2 degrees.

Area of analysis: The geographic area of focus for the analysis was the OSPAR Maritime Area that are Beyond National Jurisdiction (ABNJ). The final boundaries of the proposed MPA were then delimited by excluding areas located within current extended continental shelf claims and simplifying the final shape (**Figure A3.1**).

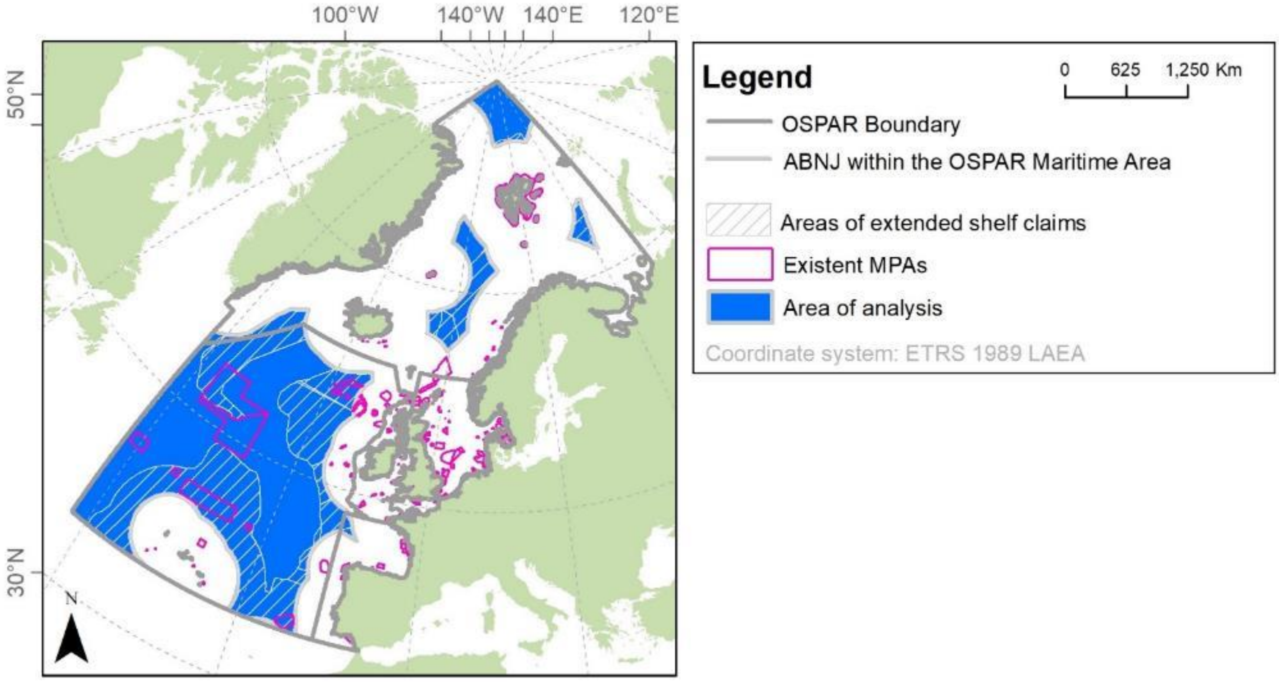

***Figure A3.1**: Geographic area of focus for the analysis. (OSPAR Maritime Area beyond the Exclusive Economic Zones of Contracting Parties).*

1. Data compilation

The identification of IBAs requires the compilation of information about the distribution of the species and their abundance. For IBAs located in pelagic seas, the main sources of data are: 1) tracking data (i.e., locations of birds collected by tracking their movements with bird-borne devices - GPS, PTT or GLS) and 2) colonies' location and abundance[17].

An extensive search was conducted in order to identify and compile all potentially relevant tracking datasets (i.e. those potentially overlapping with the area of analysis). Many different researcher teams, working across many seabird colonies, were contacted and invited to upload their tracking data into the BirdLife International's Seabird Tracking Database (www.seabird.org), or to provide authorization to use the data previously stored in the database. All the data were therefore formatted following the procedures required by the Seabird Tracking Database (details here). The **Table A3.1** lists all tracking datasets which were available for the present analysis, and the percentage of overlap of the tracking positions and the area of analysis. Data for 23 species from 105 colonies were compiled, corresponding to 2188 individual birds (collected by 66

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[17] Note- at sea survey data is used when available to help support the identification of sites.

seabird researchers; **Table A3.1**). Species overlapping less than 2% with the studied area were excluded from further analyses (Northern Gannet *Morus bassanus* and Scopoli's Shearwater *Calonectris diomedea*).

Following advices from the scientific community after a workshop held in June in Reykjavik, Iceland, it was decided to combine data from individual colonies into Large Marine Ecosystems (LME; http://www.lme.noaa.gov/). Population size for LME were obtained directly from scientists, literature review, European Red List of Birds Assessment (BirdLife International 2015), or IBA factsheets. To meet the IBA criteria, tracked birds of non-threatened species were checked against the 1% threshold (i.e. LME represents ≥ 1% of the global [for species breeding outside Europe] or biogeographic population [EU number of mature individuals for European species]). For Black-legged Kittiwakes *Rissa tridactyla* and Thick-billed Murres *Uria lomvia* a modified version of the LME classification was used, following (Frederiksen et al. 2012; Frederiksen et al. 2016). For Long-tailed Jaegers, Norwegian Sea and Barents Sea LMEs had to be combined in order to obtain more accurate population estimates.

2. Data analysis per species

The analyses followed the procedures described in Lascelles et al. (2016) and are summarized in the following paragraphs. All the analyses were carried out using R (R Core Team 2016) and the scripts provided by Lascelles et al. (2016) as well as customized scripts.

2.1 The data were combined in data groups, i.e., unique combinations of species/LME/ breeding stages (e.g., Atlantic Puffin *Fratercula arctica* from Iceland Shelf and Sea during incubation). Breeding stages were provided by scientists or obtained from literature. The next steps were carried out for each data group individually.

2.2 The “core use area” of each individual bird was estimated by doing a kernel density analysis (KDE) and selecting the 50% utilization distribution (UD) area (step *batchUD* in Lascelles et. all 2016). For PTT and GPS data, the smoothing factor (*h* value) used in the kernel analysis was calculated specifically for each data group combination to reflect the scale of the interaction of the birds with the environment, based on a First Passage Time Analysis; for GLS data, a value of 186 km was used, which corresponds approximately to the accuracy of the device.

2.3 The proportion of the tracked birds using each 0.2°cell was estimated by counting the overlap of all individual kernels estimated in 2.2 (step *polyCount* in Lascelles et al. 2016).

2.4 The total number of birds using each 0.2°cell was estimated by multiplying the size of the overall LME population (**Table 2**) by the proportion of the tracked population which had a core-use area in this grid cell. For example, we estimated that a cell overlapping with the core area of 20% of the birds tracked from an LME containing 10,000 birds, would be used by 2,000 birds.

3. Combination of usage maps of several species

3.1. Creation of density maps:

a. One of the outputs from the IBA script (Lascelles et al. 2016; see point 2.) is a kernel density map, representing the percentage of a species' population of each LME using the area, during a given breeding stage. These maps were exported as raster images and resampled in order to obtain compatible extents between data groups (resolution was already the same: 0.2°);

b. In order to standardise the different breeding stages (incubation, chick-rearing, winter, etc.) for the different species during the annual cycle, breeding stages were associated to year quarters. Each year quarter was represented by 6 fortnights. The final "species/LME/quarter" raster maps were estimated as a weighted average of the bird distribution during the breeding stages associated with its respective year quarter. For example, if during Q1 (Jan-Mar) four fortnights were coded as "winter" and two as "pre-breed", the final raster would be the result of the equation: (raster winter*4 + raster pre-breed*2)/6. If more than 50% of the year quarter was represented by a breeding stage that did not overlap with the area of analysis or when there was no available tracking data to produce density distributions, the whole year quarter for the respective species was considered non-existent (i.e. non-existent quarters can be a result of lack of data but also lack of overlap);

c. A set of maps were then produced revealing the density use by the seabird community:

- Quarterly density maps of each species: raster images of each species during each year quarter, after combining all the maps for each LME that overlapped with the area of analysis. The combination was done by weighing the percentage of the population in each LME (i.e. LME population size). An example of this map is provided in **Figure A3.2**.

- Quarterly density maps for all species combined. All single species raster-maps for each year quarter (after combining populations from different LMEs) were combined (i.e., summed up) and divided by the total number of species occurring in the area of analysis during the respective year quarter, to create a weighted average of the proportion of the populations expected to be find in each cell (**Figure A3.3**).

- Density map for all species and year quarters combined: all single species raster-maps (independent of year quarter, and after combining populations from different LMEs) were combined and divided by the total number of species occurring in the area of analysis (**Figure A3.4**).

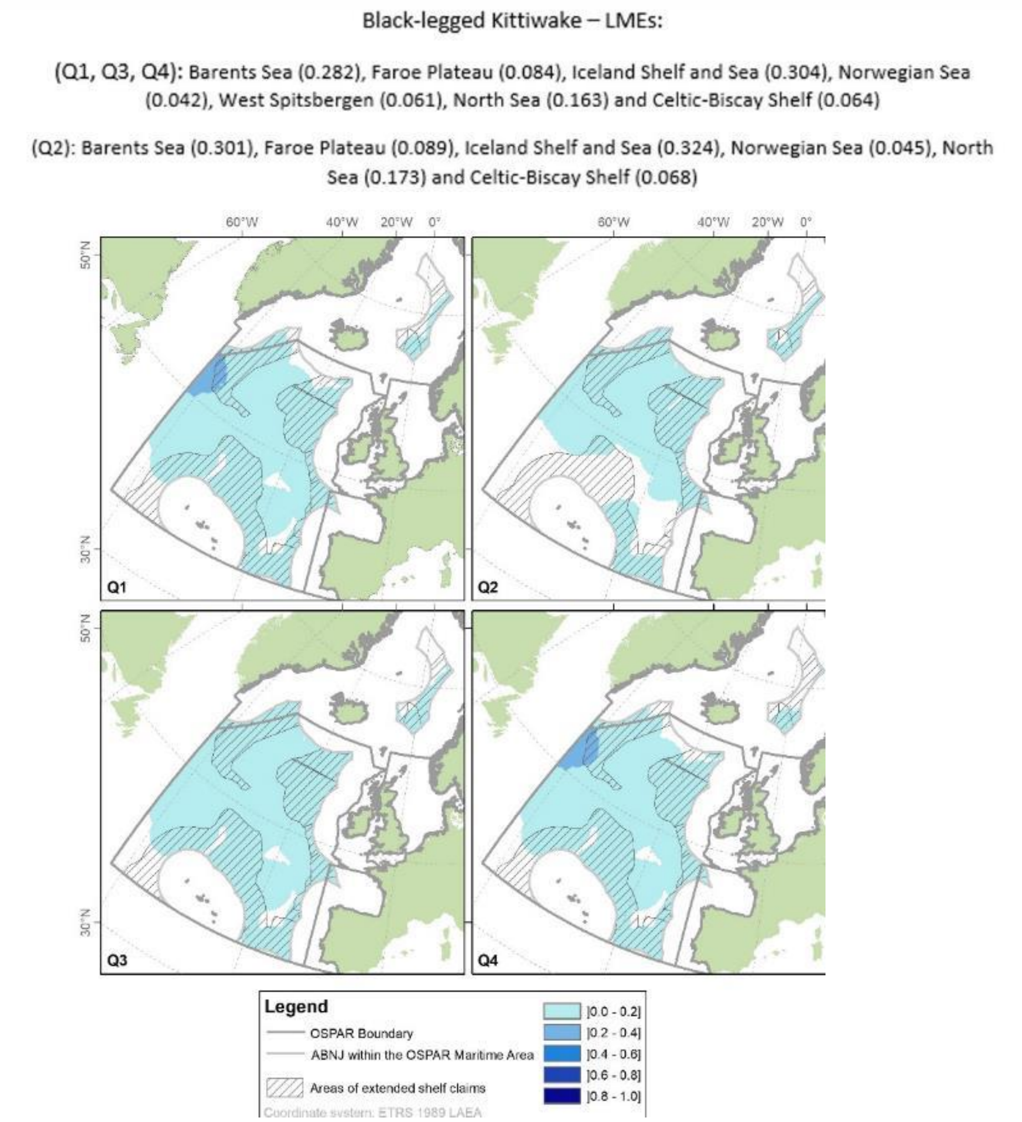

Figure A3.2. *Example of a quarterly density map (Black-legged Kittiwake). Values represent percentage of birds (total population – i.e., all LME combined) using each 0.2°cell.*

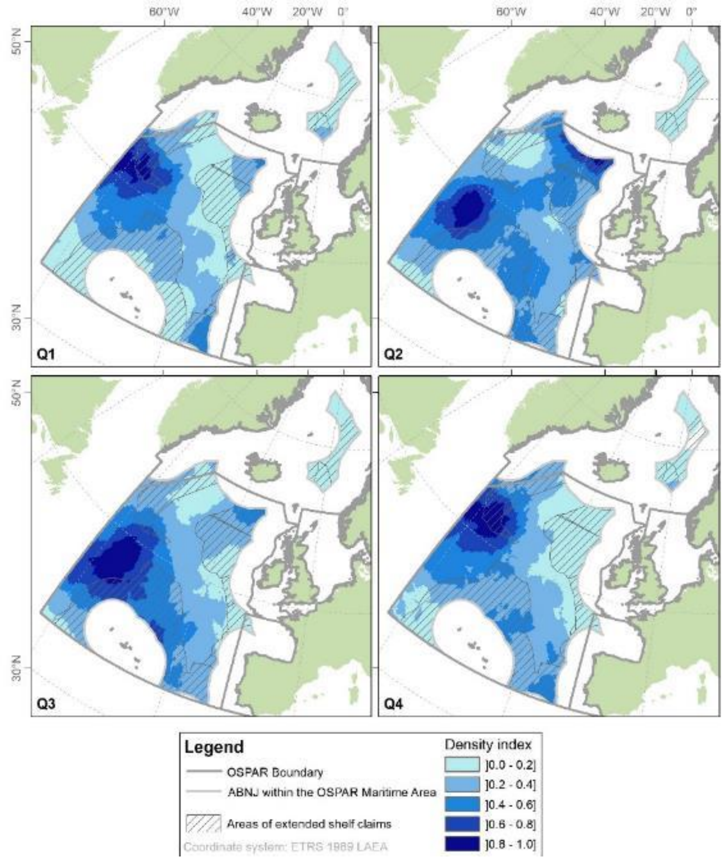

Figure A3.3. *Quarterly density maps of all the species combined. (in order to facilitate the comparison of the relative importance of the areas within each quarter, and only for mapping purposes, the average densities were standardized to obtain values varying between 0 and 1, by dividing by the maximum value of each quarter).*

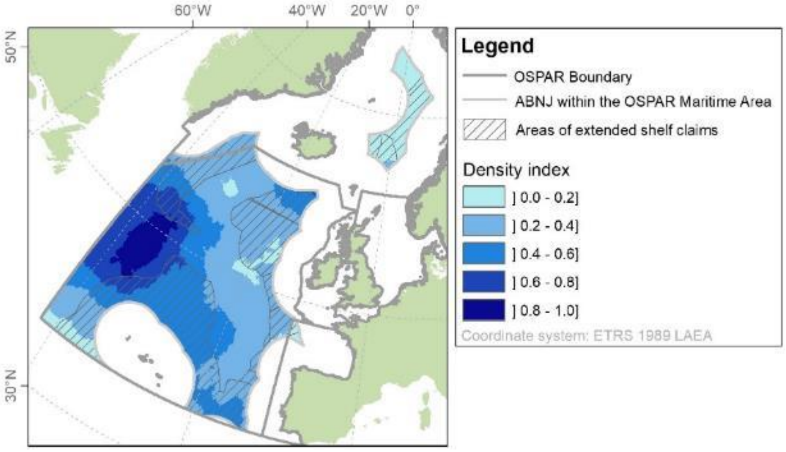

Figure A3.4. *Density map for all species and year quarters combined. (in order to facilitate the comparison of the relative importance of the areas, and only for mapping purposes, the average density index values were standardized to obtain values varying between 0 and 1, by dividing by the maximum value).*

3.2. Creation of richness maps:

In the same manner as for the density maps, a series of maps reflecting the richness of the area (number of seabird species) were produced:

- Richness quarterly maps: computed using the kernel density maps returned from the IBA scripts, following the resampling and standardization of the different breeding stages (see details in Density maps section).

Single species maps (independent of LME of origin) were converted into a presence/absence raster by recoding all cells with values higher than 0 to value 1. Prioritisation was given to identifying an important area for OSPAR listed priority species or globally and European threatened species (i.e. classified as Vulnerable, Endangered or Critically Endangered; BirdLife International 2015, BirdLife International 2017). Therefore, a higher weight was given to OSPAR species (3x, i.e., the presence of an OSPAR species contributed 3x to the final map) and globally or European threatened species (2x). For all the other species a value of 1 was assumed (i.e. presence). Finally, all single species maps were overlapped using the function sum, returning a raster image per quarter with the total sum (inflated number of species; higher weights to OSPAR listed priority species or globally and European threatened species) occurring in each cell (**Figure A3.5**).

- Richness map for all year quarters combined. All single species maps (independent of LME of origin and year quarter) were combined into a single map, and cells with values higher than 0 were recoded to value 1. A higher weight was given to OSPAR species (3x) and globally or European threatened species (2x). For all the other species a value of 1 was assumed (i.e. presence). In a second step, single species maps were overlapped using the function sum, returning a raster image with the total sum (inflated number of species; higher weights to OSPAR listed priority species or globally and European threatened species) occurring in each cell (**Figure A3.6**).

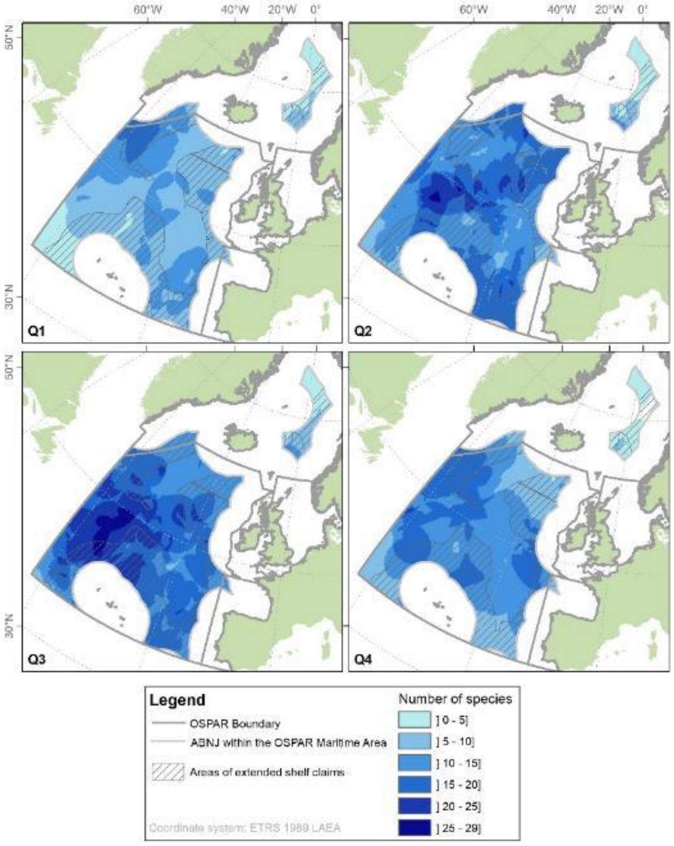

Figure A3.5. *Number of species occurring in each 0.2 ° cell in each year quarter (richness quarterly maps). Note that values correspond to "inflated numbers (i.e. OSPAR and threatened species count 3x and 2x for the count, respectively; see methods above).*

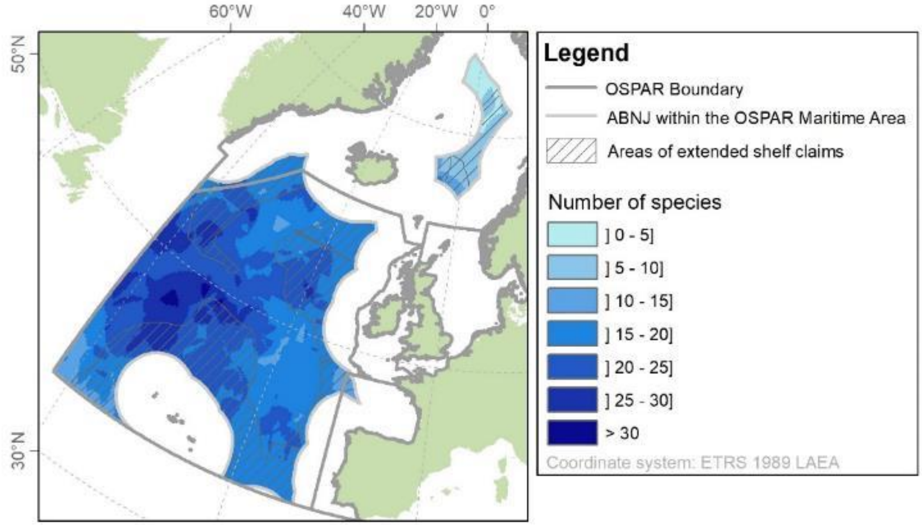

Figure A3.6. *Inflated richness map for all year quarters combined*

3.3. Final maps

The identification of the most relevant sites for seabirds in the OSPAR ABNJ was done by combining the maps reflecting the density of use and richness. The final raster maps reflect thus an index of specie's use*richness, in which the presence of OSPAR priority listed species or globally and European threatened species (European Red List of Birds) accounted more for the final result (i.e. a higher weight to OSPAR species (3x) and globally or European threatened species (2x)).

- Density and richness quarterly maps. Quarterly density and richness (i.e. inflated richness) raster-maps were multiplied and then standardized to obtain values varying between 0 and 1 (by dividing by the maximum value) (**Figure A3.7**).

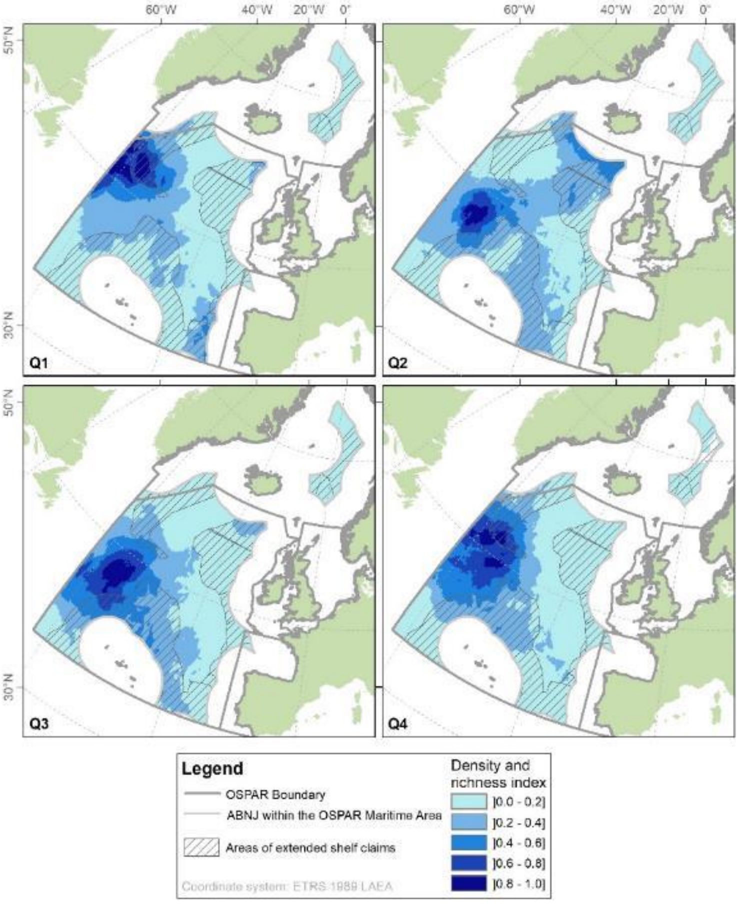

Figure A3.7. *Quarterly density and richness maps combined*

- Density and richness for all year quarters combined. The density map for all species and year quarters combined and the richness map (i.e. inflated richness) for all year quarters combined were multiplied and then standardised to obtain values varying between 0 and 1 (by dividing by the maximum value (**Figure A3.8**).

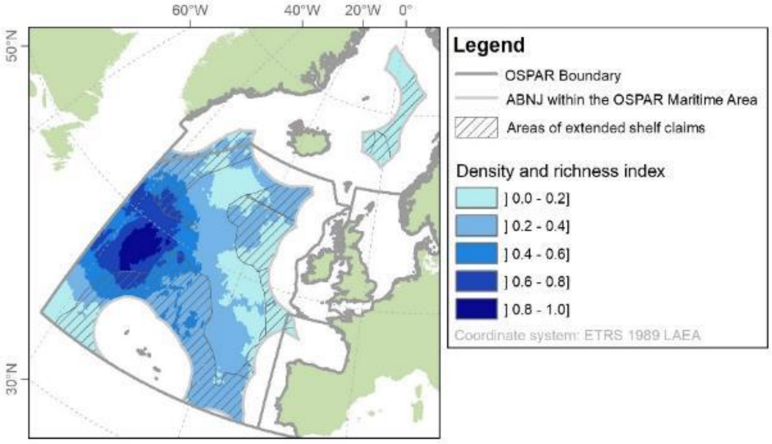

Figure A3.8. *Density and richness maps combined for all year quarters*

Finally, the boundary of the 15% highest values were identified and exported as shapefiles (**Figure A3.9**). This boundary encompasses the 15% most important area for seabirds within the area of analysis.

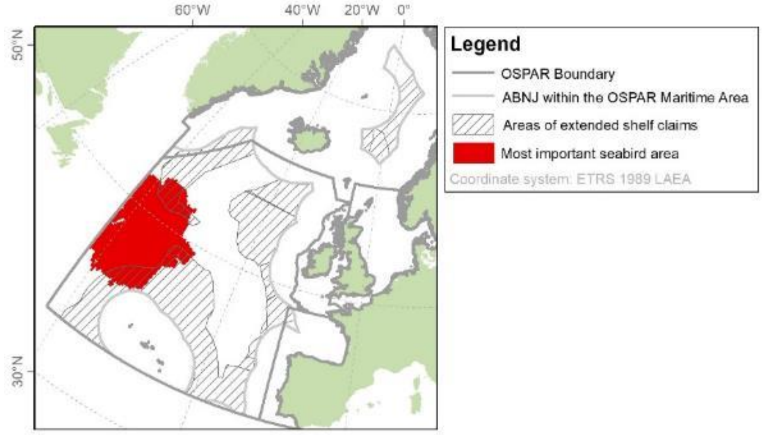

Figure A3.9. *15% most important areas for seabirds for all year-quarters combined*

3.4. Proposed MPA

The final boundary was defined by simplifying the borders of the shapefile obtained in the previous step (to reduce the number of vertices) and excluding the areas that overlapped extended shelf claims. The area of the NACESMPA was estimated after projecting the map in the European Lambert Azimuthal Equal Area (**Figure A3.10**).

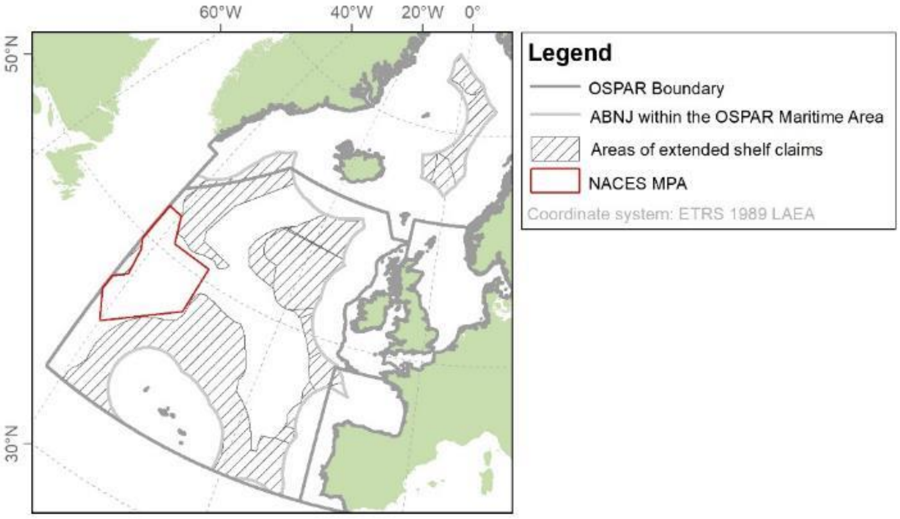

Figure A3.10. *Proposed NACES MPA*

4. Additional analysis to test if additional data from more individuals would alter the location of the Important Bird and Biodiversity Area:

4.1 Additional data for 525 Black-legged Kittiwakes from colonies in the North-East Atlantic were obtained from the SeaTrack project – an initiative of several Northern European countries to map important wintering areas and migration routes of seabirds in North Atlantic Waters (www.seapop.no/en/seatrack). These additional data (n=525) were combined with the previous data for this species used in the original analyses (n=302), totalling 827 individuals (see **Table A3.4**). The outputs from the original analyses used for the proforma (Black-legged Kittiwake, n=302) were then compared with the outputs from the analyses using the additional SeaTrack data combined with the original data included in the proforma (Black-legged Kittiwake, n=827) to evaluate if there were any differences (**Figures A3.11** and **A3.12**).

4.2 The outputs from the analyses including the additional data (Figure A3.11) confirm the importance of the area for the OSPAR-listed Black-legged Kittiwake, with the northern extent of the proposed area shown to be used by even more birds. Figure A3.12 shows the number of mature individuals by quantiles for each quarter and in terms of broad locations there is no discernible difference between the two outputs (Figure A3.12). Thus, including any further data – to the significant quantity already included in the analyses – is expected to further confirm the area as important, and not result in any substantial changes to the site.

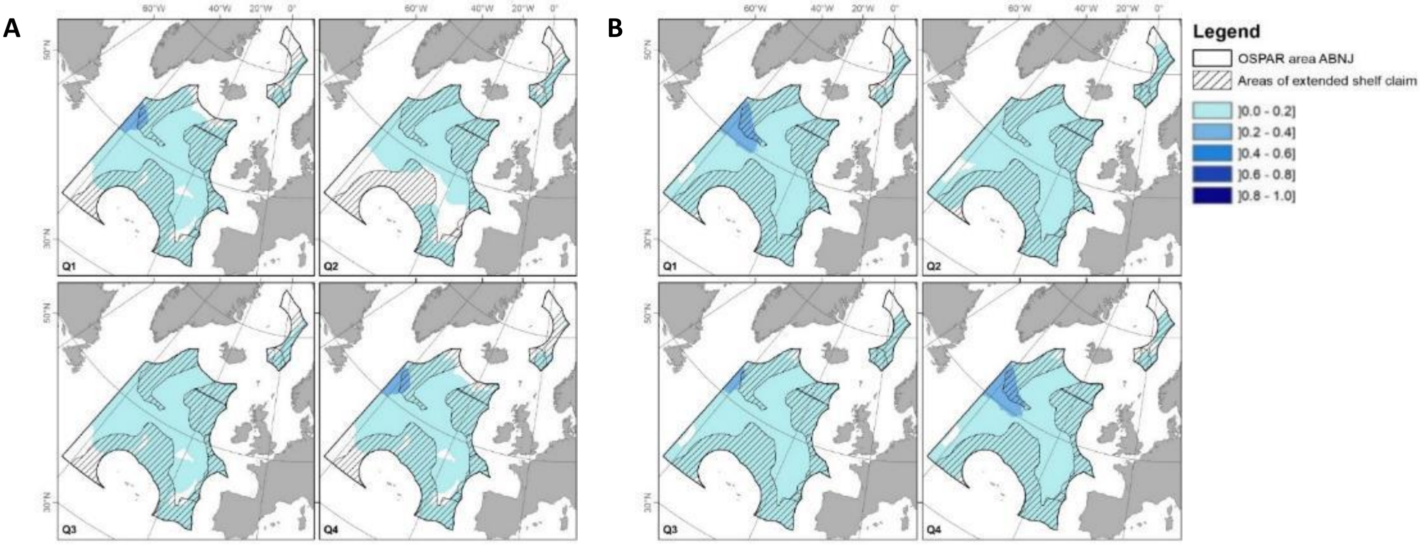

***Figure A3.11**. Comparison of important foraging areas identified for Black-legged Kittiwake using additional data provided by SeaTrack.*

A: Maps from original data analysed in NACES MPA proforma (n= 302; Figure extracted from Annex 4, Figure A4.12). The proportion of birds in each Large Marine Ecosystems (LME) is indicated when birds from more than one LME used the [proposed] area.

LME: (Quarters 1, 3 and 4) Barents Sea (0.282), Faroe Plateau (0.084), Iceland Shelf and Sea (0.304), Norwegian Sea (0.042), West Spitsbergen (0.061), North Sea (0.163) and Celtic-Biscay Shelf (0.064) (Q2) Barents Sea (0.301), Faroe Plateau (0.089), Iceland Shelf and Sea (0.324), Norwegian Sea (0.045), North Sea (0.173) and Celtic-Biscay Shelf (0.068). Usage indicated by proportion of the LME populations using area.

B: Includes additional data received from SeaTrack (n=827).

LME: (Quarters 1, 3 and 4) Barents Sea (0.282), Faroe Plateau (0.084), Iceland Shelf and Sea (0.304), Norwegian Sea (0.042), West Spitsbergen (0.061), North Sea (0.163) and Celtic-Biscay Shelf (0.064) (Q2) Barents Sea (0.364), Faroe Plateau (0.108), Iceland Shelf and Sea (0.392), Norwegian Sea (0.054) and Celtic-Biscay Shelf (0.082).

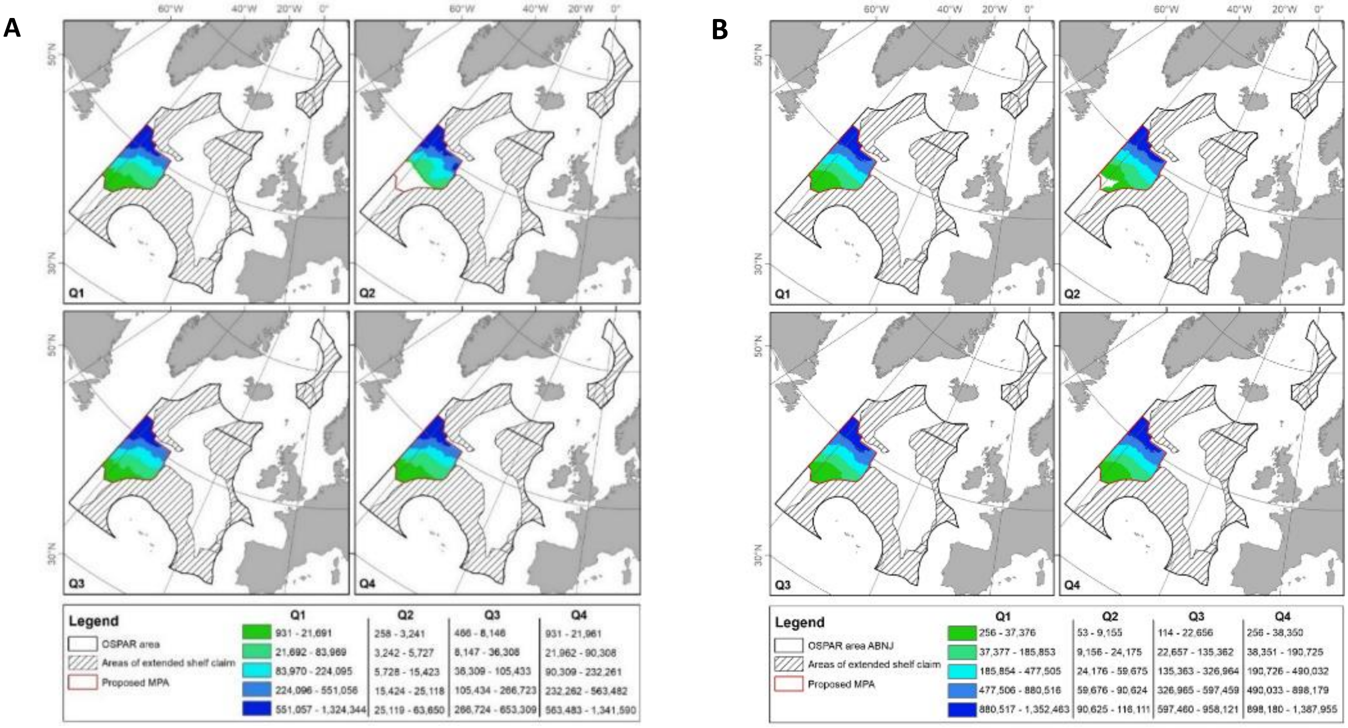

Figure A3.12. *Comparison of the number of mature individuals of Black-legged Kittiwake for each year quarter, using additional data provided by SeaTrack. Note, the figure displays an approximation of the final boundary of the NACES MPA, but does not change the validity of the findings.*

A: Number of mature individuals of Black-legged Kittiwake in the NACES MPA for each year quarter, from the original data analysed in NACES MPA proforma (n=302).

B: Number of mature individuals of Black-legged Kittiwake in the NACES MPA for each year quarter, including additional data received from SeaTrack (n=827).

The NACES MPA qualifies as a global marine IBA (Important Bird and Biodiversity Area), following the methods and criteria detailed in Lascelles et al. (2016). Legends based on the quantiles of number of mature individuals within the NACES MPA.

Table A3.1. List of all datasets provided by the researchers. (more details in http://seabirdtracking.org/), and respective LME where each dataset was included (See Table A3.2), type of device used (GPS, PTT or GLS), sample sizes and percentage of overlap with the OSPAR ABNJ region.

Species	Country	Colony	LME	Device	N birds	% overlap	Tracking data contributors
Arctic Tern *Sterna paradisaea*	Greenland	Sand Island	Greenland Sea	GLS	9	14.80	Carsten Egevang
Atlantic Puffin *Fratercula arctica*	Iceland	Flatey	Iceland Shelf and Sea	GLS	6	36.66	Aevar E Petersen
	Iceland	Grimsey	Iceland Shelf and Sea	GLS	15	21.16	Erpur S. Hansen , Thorkell Lindberg Thorarinsson, Vegard Brathen
	Iceland	Heimaey	Iceland Shelf and Sea	GLS	1	46.50	Erpur S. Hansen , Thorkell Lindberg Thorarinsson
	Iceland	Papey	Iceland Shelf and Sea	GLS	6	35.99	Erpur S. Hansen , Thorkell Lindberg Thorarinsson, Vegard Brathen
	Iceland	Storhofdi	Iceland Shelf and Sea	GLS	7	55.40	Aevar E Petersen
	Ireland	Skellig Michael	Celtic-Biscay Shelf	GLS	30	39.30	Mark Jessopp
	United Kingdom	Isle of May	North Sea	GLS	40	1.40	Sarah Wanless, Francis Daunt
	United Kingdom	Skomer	Celtic-Biscay Shelf	GLS	41	22.69	Annette Fayet, Tim Guilford
Audubon's Shearwater *Puffinus lherminieri baroli*	Portugal	Vila	Azores	GLS	4	52.70	Veronica Rodrigues Costa Neves, Jacob González-Solís
	Cape Verde	Ilheu de Cima	Cape Verde	GLS	21	0.10	Jacob González-Solís
	Portugal	Cima Islet	Canary Current	GLS	14	28.00	Vitor Paiva
	Portugal	Selvagens	Canary Current	GLS	9	8.70	Vitor Paiva
	Cape Verde	Raso	Cape Verde	GLS	9	0.30	Jacob González-Solís
Bermuda Petrel *Pterodroma cahow*	Bermuda	Nonsuch Island	Bermuda	GLS	11	16.30	Jeremy Lee Madeiros, Mandy Shailer
Black-legged Kittiwake *Rissa tridactyla*	Canada	Prince Leopold Island	Arctic Canada	GLS	2	2.60	Morten Frederiksen
	Norway	Bear Island	Barents Sea	GLS	17	17.30	Morten Frederiksen
	Russian Federation	Cape Krutik	Barents Sea	GLS	11	18.00	Morten Frederiksen
	Norway	Hjelmsoya	Barents Sea	GLS	3	6.40	Morten Frederiksen
	Norway	Hornoya	Barents Sea	GLS	20	10.80	Morten Frederiksen
	United Kingdom	Rathlin	Celtic-Biscay Shelf	GLS	5	9.10	Morten Frederiksen
	Faroe Islands	Faroe Islands	Faroe Plateau	GLS	10	12.10	Morten Frederiksen
	Greenland	Kippaku	West Greenland Shelf	GLS	25	0.60	Morten Frederiksen
	Iceland	Hafnarholmi	Iceland Shelf and Sea	GLS	14	13.90	Morten Frederiksen
	Denmark	Bulbjerg	North Sea	GLS	13	6.90	Morten Frederiksen

Species	Country	Colony	LME	Device	N birds	% overlap	Tracking data contributors
	United Kingdom	Fair Isle	North Sea	GLS	15	3.80	Morten Frederiksen
	United Kingdom	Isle of May	North Sea	GLS	48	8.70	Morten Frederiksen, Francis Daunt, Michael P. Harris, Sarah Wanless
	Norway	Anda	Norwegian Sea	GLS	12	9.70	Morten Frederiksen
	Norway	Halten	Norwegian Sea	GLS	8	15.10	Morten Frederiksen
	Norway	Rost	Norwegian Sea	GLS	46	6.60	Morten Frederiksen
	United Kingdom	Skomer	Celtic-Biscay Shelf	GLS	7	5.90	Morten Frederiksen
	Norway	Grumant	West Spitsbergen	GLS	16	32.30	Morten Frederiksen
	Norway	Kongsfjorden	West Spitsbergen	GLS	30	30.60	Morten Frederiksen
Bulwer's Petrel *Bulweria bulwerii*	Portugal	Vila	Azores	GLS	12	0.70	Jacob González-Solís
	Spain	M Clara	Canary Current	GLS	33	0.90	Jacob González-Solís
	Cape Verde	Ilheu de Cima	Cape Verde	GLS	15	0.00	Jacob González-Solís
	Portugal	Selvagens	Canary Current	GLS	15	6.02	Francis Zino, Manuel Biscoito
	Cape Verde	Raso	Cape Verde	GLS	12	0.30	Jacob González-Solís
Common Murre *Uria aalge*	Canada	Funk Island	Labrador - Newfoundland	GLS	17	0.00	Laura McFarlane Tranquilla, Greg Robertson, April Hedd, William Montevecchi
	Canada	Gannet Islands	Labrador - Newfoundland	GLS	16	0.00	Laura McFarlane Tranquilla, Greg Robertson, April Hedd, William Montevecchi
	Canada	Gull Island	Labrador - Newfoundland	GLS	15	0.00	Laura McFarlane Tranquilla, Greg Robertson, April Hedd, William Montevecchi
	Iceland	Grimsey	Iceland Shelf and Sea	GLS	10	6.60	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
	Iceland	Langanes	Iceland Shelf and Sea	GLS	3	0.90	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
	Iceland	Latrabjarg	Iceland Shelf and Sea	GLS	7	20.60	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
Cory's Shearwater *Calonectris borealis*	Portugal	Corvo	Azores	GPS	73	23.30	Vitor Paiva, Ivan Ramirez, Jaime Ramos
	Portugal	Vila	Azores	GLS	27	21.40	Jacob González-Solís
	Spain	M Clara	Canary Current	GLS	20	1.60	Jacob González-Solís
	Spain	Veneguera	Canary Current	GLS	98	3.20	Jacob González-Solís
	Portugal	Cima Islet	Canary Current	GPS	28	9.10	Vitor Paiva, Jaime Ramos
	Portugal	Selvagens	Canary Current	GLS	103	4.50	Paulo Catry, Jose Pedro Granadeiro, Maria Ana Dias
	Portugal	Berlengas	Iberian Coastal	GLS	23	10.40	Paulo Catry, Jose Pedro Granadeiro, Vitor Paiva, Jaime Ramos

Species	**Country**	**Colony**	**LME**	**Device**	**N birds**	**% overlap**	**Tracking data contributors**
	Portugal	Berlengas	Iberian Coastal	GPS	101	8.50	Vitor Paiva, Jaime Ramos, Ivan Ramirez
Desertas Petrel *Pterodroma deserta*	Portugal	Bugio	Canary Current	GLS	39	13.40	Ivan Ramirez, Vitor Paiva, Francis Zino, Manuel Biscoito
Great Shearwater *Ardenna gravis*	High Seas	At-Sea	Tristan Gough	PTT	24	2.50	Robert Alfredo Ronconi
	Saint Helena, Ascension and Tristan da Cunha	Gough Island	Tristan Gough	GLS	32	14.20	Jacob González-Solís, Peter Ryan, Richard Cuthbert
	Saint Helena, Ascension and Tristan da Cunha	Inaccessible Island	Tristan Gough	PTT	16	5.00	Robert Alfredo Ronconi
Great Skua *Catharacta skua*	Iceland	Breidamerkursandur	Iceland Shelf and Sea	GLS	11	19.30	Robert W Furness, Aevar E Petersen, Ellen Magnusdottir
	Norway	Bear Island	Barents Sea	GLS	5	23.30	Robert W Furness, Aevar E Petersen, Ellen Magnusdottir
	United Kingdom	Foula	North Sea	GLS	4	5.80	Robert W Furness, Aevar E Petersen, Ellen Magnusdottir
Little Auk *Alle alle*	Greenland (to Denmark)	Kap Hoegh	Greenland Sea	GLS	18	30.49	David Gremillet, Jerome Fort
	Greenland (to Denmark)	Thule	Canadian Eastern Arctic - West Greenland	GLS	17	0.04	Anders Mosbech
Long-tailed Jaeger *Stercorarius longicaudus*	Sweden	Ammarnas	Norwegian Sea + Barents Sea	GLS	23	14.40	Rob van Bemmelen
	Greenland (to Denmark)	Hochstetter Forland	Greenland Sea	GLS	1	9.80	Rob van Bemmelen, Olivier Gilg
	Greenland (to Denmark)	Karupelv	Greenland Sea	GLS	2	13.80	Johannes Lang
	Greenland	North East Greenland	Greenland Sea	PTT	4	16.70	Olivier Gilg
	Greenland (to Denmark)	Zackenberg	Greenland Sea	GLS	5	14.60	Niels Martin Schmidt
	Norway	Kongsfjorden	Norwegian Sea + Barents Sea	GLS	7	9.70	Borge Moe
Manx Shearwater *Puffinus puffinus*	United Kingdom	Lundy	Celtic-Biscay Shelf	GLS	24	3.90	Oliver Padget, Tim Guilford
	Iceland	Heimaey	Iceland Shelf and Sea	GLS	21	15.50	Jacob González-Solís
	United Kingdom	Copeland	Celtic-Biscay Shelf	GLS	33	5.00	Oliver Padget, Tim Guilford
	United Kingdom	Rum	Celtic-Biscay Shelf	GLS	14	8.70	Oliver Padget, Tim Guilford
	United Kingdom	Ramsey	Celtic-Biscay Shelf	GLS	11	4.10	Oliver Padget, Tim Guilford
	United Kingdom	Skomer	Celtic-Biscay Shelf	GLS	78	4.10	Oliver Padget, Tim Guilford
Northern Fulmar *Fulmarus glacialis*	United Kingdom	Eynehallow	North Sea	GLS	72	13.10	Paul Thomson
Northern Gannet	France	Ile Rouzic	Celtic-Biscay Shelf	GLS	20	0.50	David Gremillet, Justine Dossa

Species	Country	Colony	LME	Device	N birds	% overlap	Tracking data contributors
Morus bassanus	France	Ile Rouzic	Celtic-Biscay Shelf	GPS	21	0.00	David Gremillet
	United Kingdom	Les Etacs	Celtic-Biscay Shelf	GPS	17	0.00	Louise Soanes, Jonathan Green, Phil Atkinson, Roland Gauvain
	United Kingdom	Bass Rock	North Sea	GPS	78	0.00	Keith Hamer, Ewan Wakefield, Rachel Davies, Ian Cleasby
	United Kingdom	Ailsa Craig	Celtic-Biscay Shelf	GPS	16	0.00	Keith Hamer, Ewan Wakefield
	United Kingdom	Sule Skerry	North Sea	GPS	2	0.00	Keith Hamer, Jez Blackburn
Razorbill *Alca torda*	Iceland	Grimsey	Iceland Shelf and Sea	GLS	4	1.60	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
	Iceland	Langanes	Iceland Shelf and Sea	GLS	10	1.80	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
	Iceland	Latrabjarg	Iceland Shelf and Sea	GLS	6	2.20	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
Sabine's Gull *Xema sabini*	Greenland (to Denmark)	Sand Island	Greenland Sea	GLS	8	5.80	Iain Stenhouse, Carsten Egevang
Scopoli's Shearwater *Calonectris diomedea*	Spain	Pantaleu	Mediterranean Sea	GLS	24	1.40	Jacob González-SolísJacob González-Solís
	Spain	Chafarinas	Mediterranean Sea	GLS	1	0.20	Jacob González-SolísJacob González-Solís
	Spain	Chafarinas	Mediterranean Sea	PTT	9	0.10	Jose Manuel Arcos
	Malta	Filfla	Mediterranean Sea	GLS	10	1.40	Benjamin Metzger
	Malta	Gharb	Mediterranean Sea	GLS	4	1.90	Benjamin Metzger
	Malta	Hal Far	Mediterranean Sea	GLS	12	1.00	Benjamin Metzger
Sooty Shearwater *Ardenna grisea*	Falkland Islands (Malvinas)	Kidney Island	Patagonian Shelf	GLS	18	20.00	April Hedd, William Montevecchi
South Polar Skua *Stercorarius maccormicki*	Antarctica	King George Island	South Shetland Islands	GLS	32	14.50	Hans-Ulrich Peter, Jan Esefeld, Johannes Krietsch, Matthias Kopp
Thick-billed Murre *Uria lomvia*	Canada	Prince Leopold Island	Arctic Canada	GLS	19	0.10	Laura McFarlane Tranquilla, H. Grant Gilchrist, Mark Mallory, William Montevecchi
	Canada	Coats Island	Hudson Bay Complex	GLS	21	0.00	Laura McFarlane Tranquilla, H. Grant Gilchrist, Mark Mallory, William Montevecchi
	Canada	Digges Islands	Hudson Bay Complex	GLS	10	0.50	Laura McFarlane Tranquilla, H. Grant Gilchrist, Mark Mallory, William Montevecchi
	Canada	Gannet Islands	Atlantic Canada	GLS	11	2.60	Laura McFarlane Tranquilla, H. Grant Gilchrist, Mark Mallory, William Montevecchi
	Greenland (to Denmark)	Innaq	NW Greenland Shelf	GLS	7	4.10	Flemming Merkel
	Greenland (to Denmark)	Kippaku	NW Greenland Shelf	GLS	71	2.30	Morten Frederiksen

Species	Country	Colony	LME	Device	N birds	% overlap	Tracking data contributors
	Greenland (to Denmark)	Kitsissut Avaaliit	SW Greenland Shelf	GLS	7	1.40	Jannie Fries Linnebjerg, Morten Frederiksen
	Greenland (to Denmark)	Parker Snow Bay	NW Greenland Shelf	GLS	3	0.00	Anders Mosbech
	Greenland (to Denmark)	Saunders Island	NW Greenland Shelf	GLS	19	0.00	Anders Mosbech
	Iceland	Grimsey	Iceland Shelf and Sea	GLS	9	6.30	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
	Iceland	Langanes	Iceland Shelf and Sea	GLS	3	1.70	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
	Iceland	Latrabjarg	Iceland Shelf and Sea	GLS	6	3.30	Thorkell Lindberg Thórarinsson, Yann Kolbeinsson
	Canada	Minarets	Arctic Canada	GLS	14	7.40	H. Grant Gilchrist, Laura McFarlane Tranquilla, Mark Mallory, William Montevecchi
Zino's Petrel *Pterodroma madeira*	Portugal	Madeira	Canary Current	GLS	12	26.20	Frank Zino, Manuel Biscoito

Table A3.2. *Final list of species and LME considered, with an estimate of the number of birds. The analysis was performed only when the LME population size (i.e. LME N mature individuals) accounted for more than 1% of the biogeographic (EU mature individuals) or global population estimates and when the number of birds (i.e. N birds) in the LME was higher than 5.*

Species	N birds	LME	LME N mature individuals	EU mature individuals^{1}	EU Red List Status^{1}	1%th	more1%th	Reference s for population estimates
Arctic Tern	9	Greenland Sea	165000	1470000	LC	14700	1.00	European Red List (value for all Greenland: 65000-100000)
Atlantic Puffin	71	Celtic-Biscay Shelf	559496	10575000	EN	105750	1.00	Harris and Wanless 2011; checked by Sarah Wanless
Atlantic Puffin	33	Iceland Shelf and Sea	3920000	10575000	EN	105750	1.00	checked by Erpur Hansen
Atlantic Puffin	40	North Sea	642116	10575000	EN	105750	1.00	Harris and Wanless 2011; checked by Sarah Wanless
Audubon's Shearwater	4	Azores	2636	6750	NT	67.5	1.00	European Red List
Audubon's Shearwater	23	Canary Current	4084	6750	NT	67.5	1.00	European Red List
Bermuda Petrel	11	Bermuda	142	142	EN	1.42	1.00	BirdLife International 2016
Black-legged Kittiwake	14	Iceland Shelf and Sea	1161808	3935000	VU	39350	1.00	Garðarsson et al. (2013)
Black-legged Kittiwake	76	North Sea	622580	3935000	VU	39350	1.00	Frederiksen et al. (2012)
Black-legged Kittiwake	66	Norwegian Sea	160000	3935000	VU	39350	1.00	Frederiksen et al. (2012)
Black-legged Kittiwake	51	Barents Sea	1079800	3935000	VU	39350	1.00	Frederiksen et al. (2012)
Black-legged Kittiwake	10	Faroe Plateau	320000	3935000	VU	39350	1.00	Frederiksen et al. (2012)

Species	N birds	LME	LME N mature individuals	EU mature individuals[1]	EU Red List Status[1]	1%th	more1%th	Reference s for population estimates
Black-legged Kittiwake	46	West Spitsbergen	234000	3935000	VU	39350	1.00	Frederiksen et al. (2012)
Black-legged Kittiwake	25	West Greenland Shelf	206696	3935000	VU	39350	1.00	Frederiksen et al. (2012)
Black-legged Kittiwake	2	Arctic Canada	242000	3935000	VU	39350	1.00	Frederiksen et al. (2012)
Black-legged Kittiwake	12	Celtic-Biscay Shelf	244694	3935000	VU	39350	1.00	Frederiksen et al. (2012)
Bulwer's Petrel	37	Cape Verde	6000	102200	LC	1022	1.00	Ramos et al. 2015; Catry et al. 2015
Bulwer's Petrel	59	Canary Current	100000	102200	LC	1022	1.00	assumed 45000 pairs in Deserta (http://www.spea.pt/fotos/editor2/2_airo23.pdf) and numbers from European Red List (5000 in Madeira, 1000 in Canaries)
Bulwer's Petrel	13	Azores	120	102200	LC	1022	0.00	European Red List
Common Murre	20	Iceland Shelf and Sea	1392408	2705000	NT	27050	1.00	Garðarsson et al. 2016 (in press)
Common Murre	48	Labrador - Newfoundland	1392408	2705000	NT	27050	1.00	
Cory's Shearwater	100	Azores	376000	505500	LC	5055	1.00	European Red List. LME: checked by Maria Dias
Cory's Shearwater	249	Canary Current	127430	505500	LC	5055	1.00	Ramos et al. 2013 (DOI: 10.1111/ddi.12088). LME: checked by Maria Dias
Cory's Shearwater	124	Iberian Coastal	2250	505500	LC	5055	0.00	Iberian Coast: 1025 in Berlenga (Lecoq et al. 2011) +100 in Galiza (Munilla et al. 2016; http://dx.doi.org/10.1371/journal.pone.0147222). LME: checked by Maria Dias.
Desertas Petrel	72	Canary Current	340	340	VU	3.4	1.00	LME: checked by Vitor Paiva
Great Shearwater	72	Tristan Gough	8000000	8000000	LC	80000	1.00	Pers. Comm. Peter Ryan (under 2M each for Nightingale and Inaccessible, and 980000 for Gough)
Great Skua	5	Barents Sea	132	33550	LC	335.5	0.00	Furness 1987
Great Skua	11	Iceland Shelf and Sea	10800	33550	LC	335.5	1.00	European Red List
Great Skua	4	North Sea	14300	33550	LC	335.5	1.00	Furness 1987
Little Auk	18	Greenland Sea	7000000	45600000	LC	456000	1.00	Boertmann & Mosbech 1998
Little Auk	17	Canadian Eastern Arctic		45600000	LC	456000		

Species	N birds	LME	LME N mature individuals	EU mature individuals[1]	EU Red List Status[1]	1%th	more1%th	Reference s for population estimates
		- West Greenland						
Long-tailed Jaeger	12	Greenland Sea	21000	72850	LC	728.5	1.00	European Red List. All Greenland combined - not only Greenland Sea (west part); 1000-20000
Long-tailed Jaeger	30	Norwegian Sea + Barents Sea	51856	72850	LC	728.5	1.00	European Red List (values from Finland, Norway, Svalbard, Russia, Sweden)
Manx Shearwater	21	Iceland Shelf and Sea	20000	734500	LC	7345	1.00	Tim Guilford pers. comm. / checked by Erpur Hansen
Manx Shearwater	160	Celtic-Biscay Shelf	962510	734500	LC	7345	1.00	Tim Guilford pers. comm. for UK, plus European Red List values for Rep. Ireland and France
Northern Fulmar	72	North Sea	756210	6880000	EN	68800	1.00	Checked by Ewan Wakefield
Razorbill	20	Iceland Shelf and Sea	626944	999500	NT	9995	1.00	Garðarsson et al. 2016 (in press).
Sabine's Gull	8	Greenland Sea	3000	3100	LC	31	1.00	European Red List (value for all Greenland: 1000-2000)
Sooty Shearwater	18	Patagonian Shelf	600000	20000000	NT	200000	1.00	IBA factsheet (http://datazone.birdlife.org/site/factsheet/20858)
South Polar Skua	32	South Shetland Islands	1542	18000	LC	180	1.00	Ritz et al. (2006), Carneiro et al. (2016)
Thick-billed Murre	100	NW Greeland Shelf	856200	2380000	LC	23800	1.00	Frederiksen et al. (2016)
Thick-billed Murre	7	SW Greenland Shelf	37600	2380000	LC	23800	0.00	Frederiksen et al. (2016)
Thick-billed Murre	18	Iceland Shelf and Sea	653688	2380000	LC	23800	1.00	Garðarsson et al. 2016 (in press). Info supplied by him
Thick-billed Murre	33	Arctic Canada	1080000	2380000	LC	23800	1.00	Frederiksen et al. (2016)
Thick-billed Murre	45	Hudson Bay Complex	2000000	2380000	LC	23800	1.00	Frederiksen et al. (2016)
Thick-billed Murre	11	Atlantic Canada	16352	2380000	LC	23800	0.00	Frederiksen et al. (2016)
Zino's Petrel	12	Canary Current	160	145	EN	1.45	1.00	Checked by Frank Zino

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[1] For species breeding in Europe; for all the other species, global population estimates and Global Red List classification were used

Table A3.3. Breeding stages in each year quarter, for each species and LME (January-June). NA: data not available, NO: no overlap between data and target area.

Arctic Tern	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	winter	migration	migration	incubation	incubation
N locations	NO	NO	NO	NO	NO	NO	NO	NO	1508	1508	NA	NA
N birds	NO	NO	NO	NO	NO	NO	NO	NO	9	9	NA	NA

Atlantic Puffin	Q1						Q2					
Celtic-Biscay Shelf	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	pre-breed	pre-breed	incubation	incubation	incubation	chick-rearing	chick-rearing	chick-rearing
N locations	35669	35669	35669	35669	1195	1195	1074	1074	1074	3777	3777	3777
N birds	70	70	70	70	65	65	17	17	17	52	52	52

Atlantic Puffin	Q1						Q2					
North Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	migration	pre-breed	pre-laying	incubation	incubation	incubation	chick-rearing	chick-rearing
N locations	10656	10656	10656	10656	2591	NA	NA	NA	NA	NA	1121	1121
N birds	40	40	40	40	40	NA	NA	NA	NA	NA	40	40

Atlantic Puffin	Q1						Q2					
Iceland Shelf & Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	migration	migration	pre-breed	pre-breed	pre-breed	pre-laying	incubation	incubation
N locations	8618	8618	8618	8618	520	520	1700	1700	1700	73	179	179
N birds	34	34	34	34	21	21	22	22	22	8	12	12

Audubon's Shearwater	Q1						Q2					
Canary Current	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	pre-breed	incubation	incubation	incubation	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	winter
N locations	2238	1625	1625	1625	1625	2919	2919	2919	2919	2919	1240	4883
N birds	20	23	23	23	23	23	23	23	23	23	22	22

Bermuda Petrel	Q1						Q2					
Bermuda	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd

Arctic Tern	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	incubation	incubation	incubation	incubation	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing
N locations	151	151	151	151	151	NO	NO	NO	NO	NO	NO	NO
N birds	7	7	7	7	7	NO	NO	NO	NO	NO	NO	NO
Black-legged Kittiwake	Q1						Q2					
Faroe Plateau	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	pre-laying	pre-laying	pre-laying	incubation	incubation	chick-rearing
N locations	3314	3314	3314	3314	3314	3314	884	884	884	208	208	542
N birds	10	10	10	10	10	10	10	10	10	10	10	10
Black-legged Kittiwake	Q1						Q2					
Iceland Shelf & Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	pre-laying	pre-laying	pre-laying	pre-laying	incubation	incubation
N locations	6119	6119	6119	6119	6119	6119	1706	1706	1706	1706	NA	NA
N birds	14	14	14	14	14	14	14	14	14	14	NA	NA
Black-legged Kittiwake	Q1						Q2					
Norwegian Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	pre-laying	pre-laying	pre-laying	pre-laying	pre-laying	pre-laying	pre-laying	incubation	incubation	chick-rearing
N locations	20668	20668	9468	9468	9468	9468	9468	9468	9468	198	198	2350
N birds	66	66	65	65	65	65	65	65	65	10	10	60
Black-legged Kittiwake	Q1						Q2					
Barents Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	pre-laying	pre-laying	pre-laying	incubation	incubation
N locations	18332	18332	18332	18332	18332	18332	18332	1135	1135	1135	NA	NA
N birds	51	51	51	51	51	51	51	50	50	50	NA	NA
Black-legged Kittiwake	Q1						Q2					
North Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	migration	pre-breeding	pre-laying	incubation	incubation	chick-rearing
N locations	22467	22467	22467	22467	22467	22467	6211	2307	2081	1702	1702	4873

Arctic Tern	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
N birds	76	76	76	76	76	76	76	76	76	48	48	76
Black-legged Kittiwake	Q1						Q2					
Celtic-Biscay Shelf	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	migration	pre-breeding	pre-laying	incubation	incubation	chick-rearing
N locations	3401	3401	3401	3401	3401	3401	944	300	300	267	267	607
N birds	12	12	12	12	12	12	12	10	10	10	10	12

Black-legged Kittiwake	Q1						Q2					
West Spitsbergen	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	winter	pre-laying	pre-laying	pre-laying	incubation
N locations	14587	14587	14587	14587	14587	14587	14587	14587	NA	NA	NA	NA
N birds	46	46	46	46	46	46	46	46	NA	NA	NA	NA
Bulwer's Petrel	Q1						Q2					
Canary Current	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	migration	pre-breed	pre-breed	incubation	incubation
N locations	NO	NO	NO	NO	NO	NO	NO	1356	2786	2786	3349	3349
N birds	NO	NO	NO	NO	NO	NO	NO	43	46	46	48	48
Common Murre	Q1						Q2					
Iceland Shelf & Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	migration	pre-breed	pre-laying	incubation	incubation	incubation	chick-rearing	chick-rearing
N locations	5668	5668	5668	5668	301	NA	538	1415	1415	1415	228	228
N birds	20	20	20	20	20	NA	20	20	20	20	19	19
Cory's Shearwater	Q1						Q2					
Azores	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	migration	migration	pre-breed	pre-breed	pre-breed	pre-laying exodus	incubation	incubation
N locations	8190	8190	8190	8190	3047	3047	2851	2851	2851	1045	8322	8322
N birds	23	23	23	23	27	27	27	27	27	23	45	45
Cory's Shearwater	Q1						Q2					

Arctic Tern	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Canary Current	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	migration	migration	pre-breed	pre-breed	pre-breed	pre-breed	pre-laying exodus	incubation
N locations	58244	58244	58244	58244	22081	22081	20081	20081	20081	20081	3777	10785
N birds	221	221	221	221	221	221	165	165	165	165	135	125
Desertas Petrel	Q1						Q2					
Canary Current	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	winter	winter	migration	pre-breed	pre-breed
N locations	17763	17763	17763	17763	17763	17763	17763	17763	17763	3564	2403	2403
N birds	39	39	39	39	39	39	39	39	39	39	37	37

Great Shearwater	Q1						Q2					
Tristan Gough	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	migration	migration	winter	winter
N locations	NO	NO	NO	NO	NO	NO	NO	13357	13357	13357	13357	13357
N birds	NO	NO	NO	NO	NO	NO	NO	69	69	69	54	54
Great Skua	Q1						Q2					
Iceland Shelf & Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	migration	migration	migration	migration	incubation	incubation	chick-rearing	chick-rearing
N locations	3024	3024	3024	3024	1560	1560	1560	1560	600	600	1078	1078
N birds	11	11	11	11	11	11	11	11	11	11	11	11
Little Auk	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	migration	migration	pre-laying	pre-laying	pre-laying	incubation
N locations	4470	4470	4470	4470	4470	4470	1664	1664	62	62	62	NA
N birds	18	18	18	18	18	18	18	18	12	12	12	NA
Long-tailed Jaeger	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	migration	migration	migration	migration	pre-breed	pre-breed	incubation

Arctic Tern	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
N locations	4361	4361	4361	4361	4361	1812	1812	1812	1812	164	164	NA
N birds	12	12	12	12	12	8	8	8	8	7	7	NA

Long-tailed Jaeger	Q1						Q2					
Norwegian + Barents	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	migration	migration	migration	migration	migration	migration	pre-breed	incubation	incubation
N locations	NO	NO	NO	13323	13323	13323	13323	13323	13323	679	NA	NA
N birds	30	30	30	30	30	30	30	30	30	19		

Manx Shearwater	Q1						Q2					
Celtic-Biscay Shelf	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	migration	pre-breed	pre-breed	exodus	incubation	incubation	incubation
N locations	NO	NO	NO	NO	NO	NO	8875	8875	7047	11184	11184	11184
N birds	NO	NO	NO	NO	NO	NO	144	144	139	148	148	148

Manx Shearwater	Q1						Q2					
Iceland Shelf & Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	migration	migration	migration	pre-breed	pre-breed	pre-laying exodus	incubation	incubation
N locations	NO	NO	NO	NO	2279	2279	2279	1938	1938	725	1111	1111
N birds	NO	NO	NO	NO	21	21	21	20	20	19	21	21

Northern Fulmar	Q1						Q2					
North Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	pre-breed	pre-laying exodus	pre-laying exodus	incubation	incubation	incubation
N locations	31438	31438	31438	31438	31438	31438	1044	3813	3813	3238	3238	3238
N birds	68	68	68	68	68	68	53	55	55	54	54	54

Razorbill	Q1						Q2					
Iceland Shelf & Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	migration	migration	pre-breed	pre-breed	pre-breed	pre-laying	incubation	incubation
N locations	5059	5059	5059	5059	629	629	1734	1734	1734	NO	162	162
N birds	19	19	19	19	19	19	20	20	20	NO	16	16

Arctic Tern	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Sabine's Gull	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	migration	migration	migration	staging	migration	incubation	incubation
N locations	NO	NO	NO	NO	NO	1029	1029	1029	NO	1029	NA	NA
N birds	NO	NO	NO	NO	NO	8	8	8	NO	8	NA	NA
Sooty Shearwater	Q1						Q2					
Patagonian Shelf	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	winter	winter	winter	winter	winter
N locations	NO	NO	NO	NO	NO	NO	1007	4980	4980	4980	4980	4980
N birds	NO	NO	NO	NO	NO	NO	18	18	18	18	18	18
South Polar Skua	Q1						Q2					
South Shetland Is	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	breeding	breeding	breeding	breeding	breeding	breeding	migration	migration	migration	migration	winter	winter
N locations	NO	NO	NO	NO	NO	NO	4975	4975	4975	4975	5688	5688
N birds	NO	NO	NO	NO	NO	NO	32	32	32	32	32	32

Thick-billed Murre	Q1						Q2					
Arctic Canada	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	winter	winter	pre-laying	pre-laying	pre-laying
N locations	10446	10446	10446	10446	10446	10446	10446	10446	10446	NO	NO	NO
N birds	32	32	32	32	32	32	32	32	32	NO	NO	NO
Thick-billed Murre	Q1						Q2					
NW Greenland Shelf	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	winter	pre-laying	pre-laying	pre-laying	incubation
N locations	33455	33455	33455	33455	33455	33455	33455	33455	NO	NO	NO	NA
N birds	100	100	100	100	100	100	100	100	NO	NO	NO	NA
Thick-billed Murre	Q1						Q2					
Iceland Shelf & Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd

Arctic Tern	Q1						Q2					
Greenland Sea	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	winter	pre-laying	pre-laying	pre-laying	incubation
N locations	4762	4762	4762	4762	4762	4762	4762	4762	494	494	494	130
N birds	18	18	18	18	18	18	18	18	18	18	18	14
Zino's Petrel	Q1						Q2					
Canary Current	Jan_1st	Jan_2nd	Feb_1st	Feb_2nd	Mar_1st	Mar_2nd	Apr_1st	Apr_2nd	May_1st	May_2nd	Jun_1st	Jun_2nd
Stage	non-breeding	non-breeding	non-breeding	non-breeding	non-breeding	non-breeding	breeding	breeding	breeding	breeding	breeding	breeding
N locations	3278	3278	3278	3278	3278	3278	1764	1764	1764	1764	1764	1764
N birds	11	11	11	11	11	11	11	11	11	11	11	11

Table A3.4. *Breeding stages in each year quarter, for each species and LME (July-December).* NA: data not available, NO: no overlap between data and target area.

Arctic Tern	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing	migration	staging	migration	migration	migration	migration	winter	winter	winter
N locations	NA	NA	NA	1508	268	1508	1508	1508	1508	NO	NO	NO
N birds	NA	NA	NA	9	9	9	9	9	9	NO	NO	NO
Atlantic Puffin	Q3						Q4					
Celtic-Biscay Shelf	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing / exodus	exodus / winter	winter	winter	winter	winter	winter	winter	winter	winter
N locations	3777	3777	3400	3631	35669	35669	35669	35669	35669	35669	35669	35669
N birds	52	52	71	70	70	70	70	70	70	70	70	70
Atlantic Puffin	Q3						Q4					
North Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	migration	migration	winter	winter	winter	winter	winter	winter	winter	winter
N locations	1121	1121	2591	2591	10656	10656	10656	10656	10656	10656	10656	10656
N birds	40	40	40	40	40	40	40	40	40	40	40	40
Atlantic Puffin	Q3						Q4					
Iceland Shelf & Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd

Arctic Tern	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	migration	winter	winter	winter	winter	winter
N locations	179	3181	3181	3181	3181	520	520	8618	8618	8618	8618	8618
N birds	12	35	35	35	35	21	21	34	34	34	34	34
Audubon's Shearwater	Q3						Q4					
Canary Current	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	winter	winter	winter	winter	winter	winter	winter	winter	migration	pre-breed	pre-breed	pre-breed
N locations	4883	4883	4883	4883	4883	4883	4883	4883	4883	4883	4883	4883
N birds	22	22	22	22	22	22	22	22	22	22	22	22
Bermuda Petrel	Q3						Q4					
Bermuda	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	migration	migration	non-breeding	non-breeding	non-breeding	non-breeding	non-breeding	migration / pre-breed	pre-breed	pre-breed	pre-laying	pre-laying exodus
N locations	1565	1565	1565	1565	1565	1565	1565	1565	500	500	500	500
N birds	11	11	11	11	11	11	11	11	9	9	9	9
Black-legged Kittiwake	Q3						Q4					
Faroe Plateau	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing	winter	winter	winter	winter	winter	winter	winter	winter	winter
N locations	542	542	542	3314	3314	3314	3314	3314	3314	3314	3314	3314
N birds	10	10	10	10	10	10	10	10	10	10	10	10
Black-legged Kittiwake	Q3						Q4					
Iceland Shelf & Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing	winter	winter	winter	winter	winter	winter	winter	winter	winter
N locations	762	762	762	6119	6119	6119	6119	6119	6119	6119	6119	6119
N birds	14	14	14	14	14	14	14	14	14	14	14	14
Black-legged Kittiwake	Q3						Q4					
Norwegian Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing	winter	winter	winter	winter	winter	winter	winter	winter	winter

Arctic Tern	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
N locations	2350	2350	2350	20668	20668	20668	20668	20668	20668	20668	20668	20668
N birds	60	60	60	66	66	66	66	66	66	66	66	66
Black-legged Kittiwake	Q3						Q4					
Barents Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing	winter	winter	winter	winter	winter	winter	winter	winter	winter
N locations	129	129	129	18332	18332	18332	18332	18332	18332	18332	18332	18332
N birds	15	15	15	51	51	51	51	51	51	51	51	51
Black-legged Kittiwake	Q3						Q4					
North Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	migration	migration	winter	winter	winter	winter	winter	winter	winter	winter
N locations	4873	4873	6211	6211	22467	22467	22467	22467	22467	22467	22467	22467
N birds	76	76	76	76	76	76	76	76	76	76	76	76
Black-legged Kittiwake	Q3						Q4					
Celtic-Biscay Shelf	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	migration	migration	winter	winter	winter	winter	winter	winter	winter	winter
N locations	607	607	944	944	3401	3401	3401	3401	3401	3401	3401	3401
N birds	12	12	12	12	12	12	12	12	12	12	12	12

Black-legged Kittiwake	Q3						Q4					
West Spitsbergen	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	winter	winter	winter	winter	winter	winter	winter	winter	winter
N locations	NA	NA	NA	14587	14587	14587	14587	14587	14587	14587	14587	14587
N birds	NA	NA	NA	46	46	46	46	46	46	46	46	46
Bulwer's Petrel	Q3						Q4					
Canary Current	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	winter	winter	winter	winter	winter	winter

Arctic Tern	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
N locations	3349	4457	4457	4457	4457	1356	NO	NO	NO	NO	NO	NO
N birds	48	47	47	47	47	43	NO	NO	NO	NO	NO	NO

Common Murre	Q3						Q4					
Iceland Shelf & Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	migration	winter	winter	winter	winter	winter	winter	winter	winter	winter	winter
N locations	228	301	5668	5668	5668	5668	5668	5668	5668	5668	5668	5668
N birds	19	20	20	20	20	20	20	20	20	20	20	20

Cory's Shearwater	Q3						Q4					
Azores	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	migration	winter	winter
N locations	8322	8322	152193	152193	152193	152193	152193	152193	3047	3047	8190	8190
N birds	45	45	86	86	86	86	86	86	27	27	23	23

Cory's Shearwater	Q3						Q4					
Canary Current	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	migration	winter	winter
N locations	10785	10785	106058	106058	106058	106058	106058	106058	22081	22081	58244	58244
N birds	125	125	249	249	249	249	221 + 28	221 + 28	221	221	221	221

Desertas Petrel	Q3						Q4					
Canary Current	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	pre-laying exodus	incubation	incubation	incubation	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	winter	winter
N locations	1424	5139	5139	5139	5139	4556	4556	4556	4556	3564	17763	17763
N birds	38	38	38	38	38	39	39	39	39	39	39	39

Great Shearwater	Q3						Q4					
Tristan Gough	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	winter	winter	winter	migration	migration	migration	pre-breeding	pre-breeding	pre-breeding	incubation	incubation	incubation
N locations	7764	7764	7764	13357	13357	13357	NO	NO	NO	NO	NO	NO
N birds	54	54	54	69	69	69	NO	NO	NO	NO	NO	NO

Arctic Tern	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Great Skua	Q3						Q4					
Iceland Shelf & Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	migration	migration	migration	migration	winter	winter	winter	winter	winter	winter
N locations	1078	1078	1560	1560	1560	1560	3024	3024	3024	3024	3024	3024
N birds	11	11	11	11	11	11	11	11	11	11	11	11
Little Auk	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	moult	moult	moult	migration	migration	winter	winter	winter	winter
N locations	NA	NA	NA	285	285	285	1664	1664	4470	4470	4470	4470
N birds	NA	NA	NA	18	18	18	18	18	18	18	18	18
Long-tailed Jaeger	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	migration	migration	migration	migration	winter	winter	winter	winter	winter
N locations	NA	226	226	1812	1812	1812	1812	4361	4361	4361	4361	4361
N birds	NA	6	6	8	8	8	8	12	12	12	12	12
Long-tailed Jaeger	Q3						Q4					
Norwegian + Barents	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	migration	migration	migration	winter	winter	winter	winter	winter	winter	winter
N locations	1150	1150	13323	13323	13323	NO	NO	NO	NO	NO	NO	NO
N birds	19	19	30	30	30	30	30	30	30	30	30	30
Manx Shearwater	Q3						Q4					
Celtic-Biscay Shelf	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	pre-migration	migration	winter	winter	winter	winter	winter
N locations	35293	35293	35293	35293	35293	NA	NO	NO	NO	NO	NO	NO
N birds	159	159	159	159	159	NA	NO	NO	NO	NO	NO	NO

Manx Shearwater	Q3						Q4					

Arctic Tern	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Iceland Shelf & Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	migration	winter	winter	winter	winter
N locations	1111	3146	3146	3146	3146	3146	2279	2279	NO	NO	NO	NO
N birds	21	21	21	21	21	21	21	21	NO	NO	NO	NO
Northern Fulmar	Q3						Q4					
North Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing	chick-rearing	winter	winter	winter	winter	winter	winter	winter	winter
N locations	8418	8418	8418	8418	31438	31438	31438	31438	31438	31438	31438	31438
N birds	59	59	59	59	68	68	68	68	68	68	68	68
Razorbill	Q3						Q4					
Iceland Shelf & Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	chick-rearing	chick-rearing	migration	migration	winter	winter	winter	winter	winter
N locations	162	NO	NO	NO	NO	629	629	5059	5059	5059	5059	5059
N birds	16	NO	NO	NO	NO	19	19	19	19	19	19	19
Sabine's Gull	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	chick-rearing	chick-rearing	chick-rearing	migration	migration	staging	staging	migration	migration	winter	winter	winter
N locations	NA	NA	NA	1029	1029	NO	NO	1029	1029	NO	NO	NO
N birds	NA	NA	NA	8	8	NO	NO	8	8	NO	NO	NO
Sooty Shearwater	Q3						Q4					
Patagonian Shelf	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	winter	winter	winter	winter	migration	migration	pre-breeding	pre-breeding	pre-laying	incubation	incubation	incubation
N locations	4980	4980	4980	4980	1007	1007	NO	NO	NO	NO	NO	NO
N birds	18	18	18	18	18	18	NO	NO	NO	NO	NO	NO
South Polar Skua	Q3						Q4					
South Shetland Is	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	winter	winter	winter	winter	migration	migration	migration	migration	breeding	breeding	breeding	breeding

Arctic Tern	Q3						Q4					
Greenland Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
N locations	5688	5688	5688	5688	4975	4975	4975	4975	NO	NO	NO	NO
N birds	32	32	32	32	32	32	32	32	NO	NO	NO	NO

Thick-billed Murre	Q3						Q4					
Arctic Canada	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	incubation	chick-rearing	chick-rearing	moult	moult	moult	winter	winter	winter	winter	winter
N locations	NA	NA	NO	NO	NO	NO	NO	10446	10446	10446	10446	10446
N birds	NA	NA	NO	NO	NO	NO	NO	32	32	32	32	32
Thick-billed Murre	Q3						Q4					
NW Greenland Shelf	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	moult	moult	moult	winter	winter	winter	winter	winter	winter
N locations	NA	NO	NO	NO	NO	NO	33455	33455	33455	33455	33455	33455
N birds	NA	NO	NO	NO	NO	NO	100	100	100	100	100	100
Thick-billed Murre	Q3						Q4					
Iceland Shelf & Sea	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	incubation	chick-rearing	chick-rearing	moult	moult	moult	winter	winter	winter	winter	winter	winter
N locations	130	596	596	577	577	577	4762	4762	4762	4762	4762	4762
N birds	14	18	18	18	18	18	18	18	18	18	18	18
Zino's Petrel	Q3						Q4					
Canary Current	Jul_1st	Jul_2nd	Aug_1st	Aug_2nd	Sep_1st	Sep_2nd	Oct_1st	Oct_2nd	Nov_1st	Nov_2nd	Dec_1st	Dec_2nd
Stage	breeding	breeding	breeding	breeding	breeding	breeding	non-breeding	non-breeding	non-breeding	non-breeding	non-breeding	non-breeding
N locations	1764	1764	1764	1764	1764	1764	3278	3278	3278	3278	3278	3278
N birds	11	11	11	11	11	11	11	11	11	11	11	11

Table A3.5. *Details of the datasets used in the original analyses and additional datasets received from SeaTrack. Details Large Marine Ecosystem (LME) of the respective dataset; minimum and maximum years of the tracking data; sample sizes; and percentage of overlap with the OSPAR ABNJ region. All tracking data is from GLS devices.*

Country	Colony	LME	NACES MPA				NACES MPA + ADDITIONAL DATA			
			Min years	Max years	N birds	% overlap	Min years	Max years	N birds	% overlap
Canada	Prince Leopold Island	Arctic Canada	2008	2009	2	2.57	2008	2009	2	2.57
Norway	Bear Island	Barents Sea	2009	2011	17	17.34	2009	2017	57	14.89
Russian Federation	Cape Krutik	Barents Sea	2009	2010	11	18.04	2009	2017	58	21.78
Norway	Hjelmsoya	Barents Sea	2009	2011	3	6.39	2009	2011	3	6.39
Norway	Hornoya	Barents Sea	2008	2010	20	10.76	2008	2017	69	19.28
United Kingdom	Rathlin	Celtic-Biscay Shelf	2009	2010	5	9.09	2009	2010	5	9.09
Faroe Islands	Faroe Islands	Faroe Plateau	2009	2010	10	12.11	2009	2017	31	13.30
Greenland	Kippaku	West Greenland Shelf	2008	2011	25	0.56	2008	2011	25	0.56
Iceland	Hafnarholmi	Iceland Shelf and Sea	2009	2011	14	13.88	2009	2011	14	13.88
Denmark	Bulbjerg	North Sea	2009	2011	13	6.91	2009	2011	13	6.91
United Kingdom	Fair Isle	North Sea	2009	2010	15	3.81	2009	2010	15	3.81
United Kingdom	Isle of May	North Sea	2007	2010	48	8.71	2007	2017	83	10.16
Norway	Anda	Norwegian Sea	2009	2011	12	9.73	2009	2017	66	15.33
Norway	Halten	Norwegian Sea	2009	2011	8	15.12	2009	2011	8	15.12
Norway	Rost	Norwegian Sea	2008	2011	46	6.61	2008	2017	97	10.67
Norway	Runde and Alesund	Norwegian Sea	NA	NA	NA	NA	2015	2017	25	14.08
Norway	Sklinna	Norwegian Sea	NA	NA	NA	NA	2014	2017	36	15.78
United Kingdom	Skomer	Celtic-Biscay Shelf	2009	2010	7	5.92	2009	2010	7	5.92
Norway	Grumant	West Spitsbergen	2009	2011	16	32.35	2009	2011	16	32.35
Norway	Kongsfjorden	West Spitsbergen	2008	2011	30	30.62	2008	2017	64	36.76
Russian Federation	Franz Josef Land	Barents Sea	NA	NA	NA	NA	2013	2017	51	49.69
Iceland	Langanes and Skjalfandi	Iceland Shelf and Sea	NA	NA	NA	NA	2014	2017	27	22.98
Russian Federation	Cape Sakhanin	Barents Sea	NA	NA	NA	NA	2015	2017	6	5.31
Svalbard and Jan Mayen	Alkefjellet	Barents Sea	NA	NA	NA	NA	2015	2017	20	58.47
Svalbard and Jan Mayen	Isfjorden	Barents Sea	NA	NA	NA	NA	2009	2017	29	48.86

Annex 3 References

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Annex 4. Maps supporting identification of the most important areas for seabirds.

Annex 4.1. Maps of important foraging areas of individual species

Maps determined by analysis of tracking data. The proportion of birds in each LME is indicated when birds from more than one LME used the Site.

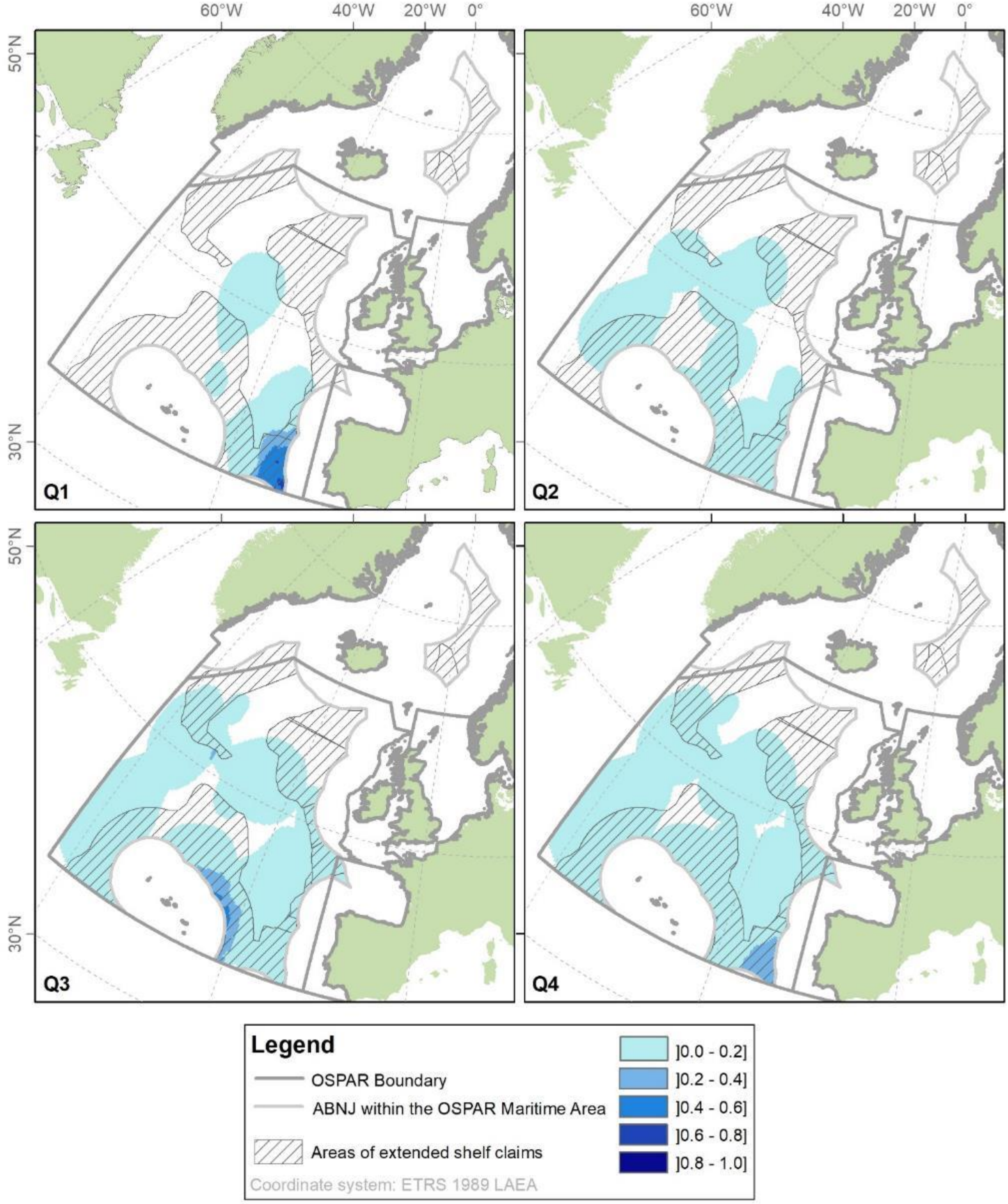


Figure A4.1-1. *Important foraging areas identified for* ***Audubon's Shearwater*** *(Puffinus lherminieri baroli)*

(European Red List Status: Near Threatened. OSPAR Listed Species). Usage identified by year quarter, based on tracking data from the Canary Current Large Marine Ecosystem.

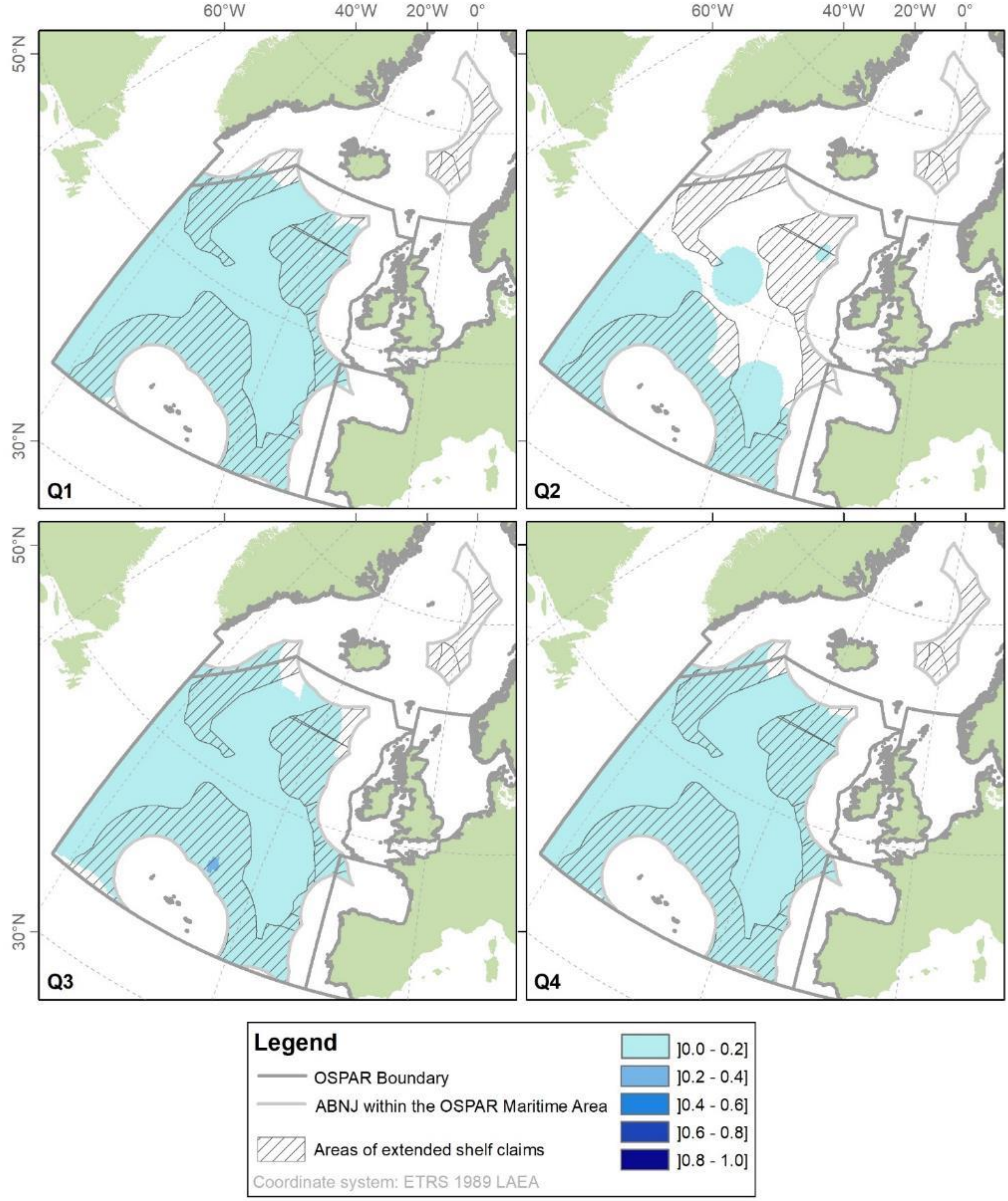


Figure A4.1-2. *Important foraging areas identified for* ***Cory's Shearwater*** *(Calonectris borealis)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Azores (0.747) and Canary Current (0.253) Large Marine ecosystems. Usage indicated by proportion of the LME populations using area.

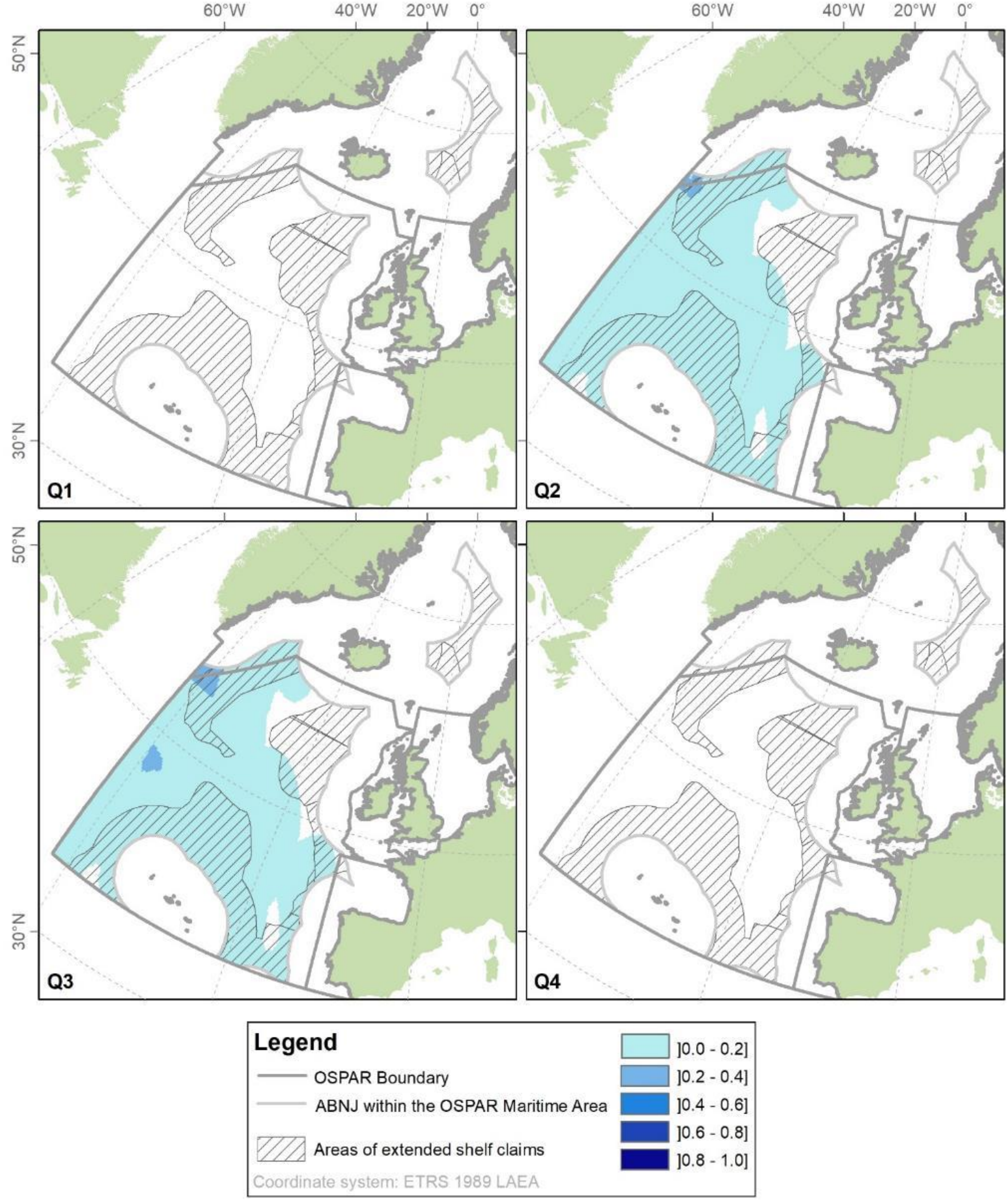


Figure A4.1-3. *Important foraging areas identified for* ***Great Shearwater*** *(Ardenna gravis)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Tristan Gough Large Marine Ecosystem.

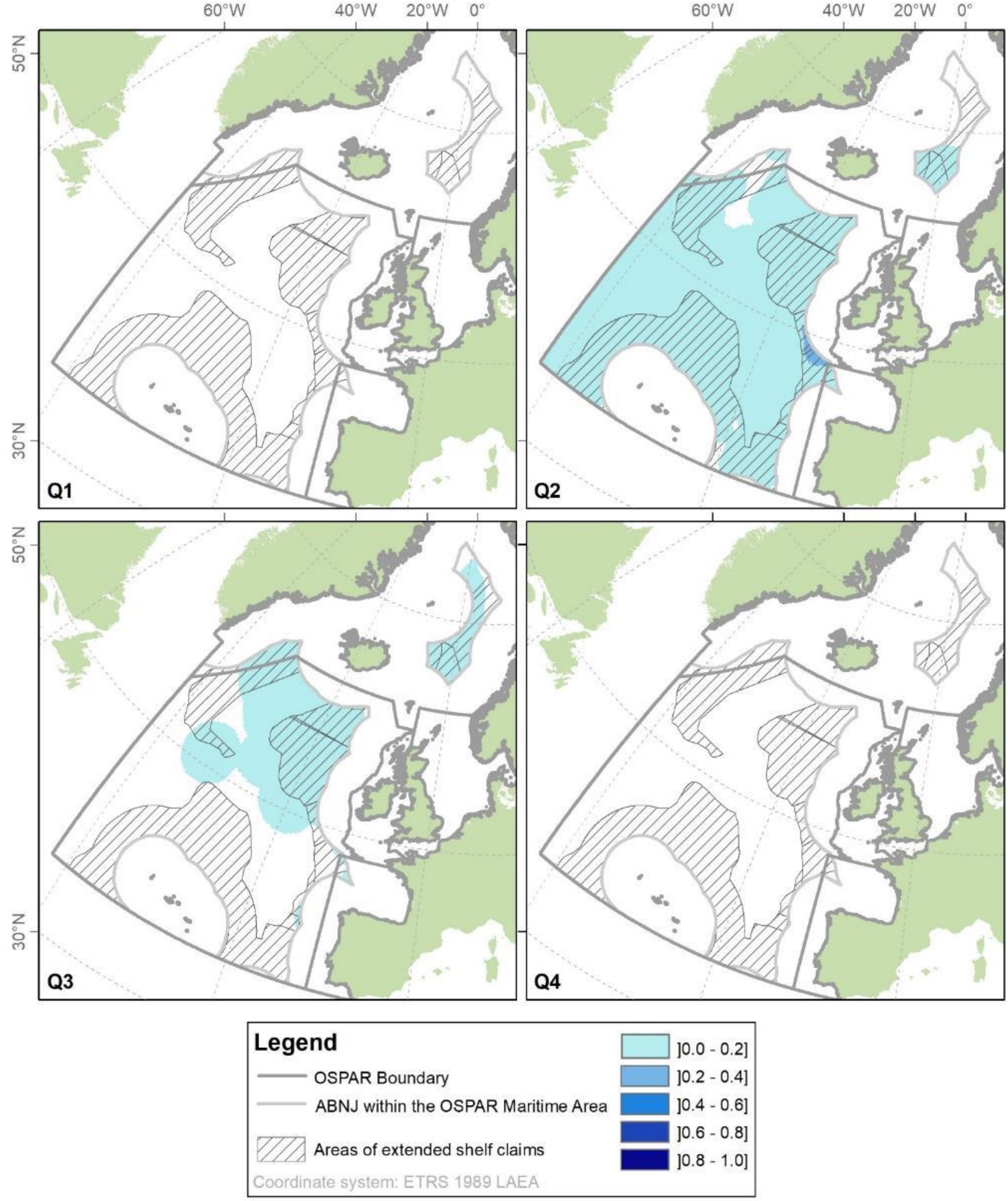


Figure A4.1-.4. *Important foraging areas identified for* ***Manx Shearwater*** *(Puffinus puffinus)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Celtic-Biscay Shelf (0.980) and Iceland Shelf and Sea (0.020). Usage indicated by proportion of the LME populations using area.

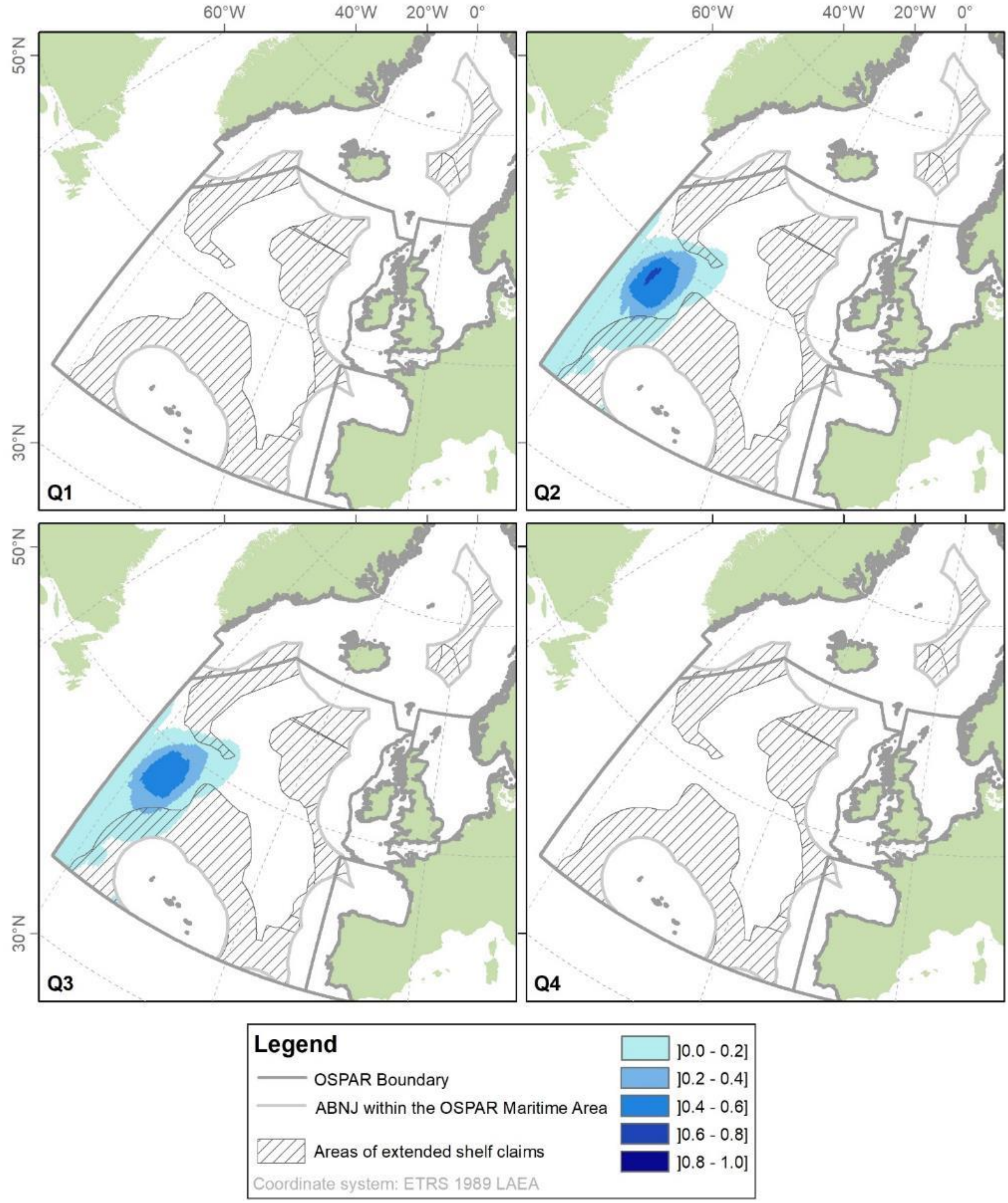


Figure A4.1-5. *Important foraging areas identified for* ***Sooty Shearwater*** *(Ardenna grisea)*

(Global Red List Status: Near Threatened). Usage identified by year quarter, based on tracking data from the Patagonian Shelf Large Marine Ecosystem.

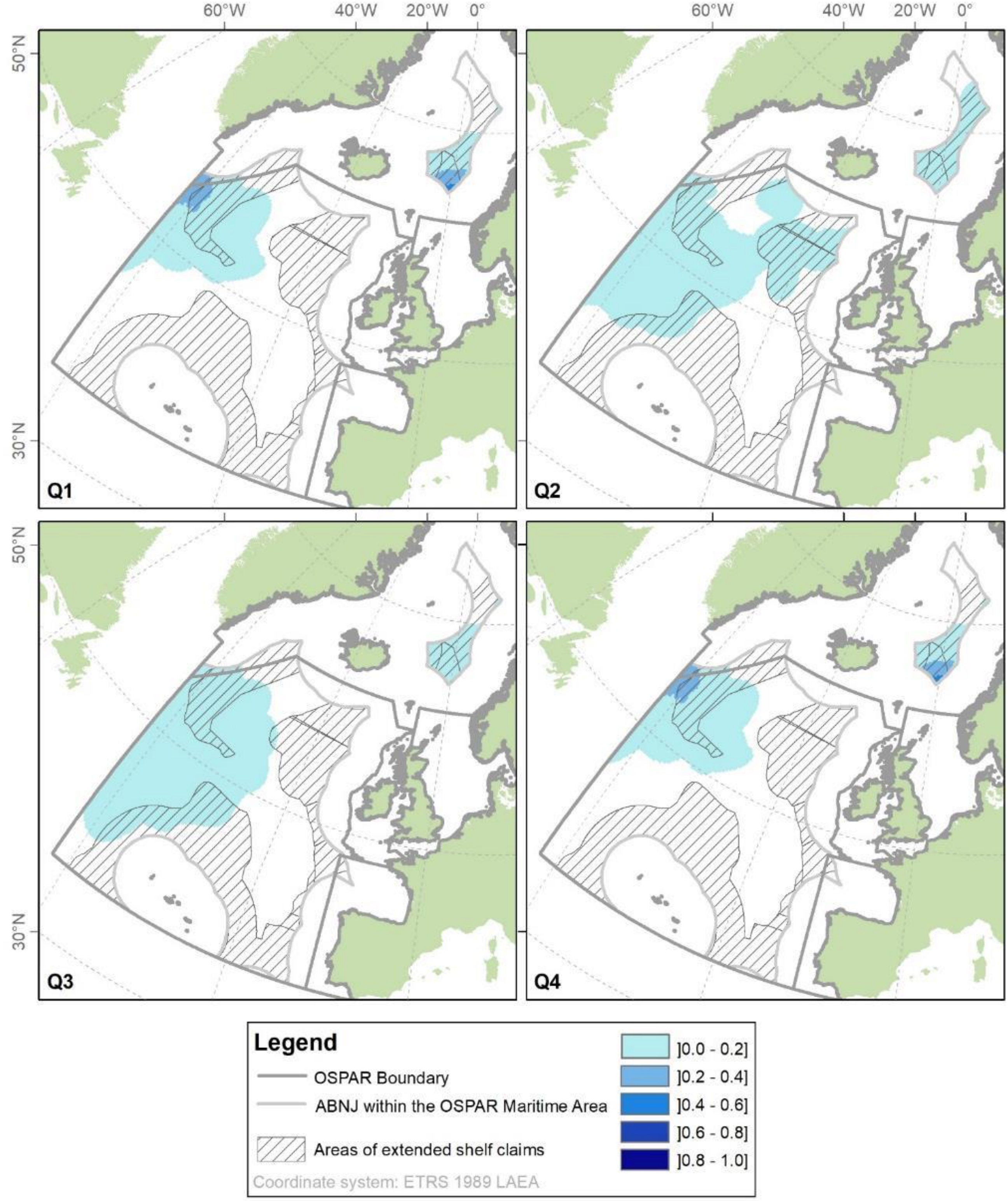


Figure A4.1-6. *Important foraging areas identified for* ***Northern Fulmar*** *(Fulmarus glacialis)*

(European Red List Status: Endangered). Usage identified by year quarter, based on tracking data from the North Sea Large Marine Ecosystem.

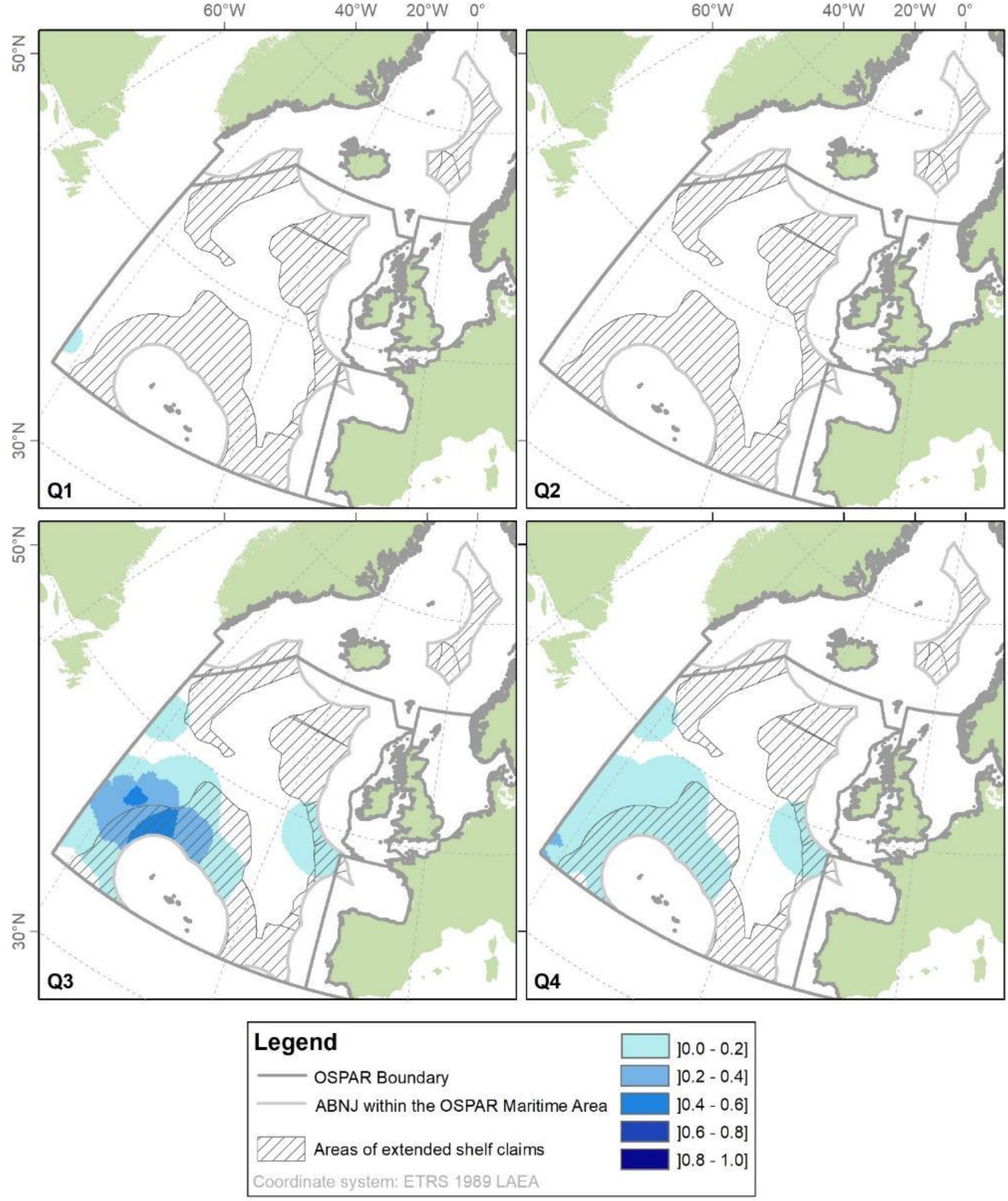


Figure A4.1-7. *Important foraging areas identified for* ***Bermuda's Petrel*** *(Pterodroma cahow)*

(Global Red List Status: Endangered). Usage identified by year quarter, based on tracking data from the Bermuda Large Marine Ecosystem.

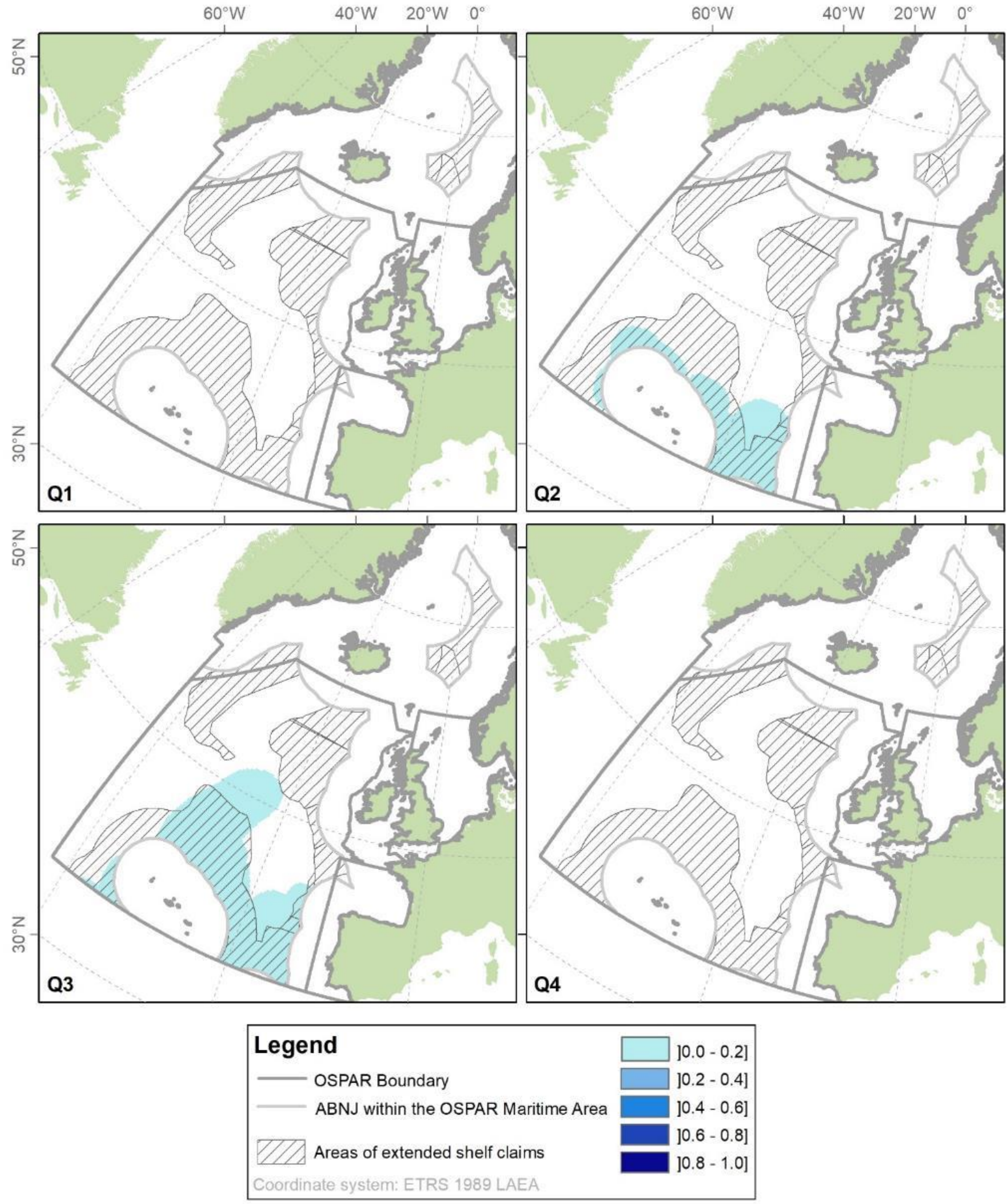


Figure A4.1-8. *Important foraging areas identified* ***for Bulwer's Petrel*** *(Bulweria bulwerii)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Canary Current Large Marine Ecosystem

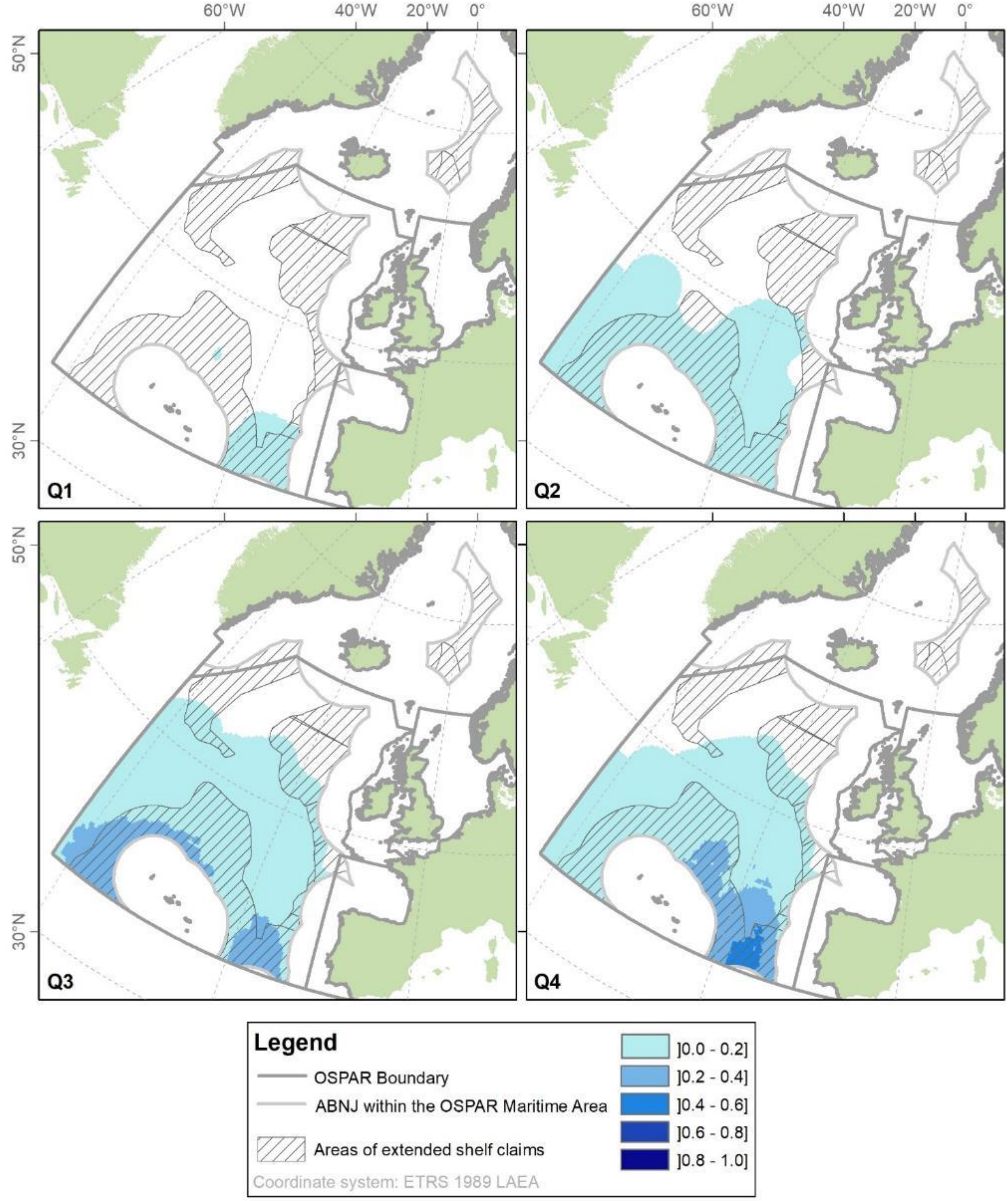


Figure A4.1-9. *Important foraging areas identified for* ***Desertas Petrel*** *(Pterodroma deserta)*

(European Red List Status: Vulnerable). Usage identified by year quarter, based on tracking data from the Canary Current Large Marine Ecosystem.

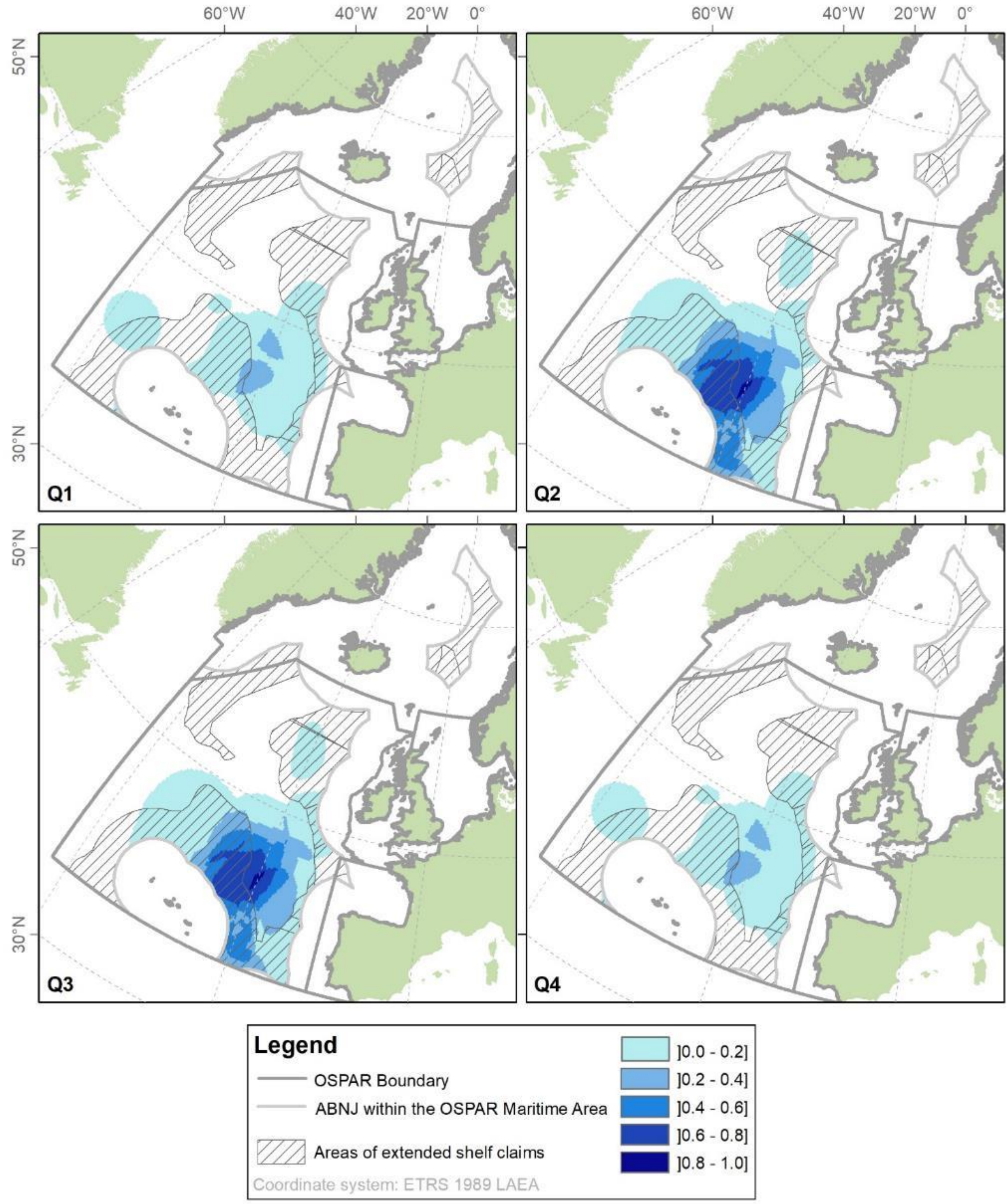


Figure A4.1-10. *Important foraging areas identified for* ***Zino's Petrel*** *(Pterodroma madeira)*

(Global Red List Status: Endangered). Usage identified by year quarter, based on tracking data from the Canary Current Large Marine Ecosystem.

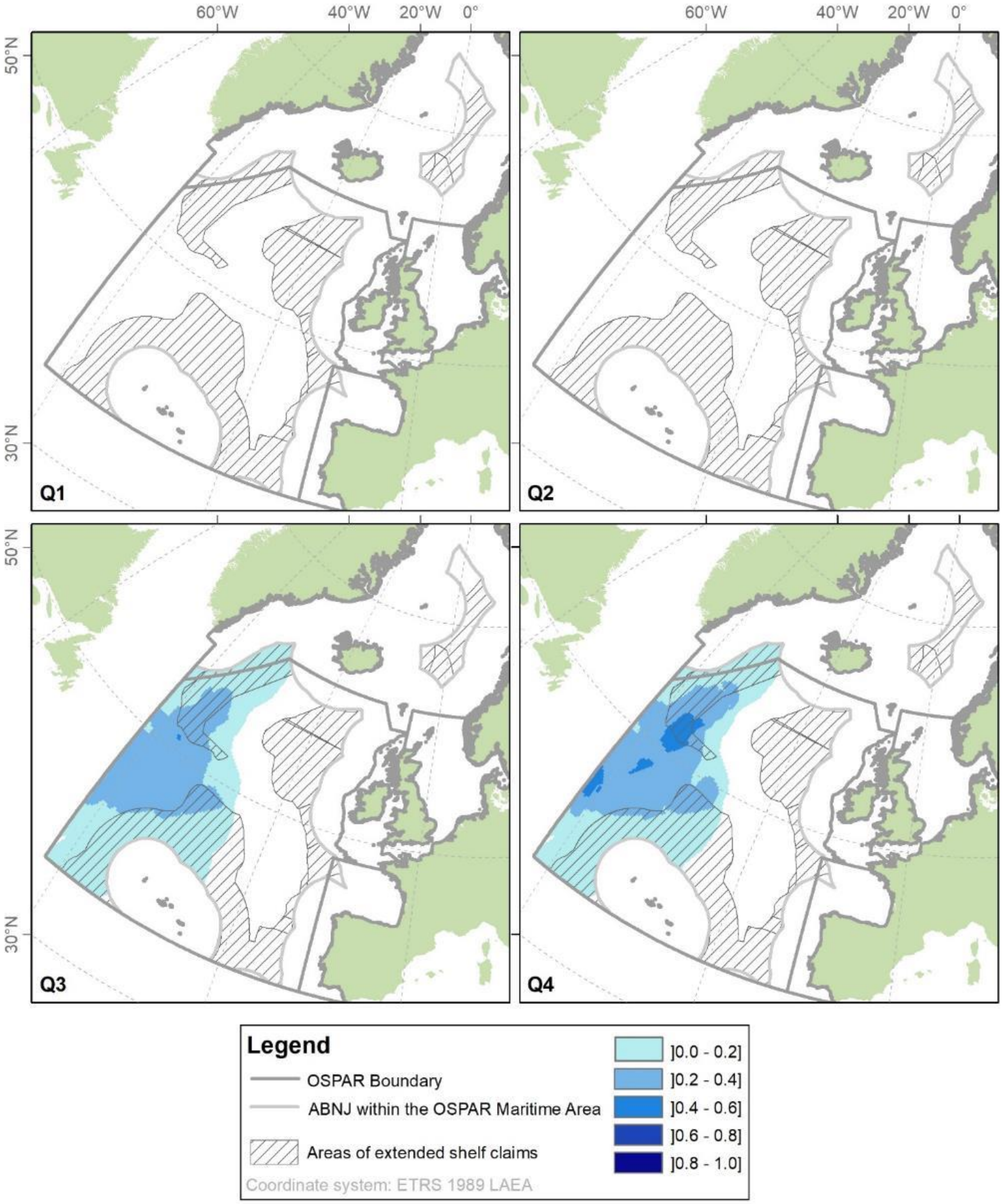


***Figure A4.1-11**. Important foraging areas identified for **Arctic Tern** (Sterna paradisaea)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Greenland Large Marine Ecosystem.

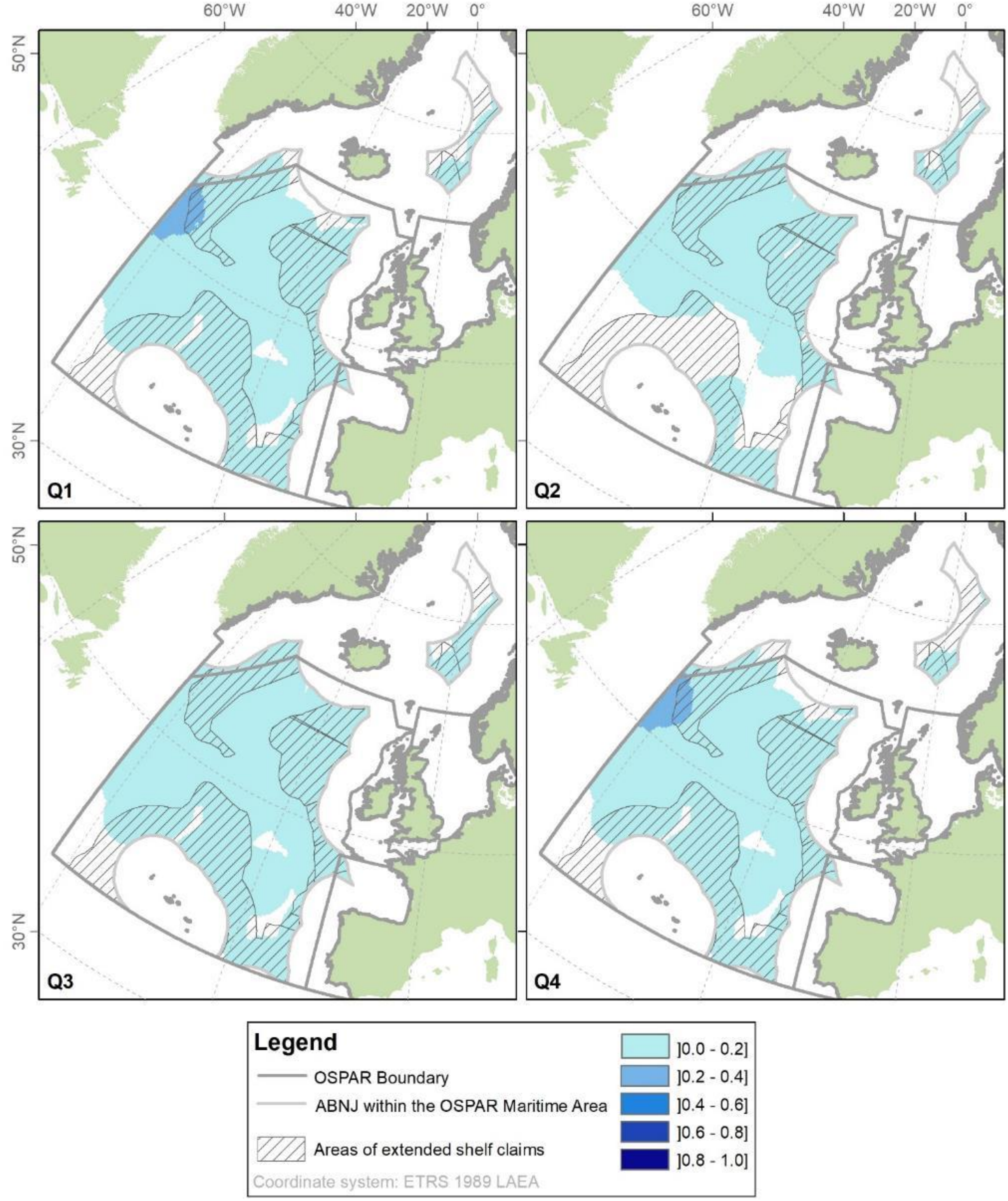


Figure A4.1-12. *Important foraging areas identified for* ***Black-legged Kittiwake*** *(Rissa tridactyla)*

(European Red List status: Vulnerable. OSPAR Listed Species) Usage identified by year quarter, based on tracking data from the following Large Marine Ecosystems: (Quarters 1, 3 and 4) Barents Sea (0.282), Faroe Plateau (0.084), Iceland Shelf and Sea (0.304), Norwegian Sea (0.042), West Spitsbergen (0.061), North Sea (0.163) and Celtic-Biscay Shelf (0.064) (Q2) Barents Sea (0.301), Faroe Plateau (0.089), Iceland Shelf and Sea (0.324), Norwegian Sea (0.045), North Sea (0.173) and Celtic-Biscay Shelf (0.068). Usage indicated by proportion of the LME populations using area.

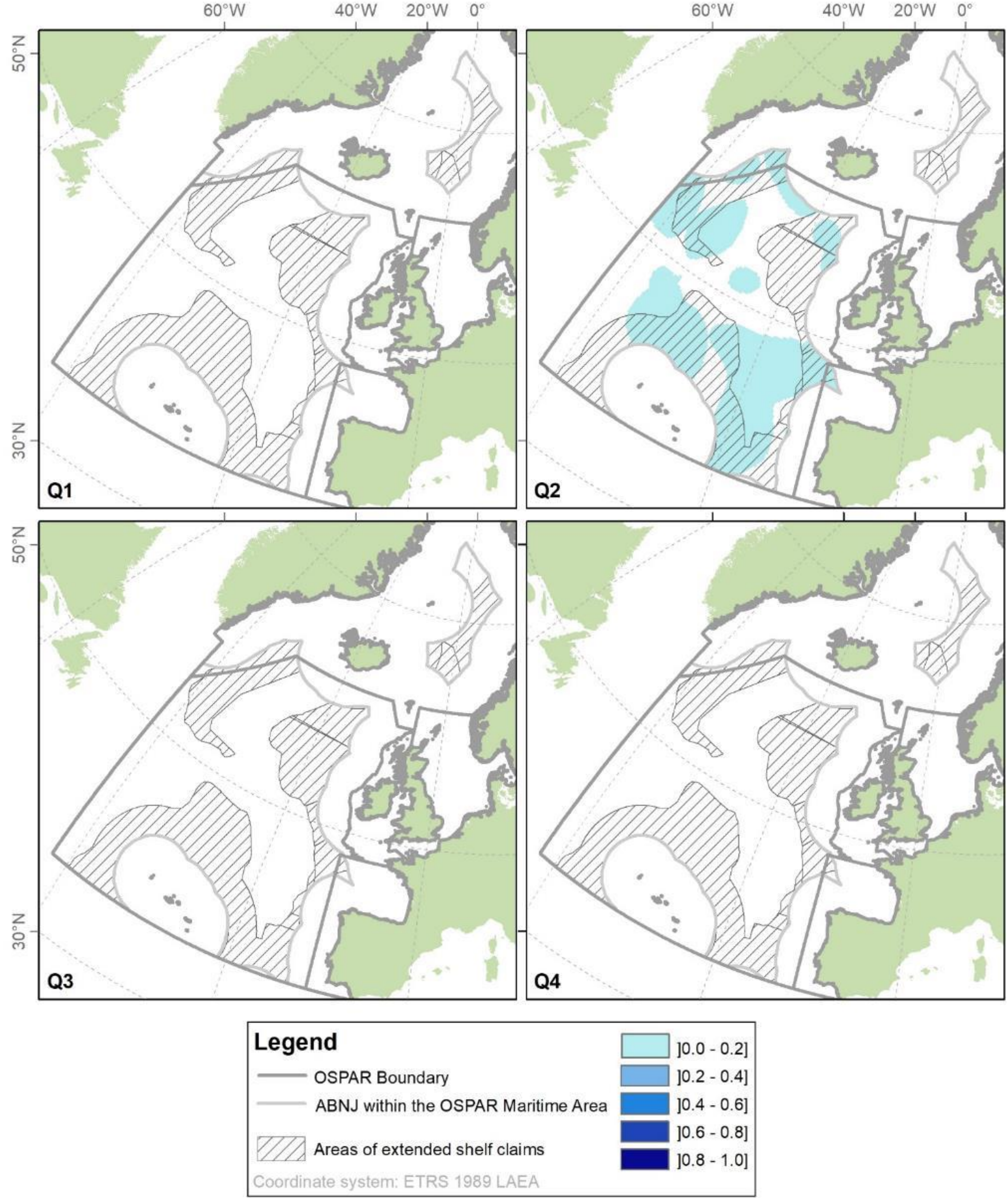


Figure A4.1-13. *Important foraging areas identified for* ***Sabine's Gull*** *(Xema sabini)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Greenland Sea Large Marine Ecosystem

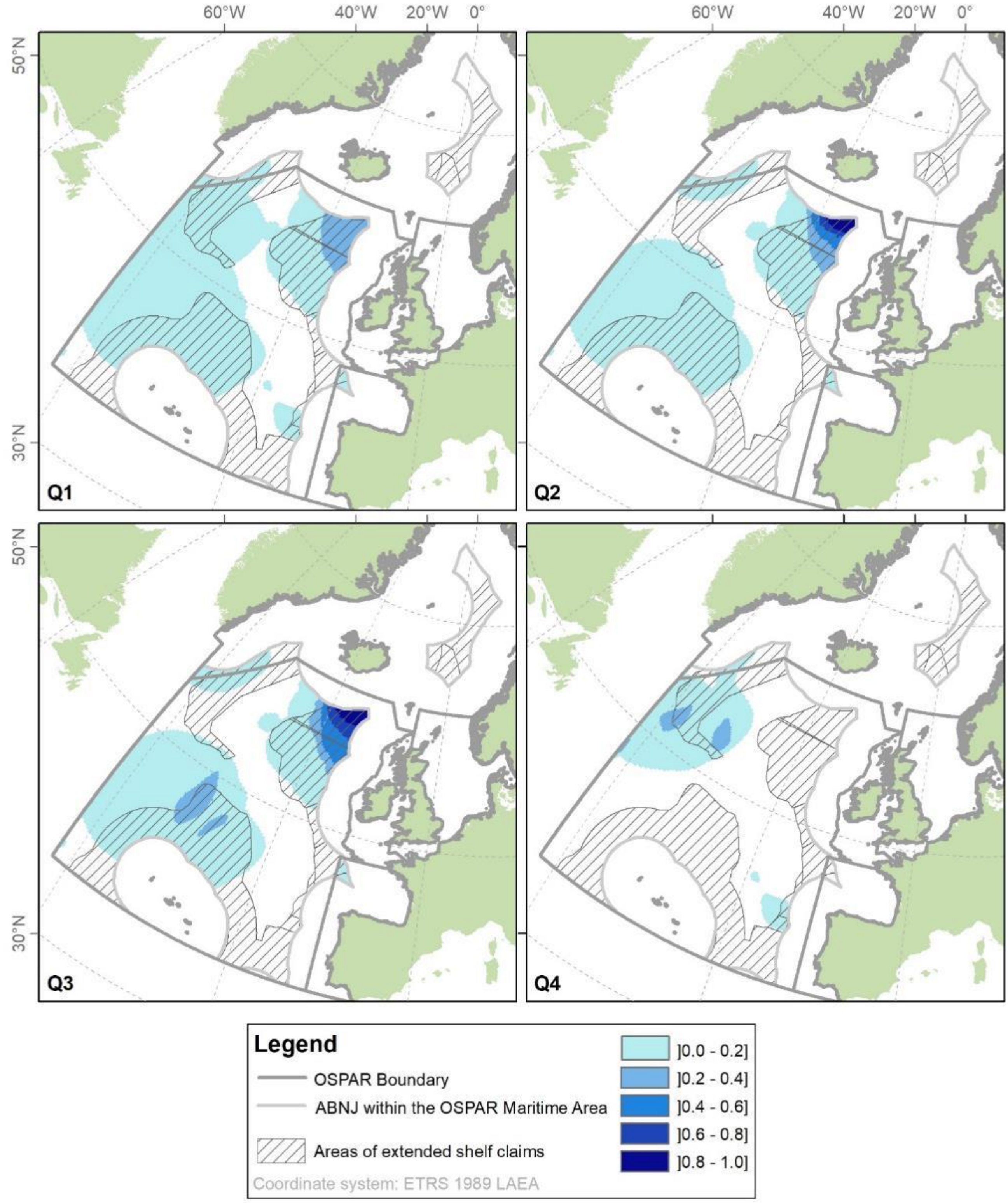


Figure A4.1-14. *Important foraging areas identified for* ***Great Skua*** *(Stercorarius skua)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Iceland Shelf and Sea.

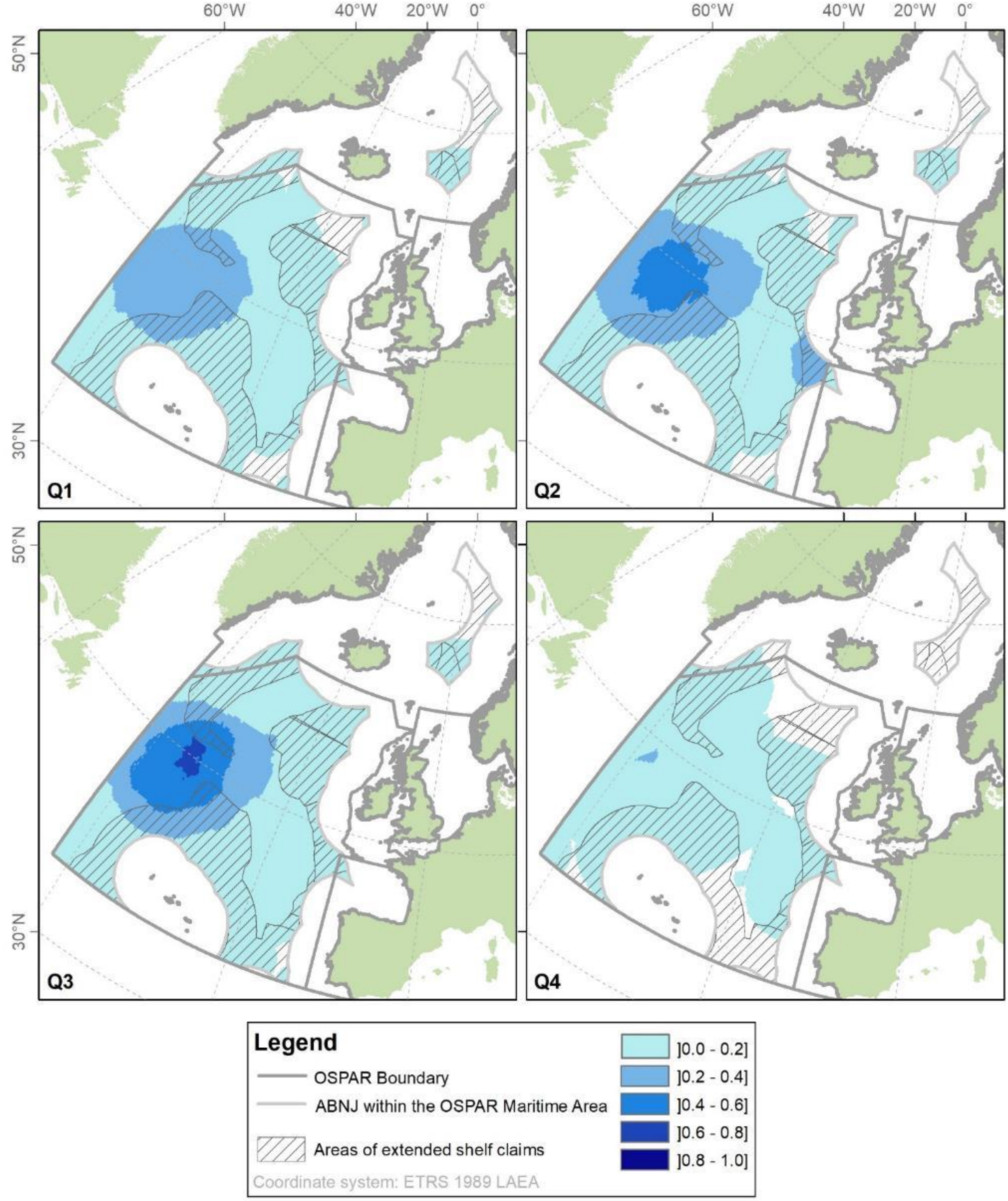


Figure A4.1-15. *Important foraging areas identified for* ***Long-tailed Jaeger*** *(Stercorarius longicaudus)* (Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Greenland Sea (0.288) and Norwegian Sea + Barents Sea (0.712). Usage indicated by proportion of the LME populations using area.

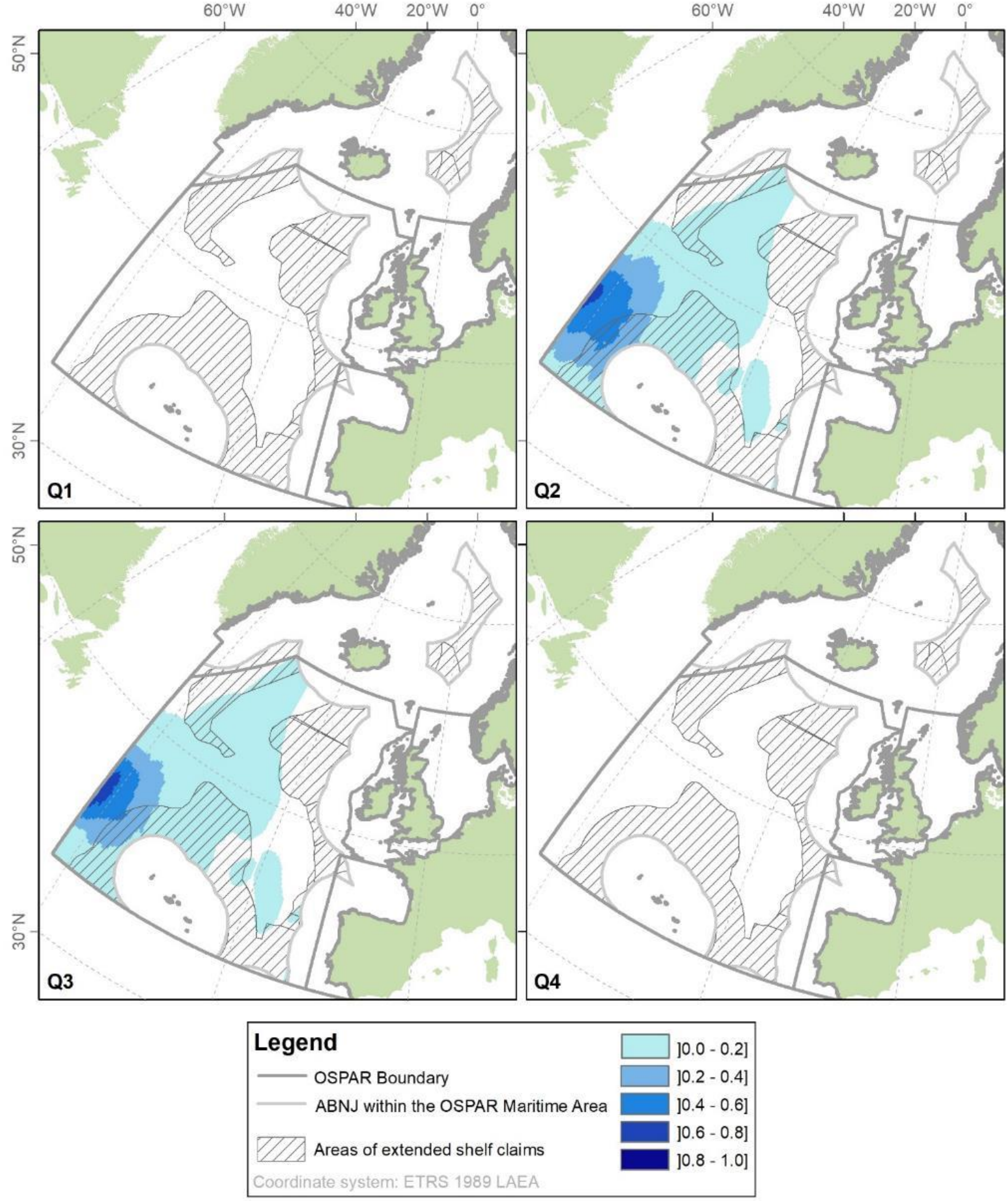


Figure A4.1-16. *Important foraging areas identified for* ***South Polar Skua*** *(Catharacta maccormicki)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the South Shetland Islands Large Marine Ecosystem.

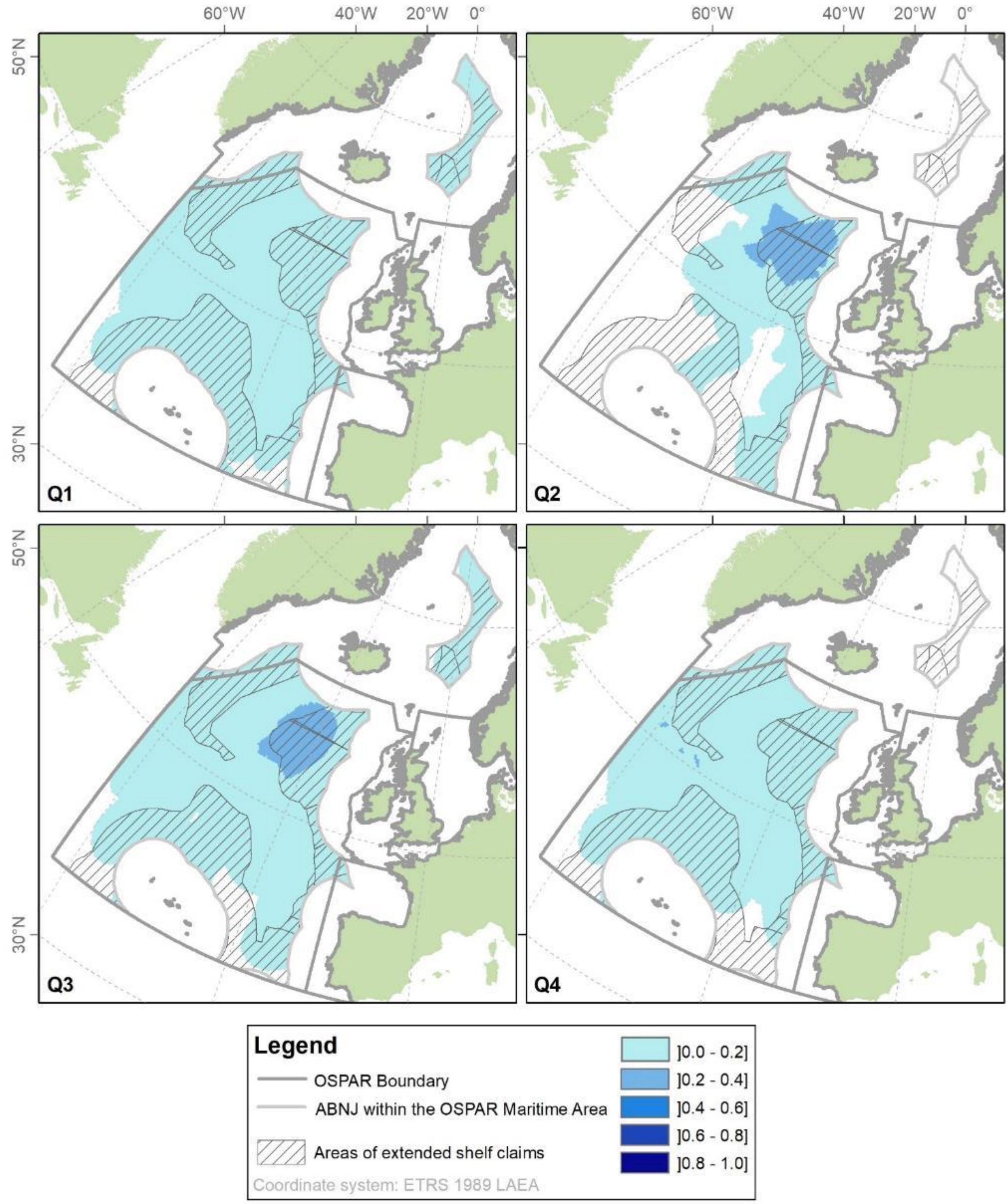


Figure A4.1-17. *Important foraging areas identified for* ***Atlantic Puffin*** *(Fratercula arctica)*

(European Red List Status: Endangered; Global Red List Status: Vulnerable). Usage identified by year quarter, based on tracking data from the following Large Marine Ecosystems: (Quarters 1, 3 and 4) Celtic-Biscay Shelf (0.109), Iceland Shelf and Sea (0.765) and North Sea (0.125) (Q2) Celtic-Biscay Shelf (0.124) and Iceland Shelf and Sea (0.875). Usage indicated by proportion of the LME populations using area.

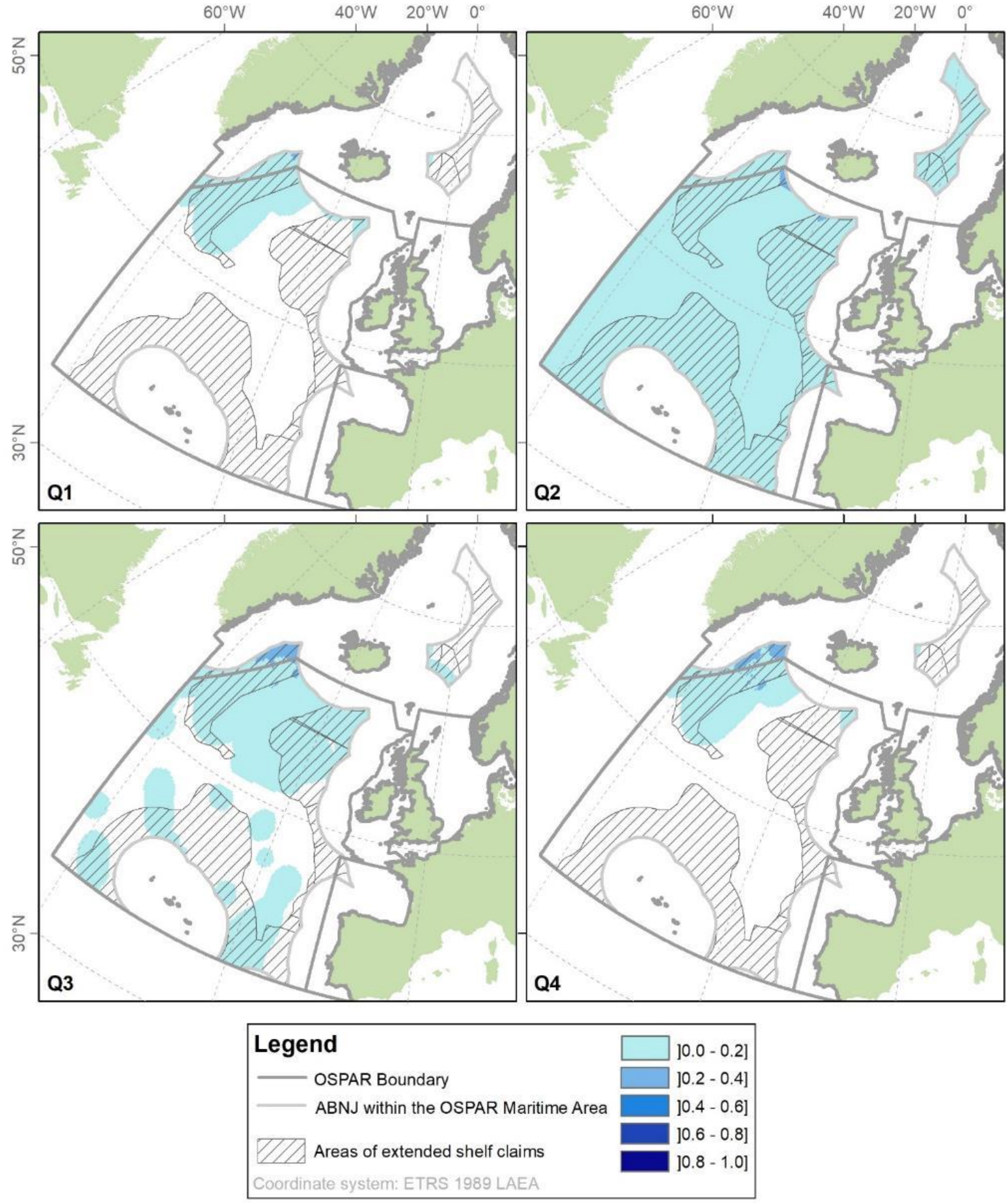


***Figure A4.1-18**. Important foraging areas identified for **Common Murre** (Uria aalge)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Iceland Shelf and Sea Large Marine Ecosystem.

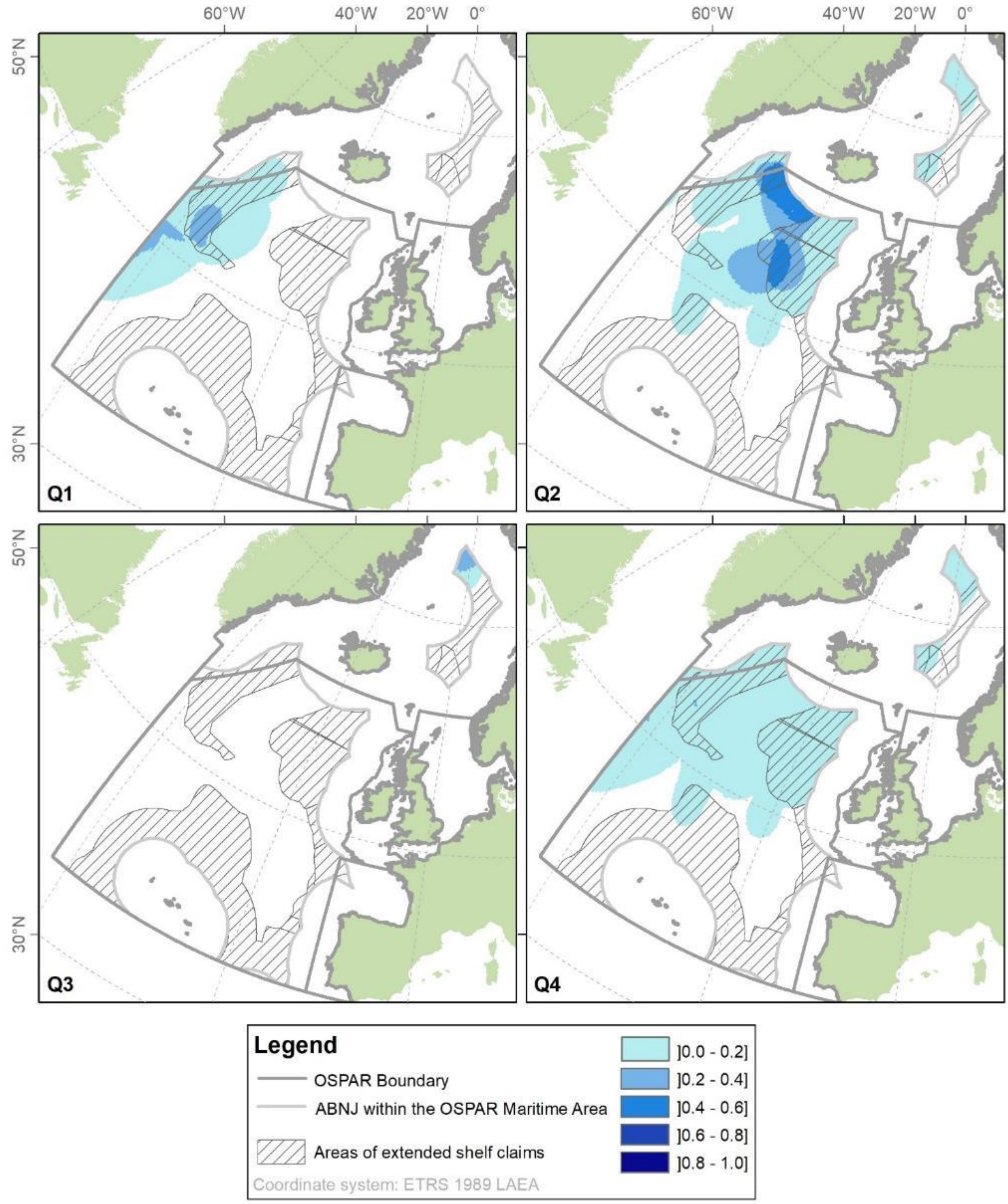


Figure A4.1-19. *Important foraging areas identified for* ***Little Auk*** *(Alle alle)*

(Global Red List Status: Least Concern). Usage identified by year quarter, based on tracking data from the Greenland Sea Large Marine Ecosystem.

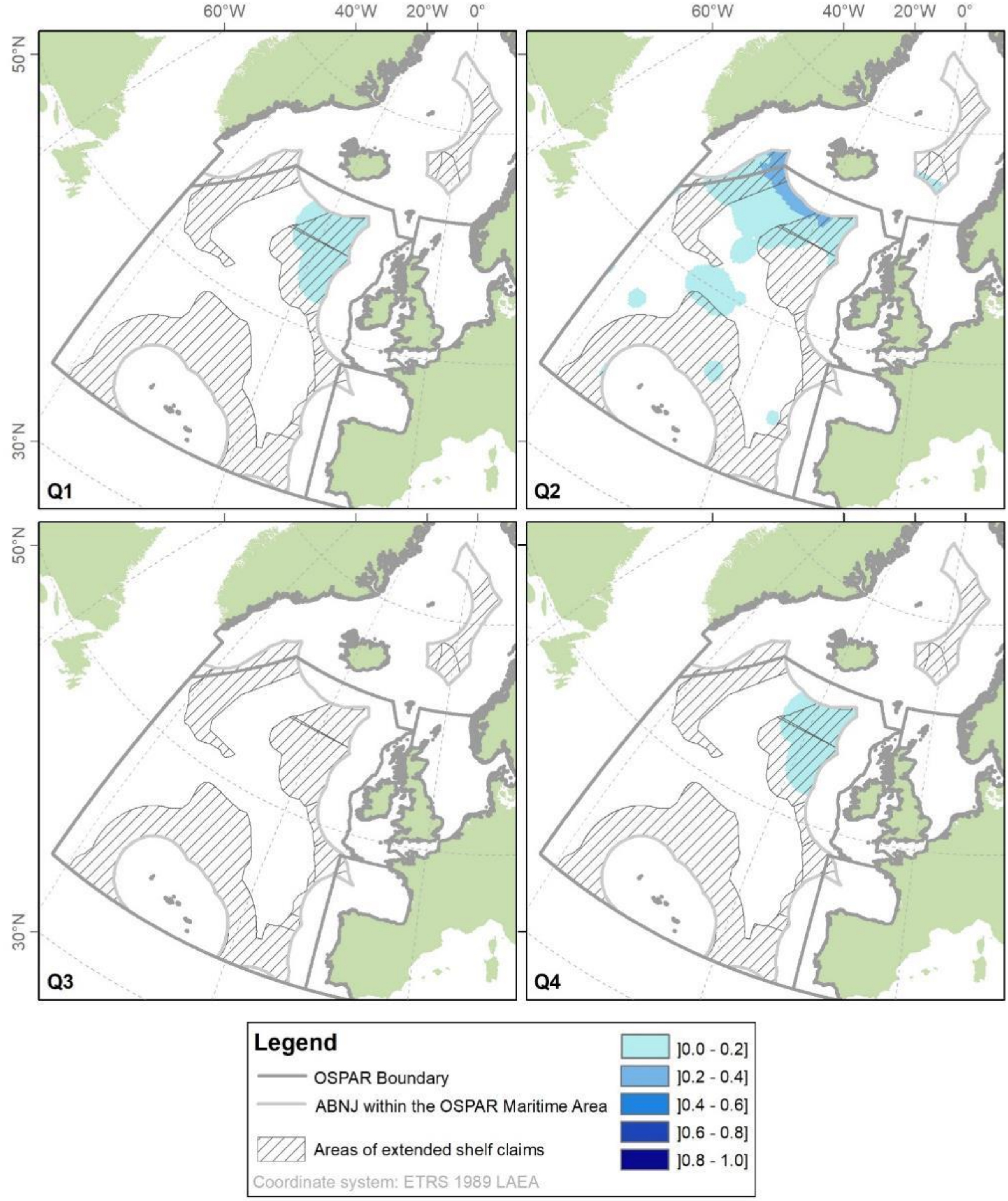


Figure A4.1-20. *Important foraging areas identified for* ***Razorbill*** *(Alca torda)*

(Global Red List Status: Near Threatened). Usage identified by year quarter, based on tracking data from the Iceland Shelf and Sea Large Marine Ecosystem.

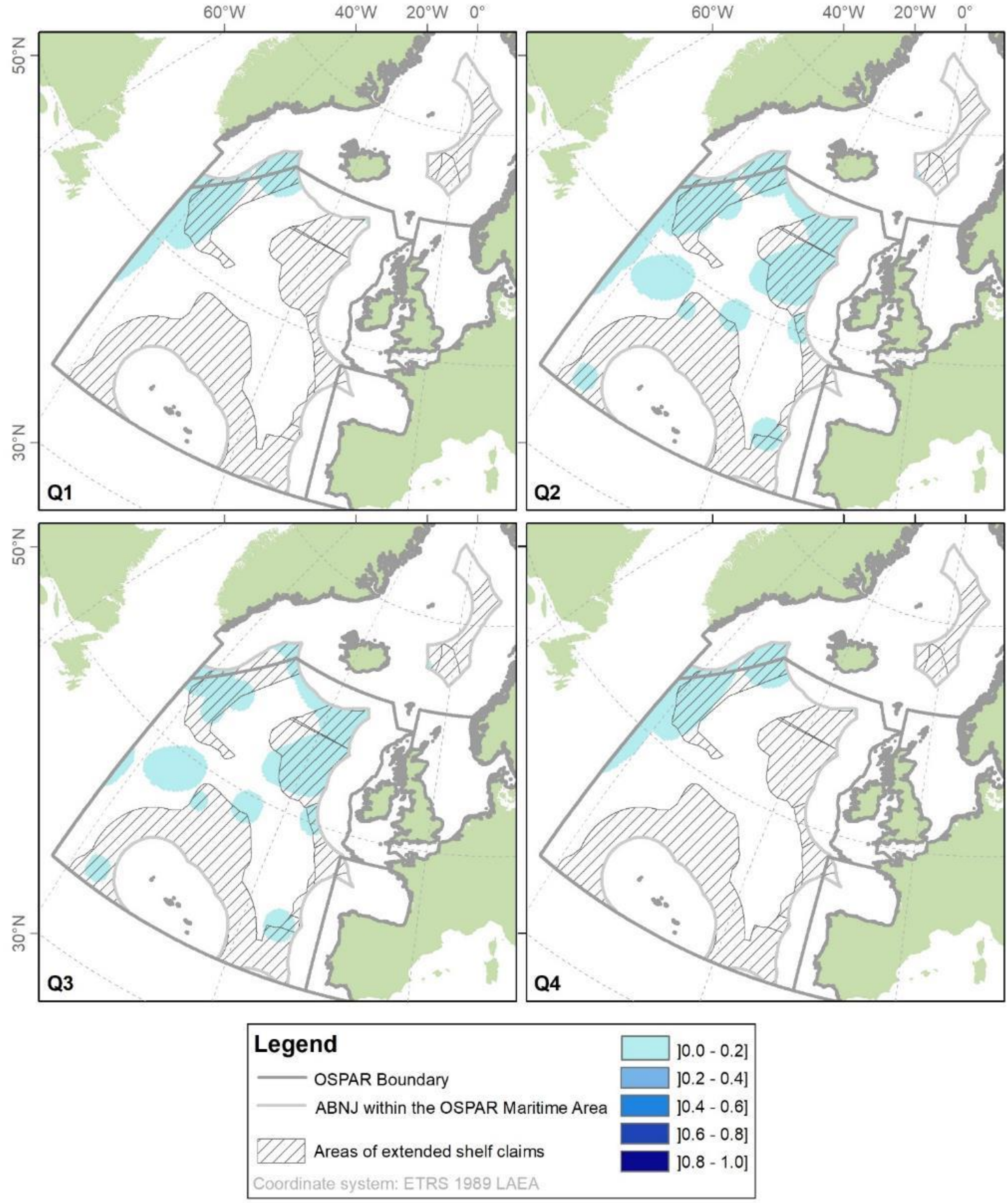


Figure A4.1-21. *Important foraging areas identified for* ***Thick-billed Murre*** *(Uria lomvia)*

(European Red List Status: Least Concern. OSPAR Listed Species). Usage identified by year quarter, based on tracking data from the following Large Marine Ecosystems: (Quarters 1 and 4) Arctic Canada (0.417), NW Greeland Shelf (0.331) and Iceland Shelf and Sea (0.252) (Q2) Arctic Canada (0.623) and Iceland Shelf and Sea (0.377) (Q3) Iceland Shelf and Sea. Usage indicated by proportion of the LME populations using area.

Annex 4.2. Maps with the estimated number of individuals in the North Atlantic Current and Evlanov Sea basin MPA

The North Atlantic Current and Evlanov Sea basin (NACES) MPA qualify as a global marine IBA (Important Bird and Biodiversity Area) candidate for all the species mapped below, following the methods and criteria detailed in Lascelles et al. (2016). Legends based on the quantiles of number of mature individuals within the Site.

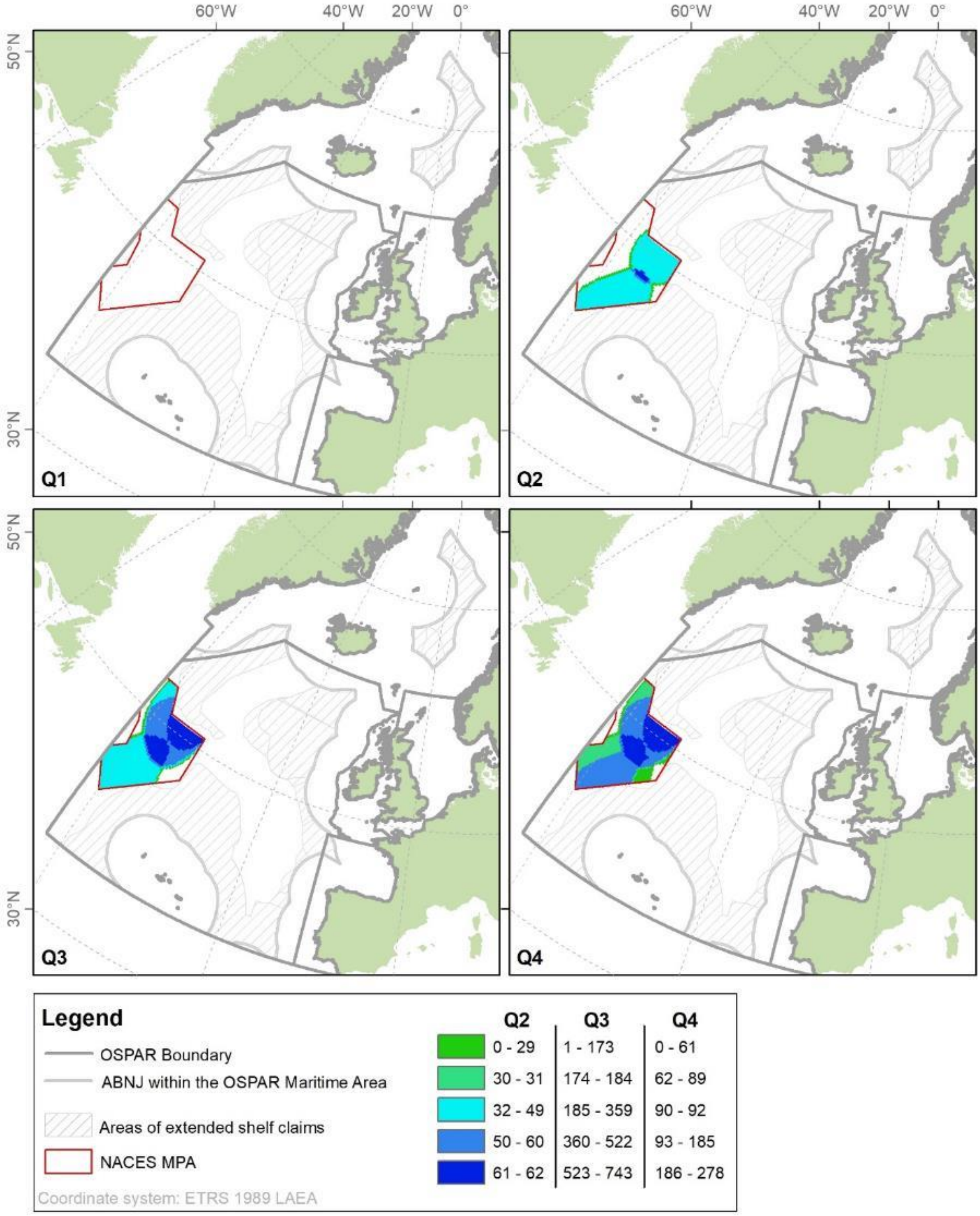


Figure A4.2-1. *Number of mature individuals of* ***Audubon's Shearwater*** *(Puffinus lherminieri baroli) in the NACES MPA for each year quarter.*

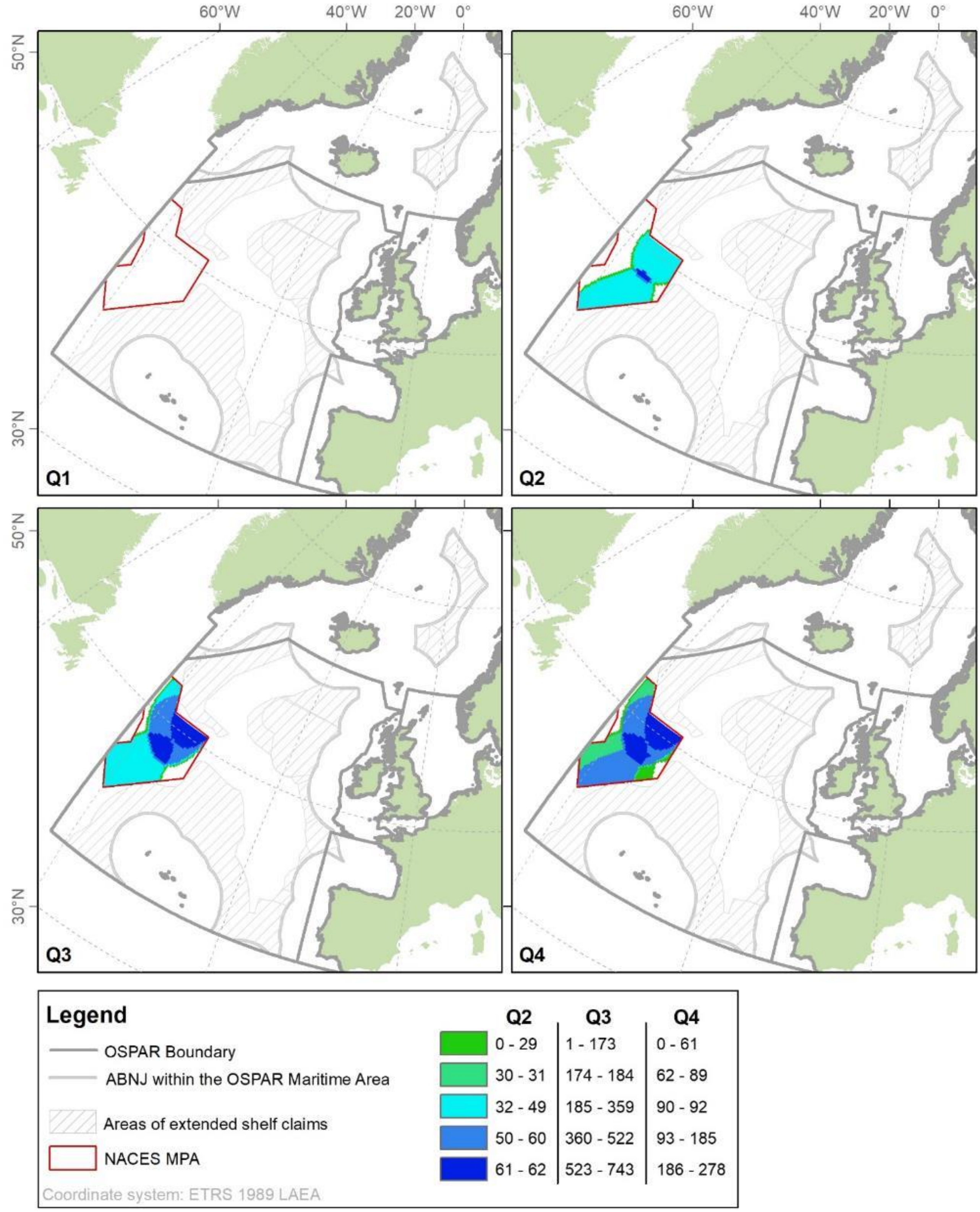
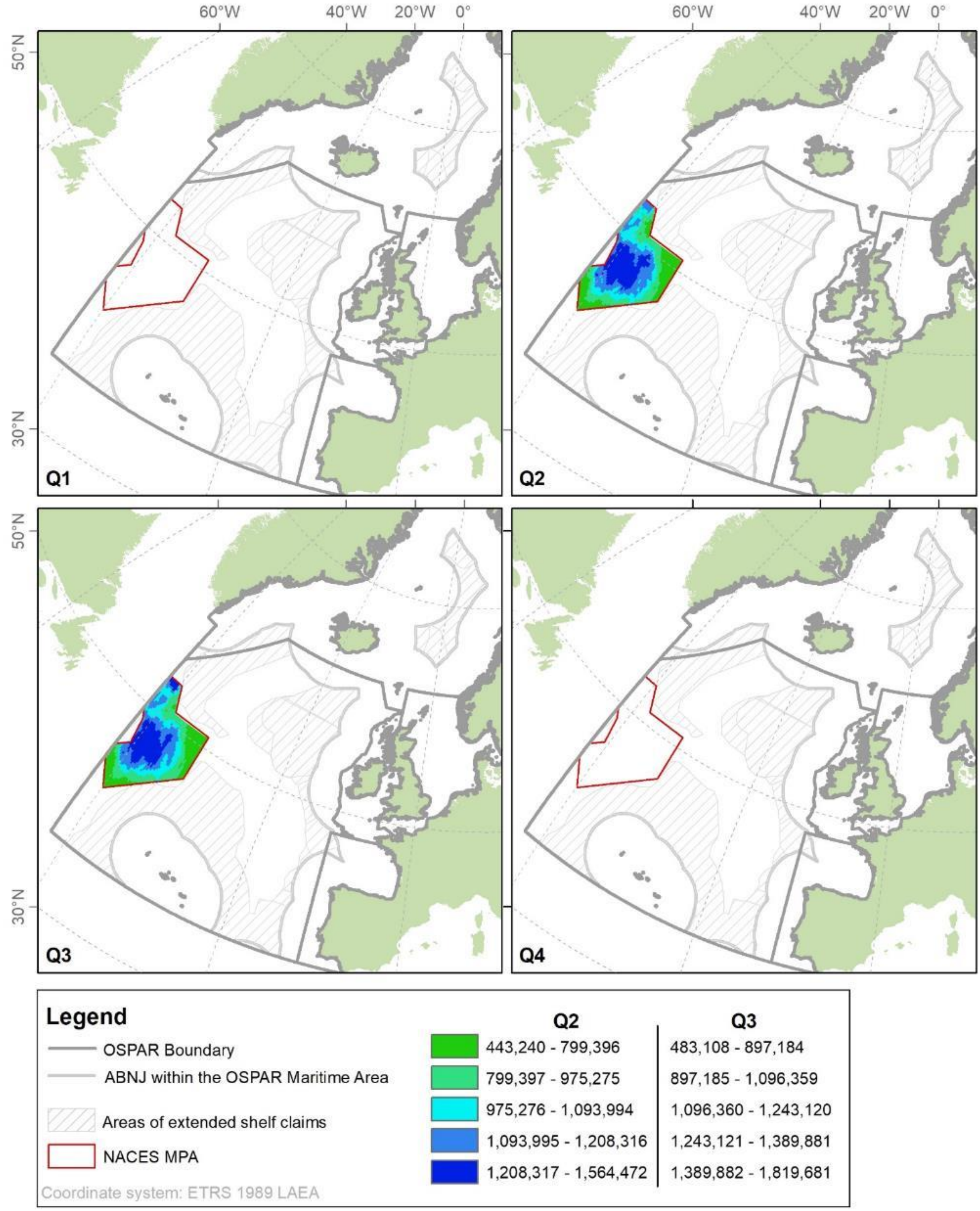


Figure A4.2-2. *Number of mature individuals of* ***Cory's Shearwater*** *(Calonectris borealis) in the NACES MPA for each year quarter.*



	Q2	Q3
🟩	443,240 - 799,396	483,108 - 897,184
🟩	799,397 - 975,275	897,185 - 1,096,359
🟦	975,276 - 1,093,994	1,096,360 - 1,243,120
🟦	1,093,995 - 1,208,316	1,243,121 - 1,389,881
🟦	1,208,317 - 1,564,472	1,389,882 - 1,819,681

Figure A4.2-3. *Number of mature individuals of* ***Great Shearwater*** *(Ardenna gravis) in the NACES MPA for each year quarter.*

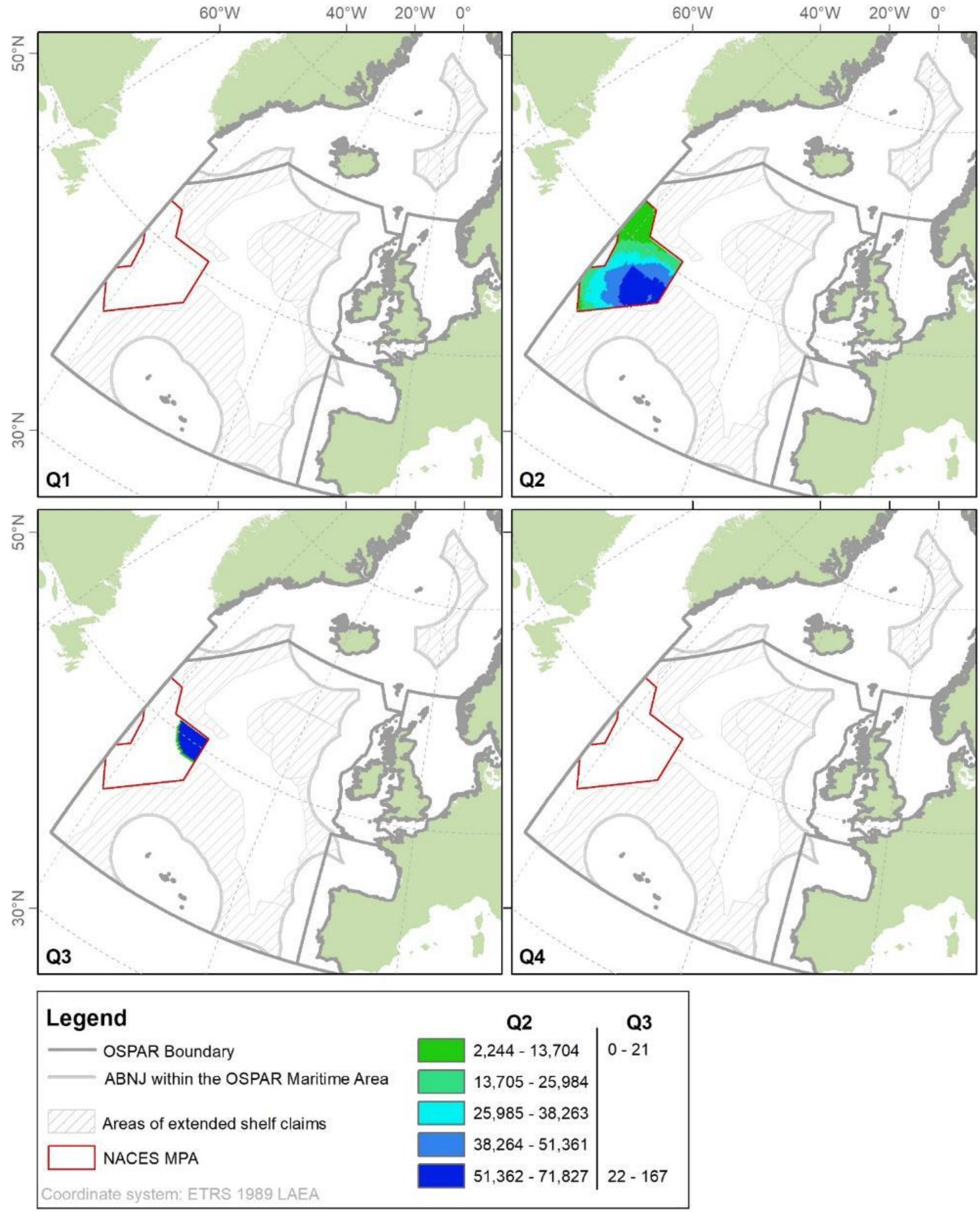


***Figure A4.2-4** Number of mature individuals of **Manx Shearwater** (Puffinus puffinus) in the NACES MPA for each year quarter.*

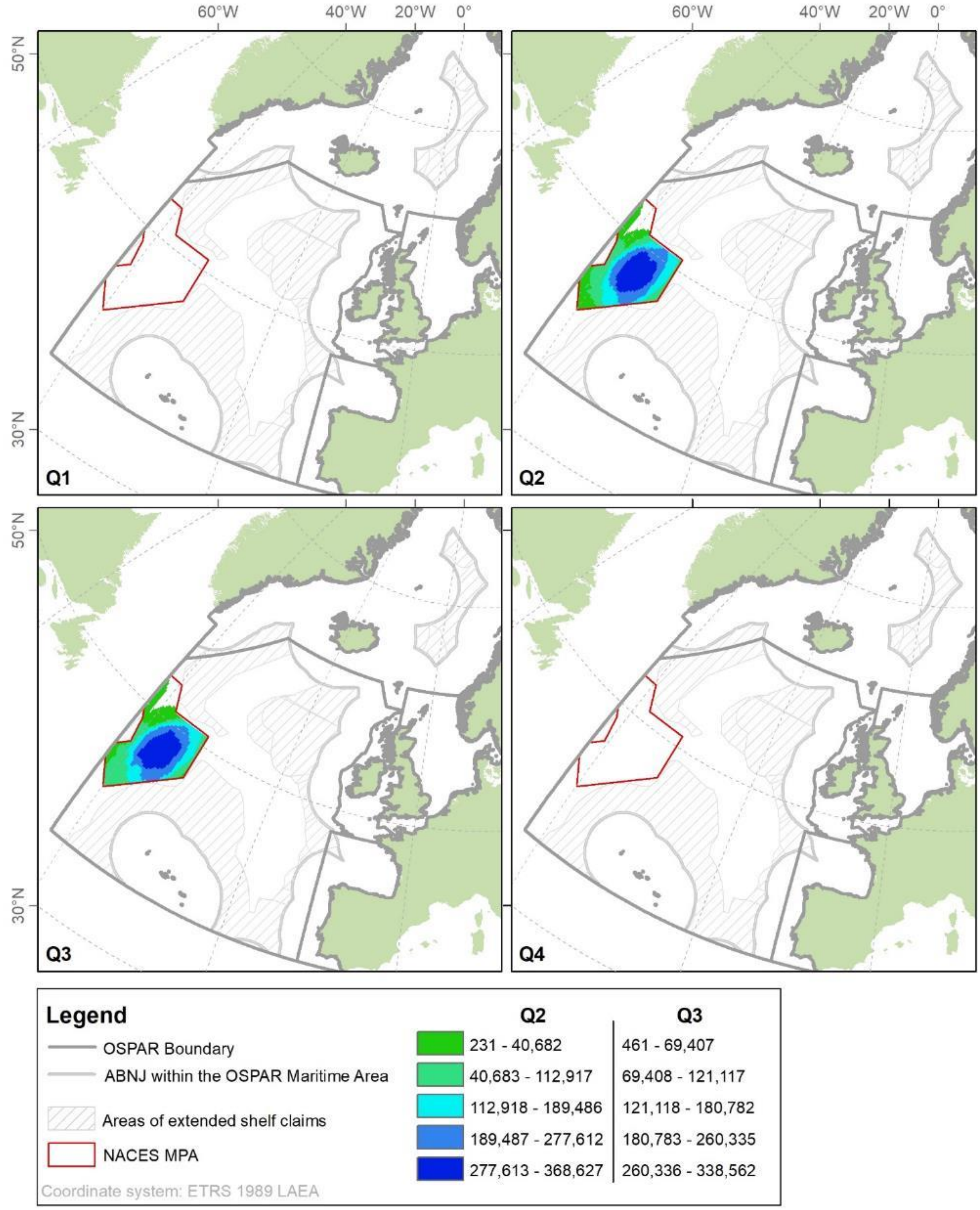


Figure A4.2-5 *Number of mature individuals of* ***Sooty Shearwater*** *(Ardenna grisea) in the NACES MPA for each year quarter.*

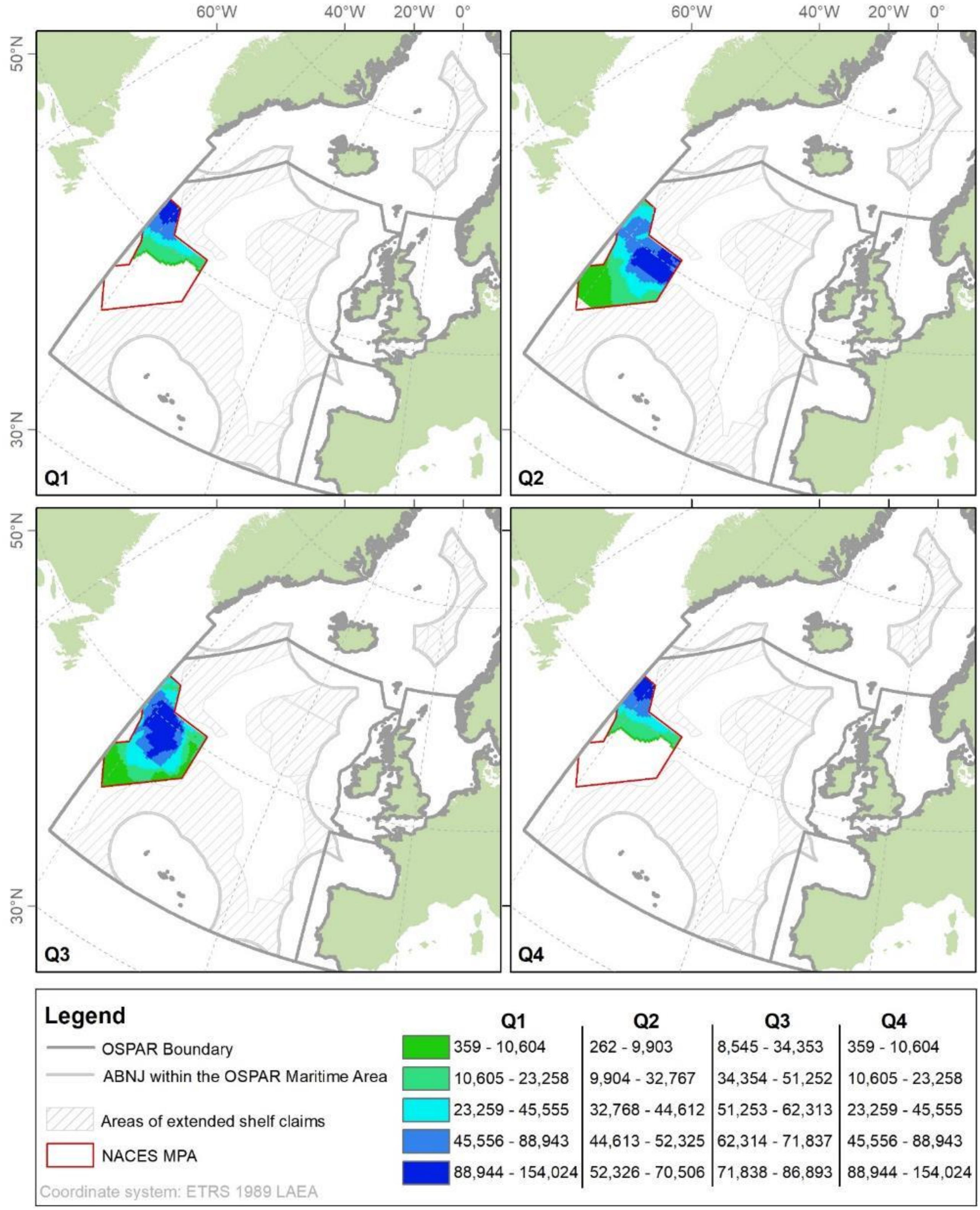


Figure A4.2-6. *Number of mature individuals of* ***Northern Fulmar*** *(Fulmarus glacialis) in the NACES MPA for each year quarter*

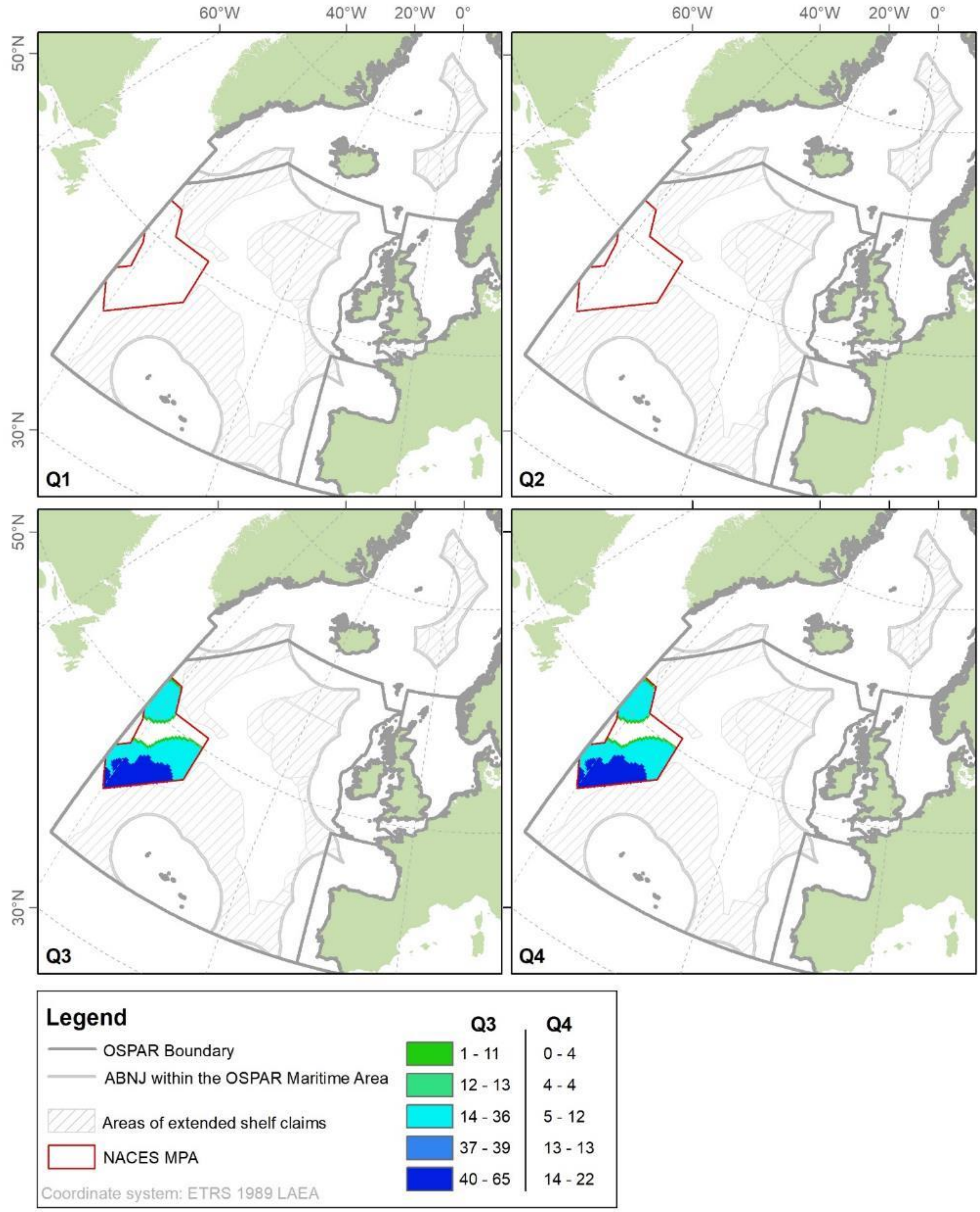


Figure A4.2-7. *Number of mature individuals of* ***Bermuda Petrel*** *(Pterodroma cahow) in the NACES MPA for each year quarter.*

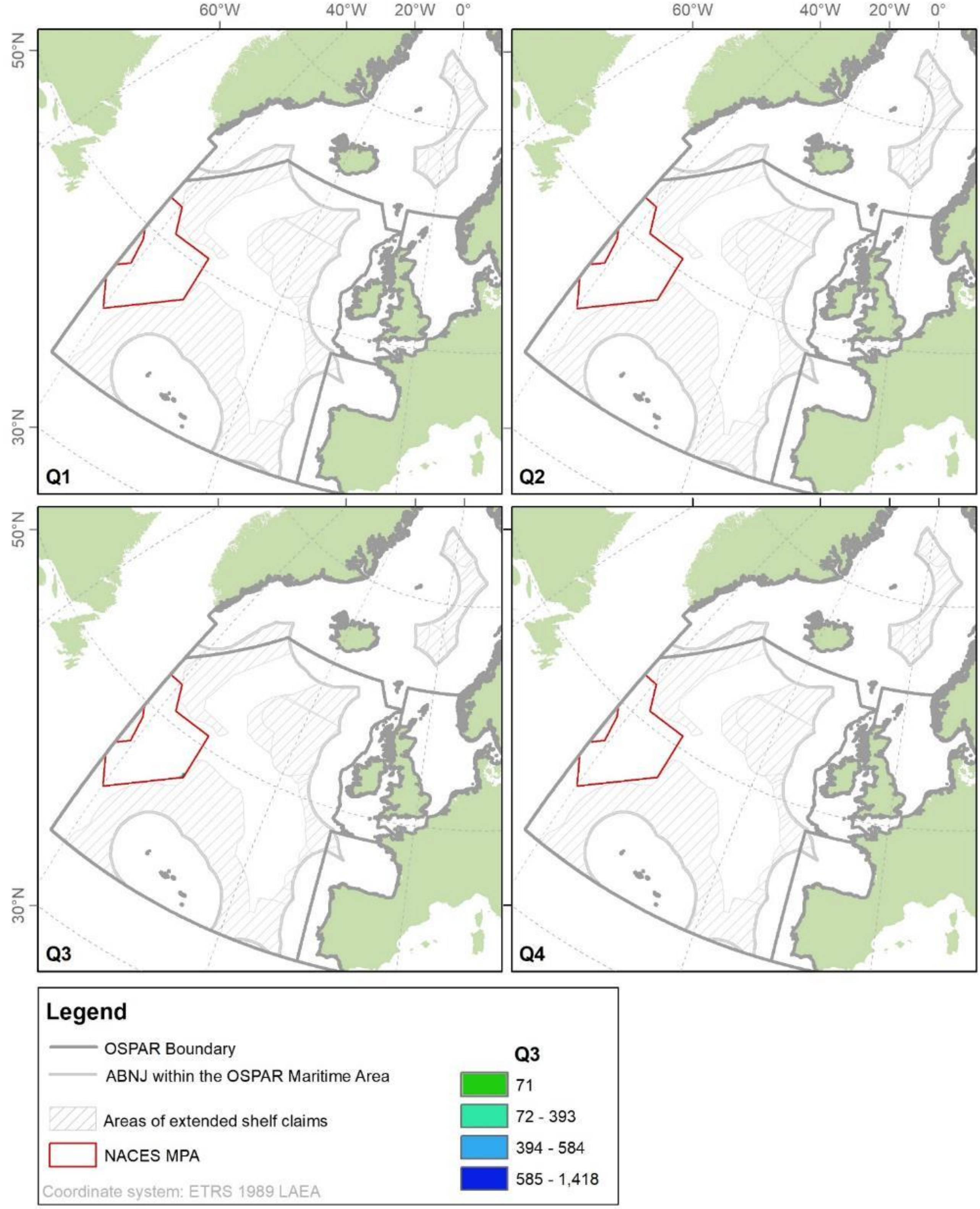


Figure A4.2-8. *Number of mature individuals of* ***Bulwer's Petrel*** *(Bulweria bulwerii) in the NACES MPA for each year quarter. Note, birds are located at the eastern boarder during Q3.*

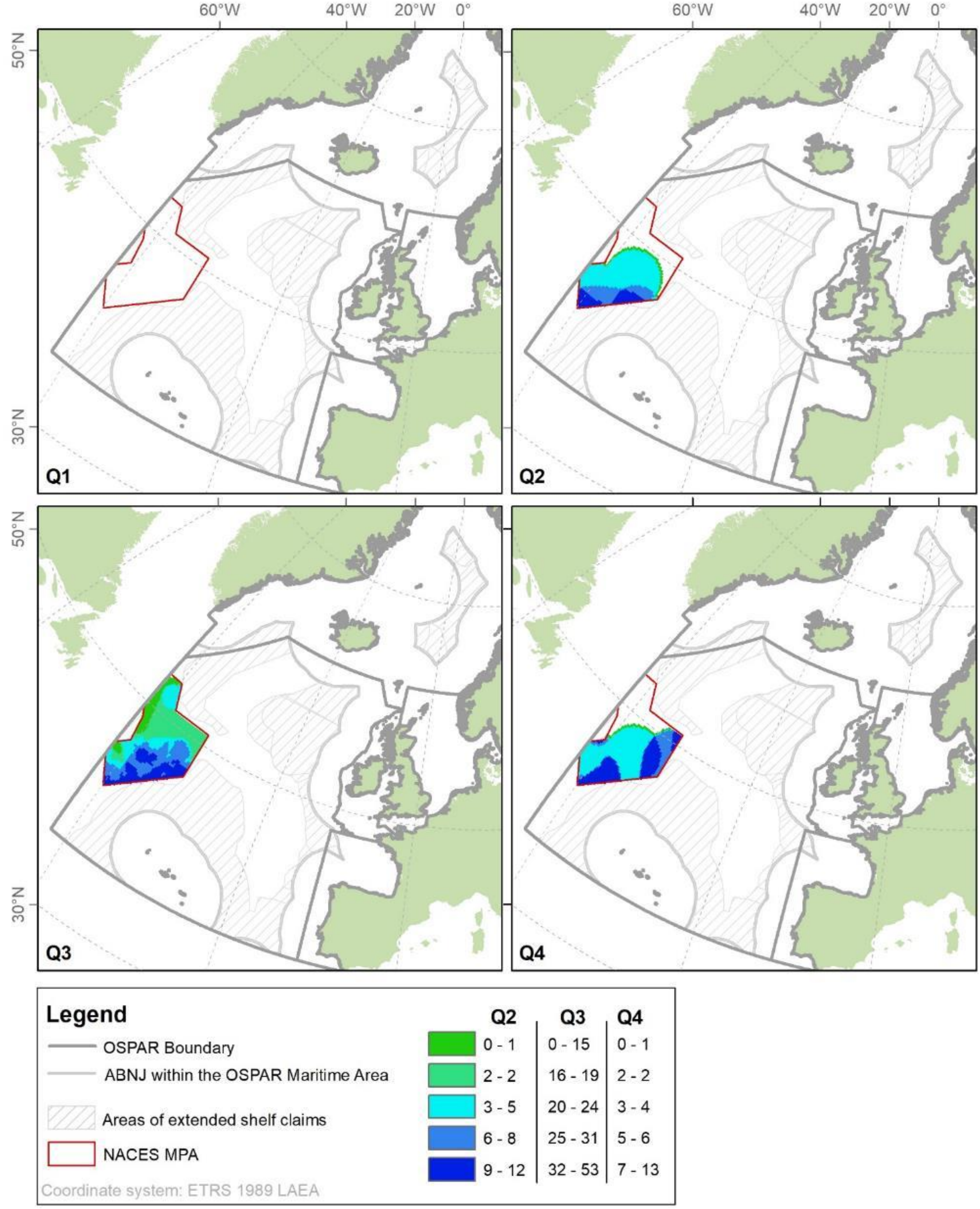


Figure A4.2-9. *Number of mature individuals of* ***Desertas Petrel*** *(Pterodroma deserta) in the NACES MPA for each year quarter.*

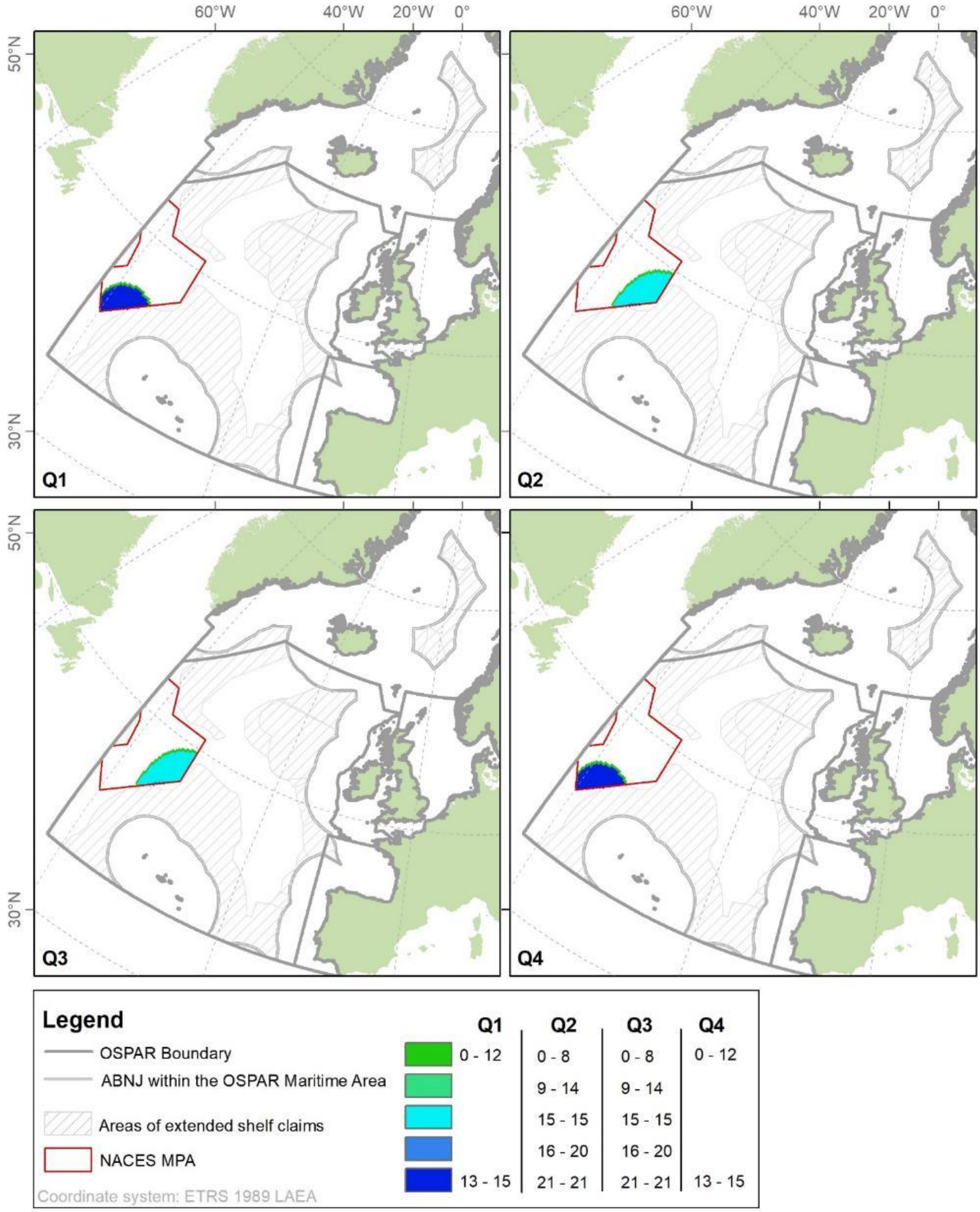


Figure A4.2-10. *Number of mature individuals of **Zino's Petrel** (Pterodroma madeira) in the NACES MPA for each year quarter.*

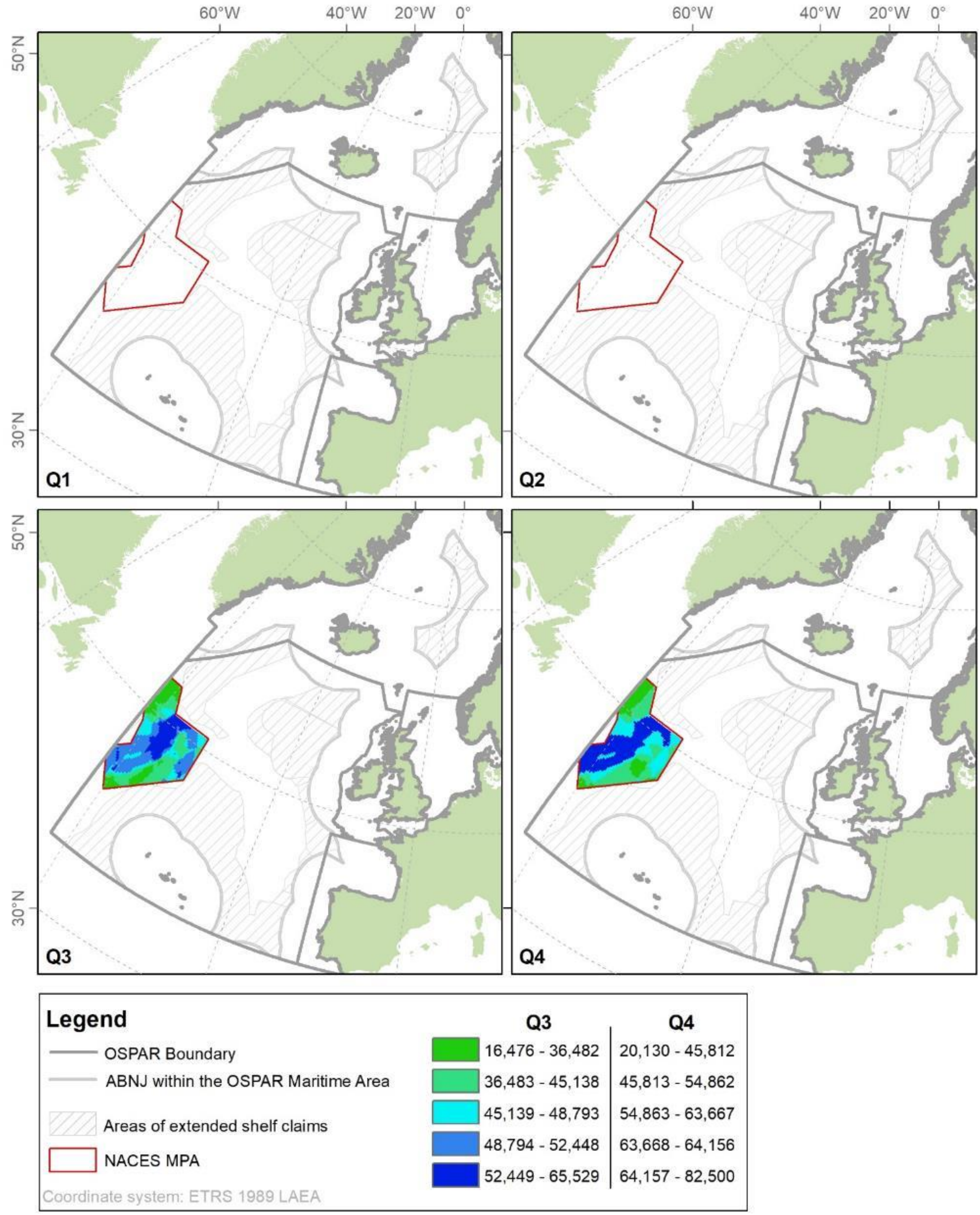


Figure A4.2-11. *Number of mature individuals* ***of Arctic Terns*** *(Sterna paradisaea) in the NACES MPA for each year quarter.*

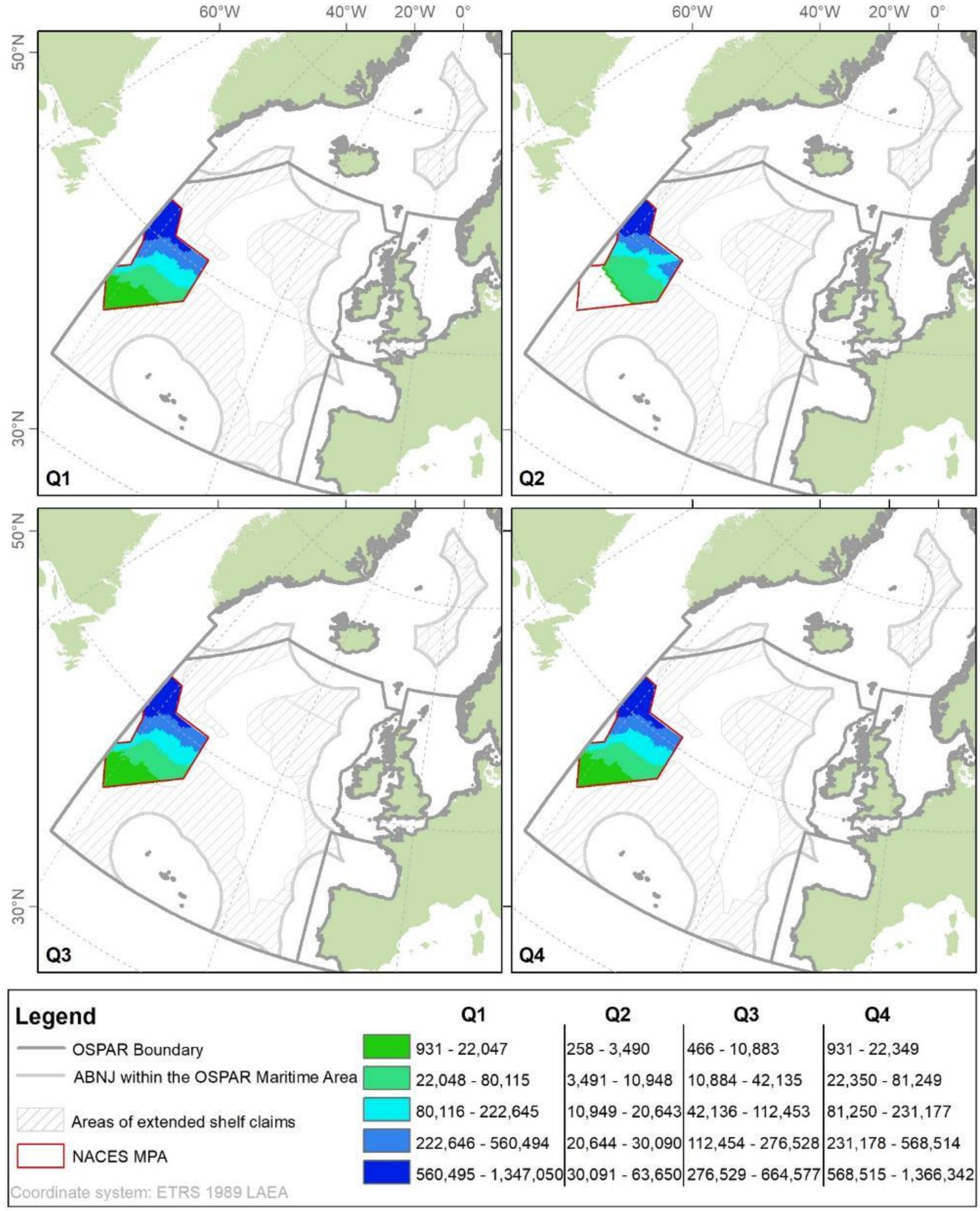


Figure A4.2-12. *Number of mature individuals of* ***Black-legged Kittiwake*** *(Rissa tridactyla) in the NACES MPA for each year quarter*

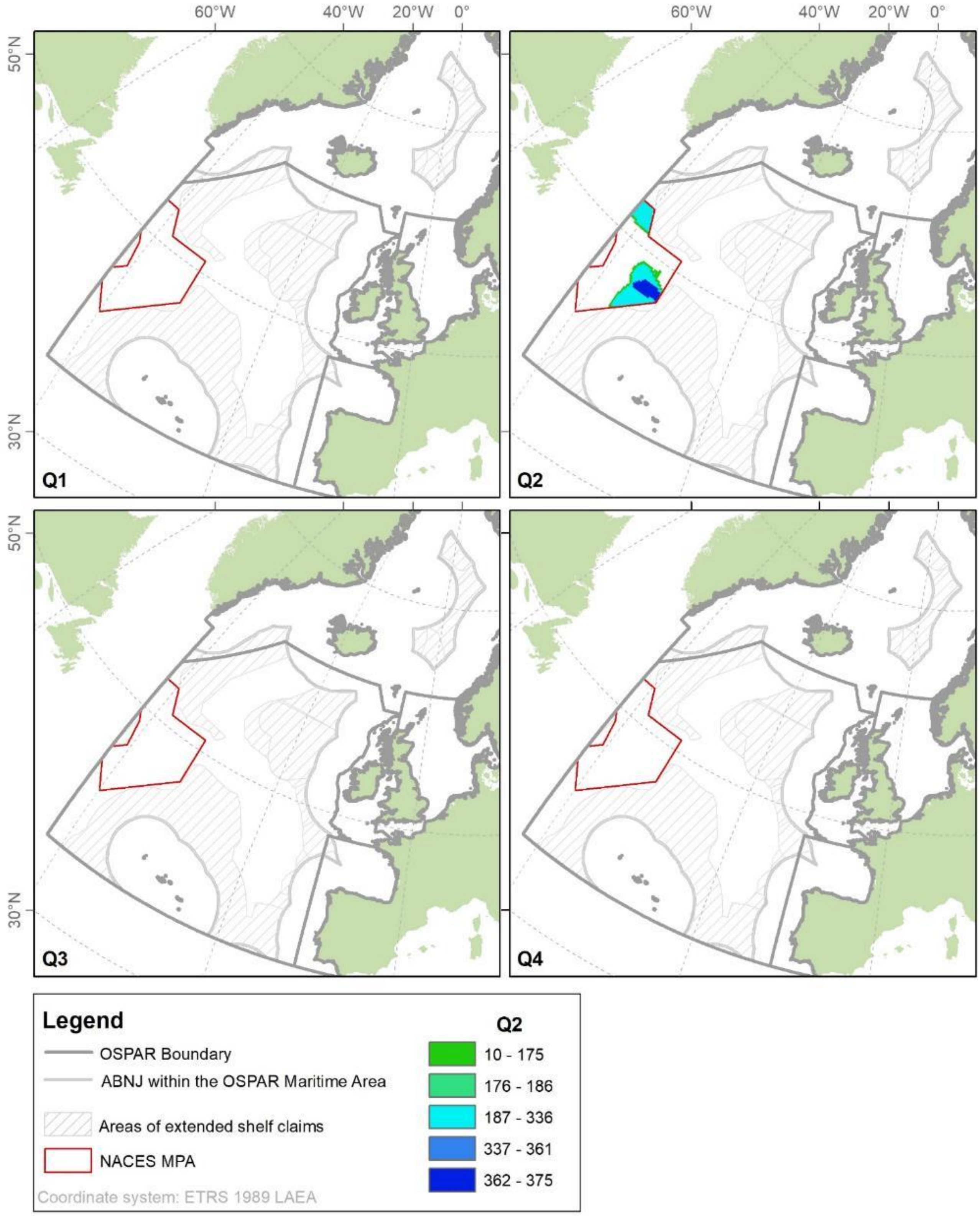
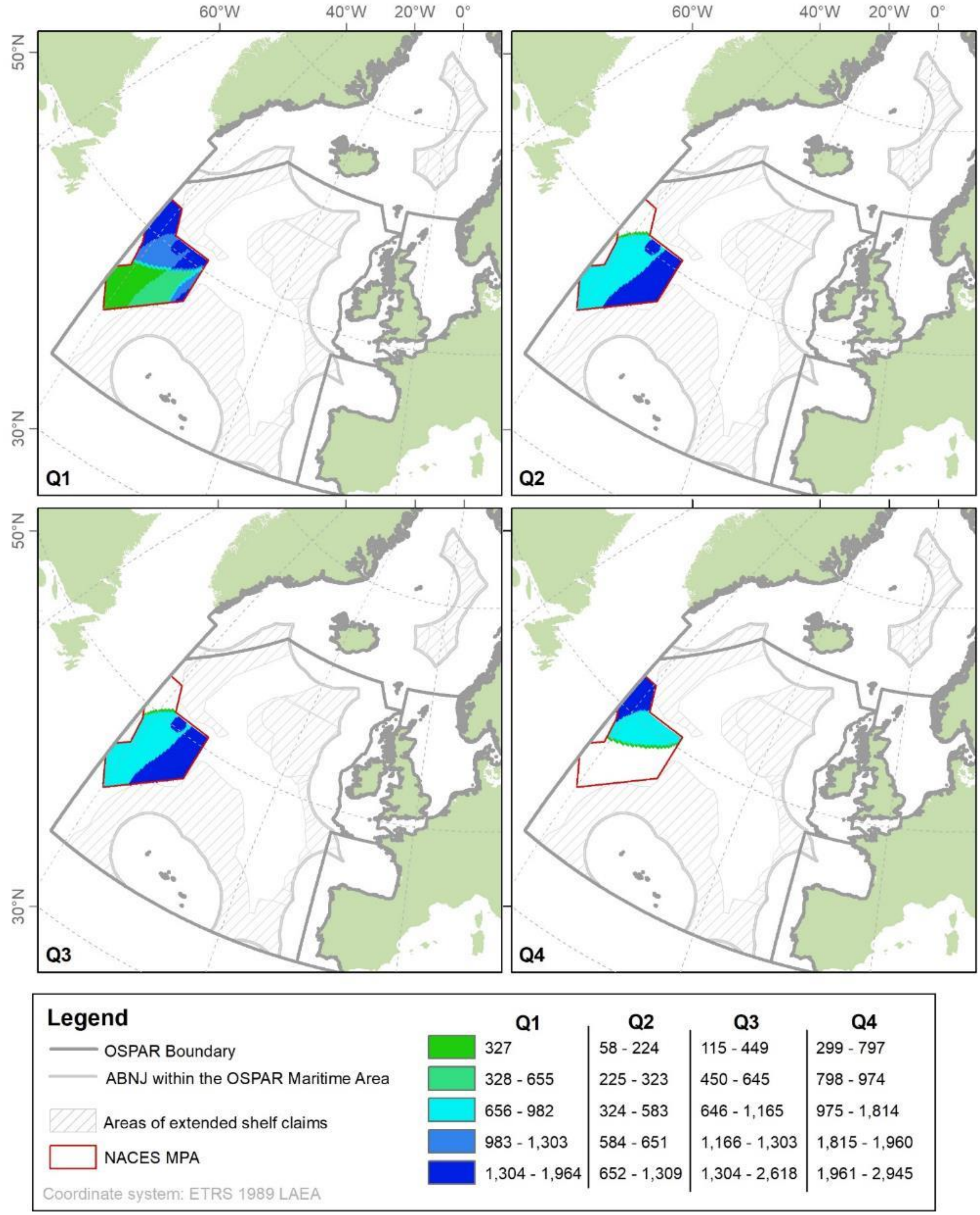


Figure A4.2-13. *Number of mature individuals of* ***Sabine's Gull*** *(Xema sabini) in the NACES MPA for each year quarter.*



	Q1	Q2	Q3	Q4
🟩	327	58 - 224	115 - 449	299 - 797
🟩	328 - 655	225 - 323	450 - 645	798 - 974
🟦	656 - 982	324 - 583	646 - 1,165	975 - 1,814
🟦	983 - 1,303	584 - 651	1,166 - 1,303	1,815 - 1,960
🟦	1,304 - 1,964	652 - 1,309	1,304 - 2,618	1,961 - 2,945

Figure A4.2-14. *Number of mature individuals of* ***Great Skua*** *(Stercorarius skua) in the NACES MPA for each year quarter*

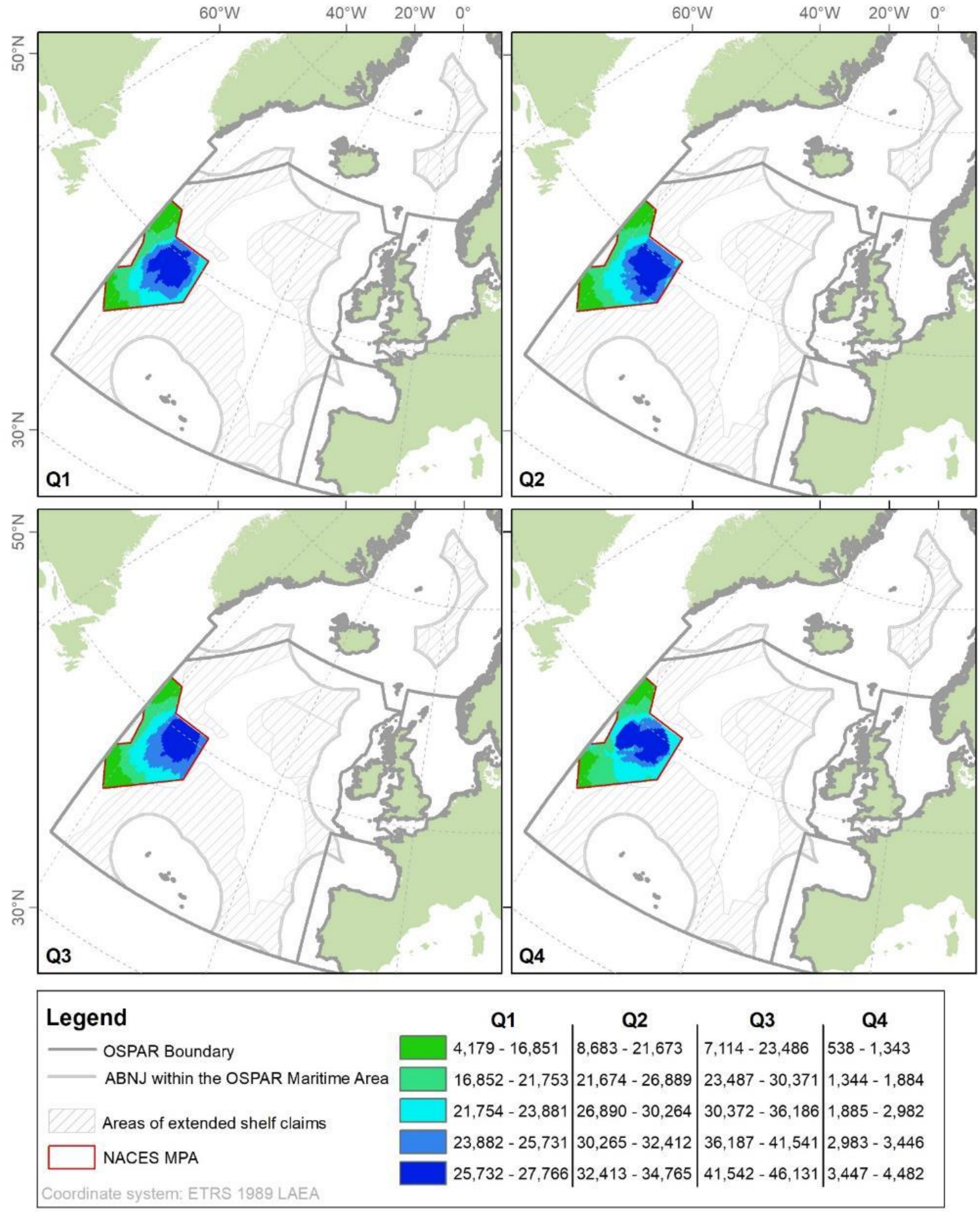


Figure A4.2-15. *Number of mature individuals of* ***Long-tailed Jaeger*** *(Stercorarius longicaudus) in the NACES MPA for each year quarter.*

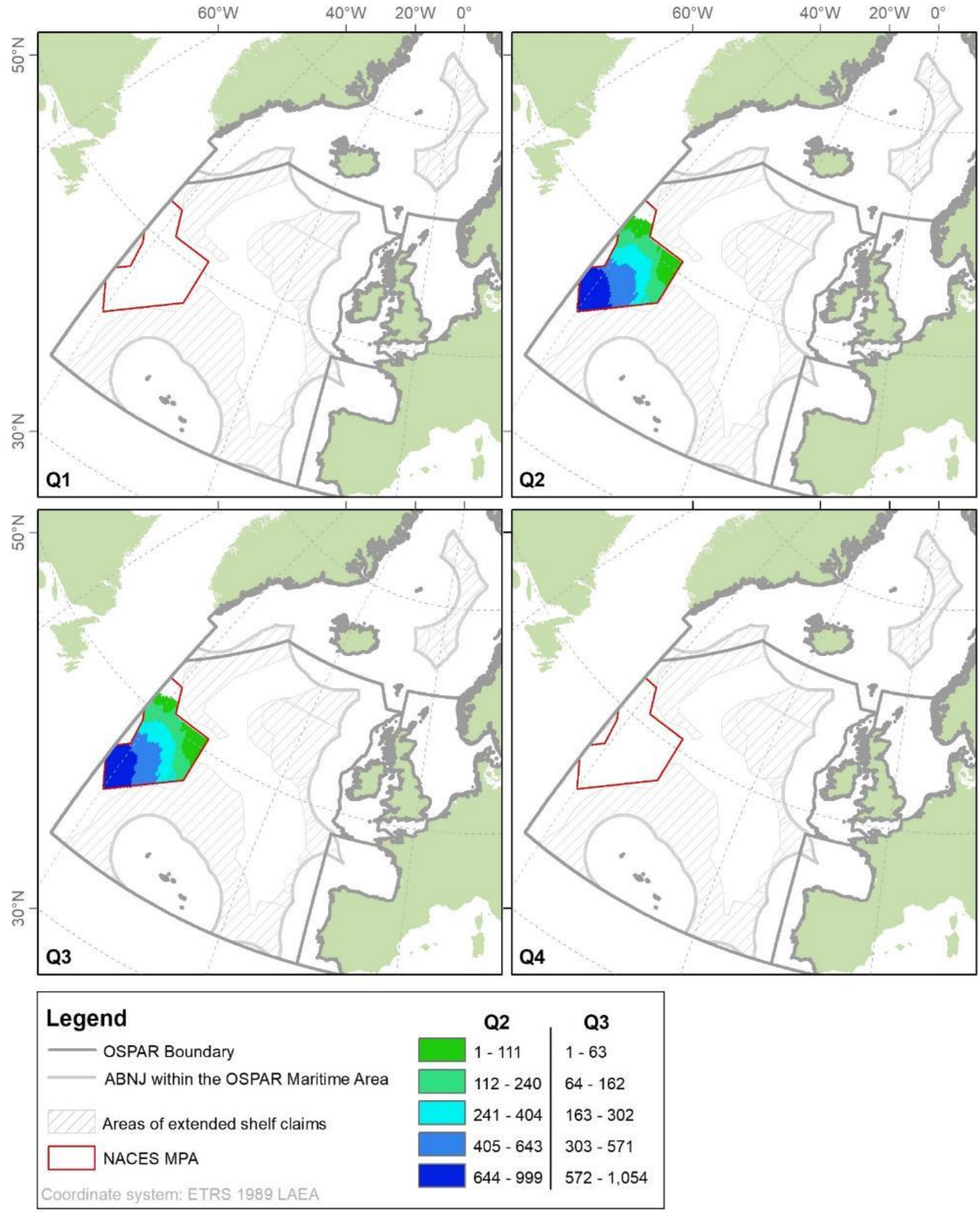


Figure A4.2-16. *Number of mature individuals of* ***South Polar Skua*** *(Catharacta maccormicki) in the NACES MPA for each year quarter.*

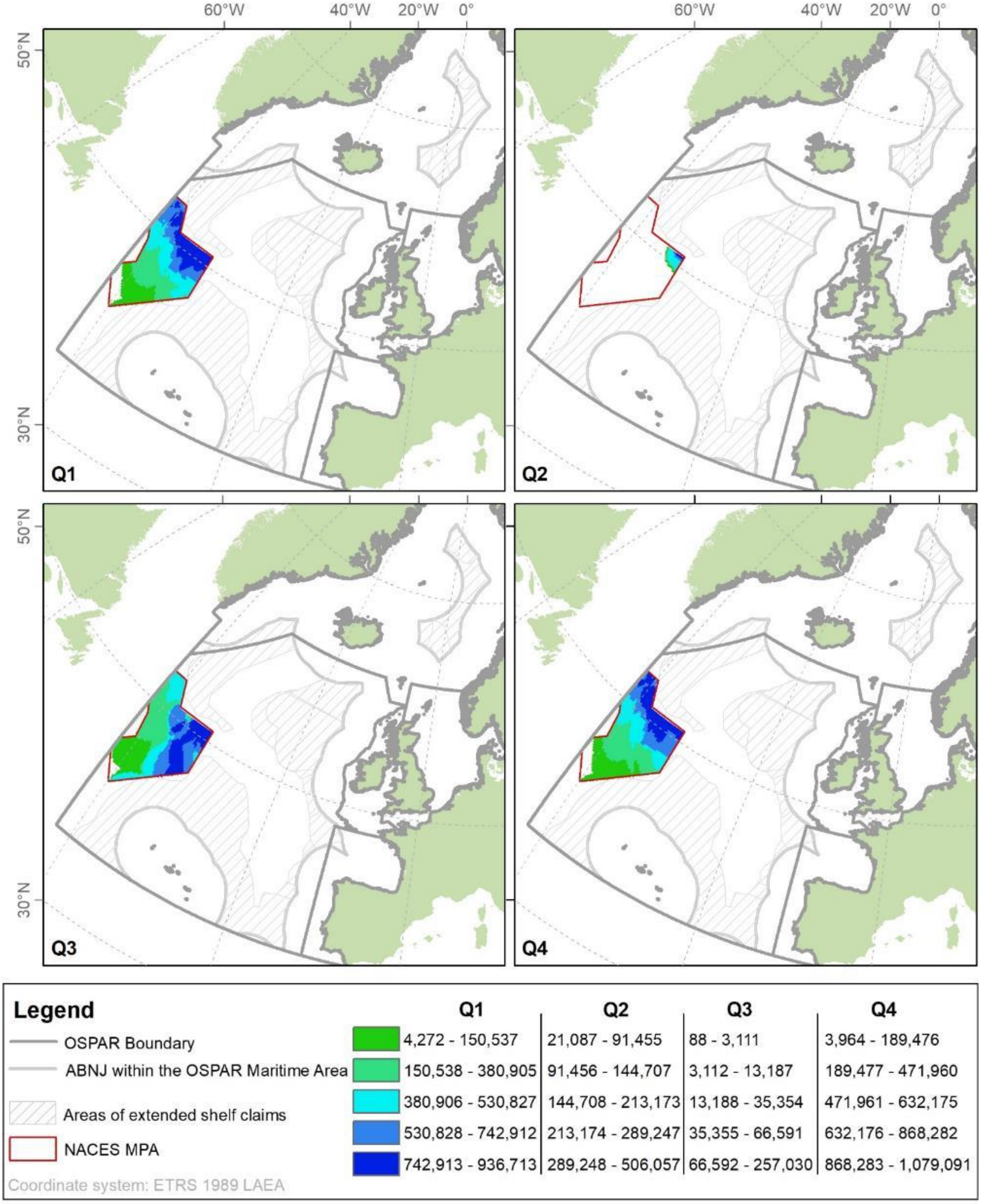


Figure A4.2-17. *Number of mature individuals of* ***Atlantic Puffin*** *(Fratercula arctica) in the NACES MPA for each year quarter.*

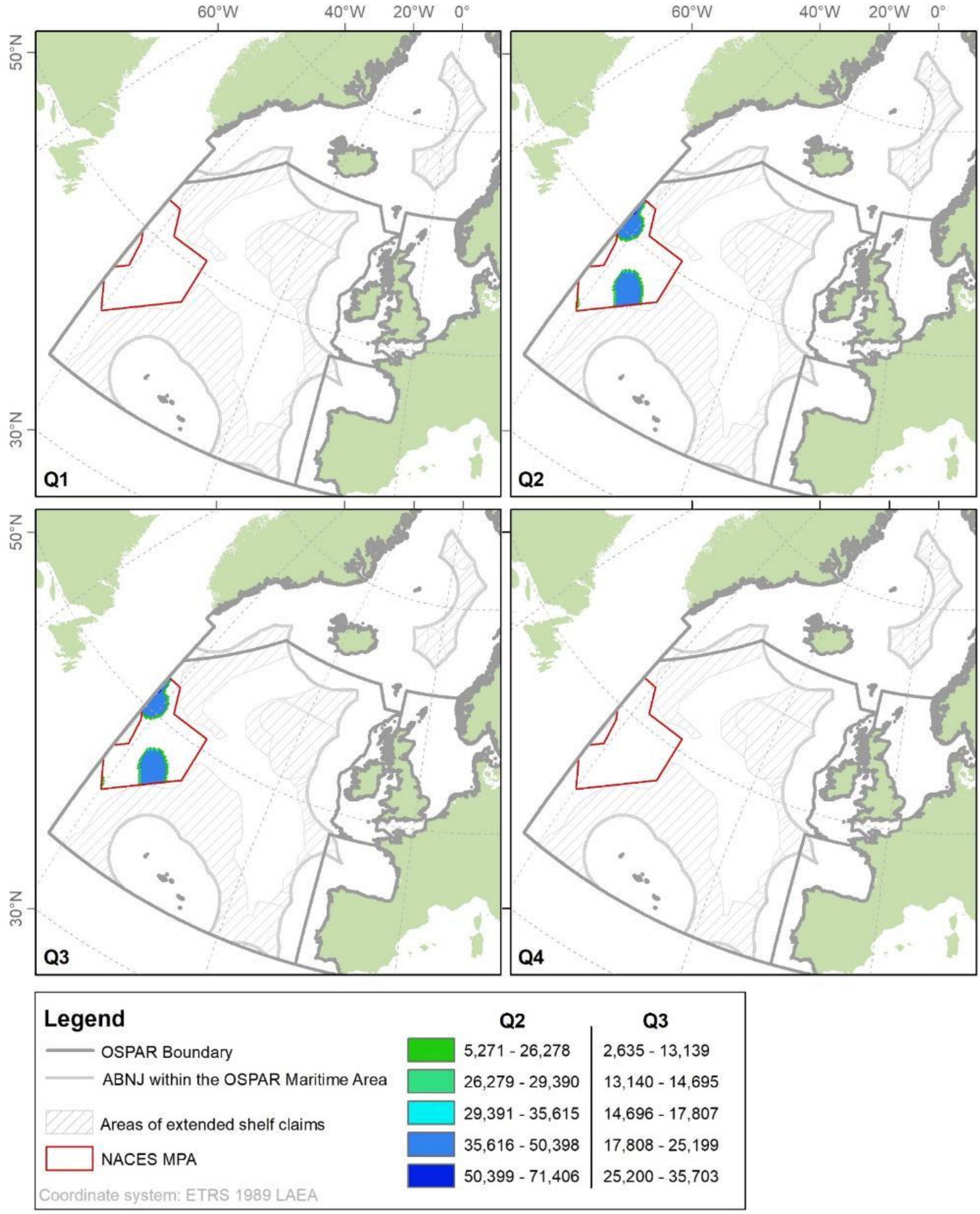


Figure A4.2-18. *Number of mature individuals of* ***Common Murre*** *(Uria aalge) in the NACES MPA for each year quarter.*

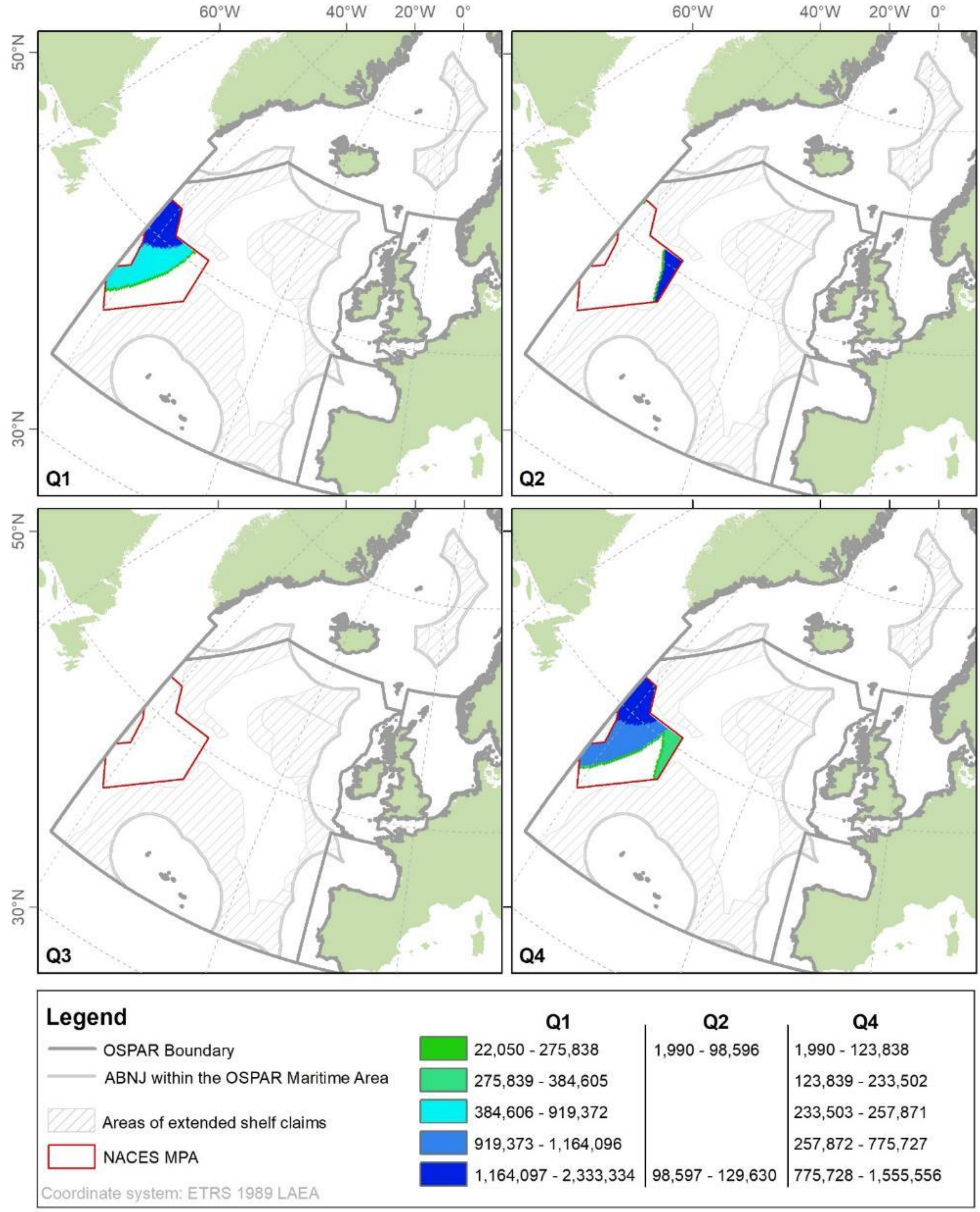


Figure A4.2-19. *Number of mature individuals of* ***Little Auk*** *(Alle alle) in the NACES MPA for each year quarter.*

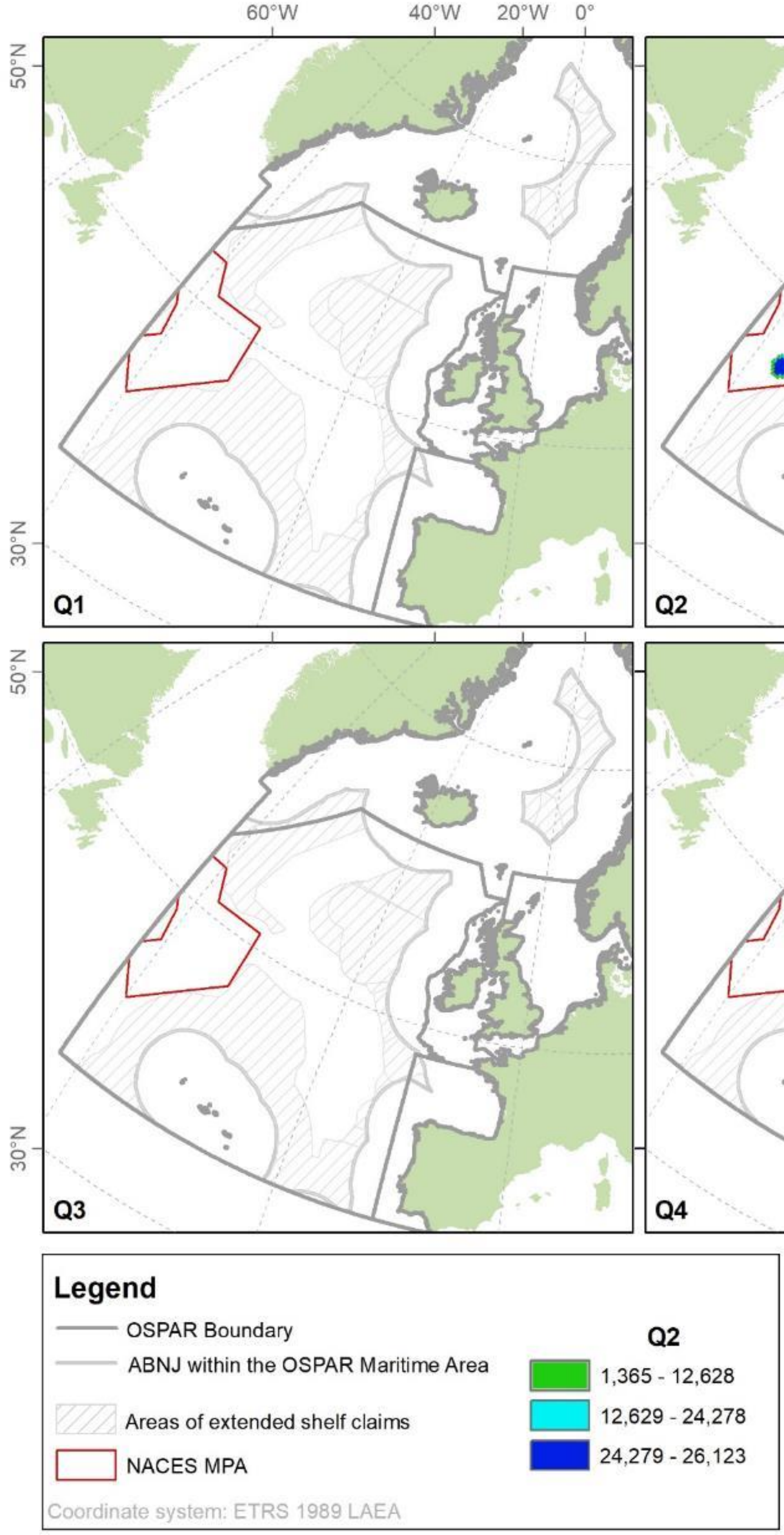


Figure A4.2-20. *Number of mature individuals of **Razorbill** (Alca torda) in the NACES MPA for each year quarter*

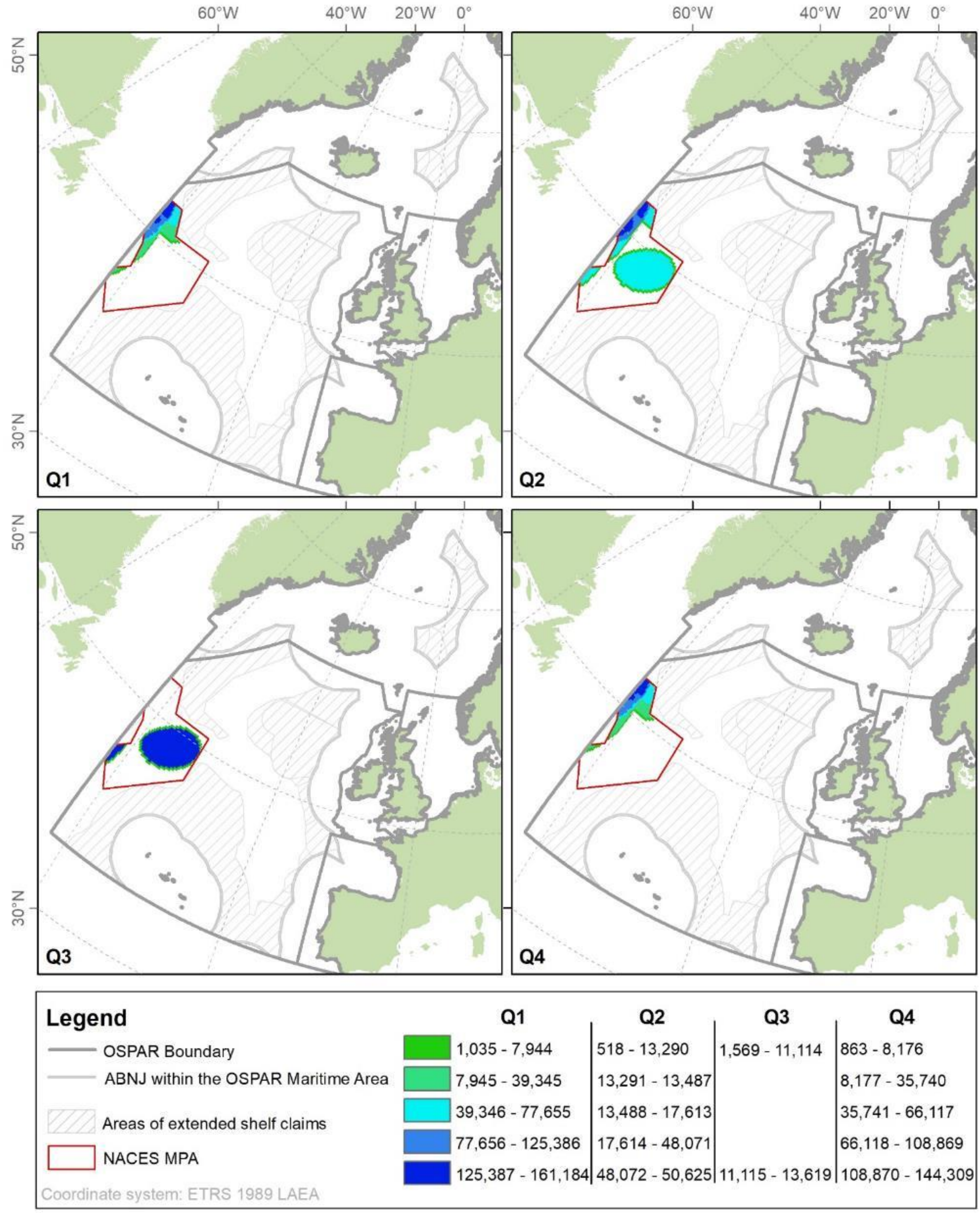


***Figure A4.2-21**. Number of mature individuals of **Thick-billed Murre** (Uria lomvia) in the NACES MPA for each year quarter.*

Annex 4.3. Combined maps (richness and density)

Maps produced after merging the species' individual maps shown in Annex 3

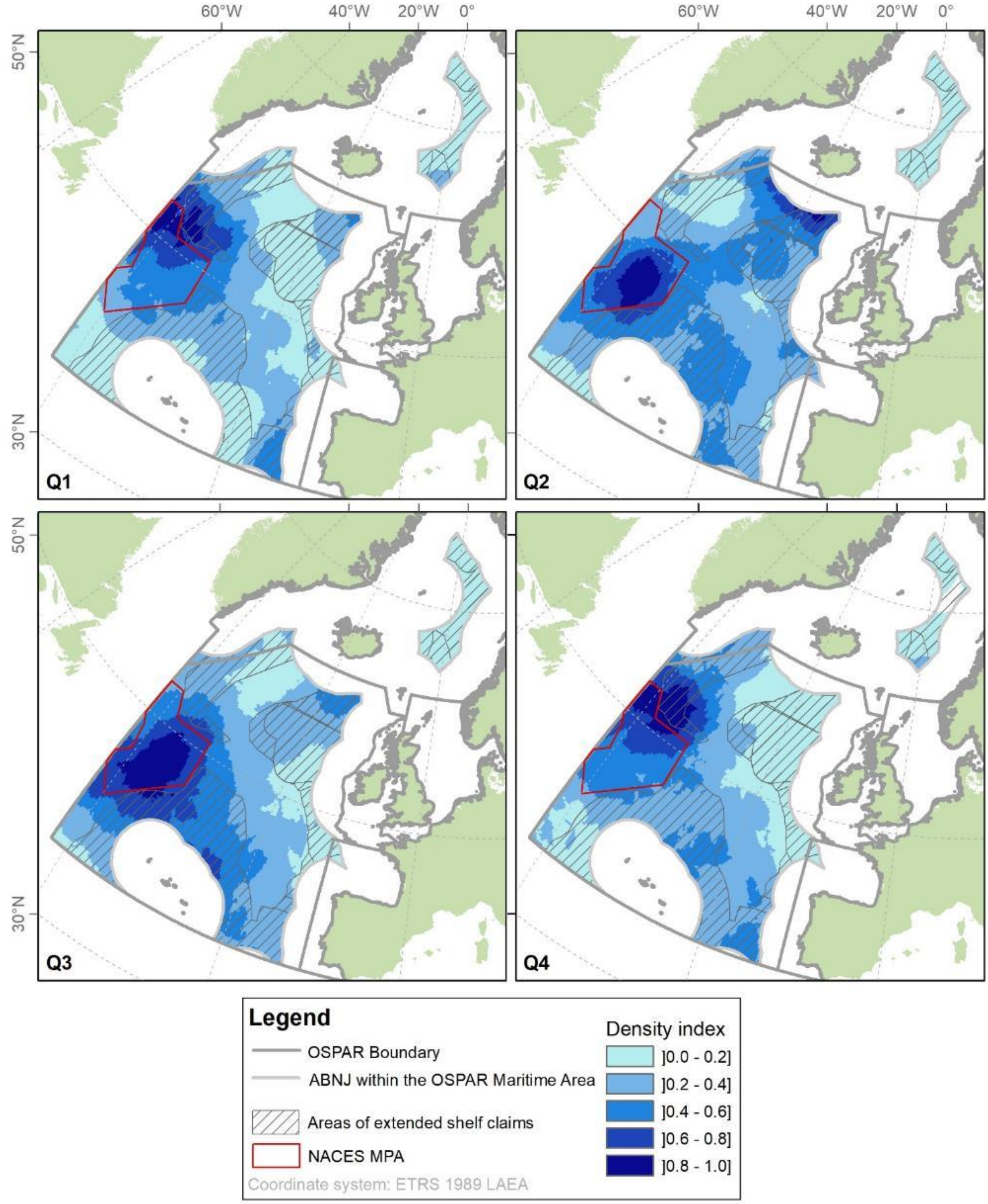


Figure A4.3-1. *Map indicating seabird species* ***density (usage)*** *across the OSPAR ABNJ* ***for each year quarter****, with the boundary of the NACES MPA.*

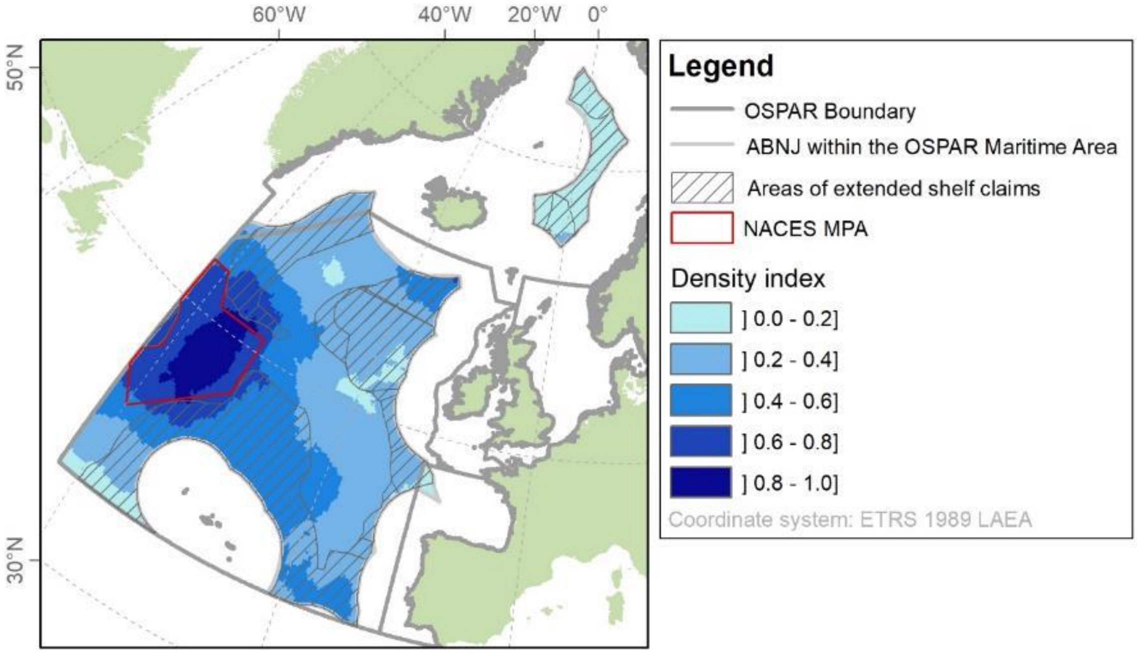


Figure A4.3-2. *Map indicating seabird species* ***density (usage)****,* ***all year quarters combined****, with the boundary of the NACES MPA.*

The darker areas represent the most relevant sites considering density for seabirds in high-seas of the OSPAR area- regardless of season.

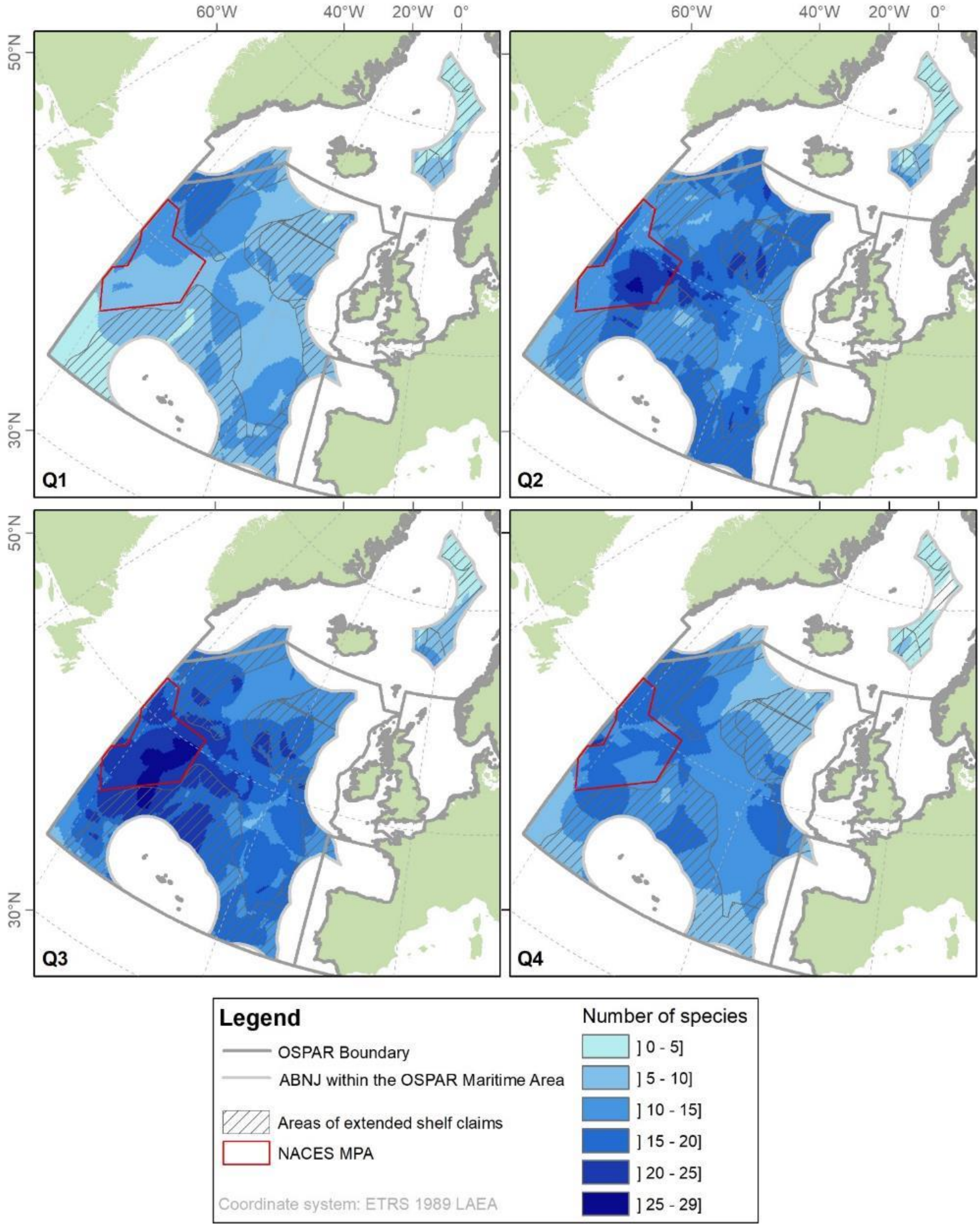


Figure A4.3-3. *Map indicating seabird* ***species richness*** *across the OSPAR ABNJ area* ***for each year quarter****, with the boundary of the NACES MPA.*

OSPAR priority species and threatened non-OSPAR species accounted more for the final result (i.e. a higher weight to OSPAR species (3x) and threatened non-OSPAR species (2x)). For all the other species a value of 1 was assumed.

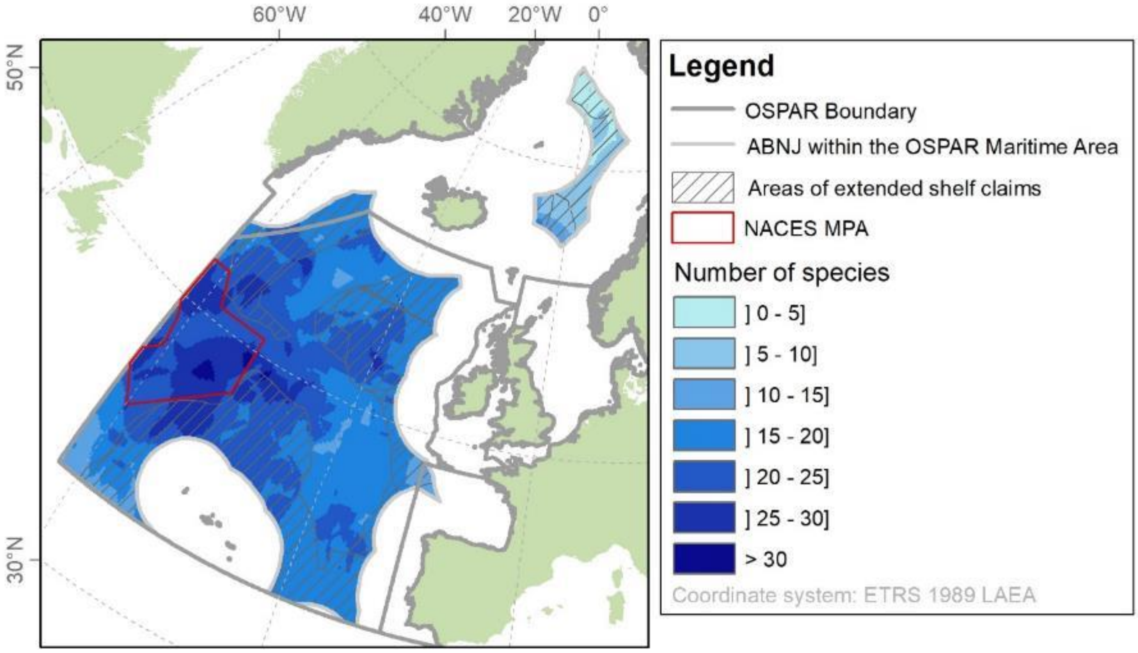


Figure A4.3-4. *Map indicating seabird* ***species richness*** *across the OSPAR ABNJ area,* ***all year quarters combined****, with the boundary of the NACES MPA.*

Scale indicates total number of seabird species occurring in OSPAR ABNJ area regardless of season. OSPAR priority species and globally threatened species accounted more for the final result (i.e. a higher weight to OSPAR species (3x) and globally threatened species (2x)). For all the other species a value of 1 was assumed.

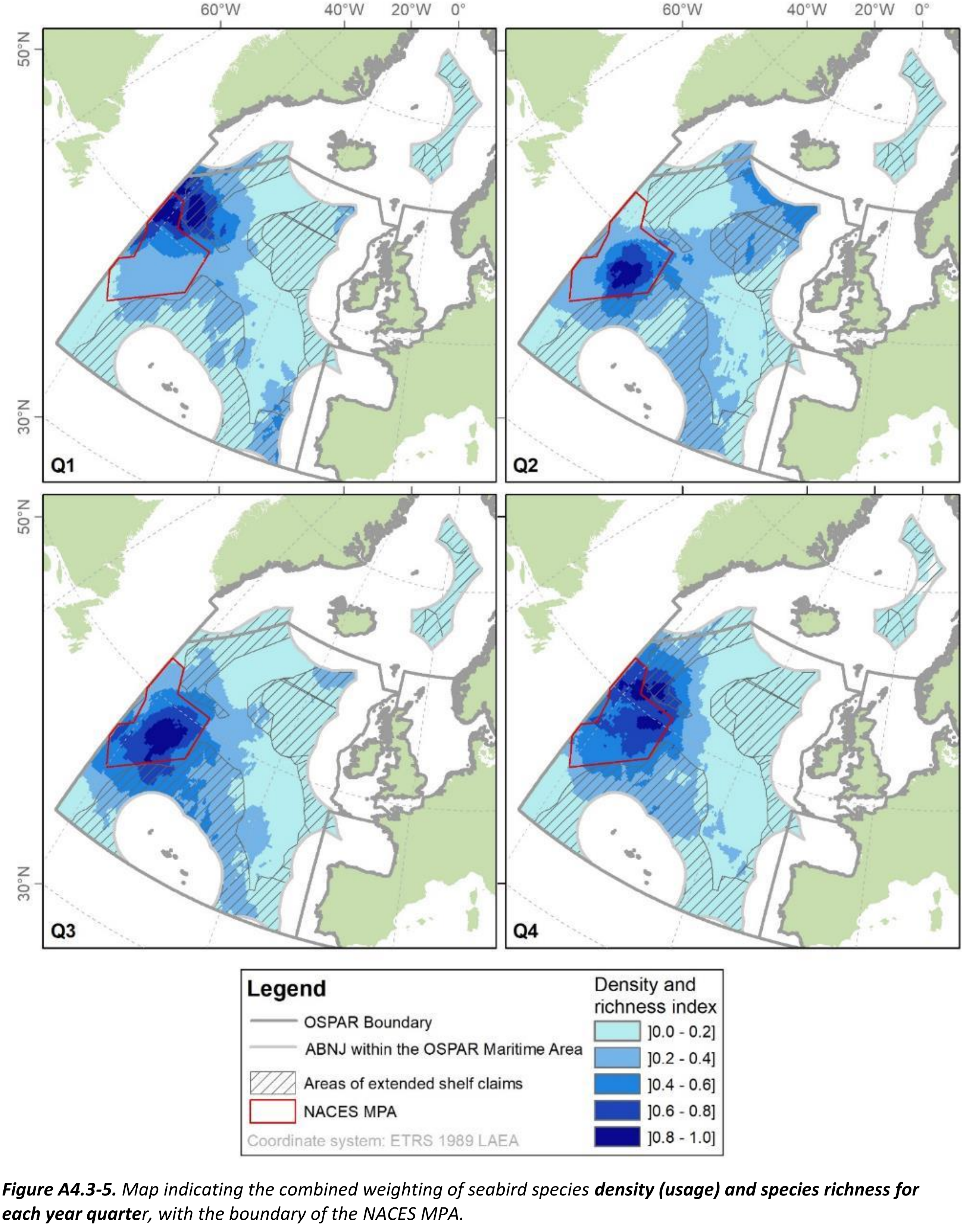


Figure A4.3-5. *Map indicating the combined weighting of seabird species* ***density (usage) and species richness for each year quarte****r, with the boundary of the NACES MPA.*

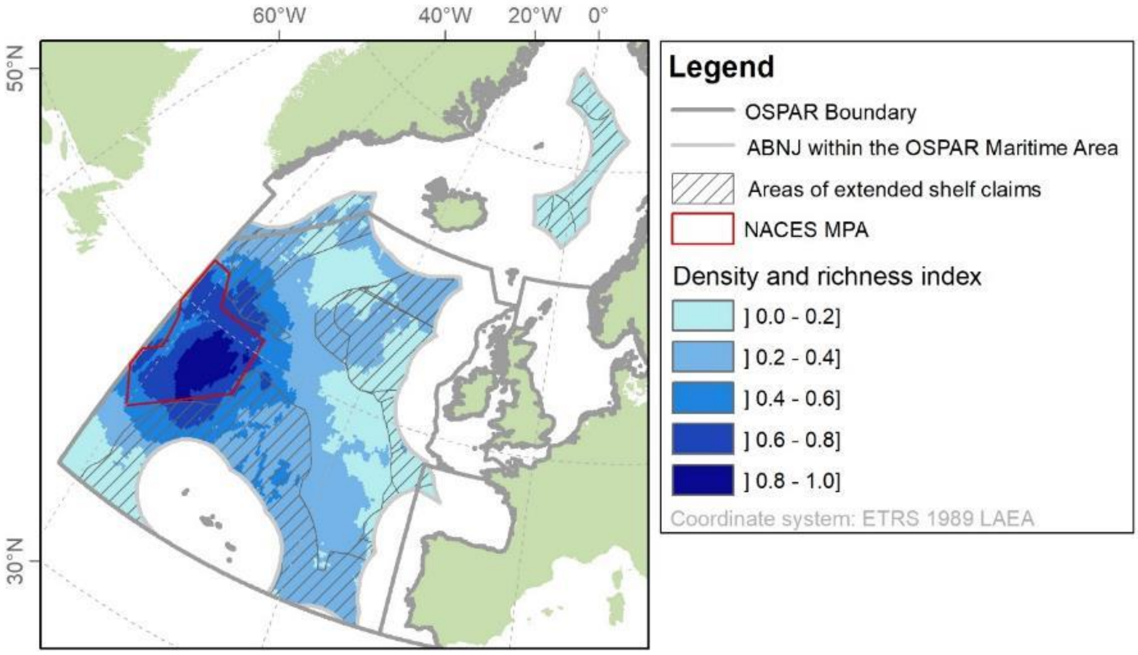


Figure A4.3-6. *Map indicating the combined weighting of seabird species* ***density (usage) and species richness****, all year quarters combined, with the boundary of the NACES MPA.*

The darker areas represent the most relevant sites considering density and richness for seabirds in the OSPAR ABNJ area- regardless of season.

Annex 5. Brief description and preliminary results of the oceanographic Cruise DY080.

Distribution and Ecology of Seabirds in the Sub-Polar Frontal Zone of the Northwest Atlantic

Author: Ewan Wakefield, with contributions from Paloma Carvalho, Rob Ronconi, Claire Lacey, Nadya Ramirez Martinez and Guilherme Bortolotto.

July 2017

Important note: The information included below is to form the basis of a number of scientific publications (in preparation).

Cruise DY080 (**Distribution and Ecology of Seabirds in the Sub-Polar Frontal Zone of the Northwest Atlantic**) was carried out between the **6th of June and the 2nd of July, 2017** under the auspices of the UK Natural Environment Research Council, with Dr Ewan Wakefield of the Institute of Biodiversity Animal Health and Comparative Medicine, University of Glasgow, acting as Principal Scientist. Participating institutes included GEOMAR, the Sea Mammal Research Unit, Environment Canada, the University of Rhode Island, ISPA - Instituto Universitário, the Centre for Ecology, Fisheries and Aquaculture Science and BirdLife International.

The objectives of the cruise were:

1. To estimate the distribution, abundance and behaviour of seabirds and cetaceans in the seabird hotspot identified by BirdLife and Ewan Wakefield, centred on the sub-polar front, south of the Charlie Gibbs Fracture Zone.
2. To map major frontal features and nutrient regimes within the off-shelf study area and along the survey track.
3. To refine non-lethal methods of sampling seabirds at sea.
4. To estimate the diet, stable isotope and contaminant loading, faecal nutrient and moult status of seabirds within the study areas, with particular focus on the cephalopod component of seabird diet.
5. To determine the comparative habitat use of great shearwaters on and off-shelf and the timing of their movements between these areas.
6. To estimate rates of primary production within the study area, phytoplankton community structure, the identity of the nutrients limiting productivity, and the effects of seabird faeces on phytoplankton growth.
7. To estimate the vertical distribution and biomass of mesopelagic nekton within the study areas.

The cruise departed from Southampton, UK and disembarked in St Johns, Newfoundland. The principal area of interest was covered in series of survey lines running approximately N-S though the seabird hotspot area, aligned along the major sea surface temperature and salinity gradients in the region, as well as core distributions of different seabird species (**Figure A5.1**). Broadly speaking, the planned cruise track was followed. However, the northern portion of line 4 was modified such that a transient eddy and associated phytoplankton bloom detected using satellite images could be sampled (line 4b). In addition, sampling was carried out more intensively on the southern section of line 5 in order to characterise a second mesoscale eddy apparent from satellite images. During the early days of the cruise high winds and seas disrupted data collection, while during the latter half of the cruise, fog frequently reduced the seabird and cetacean survey transect width.

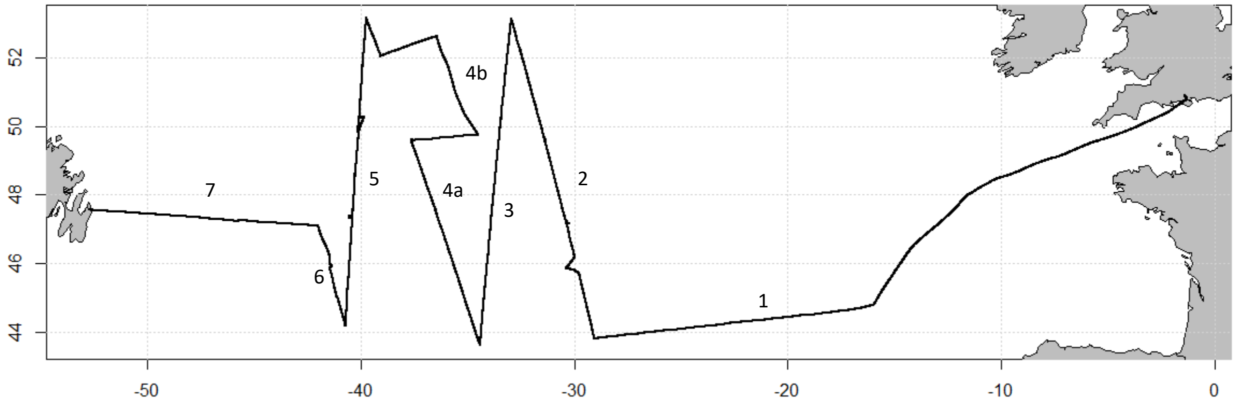


Figure A5.1. *Track of cruise DY080, June 6th – July 2nd 2017 (numbers indicate survey lines).*

Underway data collection (visual seabird and cetacean survey; passive acoustic cetacean survey; logging of surface seawater and atmospheric indices; and acoustic survey of nekton) was carried out as conditions allowed throughout the cruise. CTD casts were made to 500 m at the beginning and end of lines 2 - 6 and at dawn and dusk between these stations. Water samples were collected only during CTD casts at ends of each line. Vertical plankton hauls, from 200m to the surface, were generally carried out immediately after each evening CTD cast. On-deck phytoplankton incubation experiments, to examine nutrient limitation, were carried out on lines 1 - 5.

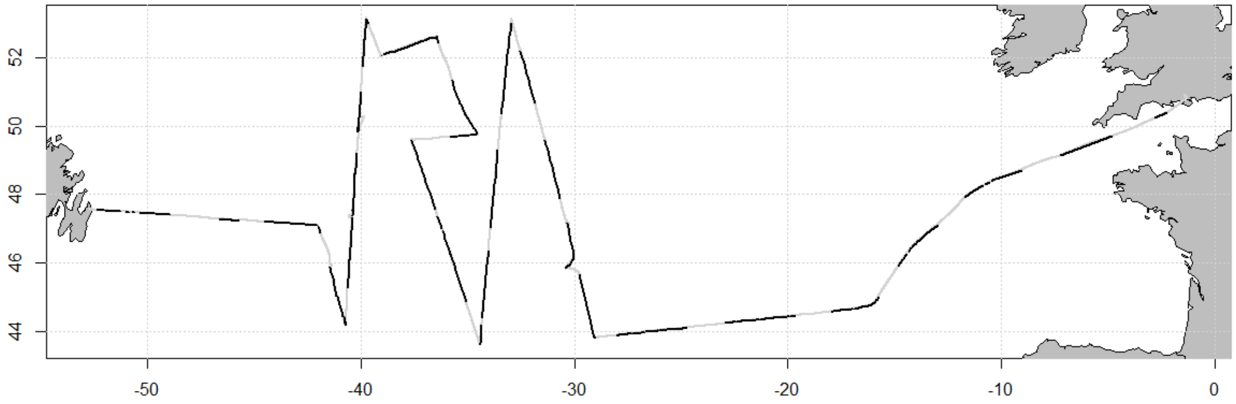


Figure A5.2 *Seabird visual survey effort during cruise DY080.*

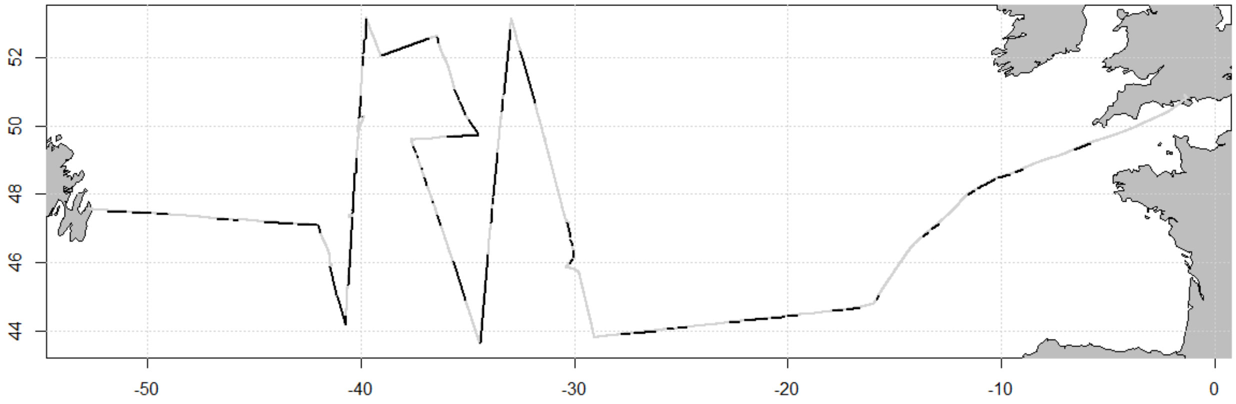


Figure A5.3 *Cetacean visual survey effort during cruise DY080.*

When conditions allowed, efforts were made to capture seabirds (using non-lethal methods) in order to obtain diet and tissue samples. Generally speaking, the ship hove to late in the afternoon each day on lines

2 – 6 for this purpose. Unfortunately, high sea states and fog largely precluded capturing seabirds using the Discovery's Fast Rescue Boat, as had been intended. Rather, birds were attracted to the ship using bait and caught using a cast net. Samples were obtained from 13 northern fulmars and 14 great shearwaters in this manner and GPS tags were deployed on ten of the latter. In addition, 19 Leach's petrels were caught and sampled after dark, using either a tape lure, a mist net or the ship's lights. Visual point transect surveys were carried out of seabirds and cetaceans during daytime seabird catching sessions.

Data from the cruise are currently being analysed and results will appear in due course in the scientific literature. Preliminary results confirm that the oceanography of the MPA area is dominate by a series of banded fronts, broadly aligned in the zonal direction, following the course of the North Atlantic Current downstream of the Northwest Corner. In addition, a number of large eddies were identified, one of which may be an undescribed, permanent feature of the region. A total of 16 seabird species were recorded in the proposed MPA, the commonest species being great shearwaters, northern fulmars and Cory's shearwaters (**Table A5.1** – please note that these counts have not yet been corrected for variability due to weather, etc.). The latter were noticeably zoned by latitude – fulmars in the north, great shearwater at mid-latitudes and Cory's shearwaters to the south. In addition, relatively high numbers of Leach's petrels were encountered in the west of the MPA (**Figure A5.4**). Analytical work currently being carried out aims to estimate the true density of these species in the MPA and to determine the causes of the distribution patterns. It looks likely that the latter reflect the distribution of major fronts and water masses in the region: That is, habitat partitioning is marked within the MPA implying that the relatively high species diversity there is likely to be due its high diversity of habitats. Tracks of the great shearwaters tagged on the Flemish Cap confirm that birds move from the North American continental shelf to the MPA area in mid-summer.

Nutrient and phytoplankton sampling indicate that the entire MPA area was iron-limited during the cruise. Results of bioassays undertaken during the cruise suggest that seabird guano may alleviate iron stress in the phytoplankton community. More analysis is require to confirm this important result, which if correct would underline the crucial role that seabirds play in recycling nutrients in the ecosystem of the MPA.

Table A5.1. *Bird species recorded in the proposed MPA area during cruise DY080 (June 6th – July 2nd 2017). Species ordered by raw, uncorrected, counts.*

Species/taxon		Raw count
Great Shearwater	*Ardenna gravis*	2664
Northern Fulmar	*Fulmarus glacialis*	666
Cory's Shearwater	*Calonectris borealis*	251
Leach's Petrel	*Oceanodroma leucorhoa*	190
Sooty Shearwater	*Ardenna grisea*	123
Skua sp.	*Stercorarius sp.*	21
Storm petrel sp.	*Hydrobatidae/Oceanitidae sp.*	17
Arctic Tern	*Sterna paradisaea*	10
Manx Shearwater	*Puffinus puffinus*	9
South Polar Skua	*Stercorarius maccormicki*	6
Long-tailed Skua	*Stercorarius longicaudus*	3
Arctic Skua	*Stercorarius parasiticus*	3
Wilson's Petrel	*Oceanites oceanicus*	3
Common/Arctic tern		2
Guillemot	*Uria aalge*	1
Bulwer's Petrel	*Bulweira bulwerii*	1
Dark petrel sp.		1
Northern Gannet	*Morus bassanus*	1
Great Black-backed Gull	*Larus marinus*	1
Pomarine Skua	*Stercorarius pomarinus*	1

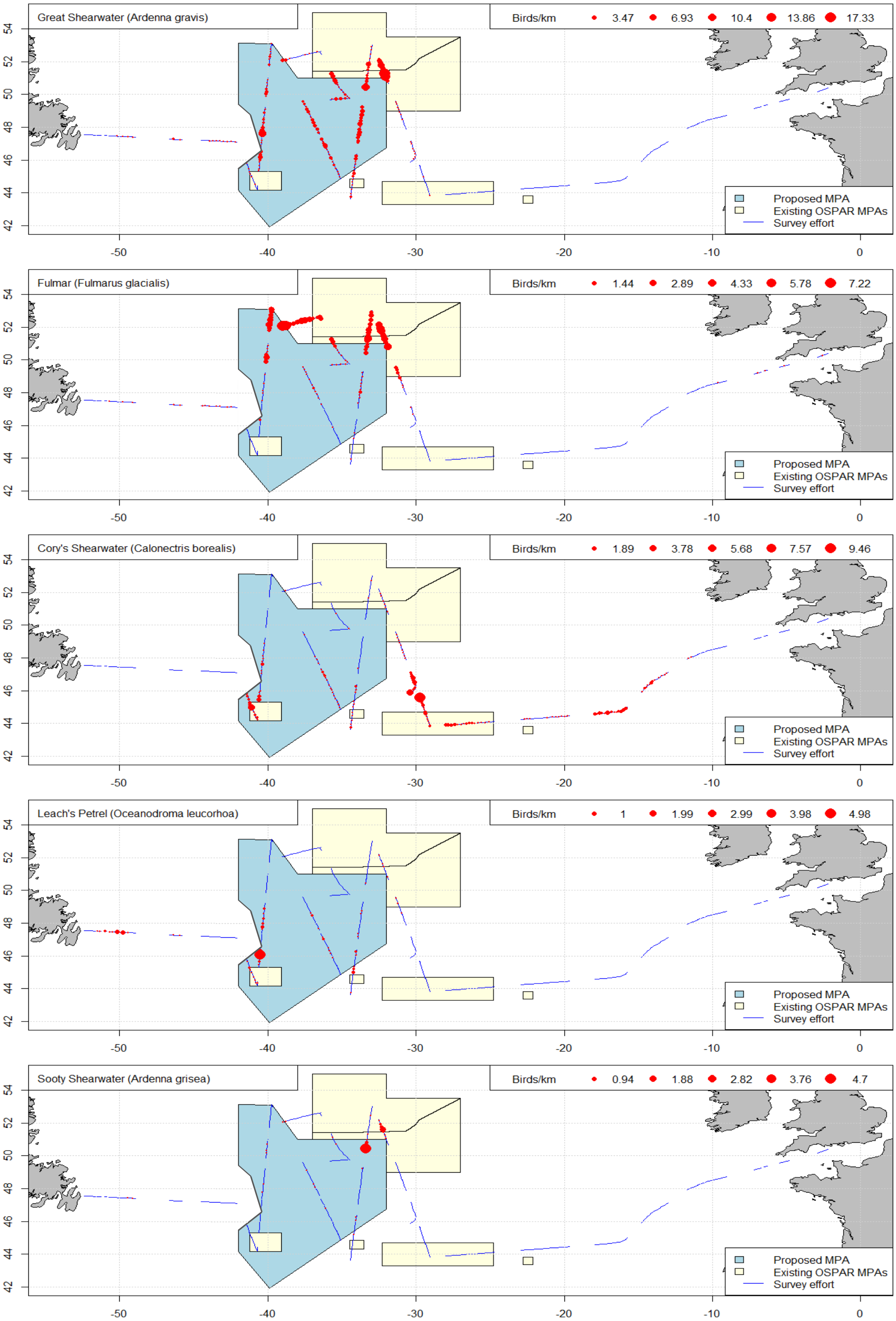


Figure A5.4. *Density of bird species along the transect (the values presented are still preliminary and have not yet been corrected for variability due to weather or other confounding factors).*

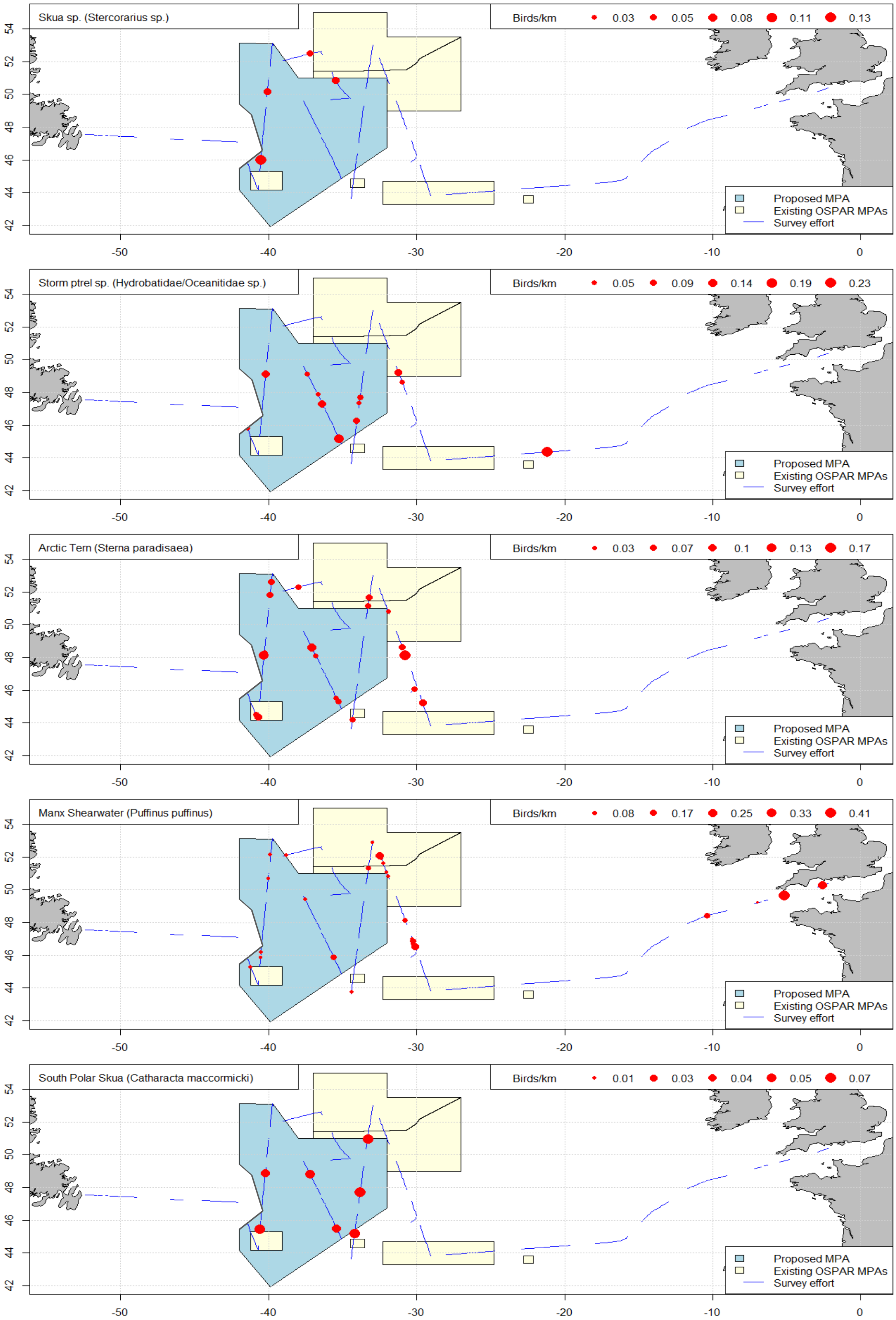


Figure A5.4 (cont.) *Density of bird species along the transect (the values presented are still preliminary and have not yet been corrected for variability due to weather or other confounding factors).*

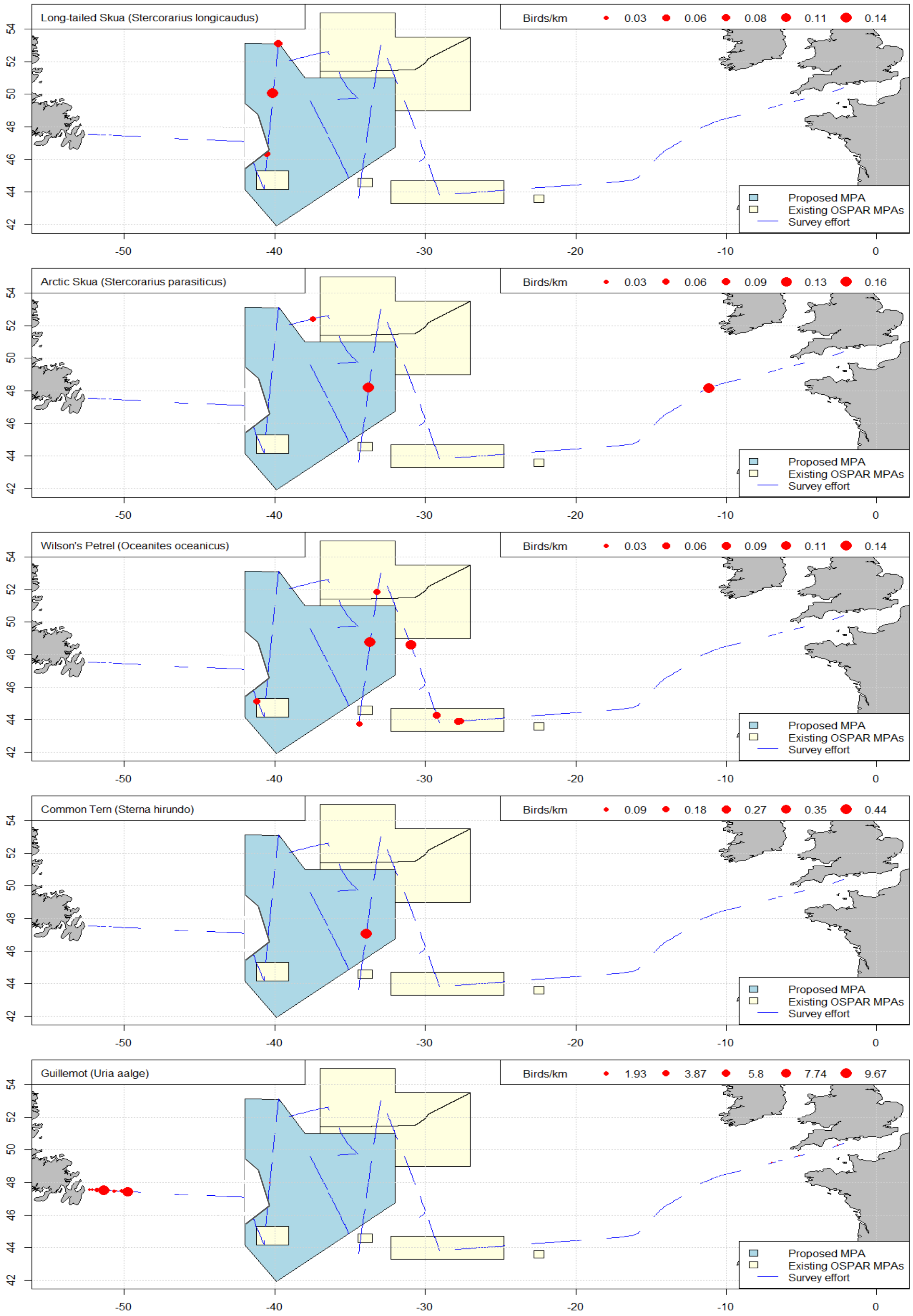


Figure A5.4 (cont.) *Density of bird species along the transect (the values presented are still preliminary and have not yet been corrected for variability due to weather or other confounding factors).*

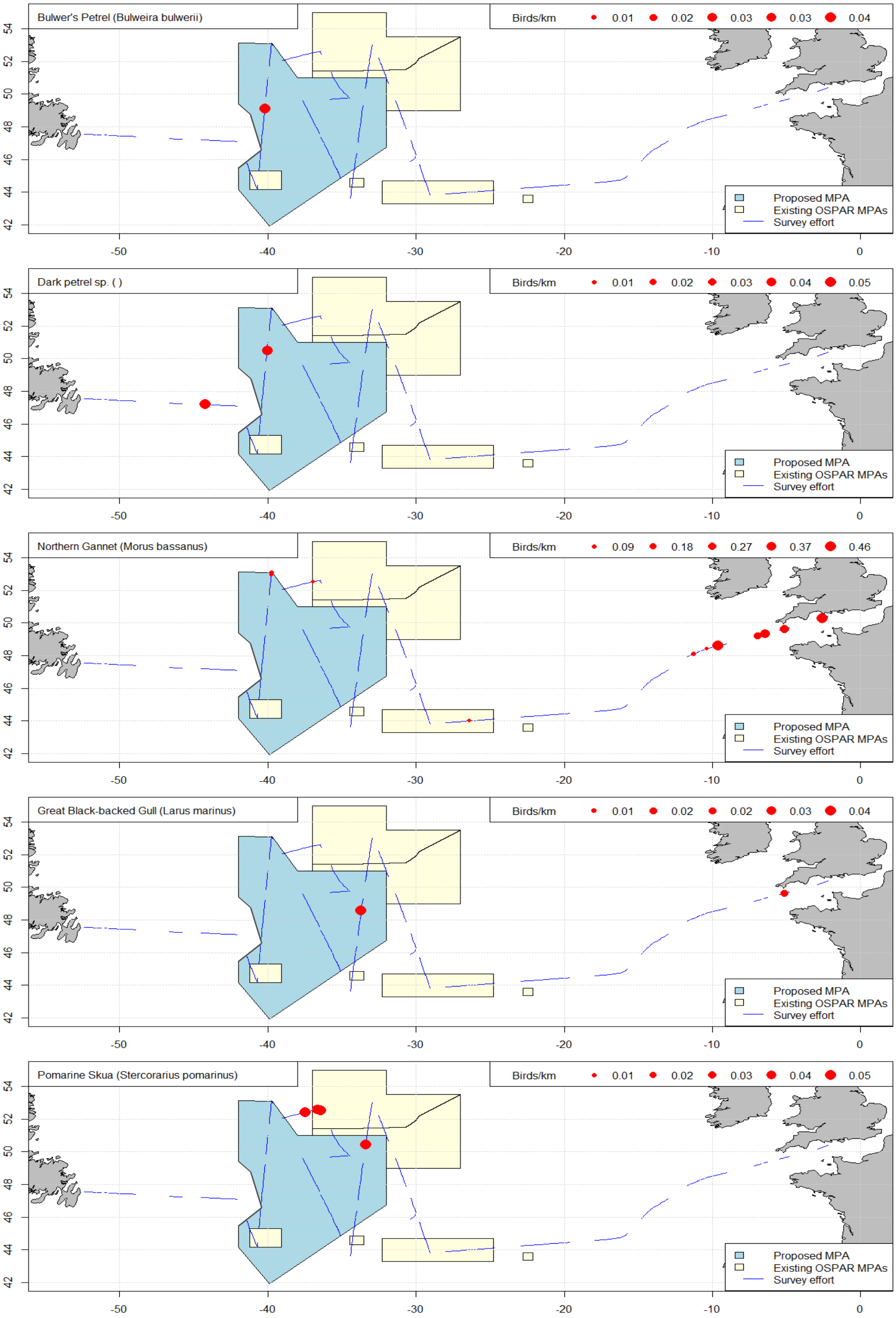


Figure A5.4 (cont.). *Density of bird species along the transect (the values presented are still preliminary and have not yet been corrected for variability due to weather or other confounding factors).*

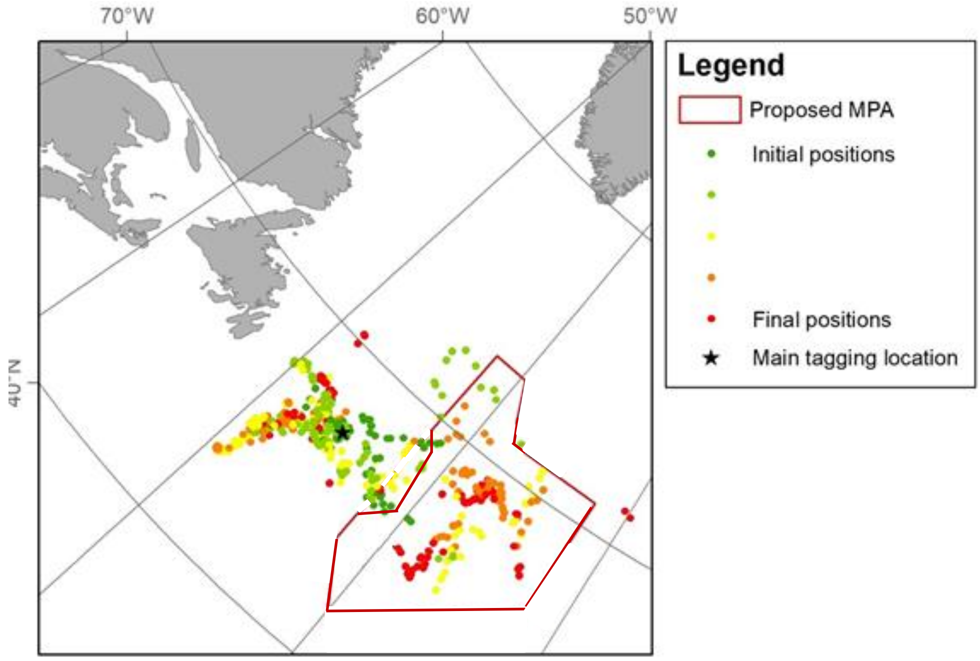


Figure A5.5. *Movements of the Great Shearwaters Ardenna gravis caught at sea and tagged during the DY080 cruise. Most birds moved eastwards, towards the direction of the MPA.*

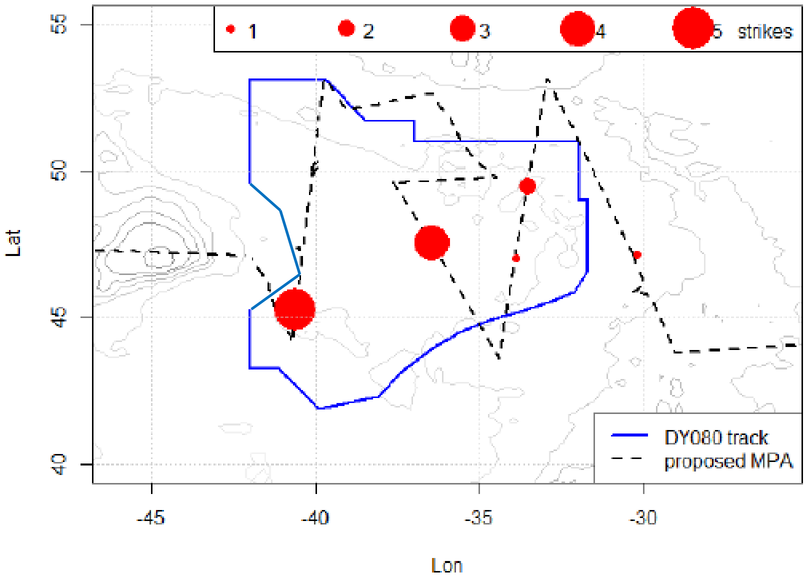


Figure A5.6. *Locations of night time ship strikes by Leach's Petrels during cruise DY080, June 2017*

Table A5.2. *Cetacean sightings*

Species	Total cruise		Within MPA boundary	
	Number of sightings	**Total number of animals**	**Number of sightings**	**Total number of animals**
Baleen whales				
Blue whale, *Balaenoptera musculus* (EN)	5	7	2	3
Fin whale, *Balaenoptera physalus* (EN)	39	70	13	37
Sei whale, *Balaenoptera borealis* (EN)	7	10	1	1
Humpback whale, *Megaptera novaeangliae* (LC)	37	40	5	5
Blue, fin or sei whale	46	51	13	16
Humpback whale or sperm whale	3	3	1	1
Unidentified “large” whale	21	22	1	1
Odontocetes				
Sperm whale, *Physeter macrocephalus* (VU)	7	8	3	3
Pilot whale *Globicephala* spp. (DD)	7	159	6	139
Common dolphin, *Delphinus* spp. (DD/LC)	34	391	15	131
Risso’s dolphin, *Grampus griseus* (LC)	1	10	1	10
Striped dolphin *Stenella coeruleoalba* (LC)	3	157	3	157
White-sided dolphin, *Lagenorhynchus acutus* (LC)	3	28	3	28
“Patterned” dolphin	6	26	3	13
Unidentified dolphin	20	109	15	97
Total	250	1102	87	644

Cetacean data collected by the Sea Mammal Research Unit (University of St Andrews, Scotland) supported by funding from the Marine and Freshwater Research Institute (Reykjavik, Iceland).

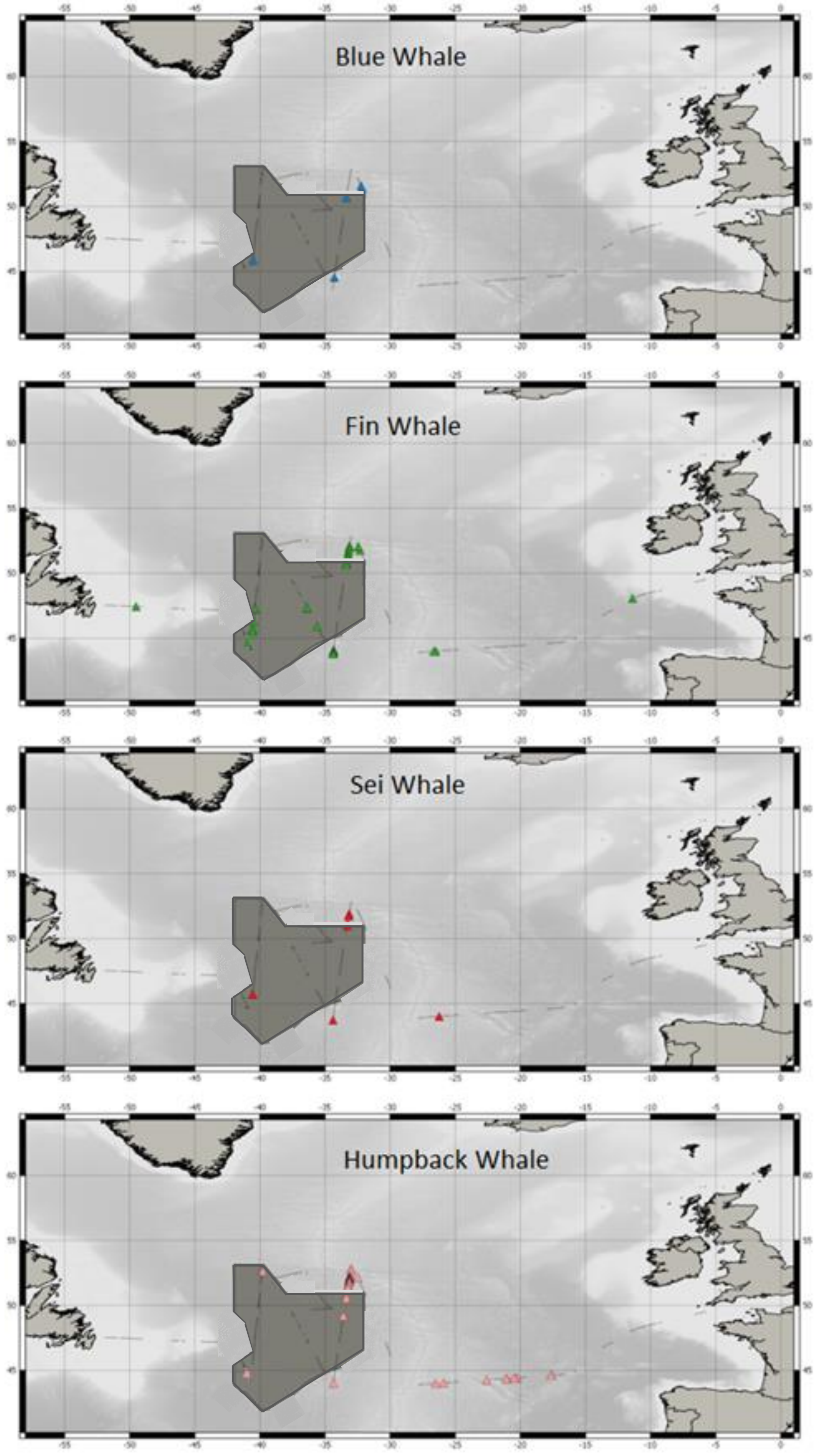
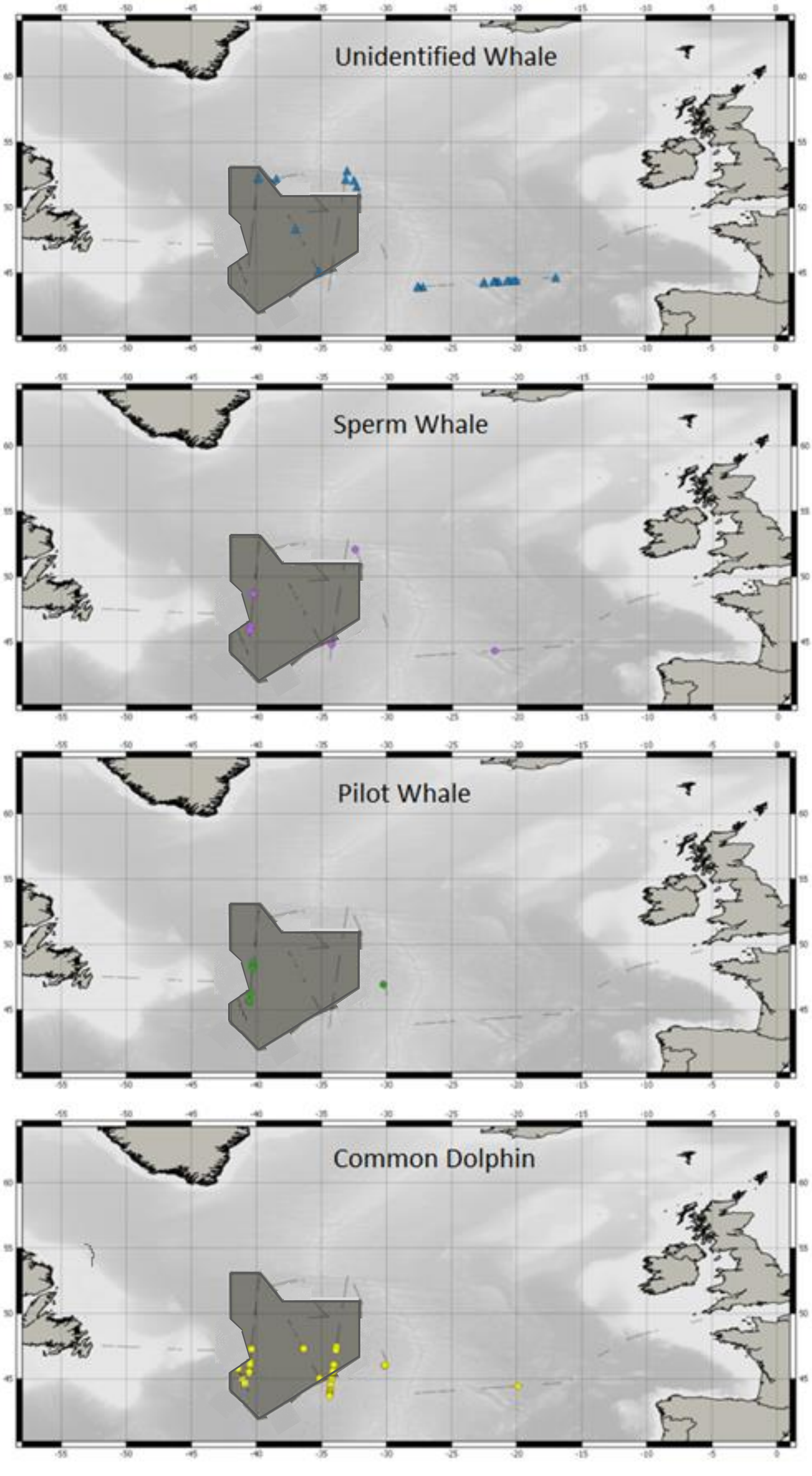


Figure A5.7. *Cetaceans sightings along the DY080 transect and within the MPA.*



Unidentified Whale

Sperm Whale

Pilot Whale

Common Dolphin

Figure A5.7 (cont.). *Cetaceans sightings along the DY080 transect and within the MPA.*

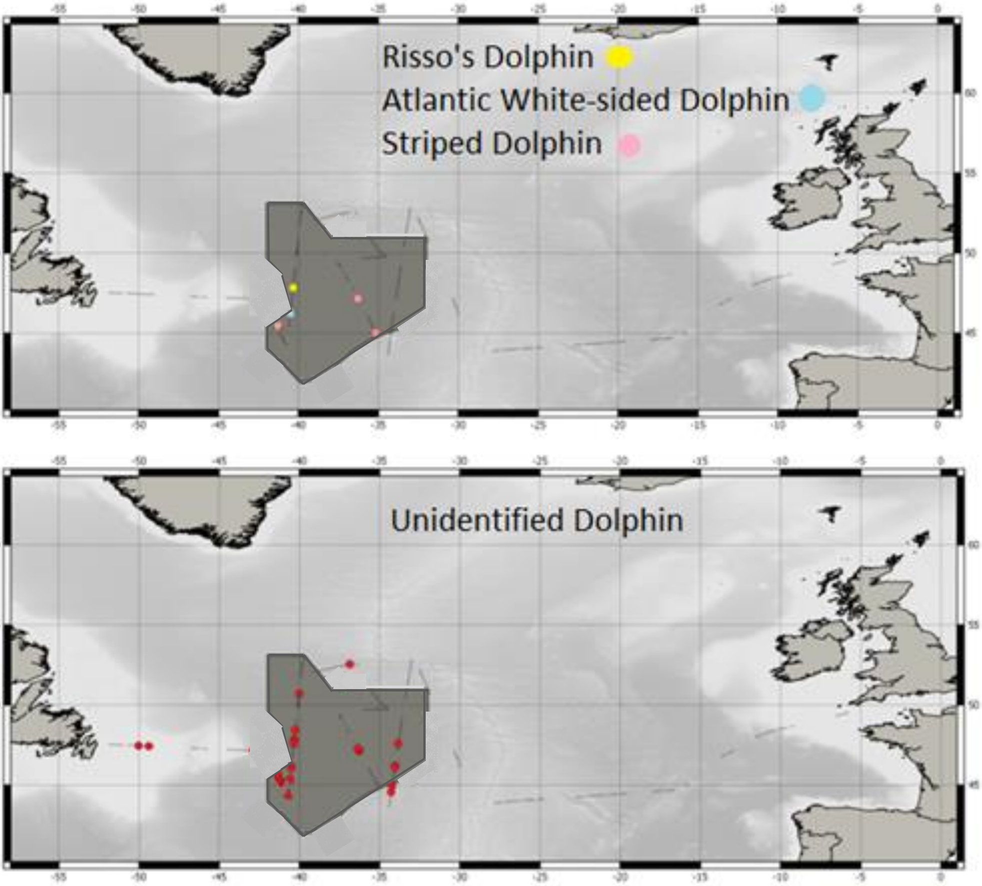


Figure A5.7 (cont.). *Cetaceans sightings along the DY080 transect and within the MPA.*

Annex 6. Evidence of species use and occurrence in North Atlantic Current and Evlanov Sea basin MPA from published literature.

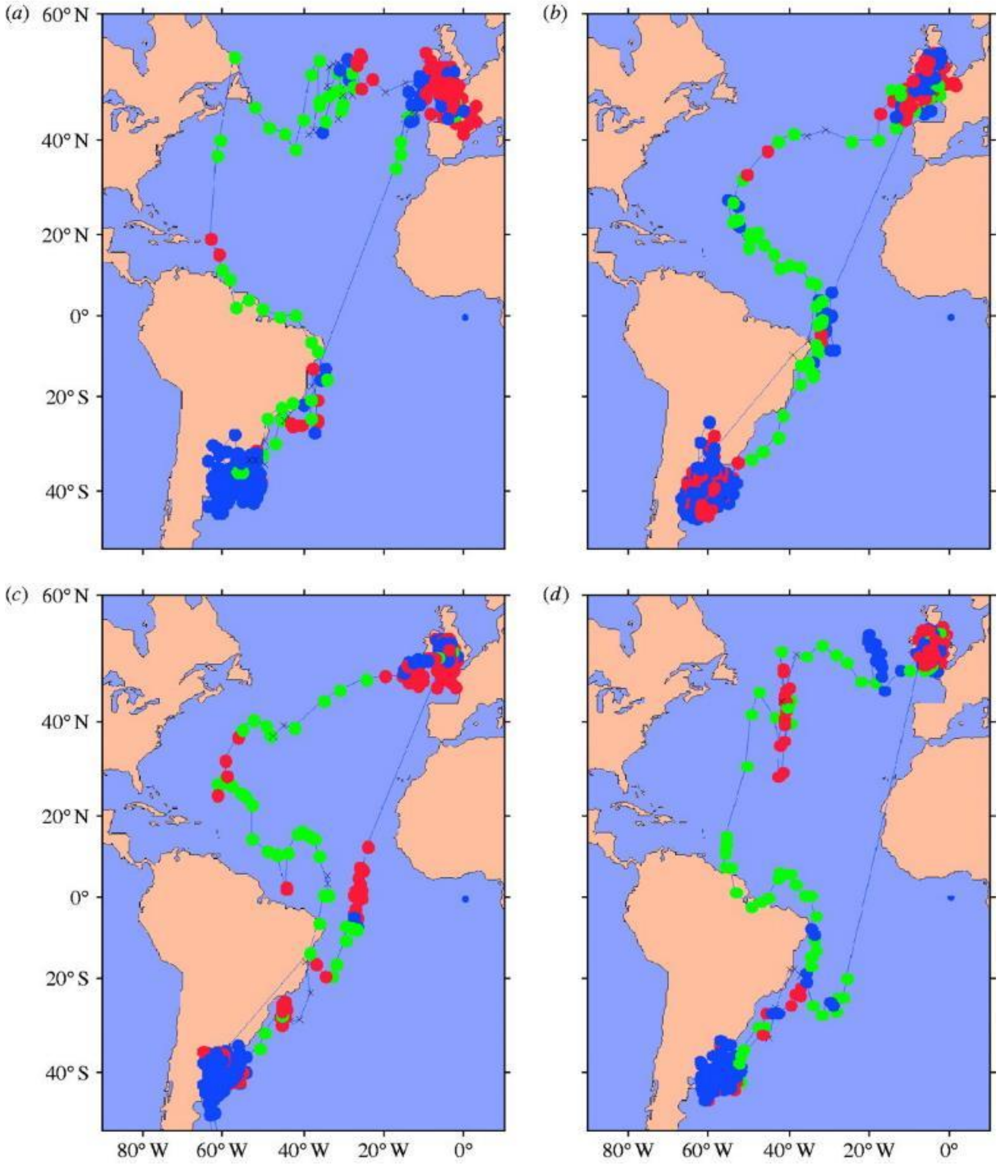


Figure A6.1. *Maps showing the migratory movements of* ***Manx Shearwater*** *(Puffinus puffinus)*

Colours represent different behaviours classification (based on Bayesian machine learning techniques; red: summer feeding; blue: winter feeding; green: migration. “Summer feeding” behaviour during migratory periods reveals the potential role of stopovers as refuelling areas (including in the area – see panel d). From Guilford et al. (2009)[18]

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[18] Guiolford et al. (2009). Proc. R. Soc. B (2009) 276, 1215–1223. DOI: 10.1098/rspb.2008.1577

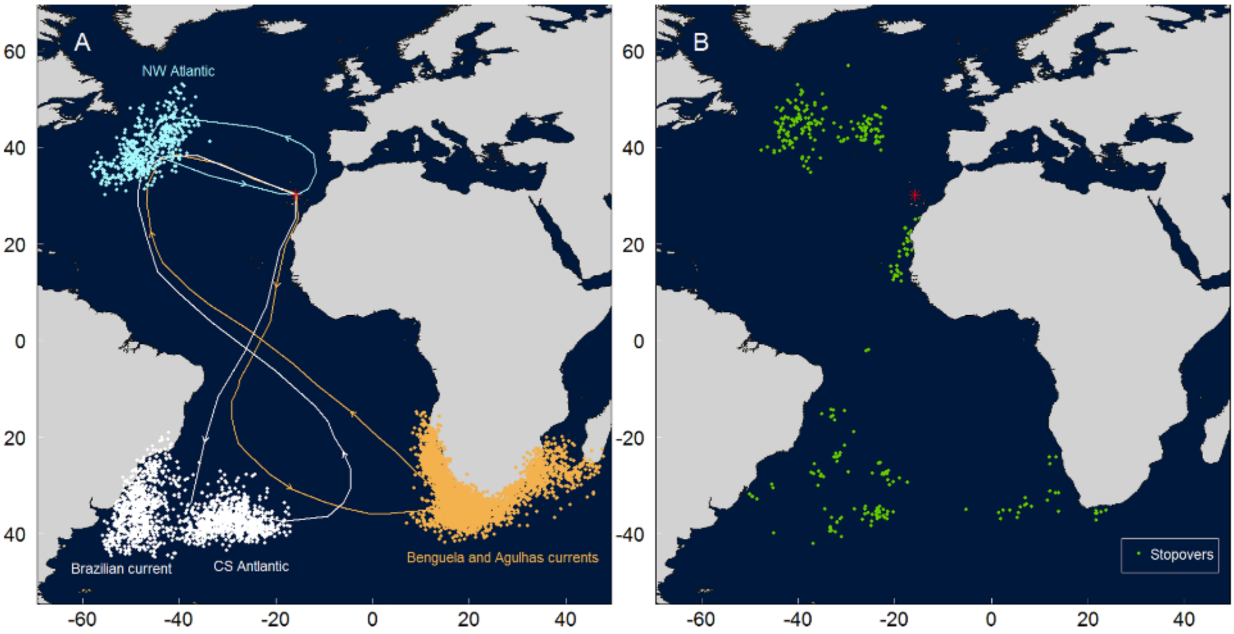

Figure A6.2. *Maps showing the migratory movements of* ***Cory's Shearwater*** *(Calonectris borealis).*

Birds tracked from the most important colony, located in Selvagem, Madeira (red asterisk). A: main wintering destinations; B: stopover locations. From Dias et al. (2012)[19]

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[19] Dias et al. (2012). PLoS ONE 7(11): e49376. doi:10.1371/journal.pone.0049376

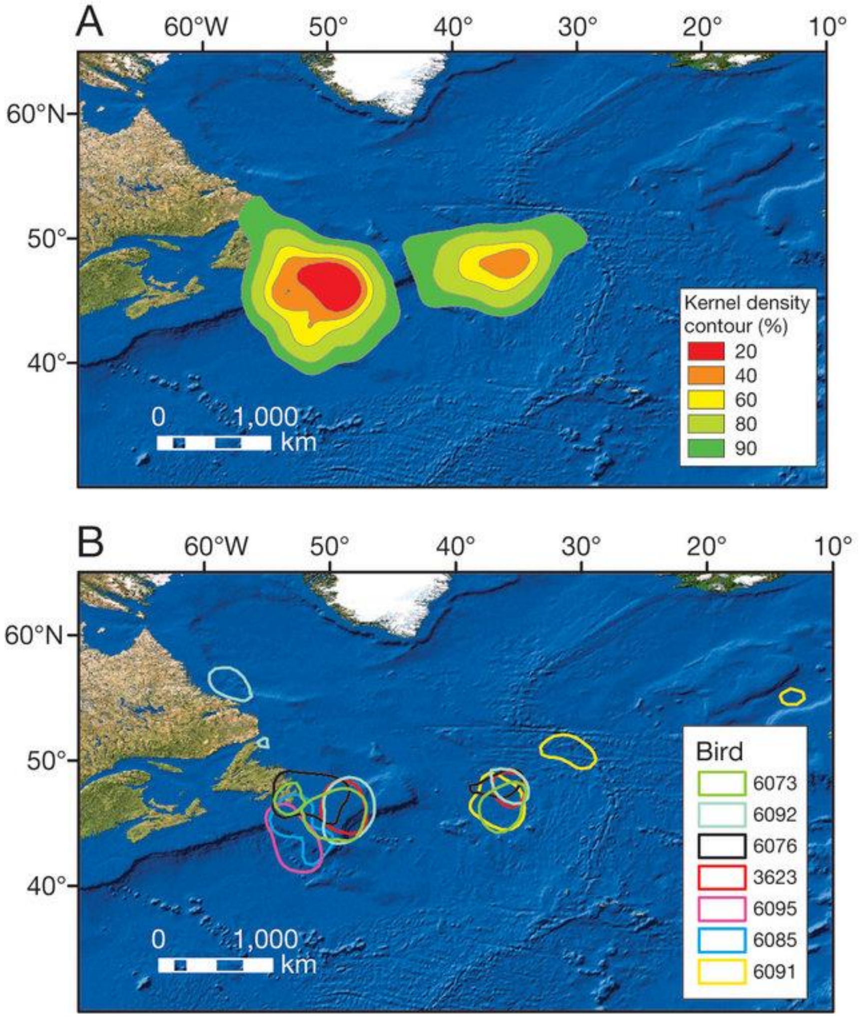

Figure A6.3. *Kernel density distributions of wintering* ***Sooty Shearwater*** *(Ardenna grisea), tracked from the Falkland Islands. From Hedd et al. (2012)*[20]

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[20] Hedd et al (2012). MEPS 449, 277–290 doi: 10.3354/meps09538

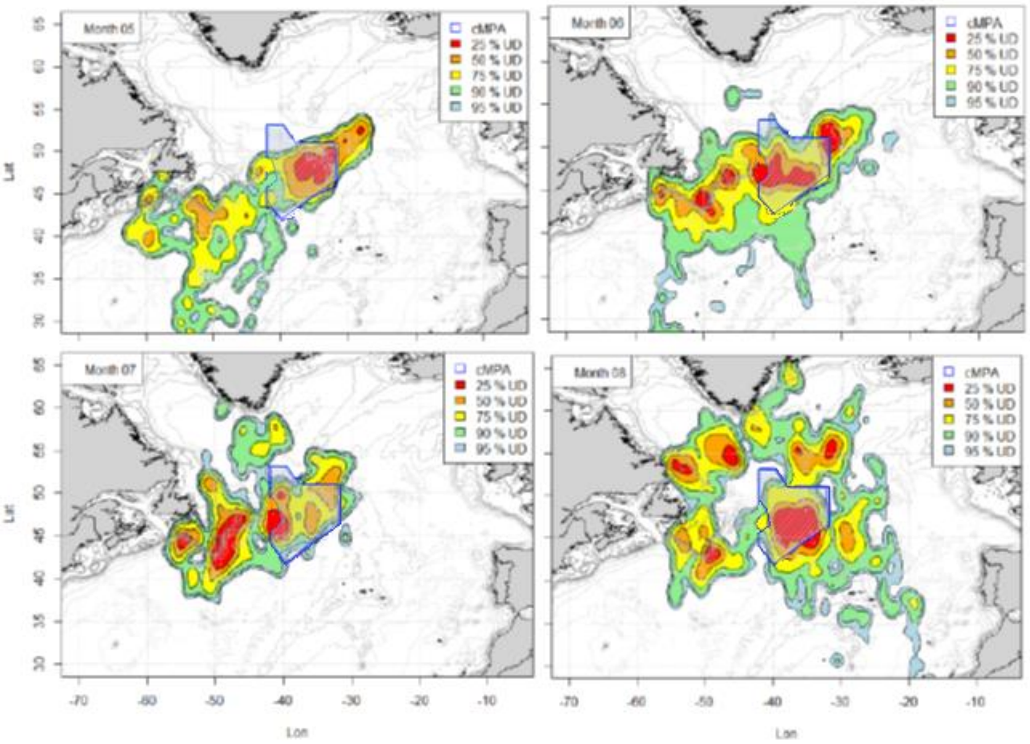

Figure A6.4. *Utilisation distribution of* ***Great Shearwaters*** *tracked from Gough Island during the boreal summer of 2017 (n=22).*

Information provided by Ewan Wakefield, University of Glasgow, during the Seeking Views process.

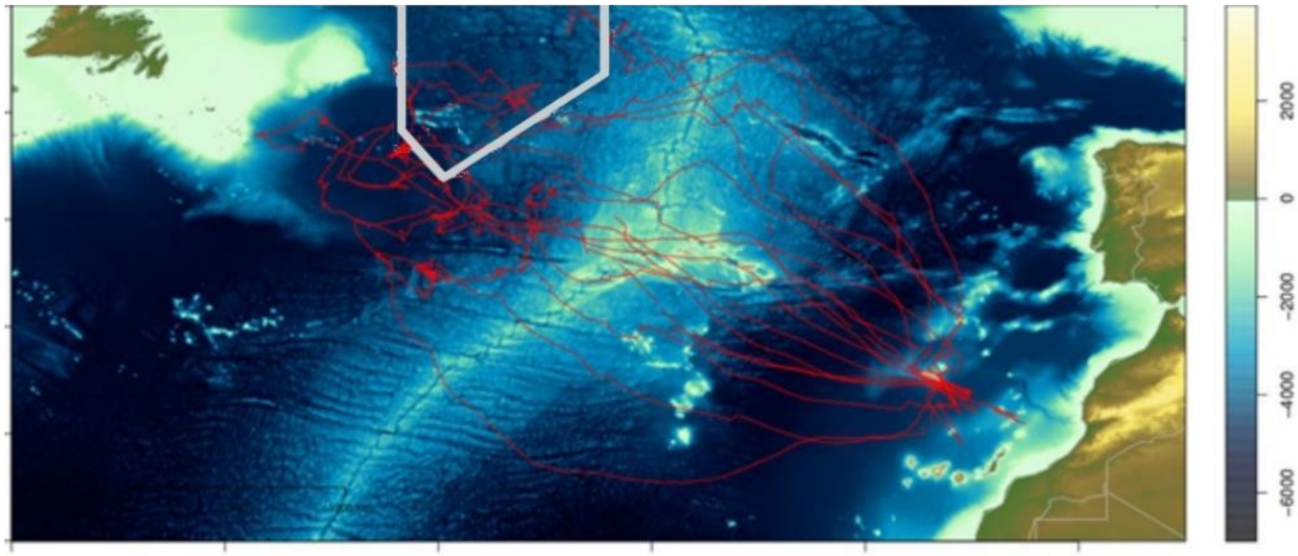

Figure A6.5. *Foraging movements of* ***Desertas Petrel*** *(Pterodroma deserta) tracked from the colony located in Bugio (Desertas, Madeira), during the incubation period. Based on GPS data collected by J.P Granadeiro and P. Catry (in prep).* ***Important note: The information included in this figure will form the basis of a scientific publication (in preparation).***

Note, additional data (2016-2018) for Desertas Petrels *Pterodroma deserta* (Vulnerable), and Zino's Petrel *Pterodroma madeira* (Endangered) also reaffirms this area as important for these globally threatened species (information provided during seeking views process, detailed below).

17 Desertas Petrels were tracked using GPS during their incubation stage in 2016 and 2017. The results show that the tracked birds fly 8-10,000km from Bugio Island (Madeira) on 2-3 week trips to feed in the area of the proposed MPA. This is new data that supplements the tracking data of Desertas Petrels (2008-2013) analysed as part of the NACES proforma, and reaffirms the proposed Site as important for this vulnerable species.

4 Zino's Petrels were tracked with GPS in 2018 during the incubation stage. These birds also forage within the Site. This information represents new data and supplements the tracking data for Zino's Petrel (2007-2010) analysed as part of the NACES nomination proforma, reaffirming that the proposed Site is important for this endangered species.

This additional data will be stored in the Seabird Tracking Database and will form part of a forthcoming publication.

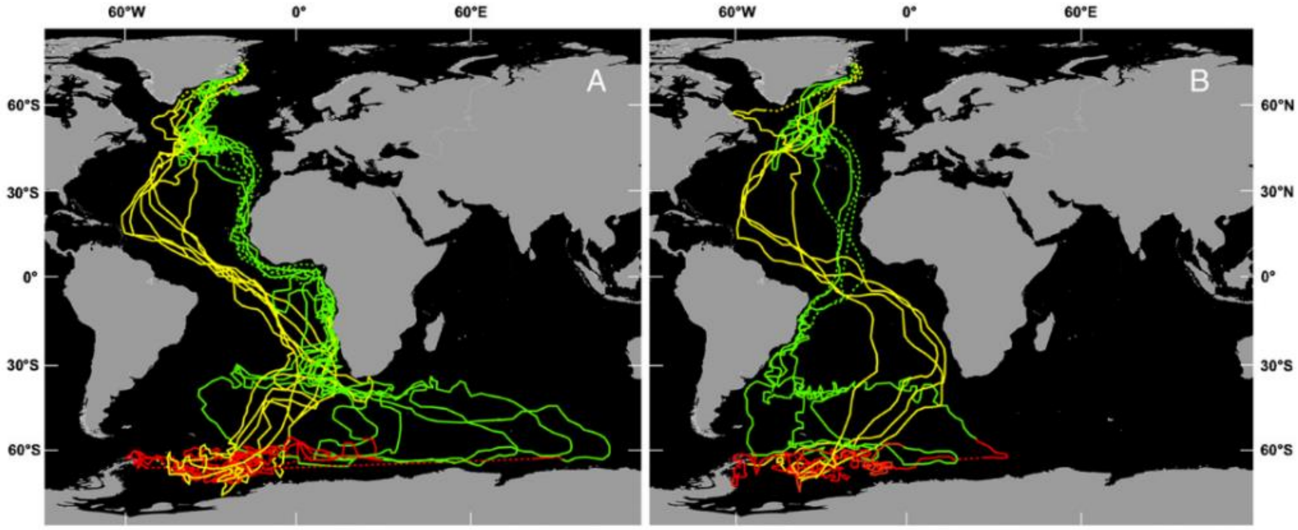

Figure A6.6. *Migratory movements of* ***Arctic Tern*** *(Sterna paradisaea)*

Birds tracked from breeding colonies in Greenland (n = 10 birds) and Iceland (n = 1 bird), showing the use of the MPA as a staging area. From Egevang et al. (2010)[21]

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[21] Egevang et al. (2010). PNAS 107, 2078–2081. doi:10.1073/pnas.0909493107

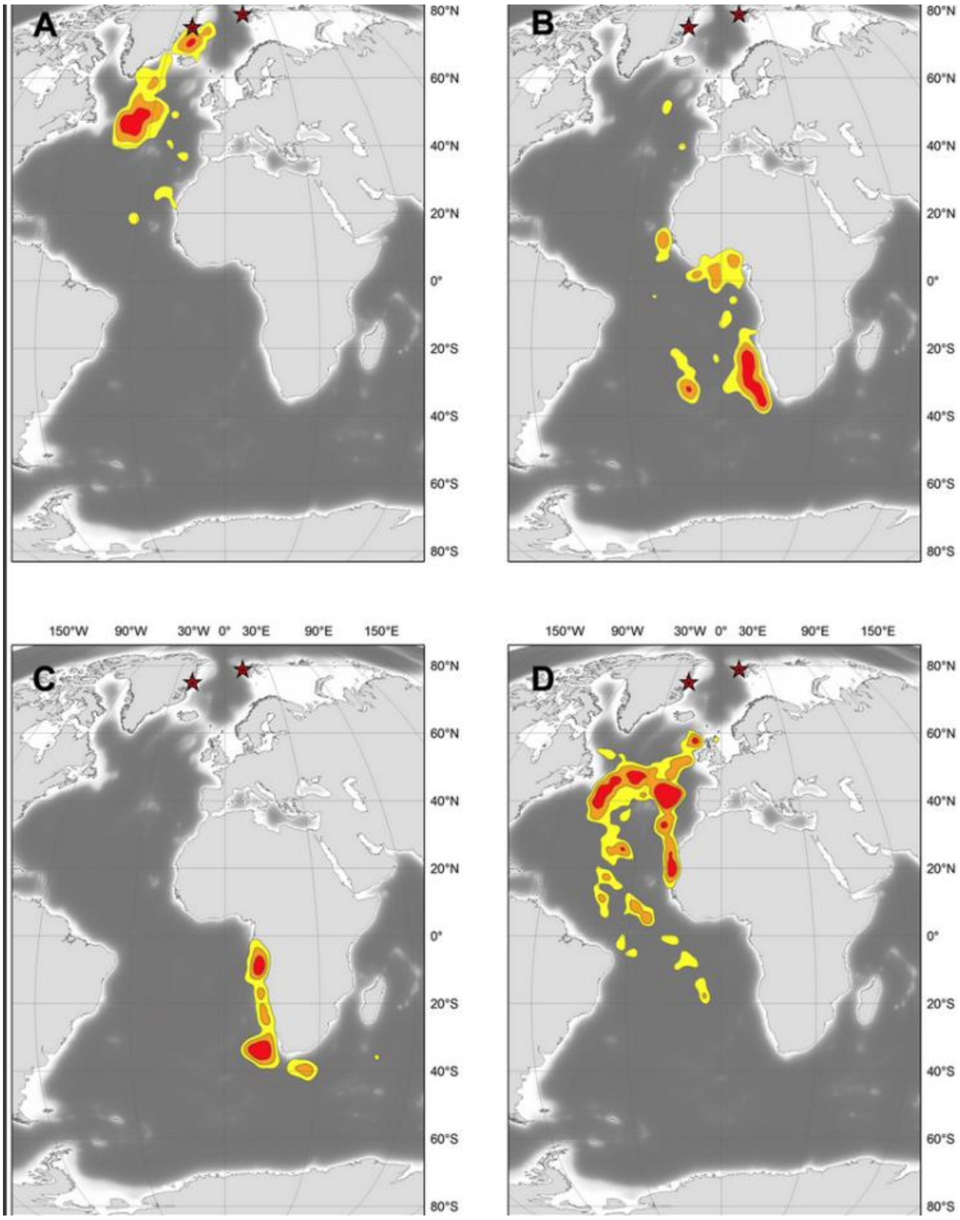

Figure A6.7. *Kernel density distribution estimated for the* ***Long-tailed Jaeger*** *(Stercorarius longicaudus) along the annual cycle(a) from release to September 10th, (b) between October 10th and November 31st, (c) December and January and (d) after April 10th. Contours represent densities of 25% (red), 50% (orange) and 75% (yellow). From Gilg et al. (2013)*[22]

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[22] Gilg et al. (2013). PLoS ONE 8(5): e64614. doi:10.1371/journal.pone.0064614

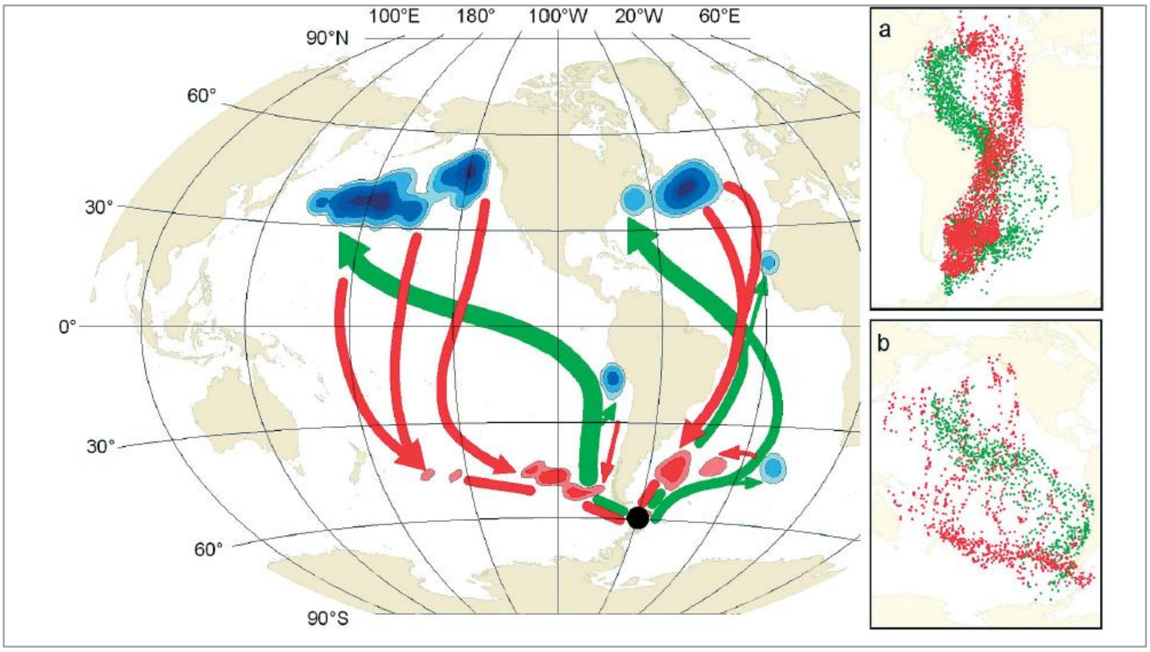

Figure A6.8. *Wintering areas and migration routes of* ***South Polar Skua*** *(Catharacta maccormicki) tracked from the colonies located in King George Island (back dot).*

Wintering areas represented in blue. From Kopp et al. (2011)[23]

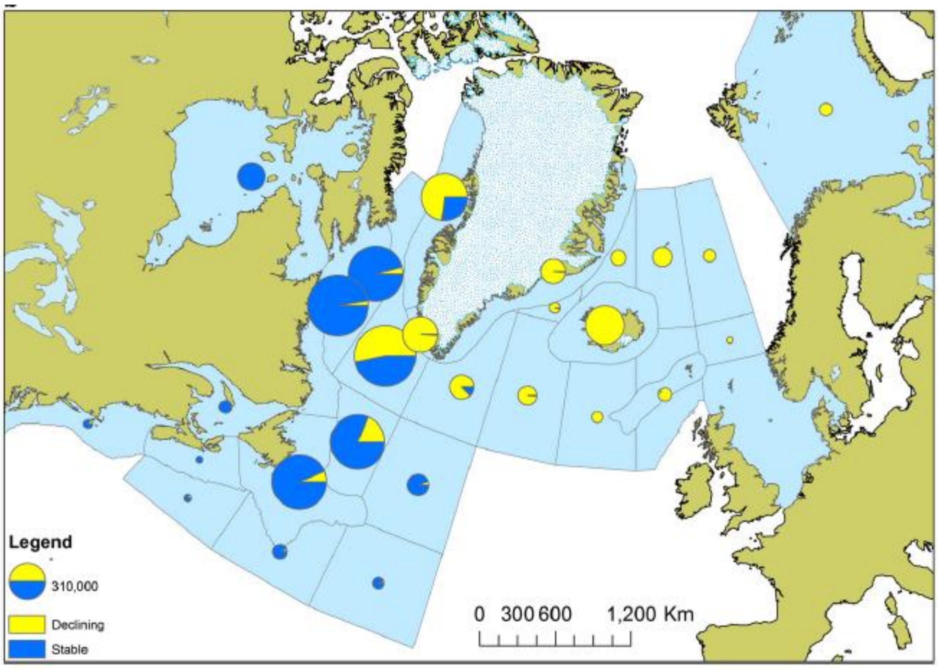

Figure A6.9. *Map showing the estimated number of adult* ***Thick-billed Murre*** *(Uria lomvia) (OSPAR-listed species) in different Atlantic sectors.*

Note the declining trend within the area where the NACES MPA is located. From Frederiksen et al. (2016)[24]

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[23] Kopp et al. (2011). MEPS 435: 263–267. doi: 10.3354/meps09229

[24] Frederiksen et al. (2016) Biol Cons 200 26–35. http://dx.doi.org/10.1016/j.biocon.2016.05.011

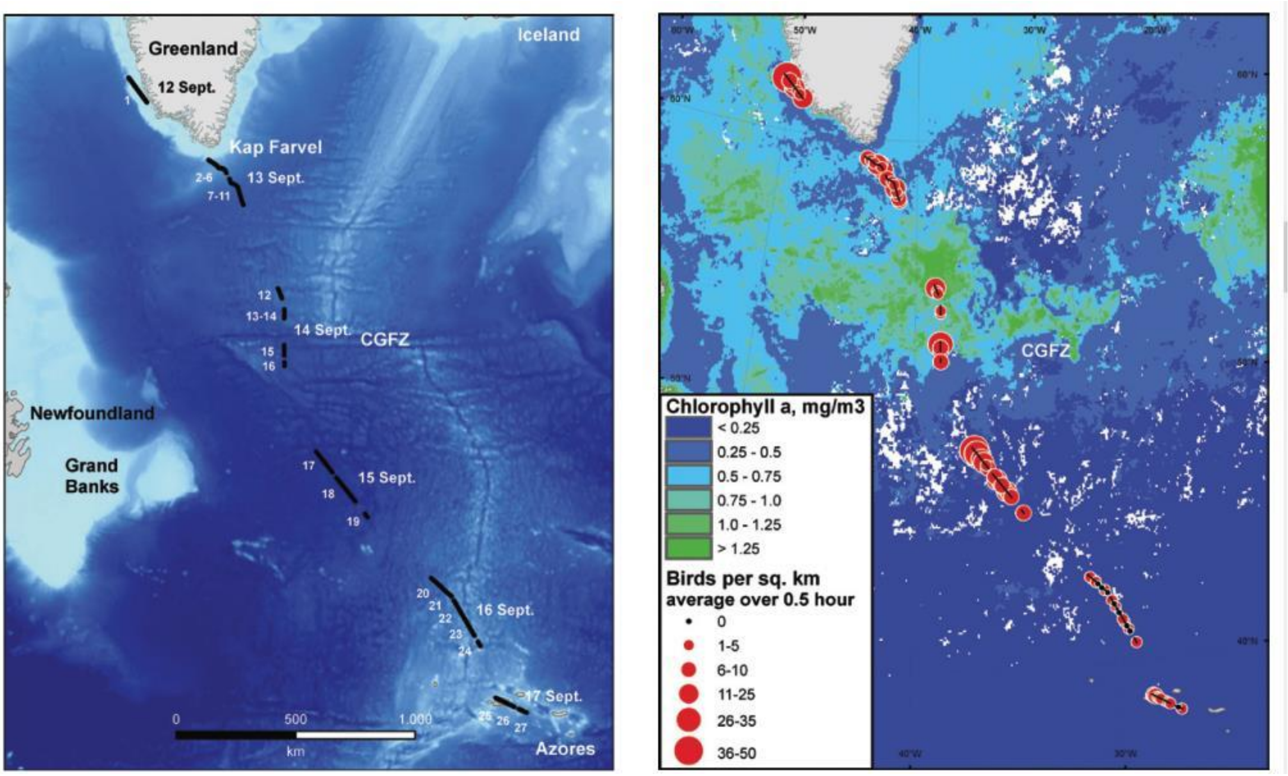

Figure A6.10. *At sea survey in 2006 across MPA area (dates 15-19 Sept). Left panel: The seabird-at-sea transect between Greenland and the Azores. Sub-transect numbers and dates are shown. CGFZ is the Charlie–Gibbs fracture zone. Right panel:* ***Densities of seabirds (all species combined)*** *along the transect. Densities are aggregated over 30 min periods, to provide a better overview. From Boertmann (2014)*[25]

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[25] Boertmann (2014). Dansk Ornitologisk Forenings Tidsskrift 108: 199-206

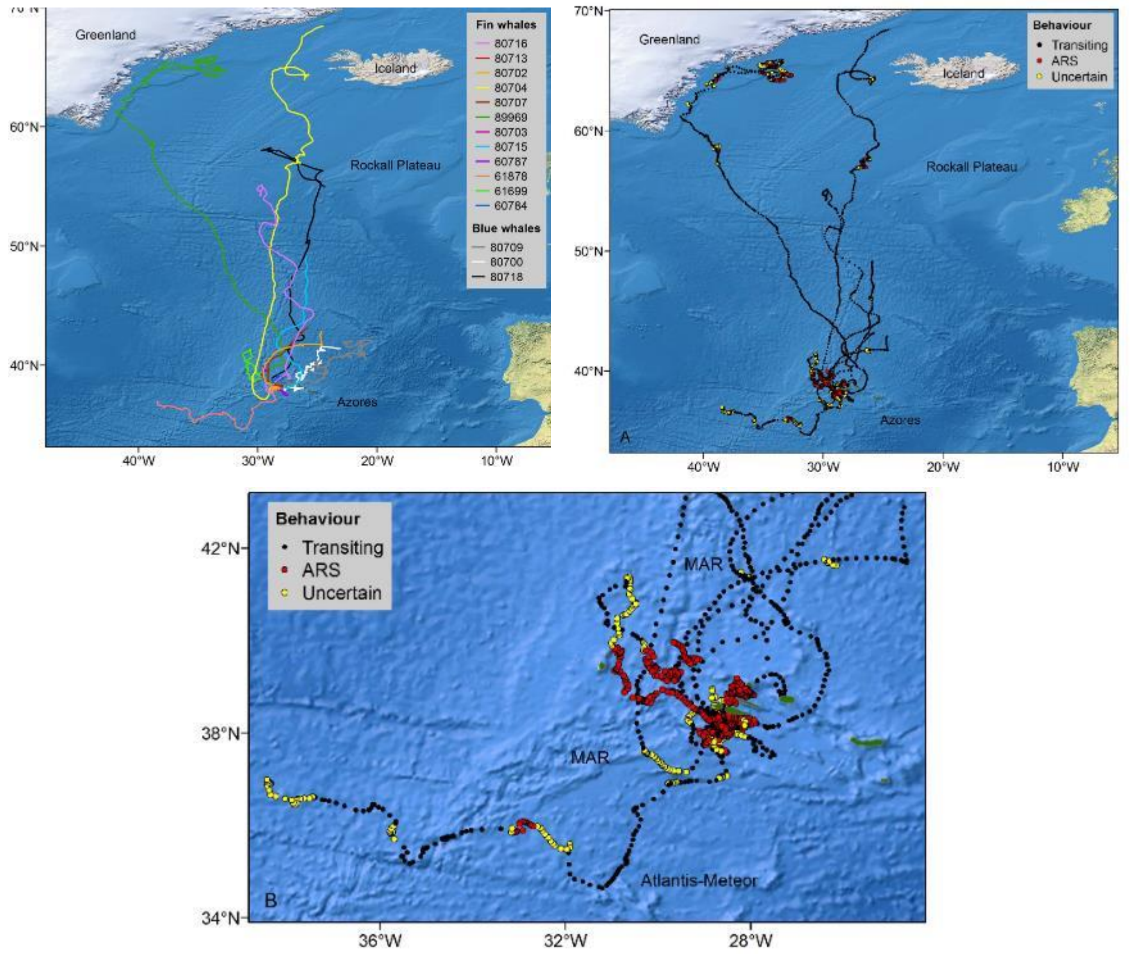

Figure A6.11. *Top left: Movements of* ***Fin Whales*** *(Balaenoptera physalus) and* ***Blue Whales*** *(Balaenoptera musculus) tagged in the Azores. Top right: Derived locations of Fin whales (based on hierarchical switching state-space models) showing inferred behavioural modes (transiting, area restricted movement and uncertain behaviour). Bottom: Details of the tracks at middle latitudes, showing the location of the Mid-Atlantic Ridge (MAR) and the Atlantis-Meteor seamount complex. From Silva et al. (2013)*[26]

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[26] Silva et al. (2013). PLOS ONE 8, e76507. doi:10.1371/journal.pone.0076507

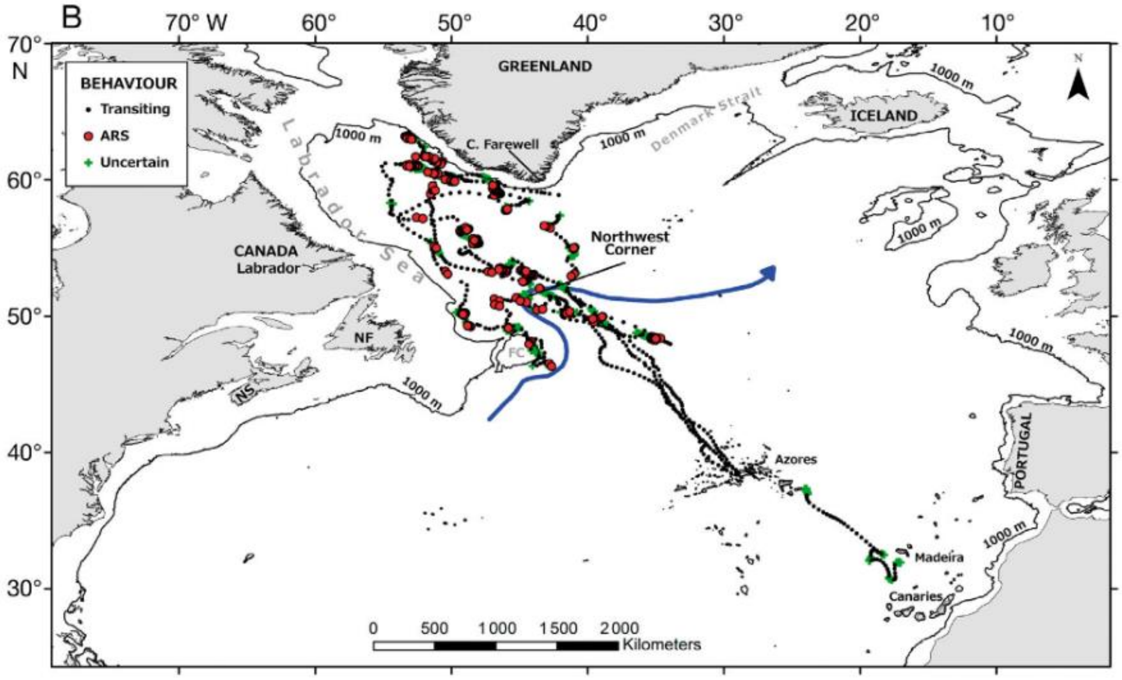

Figure A6.12. Hierarchical switching state-space model-derived locations of ***Sei Whale*** *(Balaenoptera borealis) showing inferred behavioural modes.*

The thick, blue line is a schematic representation of the main branch of the North Atlantic Current, showing the quasi-stationary large meander known as the 'Northwest Corner' and referred to in the text. ARS: area-restricted search; NS: Nova Scotia; NF: Newfoundland; FC: Flemish Cap. From: Prieto et al. (2014)[27]

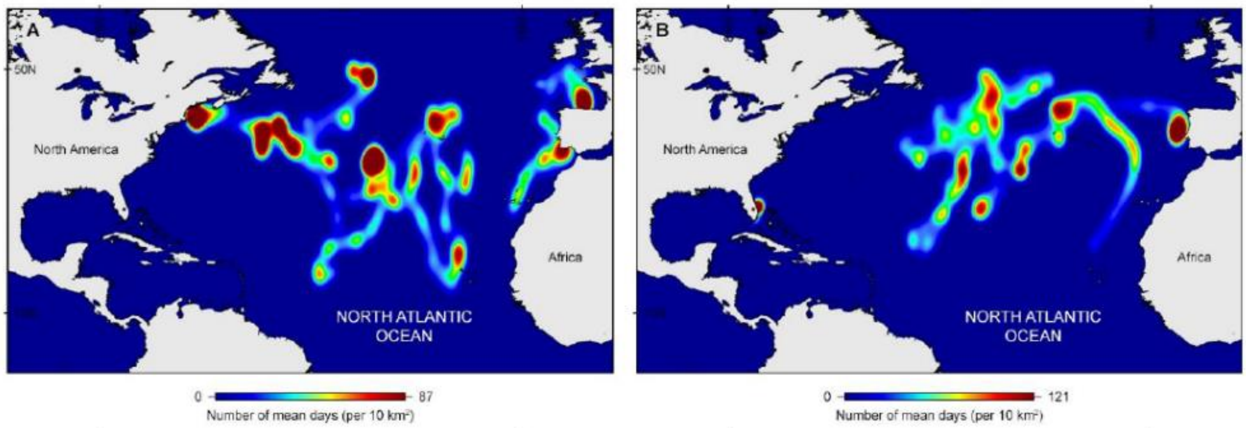

Figure A6.13. High species-specific space-use areas calculated for A) ***Blue Shark*** *(Prionace glauca) and B)* ***Shortfin Mako Shark*** *(Isurus oxyrinchus).*

The kernel smoothing parameter was kept constant to enable the visual comparison of residence probabilities.From Queiroz et al. (2016)[28]

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[27] Prieto et al. (2014). Endangered Species Research 26, 103–113. doi:10.3354/esr00630

[28] Queiroz et al (2016). PNAS 113, 1582–1587. doi:10.1073/pnas.1510090113

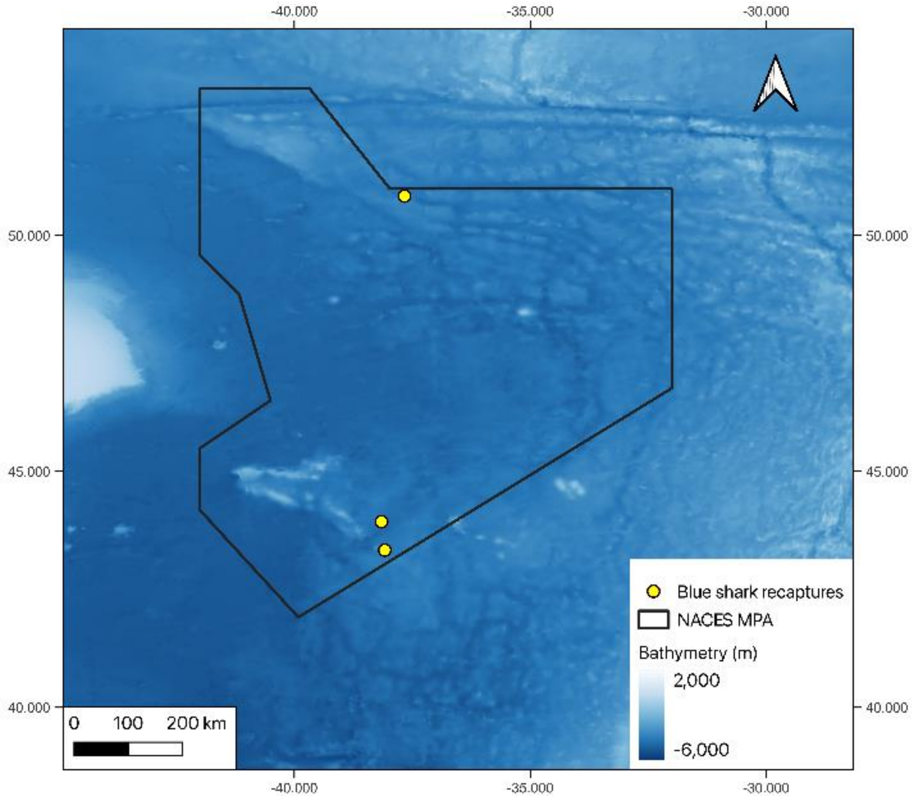

Figure A6.14 *Blue Shark angler-led tag-and-recapture data in the NACES MPA. Provided by Lucy Mead, University of Edinburgh, during the Seeking Views process. Individuals were tagged off the southeast coast of the UK.*

The information provided also noted that the area is likely an important transitory habitat for movement between the aggregation hotspots of the Mid-Atlantic Ridge and the Azores.

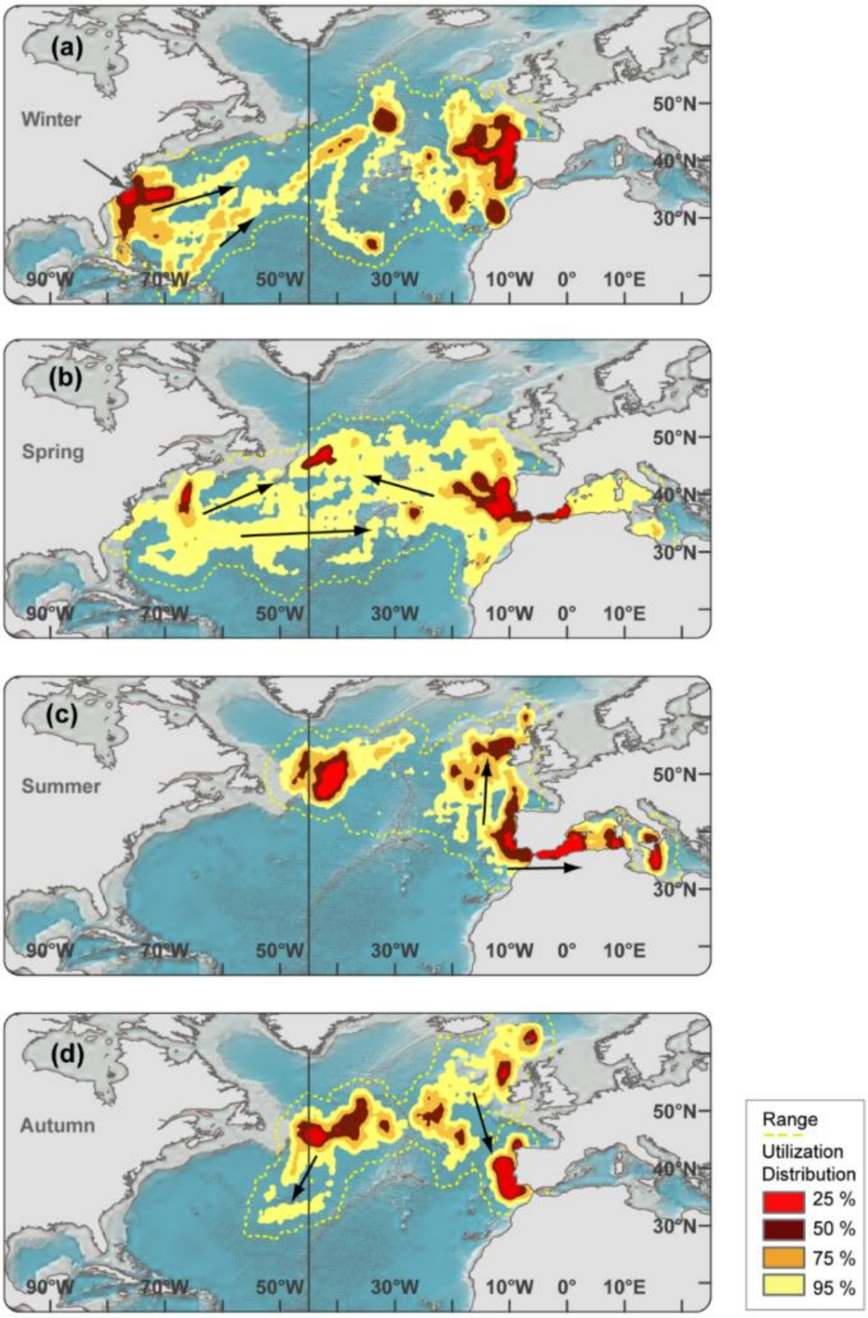

Figure A6.15. *Atlantic Bluefin Tuna Thunnus thynnus (OSPAR-listed species; Global Red List Status: Endangered) foraging area hotspot analysis across seasons. From Walli et al. (2009)*[29]

Transatlantic surveys of seabirds, cetaceans and turtles, July 2013 and July 2018.
Information provided by Ewan Wakefield, University of Glasgow, during the Seeking Views process.
http://eprints.gla.ac.uk/171090/1/171090.pdf
Suggested citation: Wakefield, E.D. 2018. Transatlantic surveys of seabirds, cetaceans, and turtles, July 2013 and July 2018. University of Glasgow, UK 34p.

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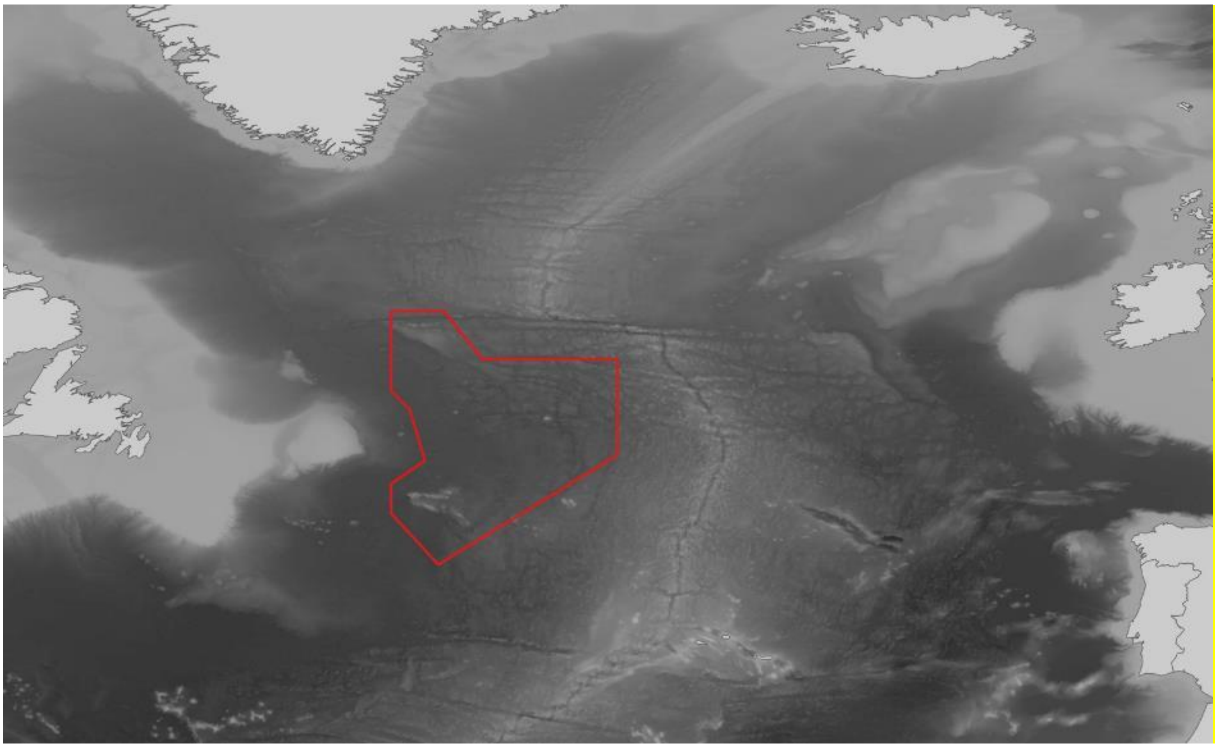
[29] Walli et al. (2009). PLOS ONE 4, e6151. doi:10.1371/journal.pone.0006151

Annex 7. Scientific information to inform the NACES MPA Roadmap (GOBI 2022).

Report authors: David E. Johnson, Christopher Barrio Frojàn & Vikki Gunn, Seascape Consultants Ltd/GOBI Secretariat. February 2022.

Background

At the OSPAR Ministerial Meeting in 2021 a new high seas Marine Protected Area (MPA) was designated for seabirds. The North Atlantic Current and Evlanov Sea basin (NACES) MPA is an important transition zone where large oceanic gyres meet, resulting in upwelling nutrients and mixing of water masses. OSPAR Decision 2021/01 (2.1) notes the need to protect 'ecosystems of the waters superjacent to the seabed' of the NACES MPA. OSPAR Recommendation 2021/1 refers to 'the biodiversity and processes that support seabirds'.



Location of NACES MPA as designated by OSPAR in 2021 (bathymetry from GEBCO)

OSPAR Parties agreed to further consider benthic and pelagic species other than those explicitly highlighted in the Decision and Recommendation. Appendix 1 of Recommendation 2021/1 highlights seamounts (an OSPAR Threatened and/or Declining Habitat); seamount-like features and associated communities, abyssal plain and deep-sea trenches; additional birds (black-legged kittiwake, thick-billed murre, Audubon's shearwater); blue whale; leatherback turtle; bluefin tuna; and basking shark. Other species of interest include seabirds, cetaceans, mesopelagic fish and cephalopods. OSPAR agreed a Roadmap for further development of the MPA (OSPAR Agreement 2021-08).

This report is an attempt to source and draw attention to relevant additional data that is complementary to the NACES MPA Proforma, in order to support and inform the Roadmap process. The aim is not to make a case for or against the extension of the MPA. Rather, it is to identify what relevant additional scientific information exists and to provide an informed opinion on the usefulness or otherwise of that information. The maps and figures presented here are purely illustrative of data holdings and products. Further assessment should refer back to original datasets and high-resolution compilations where they are available.

Methodology

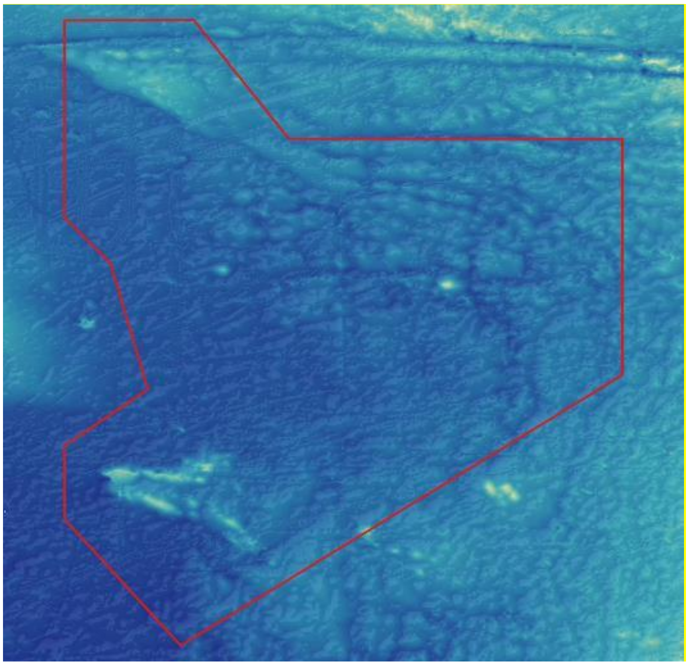
The NACES Background Document consolidated relevant biodiversity data with a clear focus on seabirds. To build on this baseline, OSPAR Contracting Parties were requested to provide relevant data. In addition, a number of related initiatives and scientific expeditions/projects were revisited and informal expert consultations conducted to scope possible additional data for benthic and pelagic features of interest. The focus was features within and species using the NACES area. Sources of information included global datasets on physical and biological characteristics such as the General Bathymetric Chart of the Oceans (GEBCO) and the Ocean Biodiversity Information System (OBIS), as well as the Migratory System in the Ocean (MiCO) system. More region-specific information was sourced from the NE and NW Atlantic regional EBSA workshops, the Milne Seamount Cluster Background Document, MAR-ECO (a Census of Life field project), ECOMAR, EU ATLAS project, EU iAtlantic project, the ISA Regional Environmental Management Plan process and its predecessor, the SEMPIA project.

Results

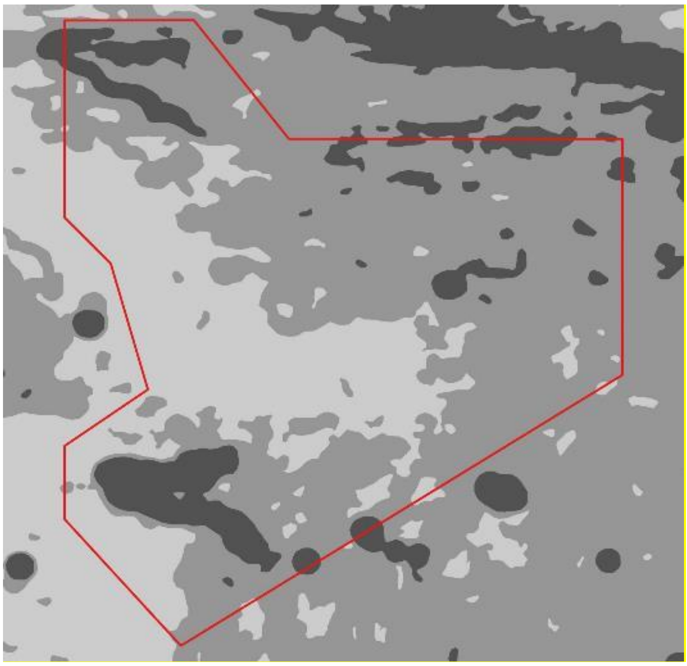
Evidence relating to the biophysical environment of the NACES area

Available datasets on global seabed geomorphology

The following extracts are from the GEBCO 2021 gridded bathymetry and associated products:

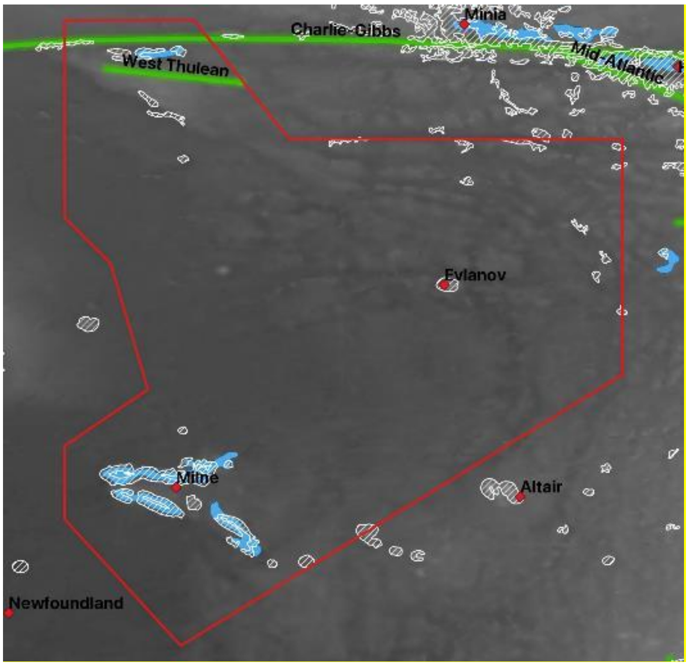


Predicted bathymetry



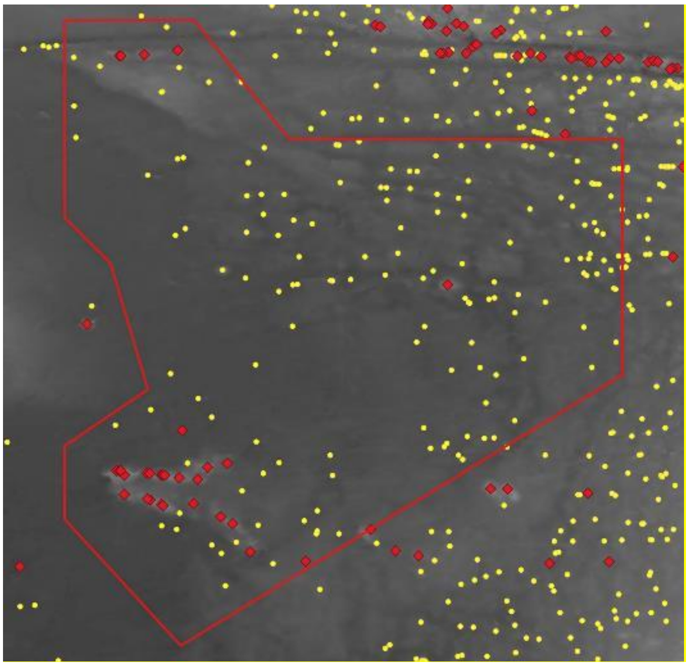
Abyssal classification

Pale grey: plains
Mid grey: hills
Dark grey: mountains



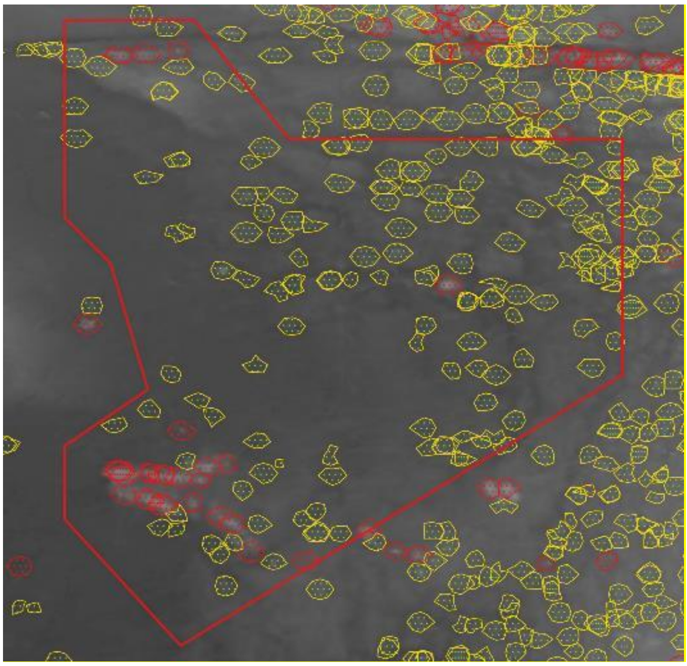
Bathymetric features

Green: fracture zones
Red: named seamounts
White hatch: escarpments
Blue: ridges



Seamount and knoll peaks

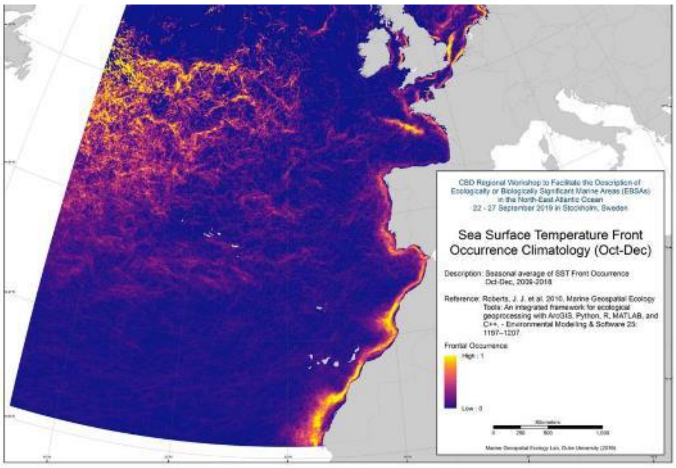
Red: all seamounts (>1,000 m tall)
Yellow: knolls (<1,000 m tall)



Seamount and knoll base area

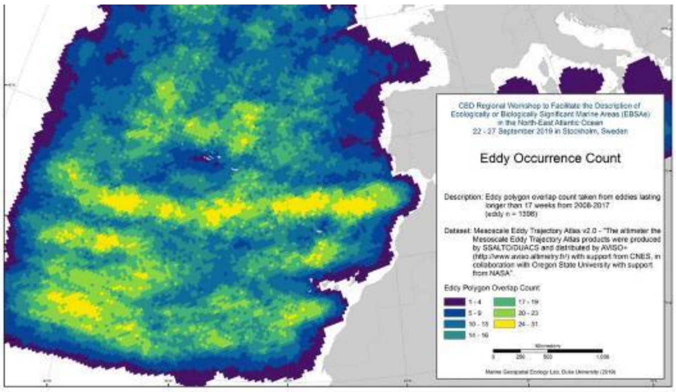
Red: all seamounts
Yellow: knolls

Available datasets on global ocean climatology



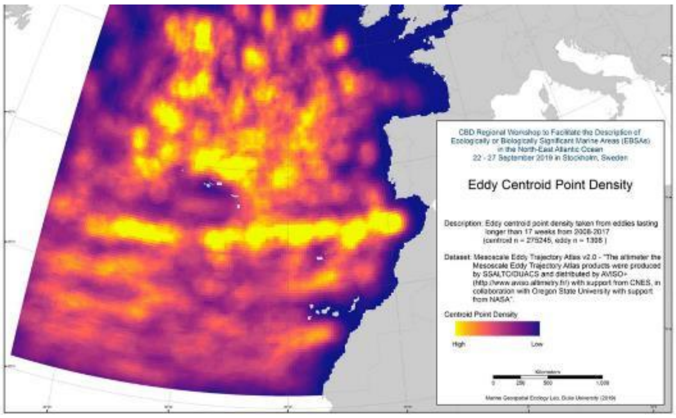
Sea surface temperature front occurrence October-December

From NE Atlantic regional EBSA workshop data report (CBD, 2019)



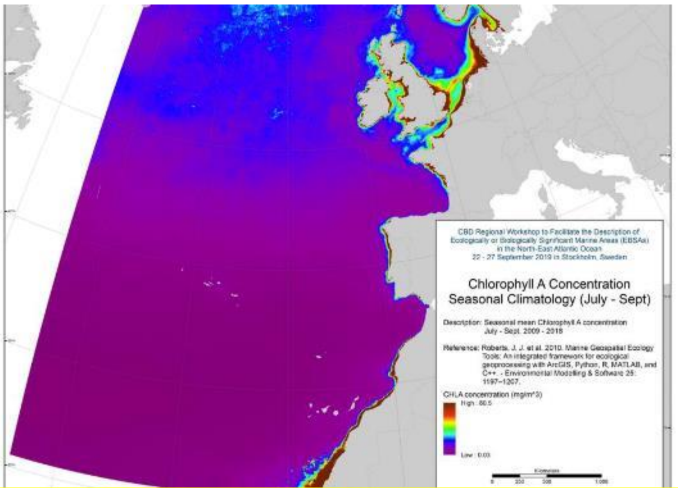
Eddy occurrence count 2008-2017

From NE Atlantic regional EBSA workshop data report (CBD, 2019)



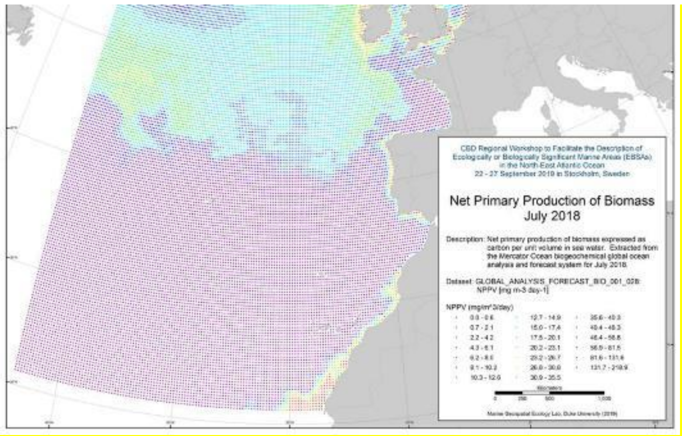
Eddy centroid point density

From NE Atlantic regional EBSA workshop data report (CBD, 2019)



Chlorophyll a concentration (seasonal climatology July-September)

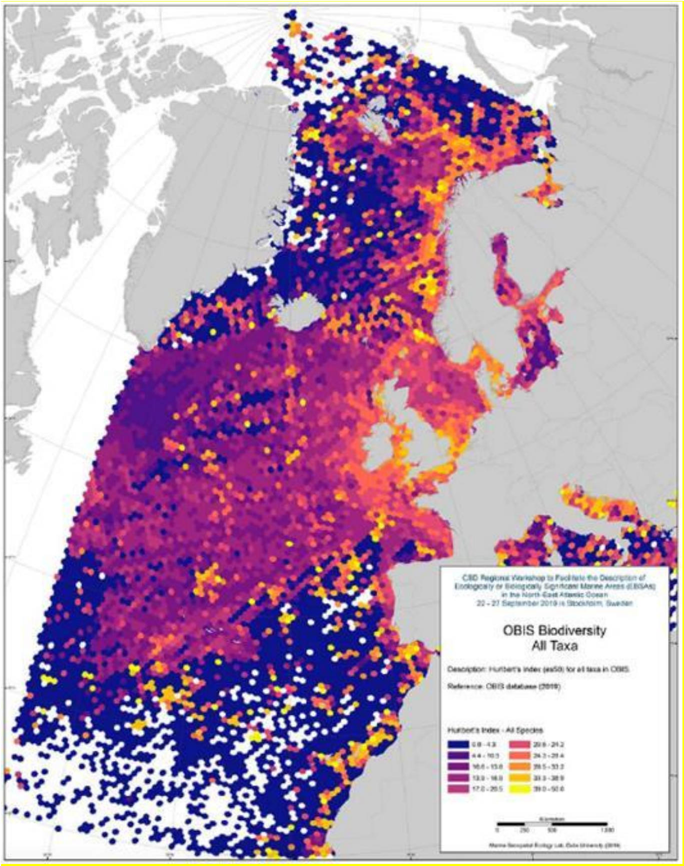
From NE Atlantic regional EBSA workshop data report (CBD, 2019)



Net primary production of biomass July 2018

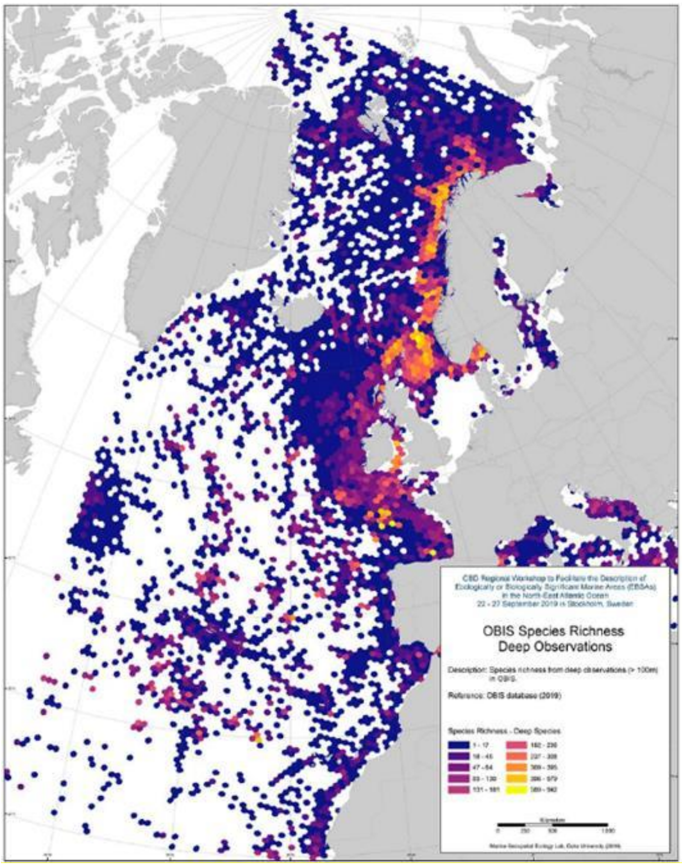
From NE Atlantic regional EBSA workshop data report (CBD, 2019)

Available global datasets on biodiversity



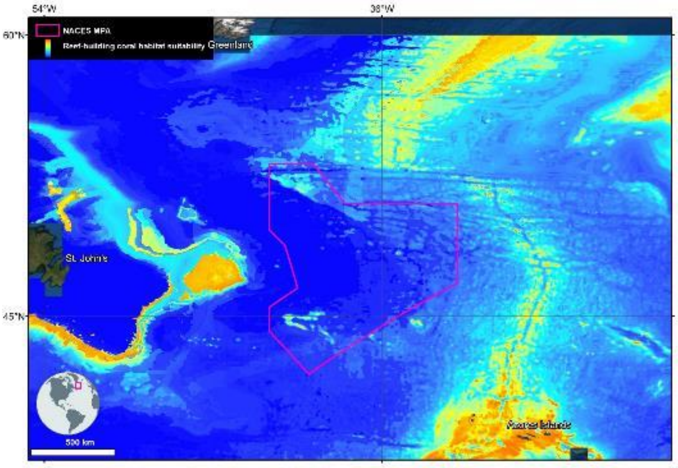
OBIS biodiversity (Hubert's es50 index)

From NE Atlantic regional EBSA workshop data report (CBD, 2019)



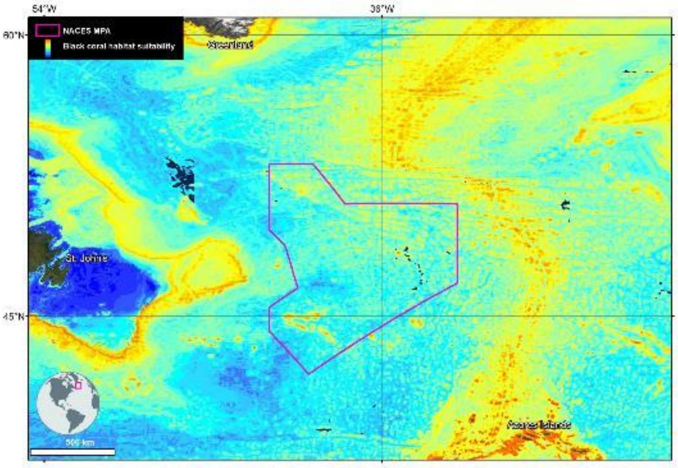
OBIS species richness (observations) >100 m deep

From NE Atlantic regional EBSA workshop data report (CBD, 2019)



Predicted habitat suitability of reef-building deep-water corals in and around the NACES MPA

From Davies & Guinotte (2011).

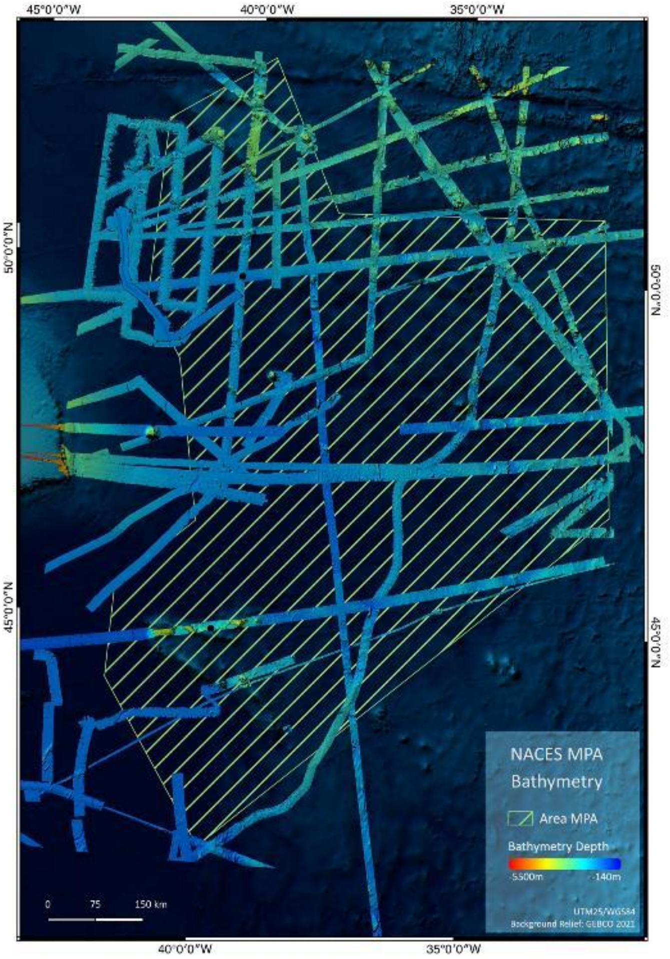


Predicted habitat suitability of black corals in and around the NACES MPA

From Yesson et al. (2016)

Highly suitable habitat for reef-building corals and black corals is predicted to occur on all seamounts of the NACES MPA. Reef-building corals and black corals are widely considered as one of the top conservation priorities globally. While the predicted reefs inside the NACES MPA are all in quite deep water (>1500 m), such deep-water reefs are known to be highly biodiverse. Reef-building, deep-water corals and black corals are considered to be indicator species of vulnerable marine ecosystems by several regional fishery management organisations including the North-East Atlantic Fishery Commission.

Multibeam bathymetry data collected by German research vessels



Bathymetry (measured) against background of GEBCO bathymetry (predicted)

Data collected by German research expeditions, 1995-2021

Red-yellow-green-blue colour gradient: high (shallow) to low (deep) seabed elevation

Summary

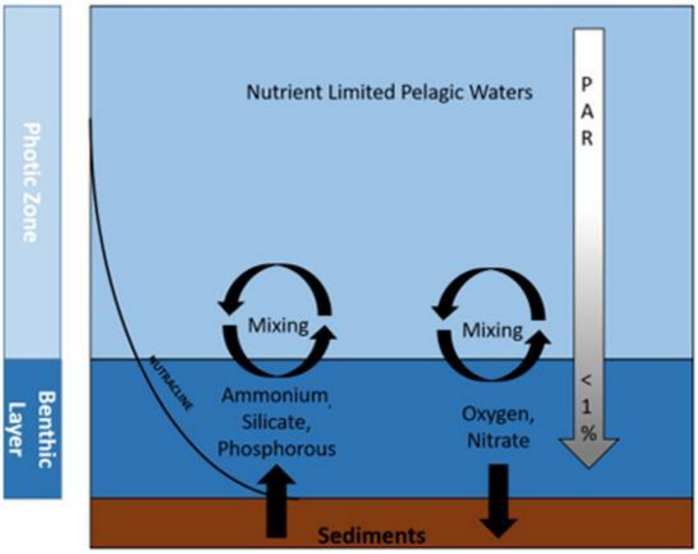
In summary, a contour plot or high coloured shaded bathymetry that picks out the heterogeneity of the abyssal seafloor can be worked up for this area based on GEBCO data. Potential areas worthy of further consideration include the Evlanov seamount and the very northern part of the NACES area, which includes a section of the Charlie-Gibbs Fracture Zone and a number of seamounts greater than 1000 m high, including a newly mapped feature on the northern margin of the area (see Conclusion). Ecological connections between the Milne Seamount Cluster MPA and other seamount-associated communities are possible.

A feature of the NACES area is a clustering of knolls that produce smaller scale seafloor heterogeneity. Comparisons could be made with the Porcupine Abyssal Plain, which lies at a similar latitude, albeit to the east rather than the west of the Mid-Atlantic Ridge (Durden et al., 2020).

The climatology maps illustrate the utility of satellite data, however, this is generally restricted to the surface and upper ocean layers, the importance of which is already recognised by the NACES MPA. Paucity of deep-sea biological data is reflected in the illustrations provided.

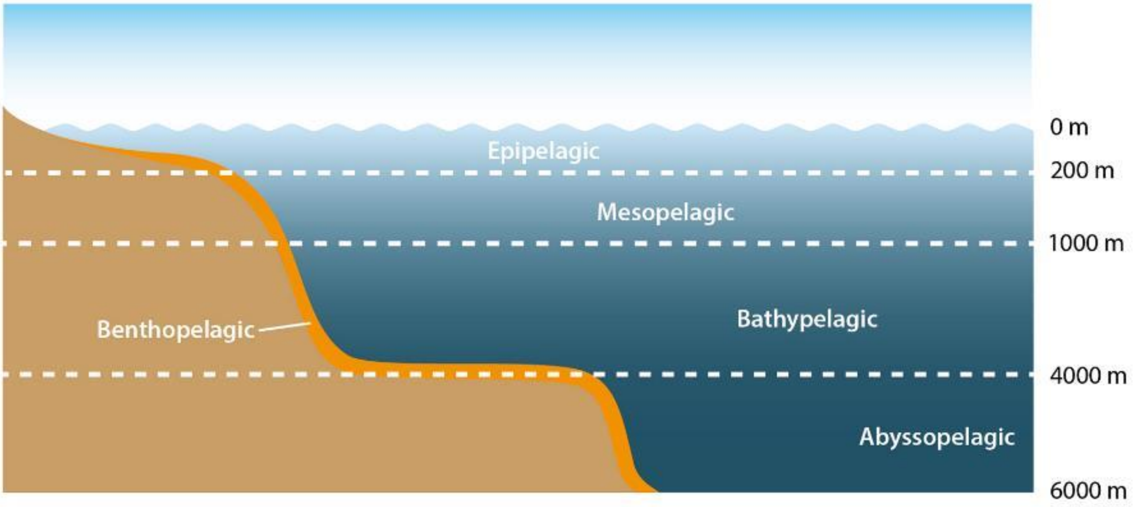
Evidence relating to benthopelagic coupling

In general terms **benthopelagic coupling** is recognised as the exchange of energy, mass or nutrients between benthic and pelagic habitats, and seen as a crucial element of ecosystem functioning. Nutrients (such as nitrogen, phosphorous and silicate) are recycled by microbially mediated processes in the benthos. In this way sediments can return a considerable fraction of organic matter to overlying water as regenerated nutrients, stimulating surface photosynthesis (Nunnally, 2019). Mixing due to wind, currents across topographic features that drive nutrient-rich deep-waters towards the surface, internal waves and upwelling are all contributory to coupling (Marcus and Boero, 1998). However, whilst it is recognised that benthic and pelagic regimes are not independent, large gaps remain in understanding the specifics of this complex process and much work to date has been in shallow marine and transitional waters. Species-specific studies, such as the biology of deep-sea holothurians from the Porcupine Seabight and Porcupine Abyssal Plain of the Northeast Atlantic at depths of 800-4850 m (Hudson et al., 2004) and large aggregations of benthopelagic fish over the slopes of McNish seamount in the South Atlantic (Campanella et al., 2021) provide some deep-sea insights.



Benthopelagic coupling. From Encyclopedia of Ocean Sciences 2019. ISBN 978-0-12-813082-7

No research publications on benthopelagic coupling relating specifically to the NACES area have been identified and this remains a future research opportunity. Benthopelagic coupling from the sea surface downwards to the seabed in organic carbon fluxes derived from primary production is probably important (see depth layers on schematic below), but the water depths apparent for the vast majority of the NACES area means that it is highly unlikely that any direct upward benthopelagic coupling from the seabed will be important.



Division of the open ocean into vertical layers on the basis of light penetration (epipelagic) and depth zones. The benthopelagic zone connects the water column and the benthos. After Hobday et al. (2011)

Remineralisation in the water column (probably 95%) will be through mixing nutrients back into surface waters during winter storms. Remineralisation will occur at the sediment water interface, but the nutrients generated here will enter the deep-water circulation and take a long time to reach the sea surface and in quite a different area.

Evidence relating to OSPAR Recommendation 21-01e, Appendix 1: Species and habitats of special interest occurring at the North Atlantic Current and Evlanov Sea basin MPA

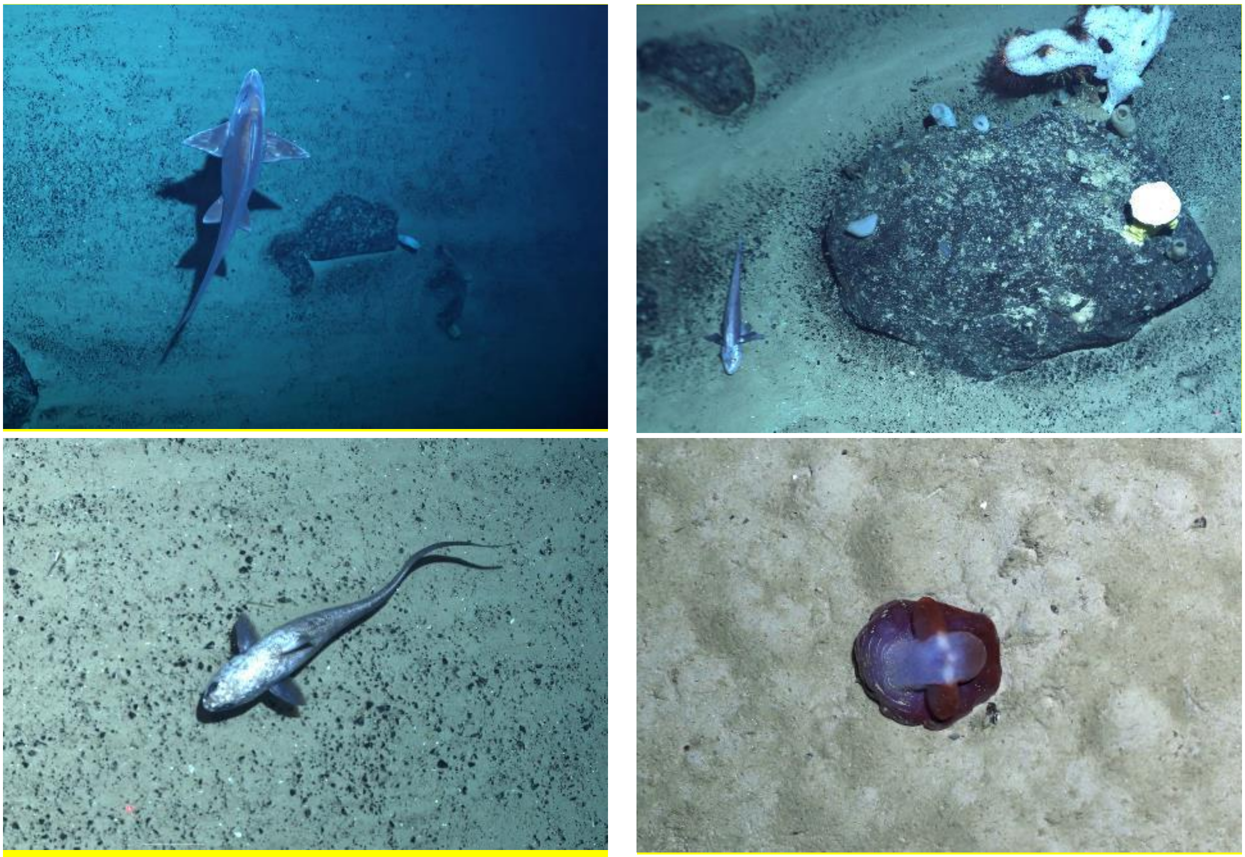
Threatened and/or declining habitats

Seamounts: Seamounts can support unique ecosystems and are often hotspots for pelagic productivity and diversity (e.g., Haney et al., 1995). However, recent research on hotspots of marine life present at Azores seamounts suggested that it is seamounts shallower than 400 m depth that are mainly associated with significant aggregation effects (Morato et al., 2008).

The NACES area includes the Evlanov Seamount and a scatter of smaller features (knolls and guyots; see section 3.1.1). No additional information on seamount-linked enhanced fish densities is available. However, associated presence of large pelagic fish predators is detailed below (under Sharks). Larger seamount and knoll features may be important for highly migratory species (as navigational aids) and as foraging sites for predators. In the NACES area, this may apply to such features in association with the Milne Seamount Cluster and the adjacent Corner Rise and New England Seamounts to the west of the NACES area.

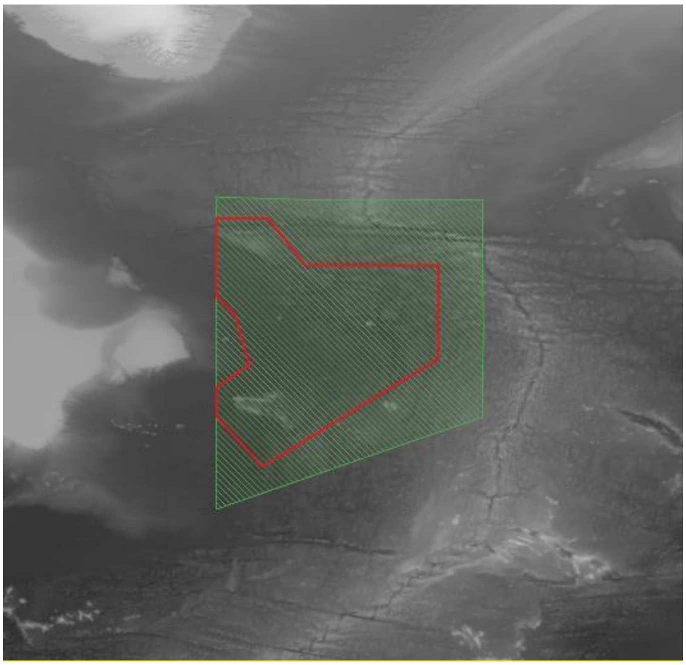
Other habitat features of interest

Seamount-like features and associated communities Abyssal Plain and deep-sea trenches: During the IceDivA2 (Icelandic marine Animals meet Diversity along latitudinal gradients in the deep sea of the Atlantic 2) the c. 49.5M-year old caldera near the NACES area (named ‘Mount Doom’), with two smaller structures nearby, was surveyed with multibeam bathymetry. The peak of the caldera was located at 2,354 m depth with the base situated at 3,666 m. Two camera surveys using the Ocean Floor Observation System (OFOS) were also conducted, the first from the top down through the centre of the caldera, and second at the base. During the dive from the peak downward, two habitats were observed: sedimented plains and steep rock facies. The topography was relatively flat until sharp vertical drops of up to 100 m were reached. Each habitat harboured different organisms. Observed organisms included macrourid fish, brachyuran crabs, ophiuroids, holothurians, stalked crinoids, crustaceans, pycnogonids, a variety of biogenic formations/tracks in the sediment, presumably from sipunculid worms, and many ‘Mermaid’s purses’, the egg cases of skate or sharks. The vertical drops host numerous sponges. The base of the caldera presented a classic abyssal plain habitat with gravel patches of volcanic material from the caldera and large aggregations of holothurians, as well as solitary large holothurians, tube forming polychaetes, pycnogonids, stalked crinoids, and Grimpoteuthis (Dumbo) octopus.



Examples of fauna and habitats from the Mount Doom region. Images courtesy IceDivA2 expedition/James Taylor/Senckenberg Research Institute

Mid-ocean channel oceanic fronts (subpolar front), seasonal and persistent eddies: The NE Atlantic EBSA description for an area coincident with the NACES area (Area 14: The North-Atlantic Current and mid-Atlantic sub-polar frontal system, yet to be recognised by CBD COP; shown below) is characterised by the biological significance of intense mesoscale oceanographic activity with 'near stationary eddies and numerous thermal fronts aligned in zonal bands'. The banded zonal fronts are associated with vertical velocities bringing nutrients to the surface, concentrated by eddies. This dynamic phenomenon creates patchy high surface productivity and consequently higher prey availability for oceanic higher predators. The EBSA description notes large-scale phytoplankton blooms during spring and summer and elevated chlorophyll concentrations.



Overlapping EBSA

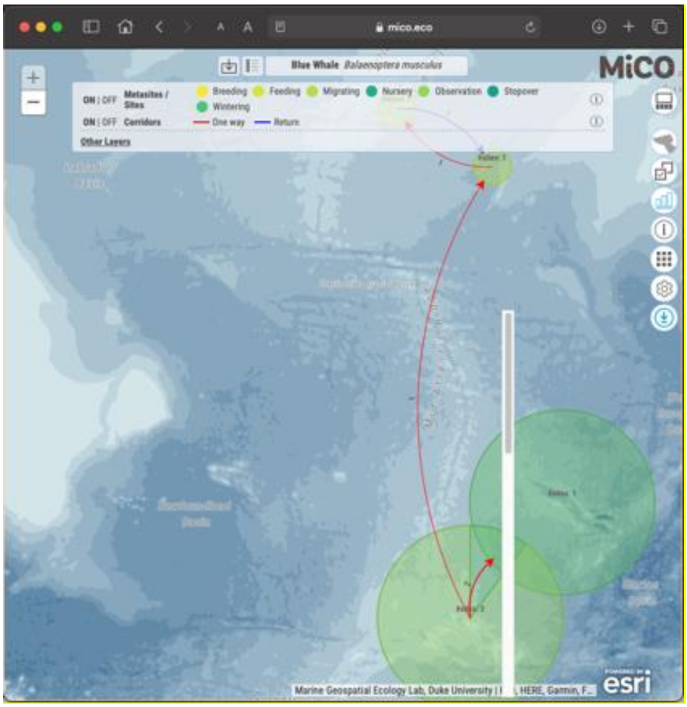
Green hatch: Area 14 - The North-Atlantic Current and mid-Atlantic sub-polar frontal system

Background bathymetry from GEBCO.

Threatened and/or declining species

Black-legged kittiwake (*Rissa tridactyla*), thick-billed murre (*Uria lomvia*), Audubon's shearwater (*Puffinus lherminieri baroli*): These three OSPAR-listed threatened and/or declining species use the NACES MPA to forage. Both the black-legged kittiwake and thick-billed murre use the NACES MPA year-round, with a peak in numbers October-March. The Audubon's shearwater uses the NACES MPA from April to December, with a peak in July-September. Thick-billed Murre are capable of extremely deep dives up to 200 m. The black-legged kittiwake has been found to be associated with the presence and abundance of the copepod *C. finmarchicus* - a key species within the Atlantic trophic food web (Frederiksen et al. 2012). Full details on these species, their diet, and behaviour can be found in the Proforma pp. 21-23 and Annex 3.

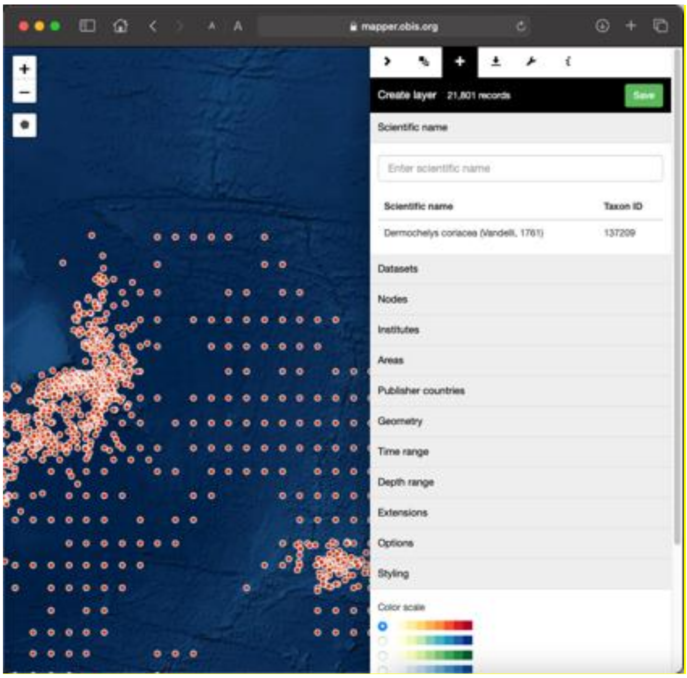
Blue whale (*Balaenoptera musculus*): The EBSA description (referred to above) notes tracking studies for blue whales (and other species, see below) passing through the area on long migratory movements (between the Azores to foraging areas in eastern Greenland and western Iceland) and remaining in the area for prolonged periods suggesting foraging behaviour.



Blue whale (Balaenoptera musculus) movements

Output from MiCO

Leatherback turtle (*Dermochelys coriacea*): The Atlantic is the last stronghold for leatherback turtles. Hayes et al. (2004) recorded wide-ranging extensive pan-oceanic tracks including passage within the NACES area.

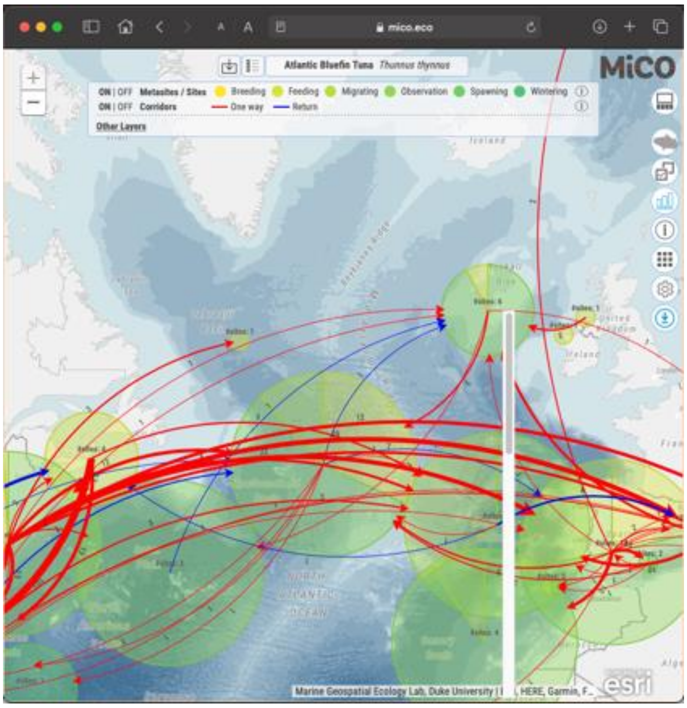


Scientific name	Taxon ID
Dermochelys coriacea (Vandelli, 1761)	137209

Leatherback turtle (Dermochelys coriacea) records

Output from OBIS

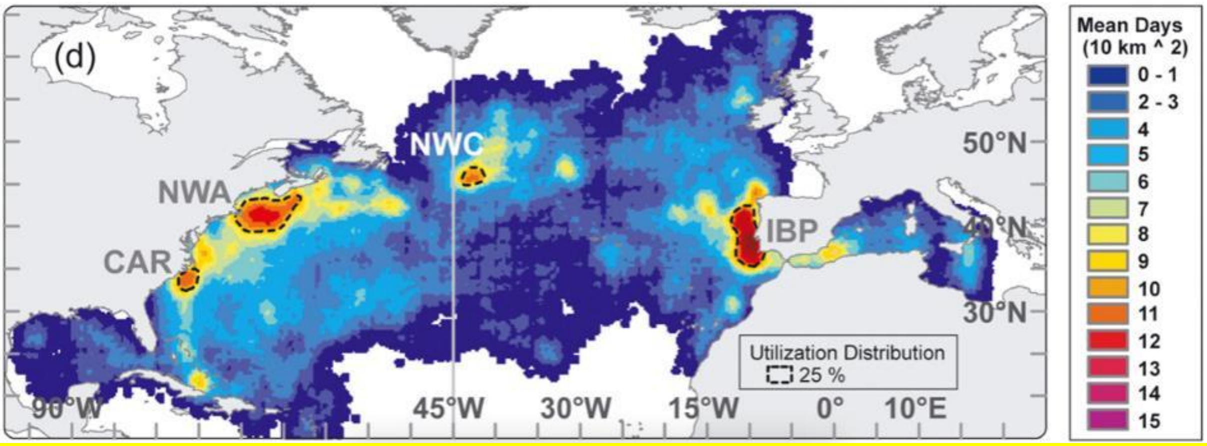
Bluefin tuna (*Thunnus thynnus*): Using an archival tag methodology Walli et al. (2009) determined four spatially confined regions for Bluefin tuna in the North Atlantic, suggesting these areas represent critical foraging habitat with abundant prey available, and correlating diving depth to the depth of the thermocline.



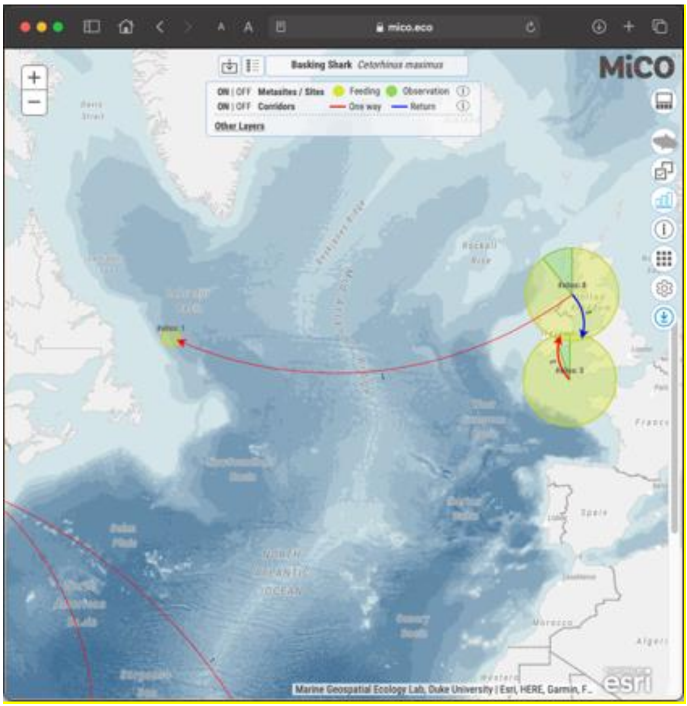
Bluefin tuna (Thunnus thynnus) movements

Output from MiCO

Below: ***Kernel density grid of bluefin tuna***. Black dotted lines outline 25% utilisation distributions, showing regions of high residency throughout the North Atlantic. From Walli et al. (2009).



Basking shark (Cetorhinus maximus): are most associated with temperate continental shelf areas but a study by Gore *et al*. (2008) presented evidence of tracking of two animals undertaking a transatlantic migration and making use of deep-water habitats.



Basking shark (Cetorhinus maximus) movements

Output from MiCO

Other species of special interest

Seabirds from different functional groups, including Shearwaters, Fulmar, Petrels, Storm-petrels, Gulls, Terns, Skuas and Alcids: The NACES MPA is a major hotspot for foraging seabirds in the North Atlantic, used by 21 species totalling up to an estimated 5 million adults (NACES MPA Proforma; Davies et al. 2021). It can be considered the most important oceanic foraging grounds for the community of seabirds in the OSPAR maritime high seas area and one of the most important concentrations of migratory seabirds in the Atlantic.

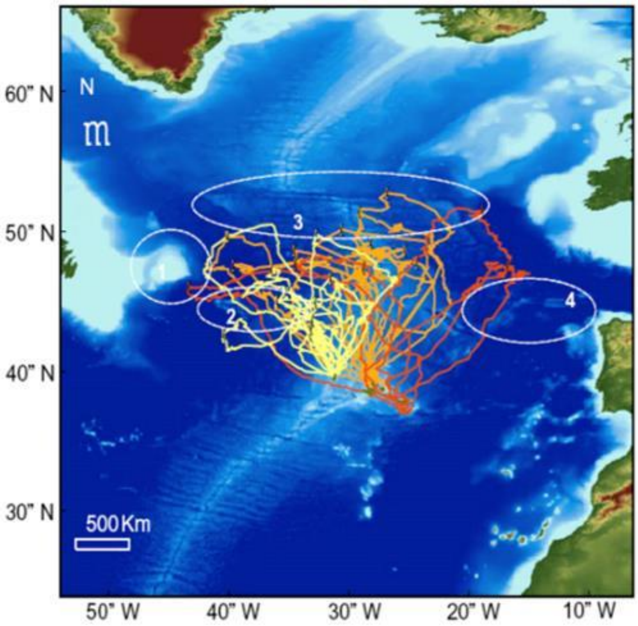
Five globally threatened species (endangered Bermuda petrel [*Pterodroma cahow*], Zino's petrel [*Pterodroma madeira*], and vulnerable Desertas petrel [*Pterodroma deserta*], black-legged kittiwake and Atlantic puffin) use the NACES MPA.

Many species travel great distances to use the area, with some using it year-round, suggesting that food availability in the area is consistently high. Studies indicate that prey, such as zooplankton (e.g., calanoid copepods) and mesopelagic fish (e.g., myctophids), are abundant in the area, with the availability to seabirds further enhanced through both mesoscale turbulence and the diel vertical migration of mesopelagic prey.

Most seabirds use the area during their nonbreeding stage - a period of their lifecycle that is currently poorly protected. Four species also used the area while breeding (Manx shearwater [*Puffinus puffinus*], Cory's shearwater, Desertas petrel, and Bulwer's petrel [*Bulweria bulwerii*]). Boreal breeders, such as Arctic terns, long-tailed Jaegers, Sabine's gulls, Manx shearwaters, and Cory's shearwaters, use the area as a staging area to fuel trans-equatorial migrations, or to fuel the last migration leg to the breeding areas sometimes making detours of >5000 km to do so. Southern Hemisphere breeders, such as south polar skuas, sooty shearwaters, and great shearwaters, migrate up to 13,000 km to spend some of the austral winter in the area (Davies et al. 2021).

OSPAR Commission (2010) Background Document on Milne Seamount considered tracking data for Cory's Shearwater from the Azores. Ship-based surveys have also recorded other seabirds in the area, including: Wilson's storm petrel, Leach's petrel, northern gannet, greater black-backed gull, Arctic skua (Wakefield et al., 2021).

Full details on the seabirds using the NACES MPA are included in the Proforma pp. 23-28, Annex 3, and in Davies et al. (2021).

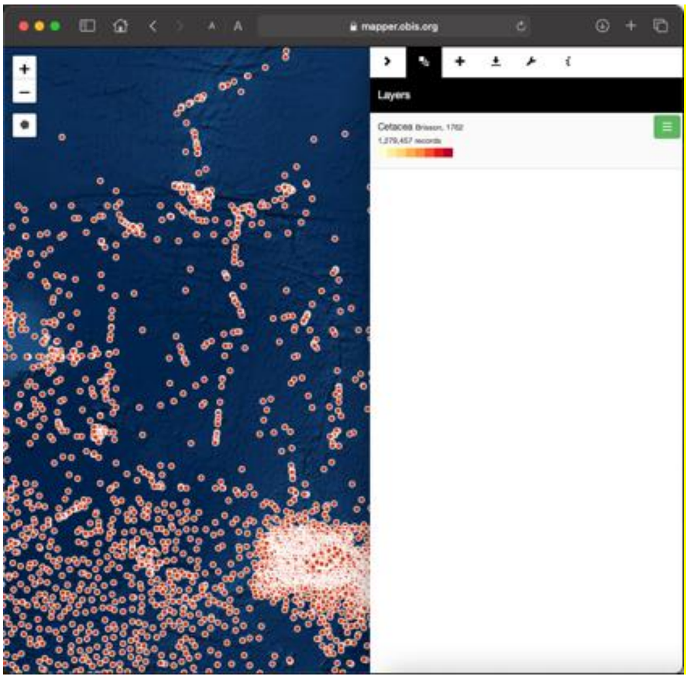


Cory's shearwater (Calonectris diomedea) foraging ranges and destinations of long trips (5-18 days) from islands in the Azores

For details and full explanation see OSPAR Commission (2010) Background Document on Milne Seamount, OSPAR Commission Publication Number: 524/2010.

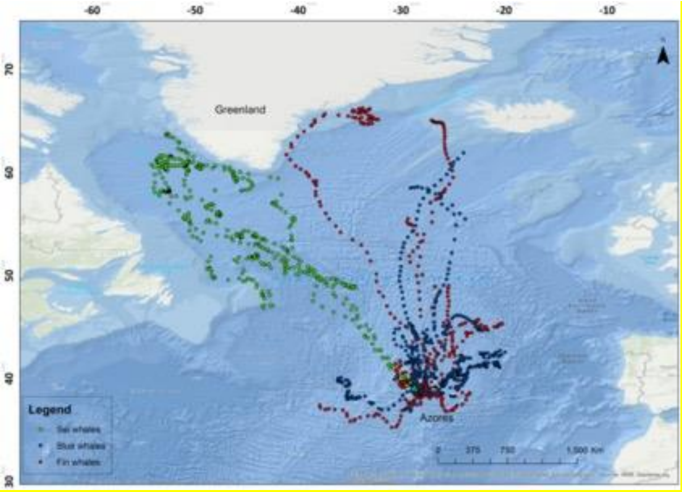
Cetaceans: Tracking studies for Endangered sei whale (*Balaenoptera borealis*) and Endangered fin whales (*Balaenoptera physalus*) have recorded animals moving through the NACES area, with fin whales in particular stopping for periods to forage (similar to the blue whale behaviour noted above). Sightings during research expeditions (2004, 2008, 2013 and 2018) confirm a relatively high diversity of cetaceans (Wakefield, 2018).

Cetaceans are known to migrate from wintering grounds in the Azores, via the Charlie Gibbs Fracture Zone, to highly productive feeding areas in the Labrador Sea. A kernel density map for sei whale (*Balaenoptera borealis*), developed by Dr Mike Tetley for the NW Atlantic EBSA Workshop in 2014, based on a limited sample of telemetry data drawn from the Azores (Prieto et al., 2014) and Labrador (Olsen et al., 2009) provides evidence of the importance of a migratory corridor for this species. The data suggest the NACES area is a critical point in 'part of a complex migration process that can involve longitudinal movements between the two sides of the ocean basin in addition to expected latitudinal movements' (Prieto et al., 2014). Sei whales are surface feeders (zooplankton and small fish) and prefer deep temperate waters.



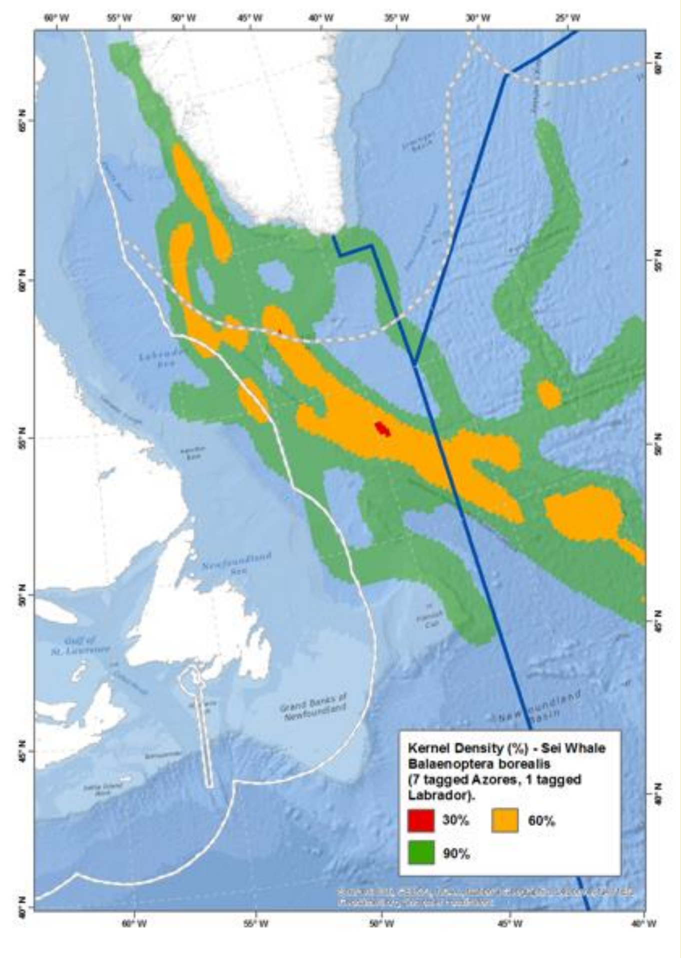
Cetacea records

Output from OBIS



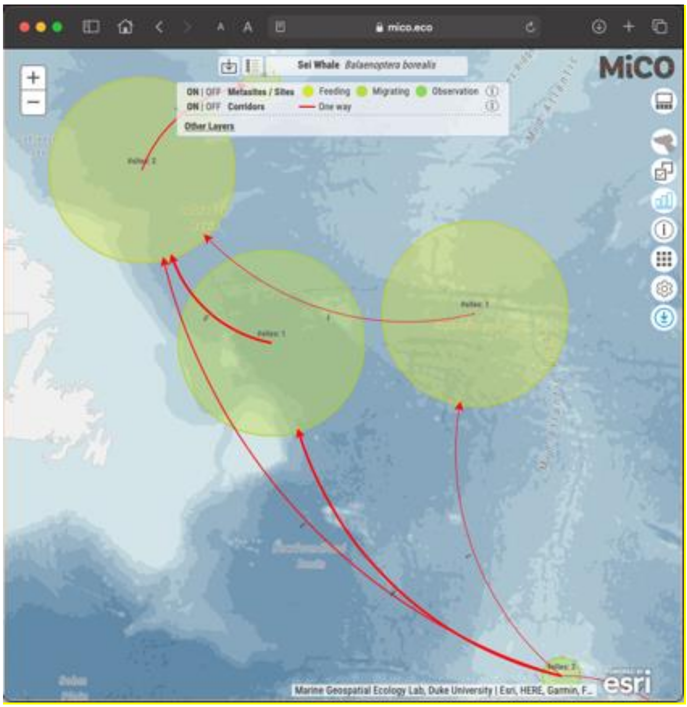
Positions of tracked blue, fin and sei whales

From Perez-Jorge et al. (2020)



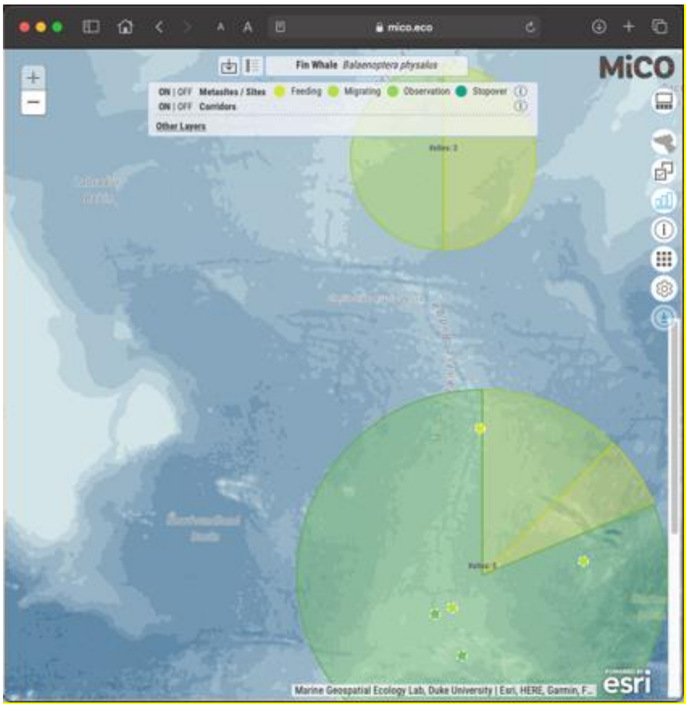
Kernel density of sei whale (Balaenoptera borealis)

© Mike Tetley



Sei whale (Balaenoptera borealis) movements

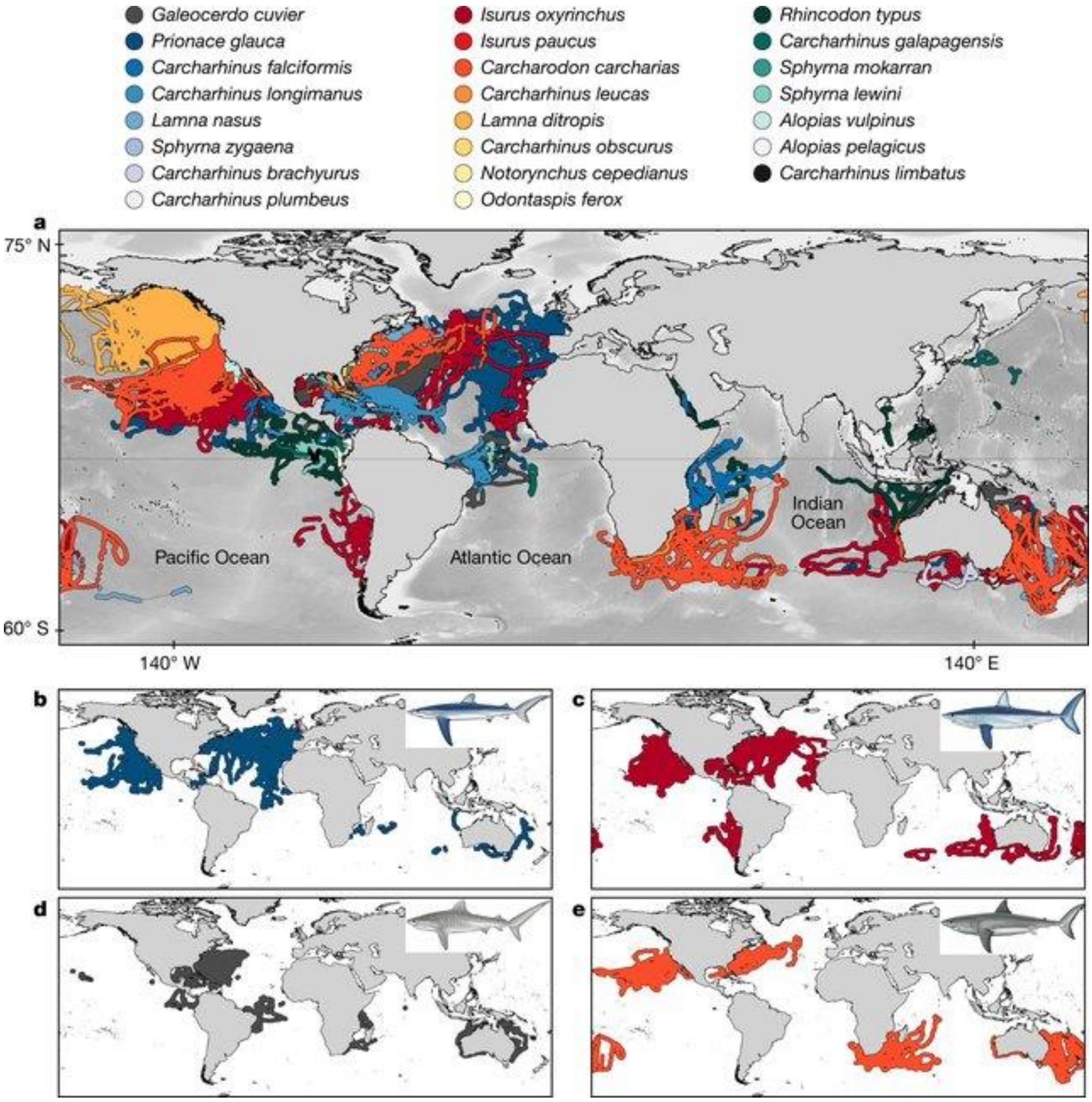
Output from MiCO



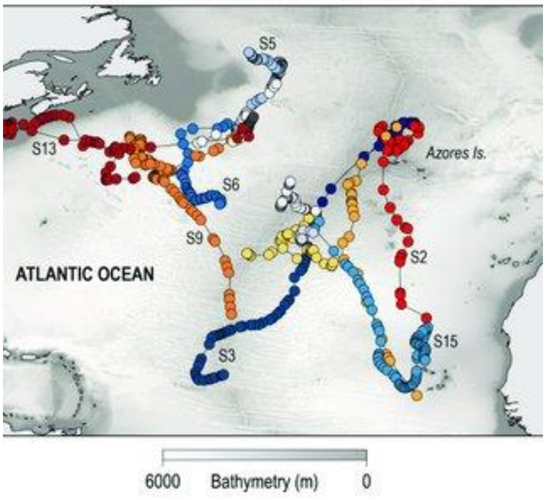
Fin whale (Balaenoptera physalus) movements

Output from MiCO

Sharks: recent research on oceanic mesopelagic habitat use by tope (*Galeorhinus galeus*) in the North-East Atlantic showed far-ranging migration trajectories and regular diel vertical migrations to depths of 700 m (Schaber et al., 2022). Blue sharks and mako sharks dive very deep, observed down to 1740 m, and their presence can be inferred in the NACES area. These depths are probably near the seabed close to the MAR. There is also data that show sharks feeding on cephalopods that live near the seafloor but also vertically migrate each day (Vedor et al., 2021).



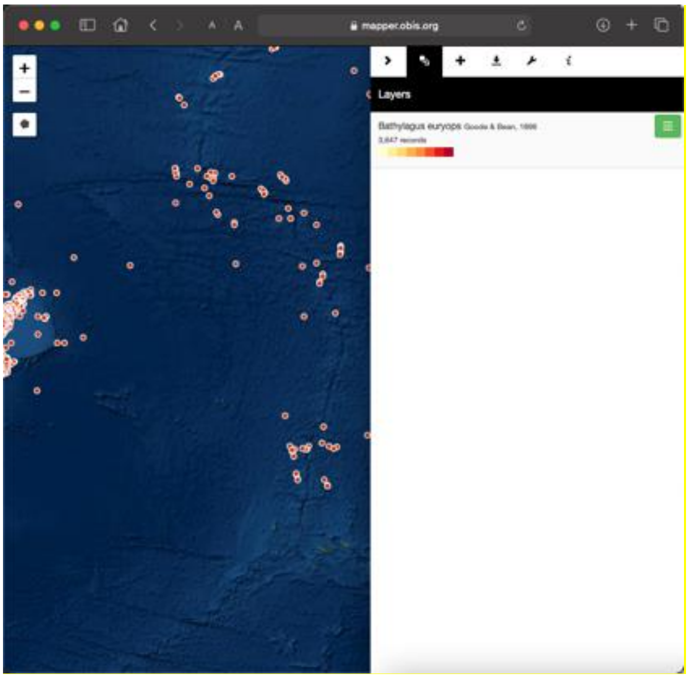
Movements of sharks. a: locations estimated from satellite transmitters deployed on 1,681 sharks from 23 species between 2002 and 2017. b: blue shark. c: shortfin mako shark. d: tiger shark. e: white shark. From Queiros et al. (2019).



Individual geolocations for 15 blue sharks tracked in the North Atlantic Ocean between 2010 and 2011

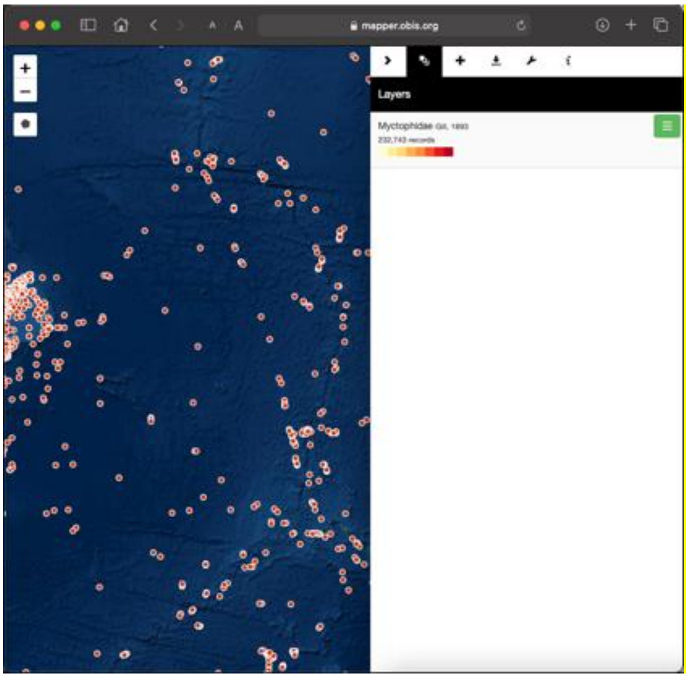
From Vedor et al. (2021)

Mesopelagic fish: are particularly abundant near fronts and eddies, as described in the Proforma (pp. 14-15). MAR-ECO and ECOMAR expeditions recorded high abundance of Goiter blacksmelt (*Bathylagus euryops*) and lanternfish (*Myctophids*). Sweetman et al. (2013) examined pelagic fish along the MAR and concluded that *Bathylagus euryops* appear to be an important species in the oceanic food web of the North Atlantic. However, in general mesopelagic data are very sparse.



Goiter blacksmelt (Bathylagus euryops) records

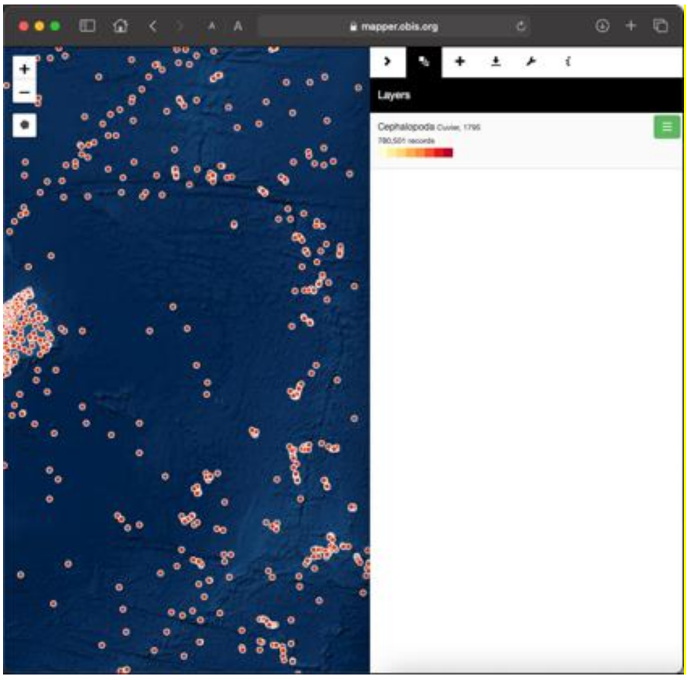
Output from OBIS



Lanternfish (Myctophids) records

Output from OBIS

Cephalopods: are potentially concentrated within the area and represent a known food source for the seabird, whale and shark species using the area.



Cephalopoda records

Output from OBIS

Possible scenarios to be considered by an OSPAR expert workshop

Based on the results above the following spatial options represent possibilities for targeted research to define areas or sub-areas worthy of further protection for all or part of the seafloor of the NACES MPA area:

1. Buffers around seamounts
2. Migration corridor(s) for cetaceans and other highly migratory species taking advantage of recent advances in animal movement research (e.g., GOBI research including the MiCO platform[30] and the recent WWF report ‘Protecting Blue Corridors’ (Johnson et al., 2022).
3. Patches of elevated benthopelagic coupling resulting in trophic aggregations
4. Area(s) of significant mixing (eddies and upwelling) indicative of high productivity likely to cascade to the seafloor and benthopelagic layer
5. Selected discrete features not currently protected e.g., Evlanov Seamount and Mount Doom Seamount

Conclusion

Limited additional data is currently available to support the NACES Roadmap.

Bathymetry is important when considering the potential of what the seafloor in such a remote area may support but this should not preclude precautionary protective measures. More comprehensive seafloor mapping in the NACES area may be achieved as part of the Seabed 2030 initiative (see Appendix 1).

The UN Decade of Ocean Science for Sustainable Development may provide opportunities to target specific research efforts over the next 5-10 years. For example work to map seafloor substrate types successfully carried out in high resolution for UK waters by UKSeaMap (Howell, 2010) has led to broad-scale habitat mapping of the Pacific Clarion-

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[30] MiCO (http://mico.eco) has generated network models with nodes in the NACES area for sei whale, loggerhead and leatherback turtles, shortfin mako shark, sailfish, bluefin tuna, white marlin and humpback whale.

Clipperton Zone (McQuaid et al., 2020) illustrating that such an exercise is possible for deep sea areas. Work by Mission Atlantic and the One Ocean Hub using 524 habitat classes is currently working to achieve global coverage (Kerry Howell (Uni. of Plymouth), pers. com.).

Research cruises in past three decades have undertaken transects in the NACES area, collecting underway bathymetry (section 3.14). Most recently, the IceDivA2 expedition (Nov-Dec 2021) undertook survey work through a portion of the area, including biological sampling and detailed seafloor mapping of the Mount Doom area. However, these results take time to process (2 years or more), indeed results from a relevant NERC cruise that took place in 2016 are not fully processed yet.

Lack of long-term studies in this remote area mean there is no information to inform and determine trends.

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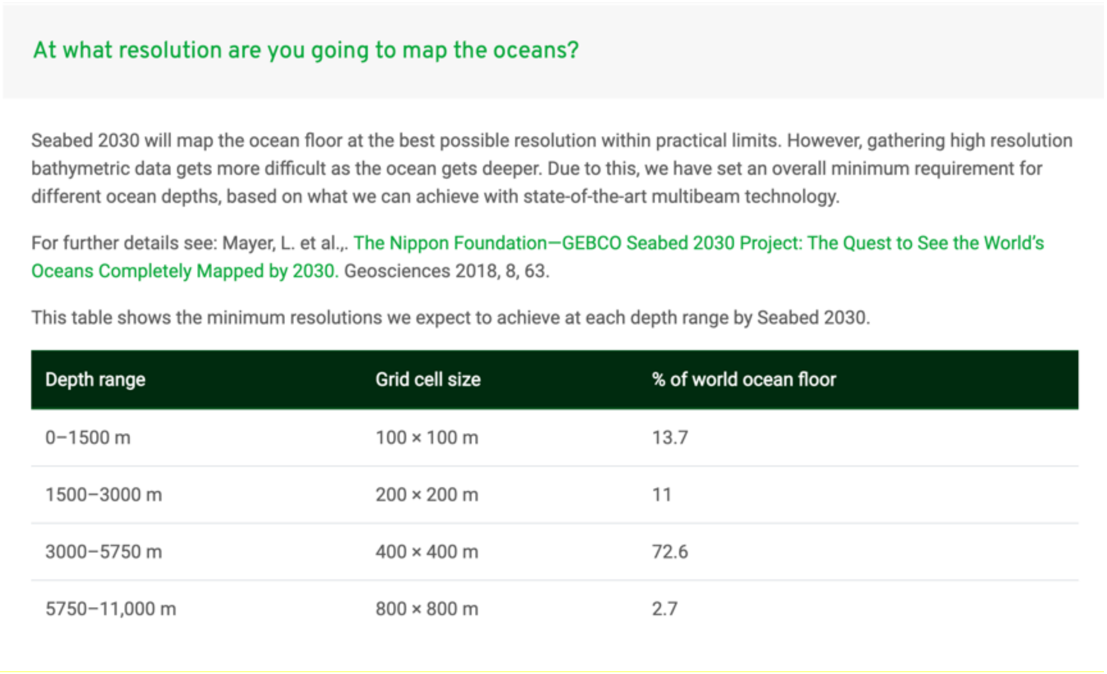
Seabed 2030

For further information see seabed2030.org



At what resolution are you going to map the oceans?

Seabed 2030 will map the ocean floor at the best possible resolution within practical limits. However, gathering high resolution bathymetric data gets more difficult as the ocean gets deeper. Due to this, we have set an overall minimum requirement for different ocean depths, based on what we can achieve with state-of-the-art multibeam technology.

For further details see: Mayer, L. et al.,. The Nippon Foundation—GEBCO Seabed 2030 Project: The Quest to See the World's Oceans Completely Mapped by 2030. Geosciences 2018, 8, 63.

This table shows the minimum resolutions we expect to achieve at each depth range by Seabed 2030.

Depth range	Grid cell size	% of world ocean floor
0–1500 m	100 × 100 m	13.7
1500–3000 m	200 × 200 m	11
3000–5750 m	400 × 400 m	72.6
5750–11,000 m	800 × 800 m	2.7

Annex 8. List of species with recorded occurrence within the North Atlantic Current and Evlanov Sea basin MPA according to the Ocean Biodiversity Information System (OBIS).

The list includes all species with recorded occurrence within the NACES MPA as of July 2022. Species names and authority given according to the World Register of Marine Species[31]. Red shading indicates the OSPAR[32]-listed species and species listed under one of the following categories by the IUCN Red List status[33]: NT=Near Threatened, VU=Vulnerable, EN=Endangered, CR=Critically Endangered. Data provided by Pieter Provoost, Intergovernmental Oceanographic Commission of UNESCO.

	Species name and authority	Phylum	Class	OSPAR Listed*[34]	IUCN status**
		Marine birds			
1	*Alle alle* (Linnaeus, 1758)	Chordata	Aves		
2	*Calonectris diomedea* (Scopoli, 1769)	Chordata	Aves		
3	*Fratercula arctica* (Linnaeus, 1758)	Chordata	Aves		VU
4	*Fulmarus glacialis* (Linnaeus, 1761)	Chordata	Aves		VU
5	*Larus argentatus* Pontoppidan, 1763	Chordata	Aves		
6	*Larus fuscus* Linnaeus, 1758	Chordata	Aves	Yes (*Fuscus* subspecies)	
7	*Larus hyperboreus* Gunnerus, 1767	Chordata	Aves		
8	*Morus bassanus* (Linnaeus, 1758)	Chordata	Aves		
9	*Numenius phaeopus* (Linnaeus, 1758)	Chordata	Aves		
10	*Oceanites oceanicus* (Kuhl, 1820)	Chordata	Aves		
11	*Oceanodroma castro* (Harcourt, 1851)	Chordata	Aves		
12	*Oceanodroma leucorhoa* (Vieillot, 1818)	Chordata	Aves		VU
13	*Puffinus gravis* (O'Reilly, 1818)	Chordata	Aves		
14	*Puffinus griseus* (Gmelin, 1789)	Chordata	Aves		NT
15	*Puffinus puffinus* (Brünnich, 1764)	Chordata	Aves		
16	*Rissa tridactyla* (Linnaeus, 1758)	Chordata	Aves	Yes	VU
17	*Stercorarius longicaudus* Vieillot, 1819	Chordata	Aves		
18	*Stercorarius maccormicki* Saunders, 1893	Chordata	Aves		
19	*Stercorarius parasiticus* (Linnaeus, 1758)	Chordata	Aves		
20	*Stercorarius pomarinus* (Temminck, 1815)	Chordata	Aves		
21	*Stercorarius skua* (Brünnich, 1764)	Chordata	Aves		

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[31] https://www.marinespecies.org/

[32] https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats

[33] https://www.iucnredlist.org/

[34] https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats

	Species name and authority	Phylum	Class	OSPAR Listed*[34]	IUCN status**
22	*Sterna hirundo* Linnaeus, 1758	Chordata	Aves		
23	*Sterna paradisaea* Pontoppidan, 1763	Chordata	Aves		
24	*Uria lomvia* (Linnaeus, 1758)	Chordata	Aves	Yes	
25	*Xema sabini* (Sabine, 1819)	Chordata	Aves		
			Cetaceans		
1	*Balaenoptera acutorostrata* Lacépède, 1804	Chordata	Mammalia		
2	*Balaenoptera borealis* Lesson, 1828	Chordata	Mammalia		EN
3	*Balaenoptera physalus* (Linnaeus, 1758)	Chordata	Mammalia		VU
4	*Delphinus delphis* Linnaeus, 1758	Chordata	Mammalia		
5	*Dolichologus longirostris* (Maul, 1948)	Chordata	Mammalia		
6	*Globicephala melas* (Traill, 1809)	Chordata	Mammalia		
7	*Grampus griseus* (G. Cuvier, 1812)	Chordata	Mammalia		
8	*Hyperoodon ampullatus* (Forster, 1770)	Chordata	Mammalia		NT
9	*Lagenorhynchus acutus* (Gray, 1828)	Chordata	Mammalia		
10	*Lagenorhynchus albirostris* Gray, 1846	Chordata	Mammalia		
11	*Leucopleurus acutus* (Gray, 1828)	Chordata	Mammalia		
12	*Orcinus orca* (Linnaeus, 1758)	Chordata	Mammalia		
13	*Physeter macrocephalus* Linnaeus, 1758	Chordata	Mammalia		VU
14	*Stenella coeruleoalba* (Meyen, 1833)	Chordata	Mammalia		
15	*Tursiops truncatus* (Montagu, 1821)	Chordata	Mammalia		
			Marine reptiles (turtles)		
1	*Caretta caretta* (Linnaeus, 1758)	Chordata	Tetrapoda	Yes	VU
2	*Chelonia mydas* (Linnaeus, 1758)	Chordata	Tetrapoda		EN
3	*Dermochelys coriacea* (Vandelli, 1761)	Chordata	Tetrapoda	Yes	VU
4	*Eretmochelys imbricata* (Linnaeus, 1766)	Chordata	Tetrapoda		CR
5	*Lepidochelys kempii* Garman, 1880	Chordata	Tetrapoda		CR
			Pelagic cephalopods		
1	*Bathypolypus arcticus* (Prosch, 1849)	Mollusca	Cephalopoda		
2	*Cirrothauma murrayi* Chun, 1911	Mollusca	Cephalopoda		
3	*Illex illecebrosus* Steenstrup, 1880	Mollusca	Cephalopoda		
4	*Rossia megaptera* Verrill, 1881	Mollusca	Cephalopoda		
			Pelagic fish (epipelagic and benthopelagic)		
1	*Acanthocybium solandri* (Cuvier, 1832)	Vertebrata	Actinopteri		
2	*Argyropelecus hemigymnus* Cocco, 1829	Vertebrata	Actinopteri		
3	*Aristostomias tittmanni* Welsh, 1923	Vertebrata	Actinopteri		
4	*Astronesthes niger* Richardson, 1845	Vertebrata	Actinopteri		

	Species name and authority	Phylum	Class	OSPAR Listed*^{34}	IUCN status**
5	*Auxis thazard* (Lacepède, 1800)	Vertebrata	Actinopteri		
6	*Bathylagichthys greyae* (Cohen, 1958)	Vertebrata	Actinopteri		
7	*Bathylagus euryops* Goode & Bean, 1896	Vertebrata	Actinopteri		
8	*Benthosema glaciale* (Reinhardt, 1837)	Vertebrata	Actinopteri		
9	*Bolinichthys indicus* (Nafpaktitis & Nafpaktitis, 1969)	Vertebrata	Actinopteri		
10	*Bonapartia pedaliot* Goode & Bean, 1896	Vertebrata	Actinopteri		
11	*Borostomias antarcticus* (Lönnberg, 1905)	Vertebrata	Actinopteri		
12	*Ceratoscopelus maderensis* (Lowe, 1839)	Vertebrata	Actinopteri		
13	*Ceratoscopelus warmingii* (Lütken, 1892)	Vertebrata	Actinopteri		
14	*Chauliodus sloani* Bloch & Schneider, 1801	Vertebrata	Actinopteri		
15	*Coryphaena hippurus* Linnaeus, 1758	Vertebrata	Actinopteri		
16	*Cryptopsaras couesii* Gill, 1883	Vertebrata	Actinopteri		
17	*Cubiceps gracilis* (Lowe, 1843)	Vertebrata	Actinopteri		
18	*Derichthys serpentinus* Gill, 1884	Vertebrata	Actinopteri		
19	*Diaphus dumerilii* (Bleeker, 1856)	Vertebrata	Actinopteri		
20	*Diaphus holti* Tåning, 1918	Vertebrata	Actinopteri		
21	*Diaphus metopoclampus* (Cocco, 1829)	Vertebrata	Actinopteri		
22	*Diaphus rafinesquii* (Cocco, 1838)	Vertebrata	Actinopteri		
23	*Diogenichthys atlanticus* (Tåning, 1928)	Vertebrata	Actinopteri		
24	*Electrona risso* (Cocco, 1829)	Vertebrata	Actinopteri		
25	*Eurypharynx pelecanoides* Vaillant, 1882	Vertebrata	Actinopteri		
26	*Exocoetus obtusirostris* Günther, 1866	Vertebrata	Actinopteri		
27	*Flagellostomias boureei* (Zugmayer, 1913)	Vertebrata	Actinopteri		
28	*Gadus morhua* Linnaeus, 1758	Vertebrata	Actinopteri	Yes	VU
29	*Gonichthys cocco* (Cocco, 1829)	Vertebrata	Actinopteri		
30	*Howella brodiei* Ogilby, 1899	Vertebrata	Actinopteri		
31	*Hygophum benoiti* (Cocco, 1838)	Vertebrata	Actinopteri		
32	*Lampanyctus crocodilus* (Risso, 1810)	Vertebrata	Actinopteri		
33	*Lampanyctus festivus* Tåning, 1928	Vertebrata	Actinopteri		
34	*Lampanyctus intricarius* Tåning, 1928	Vertebrata	Actinopteri		
35	*Lampanyctus macdonaldi* (Goode & Bean, 1896)	Vertebrata	Actinopteri		
36	*Lampanyctus photonotus* Parr, 1928	Vertebrata	Actinopteri		
37	*Lampanyctus pusillus* (Johnson, 1890)	Vertebrata	Actinopteri		
38	*Lepidocybium flavobrunneum* (Smith, 1843)	Vertebrata	Actinopteri		
39	*Lestidiops jayakari* (Boulenger, 1889)	Vertebrata	Actinopteri		
40	*Lobianchia dofleini* (Zugmayer, 1911)	Vertebrata	Actinopteri		

	Species name and authority	Phylum	Class	OSPAR Listed*^{34}	IUCN status**
41	*Lobianchia gemellarii* (Cocco, 1838)	Vertebrata	Actinopteri		
42	*Maurolicus muelleri* (Gmelin, 1789)	Vertebrata	Actinopteri		
43	*Melanolagus bericoides* (Borodin, 1929)	Vertebrata	Actinopteri		
44	*Mola mola* (Linnaeus, 1758)	Vertebrata	Actinopteri		VU
45	*Myctophum punctatum* Rafinesque, 1810	Vertebrata	Actinopteri		
46	*Nannobrachium atrum* (Tåning, 1928)	Vertebrata	Actinopteri		
47	*Nannobrachium cuprarium* (Tåning, 1928)	Vertebrata	Actinopteri		
48	*Nansenia groenlandica* (Reinhardt, 1840)	Vertebrata	Actinopteri		
49	*Nansenia tenera* Kawaguchi & Butler, 1984	Vertebrata	Actinopteri		
50	*Nemichthys scolopaceus* Richardson, 1848	Vertebrata	Actinopteri		
51	*Notolychnus valdiviae* (Brauer, 1904)	Vertebrata	Actinopteri		
52	*Notoscopelus bolini* Nafpaktitis, 1975	Vertebrata	Actinopteri		
53	*Notoscopelus kroyeri* (Malm, 1861)	Vertebrata	Actinopteri		
54	*Paralepis coregonoides* Risso, 1820	Vertebrata	Actinopteri		
55	*Photonectes margarita* (Goode & Bean, 1896)	Vertebrata	Actinopteri		
56	*Poromitra capito* Goode & Bean, 1883	Vertebrata	Actinopteri		
57	*Poromitra megalops* (Lütken, 1878)	Vertebrata	Actinopteri		
58	*Protomyctophum arcticum* (Lütken, 1892)	Vertebrata	Actinopteri		
59	*Regalecus glesne* Ascanius, 1772	Vertebrata	Actinopteri		
60	*Reinhardtius hippoglossoides* (Walbaum, 1792)	Vertebrata	Actinopteri		
61	*Ruvettus pretiosus* Cocco, 1833	Vertebrata	Actinopteri		
62	*Sarda sarda* (Bloch, 1793)	Vertebrata	Actinopteri		
63	*Scomberesox saurus* (Walbaum, 1792)	Vertebrata	Actinopteri		
64	*Scopelarchus analis* (Brauer, 1902)	Vertebrata	Actinopteri		
65	*Scopelogadus beanii* (Günther, 1887)	Vertebrata	Actinopteri		
66	*Serrivomer beanii* Gill & Ryder, 1883	Vertebrata	Actinopteri		
67	*Sigmops bathyphilus* (Vaillant, 1884)	Vertebrata	Actinopteri		
68	*Sigmops elongatus* (Günther, 1878)	Vertebrata	Actinopteri		
69	*Sternoptyx diaphana* Hermann, 1781	Vertebrata	Actinopteri		
70	*Stomias boa* (Risso, 1810)	Vertebrata	Actinopteri		
71	*Symbolophorus veranyi* (Moreau, 1888)	Vertebrata	Actinopteri		
72	*Taaningichthys bathyphilus* (Tåning, 1928)	Vertebrata	Actinopteri		
73	*Tetrapturus pfluegeri* Robins & de Sylva, 1963	Vertebrata	Actinopteri		
74	*Thalassobathia pelagica* Cohen, 1963	Vertebrata	Actinopteri		
75	*Thunnus alalunga* (Bonnaterre, 1788)	Vertebrata	Actinopteri		
76	*Thunnus albacares* (Bonnaterre, 1788)	Vertebrata	Actinopteri		

	Species name and authority	Phylum	Class	OSPAR Listed*34	IUCN status**
77	*Thunnus obesus* (Lowe, 1839)	Vertebrata	Actinopteri		VU
78	*Thunnus thynnus* (Linnaeus, 1758)	Vertebrata	Actinopteri	Yes	
79	*Valenciennellus tripunctulatus* (Esmark, 1871)	Vertebrata	Actinopteri		
80	*Vinciguerria attenuata* (Cocco, 1838)	Vertebrata	Actinopteri		
81	*Vinciguerria poweriae* (Cocco, 1838)	Vertebrata	Actinopteri		
82	*Xenodermichthys copei* (Gill, 1884)	Vertebrata	Actinopteri		
83	*Xiphias gladius* Linnaeus, 1758	Vertebrata	Actinopteri		
84	*Isurus oxyrinchus* Rafinesque, 1810	Vertebrata	Elasmobranchii		EN
85	*Prionace glauca* (Linnaeus, 1758)	Vertebrata	Elasmobranchii		NT
86	*Sphyrna lewini* (Griffith & Smith, 1834)	Vertebrata	Elasmobranchii		CR
	Demersal fish				
1	*Anguilla anguilla* (Linnaeus, 1758)	Vertebrata	Actinopteri	Yes	CR
2	*Anguilla rostrata* (Lesueur, 1817)	Vertebrata	Actinopteri		EN
3	*Hippoglossoides platessoides* (Fabricius, 1780)	Vertebrata	Actinopteri		
4	*Uroconger syringinus* Ginsburg, 1954	Vertebrata	Actinopteri		
5	*Amblyraja radiata* (Donovan, 1808)	Vertebrata	Elasmobranchii		VU
	Phytoplankron				
1	*Emiliania huxleyi* (Lohmann) W.W.Hay & H.P.Mohler, 1967	Haptophyta	Prymnesiophyceae		
2	*Gephyrocapsa caribbeanica* Boudreaux & Hay, 1967	Haptophyta	Prymnesiophyceae		
3	*Gephyrocapsa ericsonii* McIntyre & Bé, 1967	Haptophyta	Prymnesiophyceae		
4	*Gephyrocapsa oceanica* Kamptner, 1943	Haptophyta	Prymnesiophyceae		
5	*Helicosphaera carteri* (Wallich) Kamptner, 1954	Haptophyta	Prymnesiophyceae		
6	*Rhabdolithes claviger* (G.Murray & Blackman) Voeltzkow,	Haptophyta	Prymnesiophyceae		
7	*Syracosphaera pulchra* Lohmann, 1902	Haptophyta	Prymnesiophyceae		
8	*Umbilicosphaera hulburtiana* Gaardner, 1970	Haptophyta	Prymnesiophyceae		
9	*Umbilicosphaera sibogae var. foliosa* (Kamptner) Okada & McIntyre, 1977	Haptophyta	Prymnesiophyceae		
10	*Calciosolenia murrayi* Gran, 1912	Haptophyta	Prymnesiophyceae		
11	*Coccolithus pelagicus* (Wallich) J.Schiller, 1930	Haptophyta	Prymnesiophyceae		
12	*Coronosphaera mediterranea* (Lohmann) Gaarder, 1977	Haptophyta	Prymnesiophyceae		
13	*Cyclococcolithina leptopora* Murray & Blackman, 1898	Haptophyta	Prymnesiophyceae		
14	*Prorocentrum micans* Ehrenberg, 1834	Myzozoa	Dinophyceae		
15	*Tripos arietinus* (Cleve) F.Gómez, 2013	Myzozoa	Dinophyceae		
16	*Tripos azoricus* (Cleve) F.Gómez, 2013	Myzozoa	Dinophyceae		

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17	*Tripos brevis* (Ostenfeld & Johannes Schmidt) F.Gómez, 2013	Myzozoa	Dinophyceae		
18	*Tripos bucephalus* (Cleve) F.Gómez, 2013	Myzozoa	Dinophyceae		
19	*Tripos candelabrum* (Ehrenberg) F.Gómez, 2013	Myzozoa	Dinophyceae		
20	*Tripos carriensis* (Gourret) F.Gómez, 2013	Myzozoa	Dinophyceae		
21	*Tripos compressus* (Gran) F.Gómez, 2013	Myzozoa	Dinophyceae		
22	*Tripos declinatus* (G.Karsten) F.Gómez, 2013	Myzozoa	Dinophyceae		
23	*Tripos extensus* (Gourret) F.Gómez, 2013	Myzozoa	Dinophyceae		
24	*Tripos falcatiformis* (Jørgensen) F.Gómez, 2013	Myzozoa	Dinophyceae		
25	*Tripos furca (Ehrenberg)* F.Gómez, 2013	Myzozoa	Dinophyceae		
26	*Tripos fusus (Ehrenberg)* F.Gómez, 2013	Myzozoa	Dinophyceae		
27	*Tripos gibberus* (Gourret) F.Gómez, 1883	Myzozoa	Dinophyceae		
28	*Tripos hexacanthus (Gourret) F.Gómez, 2013*	Myzozoa	Dinophyceae		
29	*Tripos horridus (Cleve)* F.Gómez, 2013	Myzozoa	Dinophyceae		
30	*Tripos inflatus* (Kofoid) F.Gómez, 2013	Myzozoa	Dinophyceae		
31	*Tripos karstenii* (Pavillard) F.Gómez, 1907	Myzozoa	Dinophyceae		
32	*Tripos lineatus* (Ehrenberg) F.Gómez, 2013	Myzozoa	Dinophyceae		
33	*Tripos longipes (Bailey) F.Gómez, 2013*	Myzozoa	Dinophyceae		
34	*Tripos longirostrus* (Gourret) F.Gómez, 2013	Myzozoa	Dinophyceae		
35	*Tripos macroceros* (Ehrenberg) F.Gómez, 2013	Myzozoa	Dinophyceae		
36	*Tripos massiliensis* (Gourret) F.Gómez, 2013	Myzozoa	Dinophyceae		
37	*Tripos minutus* (E.G.Jørgensen) F.Gómez, 2013	Myzozoa	Dinophyceae		
38	*Tripos muelleri* Bory de Saint-Vincent, 1826	Myzozoa	Dinophyceae		
39	*Tripos pentagonus* (Gourret) F.Gómez, 2013	Myzozoa	Dinophyceae		
40	*Tripos platycornis* (Daday) F.Gómez, 2013	Myzozoa	Dinophyceae		
41	*Tripos pulchellus* (Schröder) F.Gómez, 2013	Myzozoa	Dinophyceae		
42	*Tripos teres* (Kofoid) F.Gómez, 2013	Myzozoa	Dinophyceae		
43	*Tripos trichoceros* (Ehrenberg) Gómez, 2013	Myzozoa	Dinophyceae		
44	*Tripos vultur* (Cleve) F.Gómez, 2013	Myzozoa	Dinophyceae		
45	*Ceratium arcticum* (Ehrenberg) Cleve, 1901	Myzozoa	Dinophyceae		
46	*Asterionella glacialis* Castracane, 1886	Ochrophyta	Bacillariophyceae		
47	*Biddulphia sinensis* Greville, 1866	Ochrophyta	Bacillariophyceae		
48	*Climacodium frauenfeldianum* Grunow, 1868	Ochrophyta	Bacillariophyceae		
49	*Corethron criophilum* Castracane, 1886	Ochrophyta	Bacillariophyceae		
50	*Corethron hystrix* Hensen, 1887	Ochrophyta	Bacillariophyceae		
51	*Coscinodiscus concinnus* W.Smith, 1856	Ochrophyta	Bacillariophyceae		

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52	*Coscinodiscus sol* C.G.Wallich, 1860	Ochrophyta	Bacillariophyceae		
53	*Cylindrotheca closterium* (Ehrenberg) Reimann & J.C.Lewin, 1964	Ochrophyta	Bacillariophyceae		
54	*Dactyliosolen antarcticus* Castracane, 1886	Ochrophyta	Bacillariophyceae		
55	*Ditylum brightwellii* (T.West) Grunow, 1885	Ochrophyta	Bacillariophyceae		
56	*Eucampia striata* Stolterfoth, 1879	Ochrophyta	Bacillariophyceae		
57	*Eucampia zodiacus* Ehrenberg, 1839	Ochrophyta	Bacillariophyceae		
58	*Lauderia annulata* Cleve, 1873	Ochrophyta	Bacillariophyceae		
59	*Lauderia confervacea* Cleve, 1896	Ochrophyta	Bacillariophyceae		
60	*Lauderia mediterranea* H.Peragallo, 1888	Ochrophyta	Bacillariophyceae		
61	*Leptocylindrus danicus* Cleve, 1889	Ochrophyta	Bacillariophyceae		
62	*Navicula planamembranacea* Hendey, 1964	Ochrophyta	Bacillariophyceae		
63	*Neodenticula seminae* (R.Simonsen & T.Kanaya) F.Akiba & Y.Yanagisawa, 1986	Ochrophyta	Bacillariophyceae		
64	*Nitzschia delicatissima* Cleve, 1897	Ochrophyta	Bacillariophyceae		
65	*Nitzschia longissima* (Brébisson) Ralfs, 1861	Ochrophyta	Bacillariophyceae		
66	*Odontella aurita* (Lyngbye) C.Agardh, 1832	Ochrophyta	Bacillariophyceae		
67	*Odontella regia* (Schultze) Simonsen, 1974	Ochrophyta	Bacillariophyceae		
68	*Paralia sulcata* (Ehrenberg) Cleve, 1873	Ochrophyta	Bacillariophyceae		
69	*Proboscia alata* (Brightwell) Sundström, 1986	Ochrophyta	Bacillariophyceae		
70	*Proboscia curvirostris* (Jousé) Jordan & Priddle, 1991	Ochrophyta	Bacillariophyceae		
71	*Proboscia inermis* (F.Castracane) R.W.Jordan & R.Ligowski, 1991	Ochrophyta	Bacillariophyceae		
72	*Pseudo-nitzschia delicatissima* (Cleve) Heiden, 1928	Ochrophyta	Bacillariophyceae		
73	*Pseudo-nitzschia seriata* (Cleve) H.Peragallo, 1899	Ochrophyta	Bacillariophyceae		
74	*Rhaphoneis amphiceros* (Ehrenberg) Ehrenberg, 1844	Ochrophyta	Bacillariophyceae		
75	*Rhizosolenia acuminata* (H.Peragallo) H.Peragallo, 1907	Ochrophyta	Bacillariophyceae		
76	*Rhizosolenia bergonii* H.Peragallo, 1892	Ochrophyta	Bacillariophyceae		
77	*Rhizosolenia delicatula* Cleve, 1900	Ochrophyta	Bacillariophyceae		
78	*Rhizosolenia flaccida* Castracane, 1886	Ochrophyta	Bacillariophyceae		
79	*Rhizosolenia fragilissima* Bergon, 1903	Ochrophyta	Bacillariophyceae		
80	*Rhizosolenia imbricata* Brightwell, 1858	Ochrophyta	Bacillariophyceae		
81	*Rhizosolenia indica* H.Peragallo, 1892	Ochrophyta	Bacillariophyceae		
82	*Rhizosolenia pungens* Cleve-Euler, 1937	Ochrophyta	Bacillariophyceae		
83	*Rhizosolenia semispina* Hensen, 1887	Ochrophyta	Bacillariophyceae		
84	*Rhizosolenia styliformis* T.Brightwell, 1858	Ochrophyta	Bacillariophyceae		

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85	*Skeletonema costatum* (Greville) Cleve, 1873	Ochrophyta	Bacillariophyceae		
86	*Thalassionema nitzschioides* (Grunow) Mereschkowsky, 1902	Ochrophyta	Bacillariophyceae		
87	*Thalassiothrix longissima* Cleve & Grunow, 1880	Ochrophyta	Bacillariophyceae		
88	*Vibrio paxillifer* O.F.Müller, 1786	Ochrophyta	Bacillariophyceae		
			Zooplankton		
1	*Acartia (Acartia) danae* Giesbrecht, 1889	Arthropoda	Copepoda		
2	*Acartia (Acartia) negligens* Dana, 1849	Arthropoda	Copepoda		
3	*Aetideus armatus* (Boeck, 1872)	Arthropoda	Copepoda		
4	*Calanoides carinatus* (Krøyer, 1849)	Arthropoda	Copepoda		
5	*Calanus finmarchicus* (Gunnerus, 1770)	Arthropoda	Copepoda		
6	*Calanus glacialis* Jaschnov, 1955	Arthropoda	Copepoda		
7	*Calanus helgolandicus* (Claus, 1863)	Arthropoda	Copepoda		
8	*Calanus hyperboreus* Krøyer, 1838	Arthropoda	Copepoda		
9	*Candacia armata* Boeck, 1872	Arthropoda	Copepoda		
10	*Candacia bipinnata* (Giesbrecht, 1889)	Arthropoda	Copepoda		
11	*Candacia bispinosa* (Claus, 1863)	Arthropoda	Copepoda		
12	*Candacia curta* (Dana, 1849)	Arthropoda	Copepoda		
13	*Candacia ethiopica* (Dana, 1849)	Arthropoda	Copepoda		
14	*Candacia longimana* (Claus, 1863)	Arthropoda	Copepoda		
15	*Candacia pachydactyla* (Dana, 1849)	Arthropoda	Copepoda		
16	*Candacia simplex* (Giesbrecht, 1889)	Arthropoda	Copepoda		
17	*Centropages bradyi* Wheeler, 1900	Arthropoda	Copepoda		
18	*Centropages chierchiae* Giesbrecht, 1889	Arthropoda	Copepoda		
19	*Centropages hamatus* (Lilljeborg, 1853)	Arthropoda	Copepoda		
20	*Centropages typicus* Krøyer, 1849	Arthropoda	Copepoda		
21	*Centropages violaceus* (Claus, 1863)	Arthropoda	Copepoda		
22	*Ctenocalanus vanus* Giesbrecht, 1888	Arthropoda	Copepoda		
23	*Elenacalanus princeps* (Brady, 1883)	Arthropoda	Copepoda		
24	*Eucalanus elongatus* (Dana, 1848)	Arthropoda	Copepoda		
25	*Eucalanus hyalinus* (Claus, 1866)	Arthropoda	Copepoda		
26	*Euchaeta acuta* Giesbrecht, 1893	Arthropoda	Copepoda		
27	*Euchaeta marina* (Prestandrea, 1833)	Arthropoda	Copepoda		
28	*Euchaeta media* Giesbrecht, 1888	Arthropoda	Copepoda		
29	*Euchaeta pubera* Sars G.O., 1907	Arthropoda	Copepoda		
30	*Euchirella messinensis* (Claus, 1863)	Arthropoda	Copepoda		

	Species name and authority	Phylum	Class	OSPAR Listed*^{34}	IUCN status**
31	*Euchirella rostrata* (Claus, 1866)	Arthropoda	Copepoda		
32	*Heterorhabdus abyssalis* (Giesbrecht, 1889)	Arthropoda	Copepoda		
33	*Heterorhabdus norvegicus* (Boeck, 1872)	Arthropoda	Copepoda		
34	*Heterorhabdus papilliger* (Claus, 1863)	Arthropoda	Copepoda		
35	*Mecynocera clausi* Thompson I.C., 1888	Arthropoda	Copepoda		
36	*Megacalanus princeps* Wolfenden, 1904	Arthropoda	Copepoda		
37	*Mesocalanus tenuicornis* (Dana, 1849)	Arthropoda	Copepoda		
38	*Metridia longa* (Lubbock, 1854)	Arthropoda	Copepoda		
39	*Metridia lucens* Boeck, 1865	Arthropoda	Copepoda		
40	*Miracia efferata* Dana, 1849	Arthropoda	Copepoda		
41	*Nannocalanus minor* (Claus, 1863)	Arthropoda	Copepoda		
42	*Neocalanus gracilis* (Dana, 1852)	Arthropoda	Copepoda		
43	*Neocalanus robustior* (Giesbrecht, 1888)	Arthropoda	Copepoda		
44	*Paraeuchaeta norvegica* (Boeck, 1872)	Arthropoda	Copepoda		
45	*Parapasiphae sulcatifrons* SI Smith, 1884	Arthropoda	Copepoda		
46	*Parasergestes vigilax* (Stimpson, 1860)	Arthropoda	Copepoda		
47	*Pleuromamma abdominalis* (Lubbock, 1856)	Arthropoda	Copepoda		
48	*Pleuromamma borealis* Dahl F., 1893	Arthropoda	Copepoda		
49	*Pleuromamma gracilis* Claus, 1863	Arthropoda	Copepoda		
50	*Pleuromamma piseki* Farran, 1929	Arthropoda	Copepoda		
51	*Pleuromamma robusta* (Dahl F., 1893)	Arthropoda	Copepoda		
52	*Pleuromamma xiphias* (Giesbrecht, 1889)	Arthropoda	Copepoda		
53	*Pontellina plumata* (Dana, 1849)	Arthropoda	Copepoda		
54	*Rhincalanus cornutus* (Dana, 1849)	Arthropoda	Copepoda		
55	*Rhincalanus nasutus* Giesbrecht, 1888	Arthropoda	Copepoda		
56	*Scaphocalanus echinatus* (Farran, 1905)	Arthropoda	Copepoda		
57	*Scolecithrix bradyi* Giesbrecht, 1888	Arthropoda	Copepoda		
58	*Scolecithrix danae* (Lubbock, 1856)	Arthropoda	Copepoda		
59	*Temora longicornis* (Müller O.F., 1785)	Arthropoda	Copepoda		
60	*Temora stylifera* (Dana, 1849)	Arthropoda	Copepoda		
61	*Undeuchaeta major* Giesbrecht, 1888	Arthropoda	Copepoda		
62	*Undeuchaeta plumosa* (Lubbock, 1856)	Arthropoda	Copepoda		
63	*Undinula vulgaris* (Dana, 1849)	Arthropoda	Copepoda		
64	*Gigantocypris muelleri* Skogsberg, 1920	Arthropoda	Ostracoda		
65	*Halocypria globosa* Claus, 1874	Arthropoda	Ostracoda		
66	*Macrocypridina castanea* (Brady, 1897)	Arthropoda	Ostracoda		

	Species name and authority	Phylum	Class	OSPAR Listed*^{34}	IUCN status**
67	*Mikroconchoecia curta* (Lubbock, 1860)	Arthropoda	Ostracoda		
68	*Obtusoecia obtusata* (Sars, 1866)	Arthropoda	Ostracoda		
69	*Rotundoecia teretivalvata* (Iles, 1953)	Arthropoda	Ostracoda		
70	*Acanthephyra pelagica* (Risso, 1816)	Arthropoda	Malacostraca		
71	*Acanthephyra purpurea* A. Milne-Edwards, 1881	Arthropoda	Malacostraca		
72	*Allosergestes pectinatus* (Sund, 1920)	Arthropoda	Malacostraca		
73	*Allosergestes sargassi* (Ortmann, 1893)	Arthropoda	Malacostraca		
74	*Amalopenaeus elegans* SI Smith, 1882	Arthropoda	Malacostraca		
75	*Eusergestes arcticus* (Krøyer, 1855)	Arthropoda	Malacostraca		
76	*Gardinerosergia splendens* (Sund, 1920)	Arthropoda	Malacostraca		
77	*Gennadas tinayrei* Bouvier, 1906	Arthropoda	Malacostraca		
78	*Gennadas valens* (SI Smith, 1884)	Arthropoda	Malacostraca		
79	*Meningodora vesca* (Smith, 1886)	Arthropoda	Malacostraca		
80	*Robustosergia robusta* (SI Smith, 1882)	Arthropoda	Malacostraca		
81	*Sergia remipes* Stimpson, 1860	Arthropoda	Malacostraca		
82	*Systellaspis debilis* (A. Milne-Edwards, 1881)	Arthropoda	Malacostraca		
83	*Agalma elegans* (Sars, 1846)	Cnidaria	Hydrozoa		
84	*Stygiomedusa gigantea* (Browne, 1910)	Cnidaria	Hydrozoa		
85	*Periphylla periphylla* (Péron & Lesueur, 1810)	Cnidaria	Scyphozoa		
86	*Calycopsis gara* Petersen, 1957	Cnidaria	Hydrozoa		
87	*Beella digitata* (Brady, 1879)	Foraminifera	Globothalamea		
88	*Globigerina bulloides* d'Orbigny, 1826	Foraminifera	Globothalamea		
89	*Globigerina falconensis* Blow, 1959	Foraminifera	Globothalamea		
90	*Globigerinella calida* (Parker, 1962)	Foraminifera	Globothalamea		
91	*Globigerinella siphonifera* (d'Orbigny, 1839)	Foraminifera	Globothalamea		
92	*Globigerinita glutinata* (Egger, 1893)	Foraminifera	Globothalamea		
93	*Globigerinita uvula* (Ehrenberg, 1861)	Foraminifera	Globothalamea		
94	*Globigerinoides conglobatus* (Brady, 1879)	Foraminifera	Globothalamea		
95	*Globigerinoides ruber* (d'Orbigny, 1839)	Foraminifera	Globothalamea		
96	*Globoconella inflata* (d'Orbigny, 1839)	Foraminifera	Globothalamea		
97	*Globorotalia (Truncorotalia) crassaformis* (Galloway & Wissler, 1927)	Foraminifera	Globothalamea		
98	*Globorotalia hirsuta* (d'Orbigny, 1839)	Foraminifera	Globothalamea		
99	*Globorotalia menardii* (d'Orbigny in Parker, Jones & Brady, 1865)	Foraminifera	Globothalamea		
100	*Globorotalia scitula* (Brady, 1882)	Foraminifera	Globothalamea		

	Species name and authority	**Phylum**	**Class**	**OSPAR Listed*[34]**	**IUCN status****
101	*Globorotalia truncatulinoides* (d'Orbigny, 1839)	Foraminifera	Globothalamea		
102	*Globorotalia tumida* (Brady, 1877)	Foraminifera	Globothalamea		
103	*Globoturborotalita rubescens* (Hofker, 1956)	Foraminifera	Globothalamea		
104	*Neogloboquadrina dutertrei* (d'Orbigny, 1839)	Foraminifera	Globothalamea		
105	*Neogloboquadrina incompta* (Cifelli, 1961)	Foraminifera	Globothalamea		
106	*Neogloboquadrina pachyderma* (Ehrenberg, 1861)	Foraminifera	Globothalamea		
107	*Orbulina universa* d'Orbigny, 1839	Foraminifera	Globothalamea		
108	*Pulleniatina obliquiloculata* (Parker & Jones, 1865)	Foraminifera	Globothalamea		
109	*Trilobatus sacculifer* (Brady, 1877)	Foraminifera	Globothalamea		
110	*Turborotalita humilis* (Brady, 1884)	Foraminifera	Globothalamea		
111	*Turborotalita quinqueloba* (Natland, 1938)	Foraminifera	Globothalamea		
112	*Clione limacina* (Phipps, 1774)	Mollusca	Gastropoda		
Benthos					
1	*Nephasoma (Nephasoma) flagriferum* (Selenka, 1885)	Annelida	Sipuncula		
2	*Parapagurus abyssorum* (Filhol, 1885)	Arthropoda	Malacostraca		
3	*Zoothamnium pelagicum* Du Plessis, 1891	Ciliophora	Oligohymenophorea		
4	*Dytaster grandis* (Verrill, 1884)	Echinodermata	Asteroidea		
5	*Freyella elegans* (Verrill, 1884)	Echinodermata	Asteroidea		
6	*Henricia lisa* A.H. Clark, 1949	Echinodermata	Asteroidea		
7	*Ophiuroglypha irrorata* (Lyman, 1878)	Echinodermata	Ophiuroidea		
8	*Amphiophiura bullata* (Thomson, 1877)	Echinodermata	Ophiuroidea		
9	*Amphiophiura convexa* (Lyman, 1878)	Echinodermata	Ophiuroidea		
10	*Limacina retroversa* (J. Fleming, 1823)	Mollusca	Gastropoda		

Annex 9. List of cephalopod species with recorded occurrence within the North Atlantic Current and Evlanov Sea basin MPA according to Taite et al. 2020.

The following species of pelagic cephalopods were recorded within the NACES MPA during the 2014-2016 cruises of RV Celtic Explorer, according to Taite et al. 2020.

Species	**Phylum**	**Class**	**Family**	**Presence in NACES**
Chtenopteryx sicula	Mollusca	Cephalopoda	Bathyteuthoidea	Yes
Brachioteuthis beanii	Mollusca	Cephalopoda	Brachioteuthidae	Yes
Brachioteuthis sp.	Mollusca	Cephalopoda	Brachioteuthidae	Yes
Chiroteuthis mega	Mollusca	Cephalopoda	Chiroteuthidae	Yes
Chiroteuthis veranyi	Mollusca	Cephalopoda	Chiroteuthidae	Yes
Bathothauma lyromma	Mollusca	Cephalopoda	Cranchiidae	Yes
Cranchia scabra	Mollusca	Cephalopoda	Cranchiidae	Yes
Helicocranchia pfefferi	Mollusca	Cephalopoda	Cranchiidae	Yes
Leachia sp.	Mollusca	Cephalopoda	Cranchiidae	Yes
Taoniinae sp.	Mollusca	Cephalopoda	Cranchiidae	Yes
Taonius pavo	Mollusca	Cephalopoda	Cranchiidae	Yes
Abraliopsis morisii	Mollusca	Cephalopoda	Enoploteuthidae	Yes
Gonatus steenstrupi	Mollusca	Cephalopoda	Gonatidae	Yes
Histioteuthis bonellii	Mollusca	Cephalopoda	Histioteuthidae	Yes
Histioteuthis reversa	Mollusca	Cephalopoda	Histioteuthidae	Yes
Histiotuethis corona	Mollusca	Cephalopoda	Histioteuthidae	Yes
Lampadioteuthis megaleia	Mollusca	Cephalopoda	Lycoteuthidae	Yes
Magnoteuthis magna	Mollusca	Cephalopoda	Mastigoteuthidae	Yes
Octopoteuthis sicula	Mollusca	Cephalopoda	Octopoteuthidae	Yes
Oegopsida indet.	Mollusca	Cephalopoda	Oegopsida indet.	Yes
Todarodes cf. *sagittatus*	Mollusca	Cephalopoda	Ommastrephidae	Yes
Ancistroteuthis lichtensteinii	Mollusca	Cephalopoda	Onychoteuthidae	Yes
Onychoteuthis cf. *banksii*	Mollusca	Cephalopoda	Onychoteuthidae	Yes
Pterygioteuthis gemmata	Mollusca	Cephalopoda	Pyroteuthidae	Yes
Pyroteuthis margaritifera	Mollusca	Cephalopoda	Pyroteuthidae	Yes
Heteroteuthis dagamensis	Mollusca	Cephalopoda	Sepiolidae	Yes

Annex 10. List of species of mesopelagic fish with recorded occurrence within the North Atlantic Current and Evlanov Sea basin MPA according to Devine et al. 2021.

The following species of mesopelagic fish were recorded within the NACES MPA during the 2015-2016 cruises of RV Celtic Explorer, according to Devine et al. 2021.

	Species	**Family**	**Order**	**Presence in NACES**
1	*Howella sherborni*	Howellidae	Acropomatiformes	Yes
2	*Xenodermichthys copei*	Alepocephalidae	Alepocephaliformes	Yes
3	*Normichthys operosus*	Platytroctidae	Alepocephaliformes	Yes
4	*Nessorhamphus ingolfianus*	Derichthyidae	Anguilliformes	Yes
5	*Nemichthys scolopaceus*	Nemichthyidae	Anguilliformes	Yes
6	*Eel leptocephalus* larvae	Nettastomatidae	Anguilliformes	Yes
7	*Serrivomer beanii*	Serrivomeridae	Anguilliformes	Yes
8	*Synaphobranchus kaupii*	Synaphobranchidae	Anguilliformes	Yes
9	*Bathylagus euryops*	Bathylagidae	Argentiniformes	Yes
10	*Dolicholagus longirostris*	Bathylagidae	Argentiniformes	Yes
11	*Nansenia oblita*	Microstomatidae	Argentiniformes	Yes
12	*Opisthoproctus soleatus*	Opisthoproctidae	Argentiniformes	Yes
13	*Alepisaurus brevirostris*	Alepisauridae	Aulopiformes	Yes
14	*Evermannella balbo*	Evermannellidae	Aulopiformes	Yes
15	*Benthosema glaciale*	Myctophidae	Aulopiformes	Yes
16	*Ceratoscopelus maderensis*	Myctophidae	Aulopiformes	Yes
17	*Diaphus effulgens*	Myctophidae	Aulopiformes	Yes
18	*Diaphus holti*	Myctophidae	Aulopiformes	Yes
19	*Diaphus metapoclampus*	Myctophidae	Aulopiformes	Yes
20	*Diaphus rafinesquii*	Myctophidae	Aulopiformes	Yes
21	*Diaphus* sp.1	Myctophidae	Aulopiformes	Yes
22	*Electrona risso*	Myctophidae	Aulopiformes	Yes
23	*Hygophum benoiti*	Myctophidae	Aulopiformes	Yes
24	*Lampadena anomala*	Myctophidae	Aulopiformes	Yes
25	*Lampadena atlantica*	Myctophidae	Aulopiformes	Yes
26	*Lampadena speculigera*	Myctophidae	Aulopiformes	Yes
27	*Lampanyctus alatus*	Myctophidae	Aulopiformes	Yes
28	*Lampanyctus festivus*	Myctophidae	Aulopiformes	Yes
29	*Lampanyctus macdonaldi*	Myctophidae	Aulopiformes	Yes
30	*Lampanyctus pusillus*	Myctophidae	Aulopiformes	Yes
31	*Lampanyctus* sp.1	Myctophidae	Aulopiformes	Yes
32	*Lampanyctus* sp.2	Myctophidae	Aulopiformes	Yes
33	*Lobianchia gemellarii*	Myctophidae	Aulopiformes	Yes
34	*Myctophum punctatum*	Myctophidae	Aulopiformes	Yes
35	*Nannobrachium atrum*	Myctophidae	Aulopiformes	Yes
36	*Notoscopelus bolini*	Myctophidae	Aulopiformes	Yes
37	*Notoscopelus caudispinosus*	Myctophidae	Aulopiformes	Yes
38	*Notoscopelus kroyeri*	Myctophidae	Aulopiformes	Yes
39	*Symbolophorus veranyi*	Myctophidae	Aulopiformes	Yes
40	*Ahliesaurus berryi*	Notosudidae	Aulopiformes	Yes
41	*Scopelosaurus lepidus*	Notosudidae	Aulopiformes	Yes
42	*Arctozenus risso*	Paralepididae	Aulopiformes	Yes
43	*Lestidiops jayakari*	Paralepididae	Aulopiformes	Yes
44	*Macroparalepis affinis*	Paralepididae	Aulopiformes	Yes
45	*Sudis hyalina*	Paralepididae	Aulopiformes	Yes

	Species	**Family**	**Order**	**Presence in NACES**
46	*Scopelarchus analis*	Scopelarchidae	Aulopiformes	Yes
47	*Beryx decadactylus*	Berycidae	Beryciformes	Yes
48	*Poromitra capito*	Melamphaidae	Beryciformes	Yes
49	*Scopeloberyx robustus*	Melamphaidae	Beryciformes	Yes
50	*Melanonus zugmayeri*	Melanonidae	Gadiformes	Yes
51	*Regalecus glesne*	Regalecidae	Lampriformes	Yes
52	*Cryptopsaras couesii*	Ceratiidae	Lophiiformes	Yes
53	*Himantolophus groenlandicus*	Himantolophidae	Lophiiformes	Yes
54	*Chaenophryne draco*	Oneirodidae	Lophiiformes	Yes
55	*Brama brama*	Bramidae	Scombriformes	Yes
56	*Pterycombus brama*	Bramidae	Scombriformes	Yes
57	*Caristius fasciatus*	Caristiidae	Scombriformes	Yes
58	*Chiasmodon* juvenile	Chiasmodontidae	Scombriformes	Yes
59	*Chiasmodon niger*	Chiasmodontidae	Scombriformes	Yes
60	*Pseudoscopelus altipinnis*	Chiasmodontidae	Scombriformes	Yes
61	*Pseudoscopelus astronesthidens*	Chiasmodontidae	Scombriformes	Yes
62	*Pseudoscopelus* sp.	Chiasmodontidae	Scombriformes	Yes
63	*Diplospinus multistriatus*	Gempylidae	Scombriformes	Yes
64	*Nesiarchus nasutus*	Gempylidae	Scombriformes	Yes
65	*Benthodesmus elongatus*	Trichiuridae	Scombriformes	Yes
66	*Squaliolus laticaudus*	Dalatiidae	Squaliformes	Yes
67	*Gonostoma atlanticum*	Gonostomatidae	Stomiiformes	Yes
68	*Gonostoma denudatum*	Gonostomatidae	Stomiiformes	Yes
69	*Margrethia obtusirostra*	Gonostomatidae	Stomiiformes	Yes
70	*Sigmops elongatus*	Gonostomatidae	Stomiiformes	Yes
71	*Maurolicus muelleri*	Sternoptychidae	Stomiiformes	Yes
72	*Polyipnus clarus*	Sternoptychidae	Stomiiformes	Yes
73	*Sternoptyx diaphana*	Sternoptychidae	Stomiiformes	Yes
74	*Argyropelecus aculeatus*	Sternoptychidae	Stomiiformes	Yes
75	*Argyropelecus hemigymnus*	Sternoptychidae	Stomiiformes	Yes
76	*Aristostomias* sp.	Stomiidae	Stomiiformes	Yes
77	*Astronesthes cyaneus*	Stomiidae	Stomiiformes	Yes
78	*Astronesthes gemmifer*	Stomiidae	Stomiiformes	Yes
79	*Astronesthes niger*	Stomiidae	Stomiiformes	Yes
80	*Astronesthes* sp.	Stomiidae	Stomiiformes	Yes
81	*Bathophilus vaillanti*	Stomiidae	Stomiiformes	Yes
82	*Chauliodus sloani*	Stomiidae	Stomiiformes	Yes
83	*Chirostomias pliopterus*	Stomiidae	Stomiiformes	Yes
84	*Echiostoma barbatum*	Stomiidae	Stomiiformes	Yes
85	*Eustomias filifer*	Stomiidae	Stomiiformes	Yes
86	*Eustomias leptobolus*	Stomiidae	Stomiiformes	Yes
87	*Eustomias longibarba*	Stomiidae	Stomiiformes	Yes
88	*Eustomias radicifilis*	Stomiidae	Stomiiformes	Yes
89	*Eustomias* sp.	Stomiidae	Stomiiformes	Yes
90	*Eustomias* sp.1	Stomiidae	Stomiiformes	Yes
91	*Idiacanthus fasciola*	Stomiidae	Stomiiformes	Yes
92	*Leptostomias haplocaulus*	Stomiidae	Stomiiformes	Yes
93	*Malacosteus niger*	Stomiidae	Stomiiformes	Yes
94	*Melanostomias bartonbeani*	Stomiidae	Stomiiformes	Yes
95	*Melanostomias* sp.1	Stomiidae	Stomiiformes	Yes
96	*Melanostomias* sp.3	Stomiidae	Stomiiformes	Yes
97	*Photonectes margarita*	Stomiidae	Stomiiformes	Yes
98	*Stomias boa ferox*	Stomiidae	Stomiiformes	Yes

	Species	**Family**	**Order**	**Presence in NACES**
99	*Stomias brevibarbatus*	Stomiidae	Stomiiformes	Yes
100	*Trigonolampa miriceps*	Stomiidae	Stomiiformes	Yes
101	*Diretmus argenteus*	Diretmidae	Trachichthyiformes	Yes

Annex 11. List of gelatinous zooplankton and other species/taxa with recorded occurrence within the North Atlantic Current and Evlanov Sea basin MPA according to Haberlin (2018).

The following species of gelatinous zooplankton and other taxa were recorded within the NACES MPA during the April 2015 cruise of RV Celtic Explorer, according to Haberlin (2018). Bold denotes taxa classification other than species/genera (e.g., suborder, family). Red denotes species also mentioned in the OBIS list.

Species/taxa	**Phylum**	**Class**	**Family**	**Presence in NACES**
Tomopteris sp.	Annelida	Polychaeta	Tomopteridae	Yes
Copepoda sp.	Arthropoda	Copepoda	-	Yes
Euphausiacea sp.	Arthropoda	Malacostraca	-	Yes
Hyperiidea sp.	Arthropoda	Malacostraca	-	Yes
Phronima spp.	Arthropoda	Malacostraca	Phronimidae	Yes
Ostracoda sp.	Arthropoda	Ostracoda	-	Yes
Chaetognatha sp.	Chaetognatha	-	-	Yes
Appendicularia sp.	Chordata	Appendicularia	-	Yes
Dolioletta gegenbauri	Chordata	Thaliacea	Doliolidae	Yes
Doliolidae sp.	Chordata	Thaliacea	Doliolidae	Yes
Salpa fusiformis	Chordata	Thaliacea	Salpidae	Yes
Salpa sp.	Chordata	Thaliacea	Salpidae	Yes
Thalia democratica	Chordata	Thaliacea	Salpidae	Yes
Hydromedusae sp.	Cnidaria	Hydrozoa	-	Yes
Physonectae sp.	Cnidaria	Hydrozoa	-	Yes
Abylopsis tetragona	Cnidaria	Hydrozoa	Abylidae	Yes
Ceratocymba sagittata	Cnidaria	Hydrozoa	Abylidae	Yes
Agalma elegans	Cnidaria	Hydrozoa	Agalmatidae	Yes
Nanomia cara	Cnidaria	Hydrozoa	Agalmatidae	Yes
Chuniphyes multidentata	Cnidaria	Hydrozoa	Clausophyidae	Yes
Crystallophyes amygdalina	Cnidaria	Hydrozoa	Clausophyidae	Yes
Cunissa alderi	Cnidaria	Hydrozoa	Cuninidae	Yes
Dimophyes arctica	Cnidaria	Hydrozoa	Diphyidae	Yes
Diphyes dispar	Cnidaria	Hydrozoa	Diphyidae	Yes
Diphyidae sp.	Cnidaria	Hydrozoa	Diphyidae	Yes
Lensia achilles	Cnidaria	Hydrozoa	Diphyidae	Yes
Lensia conoidea	Cnidaria	Hydrozoa	Diphyidae	Yes
Lensia fowleri	Cnidaria	Hydrozoa	Diphyidae	Yes
Lensia hotspur	Cnidaria	Hydrozoa	Diphyidae	Yes
Lensia multicristata	Cnidaria	Hydrozoa	Diphyidae	Yes
Lensia subtilis	Cnidaria	Hydrozoa	Diphyidae	Yes
Phialopsis diegensis	Cnidaria	Hydrozoa	Eirenidae	Yes
Hippopodius hippopus	Cnidaria	Hydrozoa	Hippopodiidae	Yes
Vogtia glabra	Cnidaria	Hydrozoa	Hippopodiidae	Yes
Vogtia serrata	Cnidaria	Hydrozoa	Hippopodiidae	Yes
Vogtia spinosa	Cnidaria	Hydrozoa	Hippopodiidae	Yes
Leuckartiara sp.	Cnidaria	Hydrozoa	Pandeidae	Yes
Amphicaryon acaule	Cnidaria	Hydrozoa	Prayidae	Yes
Desmophyes annectens	Cnidaria	Hydrozoa	Prayidae	Yes
Praya dubia	Cnidaria	Hydrozoa	Prayidae	Yes
Prayidae sp.	Cnidaria	Hydrozoa	Prayidae	Yes

Species/taxa	**Phylum**	**Class**	**Family**	**Presence in NACES**
Aglantha digitale	Cnidaria	Hydrozoa	Rhopalonematidae	Yes
Rhopalonema velatum	Cnidaria	Hydrozoa	Rhopalonematidae	Yes
Sphaeronectidae sp.	Cnidaria	Hydrozoa	Sphaeronectidae	Yes
Scyphomedusae sp.	Cnidaria	Scyphozoa	-	Yes
Atolla wyvillei	Cnidaria	Scyphozoa	Atollidae	Yes
Pelagia noctiluca	Cnidaria	Scyphozoa	Pelagiidae	Yes
Periphylla periphylla	Cnidaria	Scyphozoa	Peryphllidae	Yes
Beroe sp.	Ctenophora	Nuda	Beroidae	Yes
Pleurobrachia pileus	Ctenophora	Tentaculata	Pleurobrachiidae	Yes
Foraminifera sp.	Foraminifera	-	-	Yes
Cephalopoda sp.	Mollusca	Cephalopoda	-	Yes
Pterotracheoidea sp.	Mollusca	Gastropoda	-	Yes
Cavoliniidae sp.	Mollusca	Gastropoda	Cavoliniidae	Yes
Clionidae sp.	Mollusca	Gastropoda	Clionidae	Yes

Annex 12. List of micronekton species/taxa with recorded occurrence within the North Atlantic Current and Evlanov Sea basin MPA according to Della Penna and Gaube (2020).

The following species of micronekton were recorded within the NACES MPA during the NAAMES 2 (May 2016) and NAAMES 3 (September 2017) cruises, according to Della Penna and Gaube (2020). Bold denotes classification other than species/genera (e.g., suborder, class) or description of life stage (i.e., juvenile).

Species/taxa	**Phylum**	**Order**	**Family**	**Presence in NACES**
Tomopteris sp.	Annelida	Phyllodocida	Tomopteridae	Yes
Euchaeta sp.	Arthropoda	Calanoida	Euchaetidae	Yes
Euphausiids	Arthropoda	Euphausiacea	Euphausiidae	Yes
Halocyprids	Arthropoda	Halocyprida	Halocyprididae	Yes
Hyperiids	Arthropoda	Amphipoda	Hyperiidae	Yes
Phronima sedentaria	Arthropoda	Amphipoda	Phronimidae	Yes
Primno sp.	Arthropoda	Amphipoda	Phrosinidae	Yes
Chaetognaths	Chaetognatha	-	-	Yes
Melanolagus cf. bericoides	Chordata	Argentiniformes	Bathylagidae	Yes
Derichthys serpentinus	Chordata	Anguilliformes	Derichthyidae	Yes
Cyclothone pseudopallida	Chordata	Stomiiformes	Gonostomatidae	Yes
Gonostoma denudatum	Chordata	Stomiiformes	Gonostomatidae	Yes
juvenile *Cyclothone* sp.	Chordata	Stomiiformes	Gonostomatidae	Yes
Hyporhamphus meeki	Chordata	Beloniformes	Hemiramphidae	Yes
Melamphaes cf. suborbitalis	Chordata	Beryciformes	Melamphaidae	Yes
Unidentified Microstomatid	Chordata	Argentiniformes	Microstomatidae	Yes
Benthosema glaciale	Chordata	Myctophiformes	Myctophidae	Yes
Diaphus brachycephalus	Chordata	Myctophiformes	Myctophidae	Yes
Diogenichthys atlanticus	Chordata	Myctophiformes	Myctophidae	Yes
Juvenile Myctophids	Chordata	Myctophiformes	Myctophidae	Yes
Lampanyctus sp.	Chordata	Myctophiformes	Myctophidae	Yes
Myctophum punctatum	Chordata	Myctophiformes	Myctophidae	Yes
Nannobrachium sp.	Chordata	Myctophiformes	Myctophidae	Yes
Unidentified Myctophids	Chordata	Myctophiformes	Myctophidae	Yes
Scomberesox cf saurus	Chordata	Beloniformes	Scomberesocidae	Yes
Argyropelecus cf. hemigymnus	Chordata	Stomiiformes	Sternoptychidae	Yes
Sternoptyx pseudobscura	Chordata	Stomiiformes	Sternoptychidae	Yes
Bathophilus proximus	Chordata	Stomiiformes	Stomiidae	Yes
Chauliodus danae	Chordata	Stomiiformes	Stomiidae	Yes
Eustomias sp.	Chordata	Stomiiformes	Stomiidae	Yes
Juvenile *Stomias affinis*	Chordata	Stomiiformes	Stomiidae	Yes
Stomias affinis	Chordata	Stomiiformes	Stomiidae	Yes
Siphonophores	Cnidaria	Siphonophorae		Yes
Jellyfish	Cnidaria	-	-	Yes
Clio pyramidata	Mollusca	Pteropoda	Cliidae	Yes
Clione gracilis	Mollusca	Pteropoda	Clionidae	Yes
Histioteuthis reversa	Mollusca	Oegopsida	Histioteuthidae	Yes
Limacina helicoides	Mollusca	Pteropoda	Limacinidae	Yes
Octopoteuthis cf. sicula	Mollusca	Oegopsida	Octopoteuthidae	Yes
Radiolarians	Radiozoa	-	-	Yes

Annex 13. List of microzooplankton and mesozooplankton species with recorded occurrence within the North Atlantic Current and Evlanov Sea basin MPA according to Morison et al. (2019, 2020).

The following species of microzooplankton and mesozooplankton were recorded within the NACES MPA during the NAAMES 2 (May 2016) cruise, according to Morison et al. (2019, 2020). Red denotes species also mentioned in the OBIS list.

Species/genera	**Phylum**	**Order**	**Family**	**Presence in NACES**
Microzooplankton				
Gymnodinium spp.	Myzozoa	Gymnodiniales	Gymnodiniaceae	Yes
Gyrodinium spp.	Myzozoa	Gymnodiniales	Gymnodiniaceae	Yes
Lohmanniella oviformis	Ciliophora	Choreotrichida	Lohmanniellidae	Yes
Strobilidium spp.	Ciliophora	Choreotrichida	Strobilidiidae	Yes
Strombidium spp.	Ciliophora	Oligotrichida	Strombidiidae	Yes
Mesozooplankton				
Calanus finmarchicus	Arthropoda	Calanoida	Calanidae	Yes
Metridia lucens	Arthropoda	Calanoida	Metridinidae	Yes
Paracalanus spp.	Chordata	Calanoida	Paracalanidae	Yes
Pleuromamma sp.	Chordata	Calanoida	Metridinidae	Yes
Pseudocalanus spp.	Chordata	Calanoida	Clausocalanidae	Yes

ANNEX 14. Abbreviations

ABNJ	Areas Beyond National Jurisdiction
AEWA	African Eurasian Waterbird Agreement
AIS	Automatic Identification System
AMOC	Atlantic Meridional Overturning Circulation
ARS	Area-Restricted Search
BDE	Brominated Diphenyl Ethers
CAFF	Conservation of Arctic Flora and Fauna
CBD	Convention on Biological Diversity
CGFZ	Charlie-Gibbs Fracture Zone
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species of Wild Animals
CR	Critically Endangered (IUCN)
DD	Data Deficient (IUCN)
DPE	Diphenyl Ether
DSL	Deep Scattering Layer
DVM	Diurnal Vertical Migration
EBSA	Ecologically or Biologically Significant Area
EEZ	Exclusive Economic Zone
EGC	East Greenland Current
EKE	Eddy Kinetic Energy
EN	Endangered (IUCN)
EPSG	European Petroleum Survey Group
EU	European Union
EW	Extinct in the Wild (IUCN)
EX	Extinct (IUCN)
FAO	Food and Agriculture Organisation of the United Nations
GEBCO	General Bathymetric Chart of the Oceans
GOBI	Global Ocean Biodiversity Initiative
GPS	Global Positioning System
IBA	Important Bird and Biodiversity Area
IBP	Iberian Peninsula
ICCAT	International Commission for the Conservation of Atlantic Tuna
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organisation
IPOA-Sharks	International Action Plan for the Conservation and Management of Sharks (FAO)
ISA	International Seabed Authority
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unregulated and Unreported (Fishing)
JNCC	Joint Nature Conservation Committee
LC	Least Concern (IUCN)
LME	Large Marine Ecosystem
MAR-ECO	Mid-Atlantic Ridge Ecosystem (Project)
ME	Mann Eddy
MiCO	Migratory Connectivity in the Ocean
MPA	Marine Protected Area
MSFD	Marine Strategy Framework Directive
MSY	Maximum Sustainable Yield
NAC	North Atlantic Current
NACES MPA	North Atlantic Current and Evlanov Sea basin Marine Protected Area
NAFO	North Atlantic Fisheries Organisation
NAMOC	Northwest Atlantic Mid-Ocean Channel
NAMMCO	North Atlantic Marine Mammal Commission
NASCO	Northern Atlantic Salmon Conservation Organisation
NE	Not Evaluated (IUCN)

NEAFC	North-East Atlantic Fishery Commission
NERC	Natural Environment Research Council
NT	Near Threatened (IUCN)
NWA	North West Atlantic
NWC	North West Corner
OBIS	Ocean Biodiversity Information System
ODIMS	OSPAR Data and Information Management System
OFOS	Ocean Floor Observation System
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PECMAS	Permanent Committee on Management and Science
PSAT	Pop-up Satellite Archival Tag
PSSAs	Particularly Sensitive Sea Areas
QSR	Quality Status Report
REMP	Regional Environmental Management Plan (ISA)
RFMO	Regional Fisheries Management Organisation
SAF	Subarctic Front
SRDL	Satellite Relay Data Logger
SEMPAI	Sustainability Evaluation of Marine Protected Areas Index
SPA	Special Protection Area
SST	Sea Surface Temperature
TAC	Total Allowable Catch
TBT	Tributyltin
UNCLOS	United Nations Convention on the Law of the Sea
VME	Vulnerable Marine Ecosystem
VU	Vulnerable (IUCN)
WGDEC	ICES Working Group on Deep-water Ecology
WGS	World Geodetic System

ANNEX 15. Glossary

Abyssal plains	Flat regions of the ocean floor (slope <1:1000) between ca. 3500 and 6500 m water depth.
Abyssal hills	A distinct elevation generally of irregular shape, less than 1000 m above the surrounding relief as measured from the deepest isobath that surrounds most of the feature.
Basins	A depression more or less equidimensional in plan and of variable extent.
Bentho-pelagic coupling	Processes that connect benthic and pelagic zones through the exchange of energy, mass, or nutrients.
Carbon sequestration	Storage of carbon dioxide in deep-sea sediments.
Coral gardens	A relatively dense aggregation of colonies or individuals of one or more coral species (OSPAR 2010j).
Deep-sea elasmobranch spawning grounds	Benthic areas used by skates to deposit their eggs.
Deep-sea sponge aggregations	Aggregations of deep-sea sponges, primarily from the Hexactinellida and Demospongiae classes (OSPAR 2010k).
Escarpments	An elongated, characteristically linear, steep slope separating horizontal or gently sloping areas of the seafloor.
Fracture zones	A long narrow zone of irregular topography formed by the movement of tectonic plates associated with an offset of a spreading ridge axis, characterized by steep-sided and/or asymmetrical ridges, troughs or escarpments.
Frontal zone system	Boundary between two distinct water masses.
Knolls	A distinct elevation with a rounded profile less than 1000 m above the surrounding relief as measured from the deepest isobath that surrounds most of the feature.
Larvae dispersal	The horizontal and vertical translocation of larvae, which may crawl, swim, or passively disperse for short to long periods of time.
Mesoscale eddies	A circular current of water less than 100 km with permanent meanders.
Nutrient fluxes	Transfer of nutrients through the water column and benthos.
Pillow lava	Pillow-shaped structures where lava extrudes and cools underwater.
Ridges	An elongated elevation of varying complexity and size, generally having steep sides.
Seamounts	Undersea mountains whose summits rise more than 1,000 metres above the surrounding sea floor, but do not penetrate the sea surface (OSPAR 2010g).