ATLAS Deliverable D6.1: Sectoral activities, institutional landscape, existing management plans and MSP goals

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Abstract

ATLAS is testing a generic Marine Spatial Planning (MSP) framework[1] developed by the FP7 MESMA project to assess spatially managed areas (SMAs) in all 12 of the ATLAS Case Studies. The Case Studies represent the range of biogeographic, regulatory and jurisdictional situations encountered across the Atlantic including the deep-waters of the EU, US, Canada and Areas Beyond National Jurisdiction (NEAFC and NAFO Regulatory Areas). SMAs are discrete spatial entities occurring at different spatial scales where a spatial management framework such as Marine Spatial Planning is in place, is under development or is considered. The MESMA framework comprises seven key steps of which the first is concerned with setting high level objectives for the SMA.

Deliverable 6.1 reports on the first planning iteration in which case study leaders have applied MESMA Step 1 to delineate the extent of the spatially managed areas under consideration in their case studies, have described existing sectoral activities, mapped the institutional landscape and provided information on (any) existing management plans. Each case study has set as a management goal for its SMA, the accommodation of a theoretical new blue economy/blue growth activity while ensuring minimum disruption to existing activities, and impact on delivery of ecosystem goods and services (including protection of vulnerable marine ecosystems and biodiversity) thus ensuring good environmental status as required by the Marine Strategy Framework Directive.

[1] Stelzenmüller et al (2013). Monitoring and evaluation of spatially managed areas: A generic framework for implementation of ecosystem based marine management and its application. *Marine Policy* 37:149-164.

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Partner 6 Gianni Consultancy (GC)
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Partner 23 University of North Carolina Wilmington (UNCW)
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List of acronyms

ABNJ - Areas Beyond National Jurisdiction

AMOC - Atlantic Meridional Overturning Circulation

BBNJ - Biodiversity Beyond National Jurisdiction

CEM - Conservation and Enforcement Measures

EA - Enterprise Allocation

EAF - Ecosystem Approach Framework

EBSA - Ecologically or Biologically Significant Area

ECS - Extended Continental Shelf

EEZ - Exclusive Economic Zone

ENACW - Eastern North Atlantic Central Water

ICES - International Council for the Exploration of the Sea

IFMPs - Integrated Fisheries Management Plans

MAPAMA - Spanish Ministry for Agriculture, Fisheries, Food and Environment

MESMA - Monitoring and Evaluation of Spatially Managed Areas project

MOW - Mediterranean Outflow Water

MPA - Marine Protected Area

MSFD – Marine Strategy Framework Directive

MSP - Maritime Spatial Planning

NAFO - Northwest Atlantic Fisheries Organization

NEAFC - North East Atlantic Fisheries Commission

RFMOs – Regional Fisheries Management Organisations

SAC – Special Area of Conservation

SEA - Strategic Environment Assessment

SFAs -Shrimp Fishing Areas

TAC - Total Allowable Catch

UNGA - United Nations General Assembly

VME - Vulnerable Marine Ecosystem

VMS - Vessel Monitoring Scheme

1 Introduction

Maritime spatial planning (MSP) offers new opportunities to balance uses and protection of marine ecosystems in support of the implementation of ecosystem-based management in line with EC policies. ATLAS aims to assess the feasibility and benefits of applying MSP over current sectoral approaches in support of new Blue Growth in the Atlantic at both basin and regional/local scale. WP6 focuses on supporting area based management at regional/local scale. WP6 is applying a generic MSP framework[1] developed by the FP7 MESMA project (www.mesma.org) to all 12 of the ATLAS Case Studies. The Case Studies represent the range of biogeographic, regulatory and jurisdictional situations encountered across the Atlantic including the deep-waters of the EU, US, Canada and Areas Beyond National Jurisdiction (NEAFC and NAFO Regulatory Areas). It should be made clear at the outset that WP6 has no legal competence or mandate to produce Marine Spatial Plans in the strict application of the term and will not undertake any formal stakeholder consultations. The main focus of WP6 is to assess whether the existing science base is sufficient to support regional/local scale spatial managed areas (SMAs). Existing available information will be compiled and knowledge gaps identified and addressed so that decision support tools can be employed to test management/policy options available to each Case Study SMA faced with the accommodation of a theoretical new blue economy/blue growth activity. The goal will be to ensure a minimum disruption of existing activities and impact on delivery of ecosystem goods and services (including protection of vulnerable marine ecosystems and biodiversity) thus ensuring good environmental status as required by the Marine Strategy Framework Directive.

The MESMA generic framework describes an iterative process to assess an SMA. SMAs are discrete spatial entities at different spatial scales where a spatial management framework such as Marine Spatial Planning is in place, is under development or is considered. The MESMA framework to evaluate and monitor SMAs comprises seven key steps (Figure 1). **Step 1** requires the definition of spatial and temporal boundaries to specify the context, the boundaries and the high-level goals and operational objectives. **Step 2** comprises the collation and mapping of existing information including all ecosystem components (natural and socio-economic) relevant to the set of objectives defined in Step 1. The socio-economic components (human activities) must be mapped and the (cumulative) impacts of these on natural ecosystem components assessed. **Step 3** involves the definition of indicators and related thresholds. **Step 4** comprises state assessments of the indicators and/or a risk analysis of management scenarios. **Step 5** evaluates the findings against the operational objectives. **Step 6** assesses the effectiveness of the proposed management measures. Finally, **Step 7** collates the outputs from the previous steps leading to recommendations to support adaptive management in the SMA.

[1] Stelzenmüller et al (2013). Monitoring and evaluation of spatially managed areas: A generic framework for implementation of ecosystem based marine management and its application. *Marine Policy* 37:149-164.

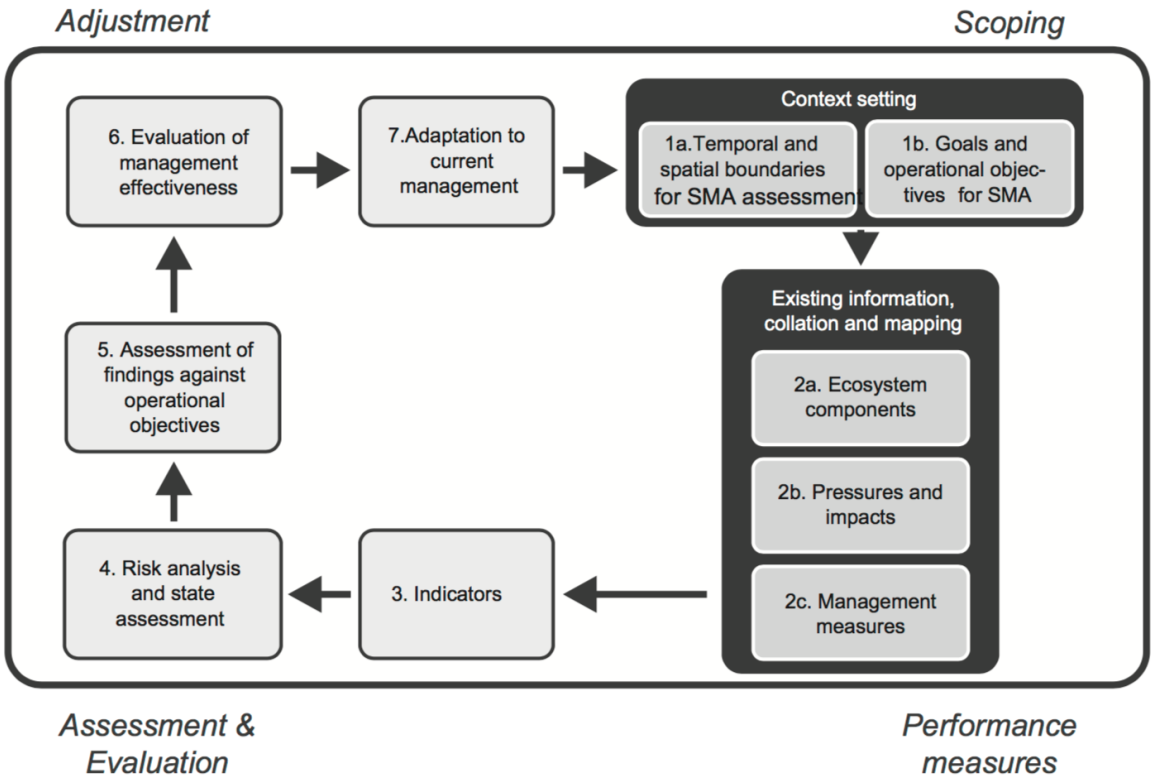

Figure 1. A flowchart showing the steps in the application of the MESMA framework for the monitoring and evaluation of spatially managed areas.

This Deliverable Report focuses on MESMA Step 1 which defines the spatial boundaries and sets the operational objectives for the Spatially Managed Area assessments in each of the 12 ATLAS Case Study areas (Figure 2) presented in the chapters that follow.

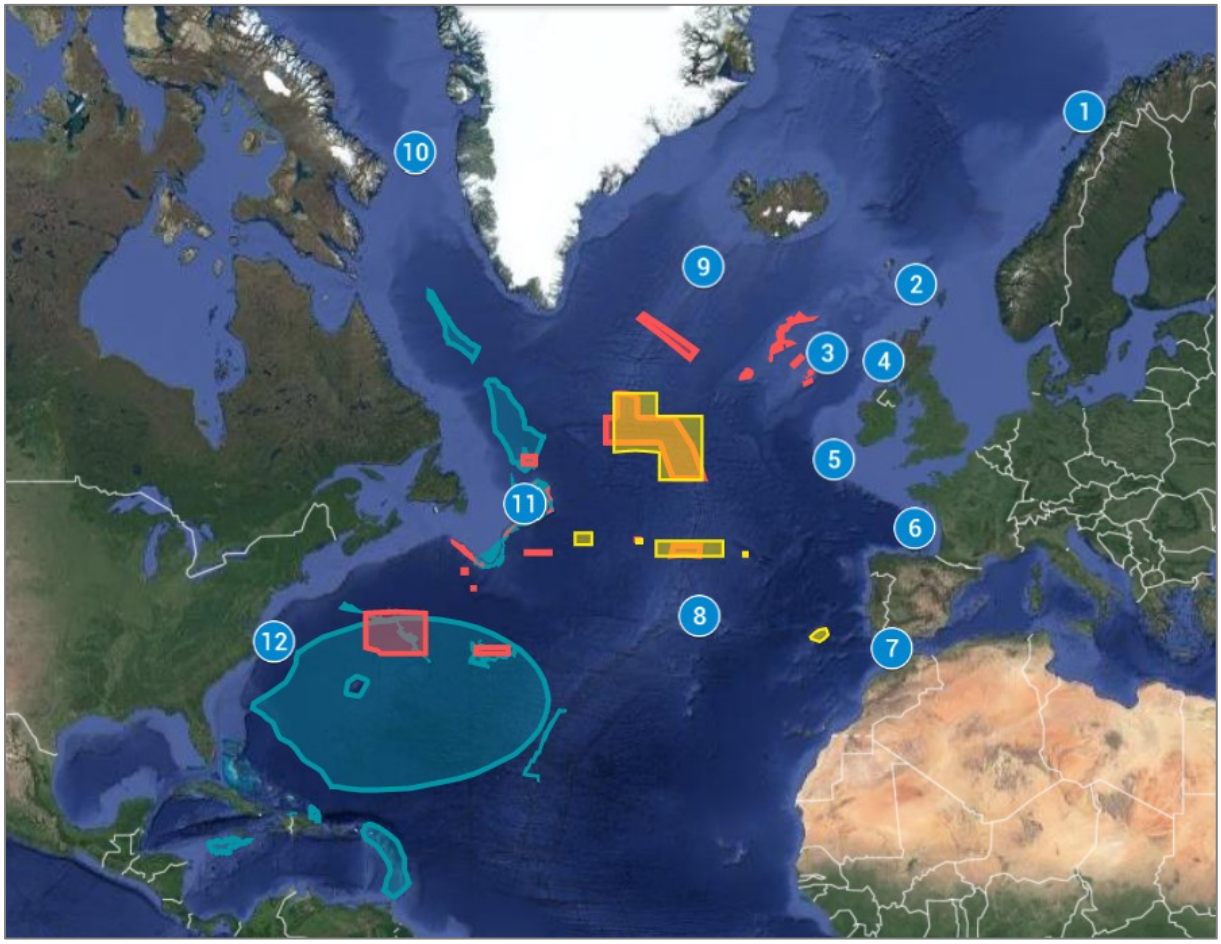

Figure 2. The location of partner institutes and the position of case study locations across the Atlantic. ATLAS Case Study locations (numbered items) overlaid with Ecologically or Biologically Significant Areas (light blue areas); Vulnerable Marine Ecosystems (red boxes) and OSPAR Marine Protected Areas in Areas Beyond National Jurisdiction (yellow boxes).

Case Study	Lead & collaborators
1. LoVe Observatory (Norway)	NIOZ, UEDIN, Statoil,
2. West of Shetland and W Scotland slope (UK)	UEDIN, BP, Oil and Gas UK, MSS
3. Rockall Bank (UK & Ireland)	MSS, IEO, OXU
4. Mingulay Reef Complex (UK)	UEDIN, MSS
5. Porcupine Seabight (Ireland)	NUIG, Woodside
6. Bay of Biscay (France)	Ifremer
7. Gulf of Cádiz/Strait of Gibraltar/Alborán Sea (Spain & Portugal)	IEO, Ifremer, IMAR
8. Azores (Portugal)	IMAR, IEO
9. Reykjanes Ridge (Iceland)	UCD
10. S Davis Strait/Western Greenland/Labrador Sea (Canada)	DFO
11. Flemish Cap (Canada)	IEO, DFO, OXU,
12. Mid-Atlantic Canyons (USA)	UNCW, Temple University, National Oceanic Atmospheric Administration (NOAA)

2 Case Studies

2.1 Case Study 1: Lofoten-Vesteralen (LoVe) - Dick van Oevelen (NIOZ)

2.1.1 Study Area Description

In collaboration with the Norwegian Institute for Marine Research, Statoil has operated a cabled ocean observatory outside Lofoten-Vesterålen in northern Norway since 2013. Due to the narrow continental shelf, the area is described as the gateway to the Barents Sea. The marine ecosystem is highly valuable and productive and an important habitat and spawning ground for a number of key species in northern ecosystems, e.g. Northeast Atlantic cod and cold-water corals including *Lophelia pertusa* which form substantial framework reefs in this area. Other important species include herring, sponges and soft corals. Fisheries and, closer to shore, tourism, are important sectors in the region. The area is not open for oil and gas activities, however, this is currently under discussion.

2.1.2 Sectoral activities and Blue Growth opportunities

The main blue economy sectors operating in the Lofoten-Vesterålen are fisheries (Figure 3) and aquaculture. Close to shore tourism is important. The main blue growth opportunities are in aquaculture, fisheries, oil/gas exploitation and maritime transport. Fisheries currently operate in relation to the defined environmental objectives for the protection of vulnerable marine ecosystems (VMEs) and the potential goods and services they provide. There is interest in oil and gas potential for this area, but at present, there are no active exploration projects and no exploitation. It is, however, a realistic future scenario and is therefore considered as a hypothetical scenario. The area contains a cabled ocean observatory that has presently one node that is positioned close to a cold-water coral reef mound, but which will be extended with additional nodes in the near future and then extend onto the Norwegian slope. Fisheries should be sustainable at current levels provided they can demonstrate they have no adverse impacts on VMEs and are done in such a way as to ensure long term sustainable harvesting.

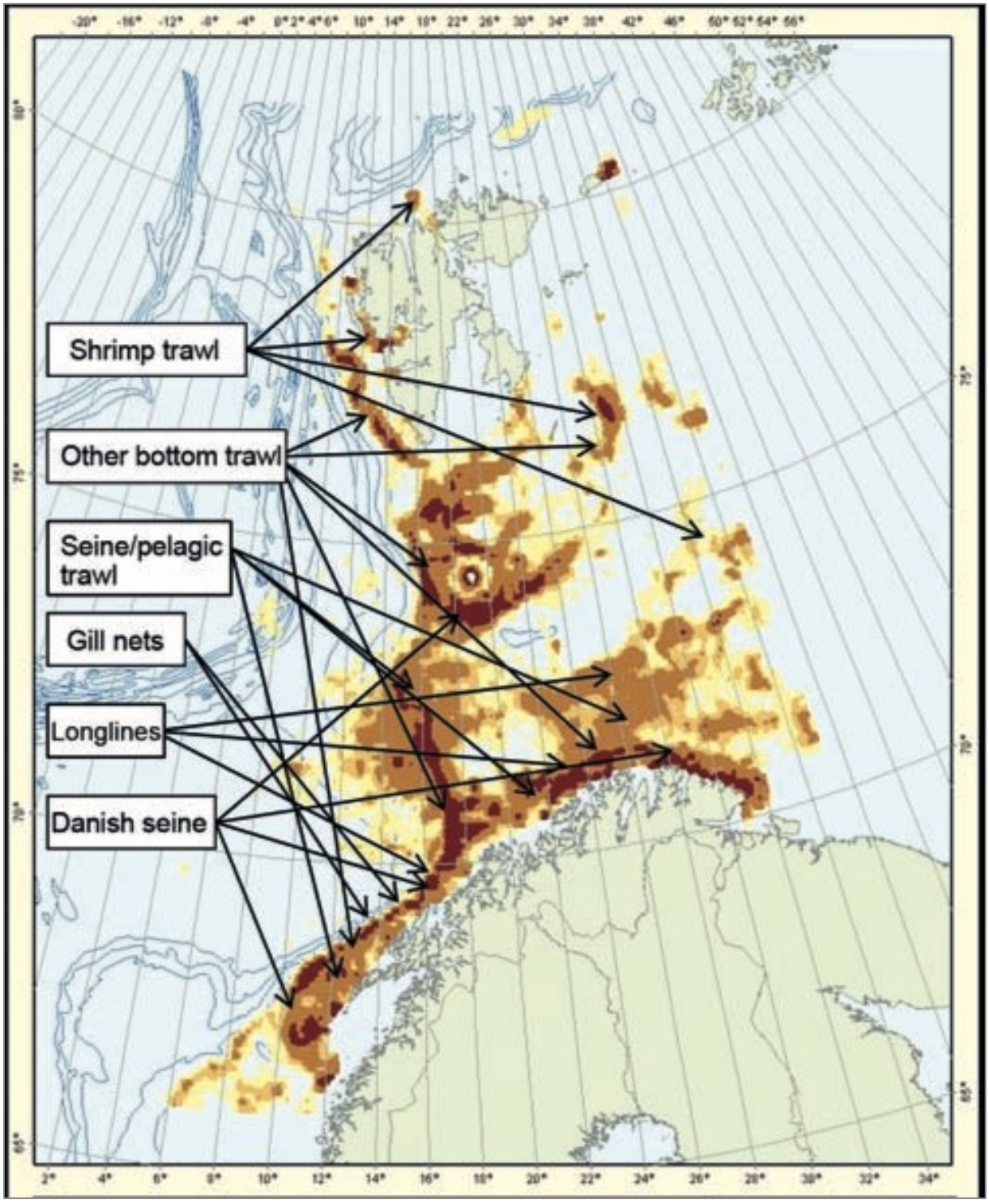

Figure 3. Fishing vessel activity for vessels with a length of more than 21 m in 2009. The dark shading shows the greatest activity.

2.1.3 Setting spatial boundaries for SMA assessment

The SMA for this case study will align with the boundaries of the existing Barents Sea Management Plan which extends from the continental shelf and slope region off the Lofoten all the way up north of Svalbard (Figure 4).

Figure 4. Boundaries of the Spatial Management Plan for the Barents Sea

2.1.4 Institutional landscape

This area lies entirely within the EEZ of Norway and as such all activities in the area are managed by the relevant governmental institutes in Norway. The area is subject to an integrated management plan for the Barents Sea and Lofoten (see 2.1.5) overseen by the Ministry of Climate and the Environment which furnishes periodic reports to the Norwegian Government (the Storting) on progress with implementation of the Plan. Three government groups were set up to implement and follow up the plan on a yearly basis: the Management forum, the Monitoring group and the Risk forum, where government Institutions and agencies participate (Figure 5).

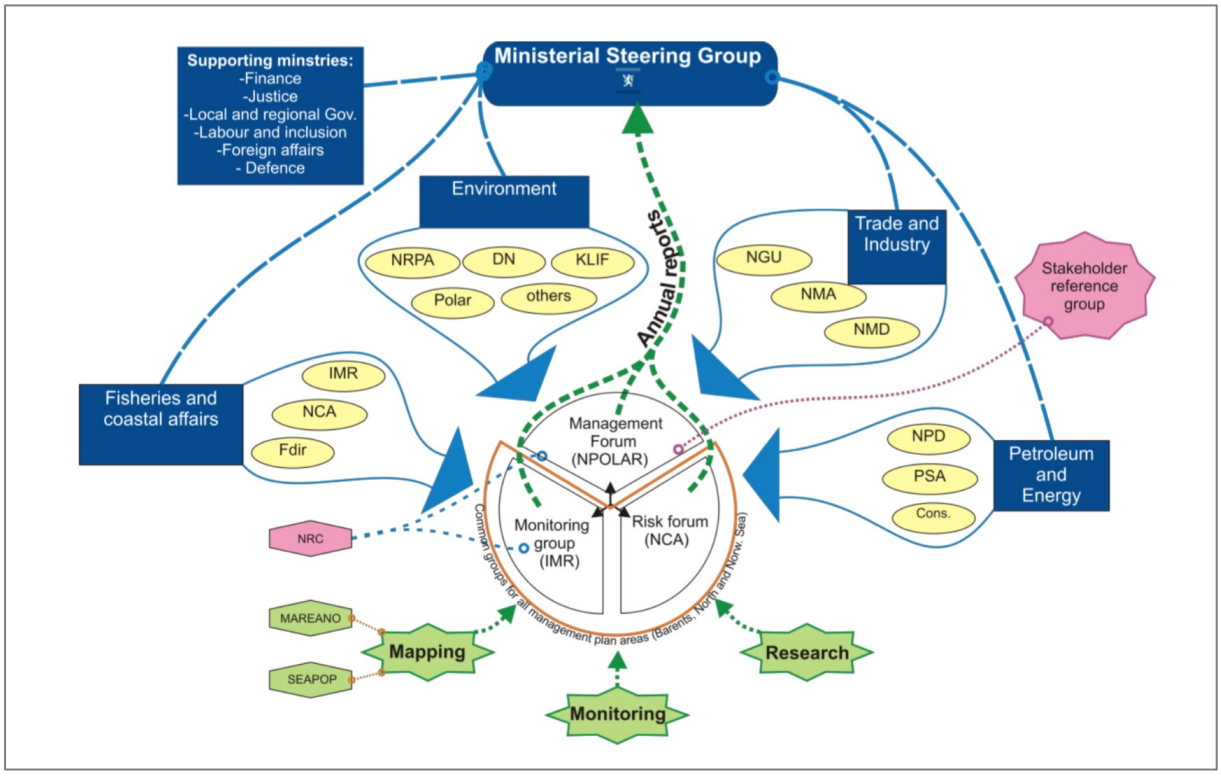

Figure 5. The organizational and governance structure of the integrated management plan for the Lofoten – Barents Sea area. The ministries (blue) of fisheries and coastal affairs, environment (chairing the steering group), trade and industry and petroleum and energy have been leading the process. Institutions and directorates (yellow) have participated on demand by their parent ministry (figure from mesma.org). Acronyms for the government institutions. FDir: Fisheries Directorate; NCA: Coastal Administration; IMR: Institute of Marine Research; NRPA: Radio Protection Agency; Polar: Polar institute; DN: Directorate for Nature Conservation; KLIF: Climate and Pollution Authority: NGU: Geological Survey; NMA: Mapping Authority; NMD: Maritime Directorate; NPD: Petroleum Directorate; PSA: Petroleum Safety Directorate; Cons.: consultants hired by the Ministry of Petroleum and Energy.

2.1.5 Existing management plans

This area lies within the EEZ of Norway and is recognized as a "Particularly valuable and vulnerable area in the Barents Sea, Norwegian Sea and North Sea" (http://www.mareano.no/). The area is managed through the Management Plan for the Barents Sea and Lofoten that was developed in 2006 and updated in 2011. A ministerial-level steering group chaired by the Norwegian Ministry of Environment led the planning process. The plan addresses all important marine economic sectors including oil and gas development, fisheries, marine transport, and marine conservation—all assessed

up until 2020. It is one of the few plans anywhere in the world that integrates fisheries management actions with those in other marine sectors. The plan is advisory only and does not provide detail on managing specific human activities; implementation of the plan is the responsibility of the relevant ministries and management bodies that are expected to manage their sectors consistent with the integrated plan. The first Barents Sea-Lofoten management plan was updated in 2010-11.The area is subjected to various fishing restrictions (Figure 6) and multiple areas are designated for aquaculture (Figure 7).

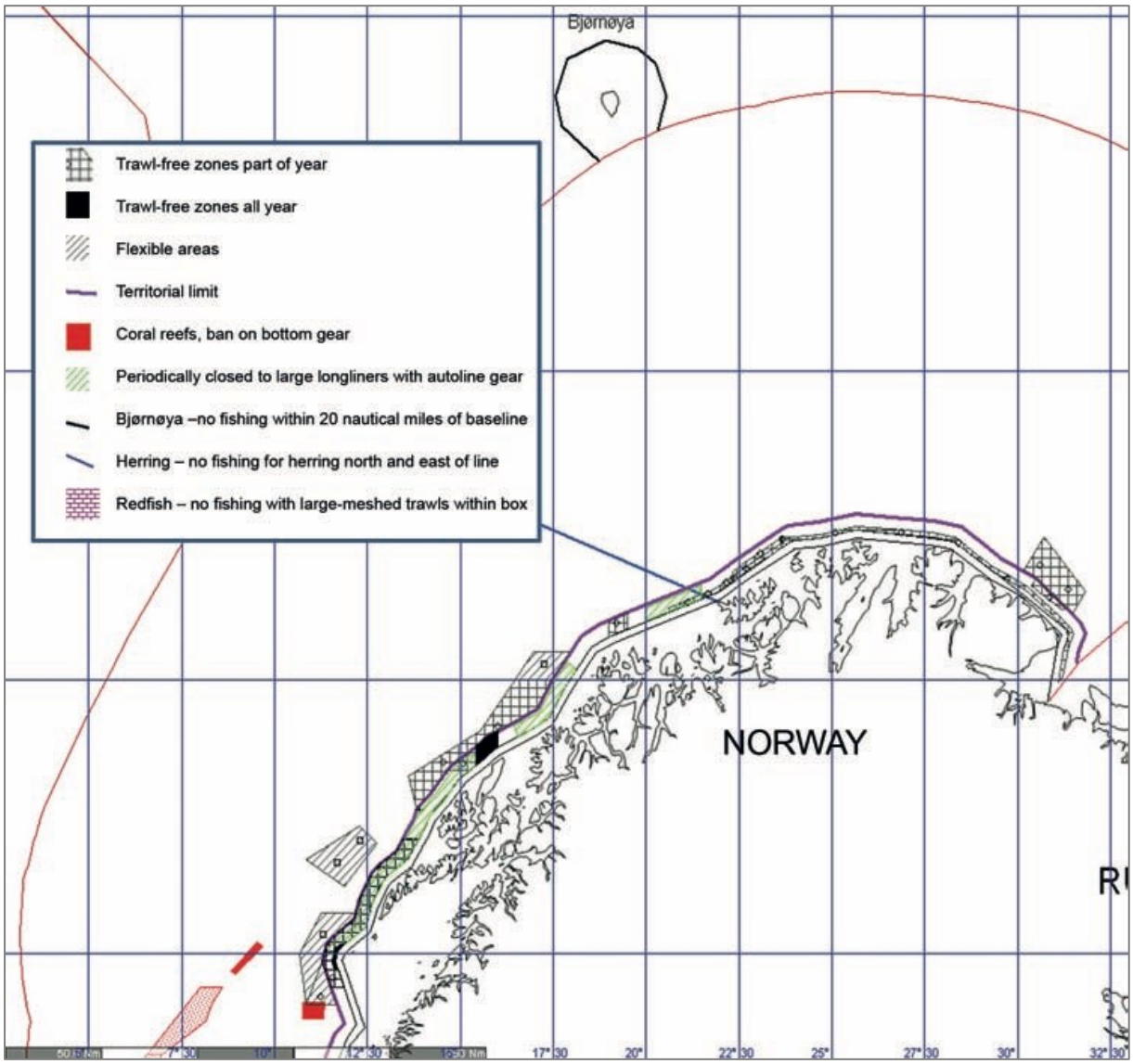

Figure 6. Fishing restrictions in the Barents Sea area

Figure 7. Aquaculture sites in Northern Norway

2.1.6 Goals and operational objectives for the SMA

The blue growth goal here is to provide a framework for the sustainable use of natural resources and goods derived from the Barents Sea–Lofoten area that can accommodate oil and gas extraction while maintaining the structure, functioning, productivity and diversity of the area's ecosystems.

2.1.6.1 Operational Objectives:

- Protect areas where VMEs are known to occur from bottom fishing activity as part of a network of marine protected areas.
- Maintain current fisheries at or close to MSY taking into account wider ecosystem impacts.
- Assess potential impacts of oil and gas developments.

2.2 Case Study 2: Faroe Shetland Channel – Lea-Anne Henry (UEDIN)

2.2.1 Study Area Description

The Faroe Shetland Channel (Figure 8) situated to the far north-east of Scotland is a large rift basin that separates the Scottish and Faroese continental shelves. The physical barrier of the Wyville Thomson Ridge is a large obstacle for southward flowing cool Nordic waters, leading to significantly different benthic communities downstream of the deep water flow. The habitats present are strongly influenced by the significant range of environmental conditions present, from the upper continental slope to the depths of the channel, and include a dynamic zone of mixing where warmer Atlantic waters flow over cold Arctic waters. Five different water masses meet in the Faroe-Shetland Channel, which interact with each other and the continental slope to generate ideal conditions for the boreal 'ostur' type of deep-sea sponge aggregations to settle. Large protists, corals, and surface-dwelling acorn worms also form distinctive habitats that are known to support diverse communities of associated species in the region. Stalked sponges occupy deep-water sandy sediments, brittlestar beds are found on gravel, sponges and soft corals colonise mixed gravel-cobble-boulder bottoms, and well-developed communities inhabit coarse sediments built up into the furrows and ridges created by grounded icebergs. A diverse range of benthic ecosystems occurs in the channel, including cold-water coral reefs, ocean quahogs, deep-sea sponge aggregations and offshore deep-sea muds. Diverse epifaunal assemblages of sponges, corals, crinoids and dense beds of ophiuroids also occur. The channel is also believed to be a corridor for migrating marine mammals, including sperm whales.

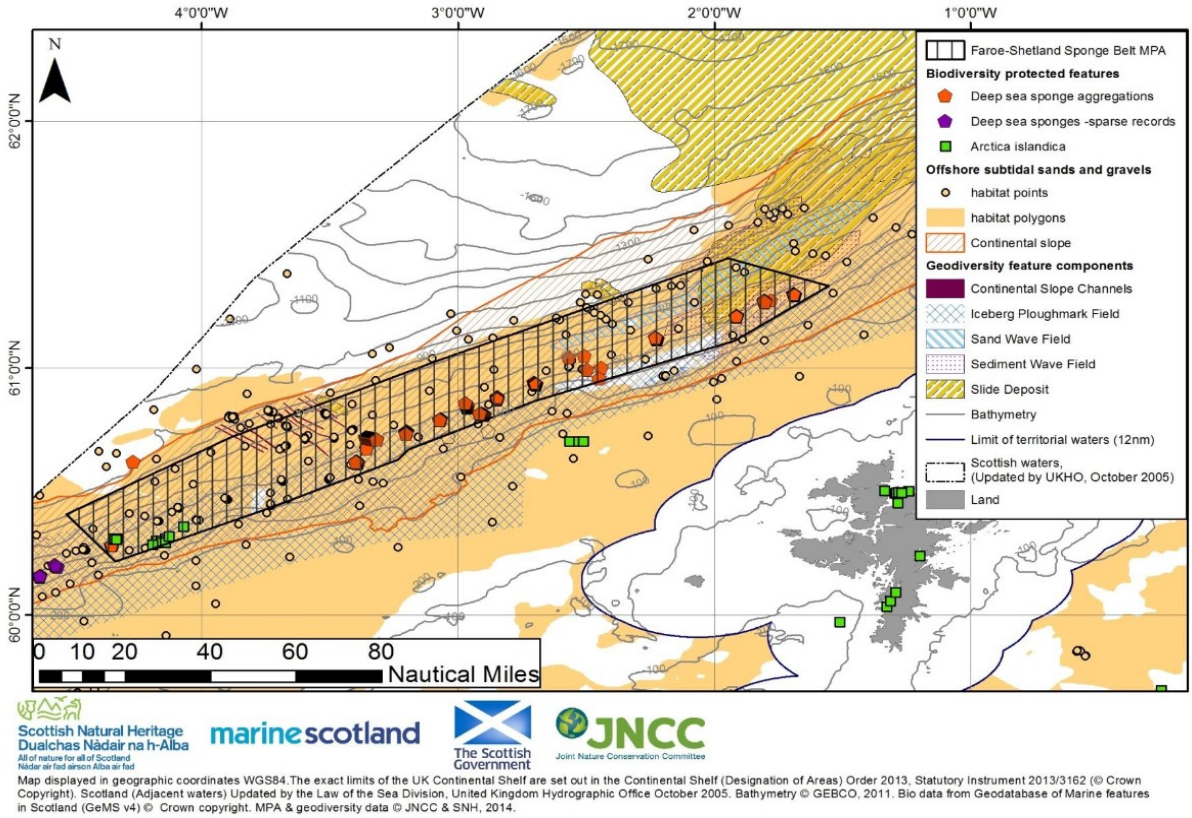

Figure 8. The Faroe Shetland Channel and protected features

2.2.2 Sectoral activities and Blue Growth opportunities

One of the main blue economy sectors operating in the Faroe Shetland Channel is oil and gas exploitation, fisheries (mobile and static), and telecommunications (Figure 9). Blue Growth opportunities in the area relate to the potential to discover and extract oil and gas.

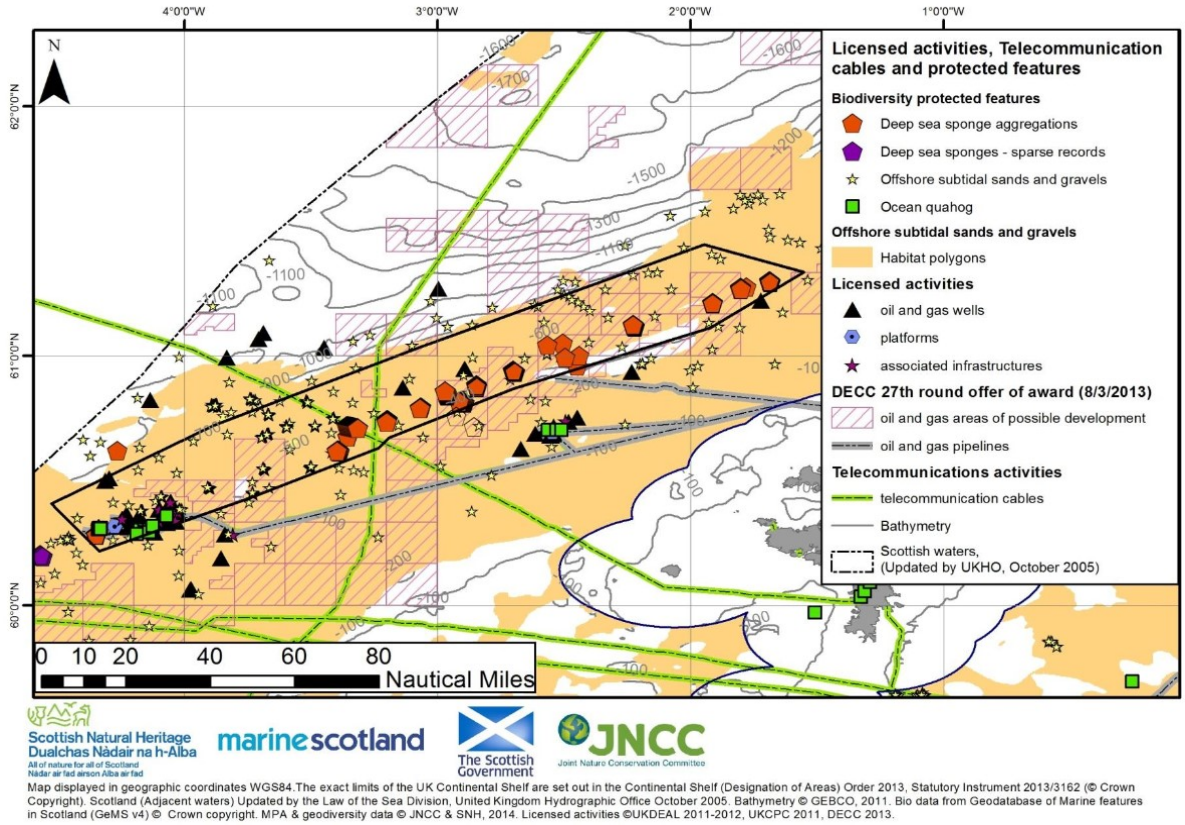

Figure 9. Map of licensed activities in the NCMPA in relation to protected features

2.2.3 Setting spatial boundaries for SMA assessment

At present, there is no single integrated management plan for the Faroe Shetland Channel. The proposed SMA is the "Nature Conservation Marine Protected Area" or NCMPA, specifically, the Faroe Shetland Channel Sponge Belt, situated in the broader area of Scotland's Strategic Environmental Areas 1 and 4 (Figure 10). The legislation behind its designated in July 2014 was underpinned by the Marine and Coastal Access Act (2009) and forms part of the UK's contributions to OSPAR's MPA network.

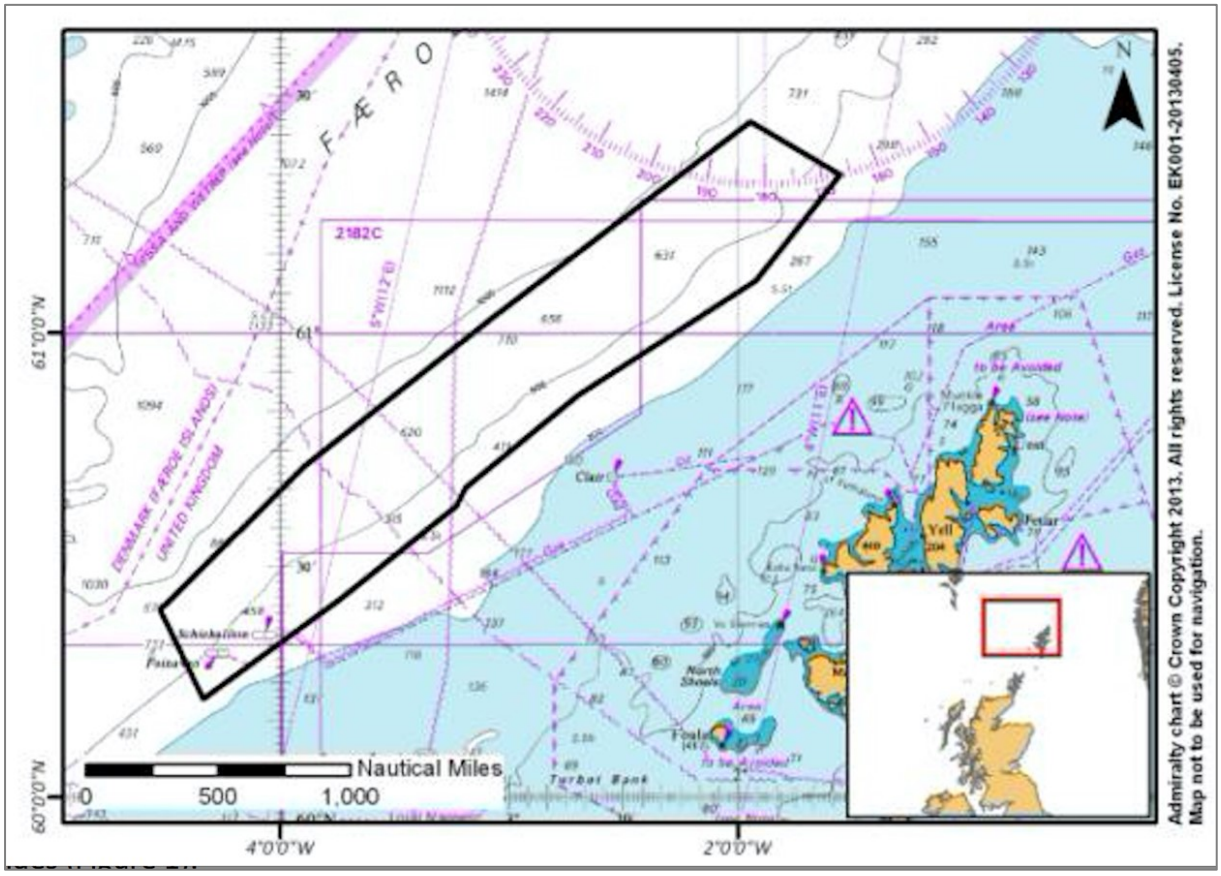

Figure 10. Map showing the boundary of the Faroe-Shetland Channel Sponge Belt NCMPA

2.2.4 Institutional landscape

This area lies within the EEZ of the United Kingdom but beyond the 12nm limits. A combination of UK and European Union directives apply including the Marine Strategy Framework Directive, with fisheries to be exclusively managed under the EU Common Fisheries Policy (CFP). In accordance with Article 18 of the revised CFP, requests for management will be developed jointly between the UK Government and any Member States with a direct management interest in the area affected.

Oil and gas exploration/production within this MPA are managed in accordance with the clauses set out under section 127 of the Marine and Coastal Access Act (2009). Under this clause, the UK's Statutory Offshore Advisor, the Joint Nature Conservation Committee (JNCC), have a statutory responsibility to advise the UK's regulator, the UK Department for Business, Energy & Industrial Strategy (BEIS) on developments that are capable of affecting (other than insignificantly) the protected features of the MPA and that may hinder the achievement of the sites conservation objectives.

Cables are largely an unregulated activity in offshore waters depending upon the type of cable being laid (or maintained), where it is being laid between and whether the cable is part of a larger development (which may be regulated). Any cable not directly associated with an energy installation does not require a marine license beyond 12 nautical miles. The JNCC encourages early discussion from operators regarding any plans related to new or existing cables and encourages the undertaking of non-statutory environmental impact assessments (EIAs) for new or existing cable projects to assess their effect on the protected features of the MPA.

Nature conservation in the sponge belt NCMPA is the responsibility of Marine Scotland with the JNCC, who are committed to ensuring that the OSPAR MPA network including this NCMPA is 'well-managed' by 2020.

2.2.5 Existing management plans

The site falls outside the UK's 12 nautical mile limit and is to be exclusively managed under the EU Common Fisheries Policy (CFP). In accordance with Article 18 of the revised CFP, requests for management will be developed jointly between the UK Government and any Member States with a direct management interest in the area affected. Marine Scotland is the lead authority regarding the implementation of, and compliance with, any measures to managing fishing activity in the NCMPA.

In July 2014, several management options were laid out and open for consultation. Marine Scotland is responsible for making recommendations to Scottish Ministers on any management measures. Any statutory measures will be subject to consultation and the processes normally required by the legislation will be utilised. Where fisheries management measures are necessary and the NCMPA is located where Scottish Ministers do not have exclusive competence, then Marine Scotland intend to application to the European Commission for appropriate measures using the mechanisms under the EU Common Fisheries Policy and include consultation on the measures at the EU level.

No activities are currently prohibited, management options have been outlined but not decided. Notably, in their 2014 Management Options paper, the JNCC have recommended that only by removing/avoiding pressures from both mobile (beam, otter) and static (set gill-netting, longlining) bottom contact gear in the area would be sufficient to conserve the sponge grounds, but these management options have yet to be decided. To illustrate pressures from otter trawling, see Figure 11.

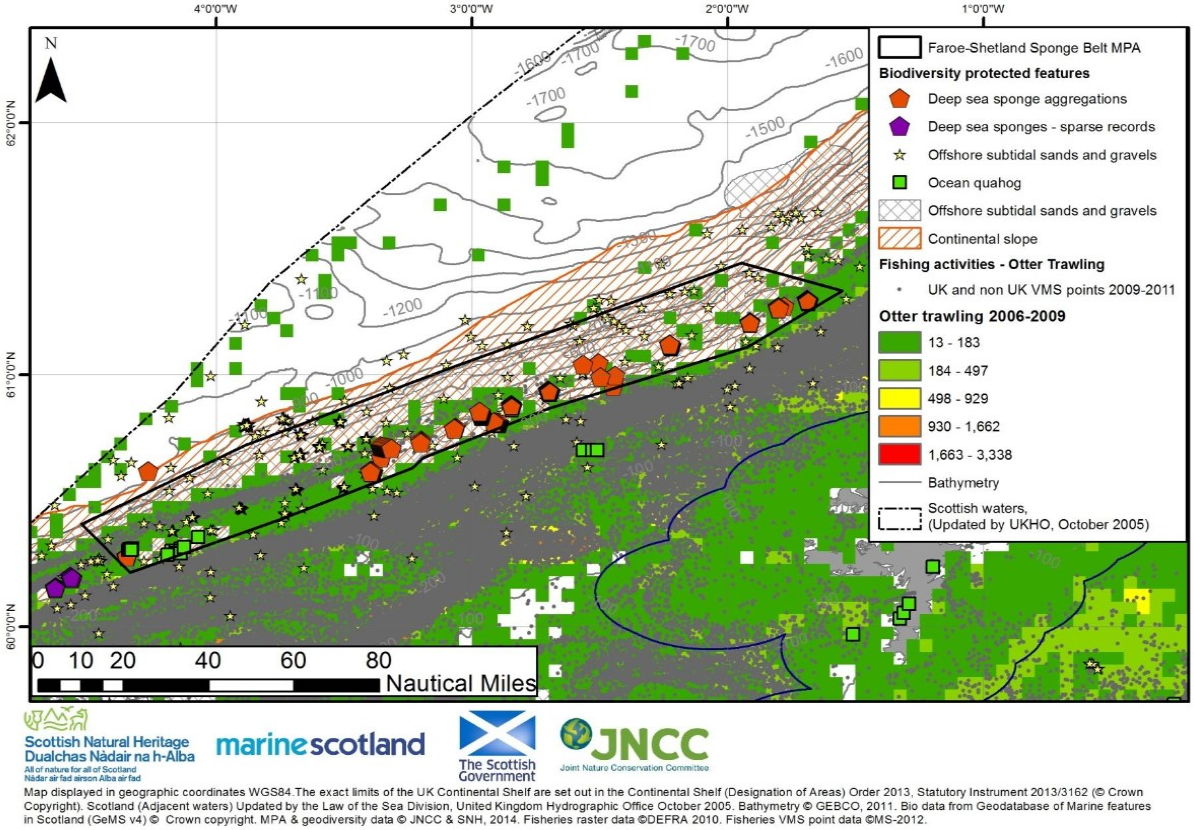

Figure 11. Otter trawling VMS data (2009-2011) in relation to protected features.

The potential impacts of oil and gas activity on the protected features within the MPA will be assessed through the existing EIA process on a case-by-case basis. Early dialogue with BEIS and JNCC would help identify and resolve any issues.

For telecommunication cables, which are not subject to EIA regulations (2009), early discussions between JNCC and the operator would be welcomed for all plans relating to cables within the MPA, including installation, maintenance and removal. It is recommended that a voluntary Environmental Impact Assessment is undertaken to support plans for any new cable installation to assess the impacts of the associated activities on the protected features present.

2.2.6 Goals and operational objectives for the SMA

The goal is to develop an adaptive SMA that supports the sustainable exploitation of future oil and gas finds.

2.2.6.1 Operational Objectives

- Achieve good environmental status for the MSFD (this objective is added *de novo* here as part of ATLAS, which goes beyond what is currently proposed by the Scottish government as the conservation objectives for the SMA's deep-sea sponge aggregations).
- Subject to natural change, conserve the deep-sea sponge aggregations and offshore subtidal sands and gravels features in favourable condition, such that:
  a) Their extent is stable or increasing; and
  b) Their structures and functions, quality, and the composition of their characteristic biological communities are such as to ensure that they are in a condition which is healthy and not deteriorating.

2.3 Case Study 3: Rockall Bank - Francis Neat, David Stirling (MSS)

2.3.1 Study Area Description

The Rockall Bank is a shallow bank situated beyond the continental shelf, c. 350 km NW of Ireland. It forms one of the western boundaries of the Rockall Trough. The Bank lies at depths ranging from 220 m to 65m, though a small pinnacle of land – the island of Rockall – does actually break the sea surface toward the northern end of the Bank. The seabed of the Bank changes gradually, from low rock ridges and boulder fields covered in coarse sand to a virtually complete cover of fine sand.

2.3.2 Sectoral activities and Blue Growth opportunities

The main blue economy sector for the Rockall area is fisheries. However, fisheries currently operate in relation to environmental objectives for the protection of vulnerable marine ecosystems (VMEs) and the potential goods and services they provide. There is interest in oil and gas potential for this area, but at present, there are no active exploration projects and no exploitation. Nevertheless, as a possible future sector, it is considered in a hypothetical scenario. The area is too far offshore to provide economically viable renewable energy and there are no major transatlantic cables within the proposed SMA, although they pass through the wider area. Fisheries have the potential to grow in this area provided they can demonstrate they have no adverse impacts on VMEs in the area and are done in such a way as to ensure long term sustainable harvesting.

2.3.3 Setting spatial boundaries for SMA assessment

At present, there is no single integrated management plan for the Rockall area. There is clear political demarcation of boundaries between the ABNJ and that within the EEZ of the EU. The boundary of the SMA will initially be focussed on the Rockall plateau where there is good data (yellow polygon in Figure 12) and the main fisheries and closed areas, but may ultimately be expanded to include the wider area (Hatton Bank, etc.) where there is less data (and where any plan or advice will be necessarily be at a lower resolution and level of certainty).

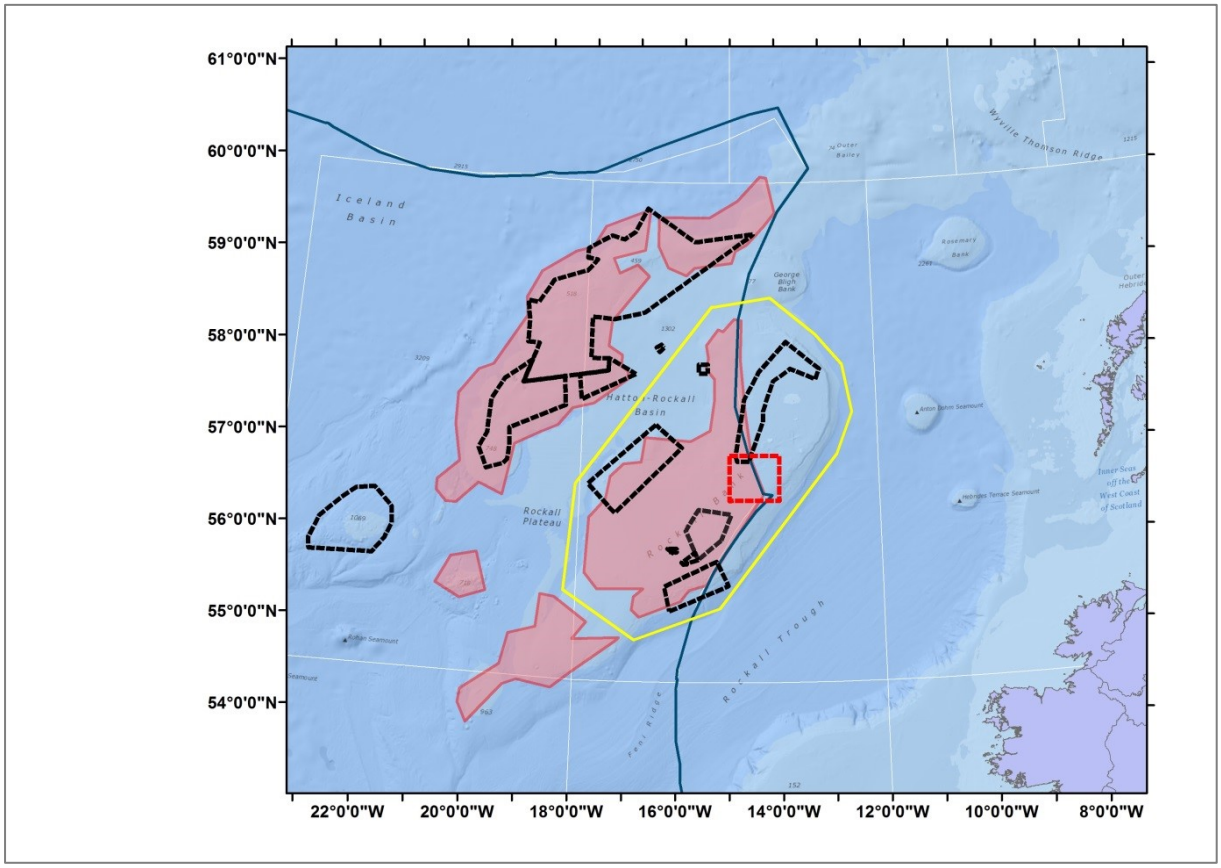

Figure 12. Map showing the Rockall area and NEAFC management measures that apply to the ABNJ. Pink polygons are existing fishing areas (or fishing footprint). Black dashed line polygons are areas closed to protect VMEs. Red dashed line square is the so called Haddock box that is a fisheries closure (not a VME closure). Grey solid line is the divide between the NEAFC regulatory area (ABNJ) and the EEZs of various countries. Yellow polygon is the approximate boundary of the SMA.

2.3.4 Institutional landscape

This area lies partially within the EEZ of the EU and partially within the ABNJ. That part within the EU's EEZ is managed under the EU's CFP. That part in the ABNJ is managed by the competent regional fisheries management organisation, the North East Atlantic Fisheries Commission (NEAFC). The seabed lies within the extended continental shelf claim of the UK and the Republic of Ireland. There are spatial management plans for the conservation of VMEs in the area that include areas closed by NEAFC to protect Vulnerable Marine Ecosystems (UN resolutions 61/105 and 64/72), Special Areas of Conservation (under the EU Habitats Directive and Natura 2000) and marine protected areas (UK/EU/OSPAR).

2.3.5 Existing management plans

2.3.5.1 Existing management plans (ABNJ)

Fisheries: there is no agreed management for the main target species (haddock) in the ABNJ. An area of Rockall bank is closed to trawl fisheries for purpose of protecting juvenile haddock (red box in Figure 13). There is no depth restriction to bottom fishing within the ABNJ, however, fishing is only permitted within existing fishing areas (pink areas in Figure 12 and 13).

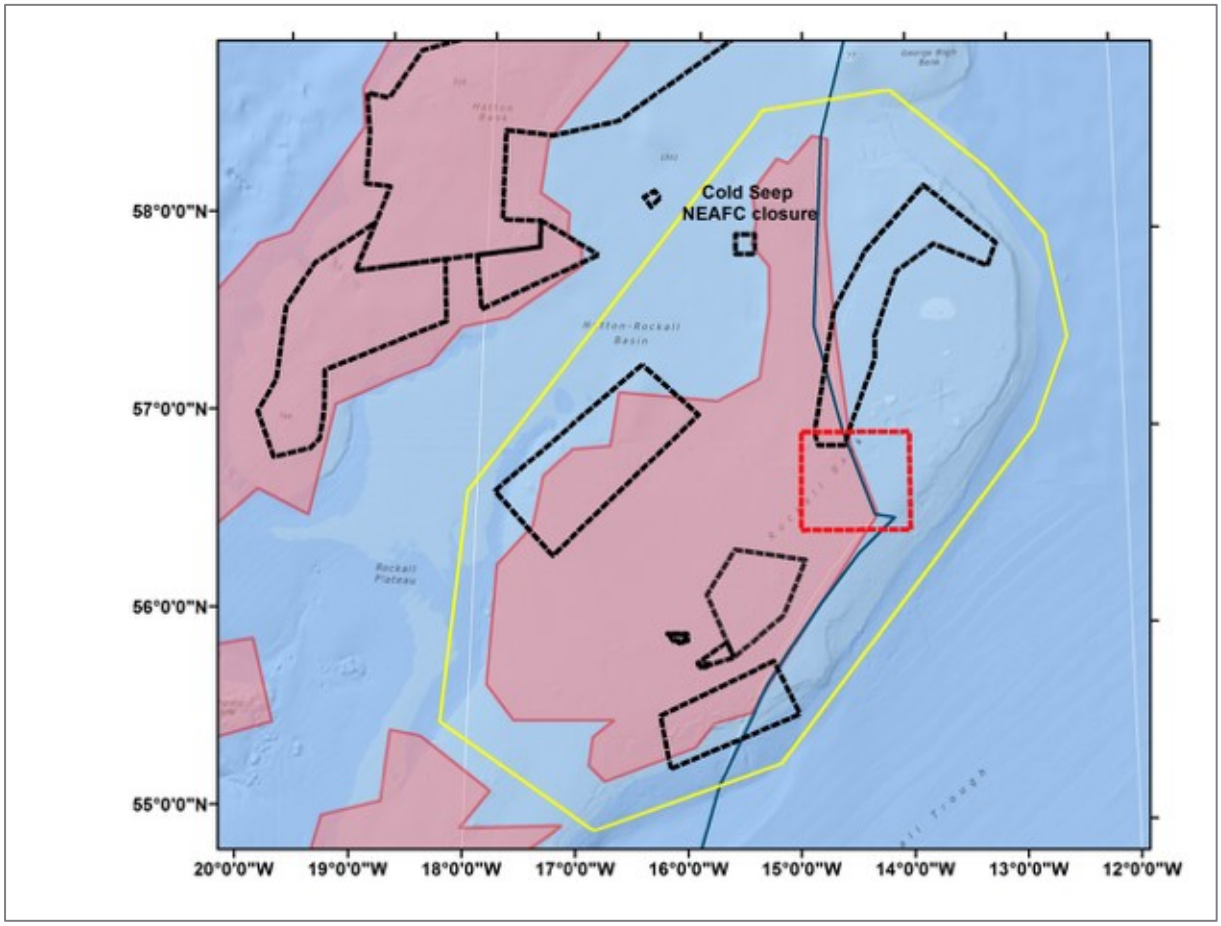

Figure 13. Detail of the Rockall SMA (delimited by yellow polygon). Note small box in north is the cold seep closed area where there is potential hydrocarbon sources.

NEAFC have adopted a series of spatial measures and regulations for bottom fishing in an attempt to protect VMEs in the area (Figure 12 and 13). Because the seabed of this area lies in the extended continental shelf claim of the UK, there are also some UK/EU protective measures for the seabed in this area. Some of these overlap with the NEAFC measures, while others are mutually exclusive (cf. Figure 12 and 14).

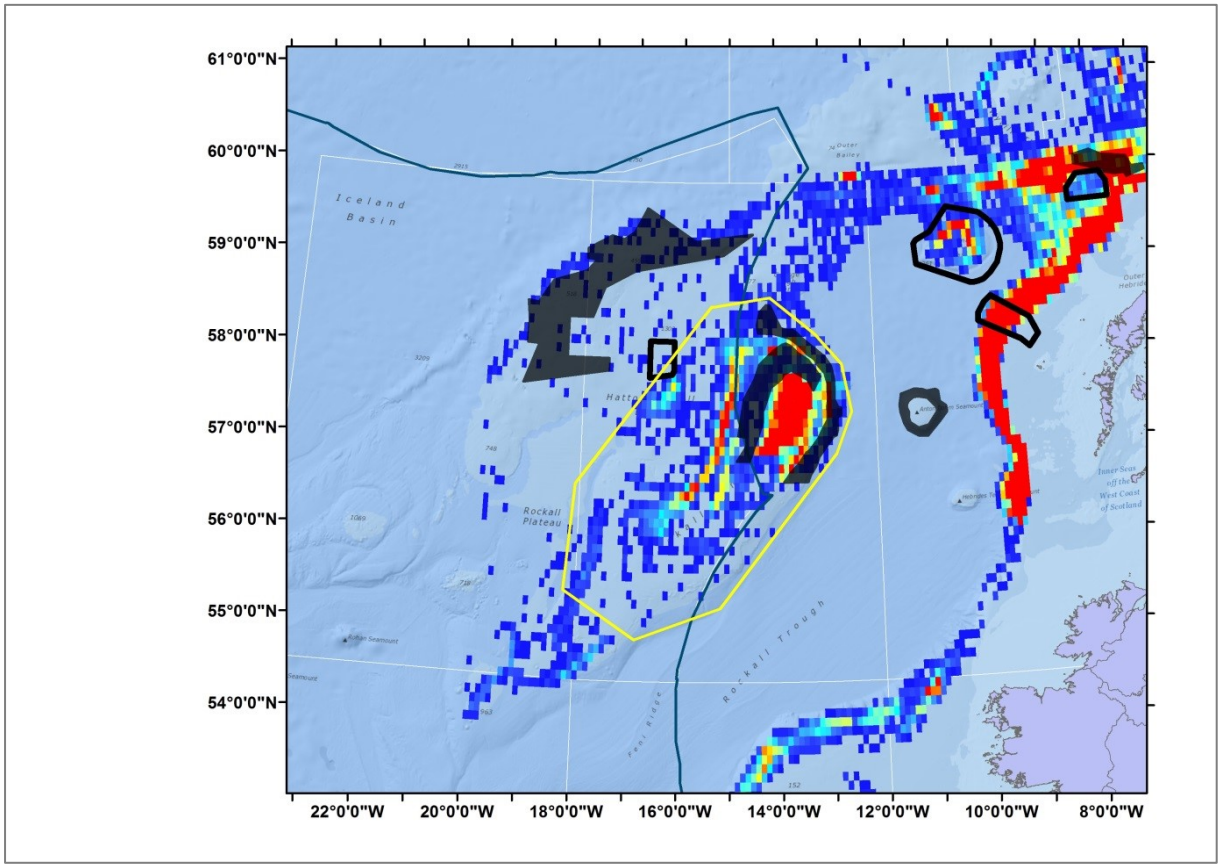

Figure 14. Map showing historical fishing activity in the Rockall area (red = high effort, blue = low: based on VMS data from 2008-09) by EU vessels landing into UK ports in relation the EU management measures for conservation. Filled grey polygons are Special Areas of Conservation (EU habitats directive), unfilled black polygons are Scottish Nature Conservation Marine Protected Areas. Management plans for these have not all been agreed, although some include prohibition of bottom trawling and others, e.g. Hatton bank, overlap substantially with the NEAFC closed areas (Figure 12) where bottom fishing is prohibited. Yellow polygon is the approximate boundary of the SMA.

2.3.5.2 Existing management plans (EU EEZ)

Fisheries: management by Total Allowable Catch (TAC) applies to catches in the EU section of Rockall bank. Rockall haddock is assessed separate from other Haddock stocks, but for other species, e.g. Monkfish they are assessed as part of the western waters stock that includes the continental shelf west of Scotland. A new deep-sea fishing regulation that came into effect in 2017 does not permit bottom trawling at depths greater than 800m.

Conservation: A range of spatial protective measures have been implemented including Special Areas of Conservation and Marine Protected Areas (Figure 14).

2.3.6 Goals and operational objectives for the SMA

The blue growth goal is to maintain or increase productivity of the fisheries while ensuring that vulnerable marine ecosystems are not compromised or significantly adversely affected. The potential for hydrocarbon extraction must be considered in relation to both fisheries and the presence of VMEs.

2.3.6.1 Operational Objectives

- Protect areas where VME are known to occur from bottom fishing activity as part of a network of marine protected areas.
- Maintain current fisheries at or close to MSY taking into account wider ecosystem impacts.
- Assess potential impacts of oil and gas developments.

2.4 Case Study 4: Mingulay Reef Complex – Lea-Anne Henry (UEDIN)

2.4.1 Study Area Description

The Mingulay Reef Complex, in 100-200 m of water, located 14 km east of the island of Mingulay in the Sea of the Hebrides, west of Scotland was first mapped in 2003 with a further survey in 2006 revealing previously unknown live coral reef areas at 120 to 190 m depth. Habitat mapping confirmed that distinctive mounded bathymetry was formed by reefs of *Lophelia pertusa* with surficial coral debris dating to almost 4000 yr. Benthic lander and mooring deployments revealed 2 dominant food supply mechanisms to the reefs: a regular rapid down-welling of surface water delivering pulses of warm fluorescent water, and periodic advection of high turbidity bottom waters. The reefs are used by sharks for egg-laying and resting sites, with the deep-water shark *Galeus melastomus* coming in year after year to the same area to lay eggs on live corals. High resolution side-scan sonar has revealed trawl marks in areas south of the coral reefs where vessel monitoring system data showed the highest density of local fishing activity.

2.4.2 Sectoral activities and Blue Growth opportunities

The main blue economy sector currently operating is fishing, but tourism and shipping also exist with the potential for growth. Mobile bottom fishing gear in the vicinity of the reefs is now prohibited as the reefs form part of the East Mingulay Marine Special Area of Conservation under the EU Habitats Directive. There is also a small creel fishery that still operates between the reefs. Blue Growth opportunities in the area could include potential growth for the creel fishing industry, as well as ecotourism: sea angling, sailing, and whale watching, and marine renewables. The Scottish Government, as part of the Draft Plan for Offshore Wind Energy in Scottish Territorial Waters, suggested a further 30 sites for consideration for future development of marine renewables in the period 2020-2030, including one site (NW4) that would overlap with the East Mingulay SAC (Figure 15).

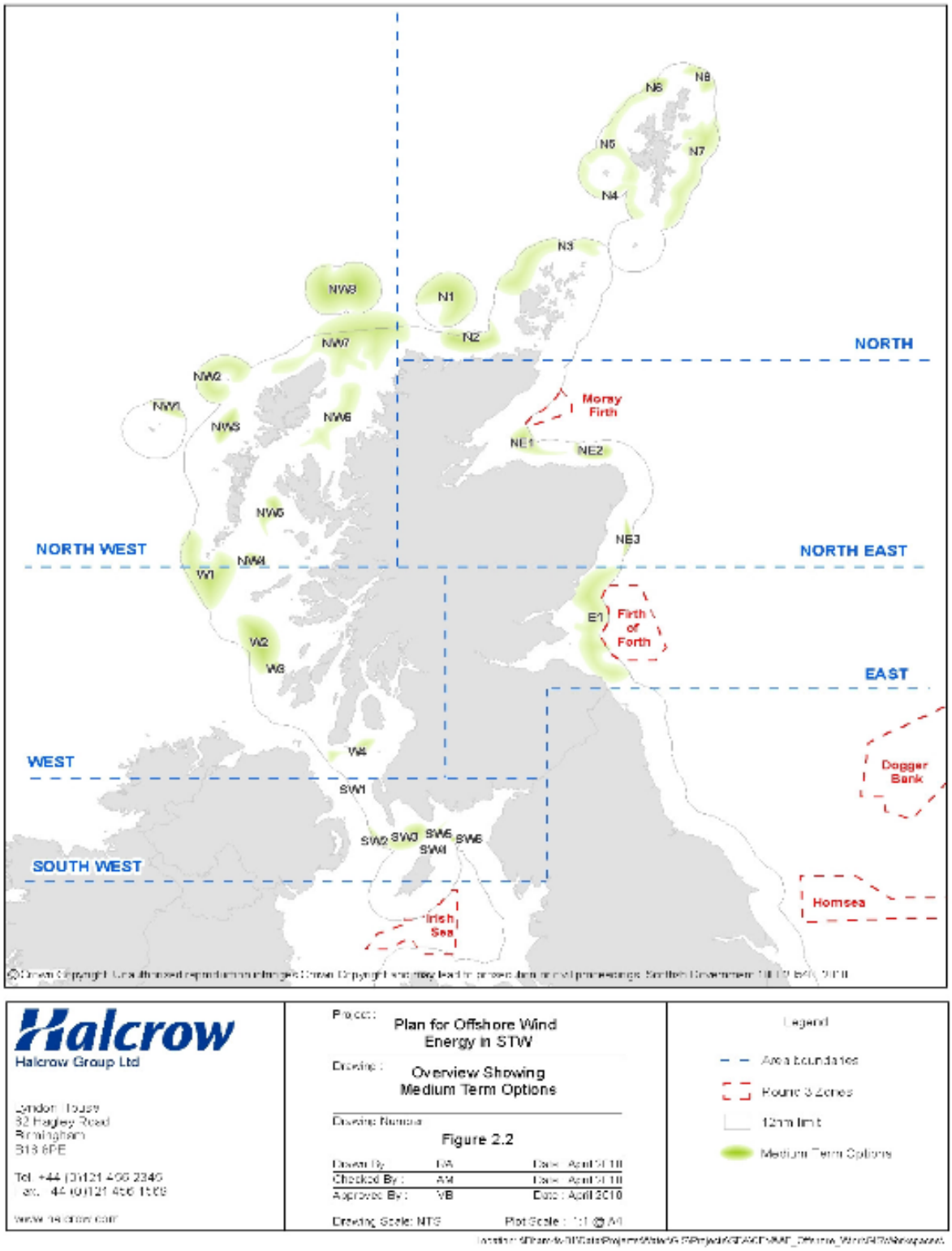

Figure 15. Candidate and existing areas for marine renewables developments on the Scottish west coast

2.4.3 Setting spatial boundaries for SMA assessment.

At present, there is no single integrated management plan for the Mingulay area. The proposed SMA will be the East Mingulay Marine Protected Area covering an area of 114.89 km^2 and situated in the broader area of the Sea of the Hebrides (Figure 16).

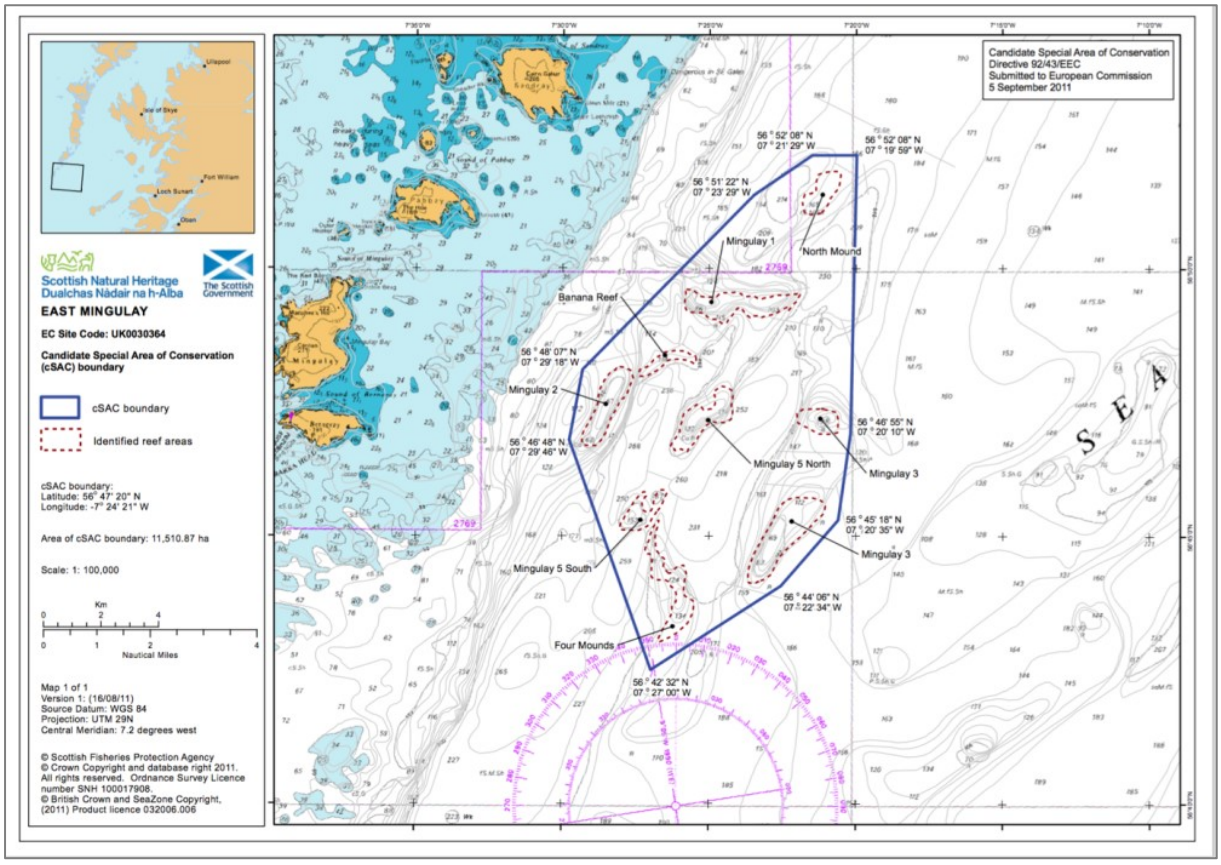

Figure 16. A map showing the boundary of the East Mingulay cSpecial Area of Conservation.

2.4.4 Institutional landscape

This area lies within the EEZ of the United Kingdom and is within the Scottish Territorial Sea. European Union directives still apply and fisheries management is the responsibility of Marine Scotland. Nature conservation is the responsibility of Marine Scotland and its statutory advisor Scottish Natural Heritage (SNH).

2.4.5 Existing Management Plans

2.4.5.1 Existing management plans (fisheries)

Currently, the East Mingulay SAC has zoned fisheries management (Figure 17). Article 11(1) of Regulation (EU) No 1380/2013 of the European Parliament and of the Council on the Common Fisheries Policy (OJ L 354, 28.12.2013, p.22) empowers EU member States to adopt conservation measures which are necessary for compliance with obligations under EU environmental legislation. This Order prohibits, subject to certain exceptions where applicable, specified methods of fishing within specified areas which have been designated as a SAC or as a MPA. Article 3 and Schedule 1 prohibit fishing for sea fish with specified fishing gear at East Mingulay. Fishing with any fishing gear except a pelagic trawl is also prohibited in a smaller inner area within the larger protected area.

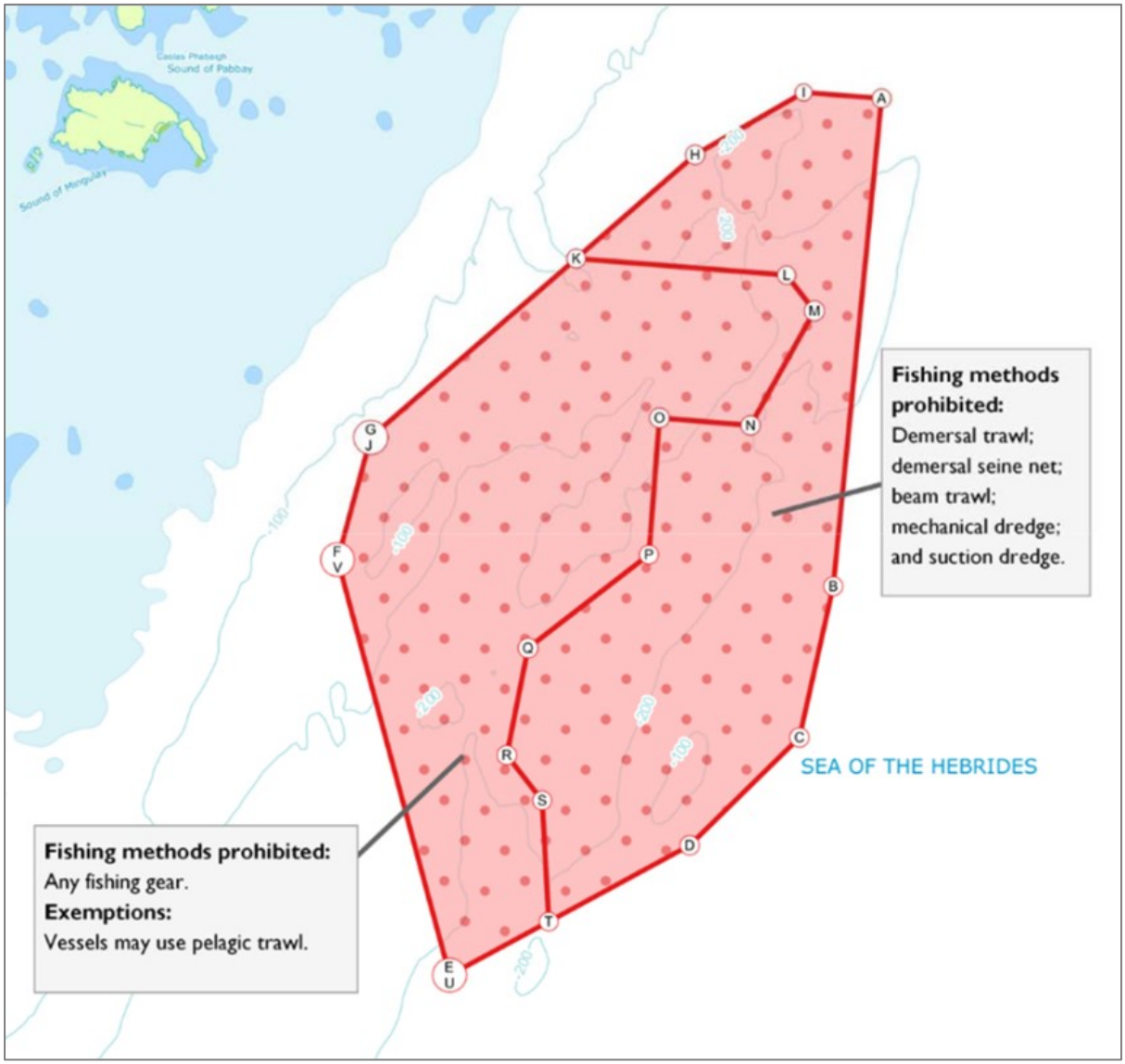

Figure 17. Agreed zoned fisheries management in the SAC.

2.4.5.2 Existing management plans (conservation)

Currently, there is only zoned fisheries management in the SAC (Figure 17), with no suction dredging, mechanical dredging, beam trawling, demersal trawling, or seine netting permitted throughout the SAC, and no creels, set nets or longlining in a more restricted western portion of the SAC (Figure 17). While there are currently no proposed offshore renewabl developments planned or proposed in the vicinity of the SAC, proposals for future marine renewables could require a Habitats Regulation Assessment under EU legislation.

2.4.6 Goals and operational objectives for the SMA

The goal is to develop an adaptive SMA that can Blue Growth in the eco-tourism sector while ensuring no degradation in the good environmental/ecological status of the *Lophelia pertusa* reef complex.

2.4.6.1 Operational Objectives

- Achieve good environmental status for the MSFD (this objective is added *de novo* here as part of ATLAS, which goes beyond what is currently proposed by the Scottish government as the conservation objectives for the SMA's cold-water coral reefs).
- Avoid deterioration of the reefs, thus ensuring the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the SMA's cold-water coral reefs. The following indicators should be maintained in favourable ecological status:

  (a) Extent of the habitat on site,

  (b) Distribution of the habitat on site,

  (c) Structure and function of the habitat,

  (d) Processes supporting the habitat,

  (e) Distribution of typical species of the habitat,

  (f) Viability of typical species as components of the habitat,

  (g) No significant disturbance of the typical species of the habitat.

2.5 Case Study 5: Porcupine Seabight and Bank - Anthony Grehan (NUIG)

2.5.1 Study Area Description[1]

The Porcupine Seabight and the underlying Porcupine Basin developed as a failed rift structure when the Atlantic Ocean first started to open 250 million years ago. It is bordered by the Slyne Ridge in the north, the Porcupine Bank in the west and the Goban Spur in the south. The Porcupine Seabight opens to the southwest onto the Porcupine Abyssal Plain. Water depths in the Porcupine Seabight range from approximately 400 m in the north to 3,000 m at its mouth in the southwest. The northern border of the Porcupine Seabight is difficult to define with no clear break of slope but a gradual transition from the Seabight to the Porcupine Bank and Celtic Shelf. The Porcupine Seabight contains some of the best investigated deep-water carbonate mounds in the world. Carbonate mounds, which can reach heights of up to 350 m, are formed from the accumulation of cold-water corals that trap fine-grained sediment. These mounds can be found at depths of 500 to 1000 m.

The Porcupine Bank separates the Porcupine Seabight from the Rockall Trough. The summit of the Porcupine Bank is shallow lying at 145 m water depth and is generally broad and flat, although some structures from the underlying basement rocks can be seen emerging in places. The eastern slope, towards the Porcupine Seabight, is gentle whereas the southern, western and northern slopes towards the Rockall Trough are steep. Along the western and northern Porcupine Bank, the slope-break from the flat summit area onto the steep slopes occurs at a remarkably consistent water depth of approximately 450 m and is generally marked by a prolonged escarpment. The western and northern slopes of the Porcupine Bank facing the Rockall Trough are characterised by irregularly spaced canyons and the south-western slope of the Porcupine Bank is especially steep and eroded.

2.5.2 Sectoral activities and Blue Growth opportunities

The main blue economy sector in the Porcupine Seabight and on the Bank area is fisheries managed in accordance with TAC and environmental considerations under the EU Common Fisheries policy. The area is the focus of national and international scientific research including a major proposal (postponed) to establish a cabled observatory in the area called Celtnet. Interest in oil and gas exploration has ramped up in recent years with new exploratory wells scheduled for drilling in 2019. The current Irish Governments energy strategy is to maintain an equal mix of renewal and non-renewables in the short-term. Gas is seen as a transitional fossil fuel on the way to establishing a low carbon economy with greater reliance on renewable energy. The Government, in order to ensure security of supply, has held a number of exploration licensing rounds promoting active engagement with the hydrocarbon industry in the Porcupine Seabight (Figure 18). The Blue Growth opportunity in the SMA is, therefore, the potential discovery of commercial quantities of gas in the Porcupine Seabight.

[1] Dorschel, B., Wheeler, A.J., Monteys, X. & Verbruggen, K. (2011) Atlas of the Deep-Water Seabed: Ireland. Springer Verlag, New-York.

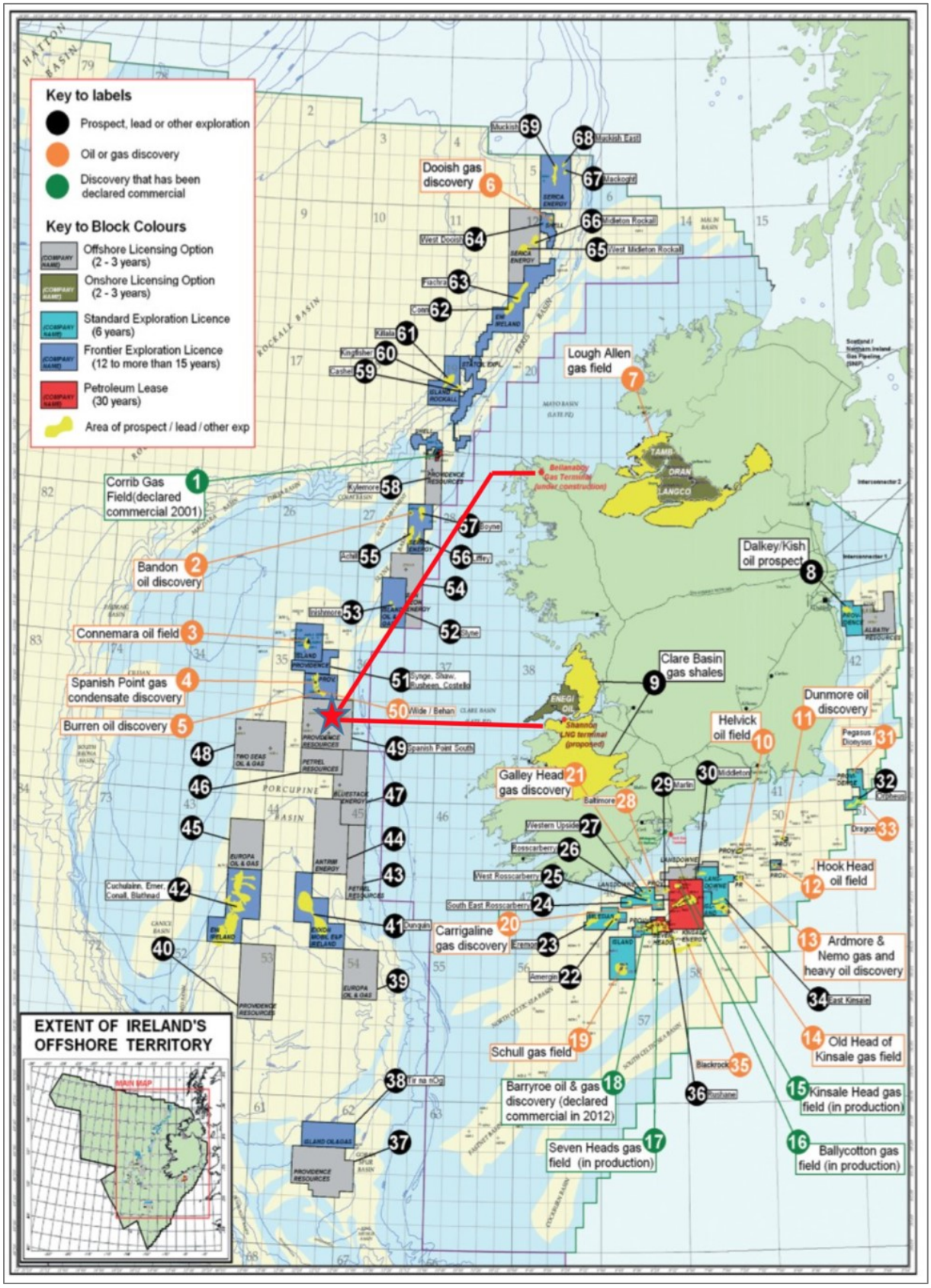

Figure 18. Oil and gas exploration and discoveries off Ireland (up to 2012)

2.5.3 Setting spatial boundaries for SMA assessment

At present, there is no single integrated management plan for the Porcupine Seabight and Bank area. Ireland has just begun the process of developing a national Maritime Spatial Plan in accordance with the EU Maritime Spatial Planning Directive. The SMA in this case study will encompass the area between the Territorial Sea boundary (12 nautical miles from baseline) and the Irish 200 mile EEZ boundary (Figure 19).

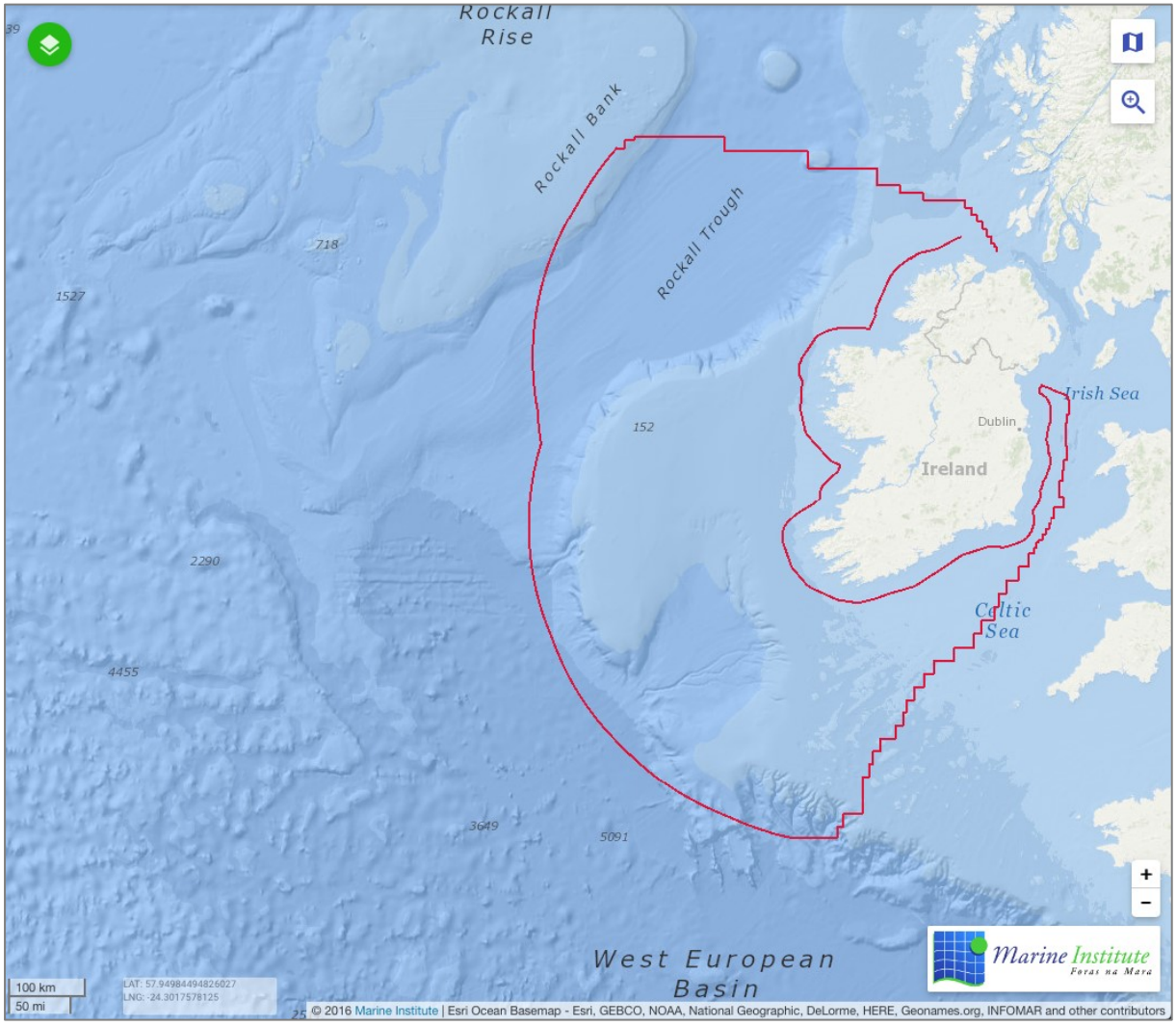

Figure 19. Irish marine jurisdictional boundaries (accessed through Ireland's Marine Atlas at http://atlas.marine.ie/, [1/1/18].

2.5.4 Institutional landscape

In Ireland, responsibility for marine matters is spread across a number of Government Departments and agencies. In recognition of the need for better coordination and the broad scope of the sector, a high level Inter-Departmental Marine Coordination Group (MCG) was established in 2009 convened by the Department of the Taoiseach. Members of the Group are at Assistant Secretary level with the following Departments represented: Agriculture, Food and the Marine, Taoiseach, Defence, Communications, Climate Action and Environment, Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Transport, Tourism and Sport, Housing, Planning, Community and Local Government, Business, Enterprise and Innovation, Public Expenditure and Reform, Foreign Affairs and Trade. The

Maritime Affairs Attaché, Attorney General's Office and the Marine Institute also participate. The Marine Coordination Group is responsible for supervision, cross-government delivery and implementation of Ireland's Integrated Marine Plan.

In December 2012, an Enablers Task Force on MSP was established by the Marine Coordination Group to recommend a framework for the implementation of MSP in Ireland. The Task Force recommended that the Department of the Environment, Community and Local Government (now the Department of Housing, Planning and Local Government) lead the development of a marine spatial planning framework for Ireland. The Department is provided with technical agency support by the Marine Institute. The Maritime Spatial Planning Directive was transposed into Irish law in September 2016. In December 2017, the Department published a roadmap, '*Towards a Marine Spatial Plan for Ireland*', providing a 3 year timeline for the development of Ireland's first marine spatial plan. The Plan will provide a coherent framework in which specific sectoral policies and objectives can be realized and will become a decision-making tool for regulatory authorities and policy makers to support decisions on individual consent applications and inform the development of future sectoral policies.

2.5.5 Existing management plans

2.5.5.1 Common Fisheries Policy

Fisheries management is by TAC set annually at the EU Council of Fisheries Ministers. A new deep-sea fishing regulation that came into effect in 2017 does not permit bottom trawling at depths greater than 800m and requires the application of the 'move on rule' if VMEs are encountered between 400 and 800m.

2.5.5.2 Conservation

In 2003 the EU Commission established a "Biologically Sensitive Area (BSA)" off the south west of Ireland (Council Regulation (EC) No 1954/2003)(Figure 20) to protect important juvenile fish nursery areas for hake, herring, cod and haddock. The EU has established a specific fishing effort regime inside the BSA and outside the BSA for demersal fishing vessels as well as scallop and crab fisheries (i.e. different fishing effort regulations apply inside and outside of the box). In 2006, Ireland established the first offshore SAC to protect cold-water coral (biogenic) reefs. It has since added a further two protected areas to better represent 'geogenic' reef (Figure 20). Additional canyon sites may be considered for protection in the future particularly along the continental slope north of the Porcupine Bank.

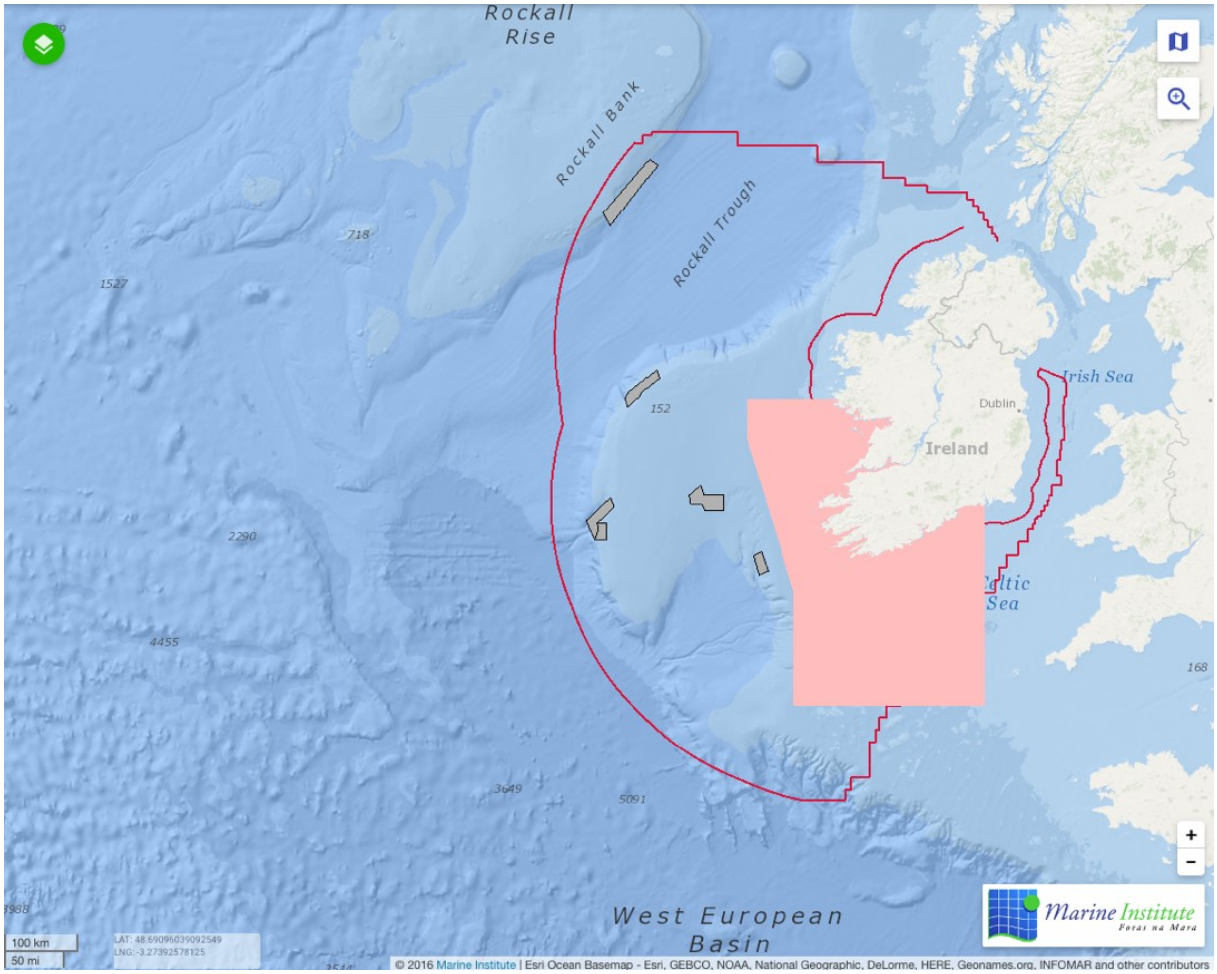

Figure 20. Location of Irish offshore Special Areas of Conservation (orange boxes) and Biologically Sensitive Area (pink shading) (accessed through Ireland's Marine Atlas at http://atlas.marine.ie/, [1/1/18]

2.5.6. Goals and operational objectives for the SMA

The blue growth goal here is to provide a framework for the sustainable use of natural resources and goods derived from the Porcupine Seabight and Bank area that can accommodate oil and gas extraction while maintaining the structure, functioning, productivity and diversity of the area's ecosystems.

2.5.6.1. Operational Objectives

- Protect areas where VME are known to occur from bottom fishing activity as part of an existing or expanded network of marine protected areas.
- Maintain current fisheries at or close to MSY taking into account wider ecosystem impacts.
- Assess potential impacts of oil and gas developments with particular reference to optimal routes for a pipeline delivering oil or gas from a commercial find in the Porcupine Seabight.

2.6 Case Study 6: Bay of Biscay - Lenaick Menot (Ifremer)

2.6.1 Study Area Description

The continental margin of the northern Bay of Biscay is divided into the Celtic and Armorican margins, which are both characterised by a relatively broad continental shelf and a steep, canyon-dominated, slope. Historical data on the occurrences of frame-building scleractinian cold-water corals, antipatharians, gorgonians and large sponges in the Bay of Biscay has mainly come from fisheries surveys. More recent studies confirmed the occurrence of cold-water coral habitats, at the boundary between the Eastern North Atlantic Central Water (ENACW) and the Mediterranean Outflow Water (MOW). The distribution of *Lophelia pertusa* and *Madrepora oculata* is skewed towards the northern half of the Bay.

The known anthropogenic pressures on the deep-seafloor of the Bay of Biscay include litter and fisheries. The distribution of litter in canyons has been assessed from imagery surveys. Fisheries pressure is quantified from Vessel Monitoring System (VMS) and logbook data, which, together with annual fisheries surveys provide information on the distribution of fish species. To date, fisheries management measures are species-specific and include closures, TAC or ancillary measures such as size limits. Although there is as yet no marine protected area along the slope of the Bay of Biscay, a proposal for a Natura 2000 network for reefs has been developed and should be implemented in 2018. Management measures of this N2000 network might include regulations on fisheries to protect VMEs.

2.6.2 Sectoral activities and Blue Growth opportunities

The main blue economy sector operating in the Bay of Biscay area is fisheries. The area is also used by the French submarine fleet and is an area that is the focus of scientific research. Fisheries currently operate in relation to environmental objectives for the protection of VMEs and the potential goods and services they provide. Fisheries have the potential to grow provided they can demonstrate they have no adverse impacts on VMEs in the area and are managed in compliance with the requirements of a planned network of Natura 2000 SACs to protect reefs.

2.6.3 Setting spatial boundaries for SMA assessment

At present, there is no single integrated management plan for the Bay of Biscay area. The SMA for this case study corresponds to the area enclosed by a proposed Special Area of Conservation to protect reefs in the Lampaul and Guilcher canyons that are part of a canyon complex that merges into a single abyssal valley (Figure 21). Seven different biotopes within the definition of *reefs* (Habitat 1170, Habitat Directive) have been observed and mapped in the Lampaul canyon, which is the highest number of different biotopes found in any single canyon in the French EEZ of the Bay of Biscay.

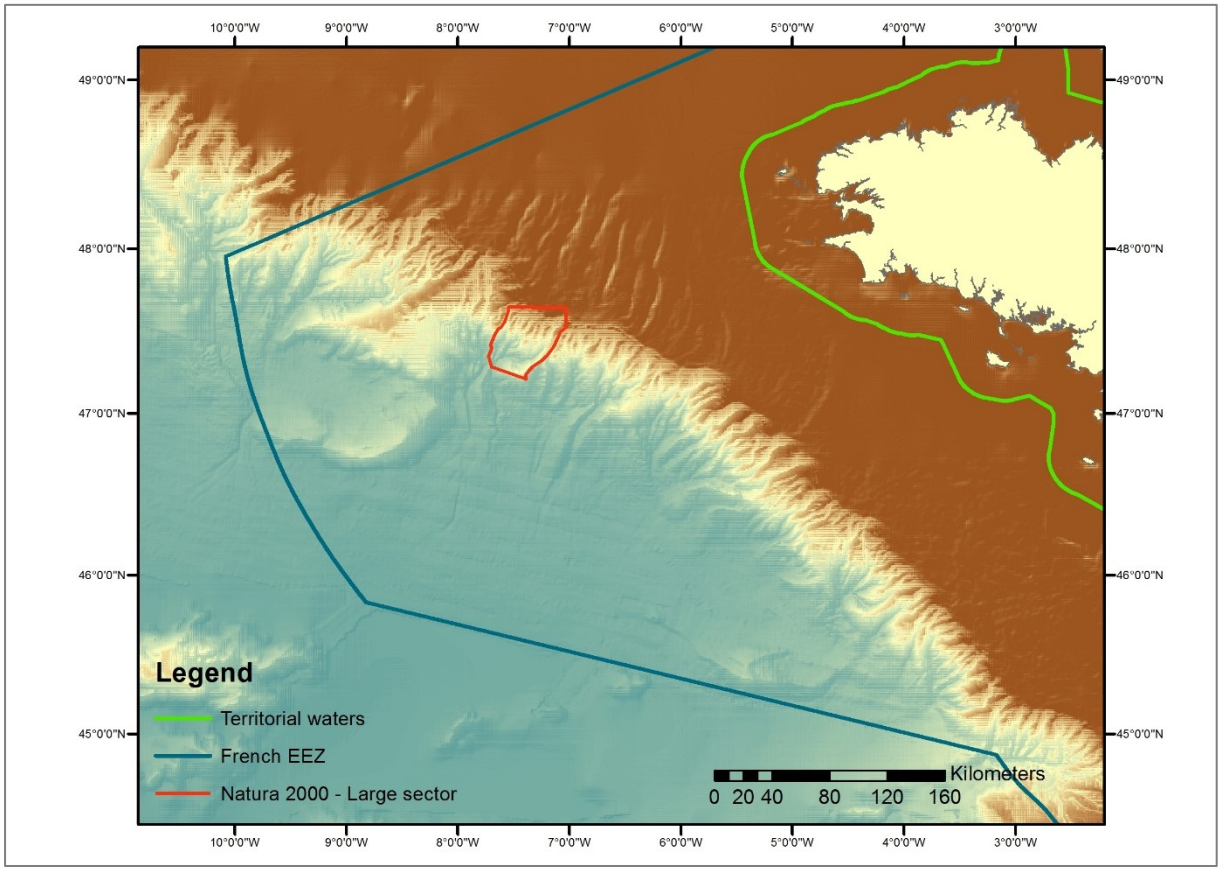

Figure 21. Delineation of the Lampaul-Guilcher canyon complex

2.6.4 Institutional landscape

The French Ministry of Ecology, Energy, Sustainable Development and Spatial Planning has developed a strategy to implement the MSFD and MSP directives jointly. The national Bill on 'Recovering Biodiversity, Nature and Landscapes' devotes an article (Article 123) to defining the national framework for maritime spatial planning. The Bill in the form of a national decree was published by the Ministry of Environment and the Sea in May 2017 (Décret n° 2017-724 of the 3rd May 2017). The main purpose of Article 123 is to organise the joint implementation of the second cycle of MSFD and a draft national marine spatial plan.

Since the publication of this decree, according to French law, each planning document aiming at the implementation of the MSFD at a sub-regional scale (called a "Plan D'Action Pour Le Milieu Marin") is now viewed as being part of a more global strategy aimed at the implementation of the EU Maritime Spatial Planning Directive (called a "Document Stratégique de Façade"). The launching of the second cycle of the MSFD will provide the opportunity to launch a common implementation strategy concerning these two directives employing the same geographical scales. This should give coherence to the shaping of two public policies dealing with the marine environment and related activities. A first major step is the definition of both environmental (as required by MSFD) and socio-economic targets by June 2018.

In January 2017, the Marine Protected Areas Agency (Agence des aires marines protégées) became the French Biodiversity Agency (Agence Française pour la Biodiversité). It is a public organization under the supervision of the Ministry of the Environment established for the purpose of supporting public

policies implementation in order to improve the knowledge, to protect, to manage and to restore terrestrial, aquatic and marine biodiversity. The Agency manages all French Marine Natural Parks and marine Natura 2000.

2.6.5 Existing management plans

2.6.5.1 Common Fisheries Policy

Fisheries management is by TAC. A new deep-sea fishing regulation that came into effect in 2017 does not permit bottom trawling at depths greater than 800m and requires the application of the 'move on rule' if vulnerable marine ecosystems are encountered between 400 and 800m.

2.6.6 Goals and operational objectives for the SMA

The blue growth goal is to maintain or increase productivity of the fisheries while ensuring that they are managed in compliance with the requirements of the planned Natura 2000 SAC that has as its main management objective the maintenance of the good ecological status of the protected reefs.

2.6.6.1 Operational Objectives

- Develop a management plan for the proposed Lampaul-Guilcher canyon complex SAC to preserve existing reefs habitats that have good conservation status and improve the quality of habitats that have an unfavourable conservation status within the SMA.
- Maintain current fisheries at or close to MSY taking into account the requirements of the SAC management plan.

2.7 Case Study 7: Gulf of Cádiz/Strait of Gibraltar/Alborán Sea - Covadonga Orejas (IEO-COB), José Luis Rueda (IEO-COMA), Miguel Hernández (IEO- COB)

2.7.1 Study Area Description

The Gulf of Cádiz is the arm of the Atlantic Ocean between Cabo de Santa Maria, the southernmost point of mainland Portugal and Cape Trafalgar at the western end of the Strait of Gibraltar. Two major rivers, the Guadalquivir and the Guadiana, as well as smaller rivers, like the Odiel, the Tinto, and the Guadalete, reach the ocean here. The Gulf of Cádiz is located in the north-eastern Atlantic Ocean between 34°N and 37°15'N and 6°W to 9°45'W. It is enclosed by the southern Iberian and northern Moroccan margins, west of Gibraltar Strait. The geological history of the Gulf of Cádiz is intimately related to plate tectonic interaction between southern Eurasia and North Africa and is driven by two major mechanisms: subduction and the oblique lithosphere collision between Iberia and Nubia. It is now well established that the whole area is under compressive deformation and that mud volcanism and processes associated with the escape of hydrocarbon-rich fluids sustain a broad diversity of chemosynthetic assemblages. The accretionary wedge formed by subduction represents an extensive area which encompasses over sixty mud volcanoes, at depths ranging from 200 to 4,000 m, and active methane seepage has been documented in several locations.

The Strait of Gibraltar is a narrow strait that connects the Atlantic Ocean and the Mediterranean Sea and separates the Iberian Peninsula (southern Europe) and northern Africa by 7.7 nautical miles (14.3 km) of ocean at the strait's narrowest point. The Strait's depth ranges between 300 and 900 m. The northern side of the Strait is protected in several areas of variable sizes, the most extensive of which is the Estrecho Natural Park. On the northern side of the Strait are Spain and Gibraltar, while on the southern side are Morocco and Ceuta. The direct linkage between the Atlantic Ocean and the Mediterranean Sea provided by the Strait of Gibraltar creates certain unique flow and wave patterns. These unique patterns are created due to the interaction of various regional and global evaporative forces, tidal forces, and wind forces. The balance of the water flow is eastwards, due to an evaporation rate within the Mediterranean basin higher than the combined inflow of all the rivers that empty into it. The shallow Camarinal Sill of the Strait of Gibraltar, which forms the shallowest point within the strait, acts to limit mixing between the cold, less saline Atlantic water and the warm Mediterranean waters. The Camarinal Sill is located at the far western end of the strait. The more saline Mediterranean waters sink below the constantly incoming Atlantic Ocean water and form a highly saline layer of warm bottom water. This layer of bottom-water constantly works its way out into the Atlantic and is known as the Mediterranean Outflow Water (MOW). On the Atlantic side of the strait, a density boundary separates the MOW from the rest at about 100 m depth. These waters flow out and down the continental slope, losing salinity, until they begin to mix and equilibrate more rapidly, much further out at a depth of about 1,000 m. The MOW can be traced for thousands of kilometres mostly west and northwards of the strait.

The Alborán Sea is the westernmost portion of the Mediterranean Sea, lying between the Iberian Peninsula and the north of Africa (Spain on the north and Morocco and Algeria on the south). Its average depth is 445 m and maximum depth is 1,500 m. Several small islands dot the sea, including the Isla de Alborán located in the central part and others located along the Moroccan shore. The seafloor is morphologically complex with several sub-basins, including three main sub-basins named West, East, and South Alborán Basins, ridges, and seamounts. The most prominent structure in the Alborán Sea is the 180 km long Alborán Ridge which stretches southwest from the volcanic Alborán

Island. The Alborán Sea is a transition zone between ocean and sea, containing a mix of Mediterranean and Atlantic species. The Alborán Sea is habitat for the largest population of bottlenose dolphins in the western Mediterranean, is home to the last population of harbour porpoises in the western Mediterranean, and is one of the most important feeding grounds for loggerhead sea turtles in Europe. The Alborán Sea also hosts important commercial fisheries, including sardines and swordfish. In 2003, the World Wildlife Fund (WWF) raised concerns about the widespread drift net fishing endangering populations of dolphins, turtles, and other marine animals.

The present day interconnection and degree of interdependency of deep-sea populations occurring on each side of the Strait of Gibraltar are not very well known but recent research suggests that the strong influence of the MOW in the Atlantic Meridional Overturning Circulation (AMOC) may result in the presence of Mediterranean deep sea species in the Northern as well as in the Mid Atlantic.

2.7.2 Sectoral activities and Blue Growth opportunities

The area supports intensive anthropogenic activity, including tourism, fisheries, aquaculture, oil and gas exploitation, bioactive compound prospection and is an important area for maritime traffic. The area is also important for conservation with several protected areas declared (Figure 22 to 25).

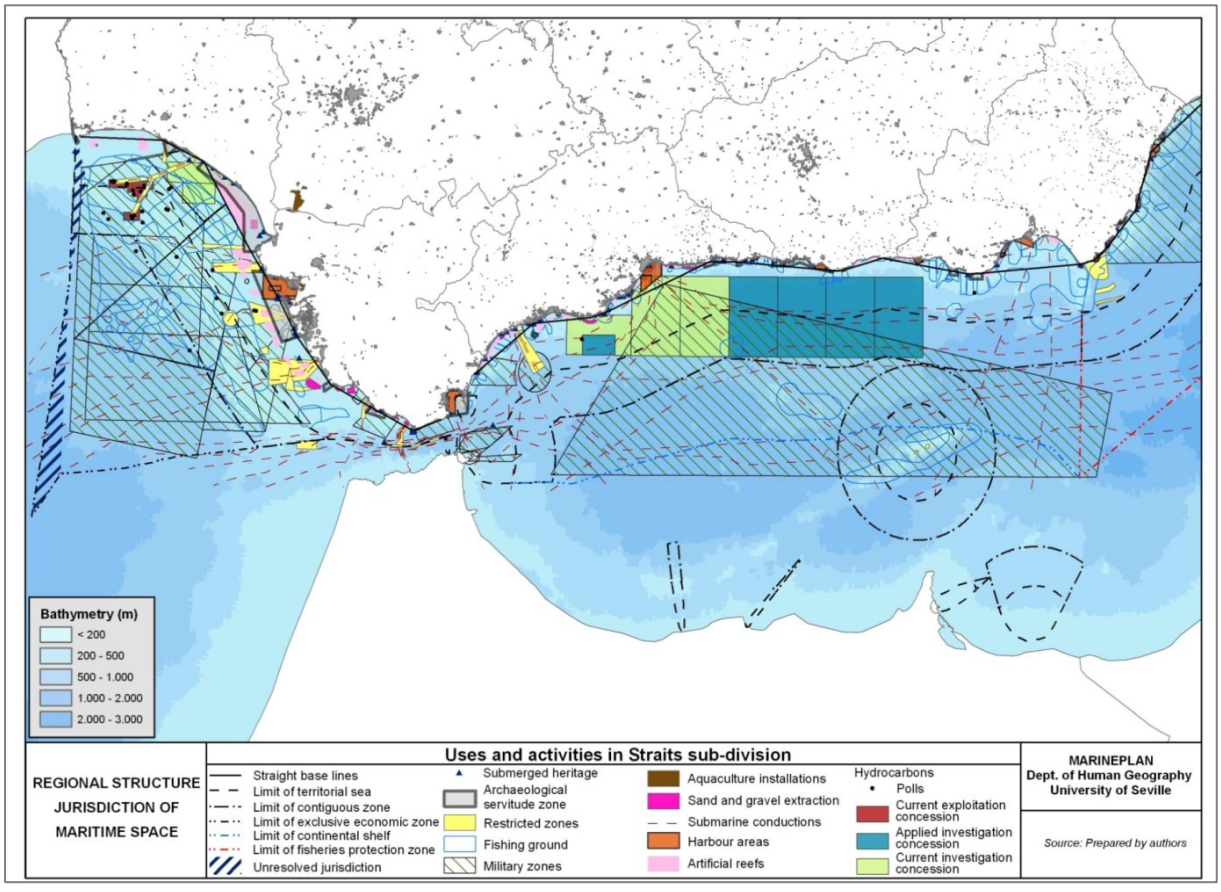

Figure 22. Uses and activities in the case study area. Source: Suárez de Vivero, JL (2011) Atlas para la para la planificación espacial marítima. Universidad de Sevilla. 312p

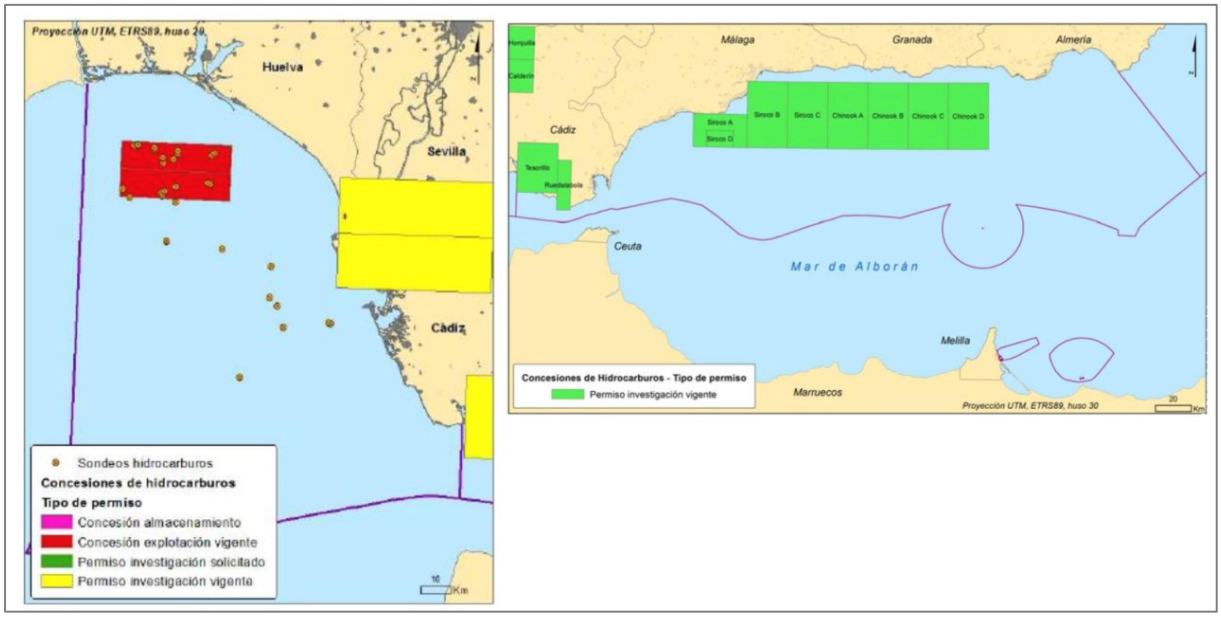

Figure 23. Oil and gas concessions in the case study area. Source: Ana Lloret Capote, Irene del Barrio Alvarellos, Isabel María Moreno Aranda (2012) Estrategias marinas: evaluación inicial, buen estado ambiental y objetivos ambientales. Centro de Estudios de Puertos y Costas – Centro de Estudios y Experimentación de Obras Públicas (CEPYC-CEDEX). Ministerio de agricultura, pesca, alimentación y medio ambiente. NIPO: 280-12-175-8

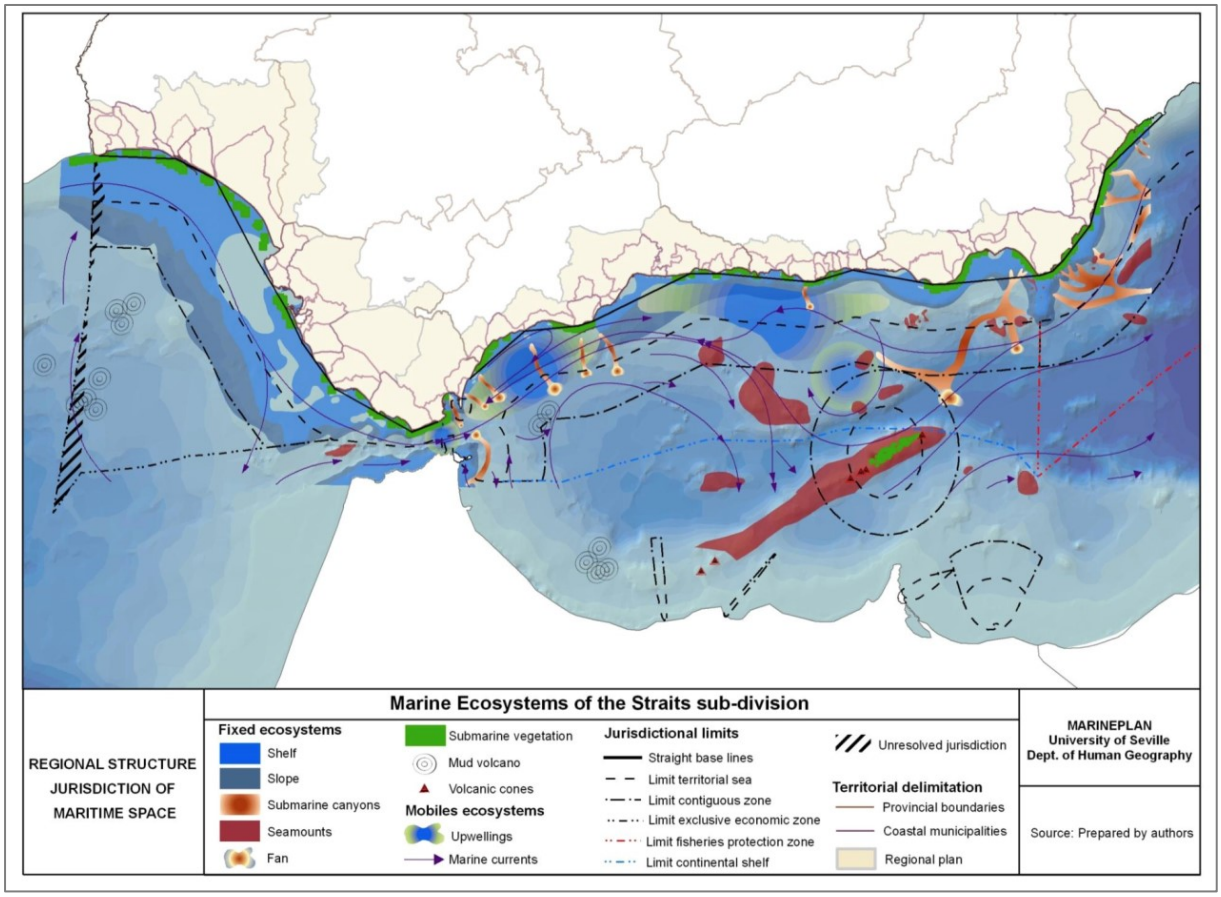

Figure 24. Important marine ecosystems in the Case Study area. Source: Suárez de Vivero, JL (2011) Atlas para la para la planificación espacial marítima. Universidad de Sevilla. 312p

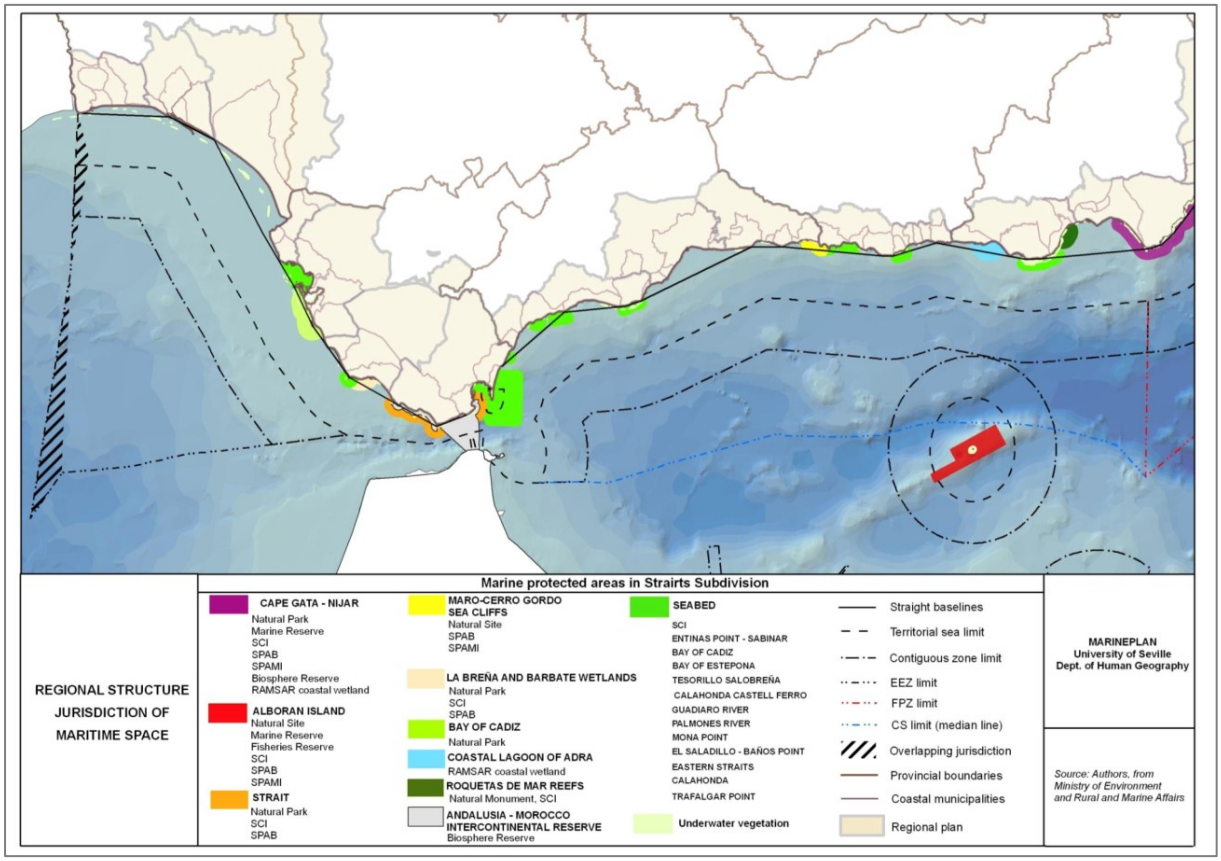

Figure 25. The location of some Marine Protected Areas in the Case Study area. Source: Suárez de Vivero, JL (2011) Atlas para la para la planificación espacial marítima. Universidad de Sevilla. 312p

Blue Growth sectors include Biotechnology, Fisheries, Oil and Gas and renewal energy (e.g. tidal energy). In addition, the area is the focus of much international marine research because of its strategic location as a gateway to the Mediterranean and a crossroad of cultures, biogeographic regions and basins (Atlantic Ocean and Mediterranean). The area is interesting from an oceanographic, geological, paleontological, biological and ecological perspectives. A number of countries and scientific expeditions have targeted different aspects of the GoC and/or the Alborán Sea. On-going scientific interest in the area, by the Spanish and international research community, can potentially be considered a new blue growth area entailing:

- Mobility of researchers (including economic activity generated to support visiting researchers (e.g. travel, accommodation, catering…)
- Knowledge transfer (including with North African countries)
- Formal and official exchanges between countries (e.g. permits to work in the area etc.)
- Potential to apply for National funds, European funds, international funds, foundations, private companies, industry …. to support research
- Potential for collaboration with private companies (e.g. development of blue technologies)
- Basic research to support many (if not all) other blue growth sectors

2.7.3 Setting spatial boundaries for SMA assessment

The Spatially Managed Area for this case study will encompass part of the southern Spanish EEZ (Gulf of Cádiz), Territorial Sea (Strait of Gibraltar and Alborán Sea) and Continental Shelf (Alborán Sea) (Figure 26). The selected boundaries comprise waters where Spain has full jurisdiction or are located in the High Seas.

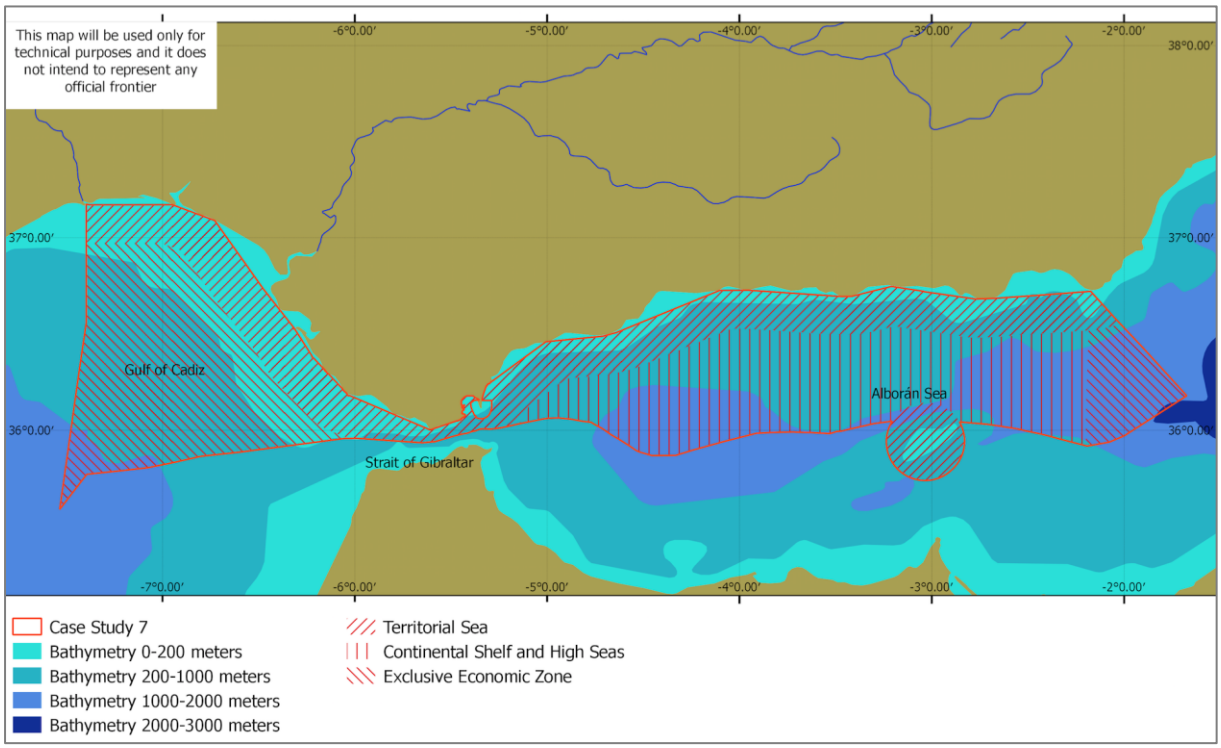

Figure 26. Bathymetry map of the case study showing the SMA boundary tentative jurisdictional zones (non-ratified). Source: The information for this map has been kindly supplied by the Spanish Ministry of Agriculture, Fisheries, Food and Environment.

The contiguous zone surrounding the Territorial Waters of Alborán Island is not included as part of the Case Study SMA (cf. Figure 27).

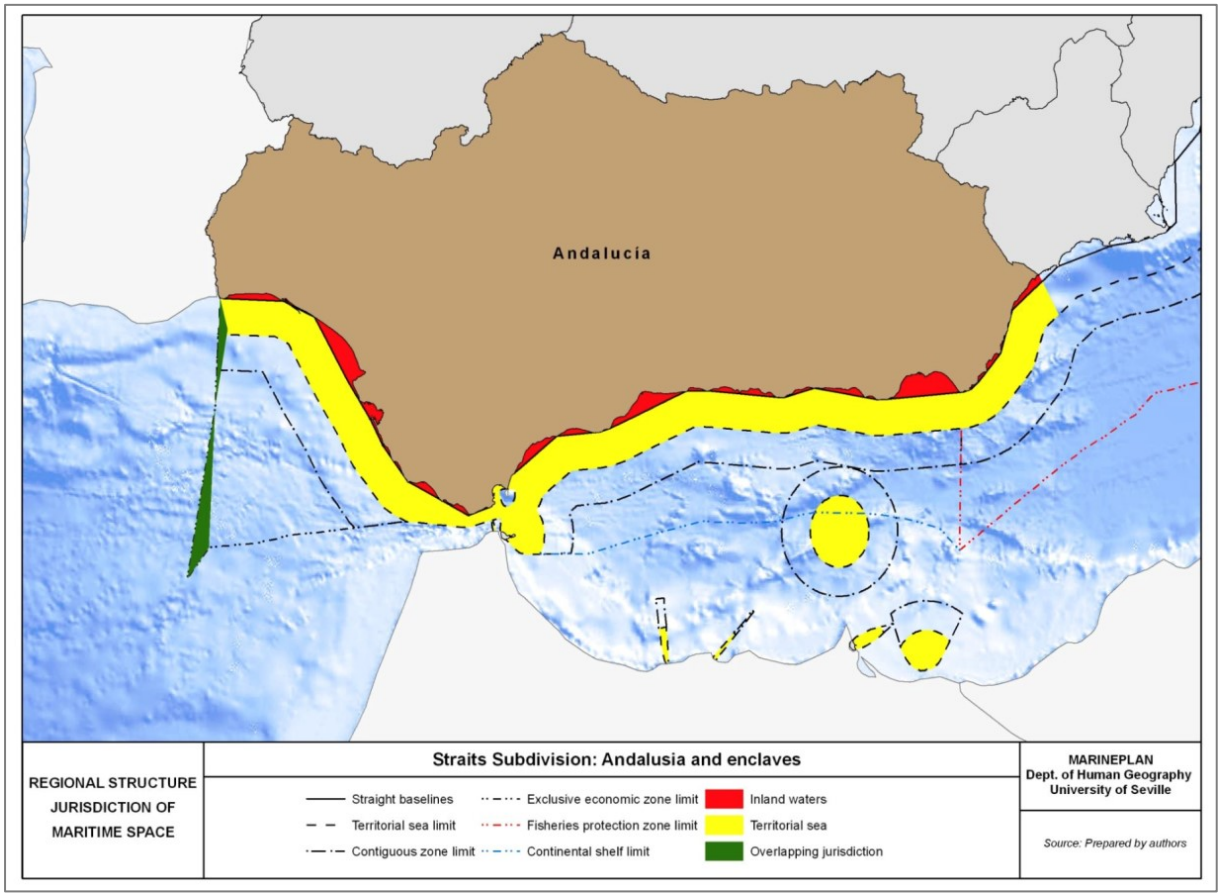

Figure 27. Regional jurisdictional boundaries. Source: Suárez de Vivero, JL (2011) Atlas para la para la planificación espacial marítima. Universidad de Sevilla. 312p

2.7.4 Institutional landscape

The competent authority for MSP, MPAs and for fisheries management is the Spanish Ministry for Agriculture, Fisheries, Food and Environment (MAPAMA).

2.7.5 Existing management plans

There is neither a management plan for the area nor an official marine spatial plan. The EU Maritime Spatial Planning Directive has been transcribed into national law on the 11 April 2017, as a "Royal Decree" (RD) which establishes the framework for marine spatial planning in Spanish waters. This requires that a national MSP is in place by 2020. Although there is no marine spatial management plan for the area, a research team (Ordenación del Litoral y Tecnologías de Información Territorial) from the University of Sevilla lead some years ago a research project where an extensive Atlas including a comprehensive and detailed compilation of maps for all Spanish territories (e.g. legal boundaries, natural resources, uses, activities, MPAs...etc.). This Atlas entitled: "An atlas of maritime spatial planning" (Juan Luis Suárez de Vivero, ed.) is freely available (http://marineplan.es/ES/en/).

2.7.6 Goals and operational objectives for the SMA

The blue growth goals are to establish the entire area as a long term 'laboratory' for international research' and to assess the potential impacts of developing renewal energy and in particular tidal energy in the Strait of Gibraltar.

2.7.6.1 Operational Objectives

- Bibliographic research on research activities conducted in the area in the last 20 years with identification of the main scientific topics targeted to date and gaps.
- Assess spatial management measures including scientific reference areas to develop the area as an international scientific laboratory and the impact such measures would have on existing activities.

Acknowledgements: We would like to thank Juan Luis Suárez de Vivero (Professor Emeritus from the University of Sevilla) for his contribution and advice to the work conducted to prepare this document. We are thankful to the Spanish Ministry for Agriculture, Fisheries, Food and Environment for supplying the map that has been used as basis for the map included in this contribution to the deliverable D 6.1.

2.8 Case Study 8: Azores - Telmo Morato, Luís Rodrigues, Marina Carreiro-Silva (IMAR/DOP)

2.8.1 Study Area Description

The Azores is a volcanic archipelago located in the northeast Atlantic, lying above a tectonically active triple junction between the North American, Eurasian and African plates. Oceanography in the region is influenced by two eastward currents branching from the Gulf Stream, the North Atlantic Current in the north and the Azores Current to the south. Mediterranean water eddies are also an important feature in the region, present as distinct lenses of warm and salty Mediterranean water at 800-1200 m deep. The water current patterns result in a complex circulation, with high salinity and temperature and a low nutrient regime, except for some localised upwelling associated with island slopes and seamounts.

The seafloor that surrounds the archipelago comprises a variety of open ocean deep-sea habitats, from island slopes and numerous seamounts to hydrothermal vents at various depths and abyssal plains exceeding 5,000 m depth. Cold-water corals are prominent habitats in the region, with more than twenty different types of coral gardens and 165 species identified to date, and which act as important habitat for commercially important fish species in the Azores. Sponge aggregations are also important habitats, covering extensive areas particularly below 500 m, but little is known about their taxonomic composition and functioning. Coral and sponge vulnerable marine ecosystems are included in deep-sea marine protected areas, which are part of the OSPAR network of MPAs.

2.8.2 Sectoral activities and Blue Growth opportunities

Existing activities in the area include fishing, research, shipping, recreation (sailing), and submarine cables. The Azores is seen as an area of increased Blue Growth opportunities in the deep-sea (fishing, bio-prospecting and mining). The seafloor around the Azores, including the extended continental shelf, may host mineable massive sulphide deposits. Several active hydrothermal vent fields have been discovered in the north portion of the slow spreading Mid Atlantic Ridge. Five of them are located south of the Azores, relatively close to each other and to the Azores islands. These are the Menez-Gwen (at 850 m depth) including Bubbylon, Lucky Strike (1700 m) including Ewan, Menez Hom (1800 m), Saldanha (2200 m), and Rainbow (2400 m). Recently, the Moytirra hydrothermal vent area was discovered north of the Azores (2900 m) at about 45.5°N. However, the detection of several hydrothermal plumes signal on the northern Mid-Atlantic Ridge may indicate that more active fields may occur in the region.

The Azores maybe the single EU Member State EEZ with sufficient mineral reserves to open up the possibility of deep-sea mining in European waters. In 2006, international companies approached the Azores Government with the intention of exploring minerals resources in the deep sea. In 2012, legislation for mineral exploration and exploitation in the Azores was created as well as legislation for granting access and equity distribution of scientific results (following the Nagoya Protocol). A dispute with the Portuguese government who ruled this legislation unconstitutional have put things on hold. In late 2016, the Portuguese Minister for Sea Affaires announced that the government wanted to speed-up assessment of the feasibility of deep-sea mining in the Azores, but no further developments have been made public.

Nautilus Minerals Inc. submitted the first proposal for exploration rights in several areas, totalling 9272 km^2, around the Azores (from North to South): Patorra (between Cavala and Ferradura

seamounts), Moreto (south of the Menez Gwen hydrothermal vent field and close to Monte Alto and Voador seamounts), Arinto (south of lucky Strike area, between Sarda and Farpas seamounts), Famous (in Famous hydrothermal vent field), Saldanha (in Saldanha hydrothermal vent), and Verdelho (around Rainbow hydrothermal vent fields) (Figure 28).

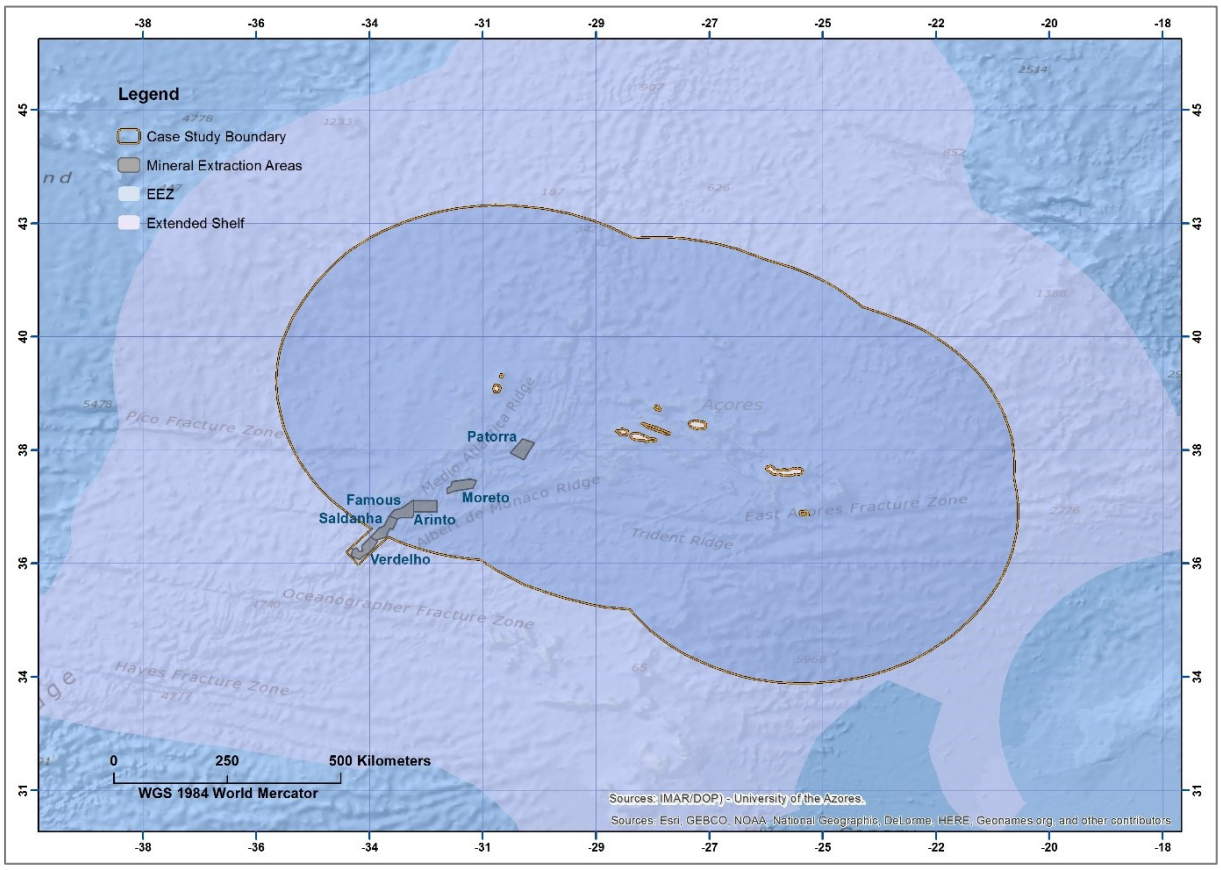

Figure 28. Boundary of the Azores case study area and the mineral areas submitted by Nautilus Minerals Inc. for deep-sea SMS mining exploration in the Azores region.

2.8.3 Setting spatial boundaries for SMA assessment

The spatial boundary of the SMA for this case study will be the EEZ of the Azores, including a portion of the Extended Continental Shelf (ECS) claim along the southern part of the Mid-Atlantic Ridge (Figure 28).

2.8.4 Institutional landscape

The Regional Government of the Azores has shared competence in most marine related issues (including fisheries), environment and planning:

- Executive – Regional government, its departments (Regional secretariats) and its services (Regional directorates);
- Legislative – Regional parliament;
- Surveillance (Regional inspectorates).

As with all EU Member States, the Azores is subject to a large suite of international and national policies, laws and agreements controlling many sectors such as fisheries, energy and conservation.

Consequently, there are many organisations and administrative bodies responsible for marine affairs. There is a patchwork of EU directives and policies and national legislation, and a number of government bodies with overlapping duties to manage them.

2.8.5 Existing management plans

2.8.5.1 Regional Network of Protected Areas

This is the main instrument of conservation for the MPAs beyond the territorial waters (12 nm); coordinated by Directorate Regional for Maritime Affairs (DRAM), it has an advisory council; 15 Marine protected areas: subdivided into two areas, completely within EEZ and partially outside EEZ. With a recent update defined in the regulatory decree-law n.o 13/2016/A, of July 19th, the Azores Marine Park Areas was increased in 135 466 km², representing 122% increase in the area protected. The Regional Network of the Protected Areas in the Azores was set up by the Azorean regulation "Decreto Legislativo Regional nº 15/2007/A" and includes Natura 2000 sites (Figure 29). The network also includes nature reserves, monument reserves, protected area of habitats/species management, protected landscape and resource management areas.

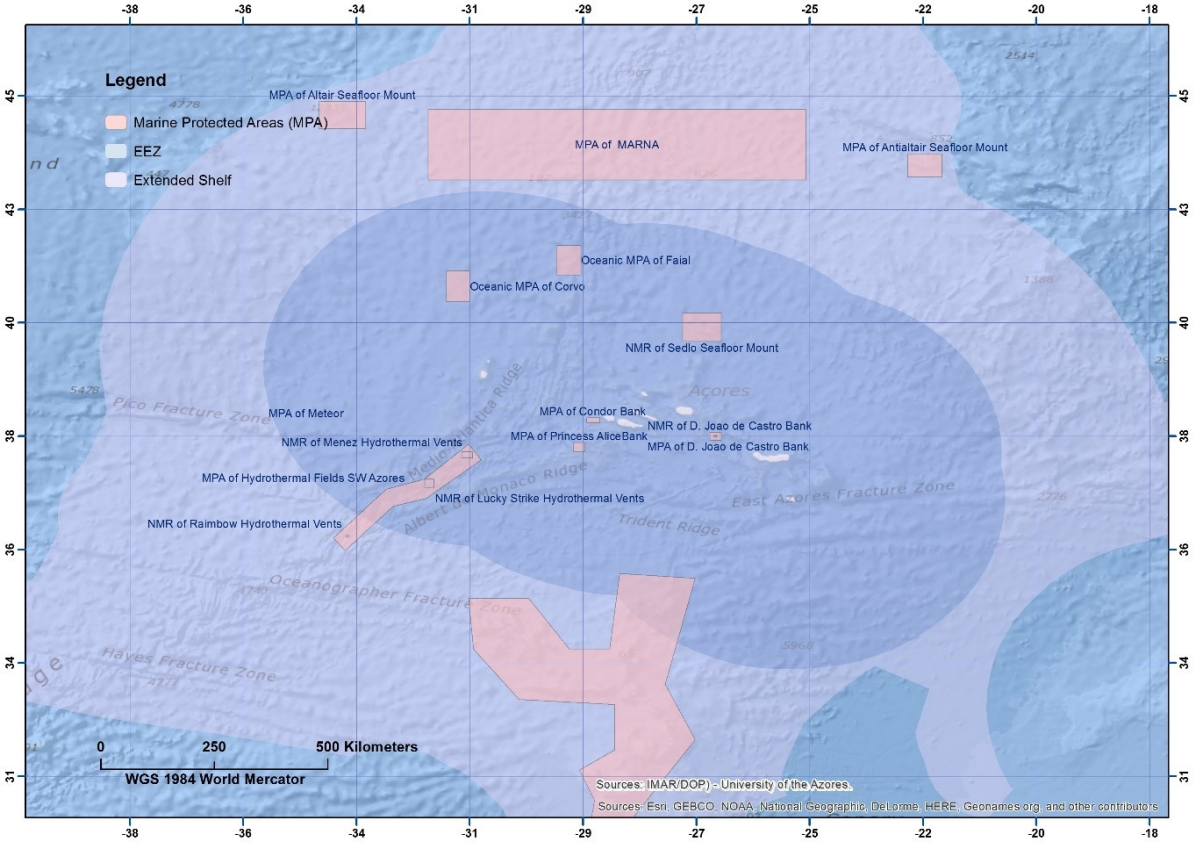

Figure 29. Location of marine protected areas in the Azores Case Study area.

2.8.6 Goals and operational objectives for the SMA

The blue growth goal is to develop a spatially managed area that can accommodate future seafloor massive sulphide mining activities in the Azores while minimising impacts on existing activities and ecosystems.

2.8.6.1 Operational Objectives

- Protect the natural diversity, ecosystem structure, function, connectivity and resilience of deep-sea communities in the SMA.
- Maintain a healthy and productive economy in the SMA wish may include environmentally sustainable use of seabed natural resources and all other existing human uses.
- Reduce conflicts among current and future users of marine space, e.g., between commercial fishing, scientific research, and deep-sea mining.

2.9 Case Study 9: Reykjanes Ridge CS - Stefán Ragnarsson, Hrönn Egilsdóttir, MFRI

2.9.1 Study Area Description

The Reykjanes Ridge constitutes the part of the mid-Atlantic ridge that is located between the Reykjanes peninsula and the Bright Fracture Zone (57°N). There is a gradual shallowing of water depth from south to north along the Ridge, towards the Icelandic continental shelf. The seafloor of the ridge is highly rugose, especially near the middle due to its volcanic nature. The Ridge contains exposed basaltic rock, volcanos and hydrothermal vent systems. Soft sediments occur in patches along the Ridge and predominate on the Ridge flanks.

2.9.2 Sectoral activities and Blue Growth opportunities

The main active blue economy sector for the Reykjanes Ridge area is fisheries. Fishing activities on and around the Reykjanes Ridge that take place outside the 200 nm EEZ of Iceland are managed by the North East Atlantic Fisheries Commission (NEAFC). This includes a small blue ling (Molva dypterygia) fishery on and around the seamount "Franshóll" at the southern limit of the EEZ. There are also pelagic fisheries targeting beaked redfish (Sebastes mentella), and some smaller fisheries for other pelagic species both within and outside the EEZ. Fisheries targeting various demersal fish species using bottom trawl and longline takes place along the northern part of the Ridge and on its flanks. Other sectoral activities occurring on and around the Ridge include shipping and occurrence of submarine cables. There are two blue growth sectors that could, hypothetically, become operational on the Reykjanes Ridge region in the future. Firstly, mining for deep-sea mineral resources. Manganese nodules have been found in the northern part of the Ridge but mining of these was shown to be not economically viable. There are no plans for further mining activities at the Reykjanes Ridge within the Icelandic EEZ. Secondly, carbon dioxide sequestration into bedrock on the Reykjanes Ridge is considered to be feasible as there are vast areas of basalt that have been shown to react with carbon dioxide to form calcium carbonate within the bedrock. The Reykjanes Ridge could therefore potentially store large amounts of carbon dioxide. Currently, carbon dioxide sequestration experiments in Iceland have only been carried out on land (CarbFix project, www.or.is/carbfix). However, partners in the project CarbFix 2 (www.or.is/carbfix2) are currently investigating the potential for off-shore injection of carbon dioxide into basaltic rocks.

2.9.3 Setting spatial boundaries for SMA assessment

The boundary for the Spatially Managed Area in this case study straddles the Reykjanes Ridge. The larger box (Figure 30, left panel) predominately addresses management of fisheries and VMEs while the smaller box (Figure 30, right panel) is located around an area with potential for carbon sequestration. The larger area is very data limited with respect to biological and environmental parameters, such as substrate and benthos information. There is a bottom trawl fishery in the northern part of the area as well as blue ling and pelagic fisheries on the Franshóll seamount that straddles both sides of the Icelandic EEZ.

The smaller area is much more data rich, e.g. detailed multi-beam bathymetry (Figure 30) and habitat maps generated after several seafloor imaging surveys.

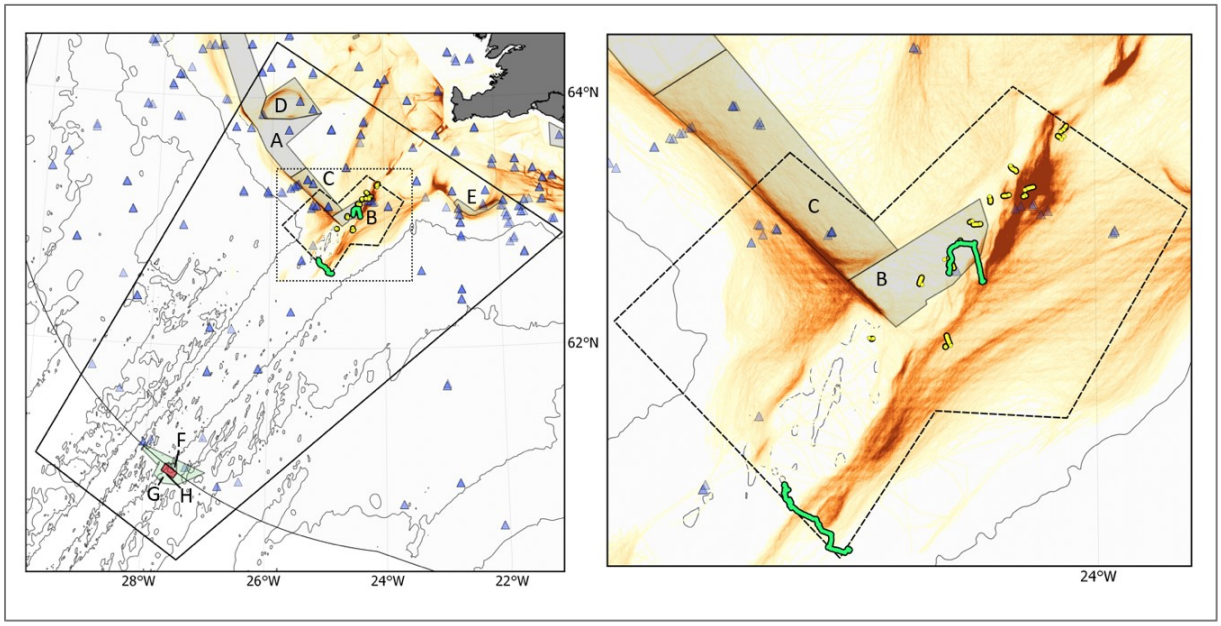

Figure 30. The location of the two Reykjanes Ridge CS Spatial Managed Area boundaries. A larger SMA (full line, left panel) and a smaller SMA for which exists more available data on environmental and biological parameters (dashed line, right panel). Areas within the spatial boundaries defined for the SMA assessments are managed by Icelandic governmental institutes (A, B, C, D, E) or NEAFC (G, H). Seasonal closures are in place in areas C, D, E, F and H. Blue points represent benthic sampling data available for the assessment and green and yellow points or lines underwater imaging data.

2.9.4 Institutional landscape

The SMA is within the EEZ of Iceland and all fisheries found there are managed by the relevant governmental institutes in Iceland. The Ministry of Industries and Innovation decides on the TAC for each species stock based on scientific advice, mostly from the Marine and Freshwater Research Institute (MRFI). The Directorate of Fisheries is entrusted with the day-to-day administration of fisheries and is responsible for the implementation of the legislation. Fisheries beyond the EEZ are managed by NEAFC. Both areas overlap within an area of Extended Continental Shelf claimed by Iceland that covers the area of the Reykjanes Ridge between Iceland and south to roughly 51°N. The main argument for the claim is the direct connection between the spreading ridges and the Icelandic landmass both morphologically and tectonically and the overall similarity of the geological history and crustal characteristics along the Reykjanes Ridge.

2.9.5 Existing management plans

At present, there is no single integrated management plan for the Reykjanes Ridge area and Iceland has not developed a roadmap to implement a Marine Spatial Planning framework. Within the SMA there are several fisheries closures (Figure 30). The closures at the northern end of the SMA were established with the objective of reducing catches of small redfish or Norwegian redfish (Sebastes marinus). These closures were established in 1994 and have been unchanged since then. The closures are either seasonally or permanently. The southernmost closure ("B" in Figure 30) is located directly on the Ridge within the SMA and contains the Steinahóll hydrothermal vent field. On both sides of the southern border of the EEZ, the seamount area "Franshóll" is seasonally closed from fishing with bottom trawls to protect blue ling spawning grounds. Areas on the Reykjanes Ridge that lie beyond the Icelandic EEZ and are not defined as existing fishing grounds by NEAFC are managed to ensure protection of vulnerable marine ecosystems in accordance with NEAFC Recommendation 19:2014.

2.9.6 Goals and operational objectives for the SMA

The blue growth goal is to: 1) maintain the productivity of fisheries but at the same time to ensure that vulnerable marine ecosystems are not significantly adversely affected, and 2) evaluate the impact of impact of carbon sequestration geo-engineering on vulnerable marine ecosystems in the region.

2.9.6.1 Operational Objectives

- Protect areas with significant concentrations of VME´s which currently (or are foreseen to) overlap spatially with fishing effort.
- Maintain current fisheries at or close to MSY considering wider ecosystem impacts.
- Assess the potential impacts of implementing carbon sequestration on the Reykjanes Ridge.

2.10 Case Study 10: Davis Strait and Baffin Bay - Ellen Kenchington (DFO Canada)

2.10.1 Study Area Description

The Davis Strait joins two oceanic basins, Baffin Bay and the Labrador Sea, and separates south-western Greenland and south-eastern Baffin Island, the latter constituting the largest island in the Canadian Arctic Archipelago. It connects to the Arctic Ocean in the north via Baffin Bay and to the Atlantic Ocean in the south via the Labrador Sea. It is considered the world's largest strait and is renowned for exceptionally strong tides, which range from 9 to 18 m, and a complex hydrography. The slopes at the Labrador Sea flank of the ridge drop to 2500 m or more.

To the north, Baffin Bay connects to the Arctic Ocean directly through three small straits – Nares Strait to the north and Jones Sound and Lancaster Sound to the west. Baffin Bay is considered a marginal sea or small ocean and Baffin Basin, the deepest part of Baffin Bay, is greater than 2000 m in depth.

2.10.2 Sectoral activities and Blue Growth opportunities

The main blue economy sector in the Davis Strait and Baffin Bay sis fisheries and these areas support the only large-scale commercial fisheries in Canada's Arctic. Those are trawl fisheries for Greenland halibut and shrimp with both fisheries having undergone considerable expansion in recent decades. Fisheries have the potential to grow in this area as the ice melt increases the fishing seasons. The second blue economy sector in the Davis Strait is oil and gas but the level of development differs between Canada and Greenland. The US Geological Survey has estimated that the seas around Greenland potentially hold large amounts of natural gas and lesser amounts of crude oil and natural gas liquids. This has led Greenland's minister and provincial council to offer a large number of off-shore concessions to potential hydrocarbon (oil and gas) extraction. The largest concession areas are located west of Greenland; primarily the Davis Strait and Baffin Bay. In contrast, there are almost no leases on the Canadian side of Davis Strait, and all new offshore Arctic oil and gas exploration licenses are currently on hold. Nevertheless, as a possible future sector, it is considered in a hypothetical scenario.

Two SMAs will be developed for the Davis Strait: 1) the Davis Strait SMA will focus on managing the future (potential) development of oil/gas exploitation, while maintaining commercial fisheries and preventing significant adverse impacts to sensitive ecosystems, 2) the Baffin Bay SMA will address options available to manage an anticipated northwards expansion of fishing activity consistent with current trends.

2.10.3 Setting spatial boundaries for SMA assessment

At present, there is no single integrated management plan for the Davis Strait and Baffin Bay. The areas are divided into Scientific and Statistical Subareas and Divisions by NAFO. The Davis Strait SMA boundary encompasses NAFO Divisions 0B and 1CDE; the Baffin Bay SMA boundary encompasses NAFO Divisions 0A, 1AB (Figure 31). Both SMAs have oil and gas concession areas in Greenlandic waters.

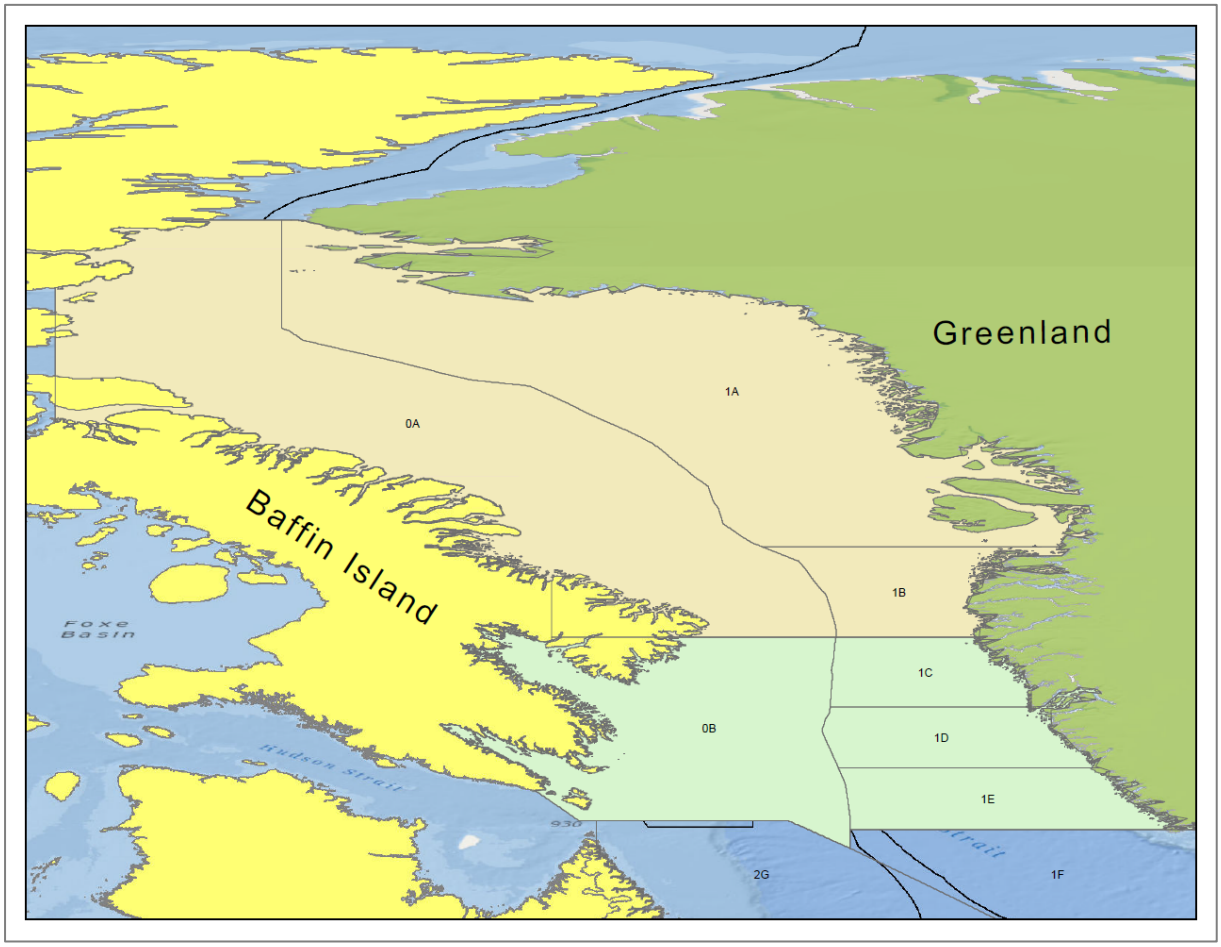

Figure 31. Location of Spatial Managed Areas in Baffin Bay and the Davis Strait with NAFO Scientific and Statistical Divisions and Subareas labelled. The Davis Strait SMA is in light blue and the Baffin Bay SMA in pink. Within these SMAs the line separating Subarea 0 from Subarea 1 marks the international boundary between Greenland and Canada.

2.10.4 Institutional landscape

Ecologically coherent spatial management plans will need to harmonize the blue growth objectives in a complex setting taking into account the interests of both Canada and Greenland while considering the position of the indigenous peoples of the region. In Canada, Davis Strait borders the territory known as Nunavut, which has a large indigenous population. The Inuit, who make up 83% of Nunavut's population, have achieved self-government with the right to participate in decisions regarding the land and water resources, and rights to harvest wildlife on their lands. Nunavut has an advisory council of eleven elders whose function it is to help incorporate Inuit culture and traditional knowledge into the territory's political and governmental decisions. Many Inuit worry that a large hydrocarbon industry in otherwise untouched parts of the Arctic threatens a vulnerable ecology. The Inuit Circumpolar Council (ICC), which brings together Inuit representatives from around the Arctic, declared “sovereignty” over the Arctic's natural resources in an effort to forestall what they described as “inappropriate” development.

The Greenland halibut and shrimp stock assessments are produced by the NAFO Commission at the request of Canada and Denmark (in respect of Greenland), being coastal fisheries. Each country retains management authority for the stocks in their waters. Canada has recently protected two large Conservation Areas (Figure 32); the Davis Strait Conservation Area in the Davis Strait SMA, a 17,298

km^2 area closed to protect Sensitive Benthic Areas (Significant concentrations of small gorgonian corals, large gorgonian corals, sea pens and sponges), and Disko Fan in the Baffin Bay SMA, a 7,485 km^2 area closed to minimize impacts on winter food source and overwintering habitat for narwhal and to conserve coral concentrations. Each of these areas restricts fishing with bottom contact fishing gears in all or a portion of the area and will have a monitoring plan.

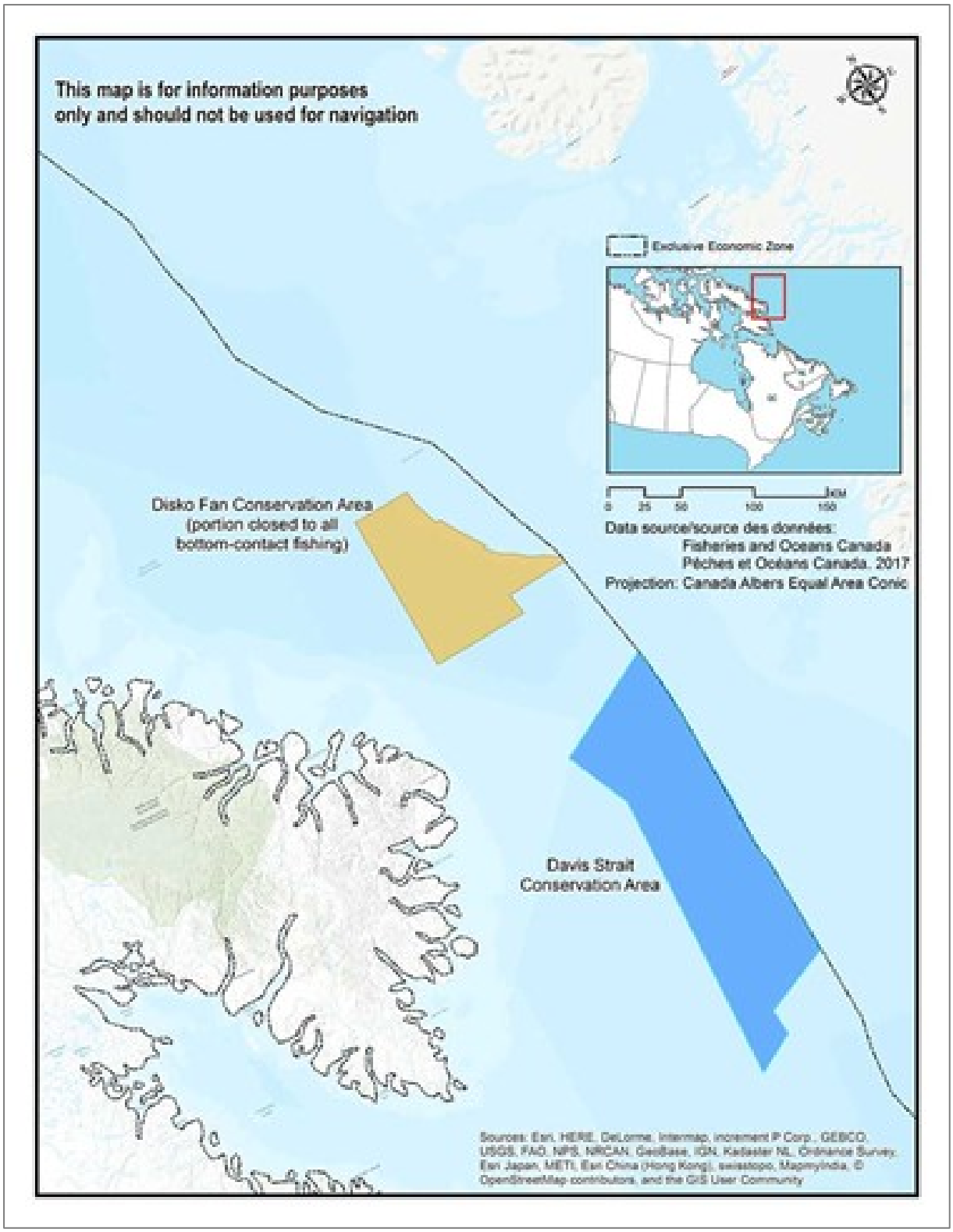

Figure 32. Conservation Areas in Canadian waters. Disko Fan is in the Baffin Bay SMA; Davis Strait in the Davis Strait SMA.

2.10.5 Existing management plans

2.10.5.1 Existing management plans (Fisheries)

Fisheries and Oceans Canada (DFO) uses Integrated Fisheries Management Plans (IFMPs) to guide the conservation and sustainable use of marine resources. IFMPs for Greenland halibut and Northern shrimp can be found at http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/index-eng.htm. IFMPs communicate the basic information on the fishery and its management to DFO staff, legislated co-management boards and other stakeholders. It provides a common understanding of the basic "rules" for the sustainable management of the fisheries resource. This IFMP summary is not a legally binding instrument.

Greenland Halibut (Reinhardtius hippoglossoides)

NAFO conducts the stock assessment of Greenland halibut for Subarea 0 and Division 1A (offshore) and Divisions 1B-F stock area, including recommendations on Total Allowable Catch (TACs) for Division 0A and 1A (offshore) and 1B in the north and Divisions 0B and 1C-F in the south (Figure 31). The Subarea 0 Greenland Halibut fishery is managed consistent with the Nunavut Land Claims Agreement (NLCA) and the Nunavik Inuit Land Claims Agreement. Further information on the IFMP can be found at http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/groundfish-poisson-fond/halibut-fletan-eng.htm The Subarea 0 Greenland Halibut fishery is managed consistent with the Nunavut Land Claims Agreement (NLCA) and the Nunavik Inuit Land Claims Agreement.

Northern Shrimp (*Pandalus borealis, P. montagui*)

This fishery takes place off the coast of eastern Canada from 47°15' N (Flemish Cap and the northern edge of the Grand Banks) to 75° N (Baffin Bay). Differences in rates of growth and maturation across the geographic range of the species provide the basis for delineating assessment and management units, referred to as Shrimp Fishing Areas (SFAs). There are two fleets engaged in the Canadian fishery, the offshore fleet (LOA >100'; >500t) and the inshore fleet (LOA <=100'; <=500t). The offshore fleet operates under an Enterprise Allocation (EA) system based on equal shares in each SFA. The inshore fleet is conducted on a competitive basis with trip limits and harvesting caps determined and regulated by the industry. NAFO conducts the stock assessments for Northern shrimp in Subareas 0 and 1 at the request of Canada and Denmark (in respect of Greenland).

2.10.5.2 Existing management plans (Oil and Gas)

The industry is still in the exploration phase with Greenland offering a large number of off-shore exploration concessions to the hydrocarbon industry. The largest concession areas are located in seas west of Greenland; primarily the Davis Strait and Baffin Bay (Figure 33). In contrast, there are almost no leases on the Canadian side of Davis Strait with issuing of new offshore Arctic oil and gas exploration licenses currently suspended. In 2017 the Nunavut Impact Review Board (NIRB) initiated a Strategic Environment Assessment (SEA) in Baffin Bay and Davis Strait to take a broad look at how offshore oil and gas development could potentially impact Nunavut's people, wildlife, land and economy ahead of any major hydrocarbon development there. The SEA will provide information on: the existing physical and human environment comprising the study area; historic oil and gas activities in the NSA, Baffin Bay, and Davis Strait; possible offshore oil and gas activities and development scenarios; and potential ecosystem and socio-economic effects associated with oil and gas development activities. This information will be used to develop an improved understanding of

potential types of oil and gas-related development that could one day be proposed for Baffin Bay and Davis Strait, their associated risks and management strategies.

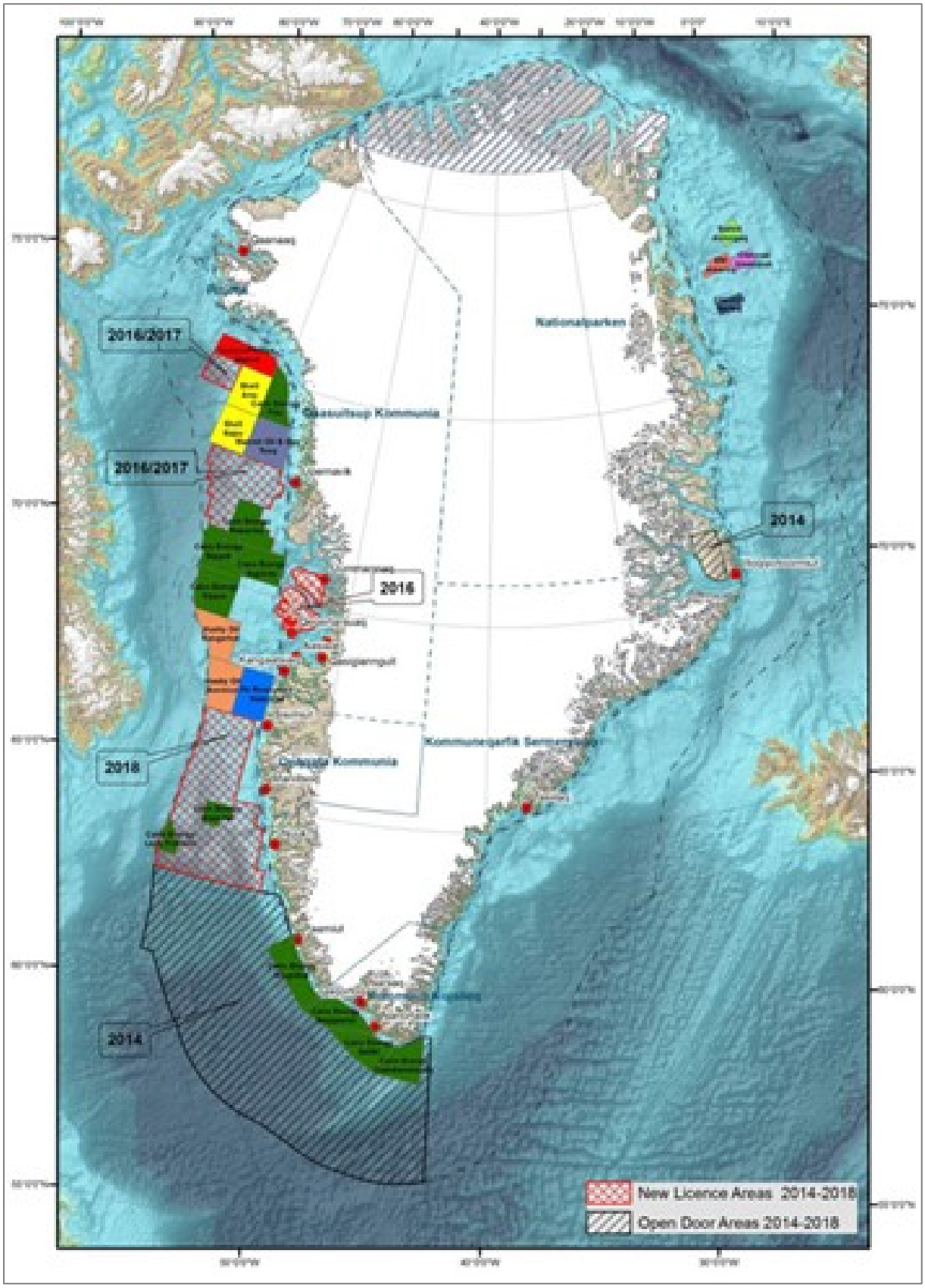

Figure 33. Oil and gas concessions offered by the Greenland government.

2.10.6 Goals and operational objectives for the SMAs

The blue growth goals are 1) to maintain or increase productivity of the fisheries in Baffin Bay following the shrinking Arctic ice cap while preventing significant adverse impacts to sensitive ecosystems; 2) accommodate future oil and gas extraction in the Davis Strait while maintaining commercial fisheries and preventing significant adverse impacts to sensitive ecosystems.

2.10.6.1 Operational Objectives

- Protect areas where corals and sponges are known or predicted to occur from bottom fishing activity as part of a network of marine protected areas.
- Ensure northward moving fisheries are managed at or close to MSY taking into account wider ecosystem impacts.
- Assess potential impacts of oil and gas developments.

2.11 Case Study 11 Flemish Cap - Ana García-Alegre, Mar Sacau and Pablo Durán (IEO-Vigo)

2.11.1 Study Area Description

Flemish Cap is an Oceanic Bank located about 600 km to the east of Newfoundland ABNJ, within the NAFO Regulatory Area and separated from the Grand Banks of Newfoundland by a rift zone known as Flemish Pass, at depths which may reach 1200 m. Flemish Cap is a plateau of about 200 km in radius. Depths range between 125 m and 1500 m. The Bank comprises 4,870 km² shallower than 200 m depth.

2.11.2 Sectoral activities and Blue Growth opportunities

The Flemish Cap area includes several types of valuable habitats and ecosystems and several types of potential Blue Growth activities. Currently, the main human activities in the region are shipping, undersea cable routes, fisheries, scientific research and hydrocarbon exploration (Figure 34). There is potential for increased oil exploration leading to exploitation in the area, however, this will present a potential conflict for existing activities (e.g. shipping, fisheries).

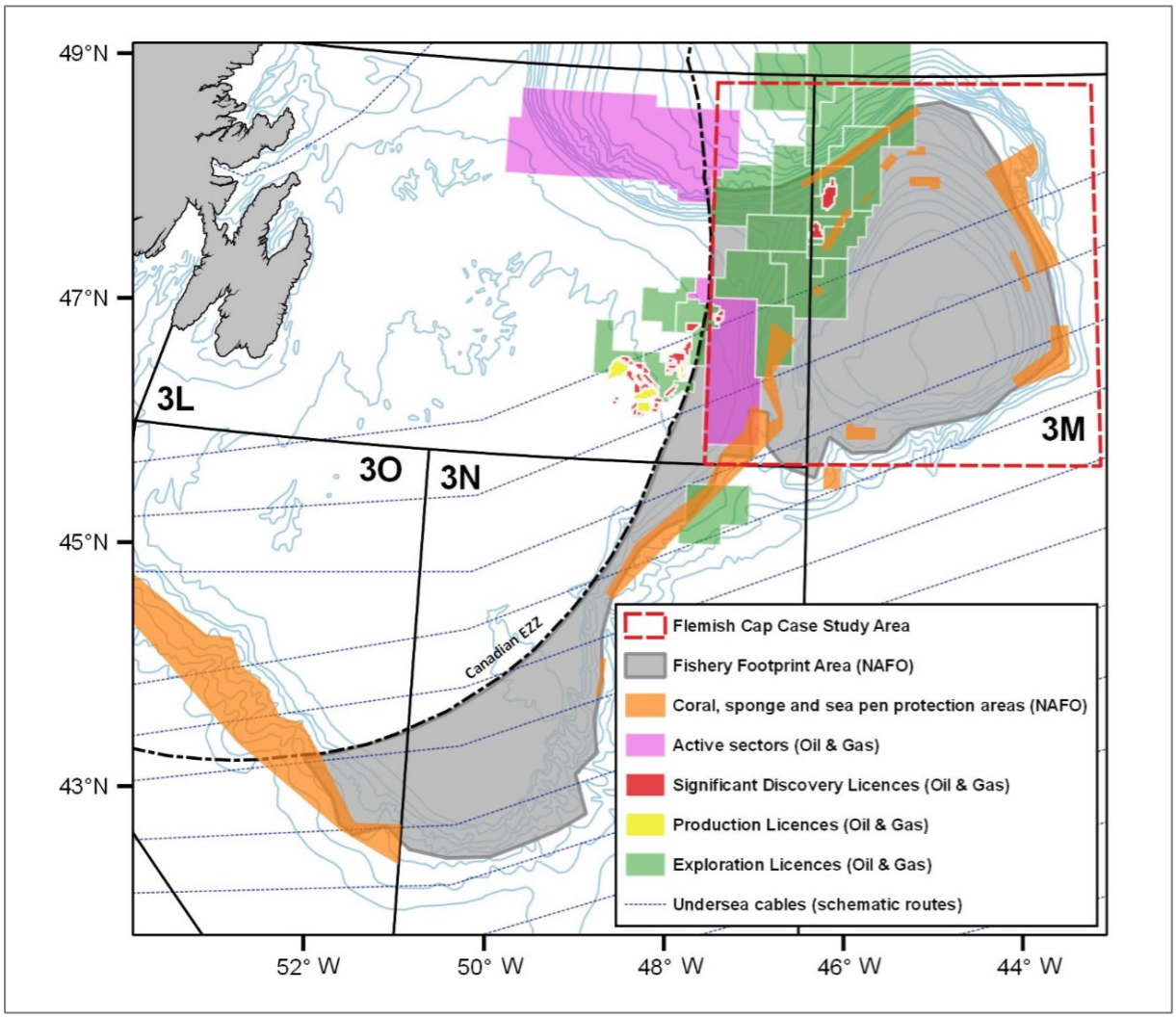

Figure 34. Sectoral activities and management zones in the Flemish Cap Case Study area with focus on undersea cables, oil & gas and fisheries (Sources: EMODnet, CLNOPB and NAFO).

2.11.3 Setting spatial boundaries for SMA assessment

The SMA for the Flemish Cap Case Study corresponds to the area identified as an Ecologically or Biologically Significant Marine Area (EBSA) in UNEP (2014): Area No. 4 - Slopes of the Flemish Cap and Grand Banks (Figure 35). This area holds most of VMEs in international water within the NAFO Regulatory Area which includes all the VME closed areas to protect corals and sponges, the fishing footprint, the area covered by a current NAFO management plan and most of the areas of interest for hydrocarbon exploration, shipping, research, cables, etc.

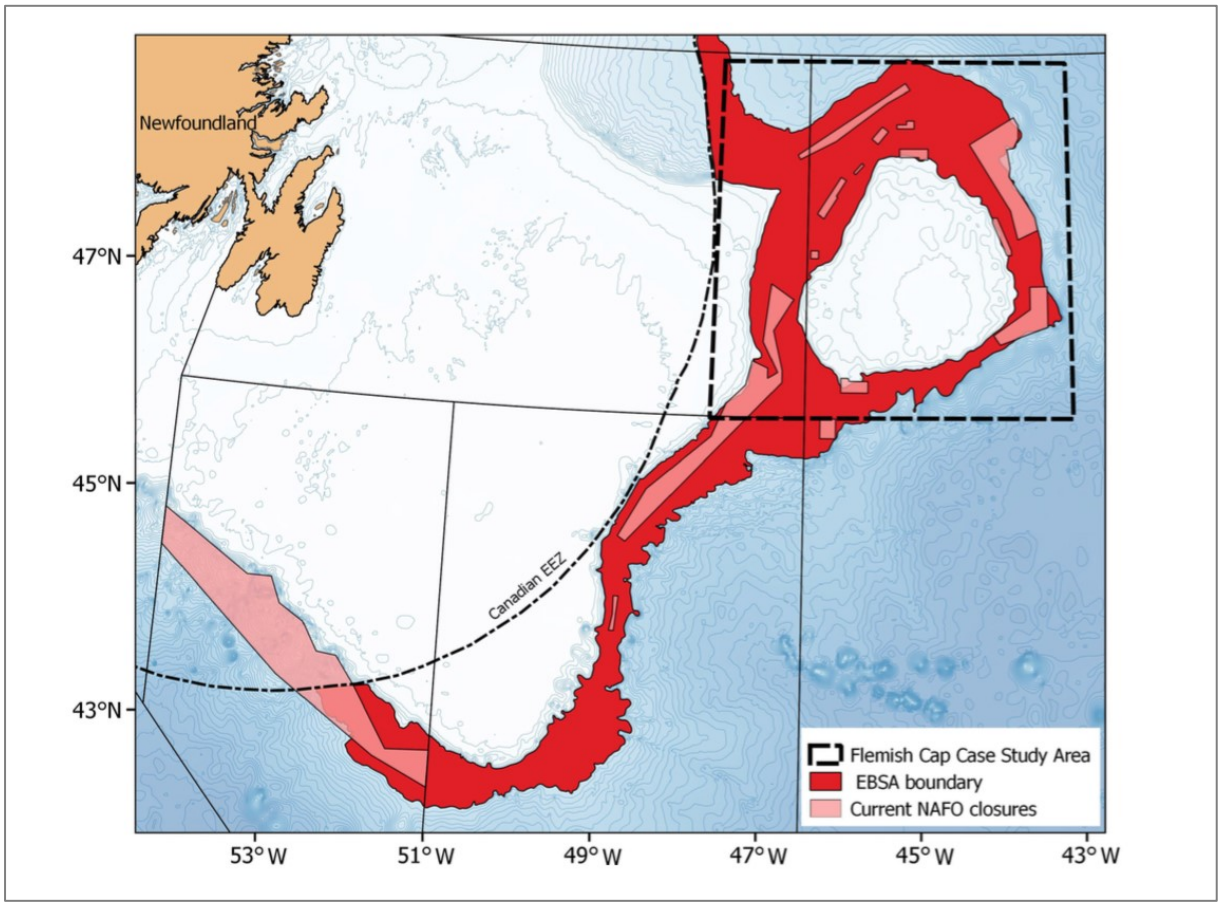

Figure 35. The EBSA Area No. 4: Slopes of the Flemish Cap and Grand Banks (Shapefiles: CBD and NAFO).

2.11.4 Institutional landscape

NAFO management covers most fishery resources in the Northwest Atlantic except salmon, tuna/marlin, whales, and sedentary species (e.g. snow crab, lobster and various clams). NAFO manages a number of straddling stocks: cod in NAFO division(s) 3NO, redfish in 3LN and 3O, American plaice in 3LNO, yellowtail flounder in 3LNO, which flounder in 3L and 3NO, white hake in 3NO, capelin in 3NO, skates in 3NO, Greenland halibut in 3LMNO, squid in sub-areas 3 & 4, and shrimp in 3L (cf. Figure 36 below for divisions). In addition, NAFO manages discrete stocks on the Flemish Cap (3M): cod, redfish, American plaice and shrimp. Regulations for conducting fisheries in the NAFO Regulatory Area are outlined in the NAFO Conservation and Enforcement Measures (NCEM), and include:

- Catch and effort limitations
- Bycatch measures
- Recovery and rebuilding plans
- Conservation and management of sharks
- Vessel and gear requirements
- Protection of vulnerable marine ecosystems (VMEs)
- Fisheries monitoring, fisheries footprint and exploratory fisheries protocols

2.11.5 Existing management plans

The Flemish Cap Case Study area lies outside Canada's 200 nautical mile (370 km) EEZ established in 1977 and is therefore in the High Seas (international waters). There is no integrated spatial management plan for the study area and currently only one active fishing sector management plan, the NAFO management plan.

NAFO is the regional fisheries management organisation that has responsibility for fisheries management and conservation efforts in relation to groundfish, squid and shrimp in the SMA (NAFO Division 3LM) (Figure 36). The objective of the NAFO Convention is to ensure the long-term conservation and sustainable use of the fishery resources in the Convention Area and, in so doing, to safeguard the marine ecosystems. Moreover, the NAFO “Road Map to EAF” is a framework introduced in 2010 to develop an Ecosystem Approach Framework (EAF), as a guiding set of ideas involving scientists and managers.

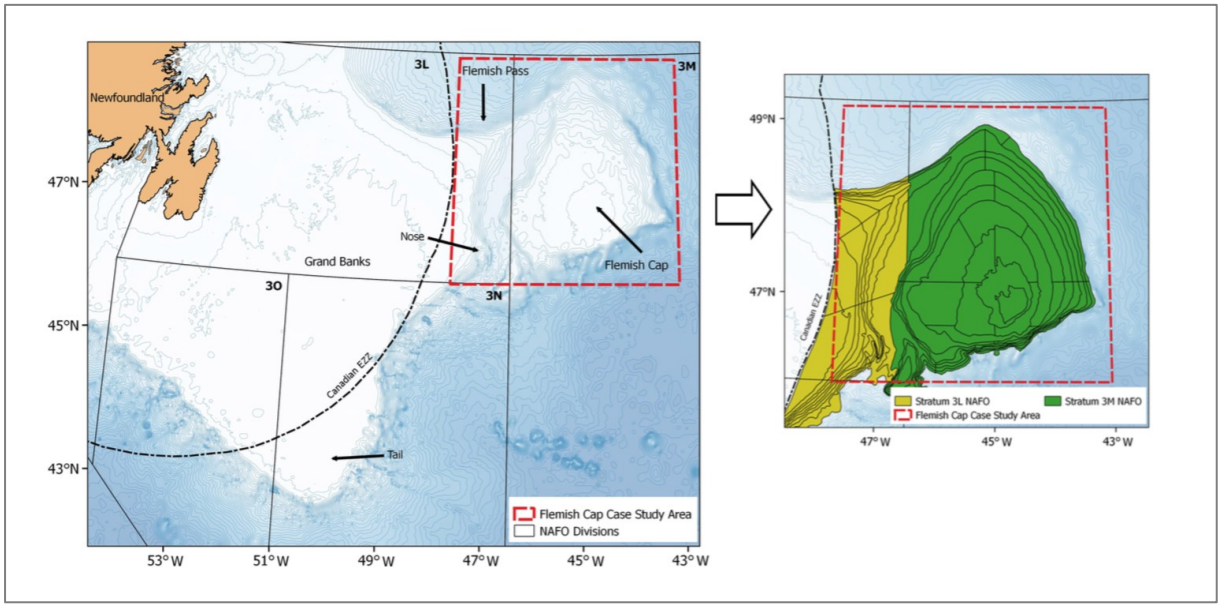

Figure 36. Flemish Cap study area (Flemish Cap and Flemish Pass) is located in 3LM NAFO Divisions.

The NAFO Conservation and Enforcement Measures (NAFO CEM, 2017) established a footprint area defined as the area where bottom fishing has historically occurred, in order to regulate bottom fisheries that may cause a significant adverse impacts on vulnerable marine ecosystems. Bottom fisheries may be conducted outside these areas if the Exploratory Fishing activities protocol is followed and the exploratory fishery is authorized by NAFO.

NAFO has identified 20 areas as being vulnerable to bottom contact fishing gears and subsequently closed these areas to bottom fishing (see Article 17 of the NAFO CEM). The VME closed areas are divided into two categories, the blue areas in the map below represent seamount closures, and the red areas represent coral and sponge closures (Figure 37). In 2016, the Fisheries Commission agreed to create a new closure (number 14 in Figure 38 below) on the Eastern Flemish Cap to protect significant concentrations of sea pens. As reflected in Article 17 of the NAFO CEM, this area will remain closed to bottom trawling activities until 31 December 2018. Additionally, areas 1-13 illustrated in Figure 38 will remain closed to bottom fishing activities until 31 December 2020. The coordinates for these areas are provided in Article 17 of the NAFO CEM. The Newfoundland Seamounts and the Beothuk Knoll have been identified as potential VMEs (NAFO 2008). The VMEs are closed to bottom fishing activities in the area, to manage habitat for corals such as gorgonians, black corals, sea pens, and sponges. These areas were created in response to the known sensitivity of corals and sponges (NAFO 2009).

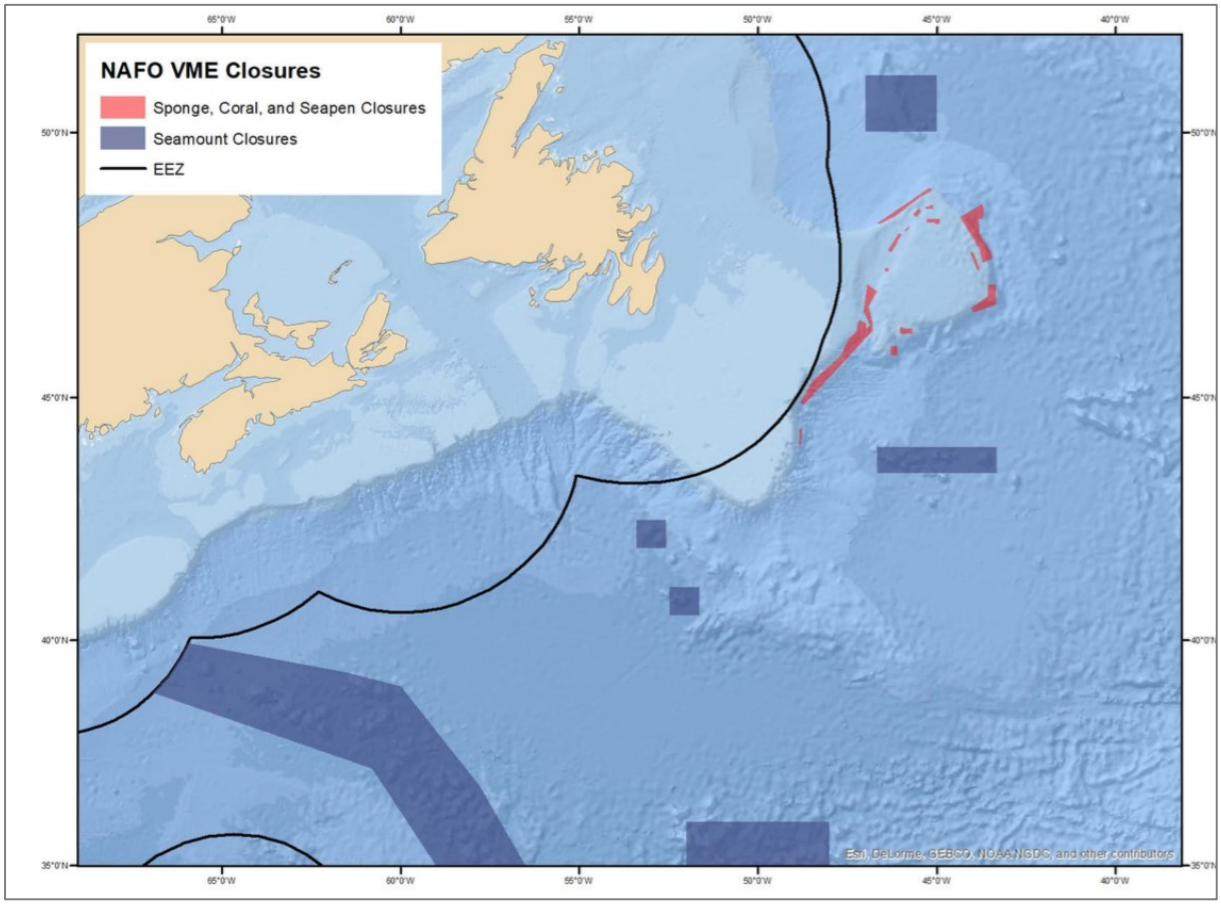

Figure 37. NAFO VME Closures (source: NAFO, 2017)

Figure 38 shows the Flemish Cap area together with the existing bottom fishing area (footprint) and the coral, sponge and sea-pen closures. The map of existing bottom fishing areas in the NAFO Regulatory Area is delimited on the western side by the Canadian EEZ boundary and the eastern side by the coordinates in Article 16 of the NAFO CEM.

Twelve of the 14 corals and sponges closed areas are within our Flemish Cap Case Study (see Figure 38). Only areas 1, 3 and half of area 2 are outside our geographical settings.

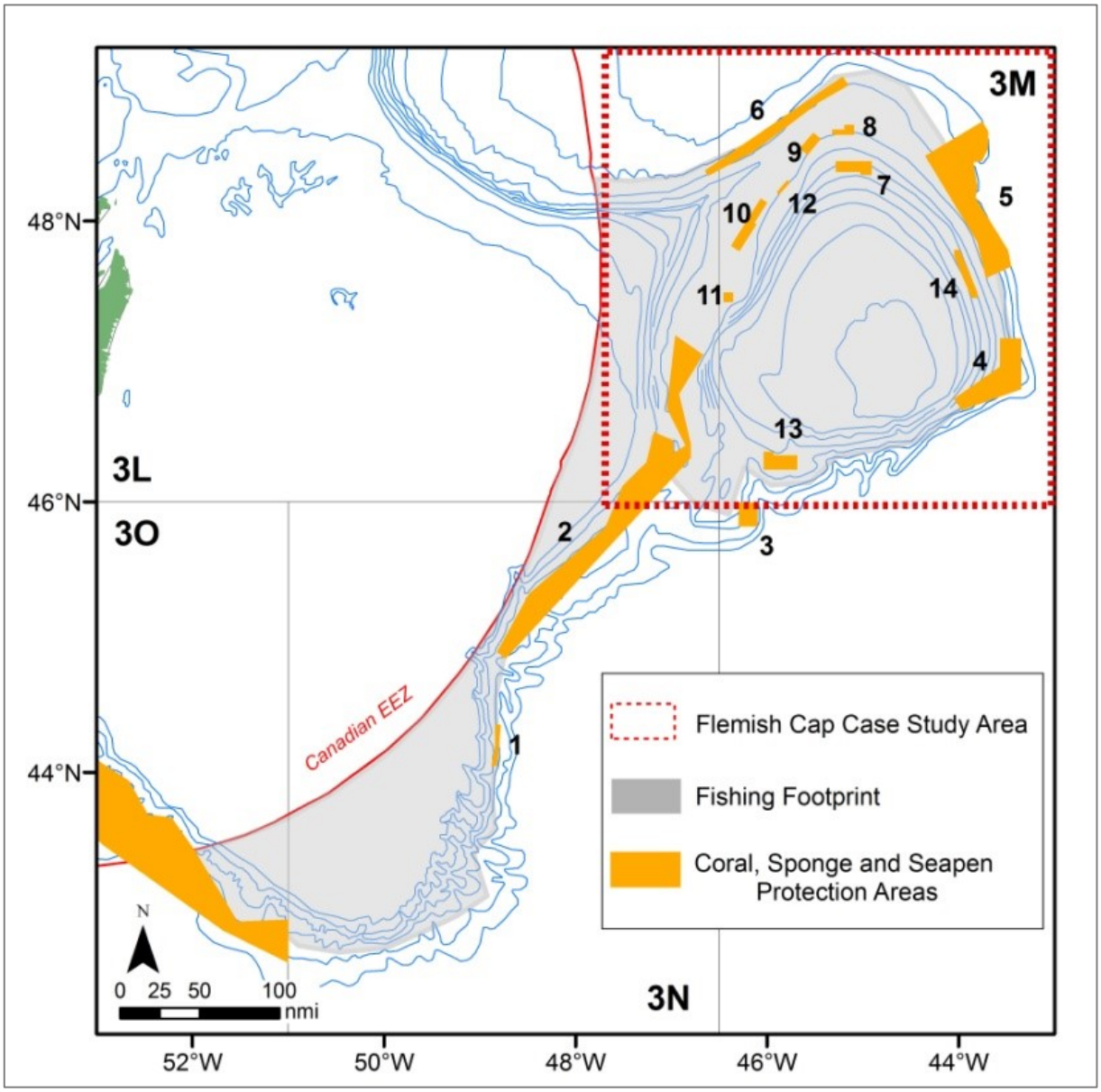

Figure 38. Study area with NAFO divisions, fishing footprint and coral, sponge and seapen protection areas (shapefiles from NAFO).

2.11.6 Goals and operational objectives for the SMA

The blue growth goal is to facilitate increased oil and gas exploration leading to potential extraction while minimising impacts on existing activities (particularly fisheries) and the presence of VMEs.

2.11.6.1 Operational Objectives

- Protect areas where VME are known to occur from bottom fishing activity in support of the conservation measures in the NAFO management plan .
- Maintain current fisheries at or close to MSY taking into account wider ecosystem impacts.
- Access the potential impacts of oil and gas developments.

2.12 Case Study 12: Mid-Atlantic Canyons, South-Eastern U.S. - Steve Ross (UNCW)

2.12.1 Study Area Description

The western North Atlantic Ocean between Cape Hatteras and Cape Cod (USA, Middle Atlantic Bight) is characterised by numerous and diverse submarine canyons that straddle the outer shelf and slope. Research interests in these canyons and associated ecosystems have increased in the last 20 years, largely in response to potential energy exploration and development. This ATLAS case study focuses on the area between Baltimore Canyon and Cape Hatteras but also draws on relevant data from recent studies on the Blake Plateau off the south-eastern US. This area represents a unique transition from the rocky and carbonate bottom Blake Plateau that is oceanographically dominated by the Gulf Stream to the softer sediment, canyon dominated area north of Cape Hatteras, influenced by colder currents.

2.12.2 Sectoral activities and Blue Growth opportunities

The main blue economy sector for the Mid-Atlantic Canyons area is fisheries, including commercial and recreational interests. Fisheries in federal waters are managed by the Mid-Atlantic Fishery Management Council. Most management is by individual species plans, but there is movement toward more integrated ecosystem based management. Most fisheries are currently operating at maximum sustainable levels and some are over-exploited. The area is used by shipping, the military, and there is interest in oil and gas exploration, wind and tidal energy, and mineral extraction. At present, there are no active oil and gas leases, but there are developing wind energy activities in more coastal waters.

2.12.3 Setting spatial boundaries for SMA assessment

At present, there is no single integrated management plan for the Mid-Atlantic Canyons area, although most of the region's canyons were recently protected from bottom disturbing activities. The boundary for the Spatially Managed Area for this case study is from Baltimore Canyon to Cape Hatteras and from approximately the 100 m isobaths to the 2000 m isobaths (Figure 39).

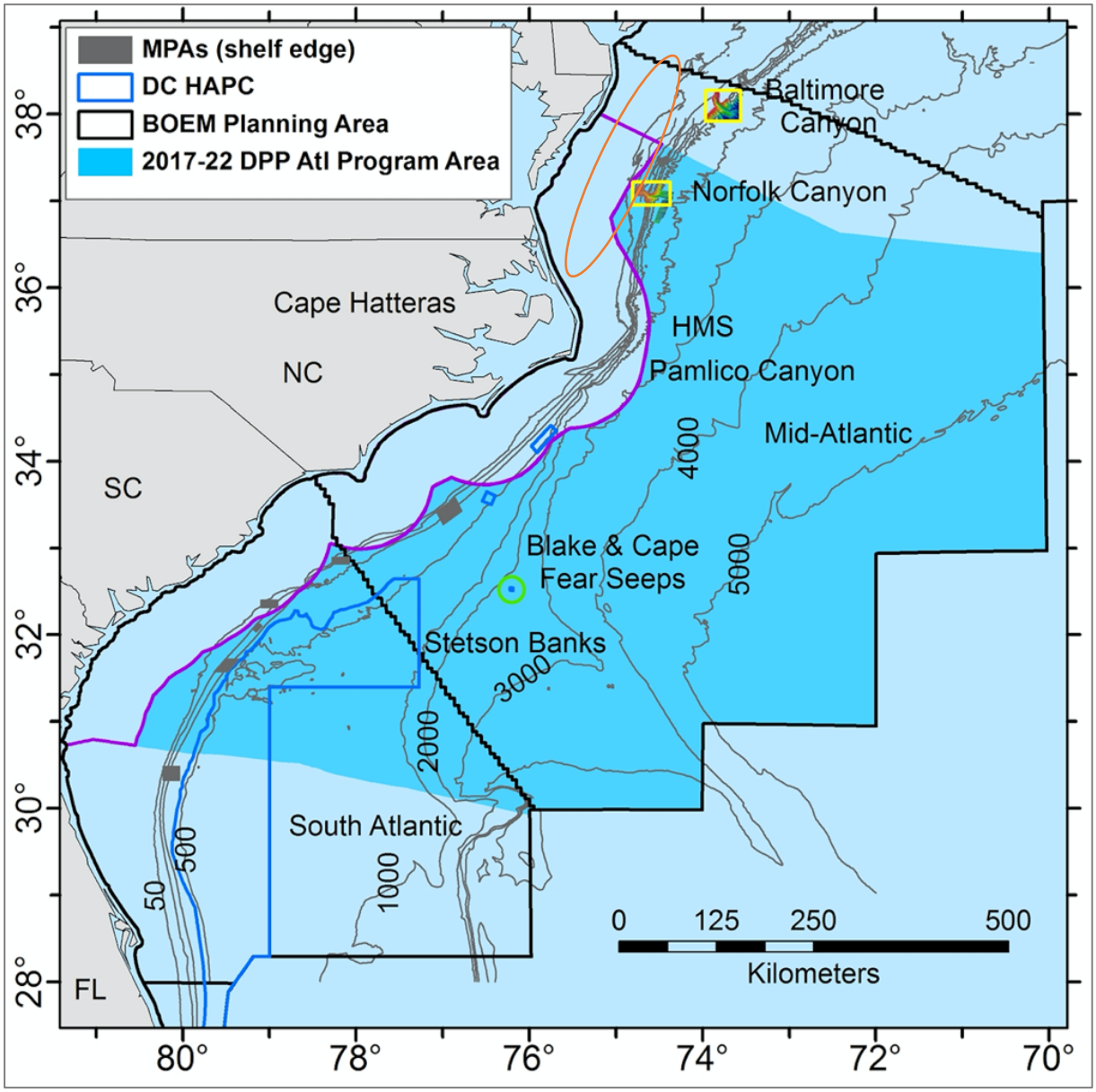

Figure 39. Western Atlantic area off the US middle Atlantic and south eastern coasts indicating major canyons, deep-sea coral Habitat Areas of Particular Concern (DCHAPC), shelf edge reef protected areas and the Bureau of Ocean Energy Management planning areas (blue shaded and black outline). The area most relevant to the ATLAS case study is approximately included within the red oval (Cape Hatteras to Baltimore Canyon).

2.12.4 Institutional landscape

This area lies within the EEZ of the United States. In 1976, the U.S. Congress passed Public Law 94-265, the Magnuson Fishery Conservation and Management Act. It extended the U.S. jurisdiction of fisheries out to 200 miles and created a new form of regional management framework through the creation of eight regional fishery management councils. Two of these councils operate in the Spatially Managed Area proposed for this case study. The South Atlantic Fishery Management Council is responsible for the conservation and management of fish stocks within the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia and east Florida to Key West. The Mid-Atlantic Fishery Management Council is responsible for the conservation and management of fishery resources within the federal 200-mile limit of the Atlantic off the coasts of New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia and North Carolina. The role of the councils is to

develop fishery management plans needed to manage fishery resources within federal waters. The area encompassing federal waters (EEZ) extends offshore from state waters (three miles in the South Atlantic) to 200 nautical miles.

On July 19, 2010, President Obama signed an executive order establishing a National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes. The executive order adopts the Final Recommendations of the Interagency Ocean Policy Task Force and directs federal agencies to implement them. The National Ocean Policy Implementation Plan describes specific actions federal agencies will take to address key ocean challenges, provide greater opportunity for state, local, and tribal engagement in marine planning decisions, streamline federal operations, save taxpayer dollars, and promote economic growth. The national policy identifies marine planning as one of nine priority implementation objectives to address conservation, economic activity, user conflict, and sustainable use of the ocean, our coasts, and the Great Lakes. Marine planning is intended to be regional in scope, developed cooperatively among federal, state, tribal, and local authorities, and include substantial stakeholder, scientific, and public input. This will promote more efficient and effective decision-making and enhance regional economic, environmental, social, and cultural well-being. There are nine regional planning areas including the Mid-Atlantic area. The planning process here is coordinated by the Mid-Atlantic Regional Planning Body established in April 2013. With a new administration in the US, which has less focus on environmental issues, execution of the activities proposed under the above policy is uncertain.

The Bureau of Ocean Energy Management (BOEM) is tasked with the development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way. The BOEM Office of Strategic Resources is responsible for the development of a Five Year Outer Continental Shelf Oil and Natural Gas Leasing Program. BOEM conducts Oil and Gas Lease Sales, sales related to wind energy, and negotiates Sand and Gravel agreements. Shore protection, beach nourishment, and coastal habitat restoration projects are the primary uses of sand and gravel. BOEM's Office of Environmental Programs prepares and oversees environmental reviews, including National Environmental Policy Act analyses for offshore energy and mineral development. In addition, BOEM develops, funds, and manages rigorous scientific research to inform policy decisions regarding the development of energy and mineral resources on the OCS.

2.12.5 Existing management plans

2.12.5.1 Fisheries Management

Both the South Atlantic and Mid-Atlantic Fishery Management Councils have designated a number of large conservation areas to protect canyons, deep-water corals and cold-seeps (Figure 40 and 41). Bottom disturbing activities, which are currently fisheries, are prevented within these protected areas.

Otherwise, all areas deeper than 200 m are open to fisheries. Fisheries in these regions are generally managed by individual plans at a species level (rather than spatial management). However, there is a move toward more inclusive ecosystem based management. Web sites for both councils provide details on the fishery management plans as well as habitat management strategies. Selected habitats can be designated as Essential Fish Habitat, increasing their management profile.

Additionally, in the mid-Atlantic, the Mid-Atlantic Regional Council on the Ocean (MARCO) was established to increase coordination of ocean management among the states of the region.

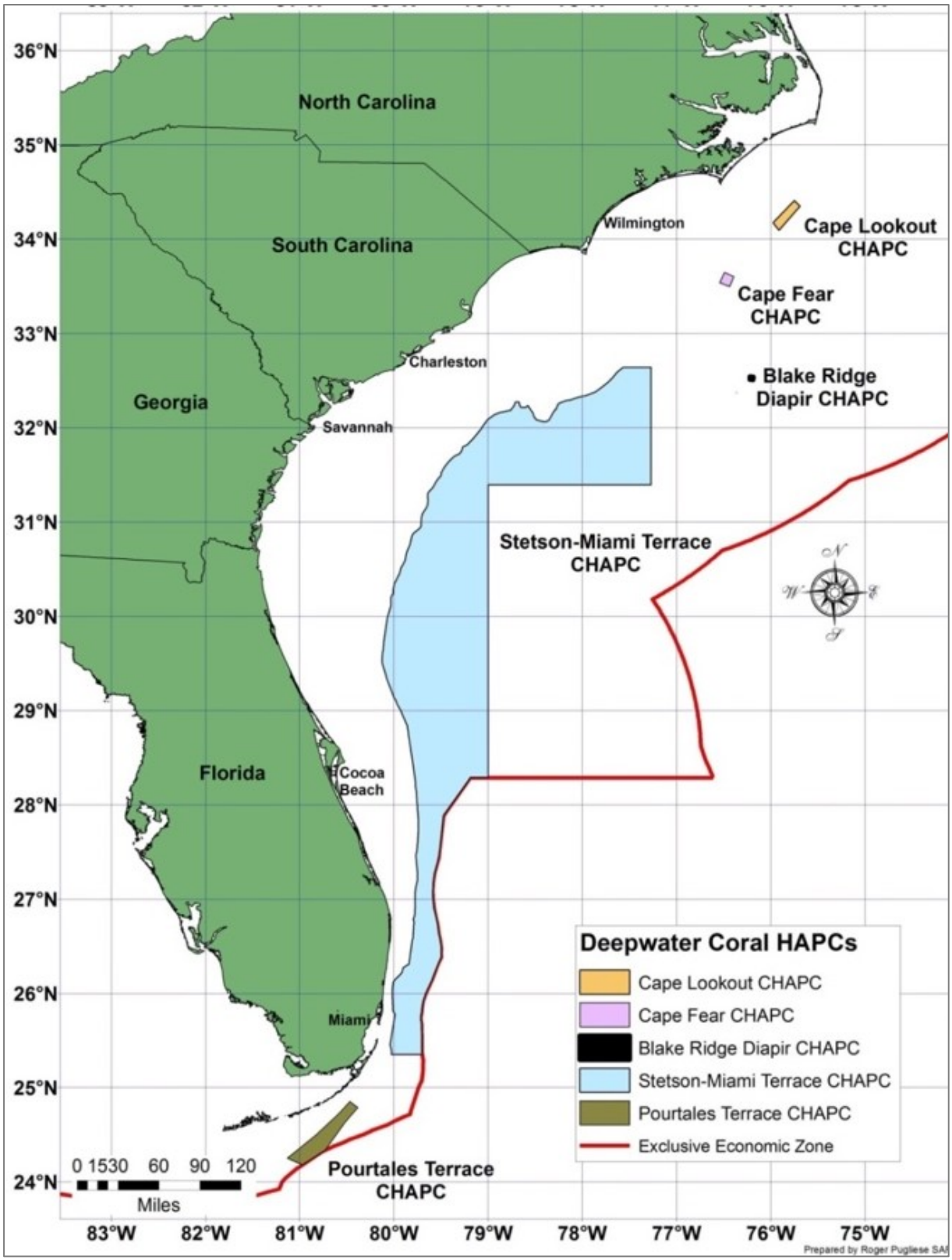

Figure 40. Deep coral Habitat Areas of Particular Concern (HAPCs) covering some 23,000 sq. mi. were established by the South Atlantic Fishery Management Council to protect deep coral & seep habitats off the south-east US.

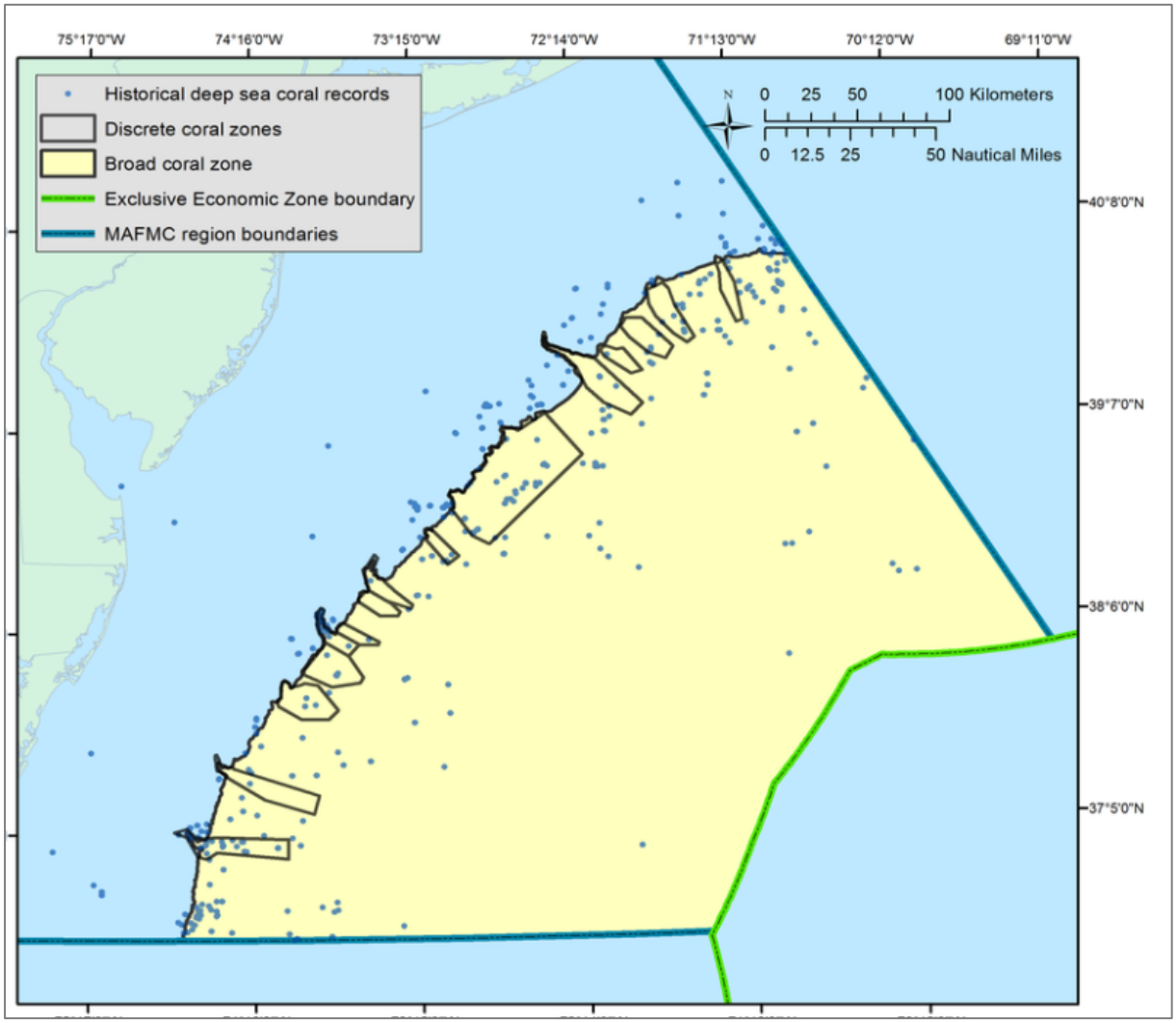

Figure 41. Mid-Atlantic Fishery Management Council's Deep-Sea Corals Amendment protects over 38,000 sq. mi. of bottom, focused on canyons and corals.

2.12.6 Goals and operational objectives for the SMA

The blue growth goal is to maintain or increase productivity of the fisheries while ensuring that vulnerable marine ecosystems are not compromised or significantly adversely affected. The potential for hydrocarbon extraction must be considered in relation to both fisheries and the presence of VMEs.

2.12.6.1 Operational Objectives

- Protect areas where VME are known to occur from bottom fishing activity as part of a network of marine protected areas.
- Maintain current fisheries at or close to MSY taking into account wider ecosystem impacts.
- Assess potential impacts of oil and gas developments.

3 Summary

Deliverable 6.1 reports on the first planning iteration in which case study leaders have applied MESMA Step 1 to delineate the extent of the spatially managed areas under consideration in their case studies have described existing sectoral activities, mapped the institutional landscape and provided information on (any) existing management plans. Each case study has set as a management goal for its SMA, the accommodation of a theoretical new blue economy/blue growth activity while ensuring minimum disruption to existing activities, and impact on delivery of ecosystem goods and services (including protection of VMEs and biodiversity) thus ensuring good environmental status as required by the Marine Strategy Framework Directive. See summary Table 1 below for more details.

Case Study SMA	Partner	Focus Ecosystems (CWC: cold-water coral)	Blue Economy/Growth Scenario
LoVe Observatory (Norway)	NIOZ/UiT	CWC reefs, sponges	Oil/gas exploitation
Faroe Shetland Channel (UK)	UEDIN	Sponge grounds	Oil/gas exploitation
Rockall Bank (UK & Ireland)	MSS	CWC reefs, coral gardens, carbonate mounds, sponge grounds, cold seeps	Fisheries; oil/gas exploitation
Mingulay Reef Complex (UK)	UEDIN	CWC reefs	Ecotourism
Porcupine Seabight and Bank (Ireland)	NUIG	CWC reefs, coral gardens, carbonate mounds, sponge grounds	Oil/gas exploitation
Bay of Biscay (France)	IFREMER	CWC on slope and in canyon settings	Fisheries; Natura 2000 SAC management
Gulf of Cádiz/Strait of Gibraltar/Alborán Sea (Spain & Portugal)	IEO	CWC reefs, coral gardens, sponge grounds	International marine research reference area
Azores (Portugal)	IMAR- UAz	Hydrothermal vents, seamounts, coral gardens, sponge grounds	Deep-sea mining
Reykjanes Ridge (Iceland)	MRI*	Hydrothermal vents, CWC reefs, coral gardens, sponge grounds	Fisheries; carbon sequestration
South Davis Strait/Western Greenland/Labrador Sea (Canada)	DFO*	WC reefs, coral gardens, sponge grounds	Expansion of Arctic fisheries; oil/gas exploitation
Flemish Cap (Canada)	IEO	Coral gardens, sponge grounds	Expansion of fisheries; oil/gas exploitation
South Eastern USA	UNCW*	CWC reefs on slope and in canyon settings	Oil/gas exploitation

*Table 1. A list of the blue economy/blue growth scenarios that will be applied in each case study spatially managed area (SMA) together with the key ecosystems located there. *Associate Partner*