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Towards Good Environmental Status

A Network of Marine Protected Areas for the North Sea

Dragonet © Peter Jonas

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Preface

The North Sea ecosystems today are driven by human impact rather than natural variability. Fisheries, shipping, extractive industrial uses, spatial needs for renewable energy and indirect impacts caused by marine pollution, invasive species and climate change are leaving a significant anthropogenic footprint. Hence, the potential for restoration and recovery is tremendous. Where habitats and species still occur at patterns and quality close to their natural range, distribution and status, there is an urgent need to preserve such features for future generations, and maintain ecosystem functions as well as ecological goods and services for the people depending on them.

To reverse this situation, North Sea states' governments and stakeholders have taken onboard important and ambitious commitments to, *inter alia*:

- Complete the Natura 2000 network based on the provisions of the EU Habitats and Birds Directives soonest;
- Secure favourable conservation status in this context;
- Establish an ecologically coherent network of well-managed marine protected areas (MPAs) by 2010 as agreed in the context of the OSPAR Convention on the Protection of the Marine Environment of the North-East Atlantic;
- Afford effective protection for threatened and/or declining Species and Habitats identified by OSPAR;
- Meet a set of defined Ecological Quality Objectives (EcoQOs) as set out by OSPAR;
- Improve their marine spatial planning systems, including transboundary co-operation; and
- Take measures to achieve Good Environmental Status (GES) by 2020 as required by the EU Marine Strategy Framework Directive (MSFD) which entered force in 2008.

This report intends to inform the overall process towards Good Environmental Status (GES) with particular focus on the role of marine protected areas. It is led by the following conservation vision:

The North Sea ecosystems mirror species compositions and habitat qualities, as well as food web structure, function and processes driven by natural variability rather than human impact. The North Sea is valued by people as a unique and rich marine ecosystem, a source of healthy food, recreation, culture and livelihoods, and serving as a pillar for the region's economic well-being.

As a step to approach this vision, this report concentrates on the selection, nomination and designation of protected areas in the first place, including identifying the gaps in governmental designations and serving as a piece of shadow information for governments and intergovernmental bodies concerned. However, this does not go without looking into management perspectives and consequences. While other organisations and institutions promote the establishment of large 'no-go' areas, WWF supports the development and integration of sites and measures fitting the specific objectives and necessities. Fisheries are considered the biggest single threat to marine biodiversity and, hence are the one human activity that needs the most attention when it comes to the implementation of protective measures in conservation MPAs. The following points shall give a first indication of criteria for fisheries measures in Natura 2000 sites, the most important framework for conservation in the European Union:

- WWF does not promote a no-fishing policy in Natura 2000 sites. However, certain areas should be established, in which no human activities take place and human influence is reduced to an absolute minimum. Such areas will be essential components of a regime to achieve a Good Environmental Status of our seas and crucial for research.
- WWF believes that in order to achieve the favourable conservation status Member States are to reach for their Natura 2000 sites and OSPAR MPAs, bottom trawling will need to be excluded from those sites established or nominated to protect the habitat and/or associated fauna.
- In other parts of MPAs, sustainable fisheries (and other use) will be possible, under very strict conditions. For example, set nets can have negative impact on harbour porpoises. They will have to be excluded from those sites established or nominated to protect the harbour porpoise or additional measures (like pingers) have to be used.
- Within MPAs, there has to be a limit on fishing intensity to prevent cumulative negative impact in light of the additional human activities mentioned above.

Bearing in mind that pilot management schemes are aleady underway in certain parts of the North Sea, including existing Natura 2000 sites and/or OSPAR MPAs, WWF remains committed to constructively inform and assist that important follow up process.

Stephan Lutter

Content

1 Introduction and message

1.1 Introduction

"*The marine environment is a precious heritage that must be protected, preserved and, where practicable, restored with the ultimate aim of maintaining biodiversity and providing diverse and dynamic oceans and seas which are clean, healthy and productive.*" (Marine Strategy Framework Directive, Recital 3)

For the next decades, the European Marine Strategy Framework Directive (MSFD 2008)[1] will set the political framework and direction for action: delivering Good Environmental Status (GES) of the North Sea.

The North Sea has much to offer: it is or at least was rich in natural resources like fish, shellfish and algae, it is one of the globally most important places for oil and gas production, and increasingly for power generation from wind, currents and tides.

In line with the EU Lisbon Strategy which primarily aims to increase the European economic competitiveness on the global markets, many people and interest groups consider the North Sea to be a mere extension of the coastal states' territory, ready for being used for economic profit. This involves the placement of ever more structures such as production platforms and wind farms together with pipelines and cables, aquaculture installations etc. In addition, the North Sea provides the basis for industries such as the maritime transport sector, tourism, sediment aggregate extraction, fishing and aquaculture. And it is still used as a dump site, sometimes illegally, for dredged materials, ships waste and litter. Riverine discharges still enrich the North Sea with nutrients, heavy metals and organic pollutants.

Further to the direct benefits and use provided by the North Sea, its ecosystems have an important role to play in regional and global processes such as atmospheric and climate regulation, nutrient cycling, carbon sink and sources of sediment for coastal processes. For science, recreation and tourism, it is a resource for learning, studying and understanding.

Therefore, the North Sea generates a considerable value in goods and services, the value created by fishing being only a minor fraction of the overall value generation. However, unlike most other industries profiting from the North Sea´s goods and services, sustainable fishing depends on an intact ecosystem.

These ecosystems and the living resources they produce are under high pressure, and in particular, the fish stocks are in strong wide scale decline, as summarised by Laffoley and Tasker (2007): fishing is considered to be the most significant human activity causing change, and reducing the resilience of the marine environment to other pressures, such as climate change. Stock sizes have been reduced to below safe biological limits, the intraspecific genetic pool has been modified and the fishing of non-target species and impacts on habitats interferes with ecosystem functioning.

So there is a considerable gap between the ambitious objectives of the Marine Strategy Framework Directive and today's reality. However, in concert with tools developed by OSPAR (e.g. Ecological Quality Objectives, OSPAR 2009), the MSFD outlines all relevant tools for making progress towards Good Environmental Status, i.e. it

- Recognises the important contribution made by marine protected areas (MPAs), including areas already designated or to be designated under the EU Habitats[2] and Birds[3] Directives and under international or regional agreements to which the European Community or Member States are Parties[4](§6);
- Reaffirms the will to proceed towards the creation of coherent and representative networks of MPAs as signed up for at the World Summit on Sustainable Development and in the Convention on Biological Diversity, approved by Council Decision 93/626/EEC (1); and
- Explicitly refers to limiting the collective pressure on the ecosystems to levels which do not compromise the achievement of Good Environmental Status and the capacity of the ecosystem (Art. 1 §3).

Some general ideas about what constitutes a Good Environmental Status (GES) are given in Annex 1, MSFD, including for example:

"*Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.*" (1)

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF

[2] Council Directive 92/43/EEC of 21 May 1992

[3] Council Directive 79/409/EEC of 2 April 1979

[4] e.g. OSPAR Recommendation 2003/3 on a Network of Marine Protected Areas http://www.ospar.org/documents/DBASE/DECRECS/Recommendations/or03-03e.doc

"*All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the longterm abundance of the species and the retention of their full reproductive capacity.*" (4).

For each region and subregion, the riparian member states shall agree on the characteristics of the GES and "*by reason of the transboundary nature of the marine environment, Member States should cooperate to ensure the coordinated development of marine strategies for each marine region or subregion.*" (§13)

In order to achieve GES, an ecosystem-based approach to the management of human activities has to be applied, and the MSFD makes clear that "*while enabling a sustainable use of marine goods and services, priority should be given to achieving or maintaining good environmental status in the Community's marine environment, to continuing its protection and preservation, and to preventing subsequent deterioration.*" (Recital 8)

The EU Integrated Maritime Policy (2007) takes up the need for regional cooperation and requests common principles and guidelines for national maritime spatial planning, "*a fundamental tool for sustainable development of marine areas and coastal regions, and for the restoration of Europe's seas to environmental health.*"

1.2 MPAs in the framework of an ecosystem approach and spatial planning

Holistic, cross-sectoral maritime spatial planning is one of the delivery tools of an ecosystem-based management (...). Therefore, MPAs, their conservation goals and spatial needs have to be at the heart of an integrated regional spatial planning process which aims to minimise conflicts between particular conservation requirements of MPAs and sustainable uses.

The conservation direction cannot be to return to some vague historic state but must look forward to a future where human impacts on the ecosystem are minimised, in particular those increasing (eutrophication), decreasing (pollution) or removing (fishing) some parts of it to an extent where the balance in the food webs is manipulated. The overall goal must be to reverse the trend of the still increasing spatial use and disruption of the North Sea ecosystems towards establishing truly sustainable (long-term ecologically and economically viable) human practices everywhere, for delivering a maximum of goods and services (Fig.1.1).

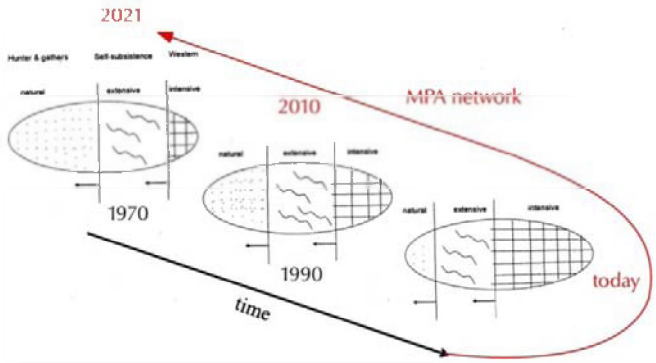


Fig. 1.1: The development of human use of natural goods of the North Sea over time: today, most of the North Sea is intensively used (cross-hatched, including some of the fishing activities), some extensively (hatched), and a very few places remain inaccessible (white).[5]

In terms of management practice, a zoning approach of the marine space to particular uses and ecological functions is the way forward. Apart from zones for particular uses, this will have to comprise zones for restoration and conservation of marine (sub)ecosystems, with a limited access regime up to areas fully closed for extractive uses (marine reserves and reference areas). Different levels of management action may thus be required inside as well as outside designated marine protected areas.

A zoning approach can therefore open the avenue for designating particular management zones, regulated by controlled access regimes for all sectors. Such a system is comparable to spatial use and allocation on land (and for most uses within national jurisdiction at sea) and has the advantage of providing rather than prohibiting access. Rights can be granted based on a truly integrated assessment of environmental impacts, with conservation priorities being observed.

A network of MPAs is one of the most important tools available for achieving GES at least in some core areas within the time frame set. Provided the MPA management system allows for achieving the conservation objectives, their contribution will be a.o. (English Nature 2003):

- The recovery of ecosystem structure and function across the range of subsystems;
- The maintenance and enhancement of ecosystem goods and services;
- Sustainability, insurance and risk management by ensuring a backup against management failures outside the network; and

[5] Figure modified after figure in SEBI Expert Group "Sustainable Management" draft report (2006)

- Reference to deliver areas that have recovered to a degree that tells us how and what the marine environment should actually look like.

The ecologically coherent network of well-managed MPAs as aspired to be established in 2010 by OSPAR and HELCOM will consist of the European Natura 2000 network comprising protected areas for a selected subset of species and habitats, and additional MPAs according to the criteria set by the conventions. To date, not a single MPA has been nominated to OSPAR which does not in the first place fulfil the criteria of the EU Habitats or Birds Directives. Nor have original Natura 2000 sites been nominated with a set of wider conservation objectives (OSPAR BDC 09/5/4 Rev.1-E) such as for the protection of species and habitats under threat and/or decline listed by OSPAR[6].

In line with the approach taken by the EU Habitats and Birds Directives and OSPAR, we only consider areas designated for wider nature conservation as MPAs here. However, there are also other types of MPAs such as temporal or metier-specific fisheries closures as part of the commercial fisheries management regime, areas of archaeological interest, military exercise areas, and safety zones around marine structures which act as *de facto* reserves.

Given the long-term ecosystem changes already caused by in particular bottom trawling acitivites in the North Sea (Chapter 3), it will be essential to limit access to and fishing effort exercised in MPAs in order to achieve the nature conservation goals, in particular also for achieving 'favourable conservation status' in the Natura 2000 areas. OSPAR has not yet set out specific conservation objectives for its MPAs.

However, as essential as developing an effective management regime for the individual MPA will it be to establish regional integrative management strategies to prevent the displacement of fishing effort. The overall need to reduce fishing effort and fleet size should be instrumental to guiding the solution finding.

1.3 OSPAR network principles

OSPAR MPAs individually and collectively aim to "*protect, conserve and restore species, habitats and ecological processes which are adversely affected as a result of human activities", "prevent degradation of and damage to species, habitats and ecological processes following the precautionary principle" and protect and conserve areas that best represent the range of species, habitats and ecological processes in the OSPAR area.*" (OSPAR 2003-17)[7]

OSPAR has developed guidance on developing an ecologically coherent network of MPAs (OSPAR 2006-3)[8]. The document specifies that a network is characterised by a coherence in purpose and by the connections between its constituent parts. Networks can also be designed to be resilient to changing conditions.

- A network's constituent parts should firstly be identified on the basis of criteria which aim to support the purpose of the network.
- The development of an ecologically coherent network of MPAs should take account of the relationships and interactions between marine species and their environment both in the establishment of its purpose and in the criteria by which the constituent elements are identified.
- A functioning ecologically coherent network of MPAs should interact with, and support, the wider environment as well as other MPAs although this is dependent on appropriate management to support good ecosystem health and function within and outside the MPAs.

The principles set out for selecting sites as part of the ecologically coherent network of MPAs include:

- Representation of species (both mobile and sessile), habitats (both pelagic and benthic by EUNIS habitat classes), and ecological processes;
- Representation of biogeographic units;
- Adequacy, threatened and/or declining species and habitats to be represented with 20-60 % of the existing population/habitat extent, representative features with 20 % (not binding);

[6] http://www.ospar.org/documents/DBASE/DECRECS/Agreements/08-06e_OSPAR%20List%20species%20and%20habitats.doc

[7] OSPAR Guidelines for the Identification and Selection of MPAs in the OSPAR Maritime Area. http://www.ospar.org/documents/DBASE/DECRECS/Agreements/03-17e_Guidelines%20identification%20MPA%20update%202007.doc

[8] http://www.ospar.org/documents/DBASE/DECRECS/Agreements/06-03e_Guidance%20ecol%20coherence%20MPA%20network.doc

- Connectivity; and
- Resilience - as a management target.
- Replication of habitats, species and ecological processes is considered desirable where possible.
- The size of the site should reflect the integrity and spatial need of the feature to be protected and enable successful management.
- The management shall ensure the protection of the features for which the sites were selected, and the functioning of an ecologically coherent network.

So far, these principles and the related scorecard for the assessement of the ecological coherence achieved (OSPAR 2007-6)[9] cannot be applied, as the number of nominations for OSPAR MPAs in the North Sea outside territorial waters is very limited. However, they will provide an important tool for assessing the qualities of the OSPAR network of MPAs in 2010.

1.4 The objective of the report

This report takes stock of the progress so far achieved by national governments around the North Sea at designating, and selecting sites as a contribution to a national and regional, ecologically coherent and representative network of MPAs. As this progress is still limited, we want to provide an inspiring look into the future: what might an ecologically coherent and representative network of (well-managed) marine protected areas look like? How could the currently designated and selected set of MPAs be developed further so that the principles of a functioning network, connectivity, replication, representation are realised?

WWF (Denmark, Germany, Netherlands, UK, Norway and Sweden), the North Sea Foundation (NSF) and a Belgian NGO coalition led by Natuurpunt (hereafter the NGO coalition) recognise that the establishment of an ecologically coherent, representative network of MPAs in the North Sea is a scientific and management challenge and will be an ongoing exercise for many years. The first step in the process is the designation of Natura 2000 and OSPAR areas. The North Sea states are currently working on it, especially on Natura 2000. **The aim of this report is to accelerate this process and in particular, to point out the need for designating MPAs according to OSPAR criteria and complementary specially managed areas (Blue Belts) with a view to achieving GES and halting the decline of biodiversity.**

Therefore, the NGO coalition launched several national studies, investigating the potential for further offshore marine protected areas eligible under the criteria of the EU Habitats Directive and for OSPAR MPAs:

- Belgium: Slabbinck *et al.* (2008) recommend additional Natura 2000 and OSPAR MPAs in Belgian waters. Natuurpunt (BirdLife International), North Sea Foundation (NSF) and Kustvereniging.
- Denmark: Andersen (2007) recommends sites in the Danish North Sea EEZ which are eligible under the EU Habitats Directive. Report to WWF Denmark[10].
- Germany: Finger (2005), Deppe (2006) and Koschinski (2006) recommend additional Natura 2000 and OSPAR MPAs in the German North Sea EEZ. Reports to WWF Germany.
- The Netherlands: Hugenholtz (2008) and North Sea Foundation (NSF) recommend additional Natura 2000 and OSPAR MPAs in the Dutch North Sea EEZ. Report to WWF Netherlands[11] and NSF brochure[12].
- United Kingdom: Gubbay (2007) compiles all work done by JNCC and recommends additional OSPAR MPA. Report to WWF Germany and UK (unpublished).

This report synthesises the national MPA proposals from the perspective of the Greater North Sea and its ecological subregions, namely the Southern North Sea, the Northern North Sea, the Norwegian Trench and Skagerrak region and the Scottish Continental Shelf and Faroe-Shetland Channel. Neither the English Channel nor the Kattegat are included in this report´s scope. It was felt necessary to subdivide the Greater North Sea into ecological subunits based on their distinct ecological qualities (see Chapter 4) in order to make an assessement of ecological coherence possible. The subregions are based on previous proposals such as from the UK (DEFRA 2005).

[9] OSPAR (2007-6) Guidance for the design of the OSPAR Network of Marine Protected Areas: a self-assessment checklist http://www.ospar.org/documents/DBASE/DECRECS/Agreements/07-06e_Guidance%20MPA%20ecoc oh%20self%20assessmt%20chcklist.doc

[10] http://www.wwf.dk/dk/Materiale/Files/Nyheder/Nyhed+4.+jan.+2008.+Rapport+An+Assessment+of+the+need+for+and+Feasibility+of+Nominating+Ad

[11] http://assets.panda.org/downloads/the_dutch_case___a_network_of_marine_protected_areas_by_e_hugenholtz_2008.pdf

[12] http://www.noordzee.nl/dossiers_artikelen.php?mainID=6&subID=5

In addition to the individual MPAs proposed, representation and coherence of the set of sites shall be achieved by integrating the MPAs as core zones into wider Blue Belts, specially managed areas comparable to IUCN management category VI. This approach reflects one possible strategy for developing a network of MPAs. Due to limitations in data availability, it was compiled in a knowledge-based, non-systematic manner. In particular the MPAs proposed for protecting species and habitats on the OSPAR List must be taken as showcases rather than a fully comprehensive set of proposals.

1.5 Selection principles applied

The principles applied when selecting sites for a North Sea MPA Network include:

- A network of ecologically coherent and representative MPAs has to be selected and assessed on the basis of an ecoregional unit, in this case the Greater North Sea and its ecological subregions (Southern North Sea, Northern North Sea, Scottish Continental Shelf, Norwegian Trench and Skagerrak).
- The selection criteria are ecological qualities and functions of the site. As a starting point, criteria of Natura 2000 and OSPAR have been applied.
- The network reflects the continuity of habitats and ecological processes from the coast to deep-water/ the continental shelf.
- Transboundary MPAs reflect the continuity of marine habitats and species.
- The individual sites which make up the MPA network need to be sufficiently large to ensure the maintenance recovery of the local ecosystem at/to a state which is characteristic of an environment of minimised anthropogenic impacts.
- Connectivity and replication will be implicitly achieved, via the size of the sites, supported by the Blue Belts.

The final aim is that the MPA networks established will represent:

- Typical examples of all natural habitats/biotopes;
- All essential ecological processes in the water column and on the seafloor that drive the ecosystem; and
- Essential habitats for migratory and mobile species.

In practical terms, the MPA network selection process departs from the stock of sites already designated, selected or proposed by the national governments and their advisory bodies, respectively, as well as proposals made by NGOs and other stakeholders. Therefore, for the Southern North Sea highest priority was given to establishing a Natura 2000 shadowlist which is as comprehensive as possible. For other parts of the North Sea subject to Community legislation this is more difficult to achieve due to wide gaps in research.

The proposed MPA network is based on the nature conservation aspects covered by the Natura 2000 and OSPAR selection criteria only. In that sense, fishes are included only in so far as they are a) listed by OSPAR as under threat and/or decline and b) not highly mobile but rather living associated to a particular habitat. This is the main difference to the MPA network proposal made by Greenpeace (2006) and Roberts and Mason (2008) who explicitly include the objective to establish marine reserves for the restoration of commercially targeted fish stocks.

Therefore, this report elaborates on a network proposal at three different levels based on:

1. **Natura 2000** sites as eligible under the EU Habitats Directive (proposed Sites of Community Importance, pSCIs and/or Special Areas of Conservation, SACs) based on best available knowledge e.g. reefs, submerged sandbanks, harbour porpoise habitat;
2. Supplemented by showcase examples of MPAs for the protection of species and habitats on the **OSPAR List**[13], e.g.
   - Spurdog (*Squalus acanthias*)
   - Porbeagle (*Lamna nasus*)
   - Common skate (*Dipturus batis*)
   - Thornback ray (*Raja clavata*)
   - Deep sea sponge aggregations
   - *Lophelia pertusa* reefs
   - *Modiolus modiolus* beds
   - *Ostrea edulis* beds
   - *Sabellaria spinulosa* reefs
   - Ocean quahog (*Arctica islandica*)
   - 'Sea-pen and burrowing megafauna communities'; and
3. Completed by a first draft of **Blue Belts**.

[13] http://www.ospar.org/documents/DBASE/DECRECS/Agreements/08-06e_OSPAR%20List%20species%20and%20habitats.doc

For a fully coherent proposal, additional sites for the protection of seabirds at sea and for recovering mobile fish species back to biologically safe stock levels will need to be added, spatial overlap and synergies will need to be explored.

1.6 Blue Belts

Blue Belts are meant to be specially managed areas which not necessarily have to be designated as MPA but are comparable to IUCN category IV-VI management zones (Dudley 2008, see Annex for explanation).

The criteria used for placing the Blue Belts were:

- Representation and connectivity - by ranging from the coasts offshore, from shallow to deep-water, they include as much habitat heterogeneity as possible and provide an ecological link between the habitats represented in individual MPAs; and
- Importance for OSPAR-listed species and habitats.

The Blue Belts extend the representativity of habitats encompassed beyond the criteria used for designating the MPAs. Therefore, they bridge the gap between the selective demands for the conservation of individual species and habitats as formulated by the EU Habitats Directive, and the more generalistic view expressed by OSPAR (Recommendation 2003/3) and the Convention on Biological Diversity (CBD) to establish an ecologically coherent, representative network of MPAs covering all waters.

We want the Blue Belts to be priority areas for the conservation of species and habitats towards achieving a Good Environmental Status (GES) of the North Sea:

- Buffer zones around the designated MPAs;
- Priority areas for delivering transboundary spatial planning and MPA managment;
- Best environmental practice zones; and
- Priority areas for delivery of good environmental status.

1.7 The management system envisaged

This layered approach can fit within a spatial planning procedures framework. Thus:

- An ecologically coherent network of MPAs consisting of Natura 2000 sites, OSPAR MPAs and any additional national designations which are clearly MPAs (either multi-use or highly protected) delivers the core protection zones.
- A series of North Sea Blue Belts (specially managed areas), will provide priority areas for targeted management, i.e. to protect the OSPAR-listed habitats and species from further impacts. Being managed for example to allow only MSC certified or otherwise environmentally friendly fisheries ('Smart Gear') they provide buffer zones around the designated MPAs.
- The wider North Sea will need to be managed on a precautionary basis, allowing for sustainability of ecosystems and uses. Marine spatial planning may be a tool to achieve a balance of interests.

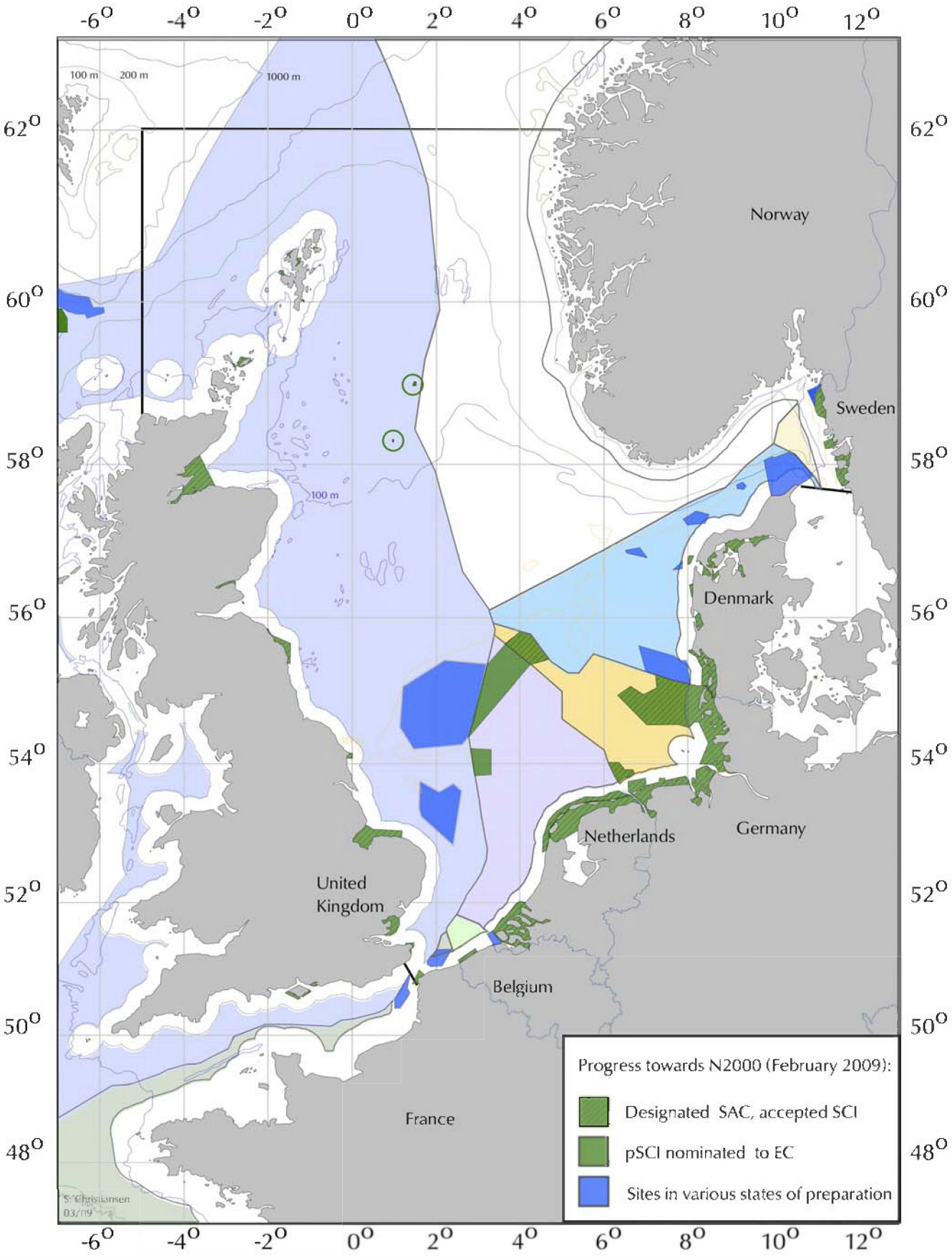
This approach can be seen as a starting point for the transfer process towards regaining a Good Environmental Status of the North Sea. Ultimately, all over the North Sea, human uses should be compatible with thriving, mainly naturally driven marine ecosystems. Laffoley and Tasker (2007), focussing primarily on fishing, provide a list of broad objectives for the ecosystem that need to be achieved while managing human activities in the marine environment:

- To ensure that ecological processes in the sea are not compromised by human activities;
- To ensure that management is conducted at spatial and temporal scales that maintain marine biological diversity;
- To maintain viable populations of all native marine species in functioning biological communities;
- To include within a spectrum of protected areas, representatives of all marine habitat types across their natural range of variation; and
- To accommodate human uses of the seas and the economic, social and cultural aspirations of people within these constraints.

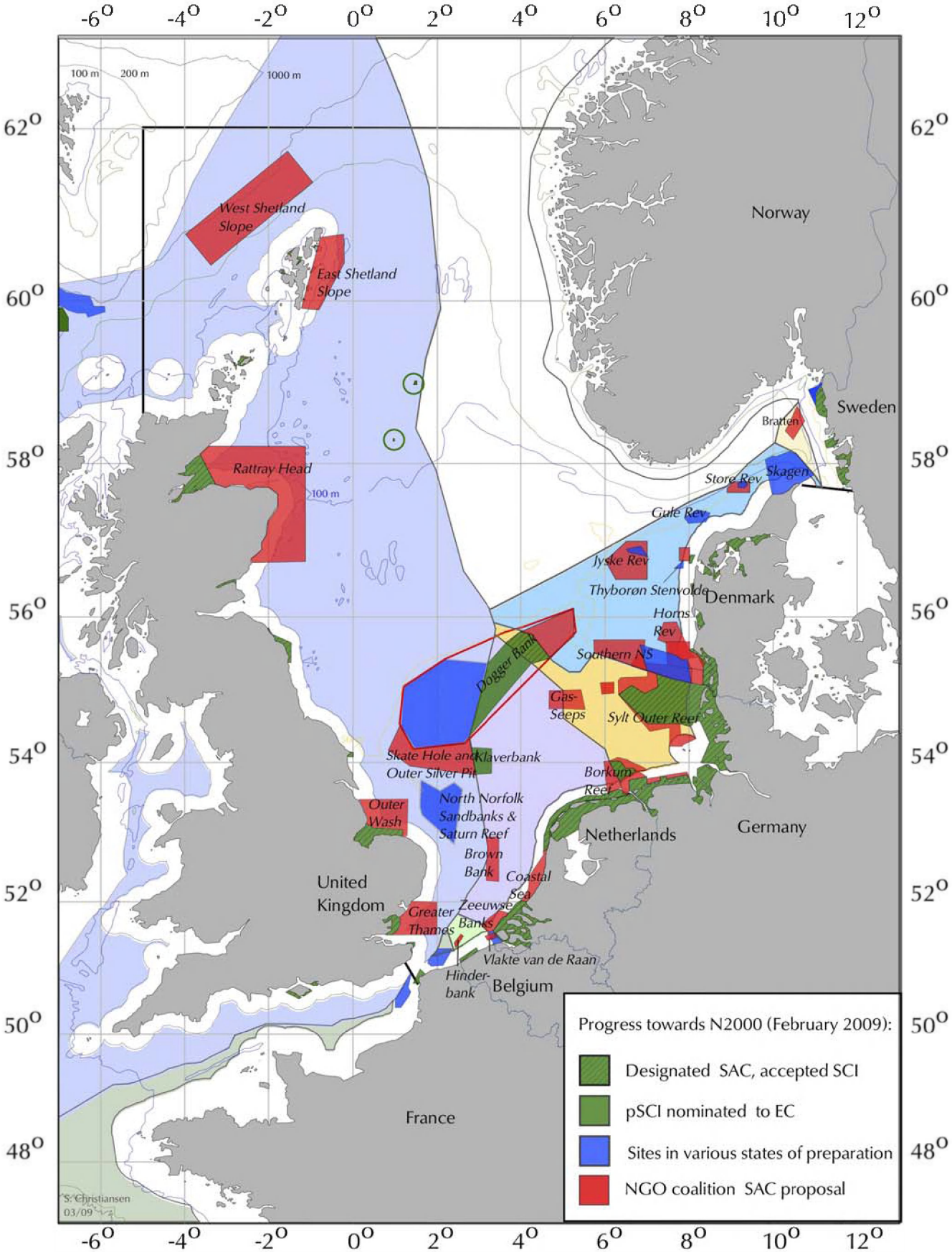
As becomes clear from the above, the designation and effective management towards a favourable conservation status of marine protected areas can only be one among several tools employed to work towards the Good Environmental Status of the North Sea.

2 The proposed North Sea MPA network maps

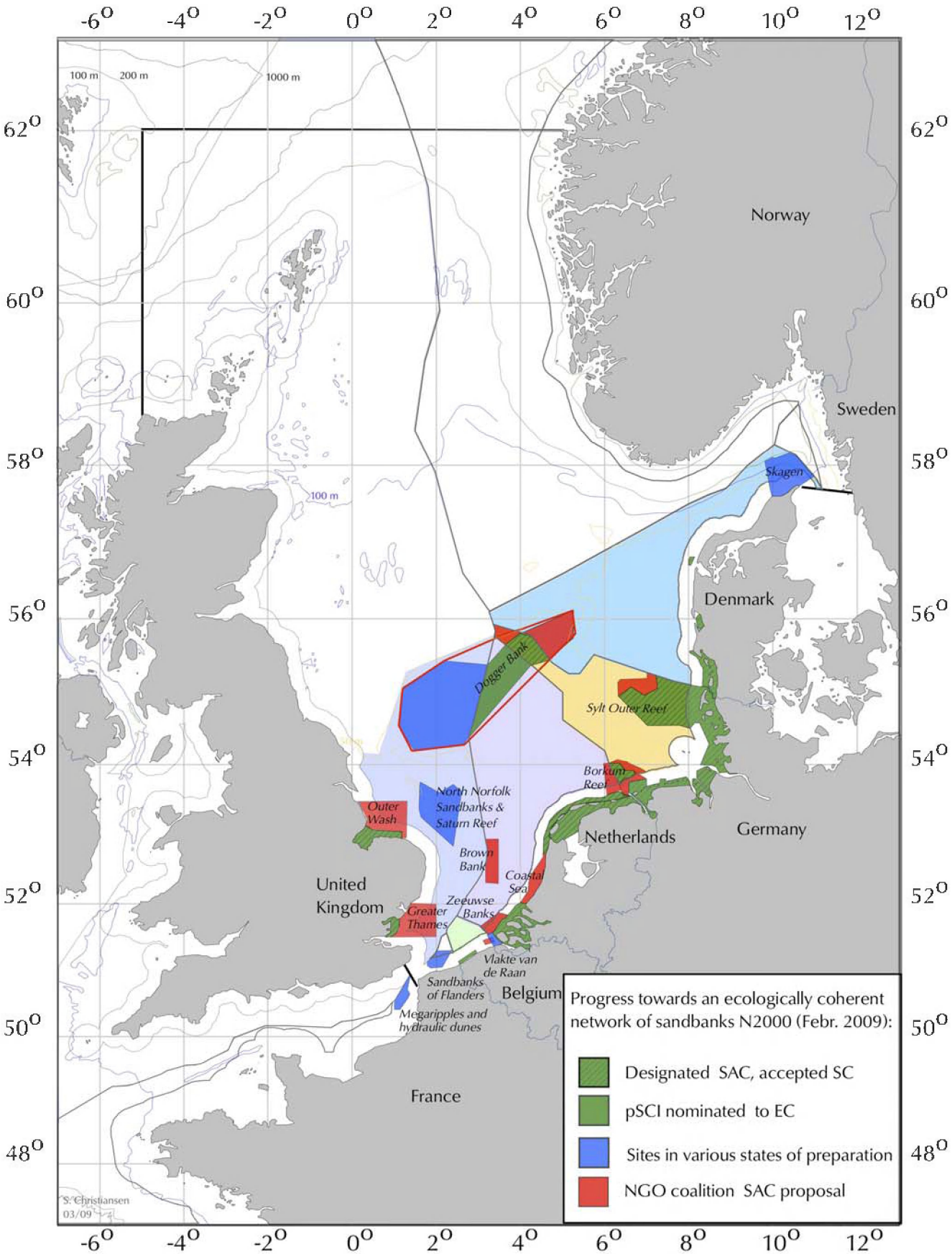
2.1 North Sea MPA network 2009 - Habitats Directive. Progress of national governments



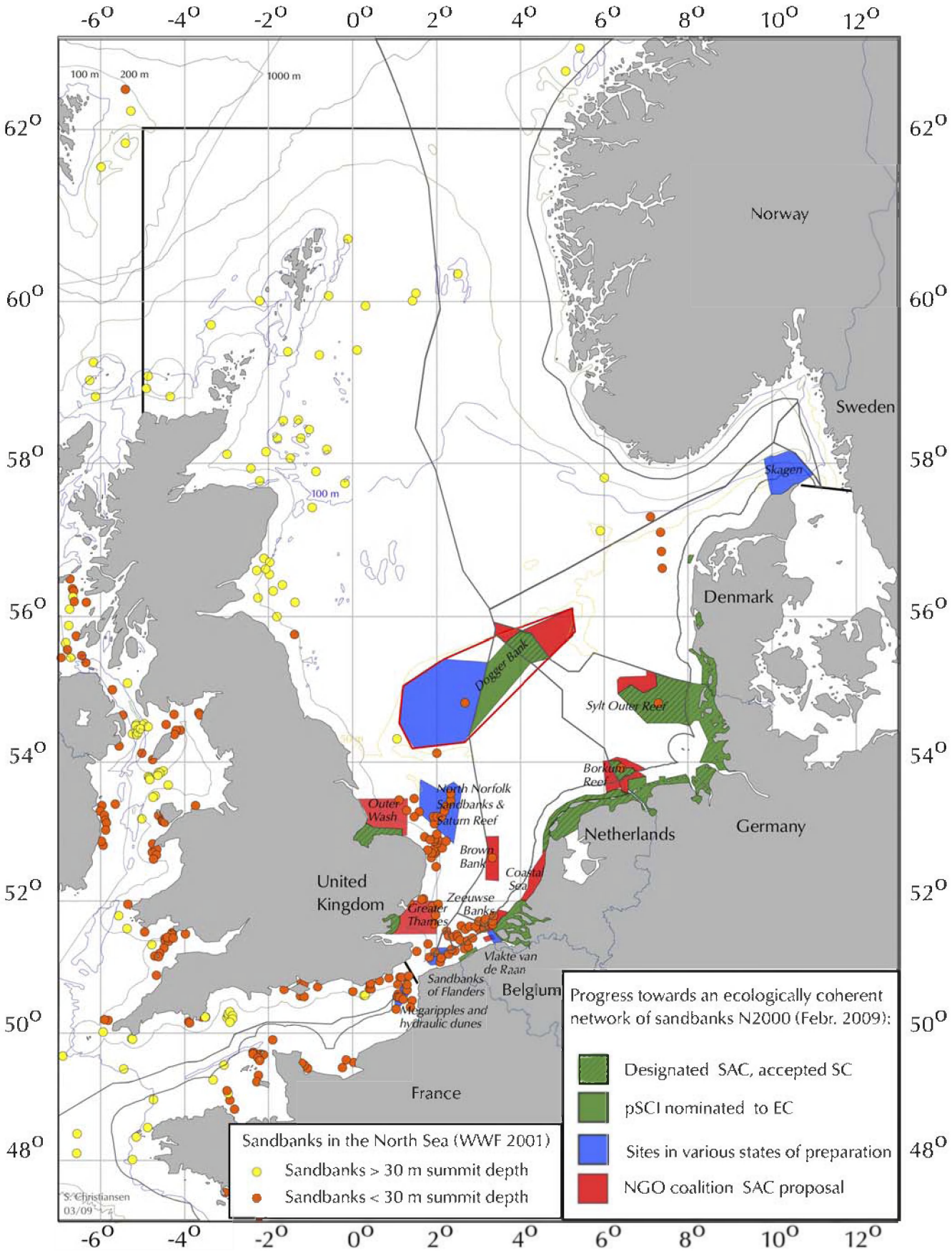
2.2 North Sea MPA network 2009 - Habitats Directive. Progress of national governments and additional NGO proposals



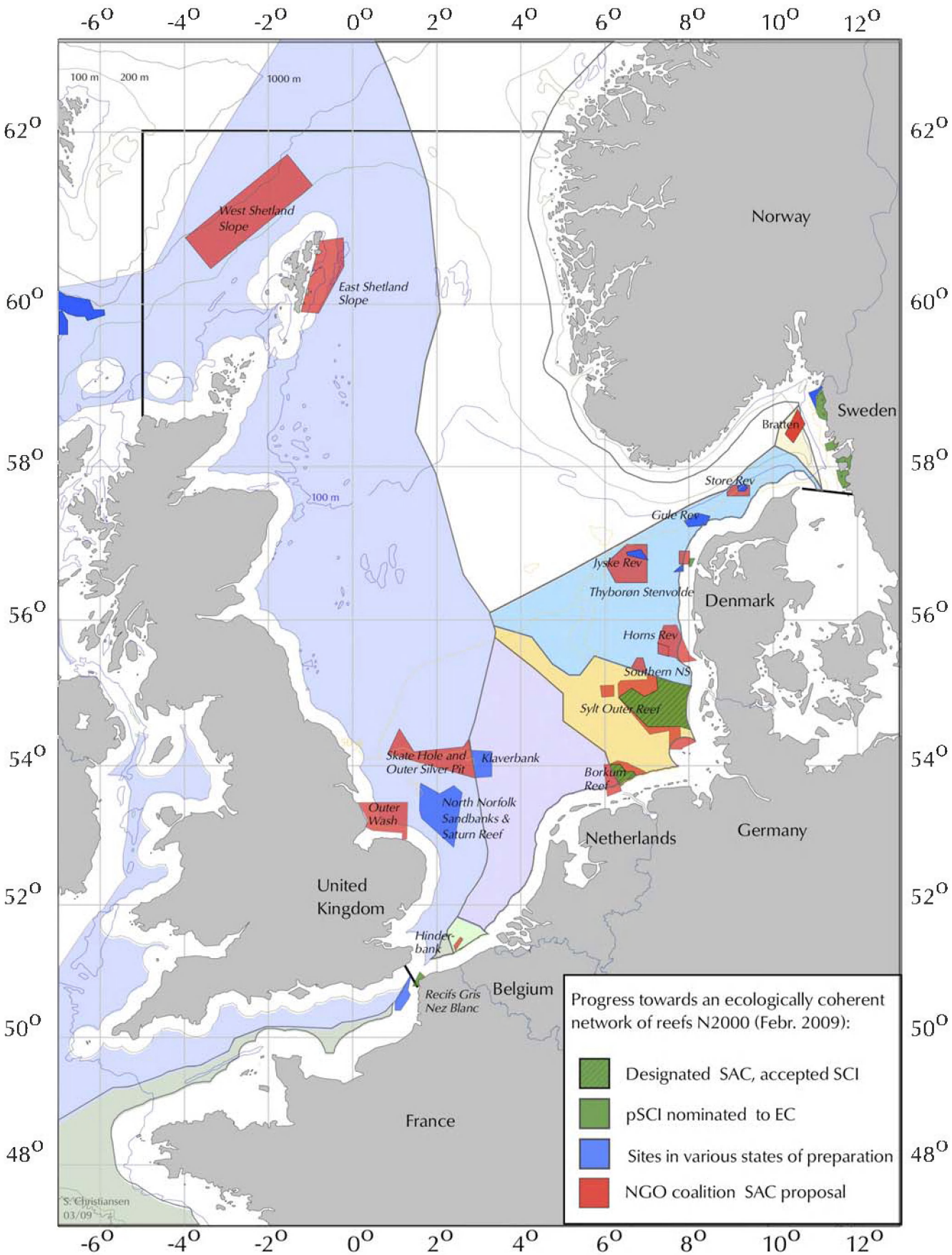
2.3 North Sea MPA network 2009 - Habitats Directive. Sandbanks. Progress of national governments and additional NGO proposals



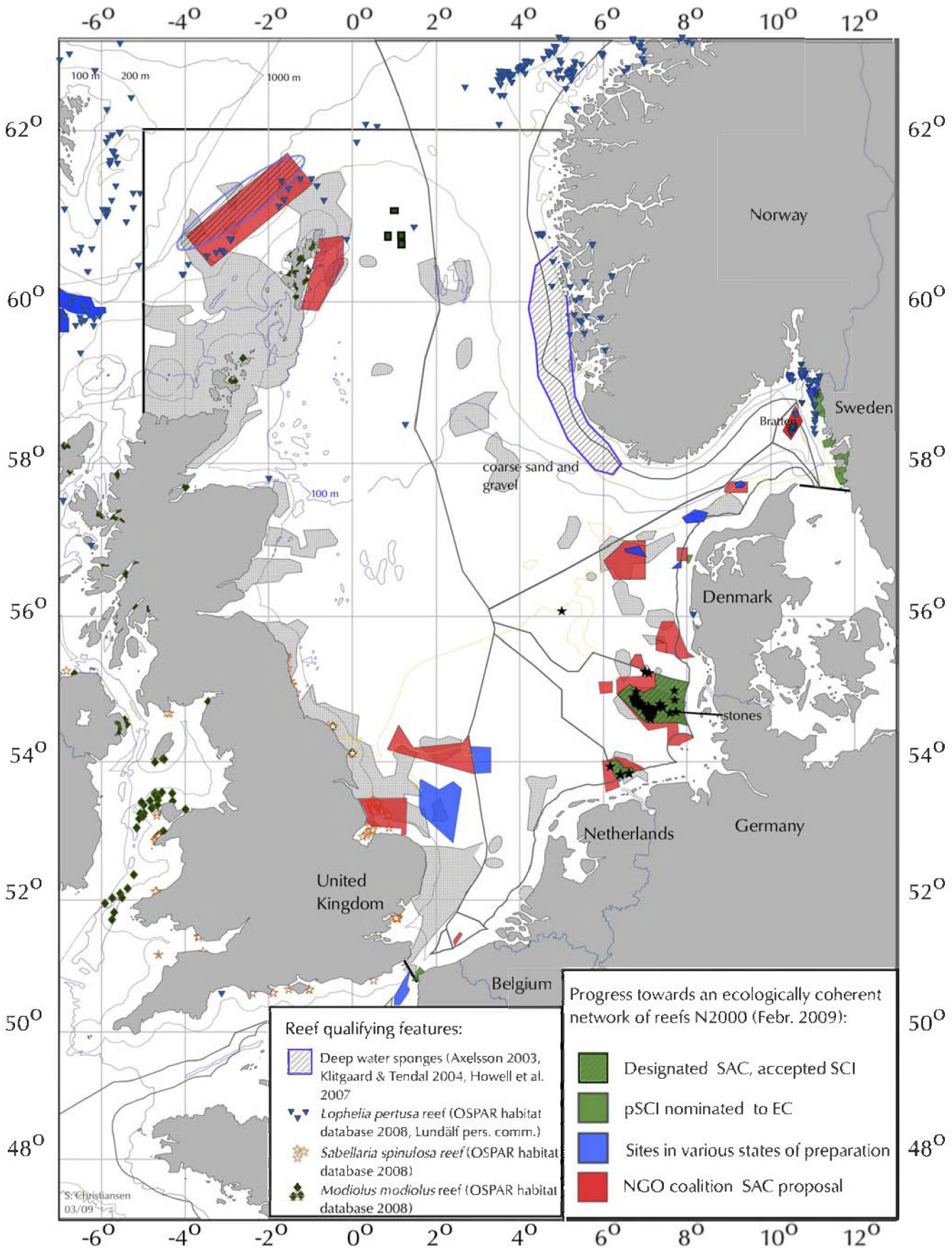
2.4 North Sea MPA network 2009 - Habitats Directive. Sandbanks. Supportive information



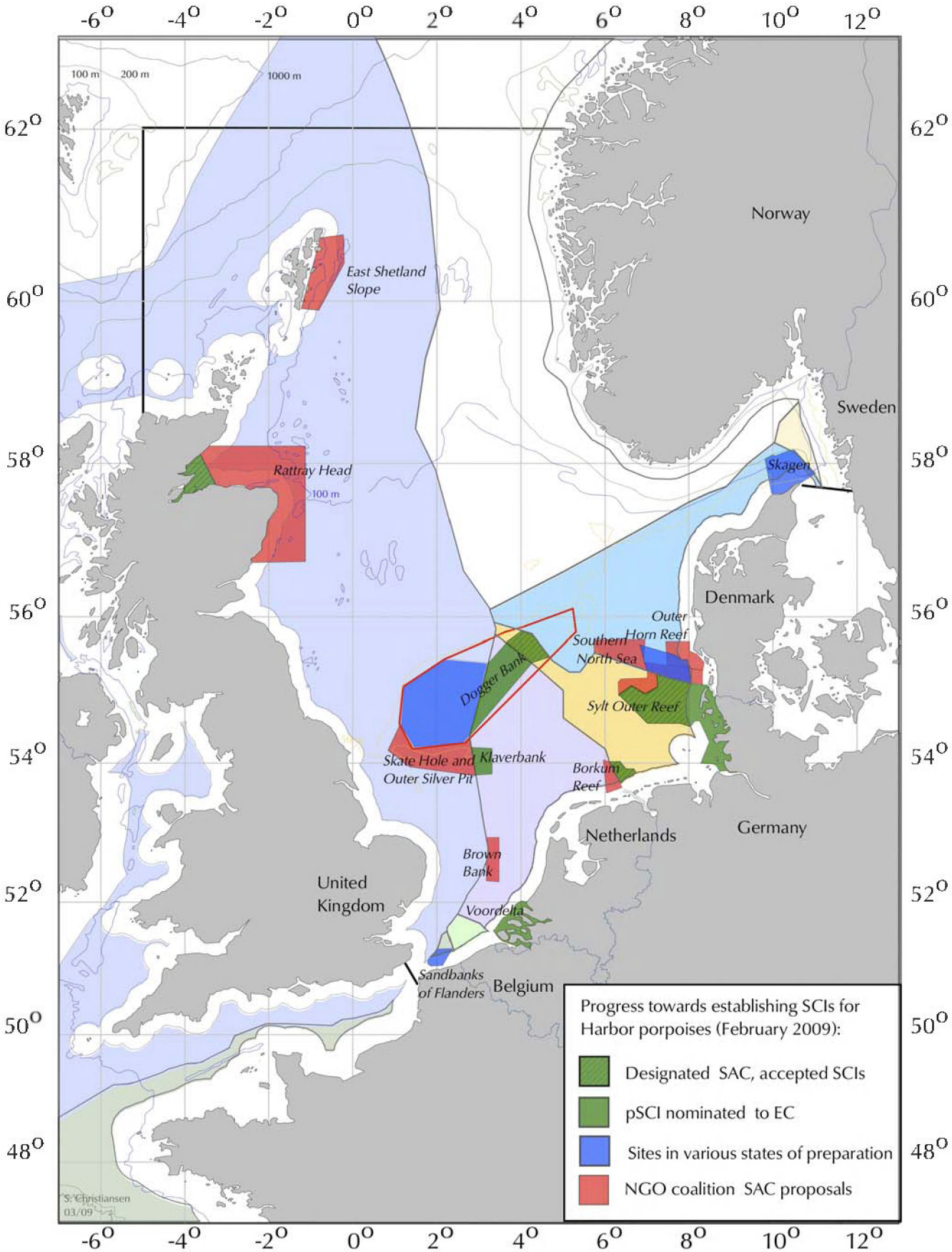
2.5 North Sea MPA network 2009 - Habitats Directive. Reefs. Progress of national governments and additional NGO proposals



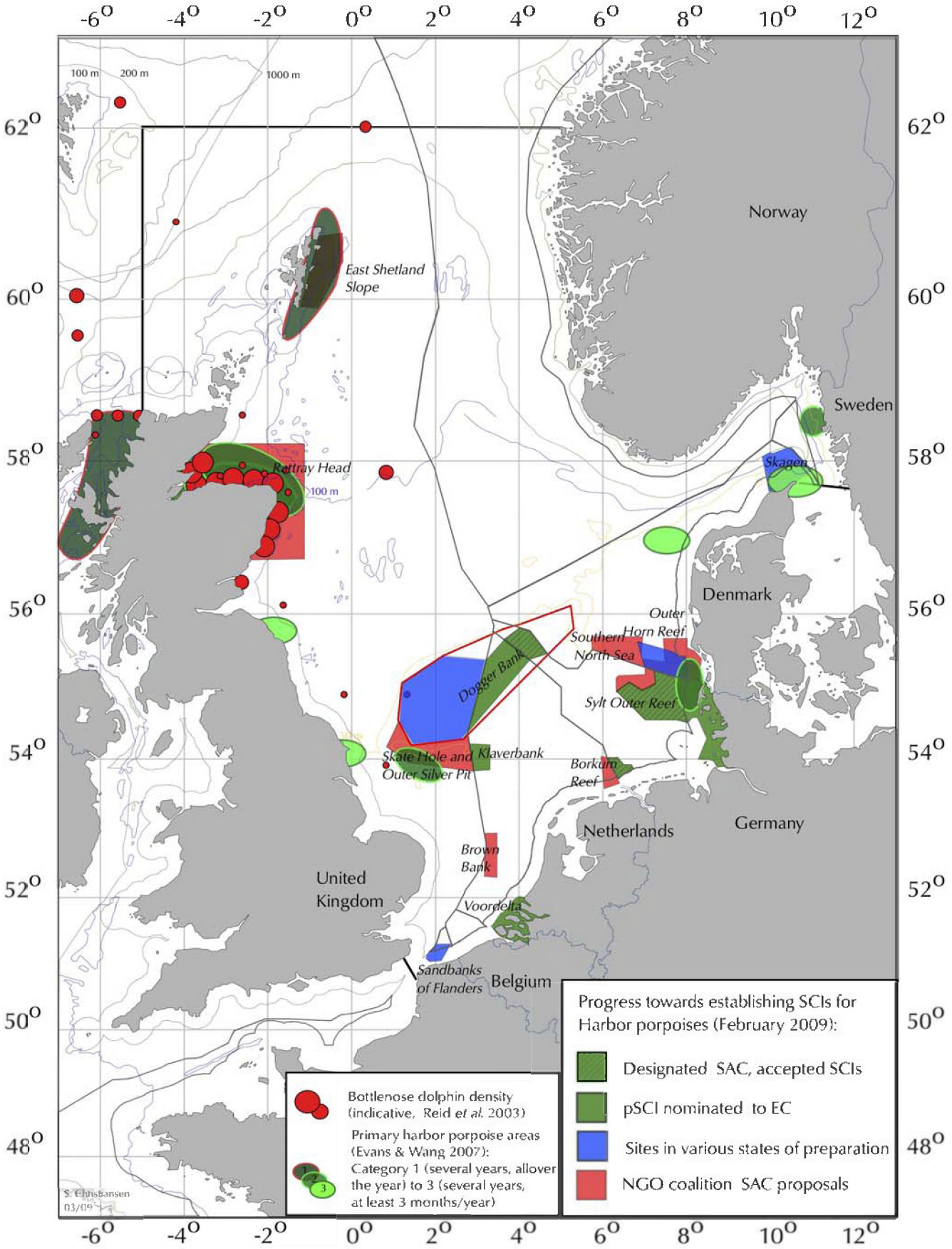
2.6 North Sea MPA network 2009 - Habitats Directive. Reefs. Supportive information



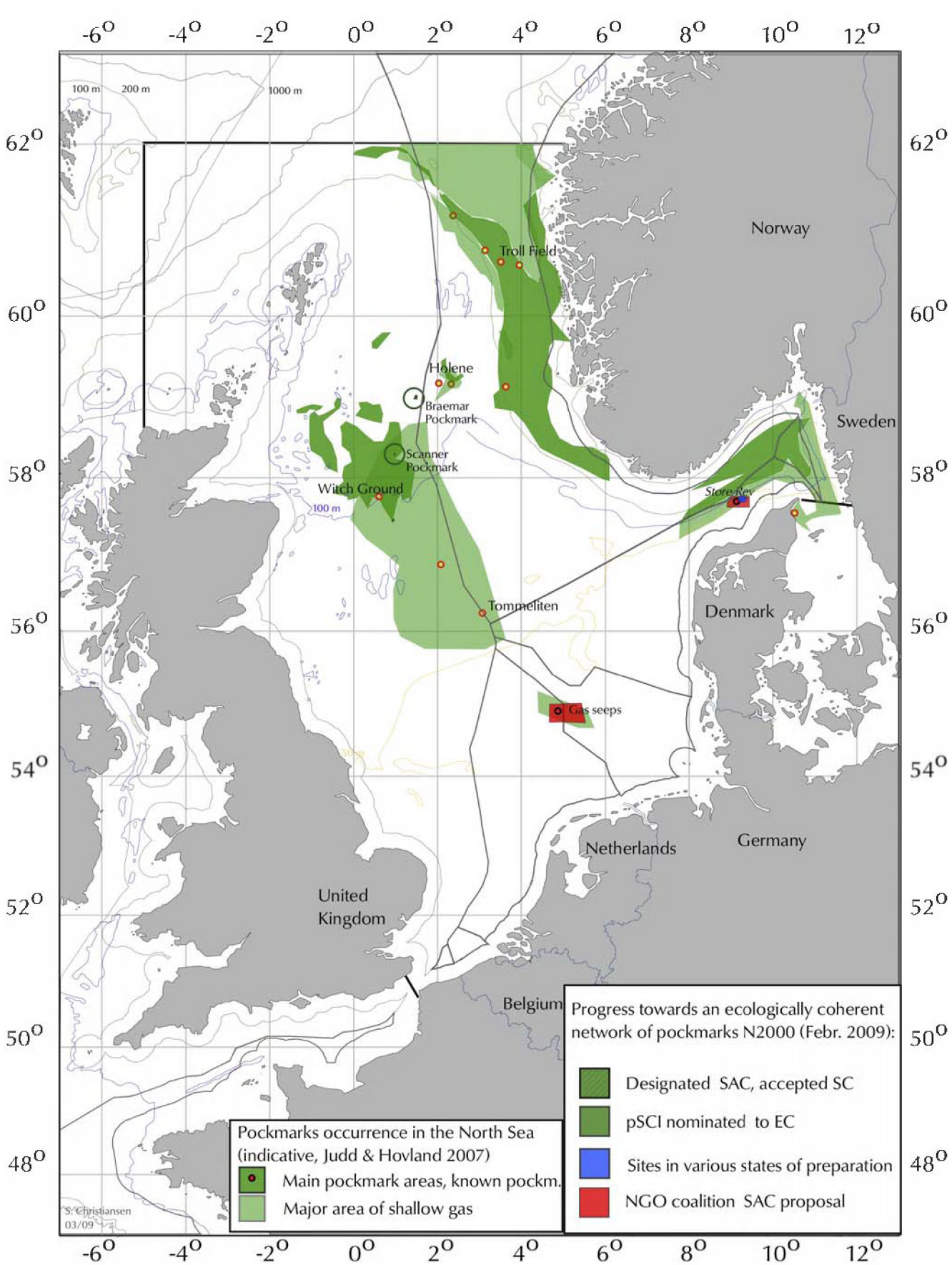
2.7 North Sea MPA network 2009 - Habitats Directive. Harbour porpoise. Progress of national governments and additional NGO proposals



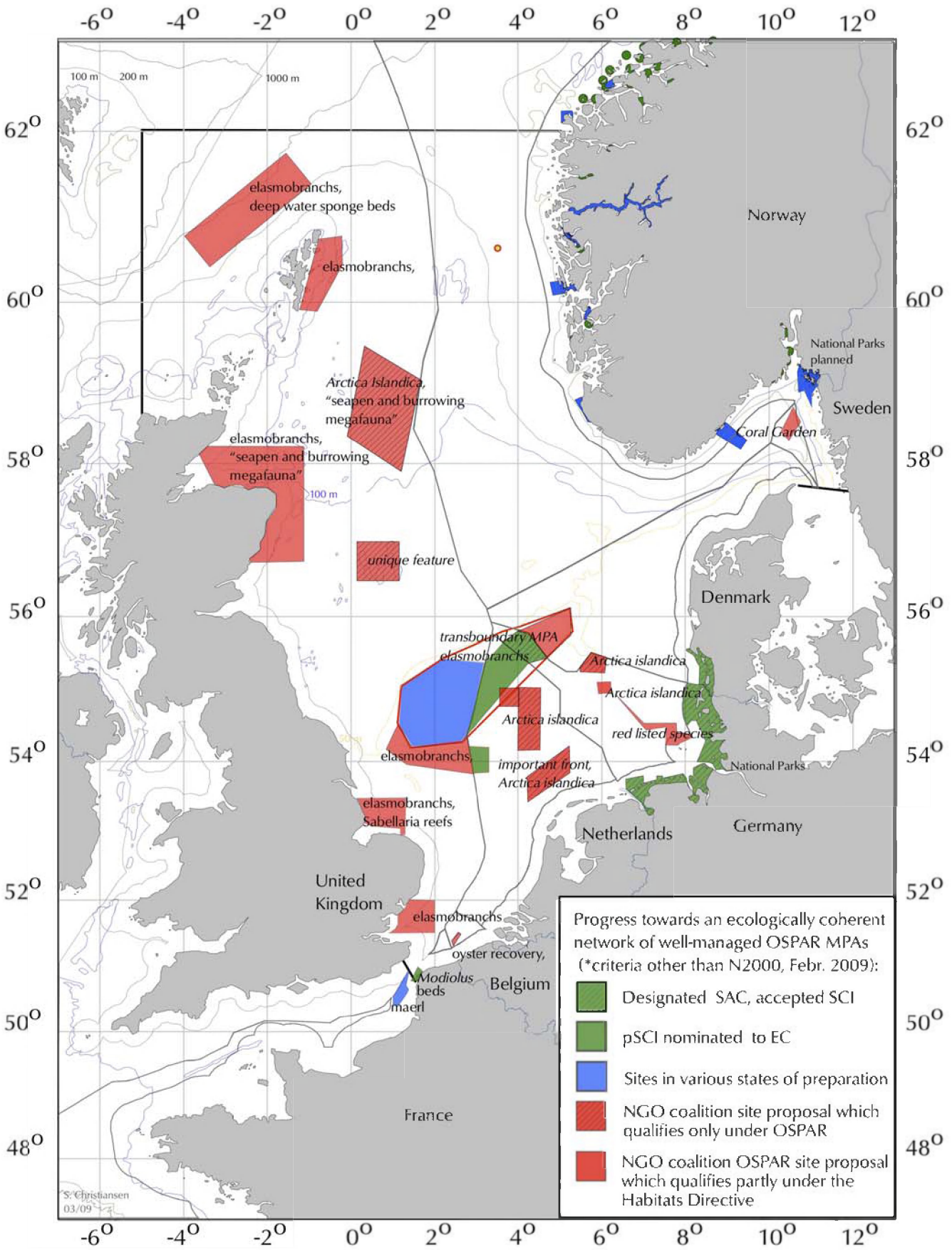
2.8 North Sea MPA network 2009 - Habitats Directive. Harbour porpoise. Supportive information



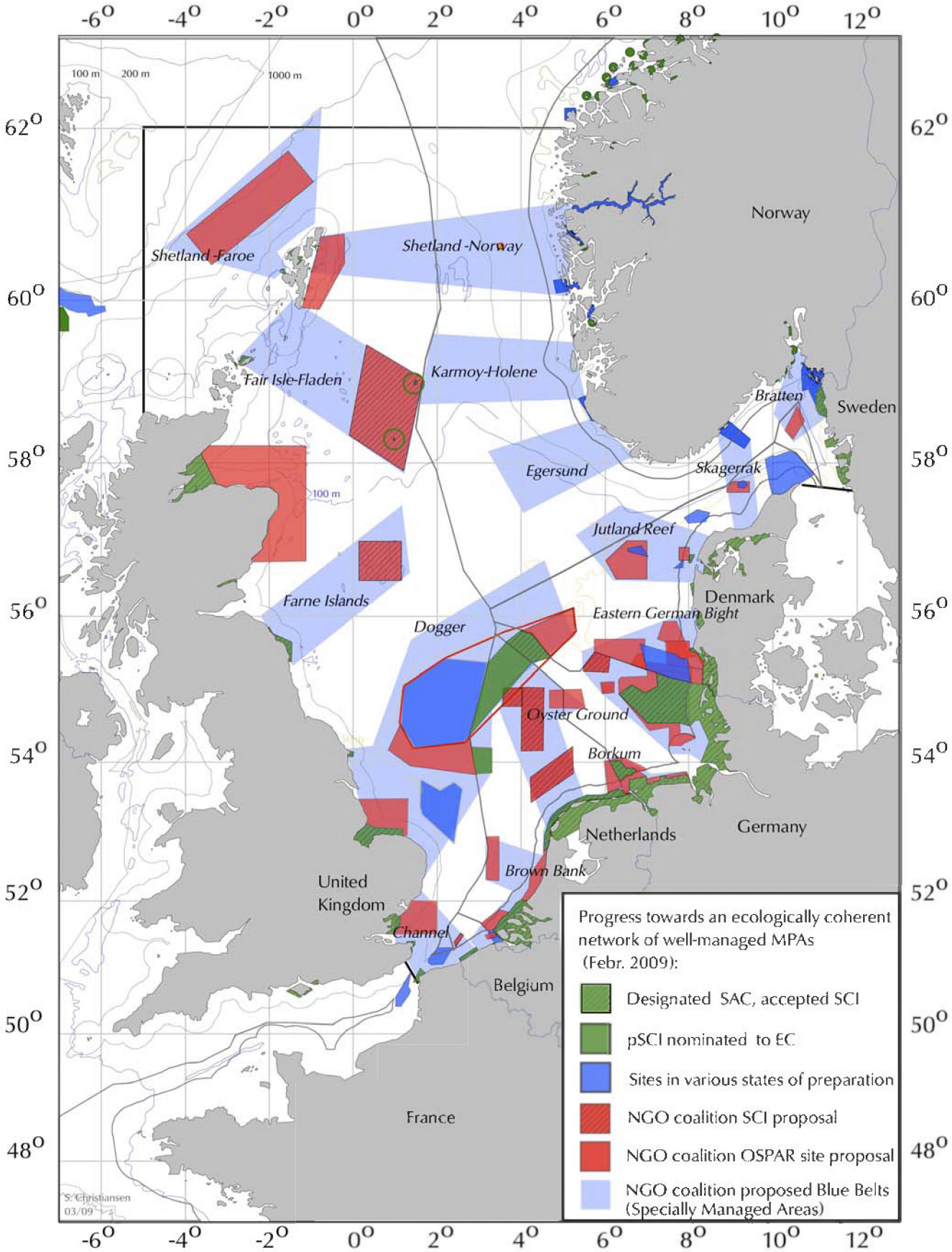
2.9 North Sea MPA network 2009 - Habitats Directive. Structures made by leaking gases. Supportive information



2.10 North Sea MPA network 2009 - OSPAR MPAs. Conservation objectives not covered by the EU Habitats Directive



2.11 Towards an ecologically coherent network of MPAs - Blue Belts to complement MPAs



3 The North Sea ecosystem: temporal change

3.1 Introduction

The North Sea environment today is very different from that in the past, and will certainly be different from that in the future. Marine ecosystems are governed by physical drivers such as temperature, salinity, bottom characteristics and currents, and biological pressures such as prey and predators, or light and nutrient availability. Therefore, the marine environment keeps changing its face. Over the last decade, new knowledge revealed the interactions between large-scale, climate-driven oscillations in weather patterns and the marine ecosystems. This helps to understand how ecosystems may change with the overall climate anticipated from the global warming trend, based on altered wind and current regimes and freshwater run-off.

Expected and assumed climate-induced changes of the ecosystems will certainly lead to new constellations in the marine food web (for review see Baker 2005), possibly even a shift towards top predators without commercial value such as jellyfish (Attrill *et al.* 2007, Jackson 2008).

However, the intensification and spatial expansion of exploitation patterns over time have led to decline, serial resource depletion and collapse of bird, mammal, fish species and structural habitats since the Middle Ages, as documented for the Wadden Sea (Lotze 2005, Lotze *et al.* 2005). In particular over the last century, the combined effects of direct human impacts on the ecosystems of the North Sea have led to substantial losses of species and habitats. It started off with the development of large-scale industrial fishing (Roberts 2007) in the early 20th century and ran in parallel to increased eutrophication and pollution from industrial sources from the developing land-based industry. During and after the world wars, when almost no fishing took place, fish stocks recovered. However, the North Sea was used as a dumpsite for ships, ammunition and chemical waste. In the second half of the 20th century, decades had to pass before national and international agreements reduced the increasing eutrophication and chemical pollution to some extent, while fishing mortality was increasing to new records from year to year. In this period, human impacts have increasingly become the main direct driver for change. Today, we are facing the combined effects of fishing at industrial scales, such as decreasing average trophic level of target fishes, food web and habitat disturbance, bycatch and organic enrichment from discards. The extraction of sand, gravel and rock, dredging and release of sediments, and the effects of land-based and offshore pollution and eutrophication all directly or indirectly have an impact on the ecosystem[14]. Today it is clear that even the global atmospheric and ocean-climate interface is to some extent modified by human impacts on the global carbon cycle.

3.2 Climate related changes

Long-term changes in the North Sea ecosystem appear to be driven by two wide ranging but separate processes (for review see Clark and Frid 2001): in the northern, western and central areas of the North Sea, long-term changes are predominantly influenced by climatic fluctuations. Here, primary productivity during a particular year is related to the effect of weather on the timing of stratification and the resulting spring bloom. In the southern and eastern areas of the North Sea, the lack of stratification and large inputs of nutrients entail that primary productivity is more strongly influenced by variations in anthropogenic nutrient inputs, and is only weakly related to climatic variation.

Long-term changes at higher trophic levels (zooplankton, benthos, fish and seabirds) are generally affected by fluctuations in their food source (i.e. the lower trophic levels) although there are many exceptions from these general patterns due to the high complexity of the North Sea ecosystem. Clark and Frid (2001) conclude that long-term changes in the ecosystem may ultimately be correlated with changes in either climate or nutrients. However, the long-term dynamics of certain taxa and communities show evidence of being influenced by both anthropogenic factors and/or internal factors such as competition and predation. In particular, the role of large-scale removal of higher level predators on shifting food web dynamics needs further investigation.

Variability and regime shifts (e.g. Cushing 1978, Clark and Frid 2001) are documented for the holo- and meroplankton (e.g. Beaugrand *et al.* 2003, Beaugrand 2004, Kirby *et al.* 2007), the benthos (e.g. Amaro 2005, in van Nes *et al.* 2007, Frid *et al.* 2009), the fish community (Cushing 1984, Southward *et al.* 1988) and the entire food web due to hydrographic changes (Weijerman *et al.* 2005), differential timing of response of ecosystem components (Edwards and Richardson 2004, van Beusekom and Diel-Christiansen 2007), and shifting distribution of marine fishes (Perry *et al.* 2005, Hiddink and ter Hofstede 2007, also see review in European Parliament 2007).

[14] see Progress Report to the 5th International Conference on the Protection of the North Sea 2002 at http://www.regjeringen.no/en/dep/md/documents-and-publications/Reports-and-plans/Reports/2002/T-1396-Progress-Report-to-the-5th-North-.html?id=420175

3.3 Fishery related changes

Out of all the uses of and impacts on the North Sea ecosystems, fishing is considered to be the activity which has the highest impact on the ecosystems (OSPAR 2000). Fishing takes place everywhere in the North Sea and it has contributed most to the non-climate related changes observed in the North Sea ecosystems. Out of all the fishing métiers, bottom trawling, and in particular beam trawling, is considered the most destructive (Morgan and Chuenpagdee 2003).

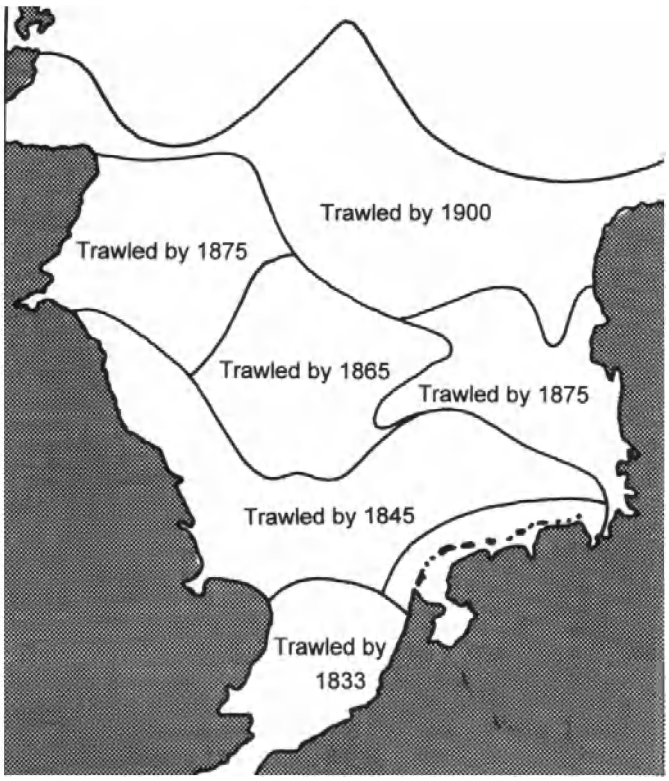


Fig. 3.1: The area trawled until 1900 using the example of the expansion of the English North Sea fleet (from Jennings and Kaiser 1998, Fig. 4)

The impacts of fishing

Since the Middle Ages, a gradual shift from hook and line, and net fishing to bottom trawling (first beam, later also otter trawling) has taken place which was spurred by the success of steam powered vessels in the late 19th century. By the beginning of the 20th century at the latest, all of the North Sea was trawled (see Fig. 3.1 in Jennings and Kaiser 1998, Roberts 2007). However, the fishery for demersal species had already expanded to the Dogger Bank as early as in the Middle Ages (Knottnerus 2001 in Lotze 2005).

Bottom trawling has been controversial ever since it was invented, with fishermen complaining about the destruction of fish spawning grounds and nurseries

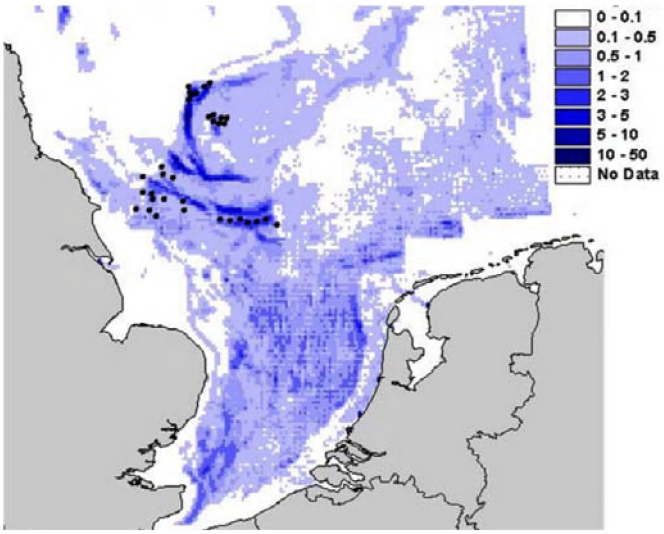


Fig. 3.2: Trawling intensity (per 9 km² cell per year) in the south-western North Sea as calculated from EuroStat VMS data (from Hiddink *et al.* 2007)

since the late Middle Ages From 1870 onwards, the emerging debate about overfishing finally led to the foundation of the International Council for the Exploration of the Sea, ICES (Lenz 1992).

Today, most of the North Sea seafloor is trawled regularly, often several times per year, as shown for the south-western North Sea in Fig. 3.2.

Changes on the seafloor

The first systematic scientific records of North Sea benthos were only published by the beginning of the 20th century. To look further back, Roberts (2007) sifted through the records given by contemporaries to the English Royal Commissions in the 19th century and found new indications for the transformation of the seabed caused by trawling.

In the 19th century, the relatively undisturbed seabed of the North Sea supported a far greater biomass of invertebrates, especially of structural habitats and associated filter-feeders such as corals, molluscs, seafans, hydroids, sponges and ascidians (see e.g. Lotze 2005). They existed in a dynamic interplay between physical disturbance, colonisation and growth. Possibly most of the seafloor of the North Sea, but in particular the deeper parts where the natural disturbance levels are lower, were covered by slow-growing complex three-dimensional biogenic structures created by bivalves (e.g. *Modiolus* sp., oyster and mussel beds), polychaetes (*Lanice* sp., *Sabellaria* sp.) or other organisms (hydroids, bryozoans, sponges). These structures modify the flow of currents, consolidate

sediments and provide a three-dimensional habitat to a multitude of associated species, including many commercially important species. Removal of habitat structure, also in relatively low structured soft sediment systems, significantly decreases benthic and, indirectly, overall species diversity (Thrush *et al.* 2001).

For example, Olsen´s Atlas of the North Sea (Olsen 1883), shows that what is today a muddy depression in the southern North Sea, the Oyster Ground, in fact was a large oyster bank a hundred years ago (Fig. 3.3).

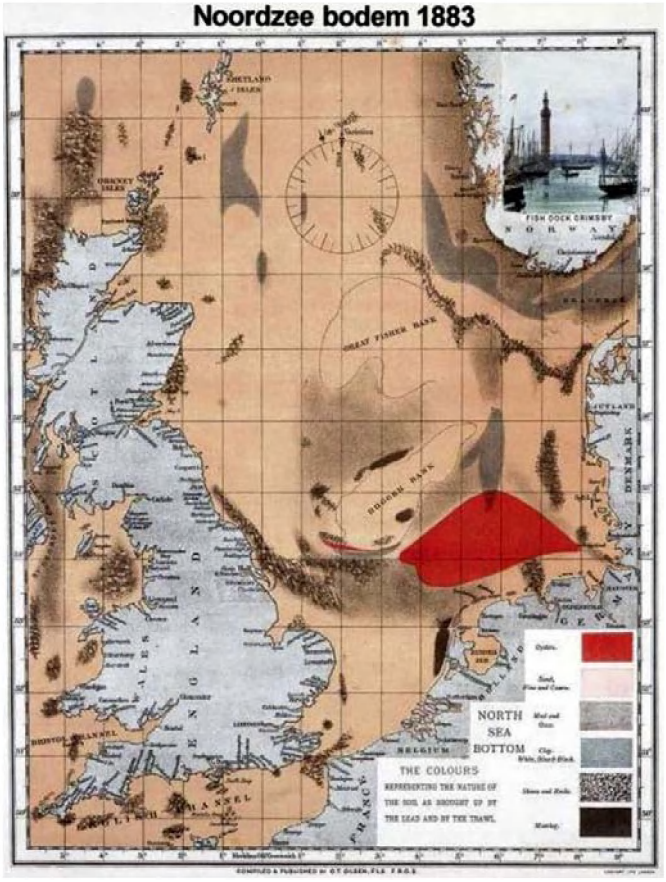


Fig. 3.3: Map of the North Sea seafloor as seen by Olsen (1883). The oyster beds present until the early 20th century are coloured in red.

Even seen from today´s baseline, chronic bottom trawling in particular reduces the biomass and production of benthic infauna and epifauna dramatically (Jennings and Kaiser 1998, Hall 1999). However, the most important effect may be a shift towards a relatively stable community composition dominated by faster growing, opportunistic species with high recovery potential (Jennings *et al.* 2001). Even after decades of intensive trawling, the sediment structure in depressions such as in the Outer Silver Pit, is still changed towards finer sediments, increasing the sulphate reduction capacity of the subsurface seafloor (Trimmer *et al.* 2005).

Rumohr and Kujawski (2000) compared historical North Sea benthos data from 1909-1912 to data from 1986. The most obvious change found was a drastic reduction in the number of bivalve species. In contrast, many scavengers and predators, including the common starfish (*Asterias rubens*), common whelk (*Buccinum undatum*) and flying crab (*Liocarcinus holsatus*), had experienced marked increases in abundance and distribution within the sites, possibly a consequence of increased food availability due to discards and moribund benthos on the seafloor.

Frid *et al.* (2000) particularly looked at three important fishing places in the southern North Sea and demonstrated significant long-term changes (1920 *vs.* late 1980s) in the benthic communities of the Dowsing Shoal, Great Silver Pit and Fisher Bank. The data of the Dogger Bank and the Inner Shoal did not show significant differences which was suggested to origin from the much longer fishing history of these places.

Callaway *et al.* (2007) conclude that the present North Sea epibenthos assemblages reflect communities adapted to a century or more of fishing impacts. The authors compared the earliest records from the early 20th century with data sets from the 1980s and 2000 and proxies for bottom trawling effort of the respective times and locations per ICES rectangles. They found that fishing in the northern North Sea only intensified in the 1960s whereas the central and southern North Sea had been fished throughout the 20th century. Almost all of the observed biogeographic changes in species distribution were found to have happened by the 1980s. Decreasing spatial presence was primarily observed for larger, long-lived species vulnerable to the impact of trawling such as *Modiolus modiolus*, *Aequipecten opercularis* (both present on e.g. the Dogger and Oyster Banks until the 1980s), *Arctica islandica*, or fragile species such as the bivalve *Phalax pellucidus,* the pea urchin *Echinocyamus pusillus* and others.

Lindeboom (2008) even goes a step further in distinguishing between natural and human-induced habitat types. He considers the seafloor which is regularly subject to beam trawling for flatfish as being in a "ploughed" state, and seafloor subject to otter trawling or shrimp trawling as being "raked". For the Dutch EEZ this means that most of the seafloor and its communities are in a non-natural state (Fig. 3.4).

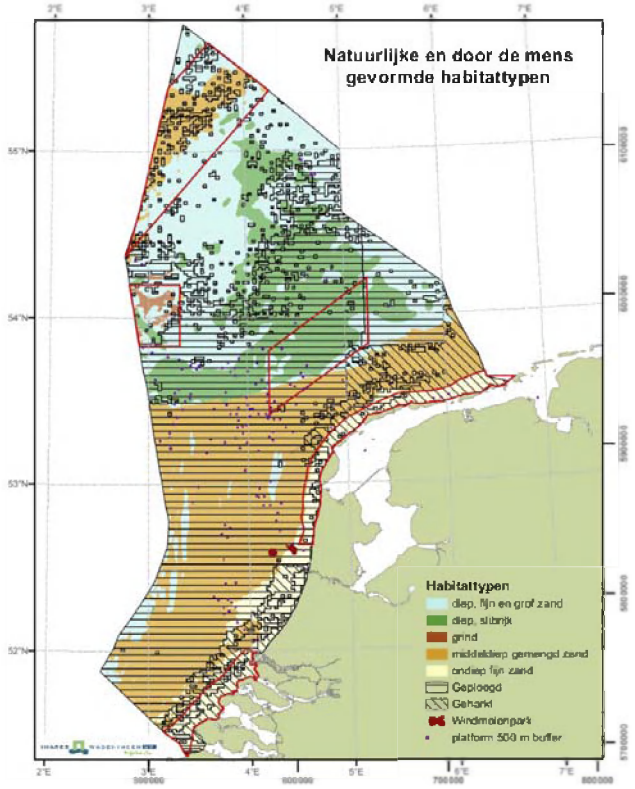


Fig. 3.4: Distribution of natural and man-made benthic habitats in the Dutch sector of the North Sea (Lindeboom 2008)

Sites that have never been impacted by trawling are extremely rare in the North Sea today, if existing at all. This means that it is almost impossible to undertake experiments that look at the impacts of trawling on pristine habitats or on time scales of recovery to undisturbed states. In fact, the lack of untrawled habitat makes it very difficult to determine what unimpacted habitats might look like today. Recent experiments with bottom trawling show that the first few passes do the greatest harm, removing accumulated biomass of invertebrates and plants (Kaiser *et al.* 2006). Today's experiments on recovery rates following bottom trawling suggest full recovery on time scales of one to ten years, depending on the type of habitat examined (e.g. Dinmore *et al.* 2003, Kaiser *et al.* 2006). But such small scale experiments are misleading as they usually examine places affected by trawling long ago which often remain subject to intermittent trawling disturbance, and due to their small size may benefit from local immigration of species.

Based on the optimistic recovery rates from above and the VMS fishing intensity, Hiddink *et al.* (2007) calculated that in more than half of the south-western North Sea trawling removed more biomass than was possible to grow in between (Fig. 3.5).

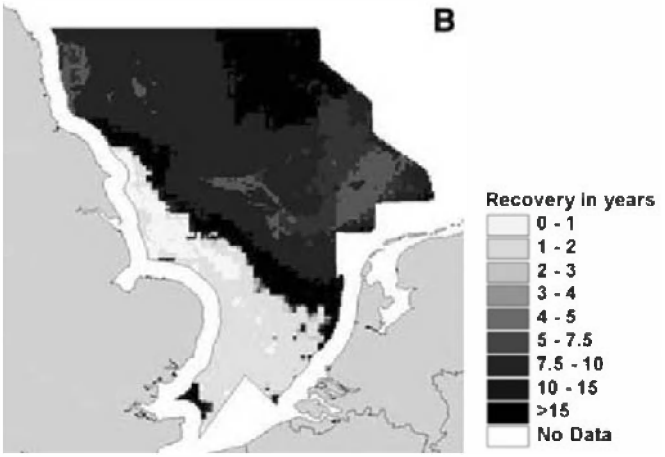


Fig. 3.5: Modelled recovery time of the benthic community biomass after a single trawl (Hiddink *et al.* 2007)

Changes in the fish community

In addition to its impact on habitats, fishing has reduced the volume, age, size and community structure of fish populations in the North Sea and has had grave effects on the structure of food webs. Once abundant species like common skate, populations of large sized fishes like cod, haddock, plaice, turbot and halibut, are estimated to have been reduced by 90% since 1900 (Christensen *et al.* 2003). The largest species may have been reduced in density to 2% or less of their biomass before fishing (Jennings and Blanchard 2004), and some species have disappeared from the North Sea, such as angel sharks and common skate[15], or haddock in the southern North Sea (Lozán 1994). Coinciding with the biomass reduction, an acceleration of the turnover time has led to greater instability in biomass and production (Jennings and Blanchard 2004).

Since the early 1980s, a continuous reduction of the mean size (and weight) of the demersal fish community can be documented (ICES 2007 and reference therein). An illustration of this is provided in Fig. 3.6 showing the proportion of fish larger than 40 cm in catches of the Scottish August Groundtrawl Survey, carried out from 1920 to 1997. Since 1983, the ICES International Bottom Trawl Survey (IBTS) has delivered comparable data which will be extended in the future. ICES pointed out that particularly high indicator values were apparent in the mid 1940s, immediately after the 2nd World War. Downward trends for each of the indicators were apparent from the 1970s onwards. OSPAR (2008) agreed on an ecological quality objective for demersal fish communities which aims at a restoration of the

[15] see http://www.iucnredlist.org/details/39332

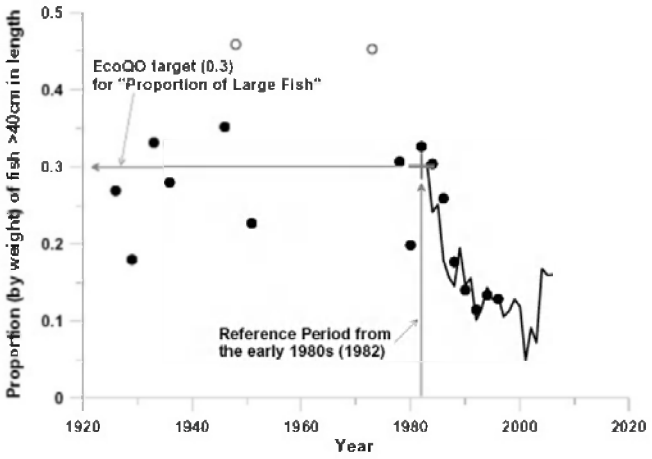


Fig. 3.6: Long-term trend in proportion (weight indicating size) of fish > 40 cm in the catches of the Scottish August Groundfish Survey carried out 1920-1997, and in the International Bottom Trawl Survey (from 1983)

proportion (by weight) of fish greater than 40 cm in length to a value of greater than 0.3, based on the ICES Q1 IBTS survey series.

Jennings *et al.* (2002) found that the decreasing average size of the North Sea demersal fish community corresponded to a significant decrease of its mean trophic level between 1982 and 2000 (Fig. 3.7). The trends in trophic level and size structure are considered to be consistent with the effects of fishing rather than environmental change because there were long term decreases in the abundance of all larger species and individuals and yet these species have a wide range of food preferences. The relatively small changes in the North Sea may be a result of the long history of fishing and the intensive directed fisheries on species at a low trophic level.

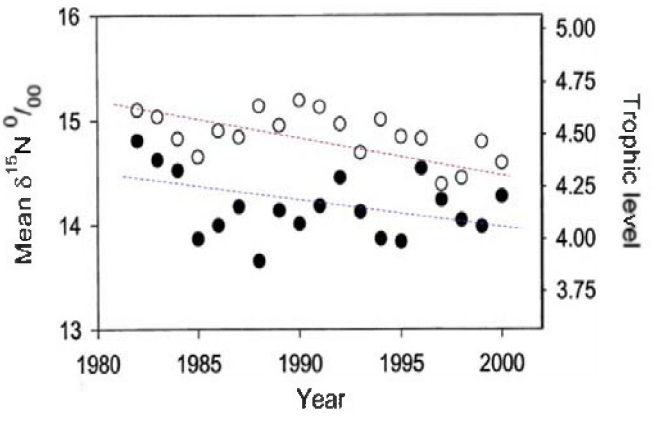


Fig. 3.7: Long-term trends in the mean d15N and equivalent trophic level of the North Sea fish community, as sampled by the International Bottom Trawl Survey (1982 – 2000). Filled circles show pelagic and demersal species; open circles show demersal species (Jennings *et al.* 2002).

Effects on Seabirds

Fishing activities may directly support scavengers by providing dead, discarded food. Populations of many species of scavenging seabird have increased in size over the past century. It is difficult to prove cause and effect in this area as there has been inadequate long-term assessment of diets and feeding relationships, and changes are not necessarily immediate. The reversibility of these changes is also unknown (RCEP 2004).

Ecosystem shifts

Cascading effects of partial removal of ecosystem components are known to cause significant shifts in the structure and function of the respective ecosystems (e.g. Pinnegar *et al.* 2000, Worm and Myers 2002, Myers *et al.* 2007). A yet underexplored question relates to the extent that overharvesting of higher trophic levels and removal of suspension feeders are inducing food web alterations, which profoundly change ecosystem functioning and services including: modified predator-prey relations, reduced plankton grazing capacity due to loss of filter-feeding organisms, lower rates of bioturbation and oxygenation, susceptibility to diseases due to impoverished communities and populations, and reduced fitness. Jackson *et al.* (2001) consider the human-induced imbalance of the coastal ecosystems to be the root cause and precondition including for the biotic manifestation of eutrophication, toxic algal blooms, and disease sensitivity. This hypothesis is supported by the meta-analysis by Worm *et al.* (2006) which points to a significant ecological destabilisation effect of reduced species diversity.

For the North Sea, the impacts of fishing on the ecosystem structure have not yet been quantified. However, e.g. Hiddink *et al.* (2006) calculated that bottom trawling reduces benthic biomass and production by 56% and 21%, respectively, compared to an unfished situation. A large-scale reduction in the production of benthic communities will in turn affect the energy flow through the ecosystem, such as greater accumulation of detritus on the seafloor with impacts on microbial communities or the storage of organic matter in sediments, or it may result in increased phytoplankton grazing in the pelagic food chain (Duplisea *et al.* 2001).

The UK Royal Commission on Environmental Pollution report (RCEP 2004 and references therein) considers that the number of trophic levels in the North Sea food web was halved between 1880 and 1981, and total fish biomass in the North Sea may have decreased

from about 26 million tonnes in the 1880s to 10 million tonnes by 1991. It is concluded that the complexity of marine ecosystems is being reduced and resilience in the marine ecosystem lost with the change from complex to simple food webs.

Shifting baselines

Nowadays, hardly anybody is yet aware of the former richness of the North Sea ecosystem. Even fishermen who often benefit from the knowledge of their forefathers seem to consider the current state of the sea as being normal. The problem is that memory is so short, reaching back one generation at the maximum, if at all. Change takes often place unnoticed. Younger generations come to accept other states of ecosystems to be normal than previous or next ones. In the case of the North Sea, diminished resources have led to diminished expectations of what the North Sea could possibly support again once the human pressures will cease. This phenomenon has been called 'shifting baseline syndrome'[16].

Of course, the look back into the past can only be an indication of the degree of richness which ecosystems might support, had the pressures not substantially altered their balance. Management direction must be to reduce human pressures to such an extent that natural forcing factors are the prime sources of variability again. Any recovery will take a very long time.

[16] www.shiftingbaselines.org

4 Ecological subdivision of the North Sea – Framework for a representative MPA network

For the purpose of this report, the following ecological subdivision of the North Sea ecosystem is proposed (Fig. 4.1), based on previous suggestions by DEFRA (2005), North Sea Task Force (1993) and descriptions of the water masses from Lee (1980).

Region 1: **Southern North Sea** shallower than 50 m (Denmark, Germany, The Netherlands, UK, Belgium, France)
Region 2: **Northern and Central North Sea** (UK, Norway)
Region 3: **Norwegian Trench and Skagerrak** (Norway, Sweden)
Region 4: **Scotland Continental Shelf and Faroe-Shetland Channel** (UK)

Reasoning

The proposed ecological subregions of the North Sea closely follow the topographic settings (Fig. 4.1). The Southern North Sea comprises the southern part, which is less than 50 m deep. The Dogger Bank acts as a divide between Atlantic water masses intruding from the north and circulating counter-clockwise to the east, and the inflow through the Channel flowing along the southern shores of Belgium, the Netherlands, Germany and Denmark before both currents circle the Skagerrak to leave the North Sea as the Norwegian coastal current (Fig. 4.2).

The Northern North Sea is significantly deeper (700-150 m) than the area south of the Dogger Bank. The Scottish Continental Shelf (Region 4) consists of the very narrow shelf off the Orkney and Shetland Islands as well as the continental slope down to the abyssal plain. The continental slope is not only disturbed by storms and swept by currents but also subject to internal waves breaking at 500 to 600 m depth. The Norwegian Trench and Skagerrak provide for a deep-water intrusion from the North Atlantic onto the European shelf. The sill depth is 270 m, and in the Skagerrak, a trough up to 720 m deep, true deep-water fauna exists (e.g. Bergstad *et al.* 2003).

Thermal stratification of the water column only occurs in the deep Northern North Sea, with the exception of the high current areas in the Fair Isle passage and the Pentland Firth. In the shallow Southern North Sea, strong tidal mixing particularly takes place in

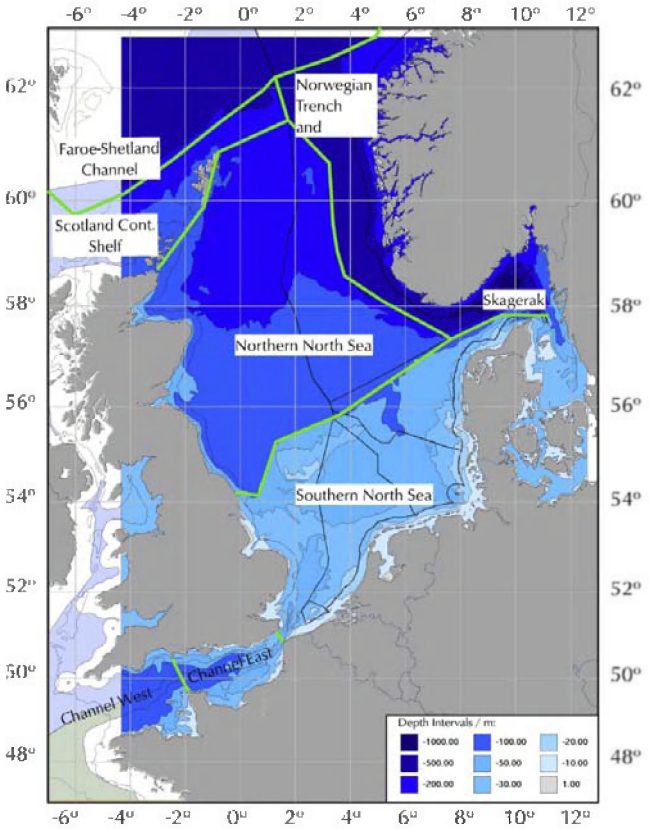


Fig. 4.1: Ecological subdivisions of the North Sea used in this report

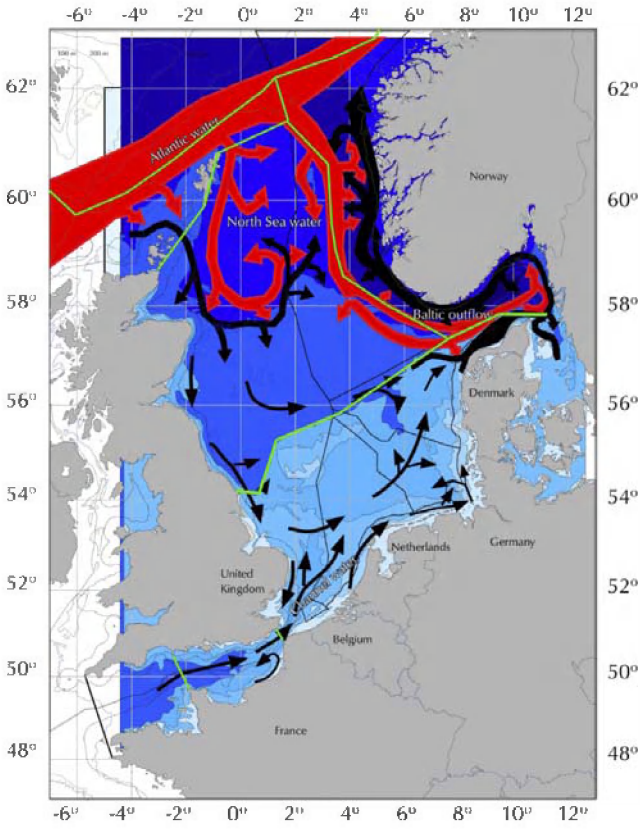


Fig. 4.2: Ecological subdivisions of the North Sea used in this report - bathymetry and current patterns (redrawn from Lee 1980, in OSPAR 2000)

the south-western part. At greater depths with lower current stress, haline stratification and fronts occur where the low salinity coastal water meets the Atlantic water inflow from the North (Fig. 4.3). Between these two major regions, a transitional zone was detected in the mixed Central North Sea water (Otto *et al.* 1990). These three regions roughly correspond to the three major ecological subdivisions suggested by some studies based on phytoplankton (Reid *et al.* 1990), zooplankton (Fransz *et al.* 1991) and fish communities (Daan *et al.* 1990).

One of the most distinct fronts in the North Sea, the Flamborough Front, forms the boundary between the shallower, permanently mixed waters of the Southern North Sea and the deeper, summer stratified waters of the Northern North Sea. Other important frontal areas are the Frisian Front south of the Dogger Bank, and the Jutland Front, separating Skagerrak waters from North Sea waters.

Furthermore, the ecological subdivisions chosen in this report are partially reflected in the sediment structure, benthos and fish communities: while the Southern and Northern North Sea predominantly support sandy habitats of limited inclination, the Norwegian Trench and Skagerrak largely are areas of fine sediment deposition (e.g. Josefson 1987). In contrast, the Scottish Continental Shelf and slope reflect the high-energy open ocean environment characterised by relatively coarse sediment mixed with sediment-free rocky substrate (see Fig. 4.4).

Strong tidal currents and shallow depths result in a high-energy environment with frequent resettling of sediments and disturbance of fauna and flora, as it is for example found in the Channel area and on the banks south-east of England. The effect of human-induced physical impact on the seafloor and its communities increases with decreasing natural disturbance level, i.e. depth (Hidding *et al.* 2006).

In particular off the coasts of Denmark, Germany and the Netherlands, the sediment composition today is different from what it used to be in historical terms. There was more hard substrate (e.g. glacial boulders) and coarser sediment in many places (cf. Trimmer *et al.* 2005) which was systematically removed over decades of trawling (e.g. Lindeboom 2008). The undisturbed benthic ecosystem probably consisted of far more

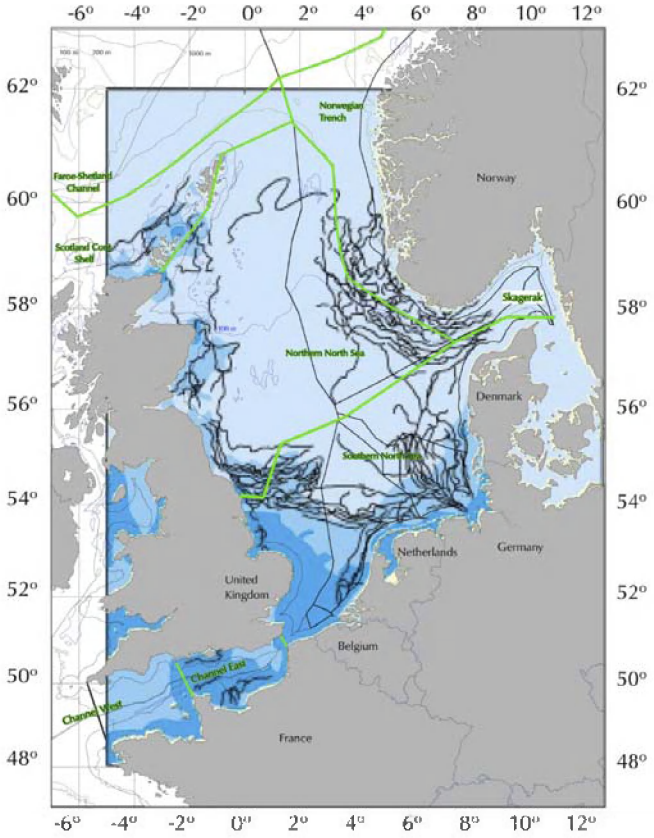


Fig. 4.3: Transition zones between mixed and stratified water in the North Sea. Source: Becker (1990) in OSPAR (2000). Blue colour shows transition from permanently mixed (dark blue) to stratified waters (light blue). Black lines indicate fronts.

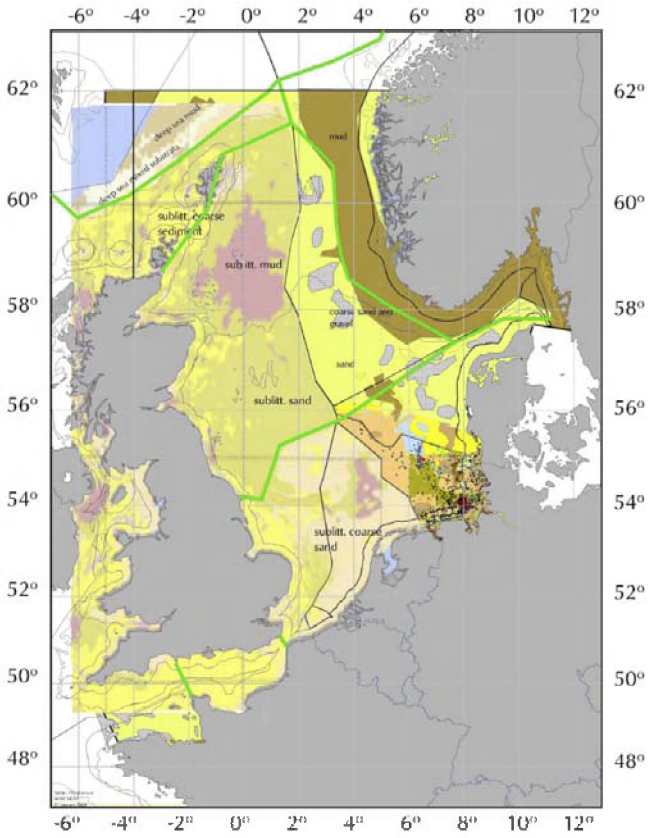


Fig. 4.4: Composite coarse map of predicted EUNIS level 3 habitats of the UK, the Netherlands, Belgium and Germany plus sediment map for Denmark and Norway. Sources: MESH project, http://www.searchmesh.net, Busch 2005, OSPAR 2000, after Eisma 1981

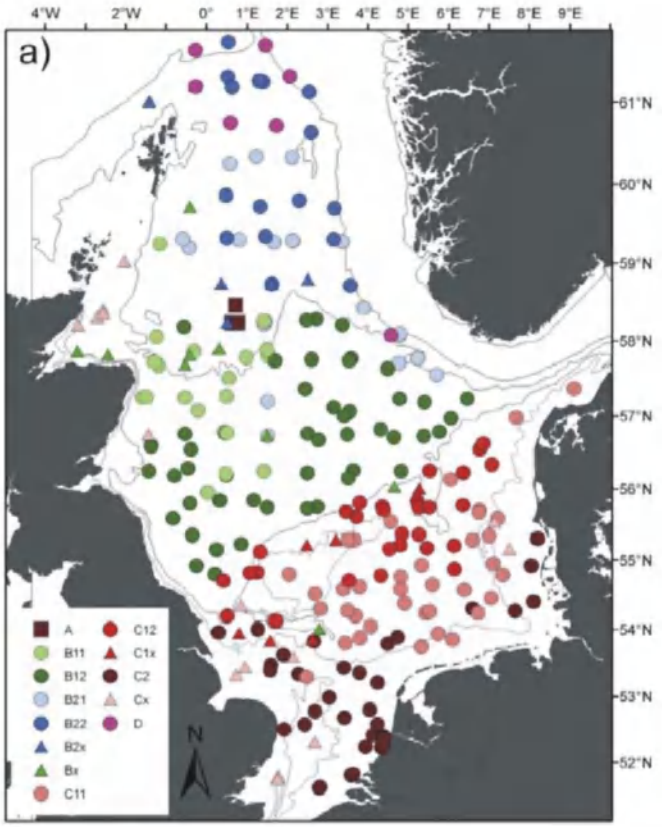


Fig. 4.5: Major epifauna communities in the North Sea. Communities as indicated by cluster analysis are shown by different colours and signatures (from Reis and Rees 2007, their Fig. 6.1.4a).

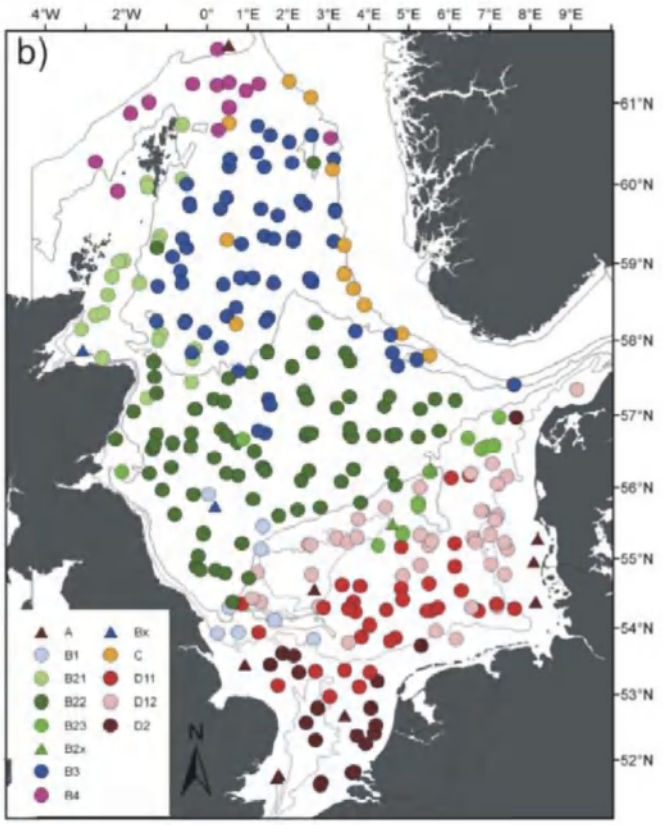


Fig. 4.6: Major demersal fish communities in the North Sea. Communities as indicated by cluster analysis are shown by different colours and signatures (from Reis and Rees 2007, their Fig. 6.1.4b).

biogenic structural communities such as *Sabellaria*, *Lanice*, oyster and *Modiolus* banks (Callaway *et al.* 2007).

The sandbanks of the North Sea have important structural functions. Being topographic elevations, they change the ambient current patterns and eventually provide for a higher level of primary production which in turn enhances all the food web turnover. For example, gannets breeding at Bass Rock in Scotland make foraging trips of hundreds of kilometres to the most rewarding feeding grounds at Dogger, Buchan and Halibut Banks or to the Outer Silver Pit and Farn Deep to feed on small sandeels (Hamer *et al.* 2000).

The ecological subdivision of the North Sea is also reflected by the large-scale patterns in the infaunal, epifaunal, and demersal fish communities, with major distinctions between a southern community (including the Oyster Ground and German Bight), an eastern Channel and southern coastal community, as well as at least two northern communities (50–100 m depth and >100 m depth) evident in all three components as shown in Fig. 4.5 and 4.6 from Reis and Rees (2007) confirming previous smaller scale investigations. The authors found that on a North Sea wide scale, the factors most influential on the distributions of benthic epifauna and benthopelagic fish especially were bottom water temperature, bottom water salinity and tidal stress, rather than the nature of the sediment.

5 Ecological subregion: Southern North Sea

5.1 Progress on designation of MPAs outside territorial waters

Habitats Directive

All North Sea states except Norway are members of the European Union and legally obliged to establish an ecologically coherent network of Natura 2000 sites in all waters under national jurisdiction according to the criteria set out by the EU Habitats and Birds Directives. Up to now, only site nominations under the Habitats Directive by the German government have been accepted by the European Commission. In the Southern North Sea, only France and the Netherlands have submitted site nominations by in spring 2009. Further site selections are in preparation or consultation by Denmark, the Netherlands, Belgium and the UK.

All habitats and species listed in the Annexes to the Directive, which also occur beyond 12 nm offshore, have been subject to scientific review at the recent Atlantic Biogeographic Seminar (Galway, Ireland, April 2009), with a view to completing the lists of candidate sites in the waters of Member States[17].

The most relevant criteria for designation of a marine Natura 2000 site in the EEZ of Member States are the requirements to maintain and/or restore to favourable conservation status of the habitats mentioned in Annex I 'reefs' (Code 1170 of the European Interpretation Manual 2008), and 'sandbanks which are slightly covered by sea water all the time' (Code 1110), 'submarine structures made by leaking gases' (Code 1130) as well as the habitats suitable for the species listed in Annex II, 'harbour porpoise', 'grey seal', 'common seal' and several anadromous fish species which are not considered here.

Fig. 5.1.1 illustrates the progress made until February 2009: only Germany has a set of SCIs already accepted by the European Commission, covering 38% of its EEZ. The Netherlands have nominated four sites covering 7,500 km² to the European Commission. France has so far nominated two banks east of Dover. Neither the UK, Belgium nor Denmark have nominated sites in their EEZ as yet, though some preparations are ongoing.

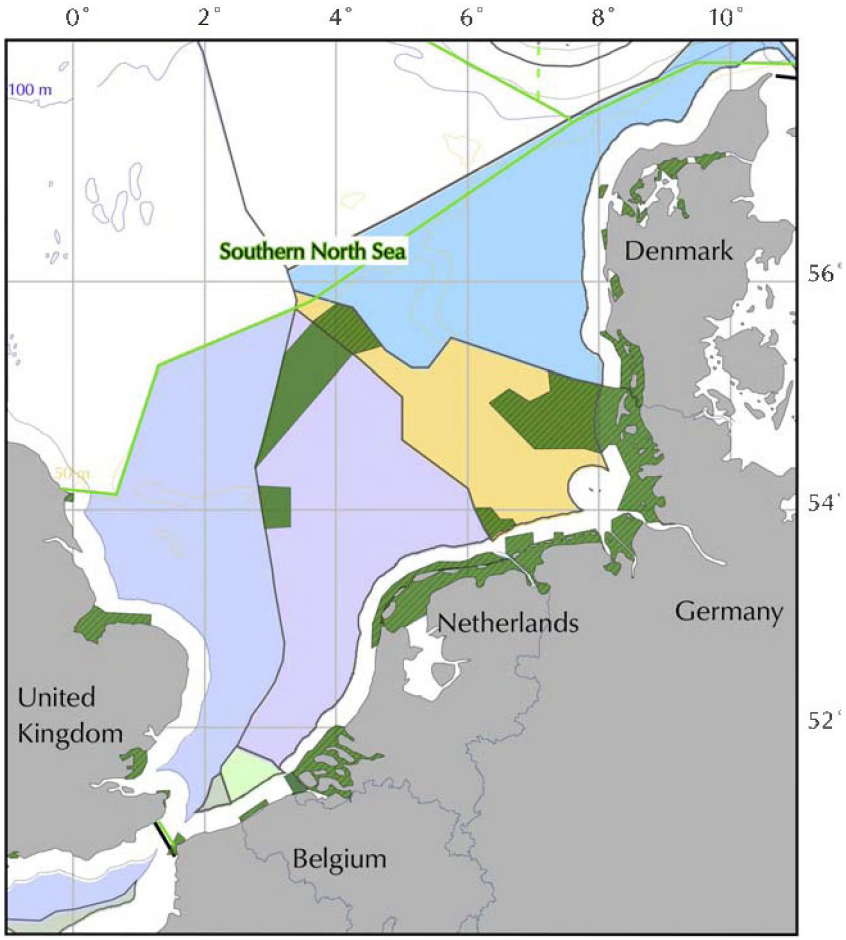


Fig. 5.1.1: Southern North Sea. State of the MPA network in February 2009: existing SACs and accepted SCIs (hatched green), pSCIs nominated to the European Commission (green)

[17] See e.g. OSPAR ICG-MPA 07/3/Info.1-E(L). Updating of the Community lists of Sites of Community Importance (SCI) under the Habitats Directive – Proposed procedures. EC Working paper

Birds Directive

While in Germany and Denmark several large EU bird protection areas (Special Protected Areas, SPAs) have been established offshore, and the Netherlands are still in the process of site selection, no such areas exist in offshore waters of the UK so far (Fig. 5.1.2). Only extensions of the breeding site SPAs have been recommended. The German and Danish bird protection areas are adjacent to each other in the eastern German Bight and they aim to afford protection to wintering seabirds. New SPAs in Dutch waters and extensions of the currently designated SPAs in German waters are proposed (van den Akker 2008, Deppe 2006). Measures eventually necessary in relation to fisheries management, i.e. to reduce risks from set nets, still need to be taken on a European basis.

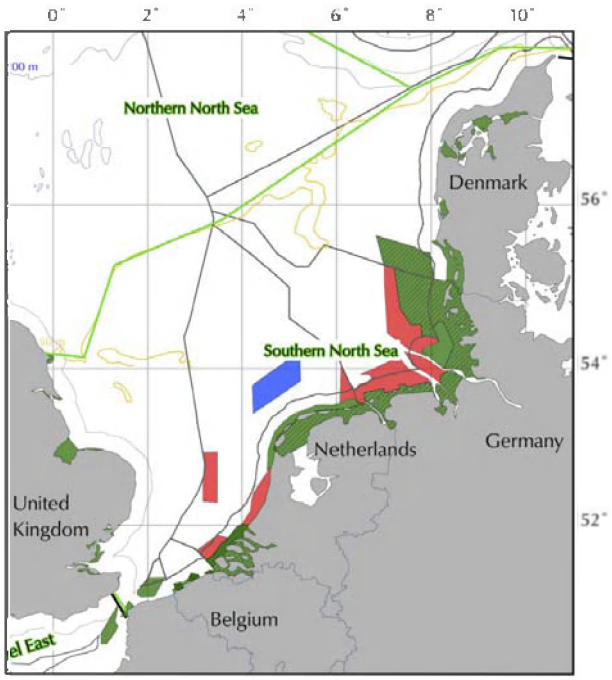


Fig. 5.1.2: Southern North Sea. Progress towards establishing an ecologically coherent network of MPAs: SPAs established (hatched green), in preparation (blue) and proposed by NGO coalition (red)

OSPAR Network

So far, none of the governments of Southern North Sea states has put forward any site as contribution to the OSPAR MPA network which

- Either aims at conservation objectives beyond the requirements of the EU Habitats Directive within the boundaries of the SCI/SAC; or
- Exclusively qualifies under the OSPAR MPA selection criteria, i.e. for the protection of species and habitats on the OSPAR List which are not eligible according to the EU Habitats or Birds Directives' Annexes.

In the Netherlands, two such well-qualified sites exist, but are currently not considered for nomination to OSPAR by the Dutch government: first, the Central Oyster Ground, a former oyster bed which is now a muddy depression of relatively high species diversity important for its population of ocean quahog (= Icelandic cyprine, *Arctica islandica*) and a likely habitat for 'sea-pen and burrowing megafauna communities' though currently without sea pens due to bottom trawling. The second site is the Frisian Front area, a permanent hydrographic front and deposition zone of high biomass and species diversity, including ocean quahog.

5.2 Government initiatives to establish MPAs

(Fig. 5.2.1)

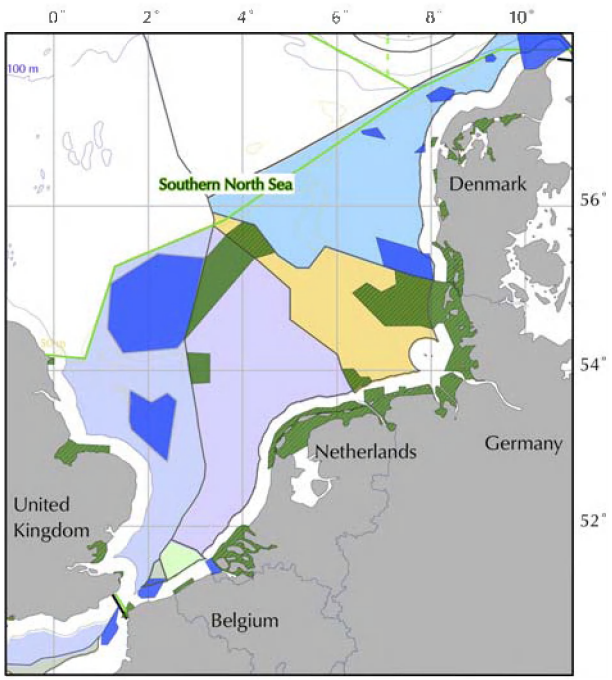


Fig. 5.2.1: Southern North Sea. Progress towards establishing an ecologically coherent network of MPAs: SACs established (hatched green), SCIs nominated (green), pSCIs in preparation (blue)

Belgium: there is a scientific proposal for establishing a first MPA according to OSPAR criteria for the recovery of the benthic fauna in a former oyster and herring spawning ground.[18]

Denmark: a public consultation on a new set of offshore Natura 2000 sites in Danish waters was conducted until December 2008. Among the sites published, six sites are located in Danish North Sea waters.

[18] OSPAR MASH 07/6/Info.2-E. OSPAR Recommendation 2003/3: possibilities for the implementation in Belgian waters. Presented by Belgium

France: a complete list of sites was published and put out for consultation in 2008.

Germany: the process of selection and nomination of Natura 2000 sites was finalised. All nominated sites were accepted by the European Commission.

The Netherlands: in December 2008, the government has nominated four areas to the European Commission as SCIs: *Doggersbank*, *Klaverbank*, extension of the *Noordzeekustzone* and *Vlakte van de Raan*. These areas and the SPA *Friese Front* will be designated as protected areas in 2010. These same areas have be been nominated as OSPAR MPAs.

United Kingdom: the draft marine bill, currently in consultation[19], will enable the government to establish MPAs according to national and/or OSPAR criteria. The public consultation process on a first set of offshore sites is concluded. Other sites are being reviewed or investigated[20].

5.3 MPA proposals in coastal states of the Southern North Sea

In the following, MPA proposals for each coastal state in the Southern North Sea will be presented (for summary see Fig. 5.3.1).

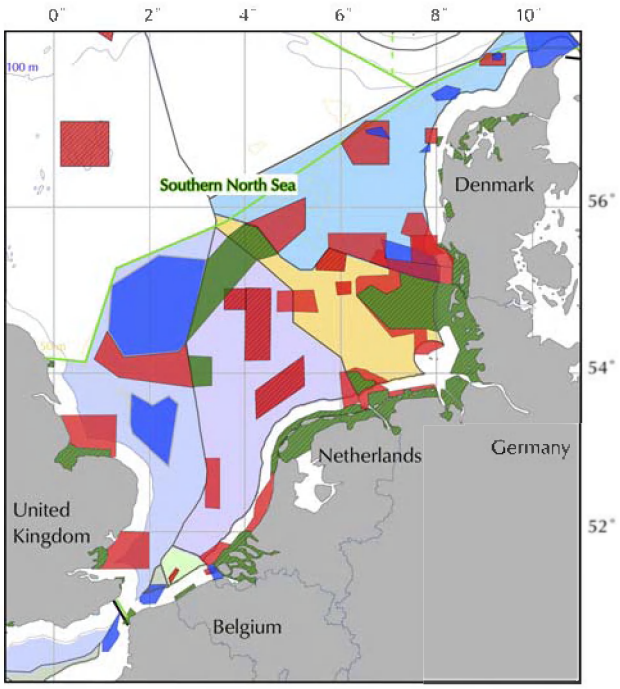


Fig. 5.3.1: Southern North Sea. MPAs proposed and state of the MPA network, February 2009: existing SACs and accepted SCIs (hatched green), pSCIs nominated to the European Commission (green) and MPAs proposed (red)

5.3.1 MPAs in the EEZ of Denmark

National policy and legal history

Denmark's total sea area (excluding waters around Greenland and the Faroes) is 105,000 km². The Danish North Sea including the Skagerrak covers 60,000 km² of which 7,100 km² are less than 20 m deep. To date, 9% of this shallow area, or 2.3% of the entire Danish North Sea, have been nominated as Special Areas of Conservation (SACs) on the basis of the occurrence of the five habitats listed in Annex 1 to the EU Habitats Directive (sandbanks, estuaries, mud- and sandflats, coastal lagoons, and reefs) according to the Geological Survey of Denmark and Greenland (GEUS). As an EU Member State, Denmark is obliged, to nominate SACs within its waters according to the occurrence of habitats and species listed in Annexes I and II of the EU Habitats Directive. At least 20% of the area covered by each habitat should be included in SACs. However, the mapping of surface sediments performed by GEUS until recently has solely aimed at disclosing raw material resources of sand, gravel and pebbles. Data therefore are still insufficient to enable the national agency concerned to document whether Denmark has fulfilled its obligations with regard to the nomination of SACs containing Annex 1 habitats, as they are so far primarily defined by geomorphological and, hence rather superficial sedimentological criteria.

By end 2008, a first set of possible Sites of Community Importance (SCIs) in the North Sea was put out to public consultation, covering reefs (four sites) and habitat frequented by harbour porpoises (one site).

Denmark is a Contracting Party to the OSPAR Convention and has committed to establish, by 2010, an ecologically coherent network of MPAs in all marine waters under its jurisdiction. In 2007, Denmark nominated the first 18 sites, all of them Natura 2000, as a Danish contribution to the OSPAR network[21]. The largest one is known as the "Southern North Sea" (*Sydlig Nordsø*) Special Protected Area (SPA) in the Danish EEZ just north of the Danish-German border.

[19] http://www.defra.gov.uk/marine/legislation/index.htm

[20] see www.jncc.gov.uk

[21] OSPAR MASH 07/6/3, 2007. Selection of eighteen areas as a component of the OSPAR Network of Marine Protected Areas. Submitted by the Secretariat on behalf of Denmark

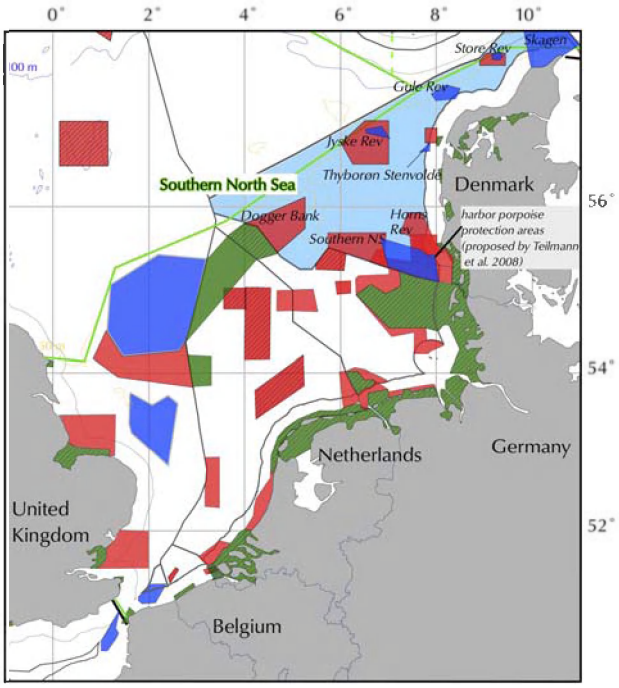


Fig. 5.3.1.1: Danish EEZ. Sites under consideration for protection under the EU Habitats Directive (blue) and additional NGO proposals (red)

Sites in consultation 2008/2009

Skagen (2,685 km²)

The largest of the new sites extends from the northern tip of Jutland into the Skagerrak. This area is proposed for the protection of two different populations of harbour porpoises which frequent the area all year round. There are sandbanks along the coast.

Store Rev (109 km²)

This stone reef with interspersed sandy flats is known for its high species diversity and also encompasses the only bubbling reef site ('submarine structures made by leaking gases', Code 1130) known in the North Sea. The methane releasing bubbling reef rises up to 3 m high and 1 m wide from the seafloor. Its carbonate structure supports typical reef fauna like sea anemones, dead man's fingers and other epifauna.

Gule Rev (471 km²)

This is a stone reef with interspersed sandy flats which is well known for its richness in fish species amongst recreational and professional fishers.

Thyborøn Stenvolde (78 km²)

This site hosts long and narrow stone reefs rising up to 8 m from the seafloor. There is no vegetation but an abundant fauna of typical reef species like dead man's fingers, sea lilies, sea anemones, and crustaceans such as hermit crab and lobster.

Lille Fiskerbanke (241 km²)

This site makes up the western part of the Jutland Reef (*Jyske Rev*) ca. 60-90 km west of Thyborøn. It is a hard substrate area in more than 30 m depth, hosting a rich fauna.

Sydlig Nordsø (2,463 km²)

This current SPA was also redesignated as a pSCI for the protection of harbour porpoise.

NGO proposals for additional Danish North Sea MPAs (Andersen 2007)

The sites proposed for protection in the Danish North Sea EEZ were selected on the basis of one or more of the habitats listed in Annex 1 to the EU Habitats Directive, in particular sandbanks and reefs, and due to their importance as a habitat for harbour porpoises. No assessment of qualifications for protection of species and habitats on the OSPAR List of threatened and/or declining species was made. Three sites totalling an area of 5,113 km² (8.5% of the Danish North Sea) are proposed as SACs by Andersen (2007) in his report to WWF (numbering and names as used in the original source):

No. 1: The "Yellow Reef" (*Gule Rev*) with the habitats 'reefs' and 'submarine structures made by leaking gases';

No. 6: The Dogger Bank (*Dogger Bank*) as an integral part of the transboundary sandbank feature; and

No. 7: "Horns Reef" (*Horns Rev*) based on frequent occurrences of the harbour porpoise. The boundaries of the WWF proposal were modified later to reflect the latest scientific knowledge (Teilmann *et al.* 2008).

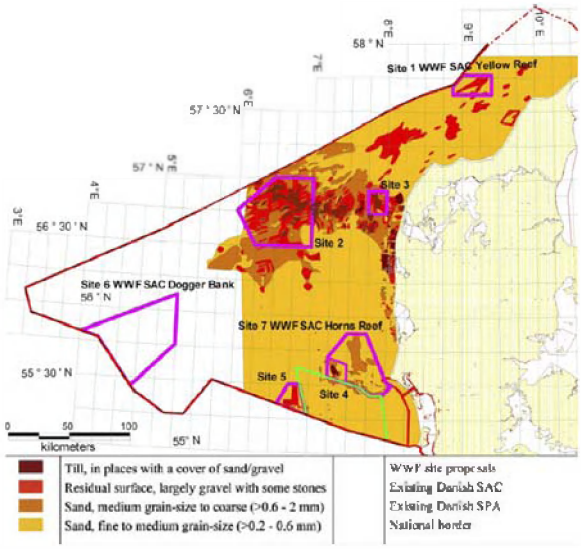


Fig. 5.3.1.2: Danish EEZ. Sites proposed for protection under the EU Habitats Directive by WWF (Andersen 2007). Numbering of sites relates to descriptions in the text.

In addition to these sites, which would raise the total area of SACs in the Danish North Sea to 6,467 km² (10.8% of the Danish North Sea), four additional sites, No. 2 and No. 3 on Jutland Bank and No. 4 and No. 5 on and adjacent to Horns Reef, are proposed for further investigations as possible SACs due to the likely occurrence of geogenic reefs.

Yellow Reef (458 km²)

The site (No. 1 in Fig. 5.3.1.2, corner coordinates 57°46'N, 9°1'E; 57°46'N, 9°25'E; 57°37.5'N, 9°25'E; 57°37.5'N, 8°53'E; and 8°53'E, 57°41'N) is proposed on the basis of the occurrence of two habitats listed by Annex 1 to the EU Habitats Directive: 'reefs' (Code 1170) and 'submarine structures made by leaking gases' (Code 1180) to be found in a terrain of fine to medium grain-sized sand. Fishermen have mapped the Yellow Reef within an area with residual surface, largely covered by gravel with some stones, surrounded by areas with fine to medium grain-sized sand (all superficially mapped by GEUS). Surfacing gases have been noted within the reef area at the approximate position 57°42.5'N, 9°12.5'E.. The terrain slopes towards the Skagerrak from about 23 to 130 m depth near the Norwegian EEZ.

Outer Jutland Bank (2,761 km²)

The Outer Jutland Bank (No. 2 in Fig. 5.3.1.2, corner coordinates 57° N, 6°30'E; 57°N, 7° E; 56°30'N, 7°E; 56°30'N, 6° 15'E; and 57°45'N, 6° E), an area covering 2,761 km², is proposed for further investigation with respect to the occurrence of the habitat type 'reefs' as listed by Annex 1 to the EU Habitats Directive (Code 1170), due to the great concentration of large areas with predominance of

(1) residual surface, largely gravel with some stones,
(2) till covered in some areas with sand/gravel in some areas, and
(3) medium grain-sized to coarse sand. Such areas can contain stones and boulders, as found in an adjacent sand and gravel extraction area.

Inner Jutland Bank (582 km²)

The Inner Jutland Bank (No 3 in Fig. 5.3.1.2, corner coordinates 56°55'N, 7°45'E; 56°55'N, 8°E; 56°45'N, 8°E; and 56°45'N, 7°45'E) is proposed for investigation with respect to the occurrence of the habitat type 'reefs' as listed by Annex 1 to the EU Habitats Directive (Code 1170), due to the existence of major areas with predominance of

(1) residual surface, largely gravel with some stones,
(2) till, in places with a cover of sand/gravel, and
(3) medium grain-sized to coarse sand.

Such areas can contain stones and boulders, as found in the adjacent sand and gravel extraction area. This site may be of particular interest, since current speeds (>3 knots) generally found in the area are higher than in other parts of the Danish North Sea.

Outer Horns Reef

The Outer Horns Reef (No. 4 in Fig. 5.3.1.2, corner coordinates 55°42'N, 7°15'E; 55°39'N, 7°30'E; 55°31'N, 7°30'E; and 55°33.5'N, 7°15'E) is proposed for investigation with respect to the occurrence of the habitat type 'reefs' as listed by Annex 1 to the EU Habitats Directive (Code 1170), due to the existence of large areas with predominance of

(1) till, in places with a cover of sand/gravel, and
(2) medium grain-sized grain to coarse sand.

Such areas can contain stones and boulders, as found in the sand and gravel extraction area.

Southern North Sea (353 km²)

The Southern North Sea site (No. 5 in Fig. 5.3.1.2, corner coordinates 55°30'N, 7°45'E; 53°30'N, 6°53.5'E; 55°16.5'N, 7°E; and 55°21.25'N, 6°36'E) is proposed for investigation with respect to the occurrence of the habitat type 'reefs' as listed by Annex 1 to the EU Habitats Directive (Code 1170), due to the existence of a large area with predominance of residual surface, largely gravel with some stones. Such areas can contain stones and boulders, as found in the adjacent sand and gravel extraction area.

Dogger Bank (2,819 km²)

The Dogger Bank (No. 6 in Fig. Fig. 5.3.1.1, corner coordinates 55°48.66'N, 4°33'E; 56°7'N, 5°15'E; 55°45'N, 5°15'E; 55°21.25'N, 6°36'E; 55°26.22'N, 4o42'E; and 55°46.36'N, 4°15'E) constitutes the northeasternmost extension of the Dogger Bank in continuation of the German SCI Dogger Bank (DE 1003-301). It is proposed on the basis of the occurrence of the habitat type 'sandbanks slightly covered by seawater all the time' as listed by Annex 1 to the EU Habitats Directive (Code 1110). Sediments in the proposed site are fine grain-sized to coarser sand with three corresponding benthic macrofauna communities on the top, flank and slope reaching into the site from the south-west.

Horns Reef (1,636 km²)

The Horns Reef (No. 7 in Fig. Fig. 5.3.1.2, corner coordinates 55°42'N, 7°15'E; 55°52.5'N, 7°30'E; 55°52.5'N , 7°45'E; and 55°33.5'N, 7°59.5'E) landwards of site proposal No. 4 is proposed on the basis of the frequent occurrence of the species harbour porpoise (*Phocoena phocoena*) as listed in Annex II to the EU Habitats Directive (Code 1351). The aim is to supplement existing EU regulations for the protection of the species.

Based on the findings by Teilmann *et al.* (2008) and Evans and Wang (2008) we propose to establish a large harbour porpoise protection area (SAC) covering the Horns Reef area and the area north of the Danish-German border (see Fig. 5.3.1.1). Evans and Wang (2008) identified the area of the German Sylt Outer Reef and northwards in Danish waters as a regional hotspot of harbour porpoise occurrence, with regular occurence recorded over several years during most of the year and high concentrations (> 50 sightings per hour) during the summer months. Teilmann *et al.* (2008) together with data from German survey flights (Gilles *et al.* 2008) demonstrated that this area is of critical importance to harbour porpoises (Fig. 5.3.1.3): there is year-round presence, with high population densities in summer showing a continuum from the German Sylt Outer Reef SAC to the north, and at least the German areas are used for propagation and nursing the calves.

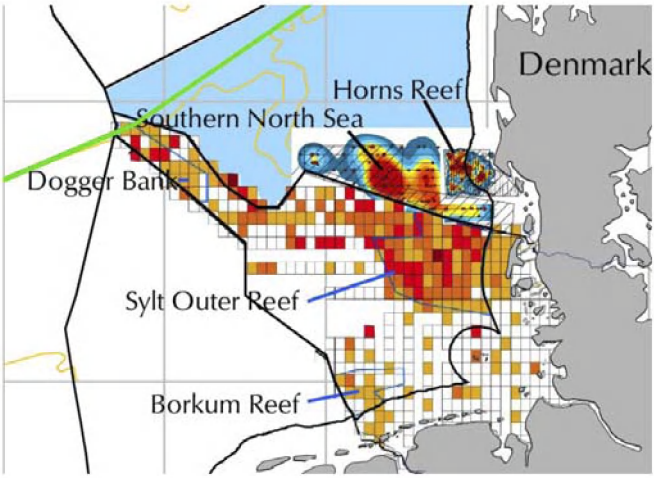


Fig. 5.3.1.3: Danish and German EEZ. Composite map of harbour porpoise density in German waters in summer (Gilles *et al.* 2008, Fig. 1) and in Danish waters (Teilmann *et al.* 2008)

5.3.2 MPAs in the EEZ of Germany

National policy and legal history

The German nature conservation law (BNatSchG), in its revision of 2002, provides the legal basis for the designation of MPAs according to European legislation for establishing a Natura 2000 network of protected sites (§38 BNatSchG). The legal responsibility for implementation of Natura 2000 (and related commitments under OSPAR) in waters up to 12 nm from the baseline rests with the German Federal States sharing the North Sea coastline (Lower Saxony, Schleswig-Holstein, Hamburg, Bremen). The respective responsibility in waters from 12 up to 200 nm was delivered to the German Federal administration. The process of nomination and designation of terrestrial and marine sites for Natura 2000 is considered complete for the North Sea.

In May 2004, Germany as the first EU Member State nominated ten offshore marine Natura 2000 sites to the European Commission, covering 31.5 % of its EEZs in the North and Baltic Seas (Fig. 5.3.2.1). In the North Sea, these are the *Sylter Außenriff* ("Sylt Outer Reef"), *Borkum-Riffgrund* ("Borkum Reef"), and *Doggerbank* ("Dogger Bank") tail's end, nominated as pSCIs under the EU Habitats Directive and the Special Protection Area (SPA) "Eastern German Bight" under the Birds Directive, which partially overlaps with the Sylt Outer Reef SCI. In 2007, all proposed Natura 2000 sites in German offshore waters were accepted as SCIs by the European Commission. Therefore, according to Article 4 (4) of the EU Habitats Directive, Germany is now in charge to implement the necessary conservation measures to secure a favourable conservation status as quickly as possible, at the latest by 2013.

In order to tackle the question of fisheries management in the new offshore SCIs which is subject to Community competence under the Common Fisheries Policy (CFP), Germany commissioned an ICES project known as EMPAS from 2006-2008 (ICES 2008b). The aim was to compile and analyse potential conflicts between human uses and site conservation objectives, including all data available on fishing activities in the German Natura 2000 sites. A set of recommendations to the German government was produced as formal ICES advice in 2008[22].

[22] http://www.ices.dk/committe/acom/comwork/report/2008/Special%20Requests/Germany%20Advice%20from%20the%20EMPAS%20project.pdf

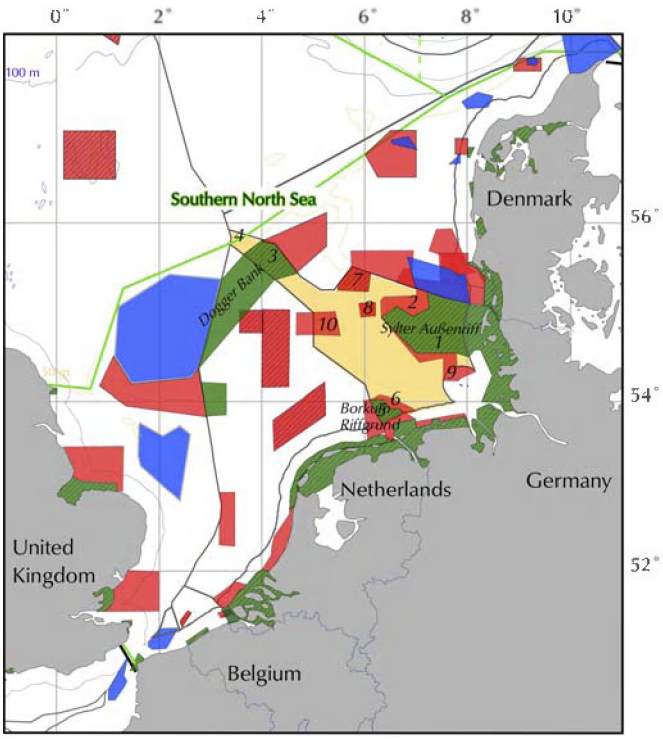


Fig. 5.3.2.1: German EEZ. The German Natura 2000 areas as established and accepted by the European Commission in 2007 (hatched green), and additional NGO proposals for sites to be designated or researched using criteria of the EU Habitats Directive (red) and/or the OSPAR List (hatched red). Numbers refer to site descriptions in the text.

Germany´s contribution to the OSPAR network of MPAs currently amounts to 12,000 km², including the Wadden Sea National Parks in Lower Saxony and Schleswig-Holstein as well as the SPAs around Heligoland and the SPA Eastern German Bight. The nomination of the three offshore SCIs to the OSPAR network in 2008, Dogger Bank, Sylt Outer Reef, and Borkum Reef will add another 7,600 km². As a first North Sea state, Germany has established legislation and is carrying through a spatial planning process in its EEZ (September 2008). Unfortunately, conservation goals and management requirements for the designated MPAs, both SCIs and OSPAR MPAs, are not adequately considered in this context.

Proposals for additional German MPAs

The following pages provide brief descriptions of the three SCIs in the German EEZ. The information is largely based on Rachor & Nehmer (2003), Finger (2005), Koschinski (2006), ICES (2006b, 2007b, 2008a) and site proposals made by WWF (2003, 2005, 2006) for additional Natura 2000 and OSPAR MPAs.

Sylter Außenriff SCI (5,314 km²)

This site (No. 1 in Fig. 5.3.2.1) is considered to best represent the remainders of glacial reef structures along the ancient Elbe river valley (1,535 km²), a sandbank with a high biotope and habitat diversity (87 km²), a year-round elevated density of harbour porpoises including function as a nursery ground. The quality of the area is currently being compromised by, *inter alia*, aggregate extraction (Fig. 5.3.2.2, Schreiber 2006), a high density of vessel traffic and intensive fishing activities. The long and intensive fishing history, together with the consequences of land-based eutrophication and pollution has caused a loss of sensitive, long-lived benthic species (see ICES 2008b). The area of the highest density of reef remainders coincides with licenced aggregate extraction areas. Set nets pose a serious threat to harbour porpoises.

It is proposed to implement strict measures to enable the achievement of the conservation objectives for all of the area, including the prohibition of trawling on reef structures where they occur, mitigation of threats from set nets, and a phase out of sand and gravel extraction inside the reef area. In addition, an experimental fishing closure on the Amrum Bank is suggested.

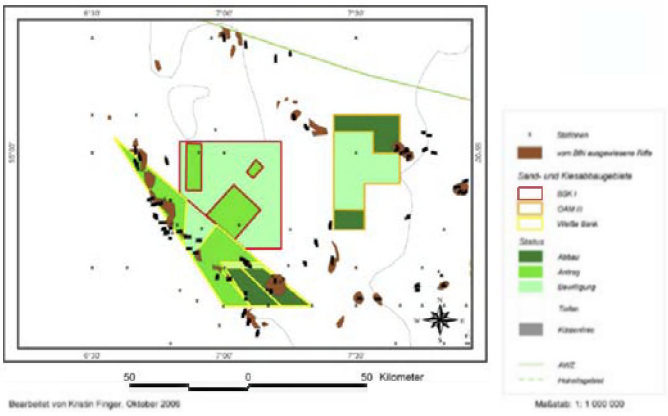


Fig. 5.3.2.2: Aggregate extraction ongoing (dark green), requested (green) and granted (light green) inside the Sylt Outer Reef SCI (reefs in brown, Finger 2006).

Extension of the Sylter Außenriff SCI

A substantial sandbank, reef structures, and the highest densities of harbour porpoises have not been included within the Sylt Outer Reef SCI but occur in the northern "bite" and across the Danish border (see No. 2 in Fig. 5.3.1.1, and Figs 5.3.2.3 and 5.3.2.4). This area was cut out of the site designation because wind farm

projects are licenced on the sandbanks there. It is proposed to either extend the designated SCI or to consider other measures for the protection of Germany´s sandbank, reef and harbour porpoise inventory in order to fulfil the obligations under the EU Habitats Directive.

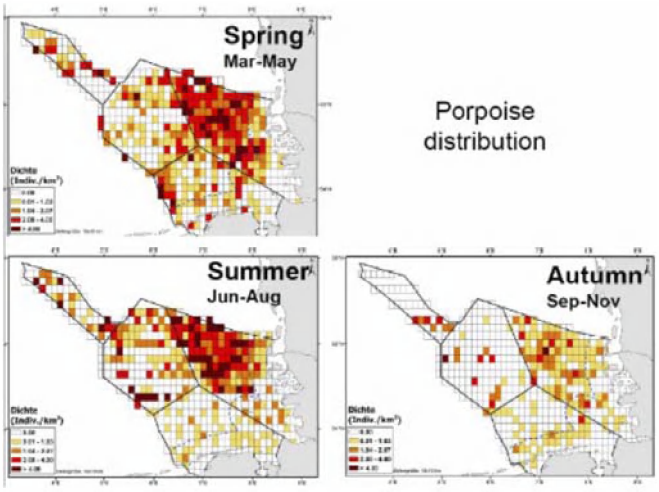


Fig. 5.3.2.3: Harbour porpoise density in the German EEZ (from ICES 2008b)

Doggerbank (1,624 km²)

Germany has designated the tail's end of the Dogger Bank (No. 3 in Fig. 5.3.2.1) as an SCI with a view to contributing to an envisaged international transboundary SAC covering the entire bank structure (Fig. 5.3.2.4). The *Bathyporeia-Tellina* macrobenthic community is characteristic of the fine sediments occurring there, and the site is considered to be a regeneration and stepping stone area for coastal macrofauna. In addition, harbour porpoises and grey seals frequent the area. The area is intensively fished by a mixed roundfish demersal beam, otter trawl and seine fishery, most importantly for sandeel, sprat and plaice. Measures are required which are suitable for the regeneration of benthic communities, now adapted to a long history of intensive trawling disturbance. Regeneration of the Dogger Bank includes restoration of a natural species composition, including long-lived, sensitive species.

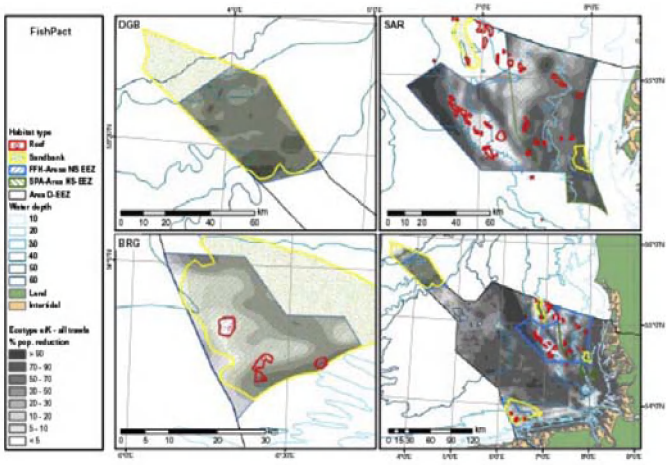


Fig. 5.3.2.4: Location of sandbanks (yellow) and reefs (red) eligible under the EU Habitats Directive in the SCIs in the German EEZ. The underlying grey shaded areas indicate the modelled relative mortality of K-strategist benthic species from bottom trawling (ICES 2008b).

Outer Doggerbank

This (No. 4 in Fig. 5.3.2.1) is the only area in the German EEZ which represents the central North Sea faunal communities. The area could be nationally representative under OSPAR. Further research is proposed.

Borkum-Riffgrund SCI (625 km²)

The bank (No. 5 in Fig. 5.3.2.1) is a glacial relict with mixed substrata providing multiple benthic habitats. There used to be extensive hard substrate (Fig. 5.3.2.5) which was, however, removed in the course of fishing activites until only the biggest boulders were left. Today, the area comprises 521 km² of sandbanks and 22 km² of reef habitat and it is considered to be a hot spot for harbour porpoises. Next to a Danish sandeel and shrimp trawling fishery, the set net frequencies e.g. by Danish summer sole fishery are increasing. The southern part of the site coincides with a traffic separation scheme with one of the highest vessel frequencies in the world. Measures must ensure to maintain or restore the qualities of the remaining reef and sandbank fauna, and the habitat for harbour porpoises.

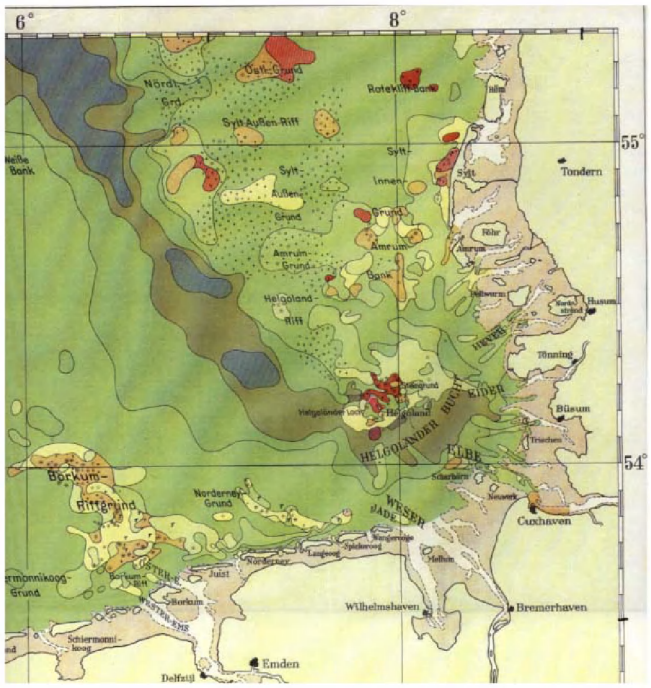


Fig. 5.3.2.5: Historic sediment map of the German Bight (from Jarke 1965). Fine sediments (sandy mud) in green to blue, coarse sediments in brown to red, gravely and stony areas with symbols. The extent of Borkum Reef and Amrum Bank is clearly visible.

Extension of the Borkum-Riffgrund SCI

The ancient glacial Borkum Reef Ground was on both sides of today's German-Dutch border (No. 6 in Fig. 5.3.2.1 and Fig. 5.3.2.5). Habitats there are highly diverse and include the sea urchin *Echinus esculentus* as well as the brittle star *Amphiura filiformis*. The ocean quahog *Arctica islandica* was found on both sides of the border. It is proposed to extend the German Borkum Reef SCI across the border to the Dutch side. On the German side, also the deeper parts of the sandbank should be covered. The gap between the Wadden Sea National Park of Lower Saxony and the SCI Borkum Reef should be closed, in particular to trawling in between the traffic separation lanes.

Elbe-Urstromtal

In particular the eastern slope of the ancient Elb river valley is characterised by the occurrence of stone reefs and cobble-pebble fields clearly distinguished as reefs by their characteristic fauna, such as dead man's fingers (*Alcyonium digitatum*), the sea urchin *Echinus esculentus*, and decapod species. The former valley proper is characterised by fine sediments and not yet represented in the German network of MPAs. The area should be proposed as SCI.

Nördliches Elbe-Urstromtal

In this area (No. 7 in Fig. 5.3.2.1), to be proposed as OSPAR MPA, crossing into the Danish EEZ, especially many red-listed species occur, including the ocean quahog *Arctica islandica* (in German waters) and the habitat 'sea-pen and burrowing megafauna communities' (in Danish waters).

Elbe-Urstromtal Mitte

This area (No. 8 in Fig. 5.3.2.1), to be proposed as OSPAR MPA and SCI, can be seen as an extension down the slope of the pleistocene Elb valley to the west of the SCI Sylt Outer Reef. Here, particularly many red-listed species occur, including high densities of the brittle star *Amphiura filiformis* and the ocean quahog *Arctica islandica*. The substrates are circalittoral reefs and other hard substrates.

Helgoland Tiefe Rinne

South of the Isle of Heligoland (inside 12 nm), on the edge of the ancient Elb river valley, stone fields occur which are very rare in German waters (No. 9 in Fig. 5.3.2.1). It is considered to be an important stepping stone for benthic epifauna. This area is representing a rare habitat in German waters, and is proposed for inclusion in the OSPAR network of MPAs (ideally as an extension of the existing coastal nature reserve of Heligoland) as well as a SCI.

Westlicher Nordschill-Grund (10)

Pockmarks are known to occur in this area on the Dutch and German side of the border. This site (No. 10 in Fig. 5.3.2.1) is an area of further research for the occurrence of biogenic structures or communities associated with leaking gases (Code 1130). However, given the long-term trawling activities in the area, it seems unlikely that any structures still exist. Further research is proposed.

5.3.3 MPAs in the EEZ of The Netherlands

National policy and legal history[23]

In 1990, the Dutch Ministry of Agriculture, Nature and Fishery[24] declared the entire Dutch North Sea as a part of the North Sea ecological network which *inter alia* entails that human activities must be guided by the precautionary principle. The Natura 2000 areas in Dutch waters will be part of the 'National Ecological Network' which is to cover the total surface of the Netherlands and aims to conserve biological diversity and to recover ecological values. This is why the selection of 'areas of ecological value' was based on a set of national criteria, more comprehensive than the criteria given for selection of Natura 2000 sites alone.

The European and global policy commitments were first translated in the national spatial planning policy document "*Nota Ruimte*" (2005)[25], and later in the Integrated Management Plan for the North Sea (IMPNS 2015, Netherlands 2005). In the national spatial planning policy document "*Nota Ruimte*", five areas were designated: *Friese Front* ("Frisian Front"), *Klaverbank* („Klaver Bank"), *Doggersbank* ("Dogger Bank"), *Kustzee* ("Coastal Sea") and the *Central Oestergronden* ("Central Oyster Ground"). A research report (Lindeboom *et al.* 2005) provided the background information on additional sites of particular ecological value in the national context, and their qualification under OSPAR and/or Natura 2000, In this report, the sites *Zeeuwse Banks* ("Zeeland Banks"), *Borkumse Stenen* ("Borkum Reef"), *Gasfonteinen* ("Gas Seeps") and *Bruine Bank* ("Brown Bank") figure as potential 'areas of ecological value' in the Dutch EEZ (Fig. 5.3.3.1).

However, the IMPNS 2015 only mentions the *Centrale Oestergronden*, the *Borkumse Stenen*, *Zeeuwse* and *Bruine Banken* as 'additional areas' without any protection status now or in the future. The *Centrale Oestergronden* site was deliberately excluded because this area only qualifies under OSPAR criteria which was not considered to be a priority. In addition, IMPNS 2015 cut out the middle part of the Coastal Sea between Bergen and the *Voordelta* because the northern and southern areas had already been nominated for the Natura 2000 network. The *Voordelta* and the *Noordzeekustzone* are already

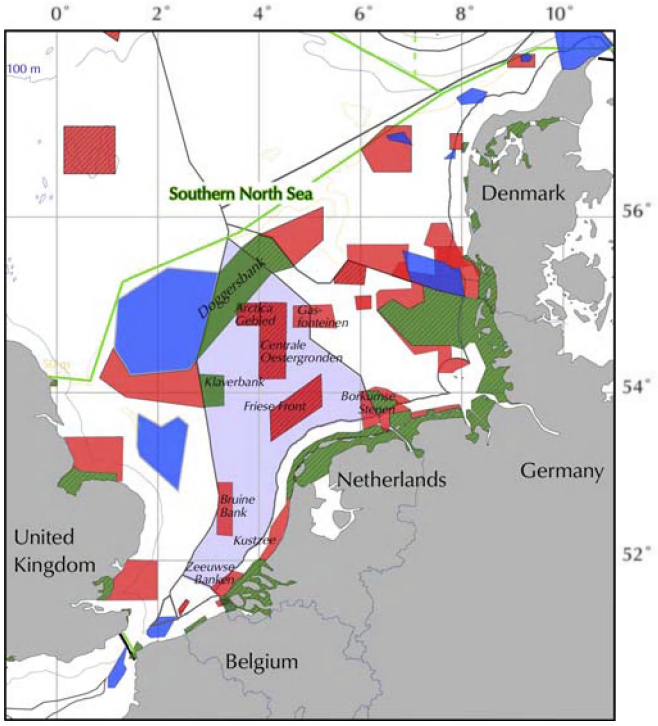


Fig. 5.3.3.1: The Netherlands EEZ. The Dutch Natura 2000 sites as established (hatched green), nominated to the European Commission in 2008 (green) and additional NGO proposals for sites to be designated or researched based on criteria of the EU Habitats Directive (red) or for the protecton of species/habitats on the OSPAR List (hatched red)

protected as SPA and SAC. In order to allow for the implementation of the European Habitats and Birds Directives up to the limits of the EEZ, the nature protection law needs to be amended.

Sites nominated to the European Commission in 2008

In December 2008, the Dutch government nominated the following sites for inclusion in the Natura 2000 network to the European Commission: the northern Coastal Sea between Bergen and the German border out to 20 m depth (extension of the *Noordzeekustzone* SAC, Birds and Habitats Directives), *Doggersbank* and *Klaverbank* (both Habitats Directive), the *Vlakte van de Raan* (Habitats Directive) in the 12 nm zone. The same areas, and the *Voordelta* have been nominated identically for the OSPAR MPA network[26]. The bird protection areas, including in addition the *Friese Front* area, will be legally designated as SPA (Birds Directive) and nominated to OSPAR in 2010. All sites will be nationally protected through the Dutch Nature Conservation Act and the Flora and Fauna Act in 2010.

[23] Text based on Hugenholtz (2008)

[24] now Ministry of Agriculture, Nature and Food quality

[25] http://www2.vrom.nl/notaruimte/

[26] OSPAR BDC 09/5/Info.3 (2009). Selection of MPAs as components of the OSPAR network by the Netherlands

Fig. 5.3.3.2: The Netherlands EEZ: sites proposed by the NGO coalition for protection under national legislation, contributing to the Natura 2000 and OSPAR MPA networks (van den Akker 2008)

NGO proposals for additional Dutch North Sea MPAs

The following pages present the current knowledge and status of the 'areas of ecological value' (based on Lindeboom *et al.* 2005, Witbaard and Lindeboom 2008). All these sites (Fig. 5.3.3.2) are proposed for protection by the Dutch NGO coalition (Hugenholtz 2008 and van den Akker 2008).

Noordkromp Gebied, Arctica islandica Area (1,000 km²)

This unnamed area was only recently (2007) discovered. It is located at ca. 40 m depth south of the *Doggersbank* and north of the *Centrale Oestergronden*. This area hosts the highest concentration of *Arctica islandica* (*Noordkromp*, ocean quahog, *Icelandic cyprine*) in the Netherlands EEZ and numerous other bivalves – probably because fishing intensity is relatively low due to cables in the area (Lindeboom pers. comm., Fig. 5.3.3.3). *Arctica islandica* is listed as under threat and/or decline by OSPAR, and MPAs are considered a suitable tool for the protection of this species.

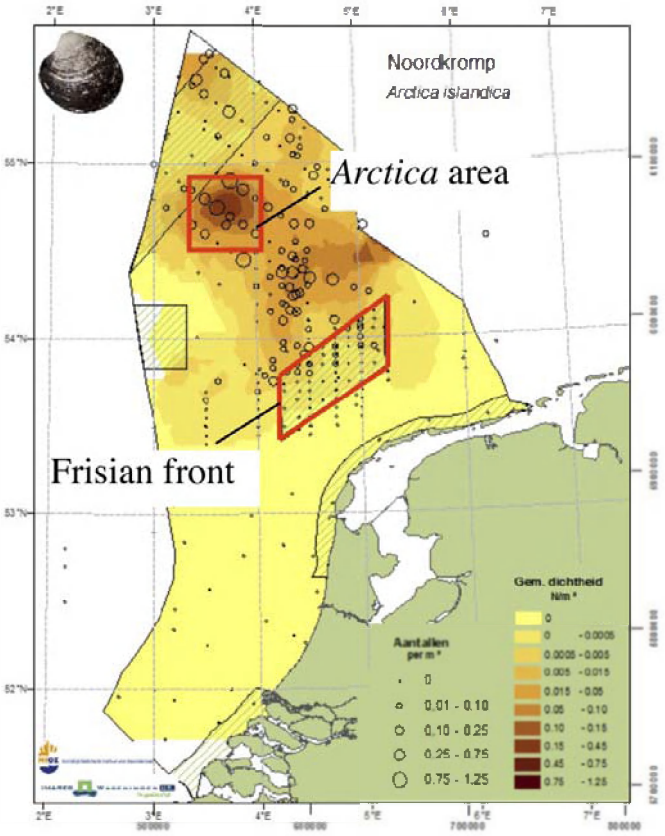


Fig. 5.3.3.3: Density of *Arctica islandica* in the Dutch North Sea. The proposed *Arctica* area and the *Friese Front* protected area proposals are outlined in red (Lindeboom pers. comm.)

Borkumse Stenen (479 km²)

This area, proposed as additional SCI, borders the German Natura 2000 site *Borkum-Riffgrund*. Relatively strong currents keep glacial remainders such as boulders and pebbles from being covered by a sediment veneer. No recent research data exist which could complement the surveys on the German side, studies of the epifauna missing completely. The variable substrate, at least present in the past, seems to result in an increased macrofauna diversity. The area is used as feeding ground by seals, and harbour porpoises have been sighted often. The area is intensely fished, smoothering the surface and removing some of the hard substrate. Acoustic mapping demonstrated 89 trawl tracks over a 3 km transect (Witbaard and Lindeboom 2008).

Bruine Bank (1,292 km²)

This is a relatively stable sandbank with a summit depth of ca. 35 m and an overall coarse sandy sediment structure and associated fauna. The strong currents continuously expose relicts of prehistoric animals from the underlying turf layers. The bank is a known spawning area for flounder and plaice. It is important for winter aggregations of guillemots (*Uria aalge*, up to 15,000 individuals), and as a foraging area for several species of gulls from coastal nesting sites. In

Leopold *et al.* (in press.), all seabird species have been considered together. The seabird conservation value of the *Bruine Bank* area, averaged over the year, is rather high. Moreover, harbour porpoises seem to occur more frequently than in the surrounding area.

The site partly lies in a shipping lane, and there is an increasing number of guillemots killed by chronical oil pollution from operational discharges. According to the OSPAR Ecological Quality Objective (EcoQO) on oiled seabirds in the North Sea, this number has to be reduced. The pressure from trawl fishing with large beam trawls (> 300 HP) is very high, statistically one fishing event per m^2 and year (Lindeboom *et al.* 2008). To optimise the effect of a protected area for birds, a revision of the originally proposed boundaries in Lindeboom *et al.* (2005) is suggested (see Fig. 5.3.3.4.). The site qualifies both as SPA and SCI.

Centrale Oestergronden (3,453 km²)

This is a well known and often studied soft substrate depression south of the Doggersbank east of the *Arctica* area. Until the end of the 19th century, this was the location of extensive oyster banks nourishing people

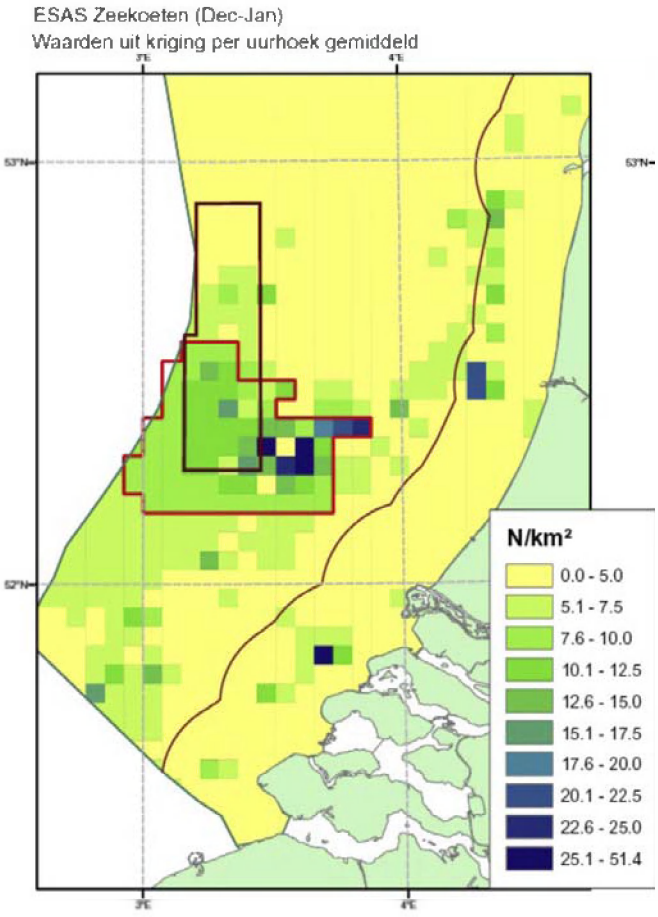


Fig. 5.3.3.4: The Netherlands EEZ. *Bruine Bank* ("Brown Bank") boundaries in relation to guillemot (*Uria aalge*) abundance (Witbaard and Lindeboom 2008)

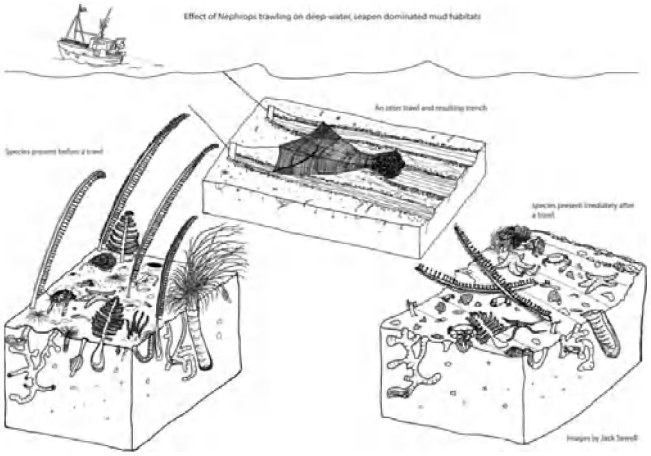


Fig. 5.3.3.5.: The Netherlands EEZ. *Oestergronden*. The likely impact of trawling on the soft sediment communities in the Oyster Grounds (Sewell and Hiscock 2005, based on data from de Wilde *et al.* 1984)

around the North Sea. Today, this muddy area is of interest because of its high diversity and biomass of macrobenthos, including elevated densities of the ocean quahog *Arctica islandica* (Witbaard and Bergmann 2003, Rachor and Nehmer 2003, Fig. 5.3.3.5.), a species listed by OSPAR. The area is a *Nephrops* trawling ground and corresponds to the OSPAR–listed habitat 'sea-pen and burrowing megafauna communities' but no sea pens were found in recent investigations (Rachor and Nehmer 2003). Due to the intensive fishery pursued since the 1850s, it is also quite unlikely that sea pens can be found associated with the habitat. Today, fishing pressure is moderate. In summer, this is an important foraging area for fulmars (*Fulmarus glacialis*, Leopold *et al.* in press). The site is proposed as an OSPAR MPA.

Klaverbank (1,237 km²)

This area is unique on the Dutch Continental Shelf (DCS) in that significant amounts of gravel lie exposed at the surface of the seabed, and larger boulders with a cover of calcareous red algae and typical hard substrate fauna occur. It is the area with the highest benthic species diversity on the DCS. The area was, and potentially still is, an important spawning ground for fish such as rays and herring that attach their eggs to hard substratum. The boundaries include two gravel areas ('reefs', Code 1170) and an interspersed silt gulley, the Botney Gut. Here, the benthic species diversity is particularly high, including i.e. the lobster *Homarus gammarus*. Both features have their prolongation in UK waters (see NGO proposal Skate Hole and Outer Silver Pit in Chapter 5.3.4). Currently

there is limited fishing pressure. The area is proposed as SCI and OSPAR MPA to also protect the soft bottom component.

Kustzee (3,994 km²)

The NGO proposal includes all of the coastal sea at least to the 20 m isobath. As by 2009, a strip of 1,120 km² between Bergen and Petten was excluded from the governmental Natura 2000 nominations.

All of the coastal area, in particular above the 20 m isobath, is of critical ecological value for seabirds, marine mammals, benthos, and as a nursery ground for many fish species. Off the Holland coast, the primary production is relatively high, and the diversity of fishes, including elasmobranchs, is higher than further offshore. The area hosts large numbers of wintering common scoters (*Melanitta nigra*, up to 100,000 individuals), and large groups of eider ducks are attracted by shifting locations of extensive shellfish beds such as such as surf clam *Spisula* sp. Thus, the area qualifies for protection under both the Habitats and Birds Directive.

There is an urgent need to lower the very high fishing pressure from Eurocutters <300 HP (vessels >300 HP are prohibited inside 12 nm), and introduce sustainable management of a multitude of other spatial uses, including resource extraction and installations, military use, aquaculture, coastal defense and alterations.

Doggersbank (4,718 km²)

The Dutch part of the Dogger Bank is the central piece of this the largest North Sea sublittoral sandbank which also straddles the waters of UK, Germany and Denmark. The Dutch section is between 30 and 40 m deep and supports a high diversity of macrobenthos on its western side, as well as important natural values at the slopes. Fronts occur frequently along the southern boundary of the bank in summer, and they may cause the observed higher concentrations of fishes including thornback ray (*Raja clavata*), white-sided dolphins (*Lagenorhynchus acutus*), harbour porpoise (*Phocoena phocoena*) and seabirds (i.e. gannet, kittiwake, guillemot, razorbill). On the southern flank of the bank, several active pockmarks were found. The long-term effect of trawling can be seen in that the long-lived species like *Arctica islandica*, *Aequipecten* sp. and *Modiolus* sp. have much reduced abundance compared to earlier records (Callaway *et al.* 2007). Currently,

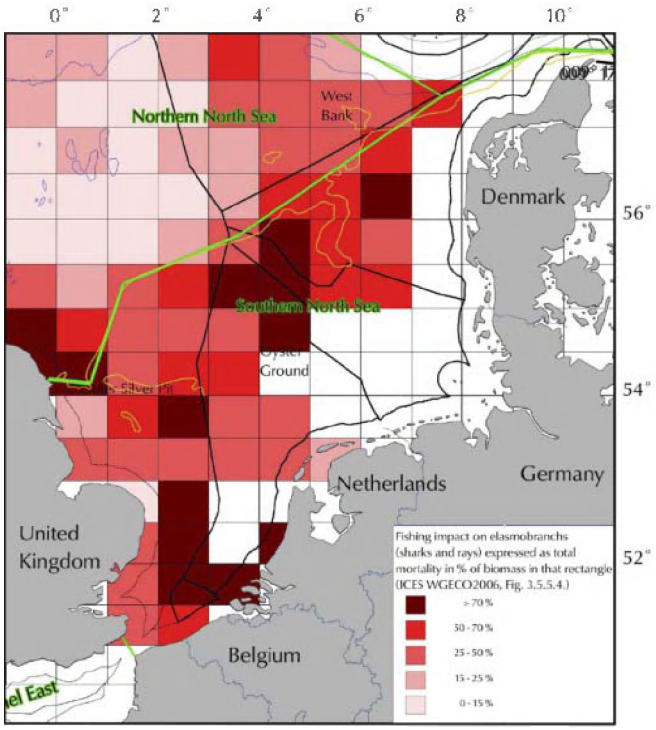


Fig. 5.3.3.6: The Netherlands EEZ. Elasmobranch mortality in the Southern North Sea estimated by ICES (2006a; Fig.3.5.5.4)

the fishing pressure from Dutch vessels is lower than before, and disturbance from fixed installations or vessels is also low. However, the annual fishing mortality of elasmobranch species amounts to more than 70 % of the standing stock biomass (Fig. 5.3.3.6, ICES 2006a). The government has nominated the area for the Natura 2000 (EU Habitats and Birds Directives) and OSPAR MPA network. It is suggested to include a reserve for thornback rays in the management plan.

Friese Front (2,881 km²)

This large frontal area acts as a deposition zone for silt and nutrients originating from English waters and tributaries, possibly coinciding with enhanced primary production. All these factors together make it a zone with a high biomass of zoobenthos and high diversity. *Arctica islandica* occurs in high numbers throughout the area. Higher concentrations of fish and birds have been observed in this area as well. Especially guillemots (*Uria aalge*) migrate to this area in large numbers with their young in late summer and in autumn to forage (Leopold *et al.* in press).

The *Friese Front* is under particular pressure from beam trawlers >300 HP. Illegal discharges of oil, platforms, vessel and air traffic, a military training area add to the human impact. Despite the exceptional value

of the seafloor habitat, and the imminent threat to it from demersal fishing, the area will only be nominated as a bird protection area (SPA) for Natura 2000 and OSPAR MPA. It is proposed as OSPAR MPA.

Gasfonteinen (593 km²)
Gas seeps are active pockmarks which release methane in bursts into the water column, producing small underwater crater-like depressions. However, only if carbonate concretions build up, such 'submarine structures made by leaking gases' (Code 1180) are eligible for site protection under the EU Habitats Directive (European Commission 2007). New research implies that this cannot be shown for the area in question – however, demersal fishing activities may also have removed the structure, so more research is needed.

Zeeuwse Banken (655 km²)
These shallow sandbanks constitute the seaward extension of the already designated *Voordelta* and the new site in the mouth of the Westerschelde. There is substantial pressure on the natural values from fishing, aggregate extraction, cables and pipelines, military and ships traffic with related problems of pollution and noise. However, more research is needed.

5.3.4 MPAs in UK waters

National policy and legal history
In 2009, the UK can be expected to have one of the most progressive and integrated marine legislative structures in the world. A Marine and Coastal Access Bill was published in December 2008 and is currently passing through Parliament. It is anticipated that it will be passed and become the Marine and Coastal Access Act before the end of the current parliamentary session. The Bill provides the tools required to establish a new ecologically coherent network of marine protected areas in the inshore waters of England and Wales, and beyond 12 nm for all UK waters. It is anticipated that marine protected areas within 12 nm from the Scottish coast will be designated via a new Scottish Marine Bill which is expected to be published in spring 2009. Together with Natura 2000 sites, the new 'Marine Conservation Zones' (MCZs) and MPAs in Scotland will deliver regional (OSPAR) and global (CBD) conservation commitments. In addition to provisions for a new network of marine protected areas, the Marine and Coastal Access Act (once enacted) will require the adoption of a Marine Policy Statement, establish a new Marine Management Organisation (MMO) in England, provide for marine planning in UK waters, improve licensing regulation and fisheries management in inshore waters.

In waters beyond 12 nm, the advisory body of the UK government, the Joint Nature Conservation Council (JNCC) must propose sites to the government and establish conservation objectives for these sites. Since 1999, the JNCC has been in the process of gathering existing and survey information to locate possible SACs (called 'Areas of Search' in the first phase) for the three relevant habitat types ('reefs', Code 1170; 'sandbanks which are slightly covered by seawater all the time', Code 1110; 'sub-marine structures made by leaking gases', Code 1180) and species (grey seal, common seal, bottlenose dolphin and harbour porpoise)[27, 28].

A sandbank complex, the North Norfolk Banks, which had been subject to public consultation in 2007/8, has not yet been nominated to the European Commission due to revisions requested during the consultation process.

[27] see http://www.jncc.gov.uk/page-4538

[28] also see Gubbay (2007)

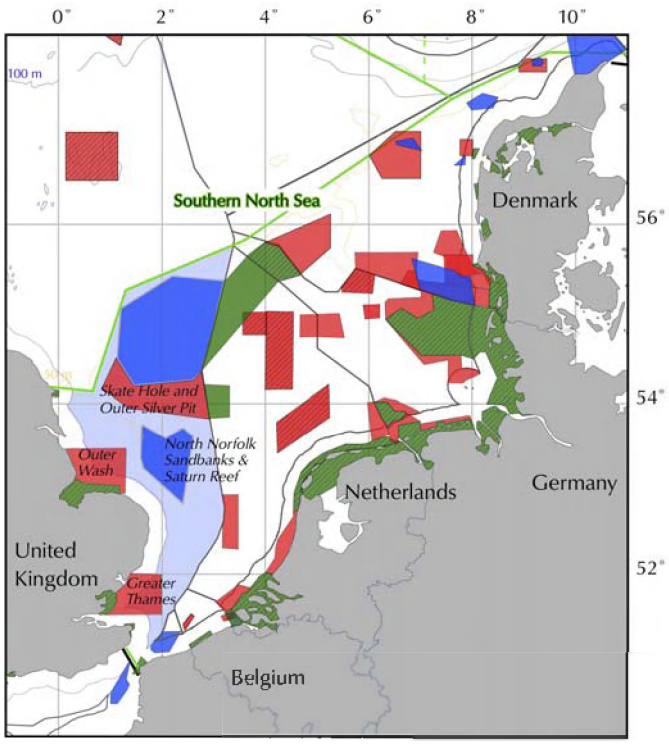


Fig. 5.3.4.1: UK waters, Southern North Sea. The UK Natura 2000 areas as established (hatched green), sites under investigation and consultation (blue), additional NGO proposals for sites to be designated using criteria of the EU Habitats Directive (red) and OSPAR (hatched red)

The UK section of the Dogger Bank has long been considered as a draft Special Area of Conservation (SAC), a full proposal being available already in 2004[29]. Yet further extensive surveys were commissioned in 2008[30]. Further six 'Areas of Search' for offshore SACs are being surveyed in the Southern North Sea, two on the Dogger Bank which is being considered for both shallow sandbank and reef habitats, and four sandbank areas.

Sites nominated to the European Commission in 2008

A first tranche of sites was nominated to the European Commission in September 2008, however it did not include any nomination in the Southern North Sea.

NGO proposals for additional UK MPAs in the Southern North Sea

In addition to sites in preparation by JNCC, it is proposed here to also consider the Outer Silver Pit for protection under the EU Habitats Directive (harbour porpoise, partly reef) and OSPAR (recovery area for the ocean quahog *Arctica islandica*). Besides, the offshore enlargement of the Greater Thames and Outer Wash estuaries is proposed under OSPAR for restoration of elasmobranchs and the EU Habitats Directive (sandbanks, reefs), respectively.

Dogger Bank

This description of the Dogger Bank is based on Gubbay *et al.* (2002): the bank is formed by a glacial moraine with an extension of more than 300 km, straddling the waters of the UK, Netherlands, Germany and Denmark. In UK waters, the summit of the bank is less than 20 m below sea surface, the bank then deepening towards the east. The UK part of the Dogger Bank is characterised by extensive areas of coarse substrates from gravelly sand to gravel and pebbles with interspersed finer sediments.

The Dogger Bank is considered to be a unique ecological region in the North Sea (Kröncke and Knust 1995) due to a frontal area separating northern and southern current systems as well as pelagic and benthic species communities, and leading to high year-round pelagic production (Brockmann and Wegner 1985; Richardson and Olsen 1987; Brockmann *et al.* 1990). The presence and high abundances of large bivalves such as razor shell (*Ensis* spp.) are restricted to the northern slopes and shallow areas (Wieking and Kröncke 2005). However, Kröncke (1992) found a shift in species composition towards smaller-sized macrofauna and decreased abundances of large bivalves compared to the 1950s. The partly reef-like and complex habitats of the bank provide spawning grounds for mackerel, herring, cod, whiting, plaice, sole, sandeels, and sprat. There has been a decline in the relative importance of skates and rays since the 1970s. Mass feedings of gannets, white-beaked dolphins (*Lagenorhynchus albirostris*) and white-sided dolphins (*Lagenorhynchus acutus*) were observed (Camphuysen *et al.* 1995). During the course of a more recent investigation of seabird and marine mammal feeding behaviours, large numbers of the northern fulmar (*Fulmarus glacialis*) were observed over the Dogger Bank, as were black-legged kittiwake (*Risa tridactyla*), northern gannet (*Morus bassanus*), white-beaked dolphin (*L. albirostris*) and harbour porpoise (*Phocoena phocoena*, Camphuysen 2001).

The Dogger Bank was one of the great fishing grounds in the 19th and early 20th century. At present, the highest fishing effort in the Dogger Bank region is that of the

[29] JNCC 04 P23 see http://www.jncc.gov.uk
[30] http://www.jncc.gov.uk/pdf/OffshoreAreasSurveyedbyJNCC_Feb09.pdf

international North Sea beam trawlers. Beam trawling for flatfish and otter trawling for sandeels both modify the sediment structure and have long-lasting impacts on the benthic epi- and infauna communities, though to a different degree.

The Dogger Bank needs to be designated as a transboundary MPA under Natura 2000, both as SAC for its importance as sandbank and for marine mammals and SPA as a feeding area for seabirds. In addition, it is proposed as OSPAR MPA for the protection of skates and rays. WWF supports boundaries which include all main features of the bank, in particular the slopes (such as in JNCC 04P23)[31].

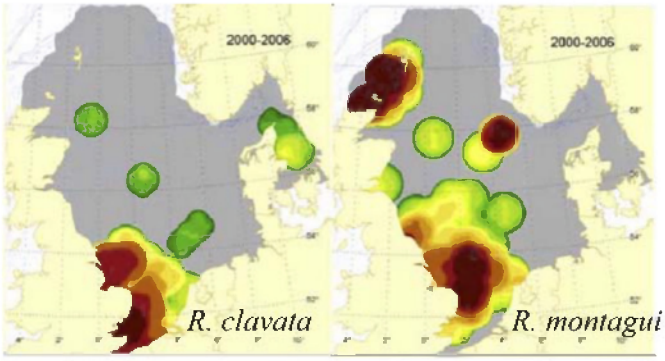


Fig. 5.3.4.2: Importance of the English southeast, in particular the Wash and Greater Thames estuaries coast for thornback ray (*Raja clavata*, left) and spotted ray (*Raja montagui*, right) 2000-2006. Increasing concentrations coloured from green to brown, (ICES 2007a, Fig. 15.7)

Greater Thames Estuary Sandbanks

This is a JNCC and English Nature (EN) 'Area of Search' which comprises several sandbanks formed and shaped by tidal current flow and modified by open shelf currents. Physical forcing decreases from shallow to deep as indicated by turbid waters, sandwaves on the banks, and a mixed, gravelly substrate with potentially rich epifauna in the deep troughs. The estuary is a spawning and partially nursery area for herring, mackerel, plaice and sole (Jones *et al.* 2004) and records of *Sabellaria* reefs (OSPAR database 2008) and *Modiolus* sp. The National Biodiversity Network database (NBN 2008) point to a relatively well-preserved benthic environment inside territorial waters.

The Greater Thames Estuary is of regional importance for thornback ray (*Raja clavata*), juvenile triakids (Ellis *et al.* 2005, 2008) and the wider estuary possibly for spotted ray (*Raja montagui*, see Fig.5.3.4.2, ICES 2007a). Spurdog (*Squalus acanthias*) occur seasonally on the offshore grounds of the area, and juvenile thresher shark (*Alopias vulpinus*) are also caught occasionally. Mortality of sharks and rays of all sizes (but the smallest) is particularly high during all four quarters of the year (Fig. 5.3.4.2, ICES 2006a). Ellis *et al.* (2008) confirm that in Greater Thames Estuary there are extensive nursery grounds for thornback ray, and likely several other elasmobranch species (Ellis *et al.* 2005), the habitat quality prefered for the deposition of the egg cases being a well-structured seafloor with dense erect megafauna (Ellis *et al.* 2005).

Human pressure on the banks and slopes is increasing, with licenced wind turbine locations and cable laying adding up to ongoing aggregate extraction, intense shipping, dredge spoil disposal and fishing in the area (Jones *et al.* 2004). However, the unsustainable high level of fishing effort, in particular bottom trawling outside the 12 nm zone, is the greatest threat to elasmobranch populations (ICES 2008b). For the inshore fishery in the Greater Thames Estuary, Ellis *et al.* (2008) noted that there already were many areas of limited access to fishermen (e.g. navigation routes, offshore wind farms, shallow water areas), and that the utility of these areas for thornback ray should be evaluated prior to establishing further spatial restrictions. Additionally, measures to protect mature females (e.g. through a maximum landing length) could also be considered. Nonetheless, given that the present total area of thornback ray is only 44 % of the extent of the species in the 1980s (ICES 2007a) urgently requires measures to prevent further decline.

Based on its importance for elasmobranchs, the Greater Thames Estuary is proposed as OSPAR MPA.

North Norfolk Banks (4,327 km²)[32]

This area comprises a combination of ten major tidal current sandbanks and sandy mounds and is a prime example of the offshore linear ridge sandbank type in UK waters. The outer banks represent the open sea type sandbank with a moderate current strength in UK waters. The summit of the banks are shallower than 20 m, the slopes reaching down to 40 m depth.

There is no vegetation on the banks, and they support typical Southern North Sea sandbank communities, e.g. the the sea potato *Echinocardium cordatum* and

[31] JNCC 04 P23 see http://www.jncc.gov.uk

[32] based on http://www.jncc.gov.uk/pdf/NNSandbanksandSaturnReef_SelectionAssessment_3.1.pdf

the bean-like tellin *Fabulina fibula*, and are a nursery area for sprat, sandeel, goby and whiting. The Saturn Reef made of ross worm *Sabellaria spinulosa* is located within the area. *Sabellaria* reefs are structural habitats eligible as biogenic reefs under the EU Habitats Directive. An extensive reef was mapped in 2003, however it was not found back in a later survey for as yet unknown reasons.

JNCC considers the site as being representative of non-vegetated, sublittoral, open shelf ridge tidal current sandbanks consisting of sandy sediment, in full salinity waters, off coastal influences. Aggregate extraction, gas extraction infrastructure and bottom trawling are likely to have impacted on the habitat quality in the area. Nonetheless the prospects for achieving favourable conservation status in the future are seen positive. Even if the *Sabellaria* reefs found in 2003 have disappeared, JNCC proposes to protect the site from bottom impacting activities to allow for recolonisation.

As of February 2009, this site has not yet been submitted to the European Commission, pending the resolution of issues raised during the stakeholder consultation in 2007/8[33].

Sabellaria reefs

In 2000, an area of *Sabellaria spinulosa* reef (Fig. 5.3.4.3) has been found in an aggregate extraction licence area (401/2) 13 nm east of Great Yarmouth, extending into the 200 nm zone (Johnston *et al.* 2002). The area surrounding the *Sabellaria* reef is characterised by stable coarse, gravelly sand. Hence it is likely that with further survey, other patches of *S. spinulosa* reef may be found in the region. Though *Sabellaria* undergoes cyclic aggregation and degeneration phases over periods of 5-7 years, it seems likely that the region may be of general importance for this species. Apart from the aggregate extraction, fishing poses a potential risk to the reefs. The area is proposed for more in-depth investigations of likely *Sabellaria* reef occurrence, and for measures to be taken to achieve favourable conservation status under the EU Habitats Directive.

Outer Silver Pit and Skate Hole

The Outer Silver Pit is a deep gully (average depth 70 m), the prolongation of the Botney Gut, of glacial origin to the southwest of the Dogger Bank slope.

[33] further see http://www.jncc.gov.uk/pdf/2007-08_OffshoreSAC_ConsultationResponseReport_Final.pdf

Fig. 5.3.4.3: UK waters, Southern North Sea. Patches of *Sabellaria spinulosa* reef (up to 25 cm high) and associated fauna seen at survey 2003 (BMT Cordah, 2003 in JNCC 2007)

This unusual area has been a traditional fishing place providing mixed catches of skates and rays, witches, megrims, monkfish, dogfish, halibut, cod, haddock, saithe and hake. Today, there is intensive beam trawling for Norway lobster (*Nephrops norvegicus*), plaice and sandeel. A long-term shift in the composition of the benthic communities (Frid *et al.* 2000), and a significant decrease in infaunal biomass and production as a result of trawling events were noted. The abundance of larger individuals was more depleted than smaller ones causing a net loss in production (Jennings *et al.* 2001). Long-lived bivalve species such as adult ocean quahog *Arctica islandica* have been abundant there until the 1980s, however disappeared from the northern edge of the Silver Pit between 1993 and 1998, presumably caused by the cumulative effects of bottom trawling raising the mortality of the adult population (up to 20 % per haul), increasing spat mortality (same ratio) and raising the indirect mortality due to changes in sediment stability and food web structure (Witbaard and Bergmann 2003 and references therein). Evidently, the geochemical qualities of an area also change after a long fishing history (Trimmer *et al.* 2005).

There is still a high diversity of elasmobranchs, as well as of rare fish species (ICES 2009). It was proposed that the area could act as a stronghold for thornback rays and spotted rays (Walker 1998). Evans and Wang (2008) locate a hotspot for the occurrence of harbour porpoises there.

The high level of current fishing effort by heavy beam trawlers exerted here (see e.g. Jennings *et al.* 2001) does not make this area a prime candidate for a protected area (compare Hiddink *et al.* 2006). However, it is proposed to investigate the ecosystem remaining today and its function for elasmobranchs in more depth, as well as the opportunities for reducing the impact of fishing on the benthic ecosystem by technical modifications and effort-related measures.

The Greater Wash and Norfolk sandy mounds

The Wash estuary is one of the great shallow estuaries of England. The inner part has extensive mudflats (622 km^2), and it is covered by several Natura 2000 sites. Further offshore, a number of sandbanks potentially relevant to Natura 2000 exist (Johnston *et al.* 2002). The Norfolk sandy mounds may be of particular interest because of a stony and coarse sediment with extensive epifauna (DTI 2001 in Johnston *et al.* 2002). Substantial *Sabellaria* reefs not only occur inside the current SAC, but also further offshore according to the OSPAR database 2008[34], and the offshore wind SEA report (BMT 2003) reports of "*extensive stable beds of biogenic reefs constructed by S. spinulosa in the mouth of the Wash*". The NBN database (2008) shows *Modiolus* sp. records in the Greater Wash which make it also likely for other long-lived species to occur there. The area is important for thornback ray (*Raja clavata*) and spotted ray (*Raja montagui*), and a nursery ground for juvenile rays (Ellis *et al.* 2005, see Fig. 5.3.4.2.). It seems relatively unimpacted by extractive activities (Eastwood *et al.* 2007). However, at least five offshore and windfarms are expected to be built in the near future.

Inner Dowsing, Race Bank and North Ridge are referred to as current 'Areas of Search' by JNCC[35]. The area is proposed as a Site of Community Importance (SCI) and as a protection area for demersal elasmobranchs under OSPAR.

5.3.5 MPAs in the EEZ of Belgium

National policy and legal history

Since 1999, the legal basis exists for designating and managing marine protected areas in marine waters. Management of human activities in Belgian marine waters shall ensure sustainable use by taking the ecosystem approach into account. This includes licensing of any industrial or public activities at sea on the basis of an Environmental Impact Assessment (EIA). In 2003, Belgium issued a Masterplan for the Belgian Part of the North Sea (BPNS) effectively creating the 'eleventh province of Belgium'. It includes a user-oriented spatial planning of human uses at sea.

In Belgian marine waters, several marine protected areas exist with sometimes overlapping boundaries, all within the 12 nm territorial limits. These MPAs comprise one area established under the Ramsar Convention, and several areas under the EU Birds and Habitats Directives, and one marine reserve. So far Belgium has not nominated any site for inclusion in the OSPAR network of MPAs.

There is one site designated under the EU Habitats Directive which aims at protecting a sublittoral sandbank system: the *Trapegeer Stroombank* in the west. A recent scientific study (Rabaut *et al.* 2009a) classifies the tube dwelling polychaete sand mason (*Lanice conchilega*), earlier described as an ecosystem engineer (Rabaut *et al.* 2009b), as a reef builder and proxy for biodiversity and the provision of goods and services. This biogenic reef habitat needs to be listed as associated to the habitat type sandbank in the EU Interpretation Manual. Though not yet considered as an important (associated) habitat in the Special Area of Conservation (SAC) in Belgian coastal waters, *L. conchilega* will be important for the evaluation of the favourable conservation status of the habitats in the SAC. The ecological restoration of the particular sandbank habitats in the BPNS will also be related to reducing existing human pressure. There is general scientific evidence that beam trawl fisheries have a far reaching impact on sandbank systems and, more specifically, there is evidence of decreasing biodiversity after fishing disturbance (Rabaut *et al.* 2008). As the EU Marine Strategy Framework Directive (MSFD)

[34] http://data.nbn.org.uk/habitat/map.jsp?HABITAT=NBNSYS0000019610

[35] http://www.jncc.gov.uk/pdf/OffshoreAoS_Feb09.pdf

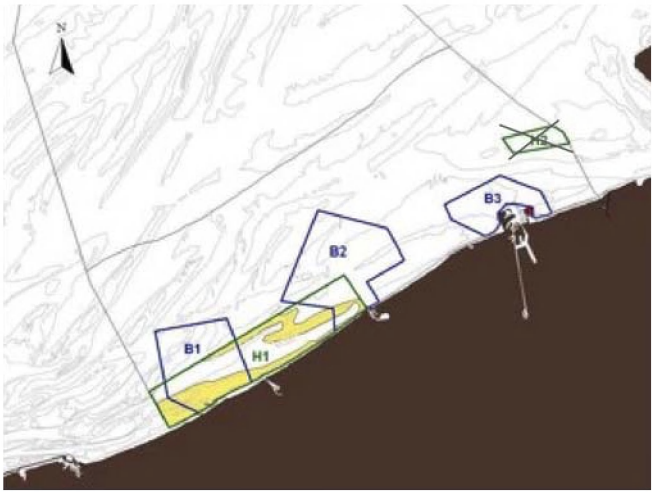


Fig. 5.3.5.1: Belgian EEZ. Map of currently designated Natura 2000 sites in Belgian waters (OSPAR MASH 07/6/Info.2-E): H1 *Trapegeer Stroombank* SAC, H2 *Vlakte van de Raan* SAC, repealed in 2008, B1-3 are SPAs. There is a nature reserve (*Baai van Heist*, too small to show) next to the port of Zeebrugge, inside B3.

explicitly refers to the application of an ecosystem-based approach to the management of human activities, a truly science-based management plan with a ban on bottom fisheries should be developed for this specific coastal zone. Government plans are in place to discuss the possibilities in reducing fisheries impact in the area (Federal Public Service, 15 July 2008). The protection of common species that play a key role in the functioning of an ecosystem, such as *Lanice conchilega*, is currently receiving attention (e.g. Godet *et al.* 2008). This approach is necessary and complementary to the protection of rare species.

The Belgian government also designated the *Baai van Heist* adjacent to the port of Zeebrugge as a marine reserve. For the "Bay of Heist", the law obtained a principally strict protection regime. Therefore, all human activities are forbidden, except those explicitly allowed by law or royal decree. This list of allowed activities is rather comprehensive though: surveillance and control, scientific research and monitoring, military activities, sea fisheries, pilotage, rescue and towing services, dredging, laying and maintaining of cables and pipelines, digging of trenches and raising of the seabed, and those activities that are mentioned in the voluntary user agreements.

A first identification of marine Special Protected Areas (SPAs) for the avifauna in Belgian marine waters (Haelters *et al.* 2004) selected high density areas for regularly occurring seabirds listed in Annex I of the EU Birds Directive or explicitly mentioned in other international conventions or agreements, and finally resulted in the designation of three irregularly shaped coastal SPAs for birds adjacent to the three main ports at the coast: Nieuwpoort, Ostend, Zeebrugge. Further identification of Important Bird Areas (IBAs) should concern areas with high numbers of waterbirds (also including the black scoter *Melanitta nigra*) as well as areas of high species diversity and feeding areas, and must give due consideration to migration bottlenecks. In Belgian marine waters, a delineation based on a certain distance from the coast seems most straightforward given the distribution and densities of key species.

NGO proposals for further MPAs

(Fig. 5.3.5.2, also see Slabbinck *et al.* 2008)

Vlakte van de Raan

After the original designation as SAC in 2005, an energy firm (Electrabel) started a legal procedure for the Belgian Council of State to file a complaint against the designation of the *Vlakte van de Raan* as SAC, because of the withdrawal of an earlier environmental permit for building an offshore wind farm in that area. In February 2008, the Belgian Council of State then annulled the decision on the designation of the *Vlakte van de Raan* as a SAC, because of insufficient motivation. In the meantime, new scientific evidence highlights the area as a possible priority area for conservation (Verfaillie 2008, Derous 2007). Derous *et al.* (in prep.) recommend including an area at the northern side of the annulled SAC *Vlakte van de Raan*, as a new SAC ('sandbank', Code 1110) within the framework of the EU Habitats Directive.

Hinder Banken

This area is proposed as a recovery area for the European oyster (Fig. 5.3.5.2) in the Belgian EEZ. Past and recent research has indicated that the seafloor at the "Hinder Banks" consists of hard substrates (cobbles and boulders mixed with sand). This habitat occurs in scattered locations throughout the Southern North Sea. It contains a high benthic biodiversity compared to the surrounding sandy sediments, and is potentially a substratum for spawning herring and oyster beds. European flat oysters have been commercially exploited in the area in the 19th century, and were virtually extirpated by the beginning of the 20th century. Possibly other species and/or habitats figuring on the OSPAR List can be found there or could be restored. The habitat clearly qualifies as a 'reefs' (Code 1170) under the EU Habitats Directive and under the OSPAR MPA criteria. The area between the southern slope of the *Westhinder Sandbank* and the northern slope of the

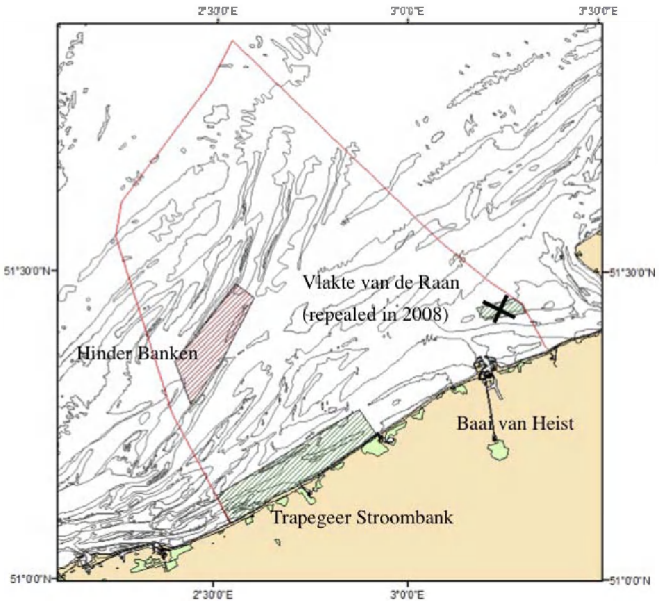


Fig. 5.3.5.2: Belgian EEZ. Location of designated SCIs (green) inside Belgian territorial waters, and the proposed Hinder Banks area in the EEZ (from Haelters *et al.* 2007). The *Vlakte van de Raan* which was a designated SAC until 2008 now appears as NGO proposal for a sandbanks SCI.

Oostdyck Sandbank extends over 119 km², or covering 3.4 % of Belgian marine waters (Haelters *et al.* 2007). The *Hinder Banken* are proposed as SCI and OSPAR MPA.

Ship wrecks

These are proposed as marine reserves since they are not only historical time capsules but also hotspots of biodiversity due to their hard substrate. This would be embedded in an as yet awaited new law followed by implementation decrees designating several wrecks and implementing management plans involving divers and recreational fishermen (cf. 'adopt a wreck'-initiative in England).

5.3.6 MPAs in the EEZ of France

National policy and legal history

In the course of the development of the French national Biodiversity Strategy in 2005, a response to the global and European conservation commitments and the need for a rapid development of the French marine protected area system became apparent. The legal basis was created in 2006[36], enabling the protection of the marine environment in waters outside the territorial waters of France. The new law provides for protection as Marine Natural Parks and creates the new French MPA Agency[37] as a tool for implementation.

The French Marine Natural Parks can take various forms of management, and shall provide for the protection of the natural values as well as a sustainable development of human activities.

In November 2007, the French government and the Ministry of Ecology and Sustainable Development (MEDAD) approved the French National Strategy for the Creation of Marine Protected Areas ('*La stratégie nationale pour la création d'aires marines protégées: Note de doctrine pour les eaux métropolitaines*').

The strategy translates the global and regional commitments to create a network of representative, ecologically coherent networks of MPAs (Convention on Biological Diversity, CBD; OSPAR) and the EU Natura 2000 network. In particular, the development of the Marine Natural Parks shall be embedded in marine research, cover a set of representative as well as exceptional habitats and species, protect particular and important ecosystem functions, contribute to continuing, in particular sustainable exploitation, and approach the management in a collaborative way with users and neighbour countries, and from a land-sea perspective.

The strategy formulates the following short-term goals:

- To deliver the French nominations to the EU Natura 2000 network before June 2008;
- To create eight Marine Natural Parks in French waters (in Europe) until 2012;
- To support existing and planned MPAs; and
- To define new categories of MPAs, such as mammal sanctuaries or fisheries no-take zones.

[36] LOI n° 2006-436 du 14 avril 2006 relative aux parcsnationaux, aux parcs naturels marins et aux parcs naturelsrégionaux

[37] www.aires-marines.fr

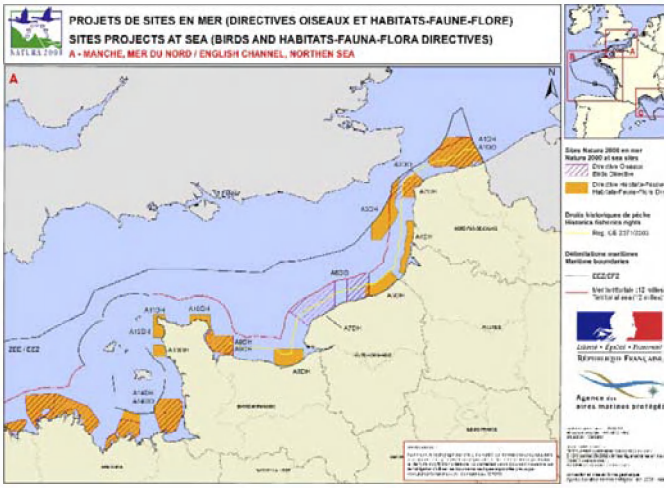


Fig. 5.3.6.1: French EEZ. Map of the French site proposals for the Natura 2000 network as of April 2008[38].

As a first marine natural park, the *Parc naturel marin d'Iroise* was created and nominated in 2008 as a first French offshore contribution to the OSPAR network of MPAs.

Proposals for French North Sea MPAs

In spring 2008, France has published a list of site proposals for inclusion in the Natura 2000 network under the EU Habitats and Birds Directives. Out of these, three sites are within or close to the geographic limit of this report, the Dover Strait, and one of them, the *Recifs Gris-Nez Blanc-Nez*, was among the 76 sites nominated to the European Commission in October 2008. Another round of site nominations was expected for March 2009.

Banc de Flandres - FR3102002 (1,130 km2)[39]

France's North Sea seafront, although small, has a particularly interesting sector made up by sublittoral sandy sedimentary units. These are true banks or bars, characteristic of the Southern North Sea. The site is entirely marine, however it extends from the existing Natura 2000 site FR3100474 called "Dunes of the Flemish maritime plain". It includes a range of so-called hydraulic dunes, underwater accumulations of sand which may look like dunes, composed of shelly sand and up to 20 m high. Due to the high sediment mobility, the faunal diversity is relatively low but typical for the environmental conditions on the tops, slopes, and between the dunes.

Characteristic species of the sandbank population are the bristleworm (*Ophelia borealis*), small amphipod crustaceans from the *Bathyporeia* genus, the mysid *Gastrosaccus spinifer*, the bivalves *Spisula elliptica* and *Spisula solida* and the common heart urchin or sea potato (*Echinocardium cordatum*). In muddy or silty places, species such as the bivalve *Abra alba* and the annelid worms *Lanice conchilega* and *Pectinaria koreni* can be present. In coarser sediment, the amphioxus (*Branchiostoma lanceolatum*), the purple heart urchin (*Spatangus purpureus*) and sandeels (*Hyperoplus lanceolatus* and *Ammodytes tobianus*) are more likely to be found.

The site designation as Special Area of Conservation (SAC) is also justified by the presence of some marine mammals of Community interest, particularly harbour seals (*Phoca vitulina*).

Furthermore, groups of grey seals (*Halichoerus grypus*) have been regularly observed at the entrance to the new outer harbour of Dunkirk. Data also show that this zone is one of the two French sites regularly visited by harbour porpoises (*Phocoena phocoena*). This species is shy, rather solitary, small and more abundant on this coast. The species is targeted by both Natura 2000 and the OSPAR List, so France has great responsibility for maintaining its distribution area.

Recifs Gris-Nez Blanc-Nez (287 km²)

This fully marine site comprises both a rocky platform in an area of high current velocity and mobile sandbanks and coarse substrate. The reef area extends from the shallow coast, characterised by large algae including a rich kelp (*Laminaria* spp.) flora, into deeper waters where the habitat includes *Modiolus* beds, gravel and pebble substrate down to coarse sands populated by ophiurids.

The reef habitat is characterised by a relatively high species diversity and biomass, in particular composed of a high diversity of sponges, cnidarians and bryozoans. The characteristic species are the common brittlestar *Ophiothrix fragilis*, the leather coral dead man's fingers (*Alcyonium digitatum*) and the Dahlia anemone *Urticina felina*. The site will also be nominated for its importance to common seals, grey seals, harbour porpoises and anadromous fishes.

[38] source: http://www.aires-marines.fr/images/stories/natura2000/N2000_Reglement_2371_2002.pdf

[39] taken from: SANDBANKS OF FLANDERS (FR3102002). http://www.aires-marines.fr/images/stories/natura2000/anglais/1_DH_MAN_01_BANC_FLANDRES_Anglais.pdf

Megaripples and hydraulic dunes in the Pas-de-Calais/Dover Strait (FR3102004, 680 km²)
This site is entirely marine without connection to land and it is located in the central part of the Dover Strait. The maximum depth is 56 m, but the site is crossed by numerous sandy or rocky shoals which are often 20 m higher than the seabed. The site features two distinct systems, the hydraulic dunes in the *Pas-de-Calais*/ Dover Strait (*Colbart*, *Vergoyer*, *Bassurelle* Banks), and the *Ridens de Boulogne* a rocky shoal partly covered by sand. The hydraulic dunes are highly dynamic systems (40 to 70 m per year) with species few in number but unique for the Channel and/or *La Manche*, most of them being largely restricted to the area. The *Ridens de Boulogne* has the only maerl deposit on the seafront of the *Nord-Pas-de-Calais* region. The area is made up of 2.5 to 3 m high rocks, with depths in the order of 15 to 20 m. It is a pocket of diversity in the Channel setting. This is the most seaward area where seaweed, particularly macroalgae, is present.

The site is of Community interest for its sandbanks (hydraulic dunes) with associated typical fauna, reefs (Ridens de Boulogne) with the particularly diverse maerl habitats providing for substrate to nearly 60 species of macroalgae. Over 160 species of annelid worms and 130 species of mollusc and crustaceans are found there. Harbour seals, grey seals and harbour porpoises frequent the area.

5.4 Blue Belts proposed

In the Southern North Sea, the Blue Belts proposed shall link the individual rather small conservation areas nominated or planned to be designated by national governments to meet the requirements of the EU Habitats[40] and Birds[41] Directives, and additional requirements seen by the NGO coalition, into several coherent, large scale specially managed areas. Ultimately, these specially managed areas shall bridge the gap between the selective demands for the conservation of individual species and habitats as required by the EU Habitats Directive, and the more generalistic view expressed by OSPAR (Recommendation 2003/3) and the Convention on Biological Diversity (CBD) to establish an ecologically coherent, representative network of MPAs covering all waters. The Blue Belts proposed shall indicate priority areas for developing targeted management measures in order to achieve Good Environmental Status (GES) of the North Sea habitats and communities as outlined by specific descriptors in Annex I to the EU Marine Strategy Framework Directive (MSFD). Below, the numbers for eight proposed Blue Belts refer to Fig. 5.5.1.

Skagerrak Blue Belt (1)
This Blue Belt is a representative cross section from the northern Jutland coast near Hirtshals across the Skagerrak to Norway. It links the proposed *Store Rev* SCI with an MPA presently in consultation in Norway (*Tromøy* transect). From Hirtshals to the *Store Rev*, there are substantial areas of gravel with stones, mapped as 'foul' ground by fishermen. To the north, the terrain slopes towards the Norwegian Trench to 800 m depth, and upwards on the Norwegian side with muddy grounds. The fauna of the deep trench includes a deep-water fish community including roundnose grenadier, chimaeras, and blue ling. The thorny skate *Raja radiata* occurs in the entire area and has its spawning and nursery areas in shallower waters off the Norwegian coast.

Jutland Reef Blue Belt (2)
This Blue Belt provides a transect from the coast off Thyborøn through the proposed inner and outer Jutland Reef SCIs to the *Vestbanken*. The area is of glacial origin and covers relatively coarse ground with some real reef structure in between.

[40] Council Directive 92/43/EEC
[41] Council Directive 79/409/EEC

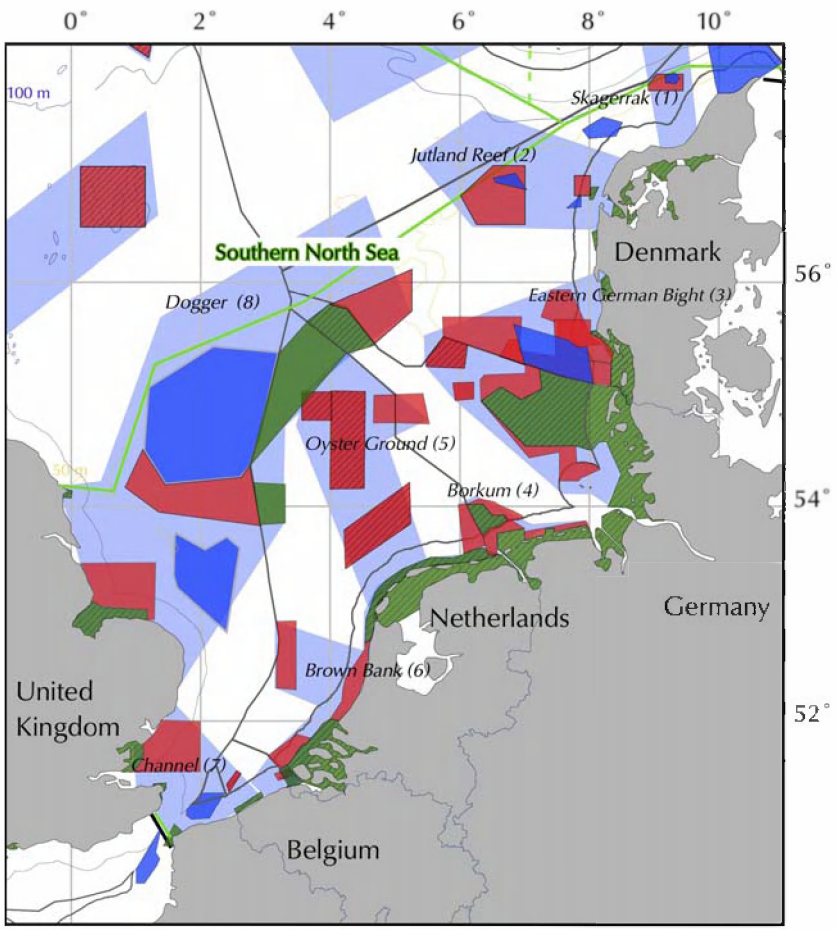


Fig. 5.5.1: Southern North Sea. Proposed Blue Belts as candidate areas for a special management regime to maintain and improve the status of vulnerable habitats and achieve Good Environmental Status. Established SACs (hatched green), nominated pSCIs (green), sites in preparation (blue), and additionally proposed MPAs (SACs red, OSPAR hatched red)

There is a permanent front in the area which makes it particularly valuable for seabirds and marine mammals, especially harbour porpoises. There is intensive fishing, including use of gill nets, and most of the coarse sediment is considered a resource area for aggregate extraction by the Danish government.

Eastern German Bight Blue Belt (3)

This Blue Belt encompasses the wider area of increased harbour porpoise abundance in the eastern German Bight. It includes a representative set of habitats, from the coast offshore, and from the slopes of the Elb river valley to the Horns Reef and frontal zone. The area represents the ecological connection between the Wadden Sea ecosystem and offshore waters, and as such an essential link for the dispersal and propagation of species. On the other hand, human pressure of all kind is high, including intensive shipping, fishing, aggregate extraction, altogether posing potential conflicts with the natural values.

Borkum Reef Blue Belt (4)

This Blue Belt includes the Borkum Reef grounds on the Dutch and German side of the border, including the additional proposals made in chapter 5.3.3, as well as the narrow stretch seawards of the Wadden Sea National Park for improved protection of marine mammals.

Oyster Ground Blue Belt (5)

This transect extends seawards from the westernmost Wadden Sea islands and the Dutch Coastal Zone SCI, across to the Frisian Front and Oyster Ground 'areas of national value', with the proposed area of particularly high *Arctica islandica* density and the pockmarks site *Gasfonteinen* included. North of the Oyster Ground, the Blue Belt links into the proposed Dutch section of the Dogger Bank SCI. It thus includes all depth zones from the sandy and turbid shore to the deep, muddy and sensitive Oyster Ground, and up the southern slopes of the Dogger Bank.

Brown Bank Blue Belt (6)

This is a Blue Belt in an area particularly important for wintering guillemots, red-throated and black-throated divers, gannets and possibly for harbour porpoises. Increasing numbers of guillemots become victims of the frequent oil spills in the high traffic shipping lane from and to Rotterdam port and the Channel. There are numerous gas platforms and potential areas for offshore windfarms. In addition, this is the area where beam trawling intensity is highest.

Channel Blue Belt (7)

This Blue Belt is a transect across the Channel. On the Belgian coast it includes the *Trappegeer Stroombank* SAC and the possible offshore SCI *West Hinder*, a former oyster ground. The French proposed SCIs *Banc de Flandres* and *Recifs gris nez blanc nez* represent extensive hydraulic dunes and proliferate hard substrate, respectively. On the English side, the Outer Thames estuary and Thames estuary and the Thanet SAC with its chalk cliffs are included.

This area is characterised by the intrusion of high salinity Channel water, high current speeds in the deeper areas, shaping ridges, sand dunes and sandbanks, and mixed sediment types. The shallower northern banks are important nursery areas for various skate and ray species, and provide a herring spawning ground. In the deeper areas, trawling frequency is high though habitats may be relatively resilient to disturbance. Seemingly, also the offshore Blue Belt area is still important as a retreat and regeneration area for various species of elasmobranchs, otherwise rare in the North Sea. However, elasmobranch mortality is relatively high and should be reduced.

The risk from ship-based pollution is particularly high due to the very high vessel traffic frequency along the Channel and correlated number of ships incidents. In particular, this affects wintering seabirds such as guillemot, razorbill, kittiwakes, fulmars and gannets.

Dogger Bank Blue Belt (8)

This is the largest Blue Belt proposed in the Southern North Sea extending from the Flamborough Front and the northern slopes of the Dogger Bank to the southern slopes of the Dogger Bank and the tidal sandbanks off Great Yarmouth. The Blue Belt encompasses all of the Dogger Bank (from the proposed Danish SCI, the German SCI, to the pSCIs nominated and considered by the Netherlands and the UK, respectively), the proposed OSPAR MPA in the Outer Silver Pit further southwest, the possible SCI North Norfolk Bank and the Wash estuary SAC in the UK.

The northerly extension is determined by location of the *Tommeliten* pockmark field, and records of sea pens in Norwegian waters. The northern slopes of the Dogger Bank are overall highly diverse and, particularly in UK waters, important for e.g. thornback and thorny ray, common skate and spurdog, all of which are listed by OSPAR as under threat and/or decline in the North Sea.

The Blue Belt area west of the Dogger Bank has about the highest elasmobranchs species richness of the North Sea and is also highly important for all of the species mentioned above. In addition, there are basking shark sightings. The Wash estuary is particularly important for juvenile rajids. However, here, the mortality of rays and sharks of all ages (as calculated by ICES 2006a) is very high and needs to be reduced.

Harbour porpoise abundance is particularly high in the western part of this Blue Belt, and scientists indicate the area of the Outer Silver Pit as a primary harbour porpoise area with regular sightings all over the year. Gannets use the Hills and Dogger Bank for wintering. Guillemots and razorbills frequent it primarily during summer from their breeding colonies near Flamborough Head.

In particular west of the Dogger Bank, large scale oil production takes place. Aggregate extraction areas and windfarms have been licenced there, and trawl and set net fishery is highly intensive, especially around the western slopes of the Dogger Bank and in the Outer Silver Pit.

6 Ecological subregion: Northern North Sea

6.1 Progress on designation of MPAs outside territorial waters

The Northern North Sea subregion falls into the jurisdiction of the UK in the west and Norway in the east. So far, there are no established marine protected areas beyond coastal waters. The Moray Firth Special Area of Conservation (SAC) is exceptional among the established SACs in that it is relatively large, and aiming to protect a mobile species, the bottlenose dolphin (*Tursiops truncatus*).

Under the EU Common Fisheries Policy (CFP), there are three metier-specific fisheries closures established in the northern North Sea (Shetland box, Regulation EEC 2371/2002, Norway pout box, EEC 850/98/27/1, and sandeel box, EEC 41/2006/III/5). However, only the sandeel box (see Fig. 6.1.1) was specifically designed for the protection of the food resources of fauna other than fish, in this case for breeding seabirds, such as kittiwakes (*Rissa tridactyla*).

By July 2008, the UK has concluded a first round of consultations on its first tranche of offshore Natura 2000 sites, to be designated according to the criteria set out by the EU Habitats Directive. In the subregion only two pockmarks are concerned, Braemar pockmark (58,99° N 1,48° E, 21.34 km²) and Scanner Pockmark (58,18° N 0.58° E, 7.25 km²)[42], which were nominated to the European Commission in September 2008 (see 6.3.1).

6.2 Government plans to establish MPAs

East of the Shetlands, the UK government has recently carried out investigations in an area of potential 'reefs' (Code 1170) habitat which forms part of the East Shetland Shelf and the Pobie Bank sedimentary rock platform. Sediment cover is patchy over the rock surfaces, generally very thin when present, and mainly of gravelly sand. The area is 100-200 m deep and contiguous with similar habitats which run into the coast of the Shetland Islands (Johnston *et al.* 2002).

In the Norwegian sector of the Northern North Sea ecological subregion, currently no MPAs or MPA proposals exist. However, the Norwegian government aims to complete its site nominations for a nationally representative network of MPAs by 2010, including offshore areas.

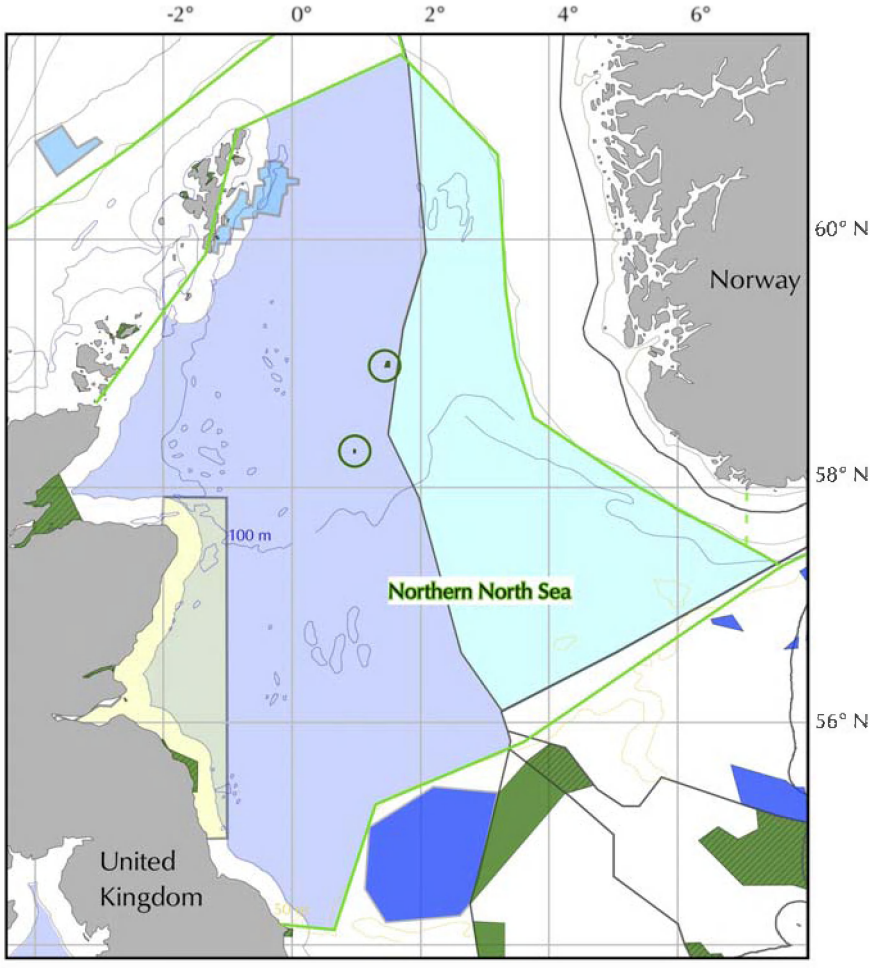


Fig. 6.1.1: Northern North Sea. State of the MPA network February 2009: existing SACs (hatched green), pSCIs nominated to the European Commission (green) and JNCC research locations (light blue, Howell *et al.* 2007). The sandeel box (yellow) indicates a permanent fisheries restriction zone for the benefit of breeding seabird populations.

[42] see http://www.jncc.gov.uk/page-3995

6.3 MPA proposals in the Northern North Sea

In the following, MPA proposals for UK waters in the Northern North Sea will be presented. For the Norwegian sector, the data available did not allow for concrete site proposals. However, the information so far available has been included in the proposals for cross-habitat Blue Belts to consider and promote a habitat-conserving management system. In the case of the *Holene* and *Tommeliten* pockmarks investigations from the 1980s indicate spectacular small scale habitats, which should be confirmed by new surveys of the sites, due to the acute vulnerability of pockmark structures to impacts from bottom trawling.

6.3.1 MPA proposals in UK waters

National policy and legal history

In 2009, the UK can be expected to have one of the most progressive and integrated marine legislative structures in the world. Both England and Wales, and Scotland are currently in the last phases of developing a Marine Act for protecting the marine environment and managing activities in their waters.

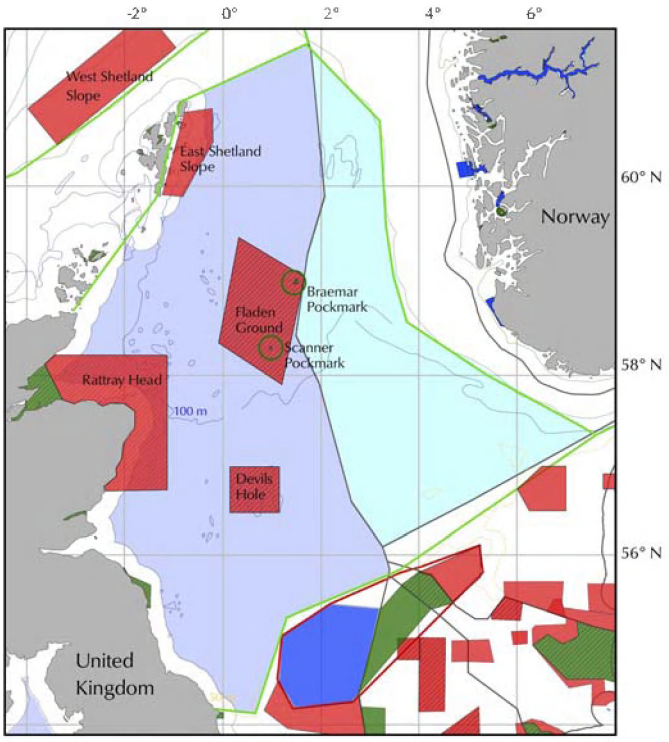


Fig. 6.3.1.1: Northern North Sea. MPAs proposed and state of the MPA network, February 2009: existing SACs (hatched green), pSCIs nominated to the European Commission (green) and MPAs proposed (red)

Valid for England and Wales, a Marine and Coastal Access Bill was published in December 2008 and is currently passing through Parliament. It is anticipated it will be passed and become the Marine and Coastal Access Act before the end of the current parliamentary session. The Bill provides the tools required to establish a new ecologically coherent network of marine protected areas in the inshore waters of England and Wales, and beyond 12 nm for all UK waters. It is anticipated that marine protected areas within 12 nm from the Scottish coast will be designated via a new Scottish Marine Bill which is expected to be published in spring 2009. Together with Natura 2000 sites, the new Marine Conservation Zones (MCZs) and MPAs in Scotland will deliver regional (OSPAR) and global (CBD) conservation commitments. In addition to provisions for a new network of marine protected areas, the Marine and Coastal Access Bill (once enacted) will require the adoption of a Marine Policy Statement, establish a new Marine Management Organisation (MMO) in England, provide for marine planning in UK waters, improve licensing regulation and improve fisheries management in inshore waters.

Parallel to the development of a Marine Bill for England and Wales, Scotland is currently consulting on a separate Scottish Marine Act which will encompass legislation for all Scottish waters. The public consultation was closed in October 2008. A preliminary debate on the proposed Scottish Marine Bill took place in the Scottish Parliament in February 2009[43]. The. Scottish Government announced[44] that Marine Scotland will be established on 1st April 2009 (further see 7.3.1).

In waters beyond 12 nm, the advisory body of the UK government, the Joint Nature Conservation Council (JNCC) must propose sites to the government and establish conservation objectives for these sites. Since 1999, the JNCC has been in the process of gathering existing and survey information to locate possible SACs (called 'Areas of Search' in the first phase) for the three relevant habitat types 'reefs' (Code 1170), 'sandbanks which are slightly covered by seawater all the time' (Code 1110), 'submarine structures made by leaking gases' (Code 1180) and species (grey seal, common seal, bottlenose dolphin and harbour porpoise)

[43] http://www.scottish.parliament.uk/business/officialReports/meetingsParliament/or-09/sor0226-02.htm#Col15307

[44] http://www.scotland.gov.uk/News/Releases/2009/02/09163825

Sites nominated to the European Commission in 2008

A first tranche of sites was nominated to the European Commission in September 2008 (Fig. 6.1.1), only including two small pockmarks areas qualifying as 'submarine structures made by leaking gases', (Code 1180) within the Northern North Sea subregion. These sites, Braemar pockmark (5.18 km^2) and Scanner Pockmark (3.9 km^2) had been selected based on the occurrence of carbonate concretions and associated fauna (European Commission 2007). Discovered during oil exploration in 2001 and further investigated in 2005, the sites were shown to be in an unimpacted conservation status (see JNCC Braemar and Scanner pockmarks selection assessments 2007[45]). However, during the public consultation prior to nomination to the European Commission, the fishing sector claimed that the structures were not existent anymore as the location of the proposed SCIs was a heavily trawled area and "*no obstacles were met*". Braemar pockmark lies to the east of a *Nephrops norvegicus* area, and it is likely that the structure was destroyed by fishing activities during the selection and nomination process. Moreover, following the stakeholder consultation the boundaries of these sites finally put forward by the JNCC were substantially reduced, to comprise the mere feature and only a limited buffer zone. Under these circumstances it will be difficult if not impossible to effectively enforce any fisheries management measures to conserve the features.

Braemar pockmark

The site was reduced from 21.34 km^2 to 5.18 km^2 (-76 %) and matches the feature closely: "*... a protective margin around the interest features of 375 m (three times water depth) to allow for distance between mobile gear on the seabed and vessel's position, as described in JNCC's guidelines on marine SAC boundary definition (JNCC 04 P23[46]), has been included within this delineation. ... A potential submarine structure made by leaking gases at 8 km from the site boundary was identified by Gardline Environmental in 2006. JNCC has not extended the Braemar Pockmarks site boundary to include this feature, as this would result in a disproportionately large site with large areas of non-Annex I habitat within it; however, this information will be taken into account in the future consideration of possible SACs in this area*"[47].

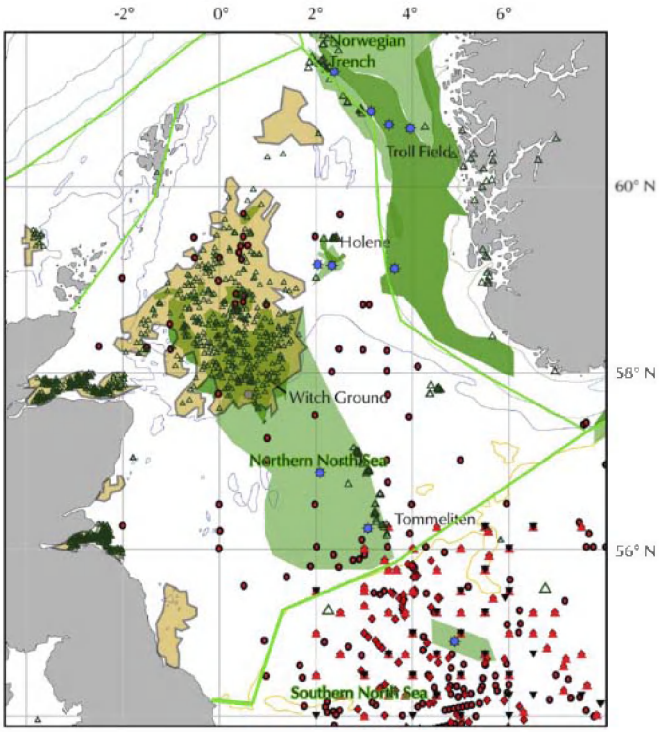


Fig. 6.3.1.2: Northern North Sea. Soft sediment structures and communities: pockmark areas (green), distinct pockmarks (blue dots), *Nephrops norvegicus* spawning area (brown) and records of the OSPAR habitat 'sea-pen and burrowing megafauna communities' (green triangles, OSPAR database 2008) and *Arctica islandica* distribution (red dots: Witbaard and Bergmann 2003; red triangles: Rachor and Nehmer 2003)

Scanner Pockmark

The site was reduced from 7.25 km^2 to 3.35 km^2 (-54 %) and matches the feature closely. A protective margin around the interest features of 450 m (three times water depth) to allow for distance between mobile gear on the seabed and vessel's position, as described in JNCC's guidelines on marine SAC boundary definition (JNCC 04 P235), has been included within this delineation.

[45] http://www.jncc.gov.uk/pdf/BraemarPockmarks_SelectionAssessment_3.1.pdf, http://www.jncc.gov.uk/pdf/ScannerPockmark_SelectionAssessment_3.1.pdf

[46] JNCC 04 P23 see http://www.jncc.gov.uk

[47] http://www.jncc.gov.uk/pdf/2007-08_OffshoreSAC_ConsultationResponseReport_Final.pdf

NGO proposals for additional Northern North Sea MPAs in UK waters

Fladen Ground

This MPA shall include the nominated Sites of Community Importance (SCIs) Braemar pockmark and Scanner pockmark and the related pockmark fields. It focusses on the central parts of the Fladen Ground and the northern Witch Ground because of high concentrations of features of conservation interest with regard to Natura 2000 and OSPAR (Fig. 6.3.1.2). The primary concern in this area is the conservation of the OSPAR habitat 'sea-pen and burrowing megafauna communities' and the occurrence of ocean quahog (*Arctica islandica*). The area is a prime fishing area for Norway lobster (*Nephrops norvegicus*) usually caught with bottom trawls. Both sea pens and *Arctica islandica* (Witbaard *et al.* 1997) are sensitive to the impacts of trawling (see OSPAR case reports[48]).

The OSPAR habitat mapping illustrates a high density of records of the OSPAR habitat 'sea-pen and burrowing megafauna communities', particularly in the spawning areas of *Nephrops norvegicus* in the deeper, muddier sediments of the central Fladen Ground. Eleftheriou *et al.* (2004), too, describe the deeper areas as characterised by the sea pen *Pennatula phosphorea*.

There are records of ocean quahog (*Arctica islandica*) from throughout the area, however its distribution seems to be patchy, and the very high densities reported from the area in the past (De Wilde *et al.* 1986, Basford *et al.* 1989) may be restricted to a few places (Witbaard and Bergmann 2003). The surveys of De Wilde *et al.* (1986), Basford *et al.* (1989) and Witbaard and Bergmann (2003) revealed and confirmed the presence of two distinct clusters of *Arctica islandica* at 58°42´N and 59°20´N. The results also demonstrated that the geographical distribution of *Arctica islandica* in the Fladen Ground had been stable for almost 20 years. To the east of these records, data from the UK NBN database indicate the regular occurrence of the species as well.

The densities of *Arctica islandica* in the central Fladen Ground are exceptionally high (Witbaard and Bergmann 2003). De Wilde *et al.* (1986) found an average density of 12 ind m^{-2}, and up to 75% of the total benthic biomass locally. This was confirmed by

Fig. 6.3.1.3: Northern North Sea. Sea anemones inside a North Sea pockmark (http://www.martinhovland.com/pockmarks.htm)

Witbaard (1996) and Witbaard *et al.* (1997). With another sampling technique, Witbaard and Bergmann (2003) estimated local densities of up to 286 ind m^{-2} in the northern cluster of stations and 23 ind m^{-2} in the southern cluster.

In particular the Witch and Fladen Grounds are considered main pockmark areas (Judd and Hovland 2007, Fig. 6.4.2). In the Fladen area, the pockmarks reach high densities of more than 30 km^{-2}, with a diameter of 50-100 m and 2-3 m depth (Long 1986, in Dando 2001). Pockmarks in the deepest parts of the Witch Ground Basin are larger but present in lower densities (10-15 km^{-2}, Dando 2001). Three unusual large deep pockmarks, the Scanner, Scotia and Challenger pockmarks, are present near the centre of the Witch Ground Basin (Judd *et al.* 1994), 15-20 m deep and with active methane escape (Dando 2001) and carbonate concretions which make the features eligible under the EU Habitats Directive. Scanner, as being the best known, has been nominated to the European Commission, however the size of the area being reduced to the mere minimum around the feature itself (see 6.3.1).

The pockmarks seem to play an important ecological role in the otherwise flat North Sea seabed: for benthopelagic fish, in particular cod, the seafloor depressions act as shelter or possibly enhanced feeding area even in the absence of carbonate concretions, as indicated by high otolith densities. Where the sediment cover of the carbonate concretions is sufficient, *Nephrops norvegicus* can be found. On the other hand, any hard substrate exposed at the surface is colonised by epibenthic fauna (Fig. 6.3.1.3), such as the frequently seen anthozoans (Dando 2001, Hovland and Thomsen 1989).

[48] http://www.ospar.org/documents/DBASE/Publications/p00358_case%20reports%20species%20and%20habitats%202008.pdf

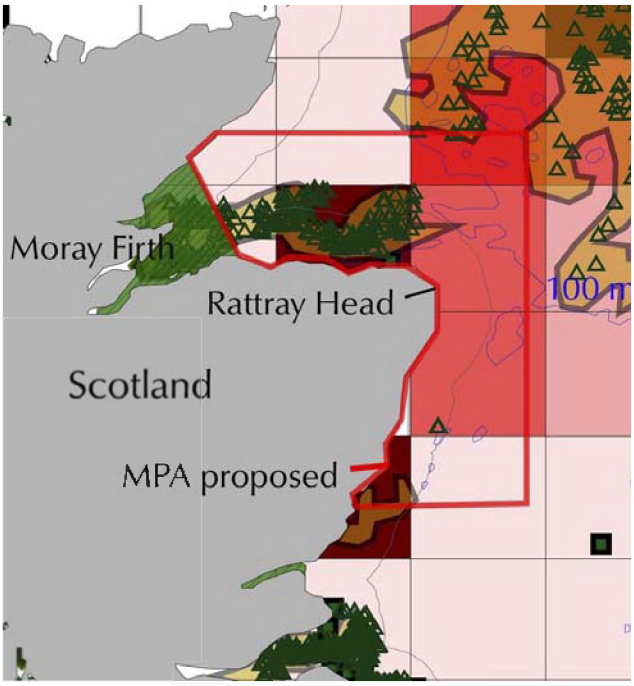


Fig. 6.3.1.4: Northern North Sea. Justification for the Rattray Head MPA proposal: fishing mortality of elasmobranchs (ICES 2006a), *Nephrops norvegicus* spawning area (brown) and records of the OSPAR habitat 'sea-pen and burrowing megafauna communities' (green triangles, OSPAR database 2007)

Rattray Head

The coastal communities all around this area are traditional fishing communities. However, the area also has a high importance for nature conservation and available data point to strong impacts from fishing activities.

North of Rattray Head, a more than 200 m deep depression, the Southern Trench, provides soft sediment benthic habitats with spawning grounds of Norway lobster (*Nephrops norvegicus*) and related 'sea-pen and burrowing megafauna communities' occurrence (see records in OSPAR habitats database[49] as included in Fig. 6.3.1.4). By visual observation, Greathead *et al.* (2007) recorded the sea pen species *Virgularia mirabilis* and *Pennatula phosphorea* in varying abundances in *Nephrops norvegicus* survey sites off the coast east of Moray Firth. The highest abundance of *Virgularia mirabilis* all over Scotland was found to be in the outer Moray Firth. Sea pens add to the three-dimensional complexity of the seafloor habitats. It has also been shown that there might be a positive relationship between the presence of pennatulids and that of gadoids and skates (Malecha *et al.* 2005).

The area proposed seems to have a particularly high mortality of elasmobranchs (ICES 2006a). For example, the density of thornback ray (*Raja clavata*) has strongly decreased from the 1980s to 2000-2003 (ICES 2007).

Extending from the Moray Firth SAC, the whole area near the coast is particularly important to bottlenose dolphins (Reid *et al.* 2003), harbour porpoises (Evans and Wang 2008) and seabirds (Skov *et al.* 1995). The only known semi-resident group (approx. 130 Individuals[50]) of bottlenose dolphins (*Tursiops truncatus*) in the North Sea lives in and adjacent to the Moray Firth (Fig 6.3.1.4) where a SAC was designated to "*establish and maintain in the long term a viable dolphin population*". However, the population is currently in decline and considered not to be viable (Moray Firth cSAC Management Scheme Revision 1, 2003[51]). Since the mid-1990s, Moray Firth dolphins have increasingly made extended movements eastwards and southwards, and probably account for regular sightings off east Scotland including the Firth of Forth. During the SCANS II surveys, bottlenose dolphins were observed in the outer Moray Firth north of Rattray Head. Transient groups are quite frequent almost anywhere around the British coast except the Southern North Sea and southeast England. The total population in UK inshore waters is probably less than 300 individuals. The species was formerly more widespread, especially in the Southern North Sea and English Channel.

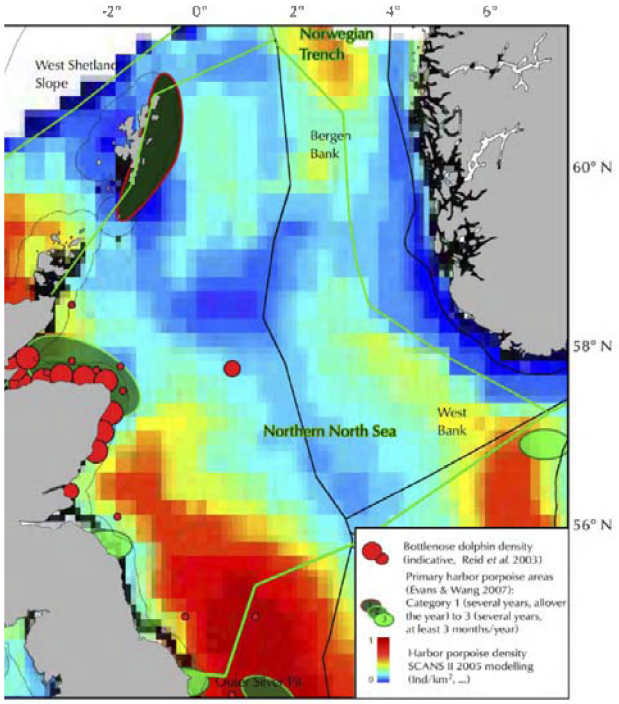


Fig. 6.3.1.5: Northern North Sea. Importance for marine mammals

[49] http://data.nbn.org.uk/habitat/map.jsp?HABITAT=NBNSYS0000019600

[50] http://www.jncc.gov.uk/ProtectedSites/SACselection/sac.asp?EUcode=UK0019808 after Wilson *et al.* 1999

[51] http://www.morayfirth-partnership.org/ext/SAC(MSD)/MorayFirthcSAC_MS_Rev1.pdf

Evans and Wang (2008) characterised the coast east of the Moray Firth and around Rattray Head as 'category 2 hotspot' for harbour porpoises based on records over several years, with a presence generally recorded in most months of the year, and high concentrations (mean standardised sighting rates >50/hour) in at least two months during the important period April-September.

The Northern North Sea probably is the most important area for seabirds in the North Sea. The English and Scottish coasts are lined with breeding colonies of many species, and the waters off the cliffs out to several particularly important offshore banks including Whee Bank and Marr Bank (Scott *et al.* 2005) and fronts (Skov *et al.* 2008) provide the food for successful recruitment. For example, gannets breeding at Bass Rock in Scotland make trips of hundreds of kilometres to the most rewarding feeding grounds at Dogger, Buchan and Halibut Bank or to the outer Silver Pit, and the Farn Deep to feed on small sandeels (Hamer *et al.* 2000).

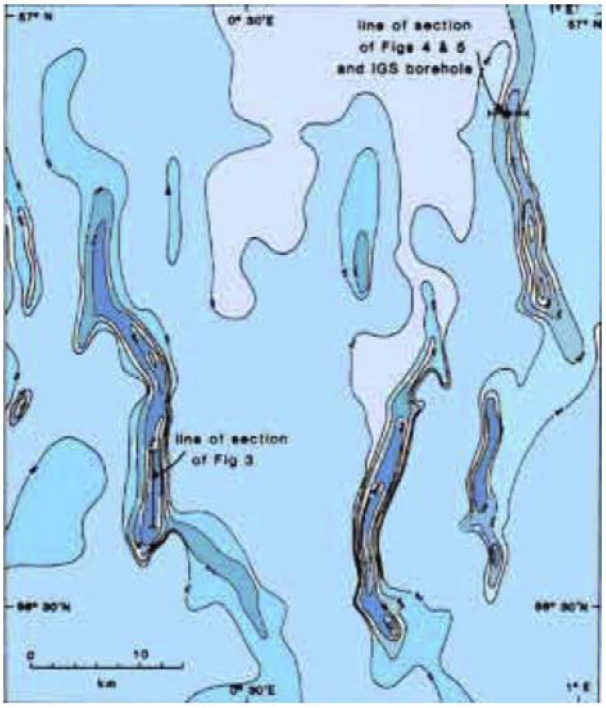


Fig. 6.3.1.6: Location and bathymetric contour maps of the Devil's Hole area (from Fyfe 1983)

East Shetland Slope, Pobie Bank

The area east of the Shetland Islands is considered as 'Area of Search' by JNCC as it is a potential 'reefs' (Code 1170) habitat. Research in 2006 confirmed the presence of hard substrate and the corresponding fauna on Pobie Bank (Howell *et al.* 2007). Pobie Bank is about 20 km wide and 70 km long running south-west to north-east, and it rises from a depth of 110 m to less than 80 m along the crest (Holmes *et al.* 2004). The Pobie Bank site surveyed ranges from 80-165 m depth and is composed of bedrock, boulder and cobble banks surrounded by coarse sand and gravel seabed. The rocky banks are sparsely colonised by hydroids, cup, branched and encrusting sponges, solitary corals (*Caryophyllia* sp.) and serpulid worms. Erect bryozoans (cyclostomes) are abundant in places, and at the bank edges where rock meets sand, a dense biogenic gravel composed of the hard skeleton of erect bryozoans is often present. Mobile species on the banks include starfish (*Stichastrella rosea, Hippasteria* sp.), squat lobsters (*Munida rugosa*), hermit crabs (Paguridae), and brittle stars (Ophiuroidea). The fauna of Pobie Bank is similar to that from comparable depths and substrate west of the Hebrides (Mitchell 2006 in Howell *et al.* 2007). However, Pobie Bank appears to support a greater range of erect bryozoan species than observed west of the Hebrides.

Evans and Wang (2008) characterised the waters to the east of the Shetland Islands as 'category 1 hotspot' for harbour porpoise occurrence (also see Fig. 6.3.1.4): porpoises have been recorded over several years, with a presence in every month of the year, and high concentrations (mean standardised sighting rates >50/hour) in at least four months during the important period April-September.

Devil's Hole

This is a unique series of very deep muddy depressions, probably cut during the last glaciation. However, no biological research data are available to date. Devil's Hole has recently been developed into a trawling area for Norway lobster (*Nephrops norvegicus*). The trenches are 1-2 km wide, 20-30 km long and aligned in a north-south orientation (Fig. 6.3.1.6). The average water depth in the region is between 80-90 m but the deepest parts of the trenches reach to more than 230 m. The slopes are steep (up to 10 degrees, Fyfe 1983) and covered by fine sand on the upper slope. Further below, very soft silty clays with occasional interspersed sands occur.

Due to their very unusual nature and the current lack of biological data, these features need surveying to verify the type of communities and ecosystems they host. However, for a network of MPAs to be coherent, such depressions in the otherwise rather flat North Sea deserve being listed as OSPAR MPAs.

6.4 Blue Belts proposed

The Blue Belts (specially managed areas) proposed shall encompass a representative section of the Northern North Sea which is limited to the north by the Orkney and Shetland Islands and the continental shelf break and, respectively, to the east by the slope of the Norwegian Trench and to the south by the Flamborough frontal area and the slopes of the Dogger Bank. Further to the proposed four sites for marine protected areas, three Blue Belts are proposed which fully or partly lie in the Northern North Sea. Particular attention was paid to represent species and habitats listed by OSPAR, as being under threat and/or decline such as the habitat 'sea-pen and burrowing megafauna communities', deep-water sponges, records of ocean quahog (*Arctica islandica*), and occurrence or particular mortality of elasmobranchs.

Shetland-Norway Transect

This Blue Belt is a transect across the Norwegian Deep at about 60° N, from the eastern islands of the Shetlands (Unst to Whalsay) to the Norwegian coast between *Sognefjord* and *Korsforden* (Fig. 6.4.1). It therefore extends across the ecological subregions Northern North Sea and Norwegian Trench and includes the proposed MPA on the East Shetland Slope, Pobie Bank, the Viking Bank, the proposed Troll Field pockmarks MPA, and the potential MPAs of the *Sognefjord* and *Korsfjord* currently being under consultation in Norway, as well as smaller fjord MPAs in between.

From west to east, the slope deepens gently towards the Norwegian Trench, intersected by Viking Bank and Bergen Bank (both ca. 100 m minimum depth and rising only 10–20 m above the surrounding area). The maximum depth of the Norwegian Trench at this latitude is approximately 350 m under the Norwegian coast, with a steep slope up to the west Norwegian fjord areas (Fig. 8.4.2).

On the East Shetland Shelf, namely the Pobie Bank sedimentary rock platform, a potential 'reefs' area (Code 1170) *sensu* EU Habitats Directive exists. Sediment cover is patchy above the rock surfaces, generally very thin when present and mainly consisting of gravelly sand. The area is 100-200 m deep and contiguous with similar habitats running into the coast of the Shetland Islands (Johnston *et al*. 2002). Bergen and Viking Bank have relatively coarse sediments, then becoming fine silt and mud when sloping down the Norwegian Trench.

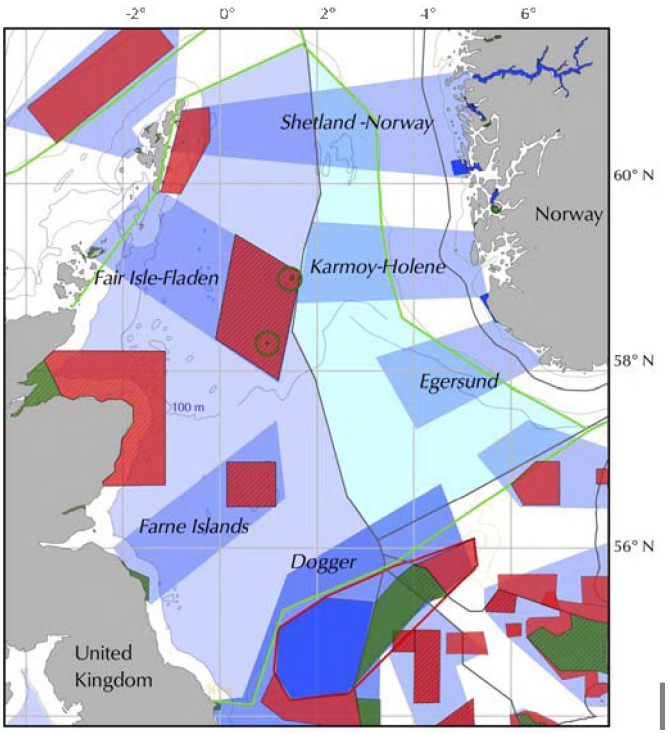


Fig. 6.4.1: Northern North Sea. Proposed Blue Belts as candidate areas for a special management regime to maintain and improve the status of vulnerable habitats. NGO proposed MPAs (red), MPAs in national preparation (blue)

This transect has several unique or rare features, not to be found in other parts of the North Sea. The occurrence of deep-water sponge beds on the slope of the Norwegian Trench (Klitgaard and Tendal 2004), probably extending at least between Bergen and Kristiansand (Fosså and Tendal 2006) is particularly remarkable. The sponges frequently clogg the nets of bottom trawls, fisheries research trawls being one source of information for Klitgaard and Tendal (2004).

Close to the Troll oil production platform at 300 m depth, several large and deep pockmark craters with unique fauna for the North Sea, such as large gorgonian corals were discovered (Hovland 2008) and proposed as MPA in chapter 8.3.1.

Hovland (2008) describes the largest cold-water coral (*Lophelia pertusa*) reef in the North Sea known to date as being located about 10 km west of the island of Fedje (60.°45'N, 4°30'E) on top of a few elongated ridges composed of sedimentary rocks.

The area proposed as a conservation transect is important for spurdog (*Squalus acanthias*) and other elasmobranchs as can be seen from the high species richness still found in that area (ICES 2006a). Sightings of basking sharks (*Cetorhinus maximus*) and relatively

high abundances of thornback ray (*Raja clavata*) and Common skate (*Dipturus batis*) are typical features of the area of *Modiolus* beds and *Lophelia pertusa* reefs. However, in particular east of Pobie Bank, there is also a very high elasmobranch mortality (ICES 2006a). Other important features are as follows:

- Records of *Arctica islandica* and *Modiolus* beds between 0°40′ E and 1°30′ E according to the OSPAR habitat database (2007);
- Records of the OSPAR habitat 'sea-pen and burrowing megafauna communities' in the Norwegian Trench and along the western slope (OSPAR database 2007);
- These records partly coinciding with the spawning areas of several commercially relevant fish species; and
- Otter trawling damage to the benthos being very high to the east of the Shetland Islands, including Pobie Bank, and decreasing towards the east. The highest impacts are inside the Shetland box (ICES 2006b).

Fair Isle Channel-Fladen Ground Transect

This Blue Belt follows the inflowing Atlantic water through the Fair Isle Channel into the North Sea where it forms an anticyclonic gyre over the Fladen Ground. Therefore, the transect extends from a coarse sediment environment in the Fair Isle Channel shaped by high currents to a soft sediment environment of the Fladen and partly Witch Grounds shaped by low currents, including their pockmark fields. All along the transect, the depth is approximately 100 m, with substantially deeper small holes scattered in between. The proposed location of this Blue Belt is a compromise between a number of facts which point to the need to take conservation measures for the protection of habitats and species of particular concern to OSPAR.

The Fair Isle Channel is a particularly important area for demersal elasmobranchs. All around the Shetland and Orkney Islands, the species richness of sharks and rays is still quite high (5-15 species, ICES 2006a). The densities of common skate (*Dipturus batis*), thornback ray (*Raja clavata*) and spotted ray (*Raja montagui*) are still relatively high. Spurdog (*Squalus acanthias*), porbeagle (*Lamna nasus*) and basking shark (*Cetorhinus maximus*) are still caught as bycatch and/or frequently sighted there.

While most of the North Sea seabed consists of more or less coarse sandy sediment, the Fladen and Witch Grounds in the Northern North Sea provide an extensive soft sediment depression (100-140 m), overlapping to a large extent with potentially gas seeping structures (pockmark fields, Fig. 6.4.2). The ecological importance of the Fladen and Witch Grounds is described above (Chapter 6.3.) as a proposal for the selection of an MPA. Off the coast, in the outer Firth of Forth, to the Farne Islands, frequent occurrences of the sea pens *Virgularia mirabilis* and *Pennatula phosphorea* were visually recorded during *Nephrops norvegicus* surveys (Greathead *et al.* 2007).

Farne Islands Transect

This Blue Belt extends from the rocky coast off the Farne Islands out to the Devil's Hole. It therefore comprises all substrates from hard bottom, sandy to muddy in the Devil's Hole. It therefore covers a representative cross section of benthic habitats in the western-central North Sea. The western part falls into the sandeel box, where industrial sandeel fishery is prohibited in order to maintain the food resources for seabird breeding colonies (and marine mammals).

Off the coast, in the outer Firth of Forth, to the Farne Islands, frequent occurrences of the sea pens *Virgularia mirabilis* and *Pennatula phosphorea* were visually recorded during *Nephrops* surveys (Greathead *et al.* 2007).

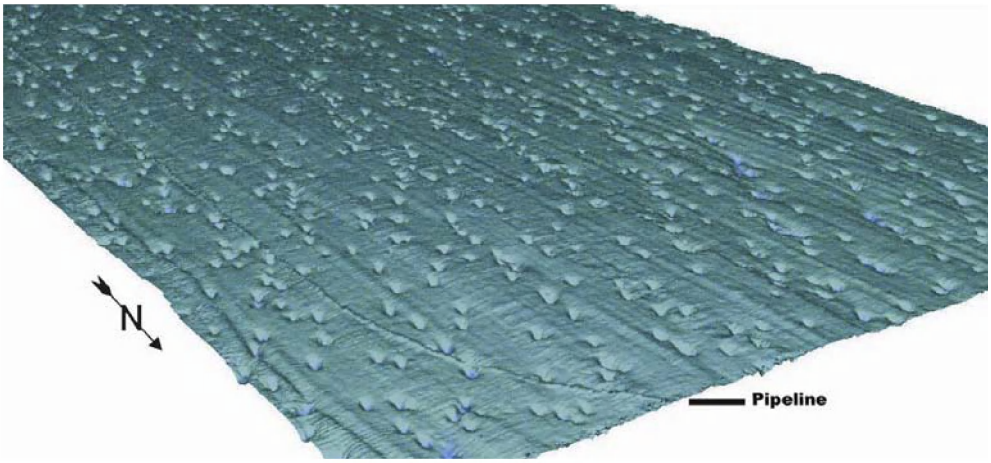


Fig. 6.4.2: Northern North Sea. Pockmarks in the northern part of the South Fladen Pockmark Study Area; MBES survey, 2001 (from Judd and Hovland 2007).

7 Ecological subregions: Scotland Continental Shelf, Faroe-Shetland Channel

7.1 Progress on designation of MPAs outside territorial waters

There are no MPAs beyond coastal waters in these two subregions (Fig. 7.1.1). Since 1983, a large area around the Shetland and Orkney Islands, the Shetlands box (Council Regulation EC 2371/2002) has been a special fisheries management area for the purpose of protecting local fisheries, with regulations of demersal fisheries based on vessel sizes as well as licensing schemes for large demersal vessels (Napier and Marrs 2004). The success of the measures has been questioned (PROTECT 2006).

7.2. Government plans to establish MPAs

The Joint Nature Conservation Committee (JNCC) advising the UK government investigated several areas on the Scottish continental slope off the Shetland Islands for their qualities as a 'reefs' (Code 1170) as defined by the EU Habitats Directive and eligible for designation as Special Area of Conservation (SAC) (see Fig. 7.1.1). The scientific descriptions of the surveys are compiled in a report by Howell *et al.* (2007).

In 2006, the Scottish Executive among others raised the territorial waters (12 nm) surrounding the Shetland Islands as a possible location for a first Scottish Marine National Park. Public consultation is ongoing, however there does not seem to be sufficient stakeholder support from the Shetlands.

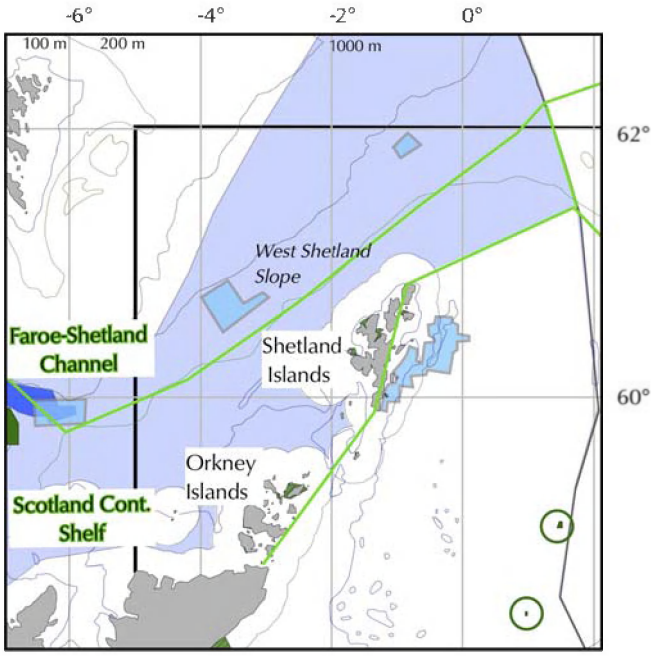


Fig. 7.1.1: Scotland Continental Shelf and Faroe-Shetland Channel. State of the MPA network February 2009: existing SACs (hatched green), pSCIs nominated to the European Commission (green) and JNCC research locations (light blue)

7.3 NGO proposal for an additional MPA on the Scottish Continental Shelf

In the following, a proposal for a further marine protected area on the West-Shetland continental slope will be presented.

7.3.1 MPAs in UK waters

National policy and legal history

Parallel to the development of a Marine Bill for England and Wales, Scotland is currently consulting on a separate Scottish Marine Act which will encompass legislation for all Scottish waters. The public consultation was closed in October 2008. A preliminary debate on the proposed Scottish Marine Bill took place in the Scottish Parliament on 26th February 2009[52]. The Scottish Government announced that Marine Scotland will be established on 1st April 2009[53].

As part of the Scottish Government's simplification programme of January 2008, the First Minister announced that Marine Scotland will deliver a simplified management and regulating system for all marine activities in Scotland, bringing together marine management functions from across public organisations into a single body, likely to be established as part of the Scottish government. The proposals contained within the consultation document reflect the Scottish Government's desire to increase the powers devolved to it and to significantly extend the geographical extent of those powers in the marine environment from 12 to 200 nautical miles from existing boundaries which presently are a mixture of the highest and lowest levels of spring tides.

West Shetland slope

It is proposed to establish a MPA on the West Shetland continental slope, stretching in parallel to isobaths at the 200–1,000 m depth, roughly between 2.5 and 1°W (see Fig. 7.3.1.1). The MPA forms the core of the specially managed area proposed in 7.4. The area qualifies as a 'reefs' (Code 1170) according to the EU Habitats Directive. Protection of the deep-water sponge belt and associated fauna is of particular interest. In addition, the area provides a habitat on the continental slope and overlaying waters for still important concentrations of demersal elasmobranchs, among

[52] http://www.scottish.parliament.uk/business/officialReports/meetingsParliament/or-09/sor0226-02.htm#Col15307

[53] http://www.scotland.gov.uk/News/Releases/2009/02/09163825

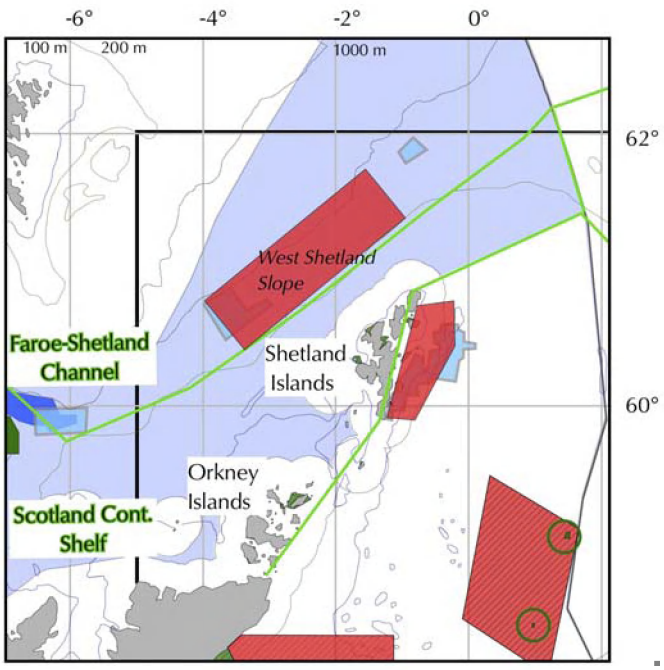


Fig. 7.3.1.1: Scotland Continental Shelf and Faroe-Shetland Channel. State of the MPA network February 2009: existing SACs (hatched green), pSCIs nominated to the European Commission (green), JNCC research locations (light blue) and proposed West Shetland Slope MPA (red)

these several species included in the OSPAR List of threatened and/or declining species and habitats. The fishing mortality of elasmobranchs is relatively high (see below). The conservation objectives for the area should focus on reducing the direct and indirect impact of fishing activities on the ecosystem and the seafloor.

The deep-water sponge fauna on the West Shetland slope is different from other locations in that at 400-600 m depth, a highly diverse sponge community of branched, cup, lamellate, globose, and encrusting forms dominates the benthic megafauna (Howell *et al.* 2007, Axelsson 2003). The sponges form a structural habitat, described as "*ostur*" (Klitgaard and Tendal 2004) e.g. at the eastern side of the Faroe Shetland Channel. Near the base of the West Shetland Slope (ca. 900 m), an unusual community dominated by a substantial population of sediment surface dwelling enteropneusts was discovered on a sandy contourite deposit (Bett 2001).

7.4 Blue Belt proposed

The focus of the conservation interest in these two subregions lies on the Scottish continental shelf and slope to the west of the Shetland and Orkney islands in the immediate vicinity of the North Sea proper (Fig.7.4.1). Hydrographically, the subregions are characterised by a strong thermohaline gradient at about 600-400 m depth. Below, a strong southward setting inflow of cold-water of Arctic and Norwegian Sea origin (<35 PSU, <3° C) enters the Faroe-Shetland Channel until turned westward at the Wyville Thomson Ridge. Above a 200 m thick layer of transient water, known to show large short-term fluctuations in temperature and salinity, a nutrient-rich and warm Atlantic surface current (<35 PSU, >8° C) sets northwards along the continental slope. Mixed with West Shetland Shelf water, this Atlantic water enters the Northern North Sea to the west (Fair Isle current) and east of the Shetlands. Due to the strong currents, further amplified by strong tidal currents, the water masses between the Orkney and Shetland islands are mixed the whole year round, whereas seasonal stratification occurs in all other deep-waters beyond the shallow shelf (Turrell 1992, North Sea Task Force 1993).

Geologically, the West Shetland shelf consists of coarse sediments under moderate to strong tidal stress. In 200-450 m depth, iceberg ploughmarks are the predominant morphological feature of the continental slope to the west. Seabed photographs show a coarse cobble

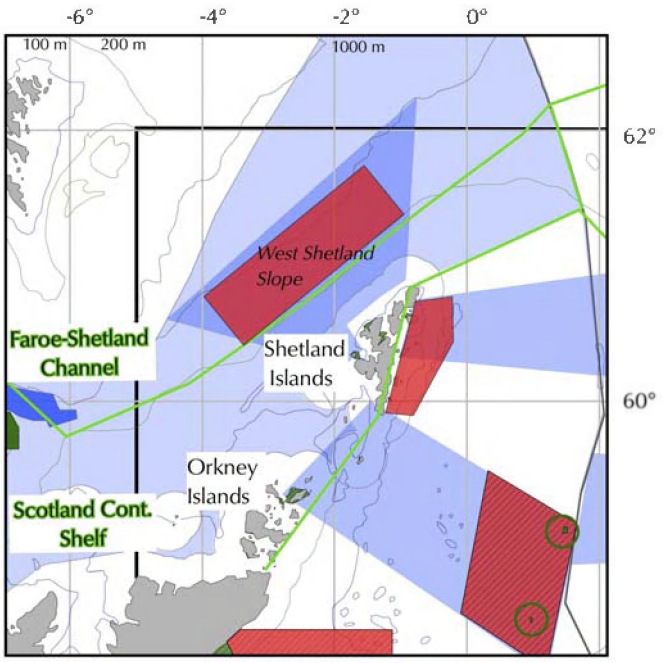


Fig. 7.4.1: Scotland Continental Shelf and Faroe-Shetland Channel. The proposed Blue Belt to the west of the Shetland Islands (dark blue) and the embedded proposed MPA (red)

substrate in the ridge areas and relatively less coarse grained material in the central grooves. This band of iceberg ploughmarks extends from southwest of the outer Hebrides to the northwest of the Shetland Islands at the edge of the continental shelf.

The continental slope west of Shetland also has a series of linear channels running down-slope (Howell *et al.* 2007). The seabed at the heads of the channels is composed of sand, with gravel, pebbles, occasional cobbles and rarely boulders at a depth of ~600 m. Overall, the deep channels act as sediment traps due to reduced current flow, the shallower channels however may have some current flow as indicated by locally observed sediment ripples. On the West Shetland continental slope, mud waves occur between 61° 05' and 61° 20' N and in water depths of 500 to 650 m (Fig. 7.4.3, Masson 2001).

The Shetland-Faroe Channel Blue Belts proposed

One very large Blue Belt (specially managed area) is proposed for these two outermost ecological subregions of the North Sea. It extends from the shallow waters off the west coast of the Shetlands down the continental slope to the bottom of the Faroe-Shetland Channel (at least to 1000 m, Fig. 7.4.1). The aim is to represent all depth zones, substrata and habitats for benthopelagic or pelagic species. Particular attention was paid to represent species and habitats listed by OSPAR, such as deep-water sponge and *Lophelia pertusa* reef habitat, and occurrence or particular mortality of elasmobranchs.

The Blue Belt covers the two sites investigated in more detail by JNCC in view of possible Sites of Community Importance (SCI) designations (Howell *et al.* 2007), and was investigated in several scientific programmes earlier (see e.g. Bett 2001, Masson 2001, Hammond *et al.* 2001, Narayanaswamy 2000). Ideally, the Blue Belt proposed could become a prolongation of a Marine National Park as proposed by the Scottish Executive in 2006.

Benthic Habitats

Recently, Howell *et al.* (2007) investigated a number of photographic transects on the West Shetland slope in detail. The analysis of the epifauna communities re-emphasised that the benthic ecology of this region is dominated by the marked difference in temperature between the shallower North Atlantic Water and deeper

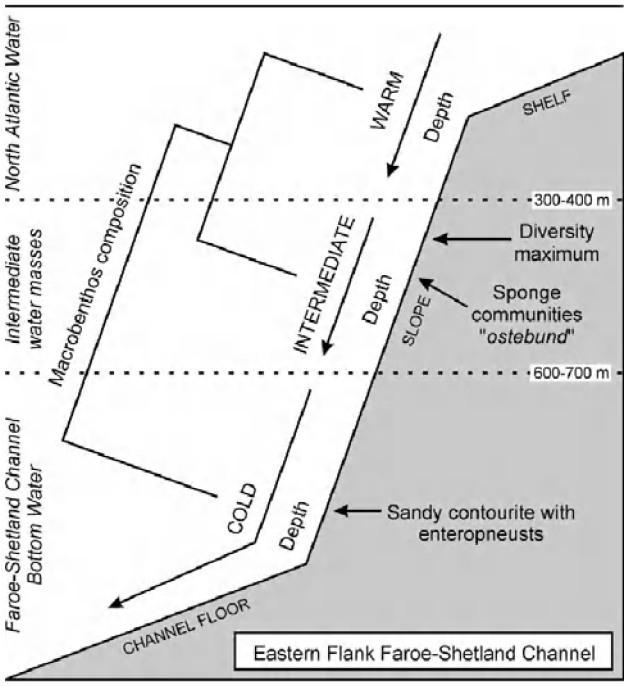


Fig. 7.4.2: Schematic diagram of the vertical distribution of benthic communities on the West Shetland continental slope in relation to water mass distribution (Bett 2001)

cold (sub-zero) Norwegian Sea waters (also see Bett 2001). Vertically, a marked change from warmer to colder water fauna was found: at shallower depths with warmer waters, the fauna is in general similar to that described previously from comparable depths and seabed types in the Rockall Trough. Commonly observed species are all typical of the region, depth and habitat, and include the blue mouth red fish (*Helicolenus dactylopterus*), squat lobsters (*Munida rugosa*), sea urchins (*Echinus acutus*, *Cidaris cidaris*), starfish (*Henricia* sp., *Poraniomorpha hispida rosea*), sea anemones, holothurians (*Stichopus tremulus*) and brittle stars (Ophiuroidea). Total macro- and megafaunal abundance and species richness decreases northwards with latitude, and vertically with depth (Bett 2001, Jones *et al.* 2007, Fig. 7.4.2).

The deep-water sponge fauna on the West Shetland slope is associated with a zone of internal waves at 400-600 m depth on the continental slope. The community is highly diverse and consists of branched, cup, lamellate, globose, and encrusting forms dominating the benthic megafauna (Howell *et al.* 2007, Axelsson 2003). The sponges form a structural habitat, described e.g. from the eastern side of the Faroe Shetland Channel as "*ostur*" (Klitgaard and Tendal 2004).

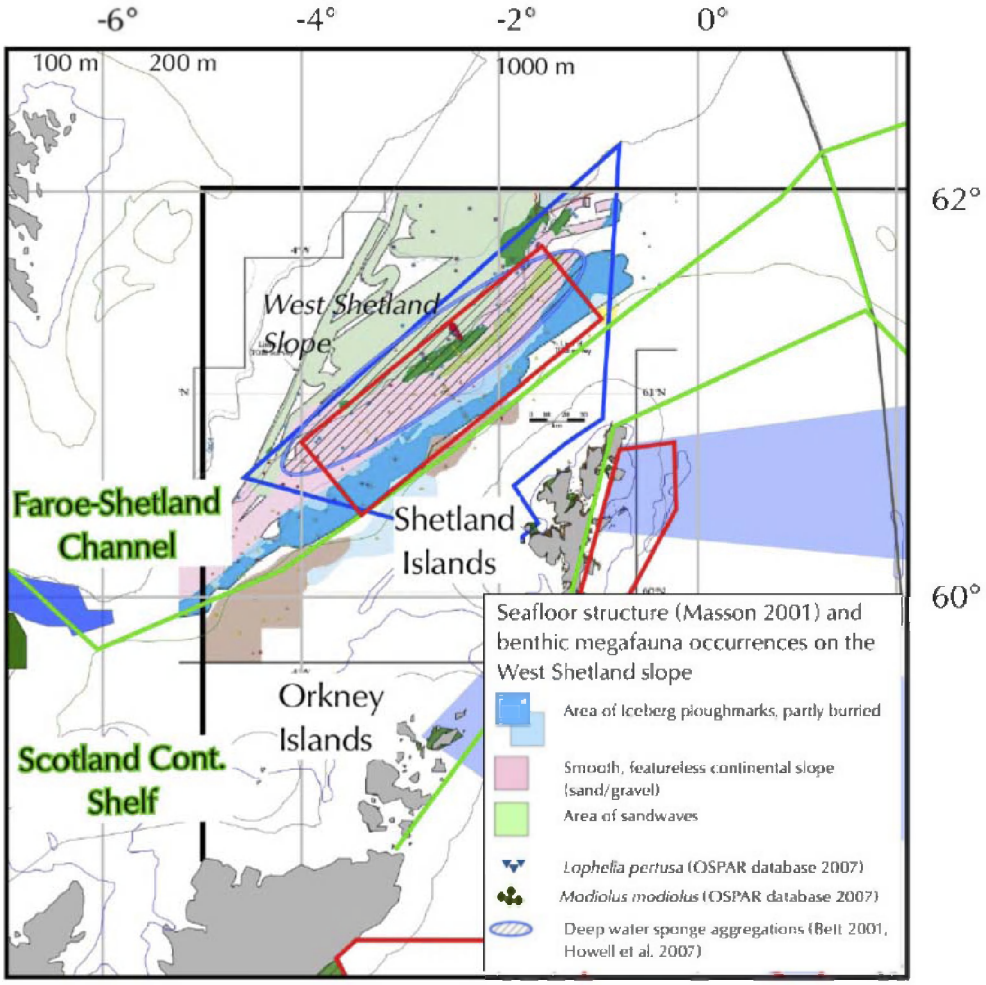


Fig. 7.4.3: Seafloor structure (according to Masson 2001) and benthic megafauna occurrences on the West Shetland slope (see legend)

On the lower slope of the West Shetland shelf (300–1200 m), seabed mounds occur related to fluid escape (Roberts *et al.* 2003). Here, near the base of the West Shetland slope (ca. 900 m), an unusual benthos community, dominated by a substantial population of sediment surface dwelling enteropneusts, was discovered on a sandy contourite deposit (Bett 2001).

Cold-water coral reef formations were notably absent from the West Shetland Channel (Bett 2001, Howell *et al.* 2007), in particular below 500 m depth (Roberts *et al.* 2003). Where found, cold-water corals either occur as individuals or in small patches, generally associated with rock outcrop, pinnacle and rock terrace (ledge) features. *Lophelia pertusa* also readily settles on the artificial hard substrate provided by oil installations offshore (Roberts 2002).

The waters around the Shetlands are among the few areas in the North Sea where sharks, rays and skates are still caught regularly, including species on the OSPAR List of threatened and/or declining species (Fig. 7.4.4): common skate (*Dipturus batis*), spurdog (*Squalus acanthias*), thornback ray (*Raja clavata*), spotted ray (*Raja montagui*) and basking shark (*Cetorhinus maximus*) (all data from Daan *et al.* 2005, also see Walker 1995, Heessen 2003).

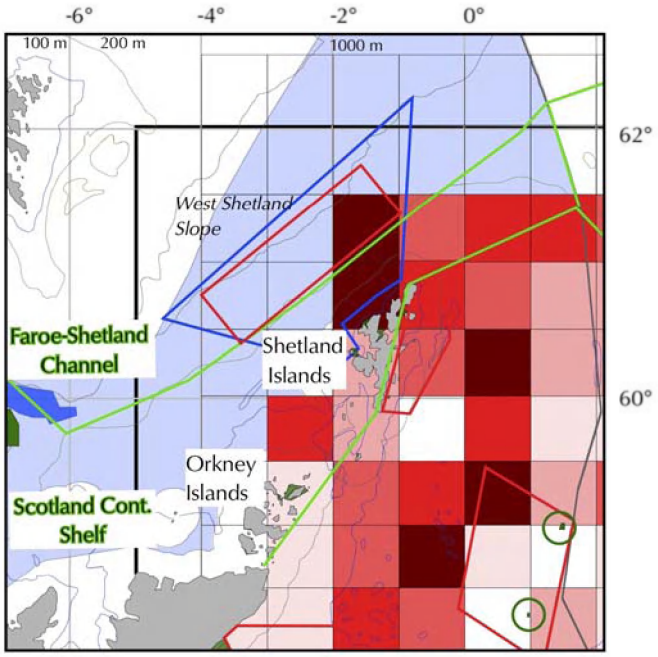


Fig. 7.4.4: Fishing impact on elasmobranchs (sharks and rays) expressed as total mortality in % of biomass (ICES 2006a)

Howell *et al.* (2007) found that "*The most notable feature of the channels was the high abundance of rays (Rajiformes) present on the floor of the channels.*" Possibly, the channels are a better feeding area for deep-water fishes than the surrounding open slope due to the reduced current speed and therefore improved sedimentary conditions for biogenic material (Bett pers. com).

Otter trawl fishing effort for demersal species is very high west of Shetland on the shelf, decreasing with depth down to 700 m (Gordon 2003, also see Fig. 7.4.5). There is a substantial mixed fishery on cod, haddock and whiting, with anglerfish as a major bycatch. A fishery targeting anglerfish has recently developed. In addition, there is significant effort for pelagic species like herring, mackerel, blue whiting and Norway pout (currently closed fishery). The most important grounds for the *Nephrops* and scallop fishery are inshore or off the Orkney Islands (The Noup), respectively.

Bett (2000) documented lost fishing gear and impacts of deep-water trawling on the seafloor and its communities all over the Atlantic Margin, on practically all sites investigated during several large scale regional seabed surveys (Fig. 7.4.5). Most but not all observations came from the upper continental slope (300-600 m), coinciding with the occurrence of

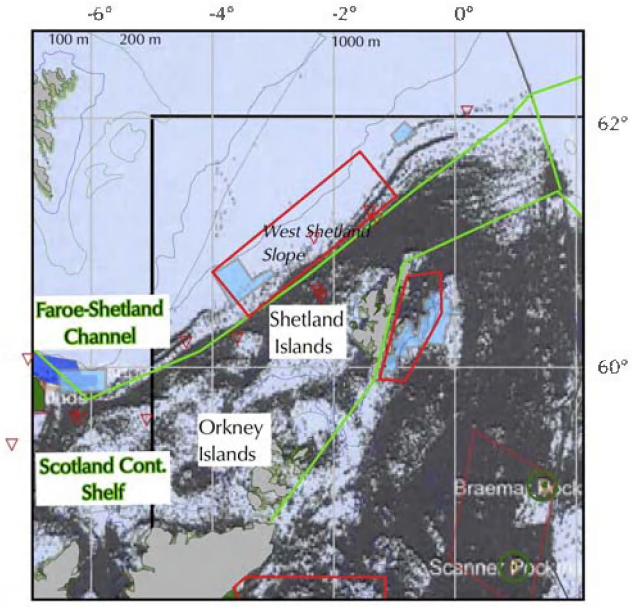


Fig. 7.4.5: VMS positioning data of Scottish trawling fishing vessels (>4 kn), adopted from Gatt (2008). The overlay shows positions where Bett (2000) documented significant damage to the seafloor from fishing activities. In addition JNCC research areas (see Fig. 7.1.1)

well developed epifauna communities, in particular deep-water sponges (see above). Consequently, Bett (2001) suggests that the environment described "*may, in part, already be influenced by the actions of deep-sea trawling as the impacts of deep-sea trawling may be encountered practically anywhere within the UK Atlantic Margin*". Evidence of human activities (trawl marks and discarded fishing gear) was also observed at all sites investigated by Howell *et al.* (2007). These observations support the studies by ICES (2006b) concluding on a moderate to high impact of otter trawling on benthos, a very high impact on elasmobranchs (>70% fishing mortality, see Fig. 7.4.4), and a relatively high impact on non-target fish species.

Mammals

Fin, sei, humpback, northern bottlenose, sperm, pilot and beaked whales, and white-sided and common dolphins were all sighted typically in deep, oceanic waters, although inshore movements of some of these species appeared to occur during the summer (Weir *et al.* 3002). In contrast, minke whales, white-beaked dolphins and harbour porpoises were almost entirely recorded in shelf waters within the 200 m isobath (Northridge *et al.* 1995). Three species, the killer whale, Risso's dolphin and bottlenose dolphin were found in small numbers throughout the study area. These three species are found in both deep offshore waters, and in shallow shelf waters throughout their geographical range (Evans 1987).

Harbour porpoises were the most frequently sighted cetacean in the study area and were widely distributed in shelf waters, particularly those of the Outer Hebrides and Shetland Islands. White-sided dolphins were most abundant in deep-water along the shelf edge, especially over the Faroe-Shetland Channel and the Faroe Bank Channel. By contrast, white-beaked dolphins are generally considered to be the most common inshore dolphin species off Scotland (Evans 1987). Although widely dispersed, the main concentration of killer whale (*Orcinus orca*) sightings occurred to the north and northwest of Shetland (Evans 1988). There are numerous nationally important colonies of grey seals and common seals on the Orkney and Shetland Islands. The prime foraging area is within 50 nm of the colonies, however, much more extensive migrations are undertaken seasonally (Hammond *et al.* 2001).

Birds

The seabird colonies on the Shetlands are recognised as of international significance and are among the largest in the North Atlantic. Offshore, the most frequently recorded species was northern fulmar (*Fulmarus glacialis*), but common guillemots (*Uria aalge*), kittiwakes (*Rissa tridactyla*), Atlantic puffins (*Fratercula arctica*) and northern gannets (*Morus bassanus*) were also numerous in the study area. Both species diversity and the number of individuals recorded were higher on the continental shelf than along and beyond the shelf edge. The shelf was mainly characterised by diving, fish-eating species such as auks and Manx shearwaters some of which occurred in important numbers whereas surface feeders like fulmars and storm petrels were mainly encountered over deep-water. Shelf waters are important, especially during the breeding season, for fulmar, Manx shearwater, gannet, great skua, Arctic skua, lesser black-backed gull, herring gull, great black-backed gull, kittiwake, Arctic tern, common guillemot, razorbill and puffin (Reid *et al.* 2001). Among the auks, Manx shearwater and great skua are rated most vulnerable to oil pollution (Webb *et al.* 1995) as the study area contains a large proportion of the biogeographic population of each. Red-throated diver, great northern diver, cormorant, shag and black guillemot are very vulnerable, too.

8 Ecological subregions: Norwegian Trench and Skagerrak

8.1 Progress on designation of MPAs outside territorial waters

EU Habitats and Birds Directives

Norway is not a member of the European Union, and therefore the EU Habitats and Birds Directives will not be implemented in the Norwegian section of the North Sea. Given the large share of Norwegian waters, this questions whether an ecologically coherent Natura 2000 network can be established at all.

Only a tiny fraction of Swedish marine waters fall within the Skagerrak region, notably the *Kosterfjorden* area. Here, several sites are protected under the EU Birds and Habitats Directives. So far, no area has been designated in waters outside 12 nm. Further south, in the Kattegat, several coastal and offshore sites are established under Natura 2000 and nominated for inclusion in the OSPAR MPA network: the nature reserves *Gullmarsfjorden*, *Kungsbackafjorden*, *Nordre Älv* estuarium, and the offshore banks *Fladen* and *Lilla Middelgrund*.

OSPAR Network

Two sites have been included in the OSPAR network of MPAs by February 2009[54]: the *Tisler* Reef in Norway (2005, 1.8 km^2), and the *Koster-Väderöfjorden* archipelago (2005, 426 km^2) in Sweden, both falling into coastal waters. So far, no sites further offshore or beyond 12 nm in the EEZ have been considered. However, due to the unique hydrographic setting, the deep-water fauna of the Skagerrak region occurs to some extent in these coastal areas. The OSPAR MPA *Koster-Väderöfjorden* Archipelago is nominated for providing protection to a wide range of features on the OSPAR List of threatened and/or declining species and habitats such as the molluscs *Arctica islandica*, *Nucella lapillus*, and *Ostrea edulis* and the fish species cod (*Gadus morhua*) and common skate (*Dipturus batis*). Occasionally, harbour porpoise (*Phocoena phocoena*) occur in the area. Threatened and declining habitats are represented by deep sea sponge aggregations, *Lophelia pertusa* reefs, *Ostrea edulis* beds, 'sea-pen and burrowing megafauna communities' and *Zostera* beds.

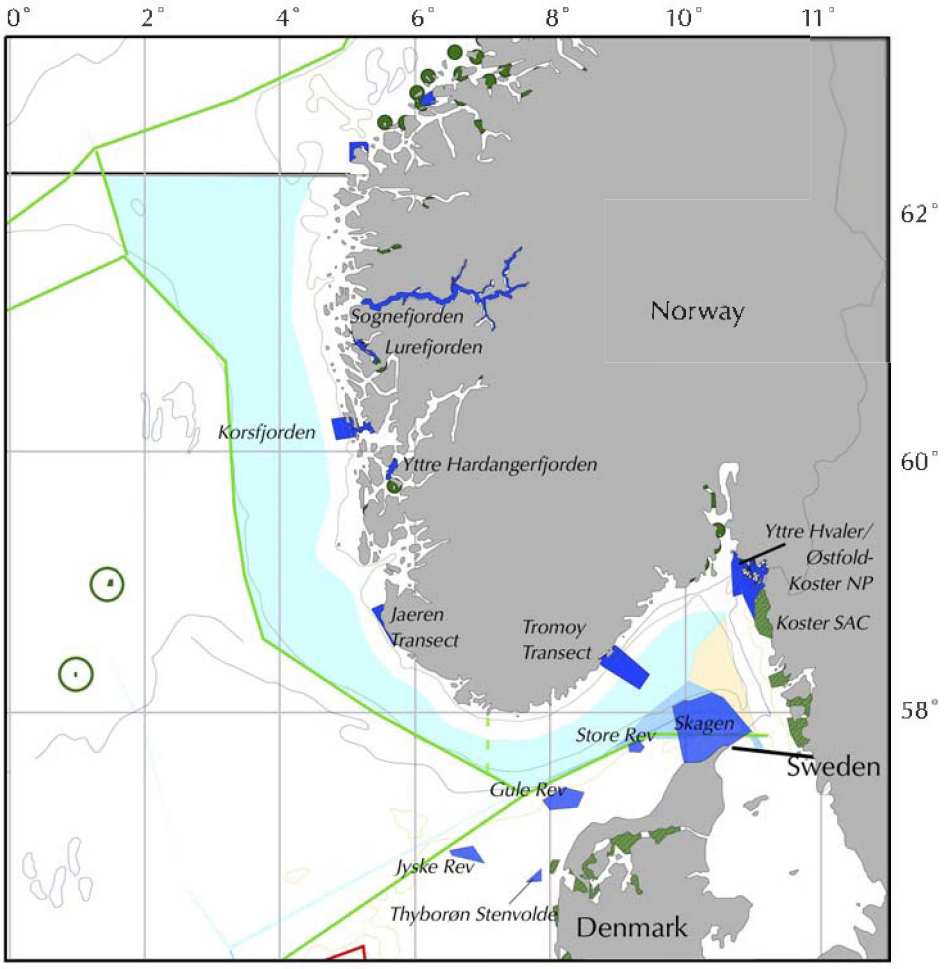


Fig. 8.1.1. Norwegian Trench and Skagerrak. State of the MPA network, February 2009: established MPAs (green), potential MPAs in preparation (blue)

[54] OSPAR BDC 09/5/4 Rev.1-E. [Draft] 2008 Report on the Status of the OSPAR Network of Marine Protected Areas

8.2 Government plans to establish MPAs

In Norway, the first tranche of sites proposed to be components of the future national representative network of MPAs, comprising several coastal locations and two sites reaching into the deep Skagerrak, are currently in consultation (Fig.8.1.1). In Sweden, there are currently no further sites under consideration, however, there is a scientific proposal for an MPA in the deep Skagerrak (*Bratten* area) as presented in chapter 8.3.

Transboundary National Parks

In the *Ytre Hvaler/Østfold-Koster*, two new marine national parks will be established in 2009. The area is situated along the northeastern edge of the deep Norwegian trench that connects the Skagerrak with the Atlantic Ocean. The eastern parts of the proposed area (*Koster-Väderöfjorden* and *Singlefjorden*) are situated in Swedish territorial waters and partially already established nature reserves and Natura 2000 sites. The western part (*Ytre Hvaler*) is situated in Norwegian territorial waters (see Fig. 8.2.1). The central position of *Kosterfjorden/Ytre Hvaler* is approximately 58°58,70 N, 11°01,60 E.

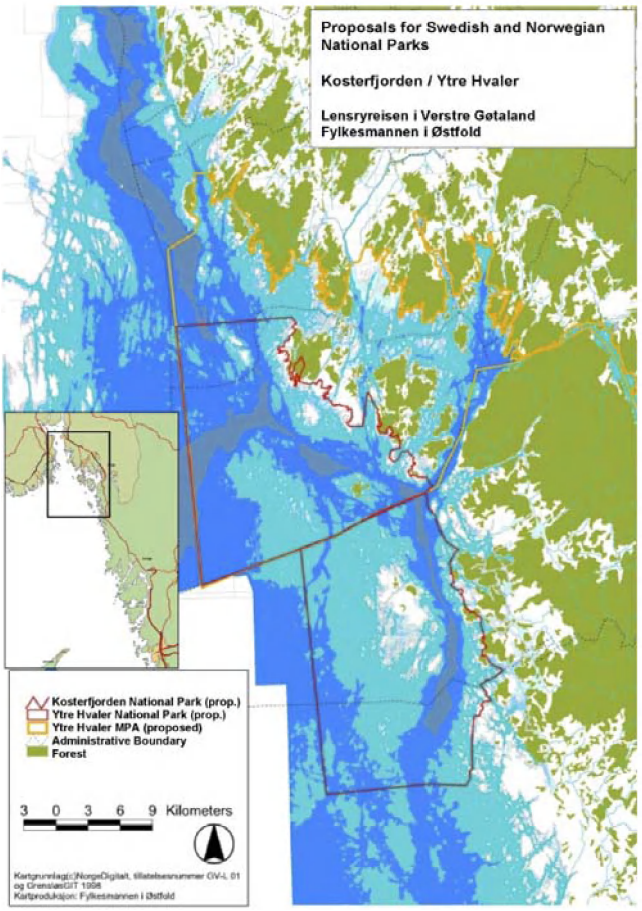


Fig. 8.2.1: Norwegian Trench and Skagerrak. Location and proposed boundaries of the future Norwegian *Ytre Hvaler/ Tisler* and Swedish *Kosterfjorden* National Parks (Source: Kartproduksjon Fylkesmannen i Østfold)

The establishment of the new national parks was motivated by the discovery, in 2002, of a previously unknown coral reef north of *Tisler* in *Ytre Hvaler* in Norway, close to the border to Sweden. This reef is at least 1.2 km long and 200 metres wide and it may be the largest found so far in inshore waters. Living corals have been found between 160 and 74 m depth. This also means that the reef is one of the shallowest so far discovered. Furthermore, yellow varieties of *Lophelia pertusa*, which have never been documented previously, have been observed on the reefs. Several additional reefs have also been found close to this area.

Many invertebrate species have been recorded in the area, e.g. sea pens, sponges and brachiopods. Areas such as *Singlefjorden*, which are lightly trawled compared to neighbouring areas, still contain many valuable species sensitive to trawling. The area is known as an important site for reproduction and growth of several commercial fish species, molluscs and crustaceans but also sharks and rays which, however, have decreased dramatically in recent times. Moreover, the area contains many important feeding grounds for the common seal (*Phoca vitulina*) and, to a smaller extent, the grey seal (*Halichoerus grypus*). These features make the area an outstanding example of the Skagerrak habitats, while at the same time containing aspects that are unique for the southeastern part of Norway and for Sweden. For Sweden, 200 species are considered unique, including the cold-water coral *Lophelia pertusa*.

Development of the Ytre Hvaler protected areas

The *Ytre Havler* protected areas will consist of two sites (see Fig. 8.3.3), a MPA and a National Park. The latter is a large section of the former but further includes land areas (NIVA 2006).

Development of the Kosterfjorden Protected Area

The process towards establishing a National Park adjacent to the Norwegian *Ytre Hvaler* National Park which is envisaged to be finalised in 2009, will extend a Natura 2000 site already designated in 2001. Under its regulations, nine areas were totally closed for shrimp trawling, and the use of smaller trawls was agreed for other areas. The National Park will now build upon these developments and the Natura 2000 site boundaries and regulations, but it will include the islands of the area, the surrounding waters and coastal areas as well.

8.3 MPAs in Norwegian and Swedish waters

In the following, the current national situation in Norway and Sweden with respect to MPA development will be described. Additional site proposals will be presented.

8.3.1 MPAs in the Norwegian EEZ

National policy and legal history

Norwegian territorial waters reach out to 4 nm from the baseline, and so does the conservation legislation. Revision of legislation and provision of comprehensive marine legislation in a marine act is ongoing. So far, beyond 4 nm only fisheries legislation can be applied to enact management measures for the protection of species and habitats. Since 1999, a specific coral protection act has been used to protect six sites of cold-water coral reefs from impacts caused by bottom trawling[55] (*Fjellknausene*, *Ivarryggen*, *Røstrevet*, *Selligrunnen*, *Sularevet*, *Tisler*). All of these sites are also included in the OSPAR network of MPAs.

Within the North Sea ecological subregion, only Tisler reef (1.8 km^2) and *Fjellknausene* (1.9 km^2) in the eastern Skagerrak are protected. There are no coral reefs known south of Bergen and west of the Oslofjord (Fosså *et al.* 2000). In addition, in *Ytre Hvaler* bottom trawling is only allowed below 60 meters. Other measures are still in proposal.

Since the late 1980s, the process towards establishing a network of MPAs in Norwegian waters has slowly taken place[56]. Since 2001, Norway has been going through the first phase of the selection process for the designation of a national representative network of MPAs, focussing primarily on sites within territorial waters. By 2004, based on scientific advice (Brattegard and Holthe 1995), an 'Advisory Committee for Marine Protected Areas in Norway' involving fisheries and nature management authorities and a wide range of stakeholders proposed a suite of MPA candidate sites to the responsible local communities (Fig. 8.3.1.1). The consultation is expected to be finalised in early 2009. In a second phase, the overall requirements for completing a representative network of MPAs in all Norwegian waters out to 200 nm is foreseen which originally has been meant to be concluded by 2010.

Fig. 8.3.1.1: Norwegian Trench and Skagerrak. National plan to establish a representative network of MPAs in Norway. Sites in consultation February 2009 (from Skjoldal 2005)

Among the sites in consultation in the Norwegian Trench/Skagerrak subregion, two are proposed to include waters beyond the coastal zone:

- The *Østfold* area (535 km^2), including the area of the envisaged *Hvaler/Tisler* National Park, which will extend into the deep Skagerrak; and
- The *Tromøya* transect (684 km^2) extending from the Norwegian coast off Arendal into the deep Norwegian Trench and Skagerrak down to 600 m depth.

NGO proposal for an additional MPA

Due to a limited knowledge base, only one MPA is proposed at the present time. All other areas likely to be of special ecological value and therefore in need of targeted management measures are included in the Blue Belts (specially managed areas) proposed in Chapter 8.4.

Troll pockmark

Close to the Troll oil production platform, the water depth is 300 m and there are several large and deep pockmark craters up to 100 m in diameter and 8 m deep (Tjelta *et al.* 2007 in Hovland 2008). Here, "*two large Paragorgia arborea (one white and one red gorgonian coral) individuals are perched inside an 8 m deep*

[55] http://www.fiskeridir.no/%EF%AC%81skeridir/english/regulations/080414-regulations-amending-theregulations-relating-to-sea-water-%EF%AC%81sheries

[56] see OSPAR BDC 01/6/Info.1-E (2001). Work on Marine Protected areas in Norway.

pockmark, which has a 1 m high column of methane-derived carbonate rock protruding up from its centre. The corals are firmly fastened to this 'natural concrete' substratum. Clusters of up to 30 Acesta excavata bivalves are also affixed to the same structure" (Hovland 2008; Fig. 8.3.1.2).

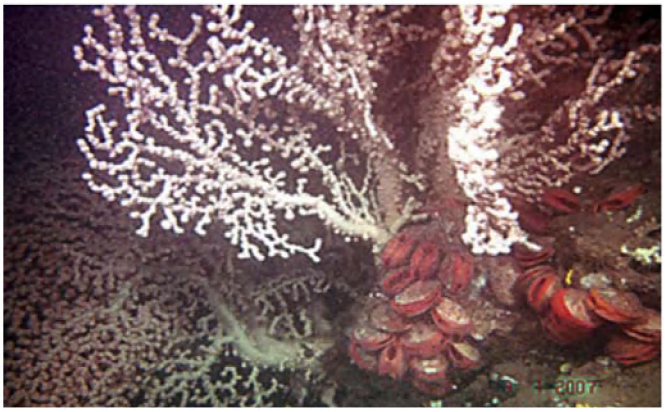


Fig. 8.3.1.2: Norwegian Trench and Skagerrak. Troll Field. At the centre of the mother pockmark, these two large *Paragorgia arborea* (gumcorals) were found. The bivalves *Acesta excavata* are seen to cluster around their stems (Hovland 2008).

There are several other known pockmarks which deserve to be further investigated, and if possible protected from disturbance: *Holene* and *Tommeliten* pockmarks (Hovland and Thomsen 1989, also see 6.4). Pockmarks can persist for a long time, then forming carbonate concretions which provide a substrate for sessile epifauna and associated species. However, these concretions making the features eligible as Natura 2000 site ('submarine structures made by leaking gases' Code 1180) are easily destroyed by physical impacts, e.g. from bottom trawling.

Hovland (2008) describes a coral reef off the island of Fugløy which he considers to be the largest *Lophelia pertusa* reef in the North Sea. The reef is about 10 kilometres west of the island of Fedje (60.°45'N, 04°30'E) on top of a few elongated ridges composed of sedimentary rocks. Fig. 8.3.1.3 shows a photograph taken in 1982. If this reef still exists, it certainly deserves to be designated as a MPA.

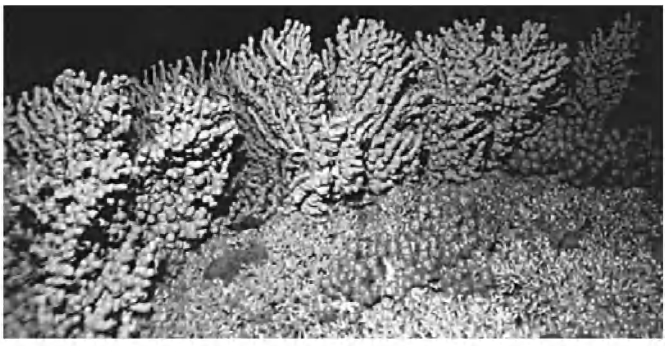


Fig. 8.3.1.3.: Norwegian Trench and Skagerrak. Gorgonian corals photographed at Fugløy reef 1982 (Hovland 2008)

8.3.2 MPAs in the Swedish EEZ

National policy and legal history

In Sweden, the government can implement marine conservation measures in the Swedish EEZ under the Swedish 'Law of the Exclusive Economic Zone'. Fisheries measures are taken under the Fisheries Act, and additional environmental measures are regulated in accordance with the Environmental Code (Chapter 7, §§ 27, 28 and 29).

The *Koster-Väderöfjorden* area was established as a Natura 2000 site with reefs and sublittoral sandbanks in 2001. The *Koster-Väderöfjorden* is a 65 km long deep trench that connects to the deep Norwegian Trench in the Skagerrak. It has a high diversity of biotopes and species, and about 209 of these species occur only here within Swedish waters. Of particular conservation value are the deep (>200 m) soft and hard bottoms and the exposed shallow areas facing the Skagerrak. There are reefs of *Lophelia pertusa*, deep sea sponge aggregations and the 'sea-pen and burrowing megafauna communities' communities and several other species associated with these habitats which are very sensitive and vulnerable to physical destruction.

There are significant fishery values in the area and bottom trawling for deep-water shrimp (*Pandalus borealis*) is the most imortant fishing activity. No other form of trawling is allowed (Sköld 2004).

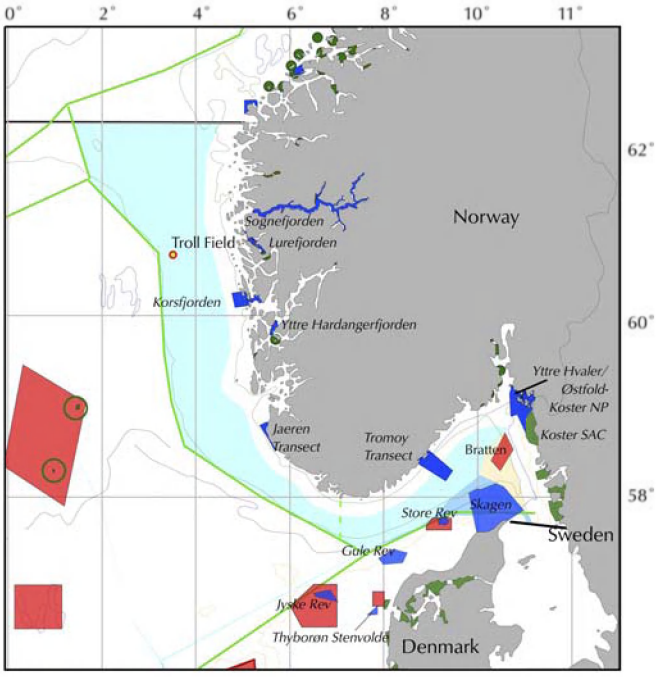


Fig. 8.3.2.1. Norwegian Trench and Skagerrak. Location of the proposed *Bratten* coral MPA in the eastern Skagerrak (red), existing MPAs (green), MPAs in preparation (blue)

Further, a voluntary management scheme has been established between fishermen and the relevant authorities. It was agreed to entirely close some areas for shrimp trawling and further to restrict the size of the trawl gear. The limit of trawling was lowered from 50 meters down to 60 meters from July 2000. In addition, a zonation of the coastal area into zones suitable for different levels of bottom trawling for Norway lobster (*Nephrops norvegicus*) and exclusion zones were agreed with the fishing sector (Sköld 2004). A national certification scheme for sustainably harvested fishery products was developed in this context as well.

NGO proposal for an additional MPA

Bratten Reef

Seabed habitat mapping in combination with visual ground truthing of a canyon system in the outer Swedish Skagerrak revealed an area of extraordinary ecological richness as recently as 2007. The investigations were part of a project which, in addition to the mapping of the offshore environment, aims at initiating a dialogue with stakeholders in the EU Common Fisheries Policy area in order to set up a management plan delivering best fishing practices (Sköld *et al.* 2007).

The *Bratten* area is situated at a depth of 150-420 m on the eastern Skagerrak slope. Several deep canyons extend from the Norwegian Trench towards the coast in a north to easterly direction. These canyons are narrow, steep sided and intersected by several sills (Fig 8.3.2.1), and they provide for a range of habitats.

Sköld *et al.* (2007) describe the bottom substrate as being mainly soft mud, but with rocky bottoms and coarse sand and gravel at the slopes and sills of the canyons. Giant pockmarks created by local gas fields were also discovered[57].

The most important fishery is for deep-water shrimps (*Pandalus borealis*), followed by witch, cod, pollock and haddock. There are also landings of threatened and declining species, such as skates. The effort in the demersal fisheries has increased since 1996. The area is also important for the recreational fishery, in particular targeting large predatory fishes like tusk, skates and rays in the deeper troughs.

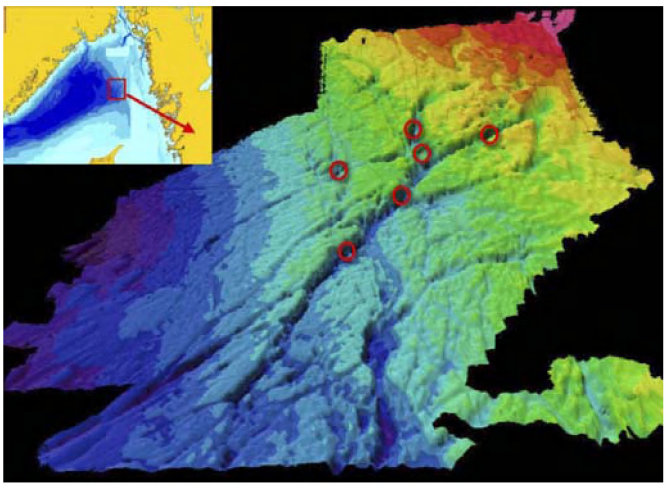


Fig. 8.3.2.2.: Norwegian Trench and Skagerrak. The *Bratten* area in three-dimensional view over the bottom topography. The insert map shows the location in the eastern Skagerrak (Sköld *et al.* 2007; 3D presentation by Marin Mätteknik AB).

Sköld *et al.* (2007) found trawl marks in the soft sediment areas and lost fishing gear in many places. Lost longlines were particularly observed to be attached to gorgonian corals and detached fragments of those.

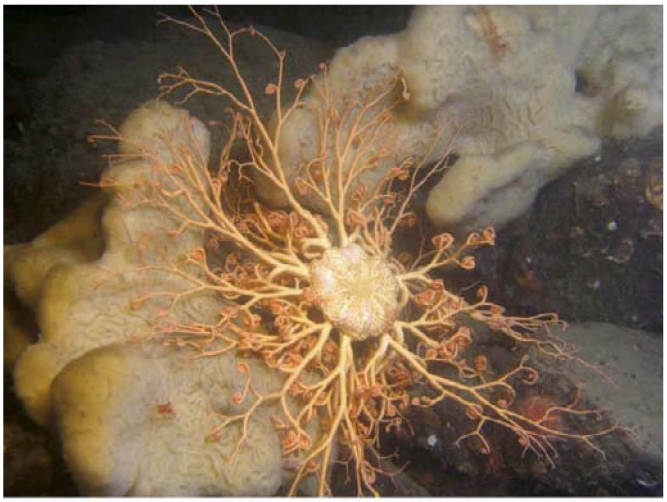


Fig. 8.3.2.3: Norwegian Trench and Skagerrak. Sponge ground (*Mycale lingua*) with *Gorgonocephalus caputmedusae* in the Bratten area (Lundälv pers. comm.)

[56] source: MPA nominations to OSPAR

8.4 Blue Belts proposed

The Blue Belts proposed shall encompass representative transects of the Norwegian Trench and Skagerrak (Fig. 8.4.1). All transects range from the Norwegian coast offshore across the Norwegian Trench. The aim is to represent all depth zones, substrata and habitats for benthopelagic or pelagic species. Particular attention was paid to represent species and habitats listed by OSPAR, such as deep-water sponge and *Lophelia pertusa* reef habitat, the habitat 'sea-pen and burrowing megafauna communities', records of ocean quahog (*Arctica islandica*), and occurrence or particular mortality of elasmobranchs.

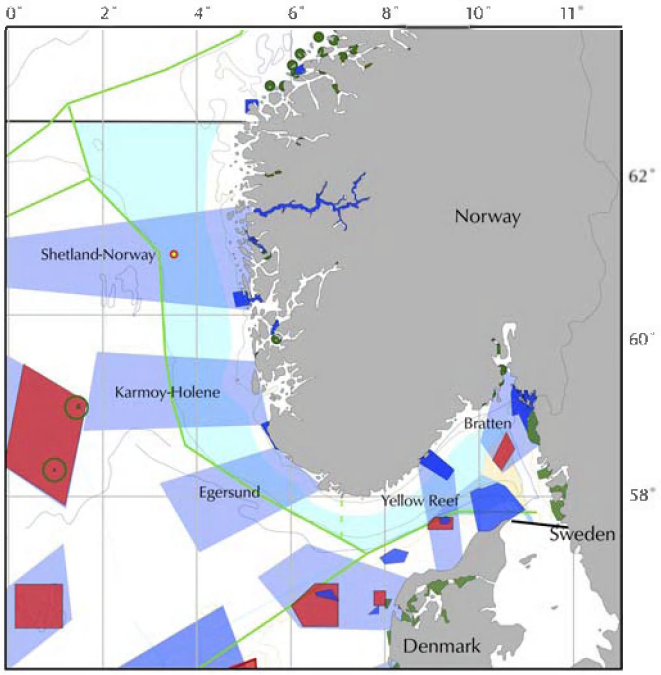


Fig. 8.4.1: Norwegian Trench and Skagerrak. Proposed Blue Belts as candidate areas for a special management regime to maintain and improve the status of vulnerable habitats. Proposed MPA (red), MPAs in preparation (blue)

Shetland-Norway Transect

This Blue Belt is a transect across the Norwegian Deep at about 60° N, from the eastern islands of the Shetlands (Unst to Whalsay) to the Norwegian coast between *Sognefjorden* and *Korsfjorden*. It therefore extends across the ecological subregions Northern North Sea and Norwegian Trench and includes the proposed MPA Pobie Bank, Viking Bank, the proposed Troll Field pockmarks MPA, and the potential MPAs *Sognefjorden* and *Korsfjorden* in consultation in Norway as well as smaller fjord MPAs in between.

From west to east, the slope deepens gently towards the Norwegian Trench, intersected by Viking Bank and Bergen Bank, both at ca. 100 m minimum depth and rising only 10–20 m above surrounding area. The maximum depth of the Norwegian Trench at this latitude is approximately 350 m under the Norwegian coast, with a steep slope up to west-Norwegian fjord area (Fig. 8.4.2).

On the East Shetland shelf (UK), on the Pobie Bank sedimentary rock platform, a potential reef area *sensu* EU Habitats Directive exists. Sediment cover is patchy on the rock surfaces, generally very thin if present, and mainly made of gravelly sand. The area is 100-200 m deep and contiguous with similar habitats running into the coast of the Shetland Islands (Johnston *et al.* 2002). The east coast of the Shetlands also is a hot spot for harbour porpoise occurrence (Evans and Wang 2008). Bergen and Viking Bank have relatively coarse sediments, then becoming fine silt and mud when sloping down the Norwegian Trench.

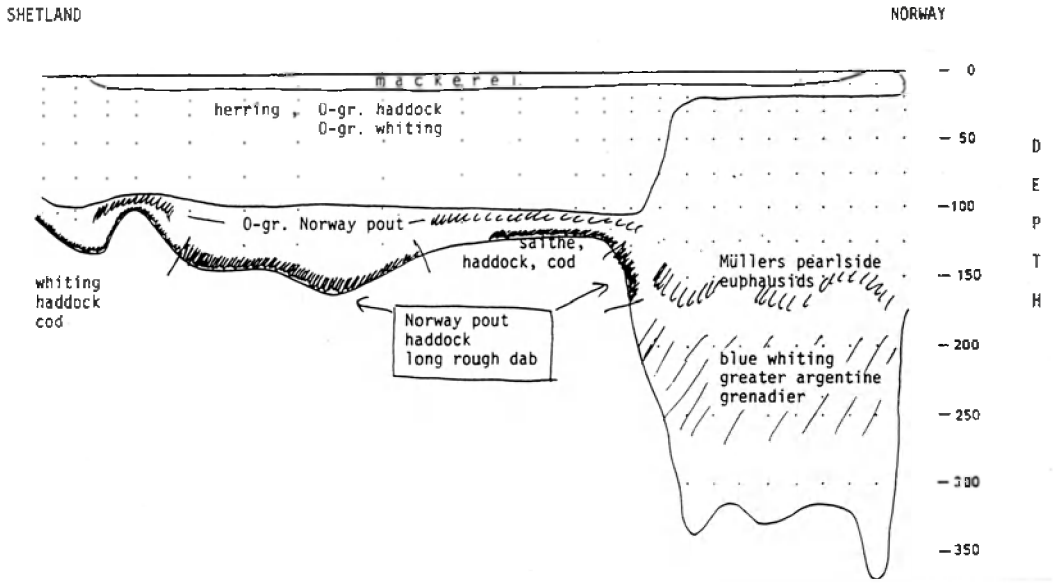


Fig. 8.4.2: Norwegian Trench and Skagerrak. Cross section of the Norwegian Deep at the latitude of Bergen (North Sea Task Force 1993)

This corridor has several unique or rare features, not to be found in other parts of the North Sea. In particular the occurrence of deep-water sponge beds on the Norwegian slope of the Norwegian Trench (Klitgaard and Tendal 2004), probably extending at least between Bergen and Kristiansand (Fosså and Tendal 2006). The sponges frequently clogg the nets of bottom trawls, fisheries research trawls being one source of information for Klitgaard and Tendal (2004).

Close to the Troll oil production platform, the water depth is 300 m and there are several large and deep pockmark craters up to 100 m in diameter and 8 m deep (Tjelta *et al.* 2007, in Hovland 2008): Here, "*two large Paragorgia arborea (one white and one red) individuals are perched inside an 8 m deep pockmark, which has a 1 m high column of methane-derived carbonate rock protruding up from its centre. The corals are firmly fastened to this 'natural concrete' substratum. Clusters of up to 30 Acesta excavata bivalves are also affixed to the same structure*" (Hovland 2008). This site should also be designated as MPA for inclusion in the national and the OSPAR network of MPAs.

Hovland (2008) describes the largest *Lophelia pertusa* reef in the North Sea known to date as being located about 10 km west of the island of Fedje (60°45'N, 04°30'E) on top of a few elongated ridges composed of sedimentary rocks.

The area proposed as conservation transect is important for spurdog (*Squalus acanthias*) and other elasmobranchs as can be seen from the high species richness still found in that area (ICES 2006). However, in particular east of Pobie Bank there is a very high elasmobranch mortality also (ICES 2006).

Other important features:

- *Arctica islandica* and *Modiolus* bed records between 0°40′ E and 1°30′ E according to OSPAR habitat mapping;
- *Lophelia pertusa* reef records off the Norwegian coast according to OSPAR habitat mapping;
- Relatively high *Raja clavata* and *Dipturus batis* abundance in an area of *Modiolus* beds and *Lophelia pertusa* reefs;
- OSPAR habitat 'sea-pen and burrowing megafauna communities' in the Norwegian Trench and along the western slope according to OSPAR habitat mapping;

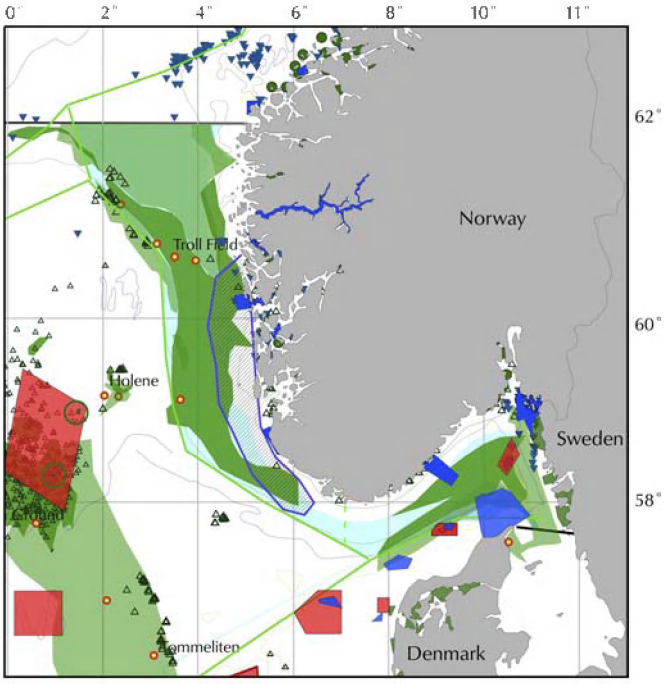


Fig. 8.4.3: Norwegian Trench and Skagerrak. Records of *Lophelia pertusa* reefs (blue triangles), the OSPAR habitat 'sea-pen and burrowing megafauna communities' (both according to OSPAR habitat database 2008), deep-water sponges (purple area, according to Klitgaard and Tendal 2004, Fosså and Tendal 2005). Proposed MPA (red), MPAs in preparation (blue)

- Frequent sightings of basking sharks (*Cetorhinus maximus*);
- Coinciding partly with cod spawning area;
- Otter trawling damage to the benthos being very high to the east of the Shetland Islands, including Pobie Bank, and decreasing towards the east. The highest impacts coincide with the boundaries of the Shetland box; and
- The Oseberg and Troll oil fields are located in the area, and several pipelines, also connecting the Gullfaks and Brent oil fields to the north, are crossing.

Karmøy-Holene Transect

This transect extends from the *Haugesund-Stavanger-Jernkusten* MPA on the Norwegian coast across the Norwegian Trench to the Norwegian EEZ boundary shared with the UK. The trench is up to 290 m deep here and relatively wide.

The area includes several features of particular interest to OSPAR: on the eastern slope of the Norwegian Trench and into the fjords of Norway, deep-water sponge beds are found in areas of stone and gravel occurring due to higher current velocities and lower sedimentation rates (Klitgaard and Tendal 2004). The authors further investigated the nature of sponge-

dominated trawl catches from the eastern slopes of the Norwegian Trench mostly between 300 and 200 m by scientific trawling in the *Karmøy* area at 160 m depth. The Norwegian Trench and its slopes are a Norway lobster (*Nephrops norvegicus*) fishing area, and some records of 'sea-pen and burrowing megafauna communities' have been documented according to OSPAR habitat mapping.

The *Holene* area, about 30 km south-southeast of the Heimdal oil field, is a densely pockmarked area (Hovland and Thomsen 1989). While the area outside the pockmark depressions is a featureless soft sediment environment with some sea pens and actinians, the benthos inside the pockmarks is dominated by anthozoans (e.g. *Alcyonium digitatum*) and sea pens (*Pennatula phosphorea*, *Virgularia mirabilis*).

Egersund Transect

This transect extends from the Norwegian coast between Egersund and Flekkefjord across the Norwegian Trench up to the Central North Sea sandy plateau. The Norwegian Trench slopes steeply from the Norwegian coast down to 330 m, forms a relatively wide trough of more than 300 m depth, and then rises gently upwards towards the *Egersundsbanken* at depths of 100 m and less.

From at least 62° N to 58 °N, the Norwegian trench is considered to be an area of potential gas seepage and pockmarks (Judd and Hovland 2007). It is known from the *Holene* pockmark fields that elevated densities of cod, ling, tusk and catfish can be found inside the depressions (Hovland and Thomsen 1989).

Close to the Norwegian coast, in the deep-waters of the Norwegian Trench, ICES data point to a very high fishing mortality of elasmobranchs (ICES 2006). This is either due to the fact that skates and rays still occur in higher densities, such as thornback ray (*Raja clavata*), spotted ray (*Raja montagui*) and common skate (*Dipturus batis*) or because the impact on the populations is particularly severe. In any case, the mortality should be reduced. In addition, the transect partly coincides with known cod spawning and nursery areas which are utilised for trawling Norway lobster and Norway pout. Records of the OSPAR habitat 'sea-pen and burrowing megafauna communities', currently only from the area west of *Egersundsbanken* according to OSPAR habitat mapping indicate a conflict between bottom trawling activities and soft sediment epifauna.

Skagerrak Transect

This transect is a representative cross-section from the northern Jutland coast near Hirtshals across the Skagerrak to Norway. It links the proposed *Store Rev* SCI with an MPA presently in consultation in Norway (*Tromøy* transect). From *Hirtshals* to the *Store Rev* there are substantial areas of gravel with stones, mapped as 'foul' ground by fishermen. Towards the north, the terrain slopes towards the Norwegian Trench to 800 m depth and upwards on the Norwegian side, with muddy grounds. The fauna of the deep trench includes a deep-water fish community including roundnose grenadier, chimaera, and blue ling. The thorny skate (*Raja radiata*) occurs in the entire area and

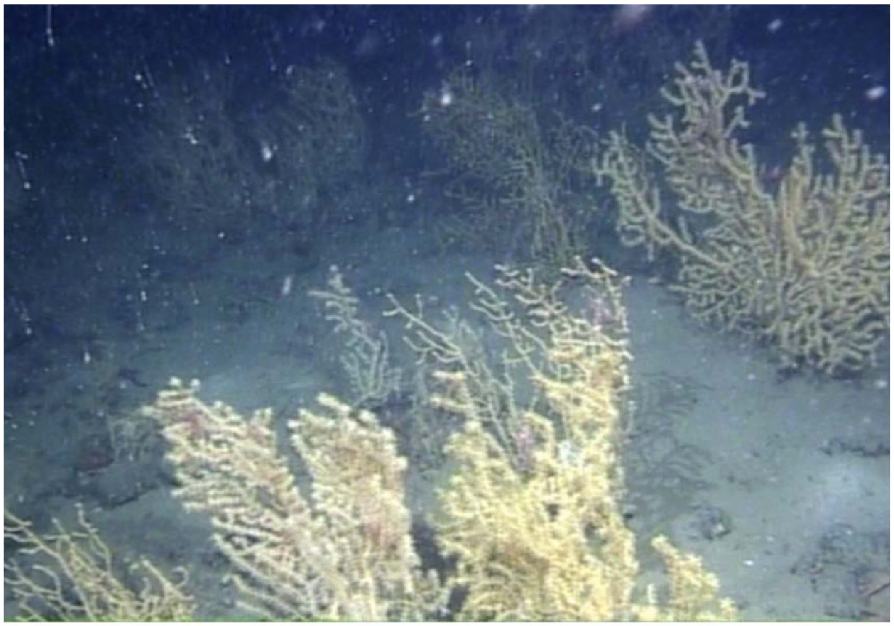


Fig. 8.4.4: Norwegian Trench and Skagerrak. *Parmuricaea* sp. photographed in the deep Skagerrak (Lundälv pers. comm.)

has its spawning and nursery areas in shallower waters off the Norwegian coast.

Ytre Hvaler/ Østfold -Koster transect

This corridor is the extension of the *Hvaler/Østfold* and *Koster* MPAs and envisaged transboundary National Parks. It extends from the coast down the slope towards the deepest point of the Skagerrak at 700 m and includes the *Bratten* area which is proposed as an MPA (Chapter 8.3.2).

In several locations of the Skagerrak, mostly in the channels connecting the Oslofjord proper with the open Skagerrak, and in one area (*Bratten*) in the open Skagerrak, Lundälv (2004), Lundälv and Johnsson (2005) and Sköld *et al.* (2007) found rich communities of gorgonian corals (*Primnoa resedaeformis*, *Paramuricea placomus* and *Muriceides kuekenthali*) and basket stars (*Gorgonocephalus caputmedusae*) as well as other megafauna. On soft bottom, dense stands of *Funiculina quadrangularis* and other sea pens were observed. New records of the gorgonian *Anthothela grandiflora* in the Skagerrak and Swedish waters were established.

It is likely that these vulnerable habitats occur in the wider slope area in the easternmost Skagerrak, a loophole for Atlantic water inflow, thus not being limited to the *Bratten* area which marks the beginning of scientific exploration for deep-water megafauna in the deep Skagerrak.

Therefore, the proposal of the *Ytre Hvaler/Østfold-Koster* transect shall indicate an area of particular vulnerability to deep-water fishing activities.

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Appendix 1: Application of IUCN management categories in marine protected areas (from Dudley 2008).

Table 9. Application of categories in marine protected areas

Category	Notes relating to use in MPAs
Ia	The objective in these MPAs is preservation of the biodiversity and other values in a strictly protected area. No-take areas/marine reserves are the specific type of MPA that achieves this outcome. They have become an important tool for both marine biodiversity protection and fisheries management (Palumbi 2001; Roberts and Hawkins 2000). They may comprise a whole MPA or frequently be a separate zone within a multiple-use MPA. Any removal of marine species and modification, extraction or collection of marine resources (e.g., through fishing, harvesting, dredging, mining or drilling) is not compatible with this category, with exceptions such as scientific research. Human visitation is limited, to ensure preservation of the conservation values. Setting aside strictly protected areas in the marine environment is of fundamental importance, particularly to protect fish breeding and spawning areas and to provide scientific baseline areas that are as undisturbed as possible. However such areas are extremely difficult to delineate (the use of buoys can act as fish-aggregating devices, nullifying the value of the area as undisturbed) and hence difficult to enforce. Whenever considering possible category Ia areas, the uses of the surrounding waters and particularly "up-current" influences and aspects of marine connectivity, should be part of the assessment criteria. Category Ia areas should usually be seen as "cores" surrounded by other suitably protected areas (i.e., the area surrounding the category Ia area should also be protected in such a way that complements and ensures the protection of the biodiversity of the core category Ia area).
Ib	Category Ib areas in the marine environment should be sites of relatively undisturbed seascape, significantly free of human disturbance, works or facilities and capable of remaining so through effective management. The issue of "wilderness" in the marine environment is less clear than for terrestrial protected areas. Provided such areas are relatively undisturbed and free from human influences, such qualities as "solitude", "quiet appreciation" or "experiencing natural areas that retain wilderness qualities" can be readily achieved by diving beneath the surface. The issue of motorized access is not such a critical factor as in terrestrial wilderness areas given the huge expanse of oceans and the fact that many such areas would not otherwise be accessible; more important, however, is minimizing the density of use to ensure the "wilderness feeling" is maintained in areas considered appropriate for category Ib designation. For example, fixed mooring points may be one way to manage density and limit seabed impacts whilst providing access.
II	Category II areas present a particular challenge in the marine environment, as they are managed for "ecosystem protection", with provision for visitation, recreational activities and nature tourism. In marine environments, extractive use (of living or dead material) as a key activity is generally not consistent with the objectives of category II areas. This is because many human activities even undertaken at low levels (such as fishing) are now recognised as causing ecological draw-down on resources, and are therefore now seen as incompatible with effective ecosystem protection. Where such uses cannot be actively managed in a category II area to ensure the overall objectives of ecosystem protection are met, consideration may need to be given to whether any take should be permitted at all, or whether the objectives for the reserve, or zone within the reserve, more realistically align with another category (e.g., category V or VI) and should be changed. The conservation of nature in category II areas in the marine environment should be achievable through protection and not require substantial active management or habitat manipulation.
III	The protection of natural monuments or features within marine environments can serve a variety of aims. Localized protection of features such as seamounts has an important conservation value, while other marine features may have cultural or recreational value to particular groups, including flooded historical/archaeological landscapes. Category III is likely to be a relatively uncommon designation in marine ecosystems.

Category	Notes relating to use in MPAs
IV	Category IV areas in marine environments should play an important role in the protection of nature and the survival of species (incorporating, as appropriate, breeding areas, spawning areas, feeding/ foraging areas) or other features essential to the well-being of nationally or locally important flora, or to resident or migratory fauna. Category IV is aimed at protection of particular species or habitats, often with active management intervention (e.g., protection of key benthic habitats from trawling or dredging). Protection regimes aimed at particular species or groups, where other activities are not curtailed, would often be classified as category IV, e.g., whale sanctuaries. Time-limited protection, as in the case of seasonal fishing bans or protection of turtle nesting beaches during the breeding season, might also qualify as category IV. Unlike on land where category IV may include fragments of ecosystems, in the marine environment, use of this category has a significant opportunity for broader-scale ecosystem protection, most frequently encompassing patches of category Ia or b and category II interest.
V	The interpretation of the seascape concept in protected areas is attracting increasing interest. Category V protected areas stress the importance of the "interaction of people and nature over time" and in a marine situation, Category V might most typically be expected to occur in coastal areas. The preservation of long-term and sustainable local fishing practices or sustainable coral reef harvesting, perhaps in the presence of culturally-modified coastal habitats (e.g., through planting coconut palms) could be a suitable management mosaic to qualify as category V.
VI	MPAs that maintain predominantly natural habitats but allow the sustainable collection of particular elements, such as particular food species or small amounts of coral or shells for the tourist trade, could be identified as category VI. The point where an area managed for resource extraction becomes a category VI marine protected area may sometimes be hard to judge and will be determined ultimately by reference to whether the area meets the overall definition of a protected area or not, as well as whether the area achieves verifiable ecological sustainability as measured by appropriate metrics.

Appendix 2: Atlas of the North Sea Features

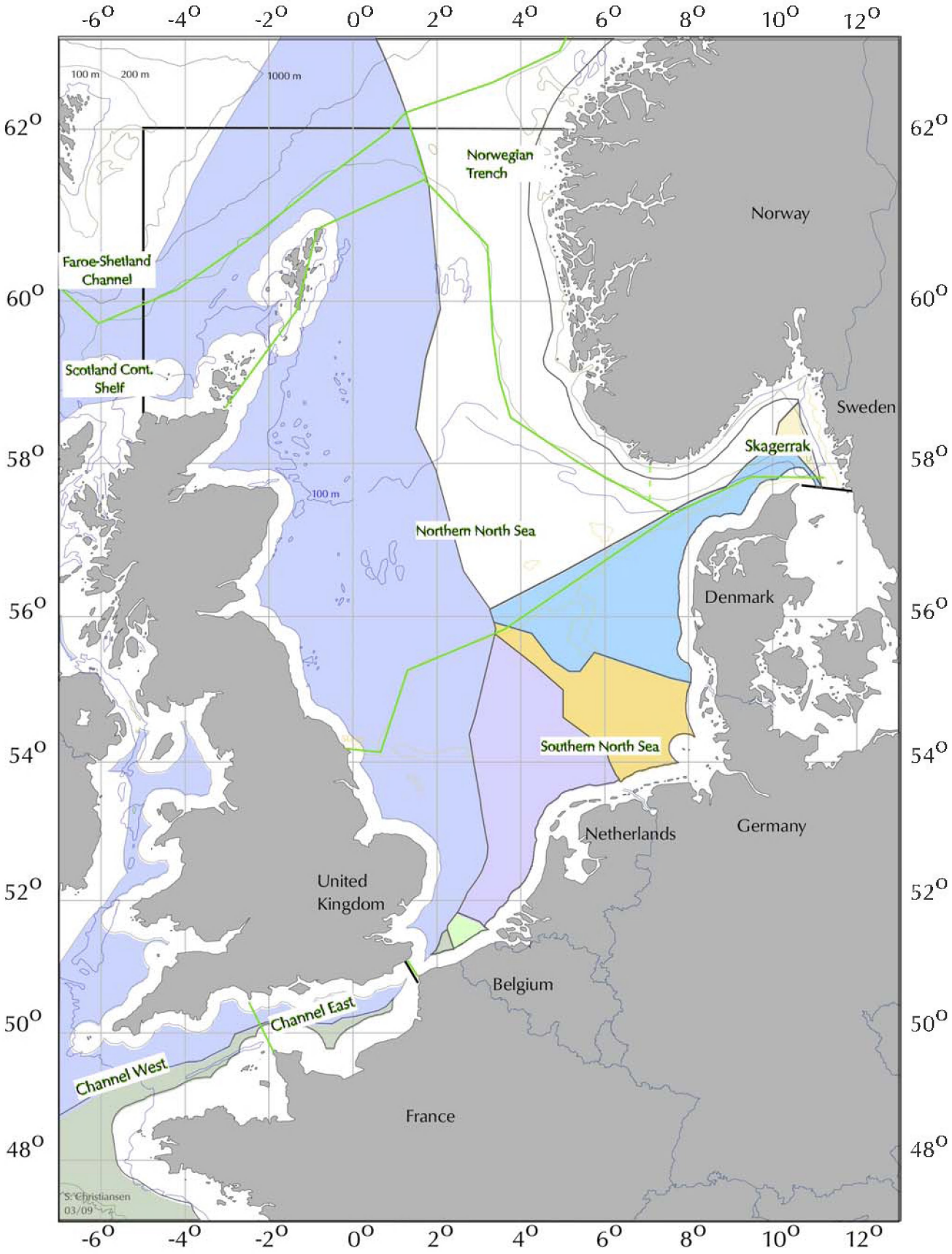

Fig. A2.1: North Sea - EEZs and subregions

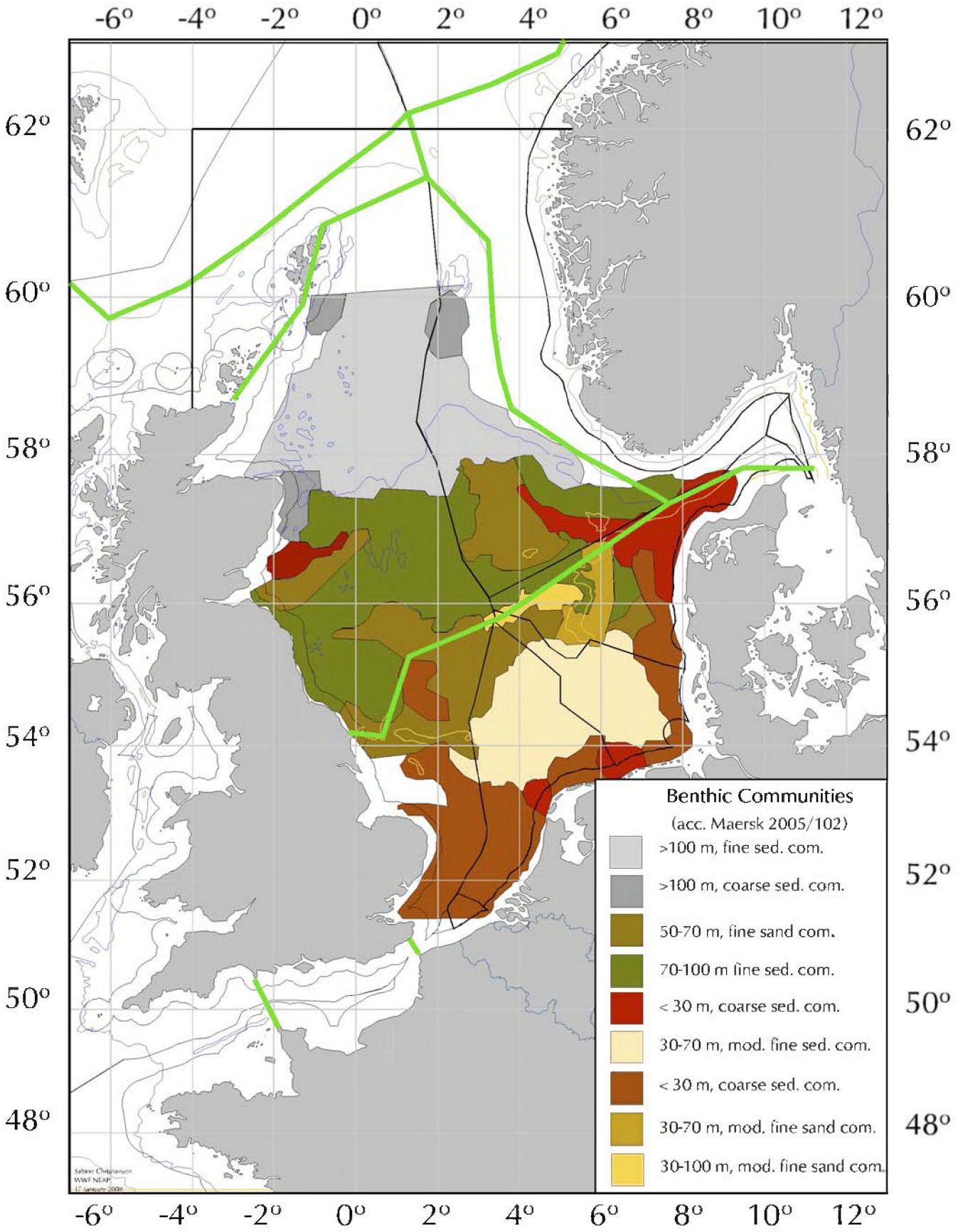

Fig. A2.2: North Sea - benthic megafauna communities

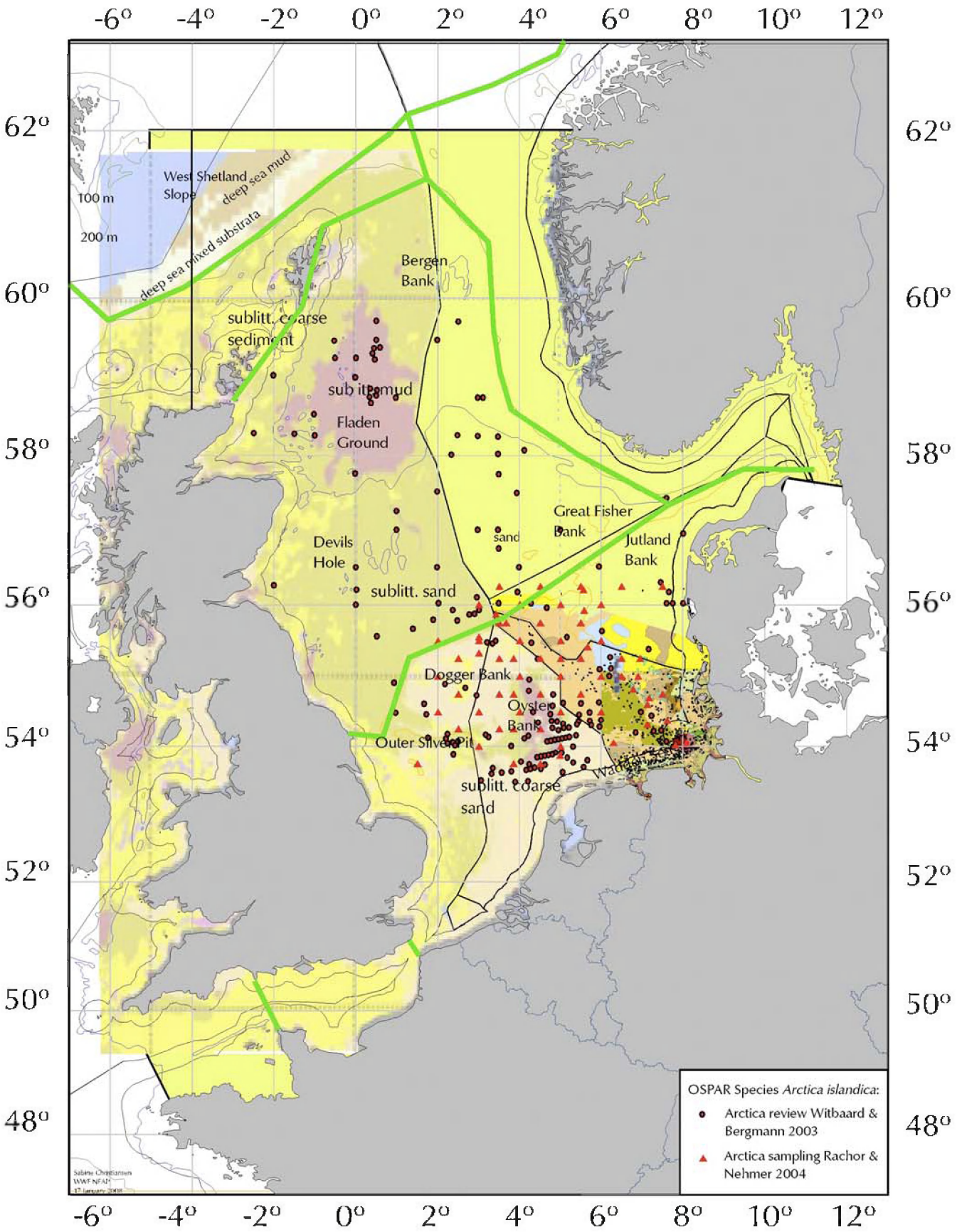

Fig. A2.3: North Sea - OSPAR Species: ocean quahog (*Arctica islandica)*

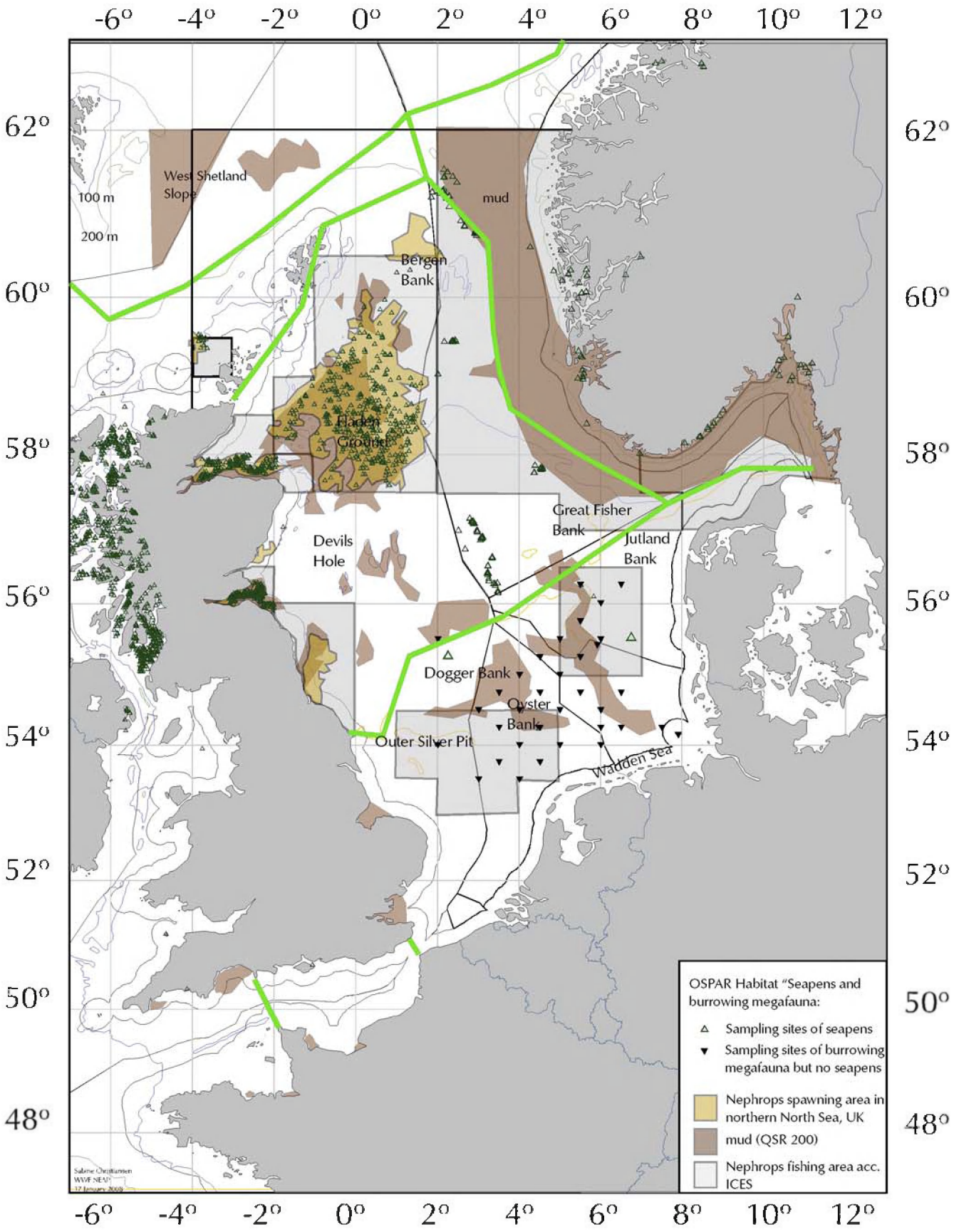

Fig. A2.4: North Sea - OSPAR habitats: sea-pen and burrowing megafauna communities

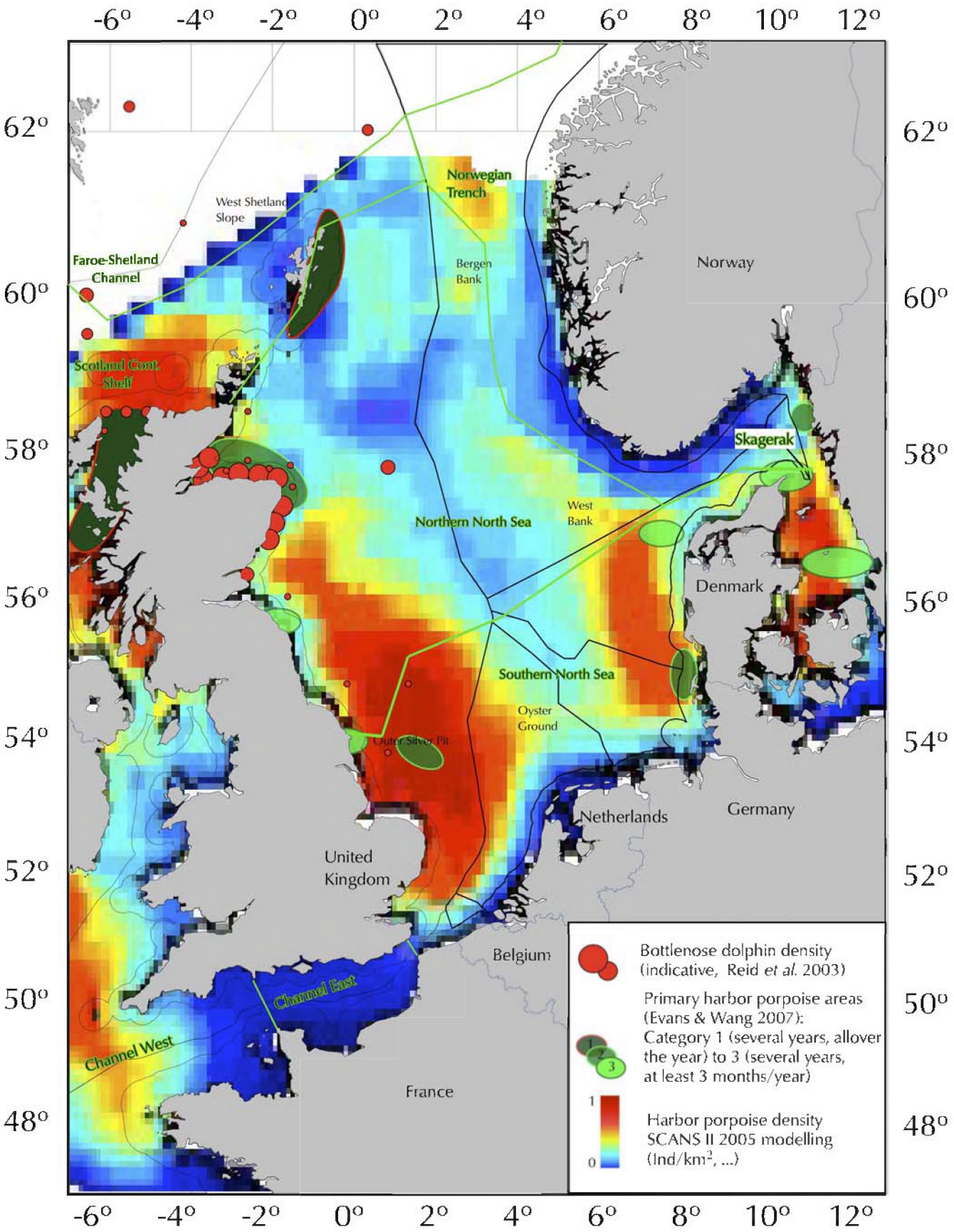

Fig. A2.5: North Sea - marine mammal occurrence - harbour porpoise and bottlenose dolphin

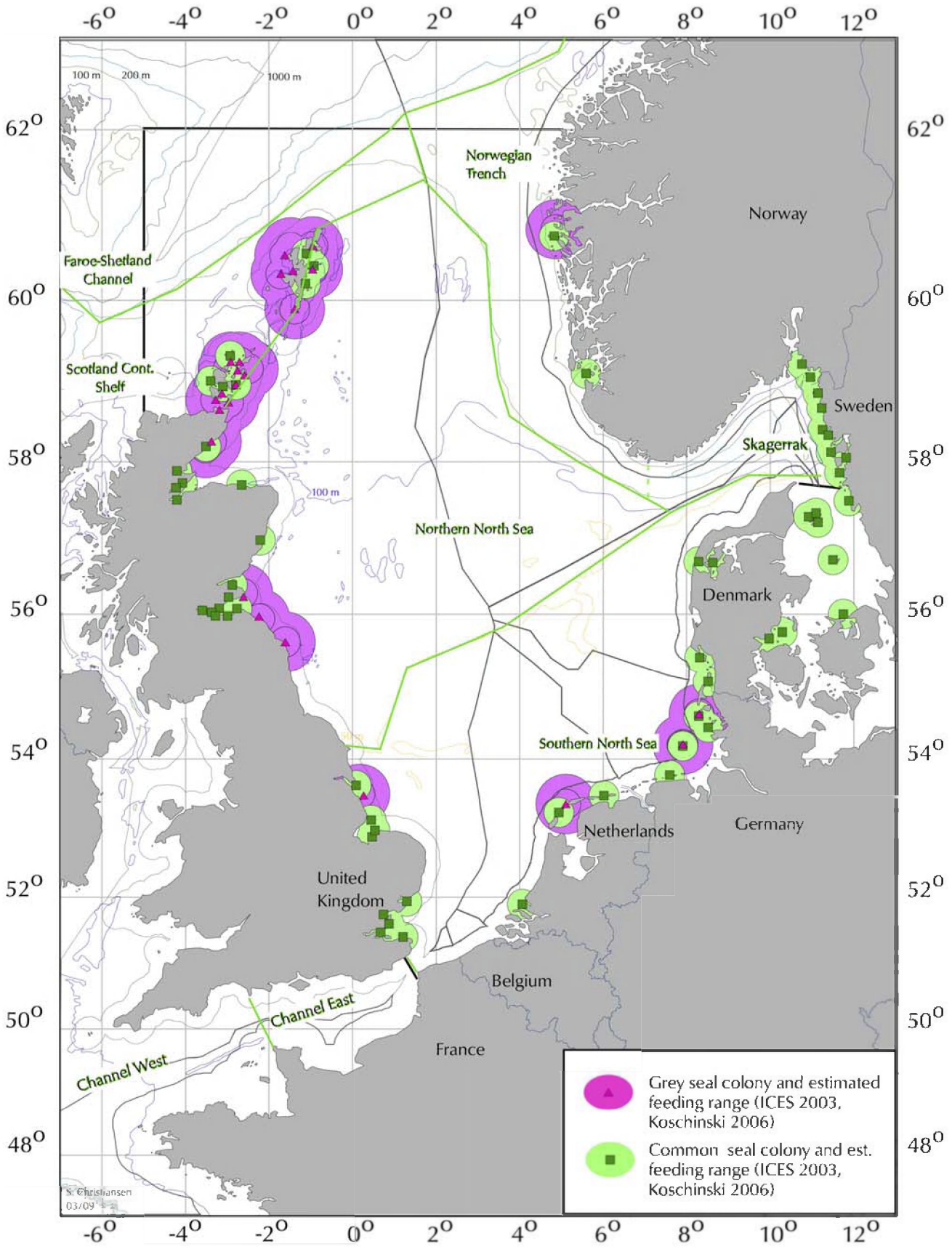

Fig. A2.6: North Sea - grey seal and common seal colonies

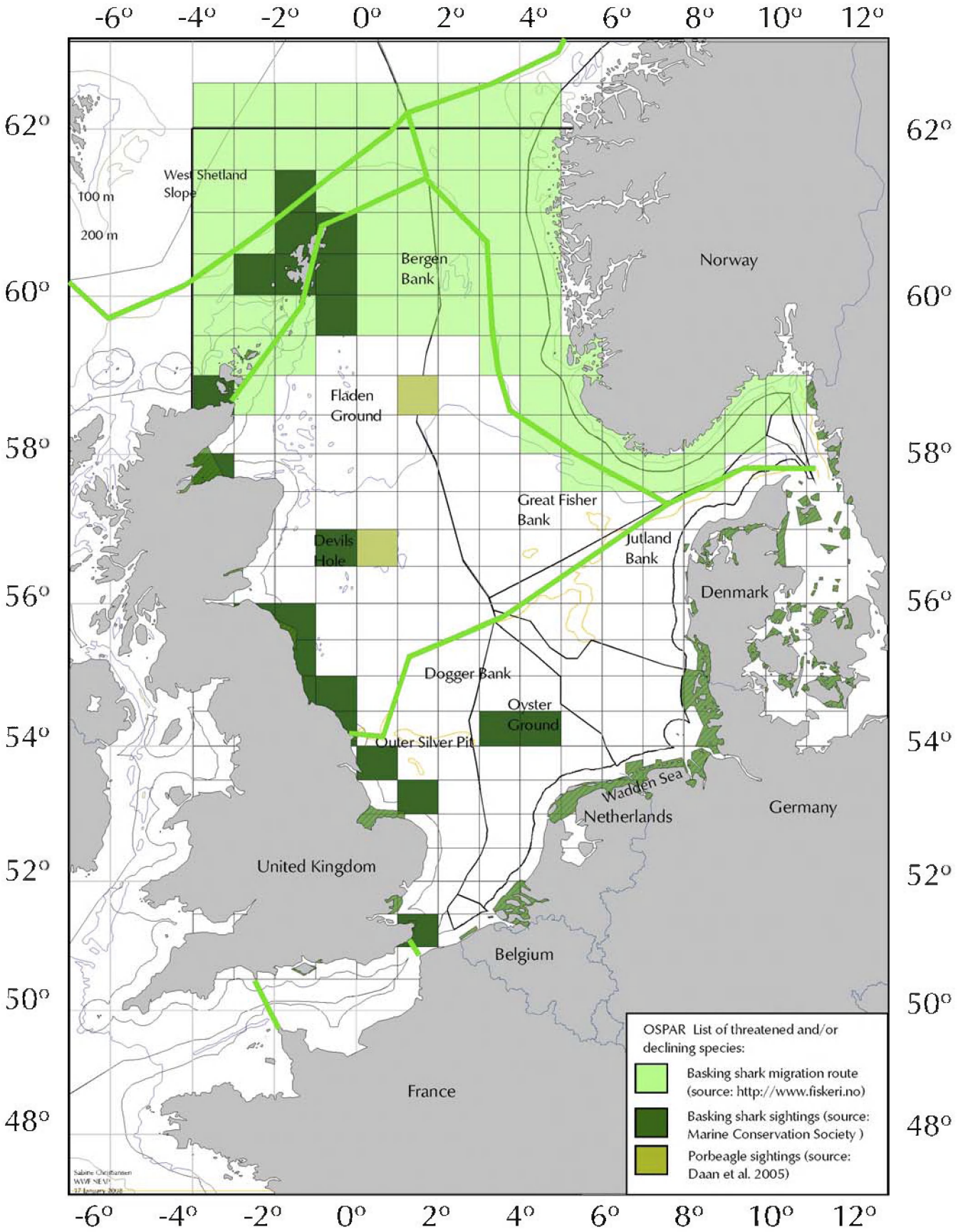

Fig. A2.7: North Sea - OSPAR species: basking shark (*Cetorhinus maximus*) and porbeagle shark (*Lamna nasus*)

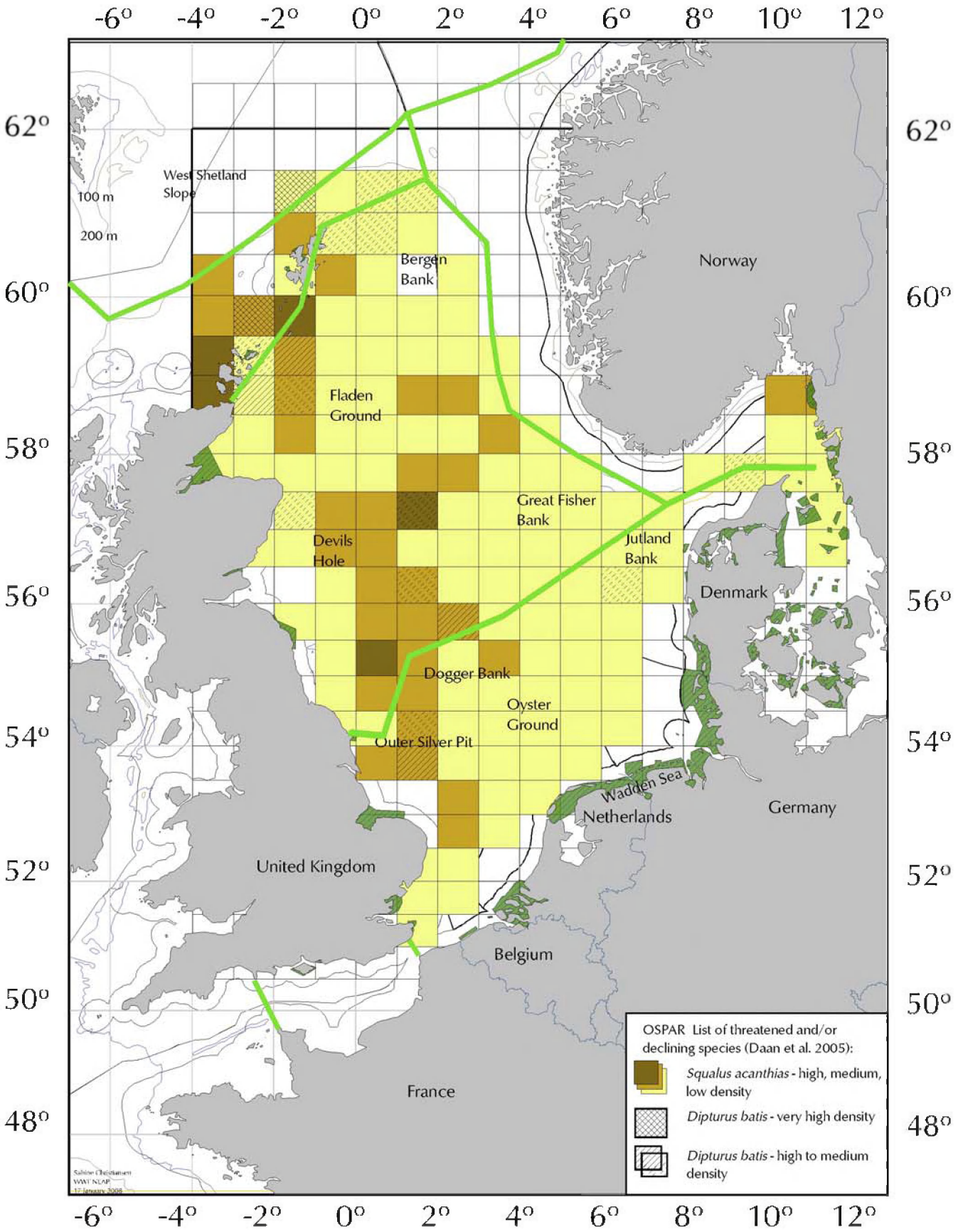

Fig. A2.8: North Sea - OSPAR species: spurdog (*Squalus acanthias*) and common skate (*Dipturus batis*)

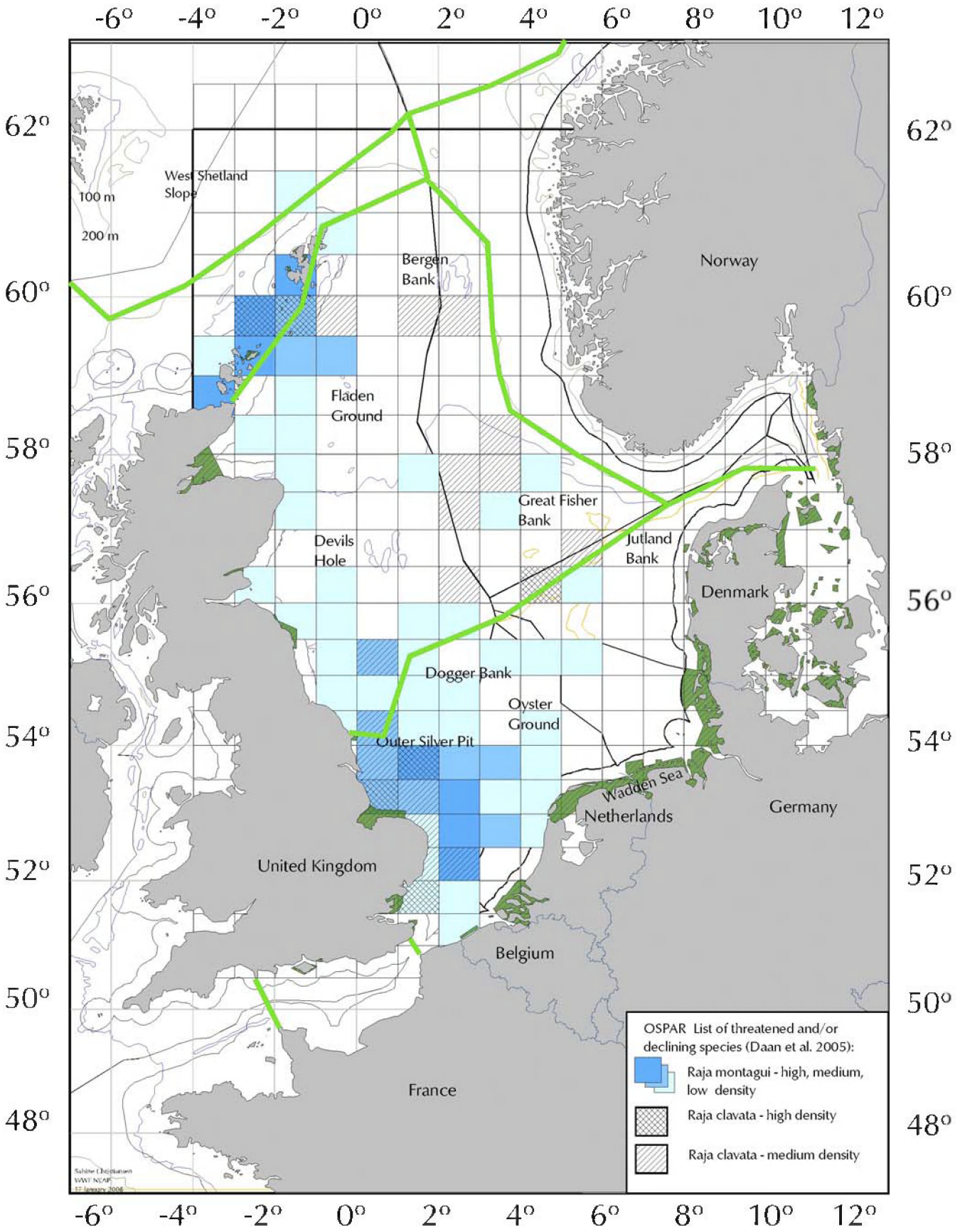

Fig. A2.9: North Sea - OSPAR species: spotted ray (*Raja montagui*) and thornback ray (*Raja clavata*)

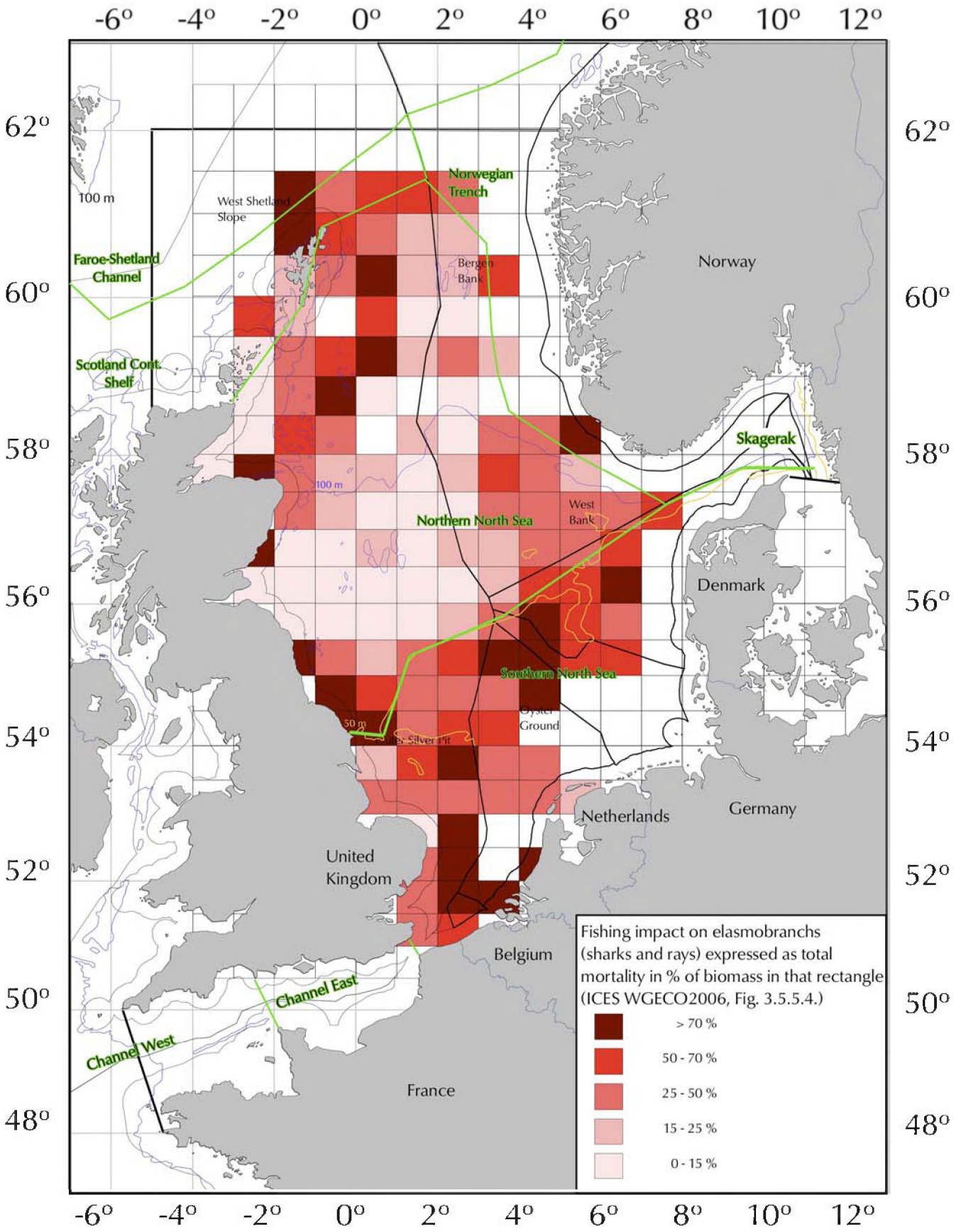

Fig. A2.10: North Sea - elasmobranch fishing mortality

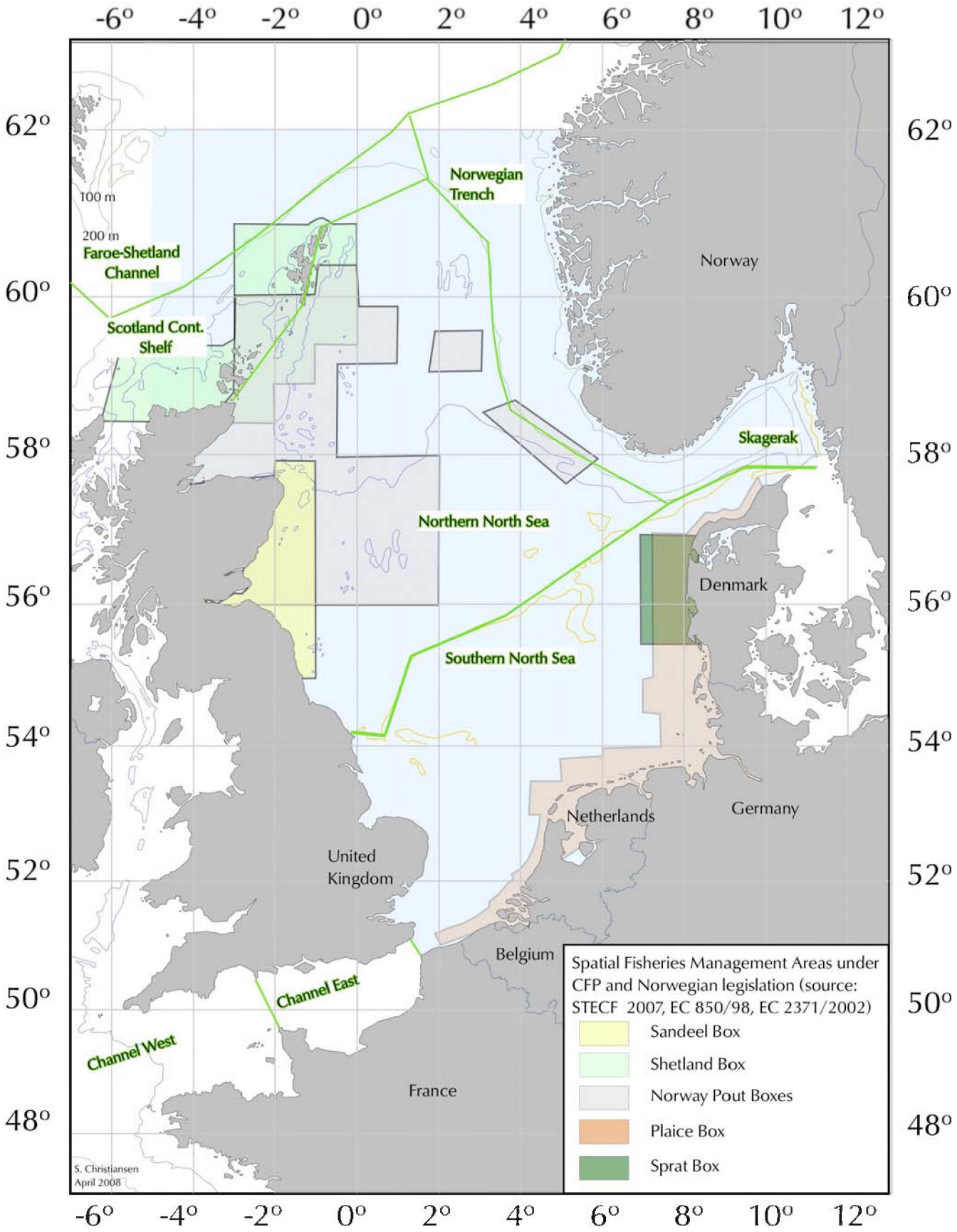

Fig. A2.11: North Sea - Permanent Spatial Fisheries Management Areas

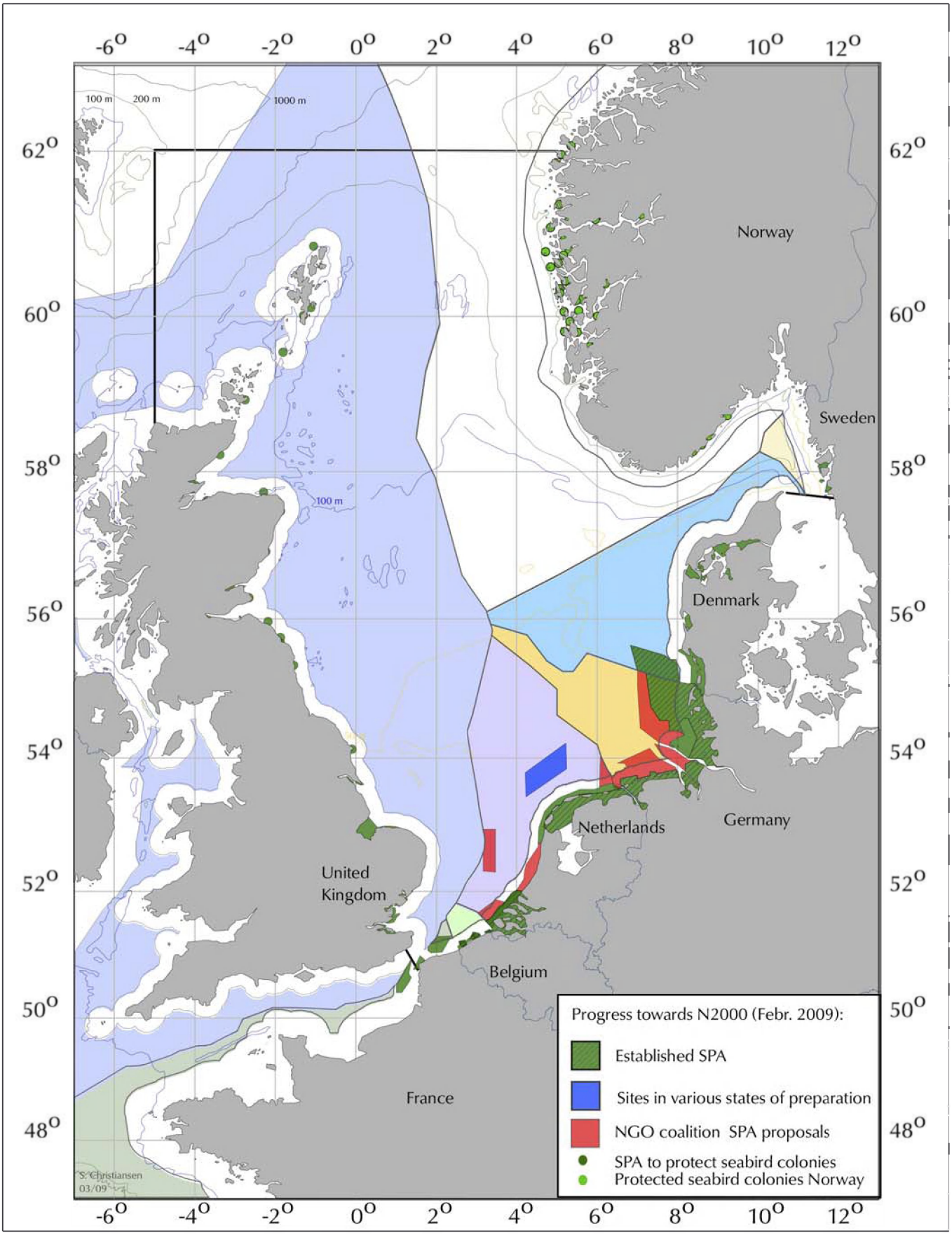

Fig. A2.12: North Sea Special Protected Areas (SPAs) - Birds Directive

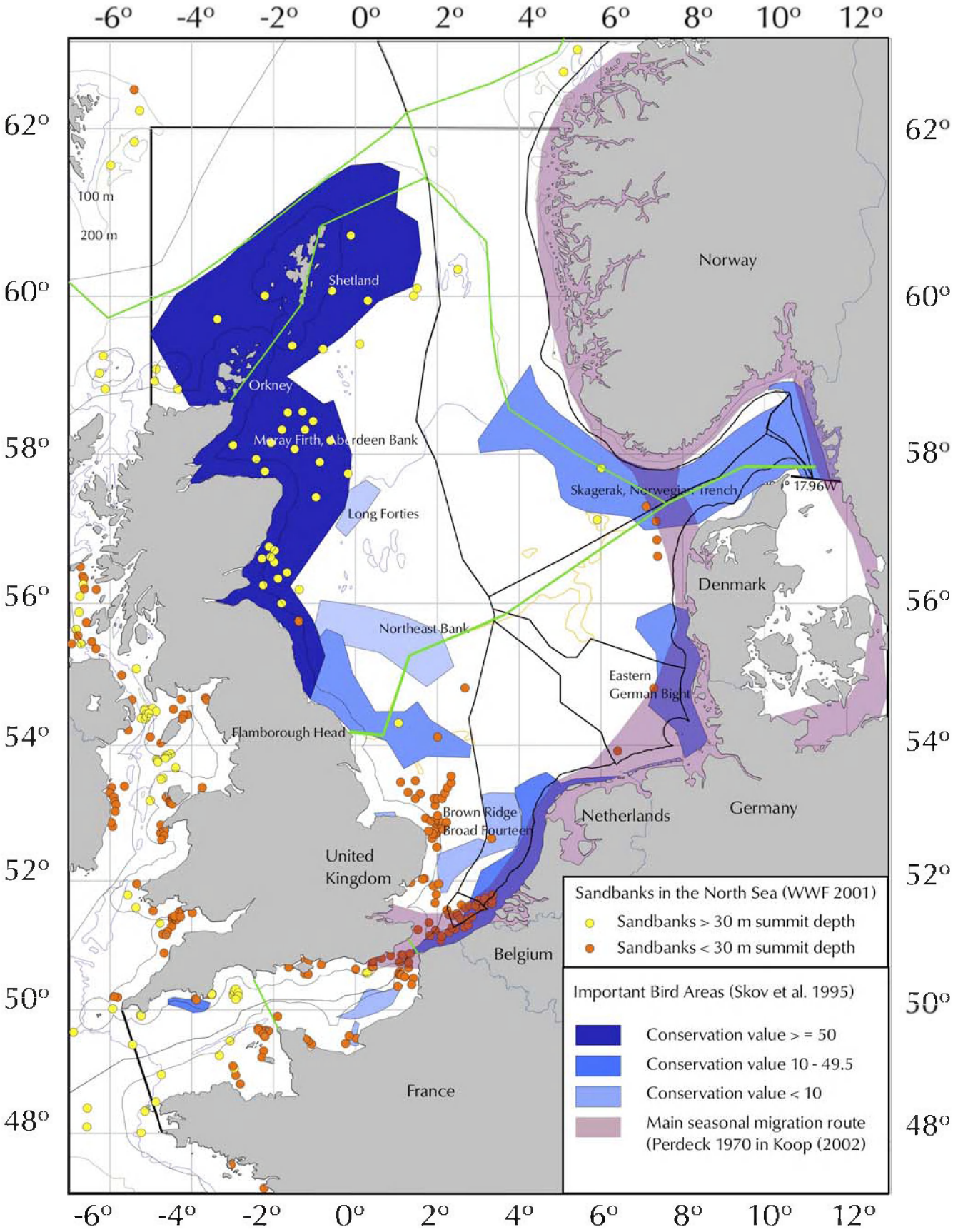

Fig. A2.13: North Sea - sandbanks and Important Bird Areas (IBAs)

Acknowledgements

This report flows from the project on offshore marine protected areas in the OSPAR Maritime Area including pilot MPA proposals (Dogger Bank) and inventories (sandbanks and reefs) as initiated by Stephan Lutter, Sarah Jones and Sian Prior (WWF North-East Atlantic Programme) and supported by Susan Gubbay since 1998. The report was made possible by the longstanding engagement and contributions of a considerable number of individuals from the WWF National Organisations around the North Sea and NGO partners, including the Dutch North Sea Foundation, the Belgian Natuurpunt and allied NGOs. In December 2006, a first all-NGO workshop was convened to agree a cooperative approach to developing the proposal for a network of marine protected areas in the North Sea. Based on this, a series of national reports and shadow listing proposals emerged in 2007 providing the basis for developing the North Sea MPA network proposal presented in the current report. Uwe Johannsen, and later Christian Neumann from WWF Germany commissioned several of these studies with regard to German, Danish and UK waters. Due to their engagement, the shadow proposals for MPAs to be established in the Southern North Sea are fairly extensive.

Comments and thoughts on earlier versions of the manuscript were received from a larger group of experts through national focal points: in Belgium, Bart Slabbinck (Natuurpunt) initiated and steered the "kustwerkgroup", an alliance of NGOs, scientists and other experts, who produced two reports to focus the input into the policy debate on marine protected areas and sustainable fishing in Belgian waters. In the Netherlands, Sytske van den Akker (and Thomas Rammelt (North Sea Foundation) coordinated the input with Emilie Hugenholtz (WWF Netherlands) and national lobbying initiatives. In Norway, Maren Esmark and Nina Jensen (WWF Norway) and in the UK, Sian Prior (for WWF UK) and Natasha Barker (WWF UK) provided feedback on the views of the conservation agencies.

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Glossary

BD	EU Wild Birds Directive - http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm
BNatSchG	Bundesnaturschutzgesetz, German Federal Nature Conservation Law
BPNS	Belgian Part of the North Sea - http://www.marinebiology.ugent.be/index.php option=com_content&view=article&id=39: mpas&catid=1:latest
CBD	Convention on Biological Diversity - http://www.cbd.int/
CFP	Common Fisheries Policy of the EU - http://ec.europa.eu/fisheries/cfp_en.htm
DCS	Dutch Continental Shelf
DEFRA	UK Department for Environment, Food and Rural Affairs - http://www.defra.gov.uk
DTI	UK Department of Trade and Industry, lately renamed as UK Department for Business, Enterprise & Regulatory Reform (BERR) - http://www.berr.gov.uk
EcoQO	Ecological Quality Objective such as established for the North Sea by the North Sea Conference and OSPAR - http://www.ospar.org/content/content.asp?menu=00180302000010_000000_000000
EEZ	Exclusive Economic Zone – the waters and seabed between 12 nm and 200 nm of a coastal state where it exerts souvereign rights on fish stocks and seabed resources according to the UN Law of the Sea. Subsequently, EU conservation law applies - http://www.un.org/Depts/los/convention_agreements/texts/unclos/part5.htm
EIA	Environmental Impact Assessment - http://ec.europa.eu/environment/eia/home.htm
EMPAS	Environmentally Sound Fishery Management in Protected Areas, ICES Project - http://www.ices.dk/projects/empas.asp
EN	English Nature (Natural England) - http://www.naturalengland.org.uk/
EUNIS	European nature information system web site and database - http://eunis.eea.europa.eu/
GEUS	Geological Survey of Denmark and Greenland - http://www.geus.dk/geuspage-uk.htm
HD	EU Habitats Directive - http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
HP	Horse Power
IBA	Important Bird Area - http://www.birdlife.org/action/science/sites/
IBTS	ICES International. Bottom Trawl Survey - http://www.ices.dk/Ocean/project/IBTS/
ICES	International Council for the Exploration of the Sea – www.ices.dk
IMPNS	Dutch Integrated Management Plan for the North Sea - http://www.unesco-ioc-marinesp.be/spatial_management_practice/the_netherlands
JNCC	Joint Nature Conservation Committee, nature conservation advisor to the UK government - http://www.jncc.gov.uk
MBES	Multibeam Ecosounder (mapping survey)
MCZ	Marine Conservation Zones according to the Marine and Coastal Access Bill for England and Wales
MEDAD	French Ministry of Ecology and Sustainable Development - http://www.developpement-durable.gouv.fr
MESH	Mapping European Seabed Habitats - www.searchmesh.net
MMO	Marine Management Organisation according to the Marine and Coastal Access Bill for England and Wales
MPA	Marine Protected Area - http://www.panda.org/what_we_do/how_we_work/conservation/marine/our_solutions/protected_areas/
MSFD	EU Marine Strategy Framework Directive - http://ec.europa.eu/environment/water/marine/index_en.htm
NBN	National Biodiversity Network UK - http://www.nbn.org.uk
nm	nautical mile: 1 nm = 1.85200 km - http://en.wikipedia.org/wiki/Nautical_mile
NSC	North Sea Conference = International (Ministerial) Conference on the Protection of the North Sea (London 1997, The Hague 1990, Copenhagen 1993, Esbjerg 1995, Bergen 1997, Bergen 2002, Gothenburg 2006) the implementation of which now IS under the auspices of the OSPAR Commission - http://www.ospar.org/content/content.asp?menu=00590624000000_000000_000000
OSPAR	OSPAR (origin: Oslo and Paris) Convention on the Protection of the North-East Atlantic Marine Environment (Paris 1992) - www.ospar.org
pSCI	Proposed Site of Community Importance, according to the EU Habitats Directive - http://ec.europa.eu/environment/nature/natura2000/sites_hab/sites_sci.htm
PSU	Practical Salinity Unit - http://en.wikipedia.org/wiki/Salinity
RCEP	UK Royal Commission on Environmental Pollution - http://www.rcep.org.uk
SAC	Confirmed Special Area of Conservation, according to the EU Habitats Directive - http://ec.europa.eu/environment/nature/natura2000/sites_hab/index_en.htm, http://www.ngo.grida.no/wwfneap/Projects/Reports/Reefs_Sandbanks_Vol1.pdf
SEA	Strategic Environmental Impact Assessment - http://ec.europa.eu/environment/eia/sea-legalcontext.htm
SEBI	Streamlining European 2010 Biodiversity Indicators - http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995
SPA	Special Protected Area, according to the EU Wild Birds Directive - http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm
VMS	Vessel Monitoring System – satellite based tracking system for (fishing) vessels

WWF is one of the world's largest and most experienced independent conservation organisations, with almost 5 million supporters and a global network active in more than 90 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by
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- promoting the reduction of pollution and wasteful consumption.

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