Fishing Activities in Ecological or Biologically Sensitive Areas in the Barents Sea and adjacent waters

Introduction

Certain NGOs are recommending the supply chain not to buy fish from Ecologically or Biologically Sensitive Marine Areas (EBSAs) exposed by receding ice in the Arctic. This report is intended to inform the understanding of the extent of the ice vs the fishing grounds and any trends in northward migration of fish.

Northeast Arctic Ecologically or Biologically Sensitive Marine Areas

The Barents Sea is situated north of Norway and Russia and boarders on the Arctic Sea to the north and the Kara Sea to the east. Ecologically or Biologically Sensitive Marine Areas (EBSAs) are derived from the Convention on Biological Diversity which was opened for signature at the Rio "Earth Summit" in 1992, which was inspired by the world community's growing commitment on sustainable development. The Convention on Biodiversity has been signed by most of the World's nations including Norway and Russia, the principle states bordering the Barents Sea.

There have been two meetings which set out to evaluate areas meeting the EBSA criteria in this area. The first was held in La Jolla, California in 2011 (Speer and Laughlin, 2011) by IUCN[1] and NRDC[2]. Here the 'High Arctic and Shelf' was identified as meeting the EBSA criteria and described as a so-called 'Super EBSA' and included waters around Svalbard and to the North and East (Figure 9). However, at a subsequent meeting of the UNEP[3] and CPD[4] in Helsinki in 2014 the area around Svalbard was outside the area under consideration at the meeting. An area to the North and West of Svalbard, the North-eastern Barents–Kara Sea (area 7; Figure 1) was considered to meet the EBSA criteria. The area around Svalbard had already been identified as vulnerable by the Norwegian Government (Norwegian Ministry of Environment, 2011), the approximate area is shown bounded by dashed lines in Figure 1.

Analysis

Analysis was carried out on publically available data on fish catch and effort distributions and sea ice distributions and the locations of the Ecologically or Biologically Sensitive Marine Areas. See Appendix 5 for data sources

Fish catch distributions

The stocks of cod and haddock have been expanding in recent years and it is predicted that the range of these stocks particularly cod may be increasing north and eastwards (ICES AFWG 2015).

[1] International Union for the Conservation of Nature
[2] Natural Resources Defence Council
[3] United Nations Environment Programme
[4] Convention on Biodiversity

Whilst receding sea ice may enable fishing further North, it is the distribution of the fish which will determine where fishers would pursue them. However, there is evidence that this process may have at least paused. Examination of the Norwegian catch distributions from AFWG for 2009 and 2013-14 (2010-12 not updated) (Figure 2- Figure 4) show that whilst catches of cod (and haddock to a lesser extent) were distributed further north and west around Svalbard during 2009, which coincided with the beginning of the period of expansion of these stocks (see ICES Advice 2015), the 2013-14 data show a more southerly distribution of catches with some catches to the south and east of Svalbard in the 3rd and 4th quarters of these years. These stocks appear to have reached their maximum biomass with cod peaking in 2013 and haddock in 2015 (ICES Advice 2015), so we may have seen the maximum Northerly extension of their ranges for the time being. These results should be caveated with the observation that the time series is relatively short beginning in 2009 and it is not complete, ICES having not updated the information in 2011-2012. A more comprehensive analysis is required (see Conclusions). Hollowed et al, (2013) consider that there is a low potential for cod to establish populations in the high Arctic beyond the shelf, although some demersal species such as redfish may have more potential.

The Russian catches are mostly to the southeast of the Barents and in the Pechora Seas during 2009 and judging by the effort information Figure 7 fishing activities were distributed similarly in 2014.

Fishing distributions

Data on fishing abrasion and Sea ice sea ice distributions was analysed in relation to the spatial extent of the North-eastern Barents–Kara Sea EBSA and the results are shown in Figure 5 to Figure 8.

- During the period 2009 to 2013, most of the fishing abrasion occurred south of and around Svalbard with an area along the continental shelf break Northeast of Svalbard which extends into a small area in the Northwest corner of the North-eastern Barents–Kara Sea EBSA (Figure 5). Shrimp (*Pandalus borealis*; cold water prawn) trawling has been conducted in the area North of Svalbard since the 1980s and is a well-established fishery on a relatively unexploited stock.

- Sea ice extent data was chosen based on analysis by ICES (ICES WGIBAR 2015), for the two Septembers (the month when sea ice is usually at its minimum) in the years 2010 and 2012 which the sea ice was most and least extensive during the period of the fishing abrasion data. This illustrates the extent to which sea ice would inhibit the fishing activity when it extended furthest south.

None of the above analysis includes fishing activities by Russian vessels because data from Russian vessels was not in the abrasion dataset. However, data from Russian fleets are available for 2014 in the ICES WGIBAR (2015) report and is shown in Figure 7 together with corresponding 2014 Norwegian fishing activities in Figure 8. The sea ice extent for September 2014 is shown in Figure 6. In this year the ice was comparatively extensive in this region, in contrast with September 2012 (Figure 5).

- The Russian fishing activity is concentrated south of Svalbard and in the south east Barents Sea (the Pechora Sea) and Murman Coast areas which also considered to meet the EBSA

criteria. Apart from a few locations, most of which appear to be trap fishing, there is no fishing activity in the North-eastern Barents Sea- Kara Sea area.

- The Norwegian fishing activity in 2014 is similar to that reported in 2009-13 (note that describes seabed abrasion whilst Figure 8 reports activity by gear type, so longlining and gill netting in the southeast Barents Sea does not weight highly for seabed abrasion) with activity around Svalbard including to the north and east of the islands in spite of 2014 being a year of relatively high ice cover.

Scientific studies of ecosystem vulnerability

In a very extensive survey of the benthic (seabed living) organisms caught in research vessel trawls in the Barents Sea and extending around Svalbard and to the North and East of Svalbard into the North-eastern Barents-Kara Sea area, Jorgensen et al (2016) examined life history 'traits' of the species caught and was able to relate these to their vulnerability to trawling. The traits which are likely to make species more vulnerable to trawling include a large body weight and an upraised habit, for example sponges and corals. In this paper the authors discuss how this type of knowledge can help guide management approaches to avoid adverse impacts. For example they find that in the South West of the Barents Sea the fishermen may have created 'corridors' within which they fish to avoid the trawl filling with sponges and affecting the quality of the catches, this is now reinforced by conservation measure.

In the area north of 80^{o}N (North of Svalbard) there were species of sea pen, which are recognised by OSPAR as in need of conservation. They also found a range of species which vulnerability studies should be carried out and strategies should be considered for their conservation.

Conclusions

The main issues in relation management of fisheries to the EBSAs in this area are;

- **Fisheries presence;** clearly within the 'Super EBSA' around Svalbard there are extensive fisheries and have been for many years. Further east in the Northeast Barents Sea- Kara Sea area designated as meeting the EBSA criteria by the UNEP meeting there is very little fishing activity apart from a small area to the north east of Svalbard.

  While there is potential for stocks of demersal fish such as cod to migrate further into these areas, the catches in 2013-14 occurred to the South and East of Svalbard where previously, in 2009 catches also occurred to the North and West of Svalbard. These observations should caveated by the fact that they represent a limited number of years, further spatial and temporal analysis is required; it is understood that the Norwegian government is undertaking this analysis. There are also extensive fisheries in the southern EBSAs; south Eastern Barents Sea (Pechora Sea) and off the western and Northern Novaya Zemlya

- **Current environmental management;** the area around Svalbard is the subject of a Norwegian management plan. These include marine parts of seven national parks and four

nature reserves as OSPAR[5] (www.ospar.org) Marine Protected Areas. There are also fisheries regulations under the auspices of NEAFC (North East Atlantic Fisheries Commission- which includes Norway and Russia as its members) which are designed to prevent damage to vulnerable deep-water coral and sponge habitats throughout the area. There is a requirement for vessels to report catches of more than 60 kg of live corals or 800 kg of sponge per haul; this has recently (March 2016) been reduced to 30 kg of live corals and 400 kg sponges, and the vessel must move a minimum of 2 miles before shooting the gear once more; it is an offence to fish where corals and sponges occur (Nichols et al 2015). Live coral means hard and soft corals including Lophelia reefs and species which form so called 'coral gardens'.

The technology available to the fishers enables good seabed discrimination and fishers actively avoid sponge and corals because of their effects on the catch and gear. The approach taken has enabled the Marine Stewardship Council certification of a number of fisheries for cod, haddock, saithe and shrimp from several nations including Norway and Russia.

- **Future environmental management**. The extensive studies carried out by Jorgensen et al (2016) discussed above and surveys of benthic habitats under the Mareano project (see Appendix 2) which presents the opportunity to develop measures to protect the Vulnerable Marine Ecosystems (VMEs) within the EBSAs and in the vulnerable area around Svalbard in accordance with FAO principles and guidelines. Jorgensen et al (2016) has outlined an approach to risk assessment (see Scientific studies of ecosystem vulnerability above) and also highlights that there is a range of habitats and species which should be risk assessed for vulnerability to trawling in order to help to develop protective measures.

- **The Northeast Barents Sea- Kara Sea EBSA** is within the Russian EEZ so fisheries in this area would be managed by Russia within international agreements such as the Joint Russian Norwegian Fisheries Commission. There is also a Joint Norwegian-Russian Commission on Environmental Protection. However, Russia is not currently a signature nation to the OSPAR agreement which is the international agreement which provides the framework for environmental protection in the North East Atlantic.

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[5] Convention for the protection of the marine environment of the North East Atlantic

References

Convention on Biological Diversity (2014)

REPORT OF THE ARCTIC REGIONAL WORKSHOP TO FACILITATE THE DESCRIPTION OF ECOLOGICALLY OR BIOLOGICALLY SIGNIFICANT MARINE AREAS, March 3-7th 2014, Helsinki

"At its tenth meeting, the Conference of the Parties to the Convention on Biological Diversity requested the Executive Secretary to work with Parties and other Governments as well as competent organizations and regional initiatives, such as the Food and Agriculture Organization of the United Nations (FAO), regional seas conventions and action plans, and, where appropriate, regional fisheries management organizations (RFMOs) to organize, including the setting of terms of reference, a series of regional workshops, with a primary objective to facilitate the description of ecologically or biologically significant marine areas through the application of scientific criteria in annex I of decision IX/20 as well as other relevant compatible and complementary nationally and intergovernmentally agreed scientific criteria, as well as the scientific guidance on the identification of marine areas beyond national jurisdiction, which meet the scientific criteria in annex I to decision IX/20 (paragraph 36 of decision X/29)."

https://www.cbd.int/doc/meetings/mar/ebsaws-2014-01/official/ebsaws-2014-01-05-en.pdf

Hollowed, A Planque, B and Loeng H (2013) Potential movement of fish and shellfish stocks from the sub-Arctic to the Arctic Ocean Fish. Oceanogr. 22:5, 355–370, 2013

ICES' Working Group on the Integrated Assessments of the Barents Sea (WGIBAR) is a new ICES group that conducts and develops Integrated Ecosystem Assessments for the Barents Sea as part of the Ecosystem Approach to Fisheries Management.

http://www.ices.dk/community/groups/Pages/WGIBAR.aspx

ICES' Arctic Fisheries Working Group (AFWG) performs assessments of cod, haddock, saithe, redfish, Greenland halibut, and capelin stocks in ICES areas I and II (Barents Sea and Norwegian Sea).

http://www.ices.dk/community/groups/Pages/AFWG.aspx

Jørgensen, L. L., Planque, B., Thangstad, T. H., and Certain, G. (2016) Vulnerability of megabenthic species to trawling in the Barents Sea. –ICES Journal of Marine Science, 73: i84–i97

Norwegian Ministry of Environment, (2011) Meld. St. 10 (2010–2011) First update of the Integrated Management Plan for the Marine Environment of the Barents Sea−Lofoten Area Meld. St. 10 (2010–2011) Report to the Storting (white paper) 151 pp https://www.regjeringen.no/contentassets/db61759a16874cf28b2f074c9191bed8/en-gb/pdfs/stm201020110010000en_pdfs.pdf

Speer, L and Laughlin, T L. (2011) IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment November 2-4th 2010, La Jolla California https://portals.iucn.org/library/efiles/edocs/Rep-2011-001.pdf

"The International Union for the Conservation of Nature (IUCN) and the Natural Resources Defense Council (NRDC) have undertaken a project to explore ways of advancing implementation of ecosystem based management in the Arctic marine environment through invited expert workshops."

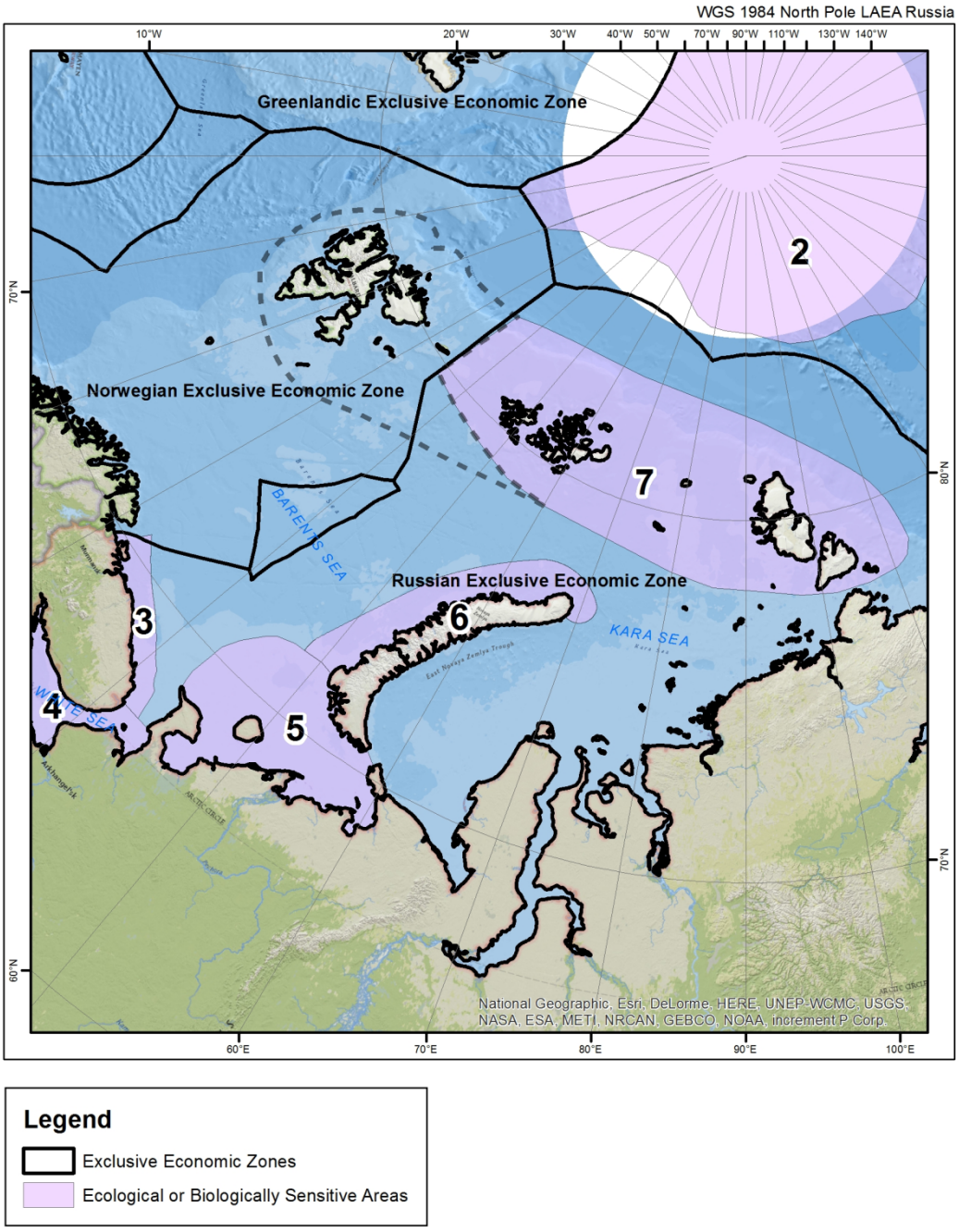


Figure 1 Ecological or Biologically Sensitive Areas of the Barents and Kara Seas area as described in the Helsinki meeting (Convention on Biological Diversity 2014). These are keyed on the map as follows;

1 The marginal ice zone and the seasonal ice-cover over the deep Arctic Ocean; the location of this area varies according to the position of the sea ice margin
2 Multi-year ice of the Central Arctic Ocean
3 Murman Coast and Varanger Fjord
4 White Sea
5 The south-eastern Barents Sea (the Pechora Sea)
6 The coast of Western and Northern Novaya Zemlya
7 North-eastern Barents–Kara Sea

In a meeting of the IUCN/NRDC (Speer and Laughlin 2011; see reference section for further information) a 'Super Ecologically and Biologically Significant Area' the "High Arctic and Shelf" is defined as the North-eastern Barents-Kara Sea area; Number 7 above plus the area around Svalbard; approximately inside the dashed lines above see also Appendix 1.

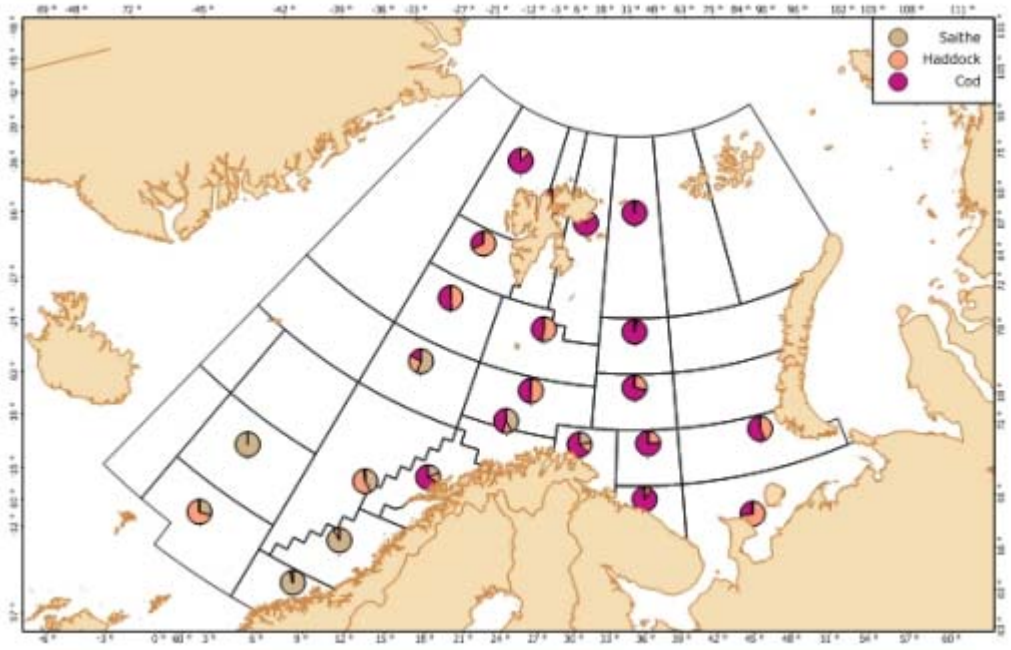


Figure 2 Relative distribution by weight of Norwegian catches of cod, haddock, and saithe per main area in 2009 for the Norwegian strata system; from ICES AFWG 2013

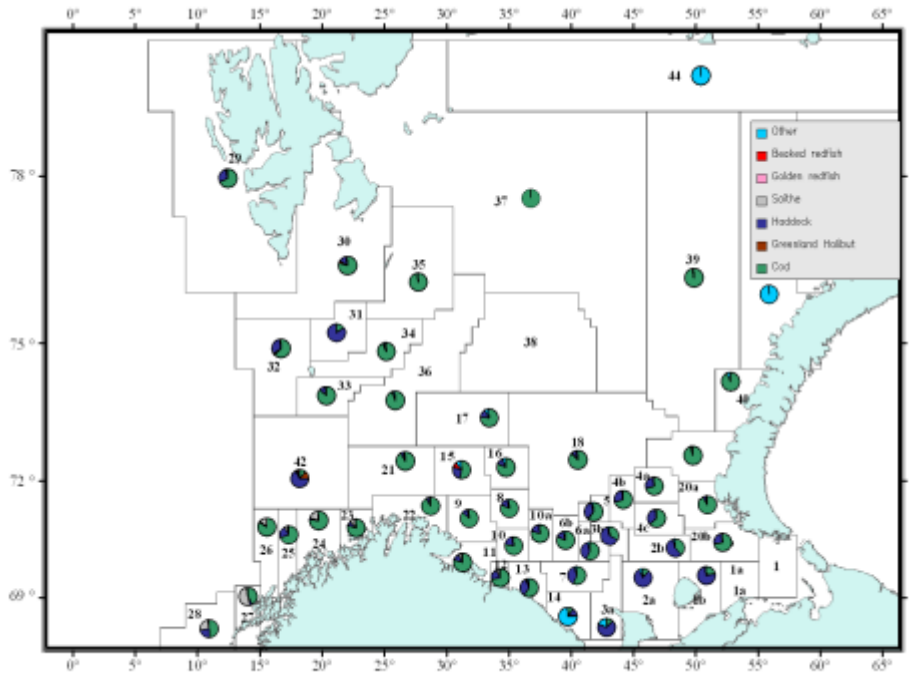
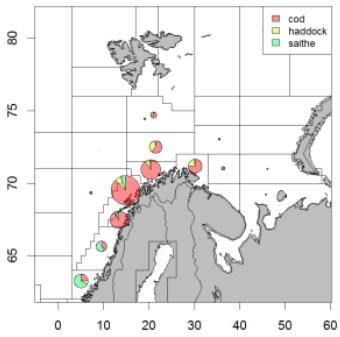
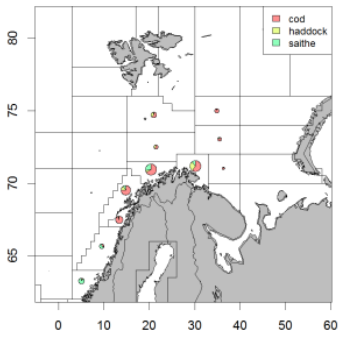


Figure 3 Relative distribution by weight of cod, haddock, saithe, Greenland halibut, golden redfish (*Sebastes marinus*), beaked redfish (*Sebastes mentella*) and other species taken by Russian bottom trawl in 2009 per main area for the Russian strata system from ICES AFWG 2013.

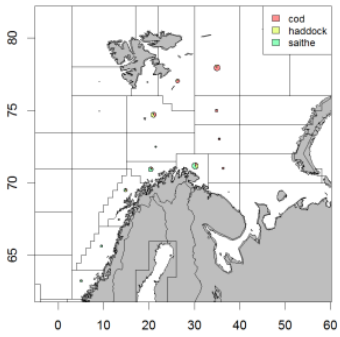
1. quarter 2013



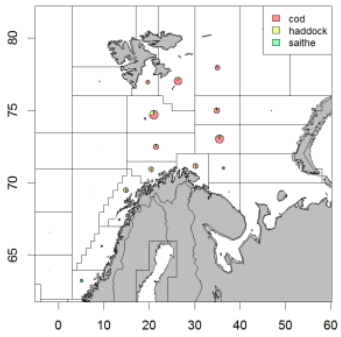
2. quarter 2013



3. quarter 2013



4. quarter 2013



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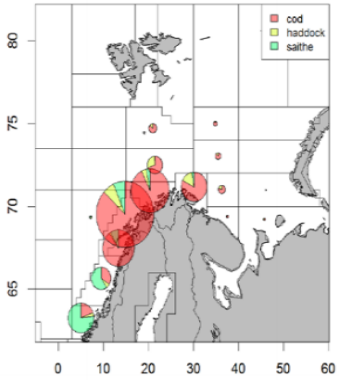
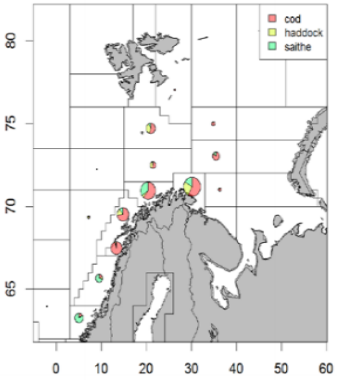


2. quarter 2014



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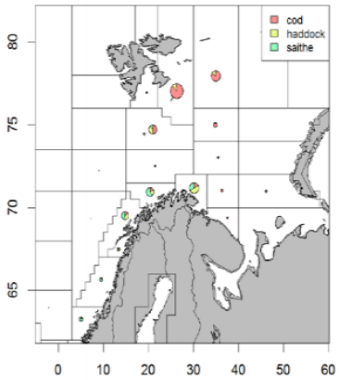

4. quarter 2014

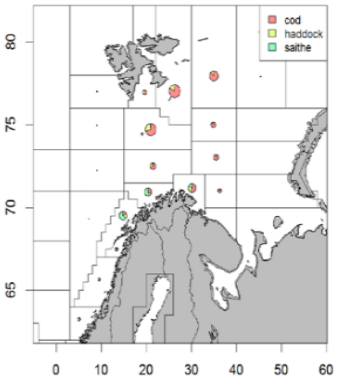

Figure 4 The Norwegian quarterly catch of cod, haddock and saithe by main statistical areas in 2013 above and 2014 below from ICES AFWG 2014 and 2015

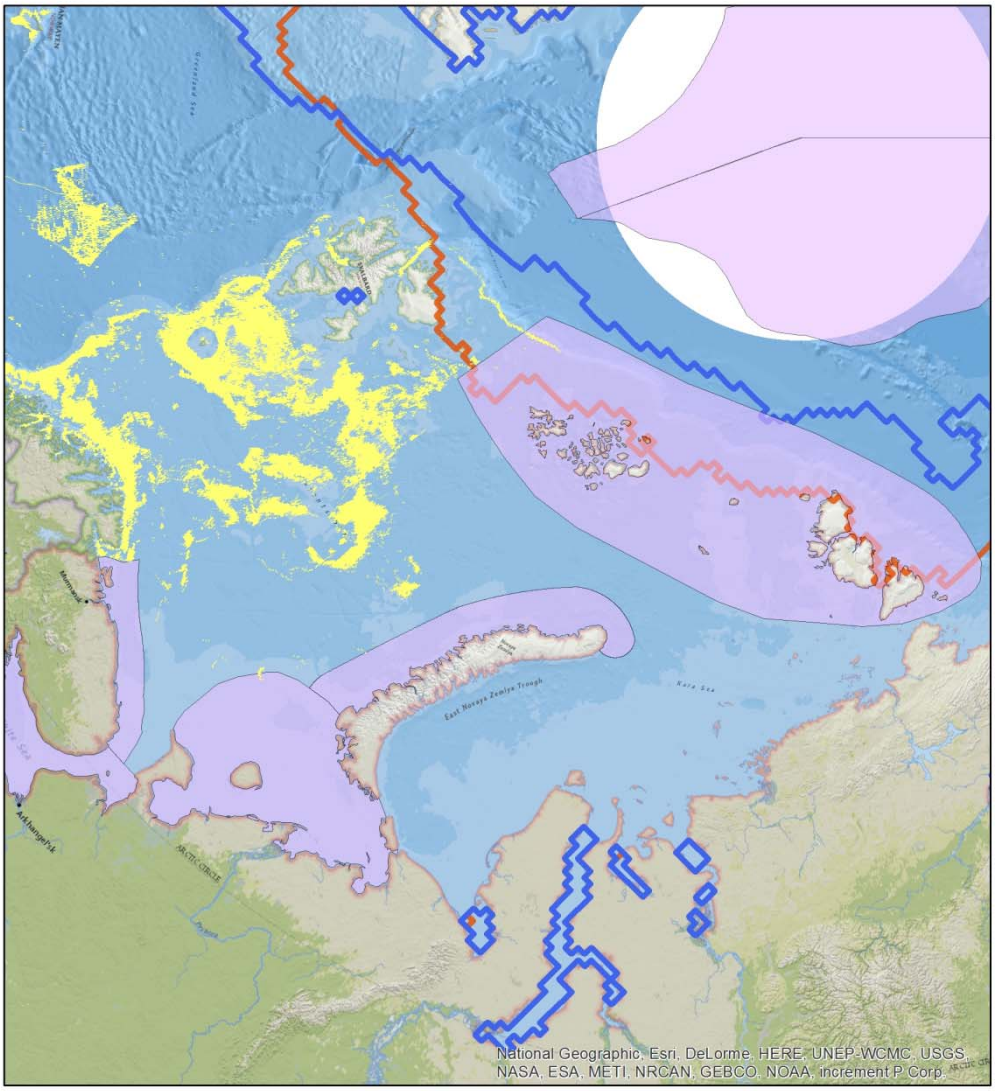

Figure 5 Sea ice distributions during September 2012 (least extensive) and September 2010 (most extensive) and fishing abrasion distributions (for mostly Norwegian data) during the whole of the period 2009 to 2013 in relation to the ESBAs in the Arctic-Barents Sea-Kara Sea region

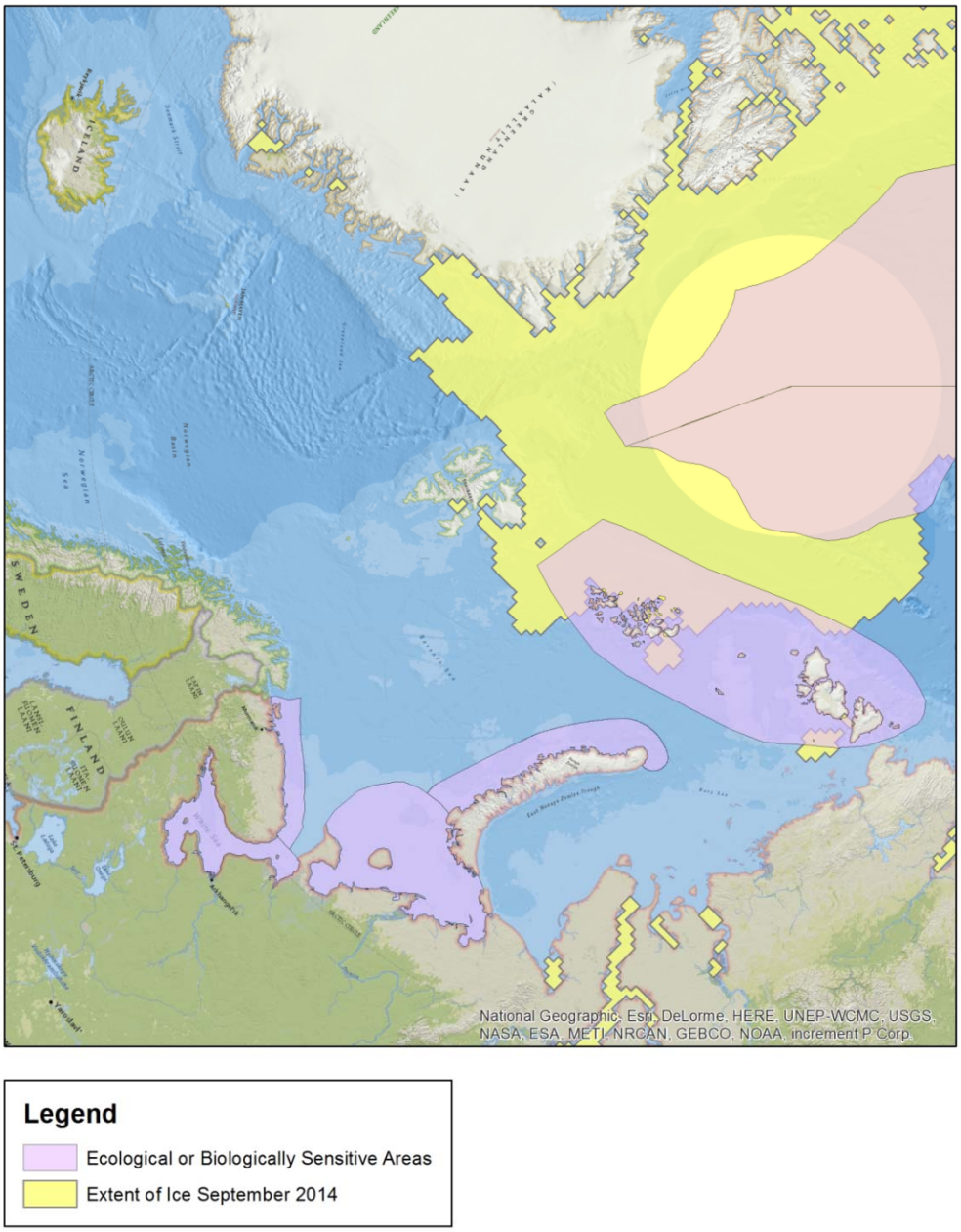

Figure 6 Sea ice distributions during September 2014 in relation to the ESBAs in the Arctic-Barents Sea-Kara Sea region

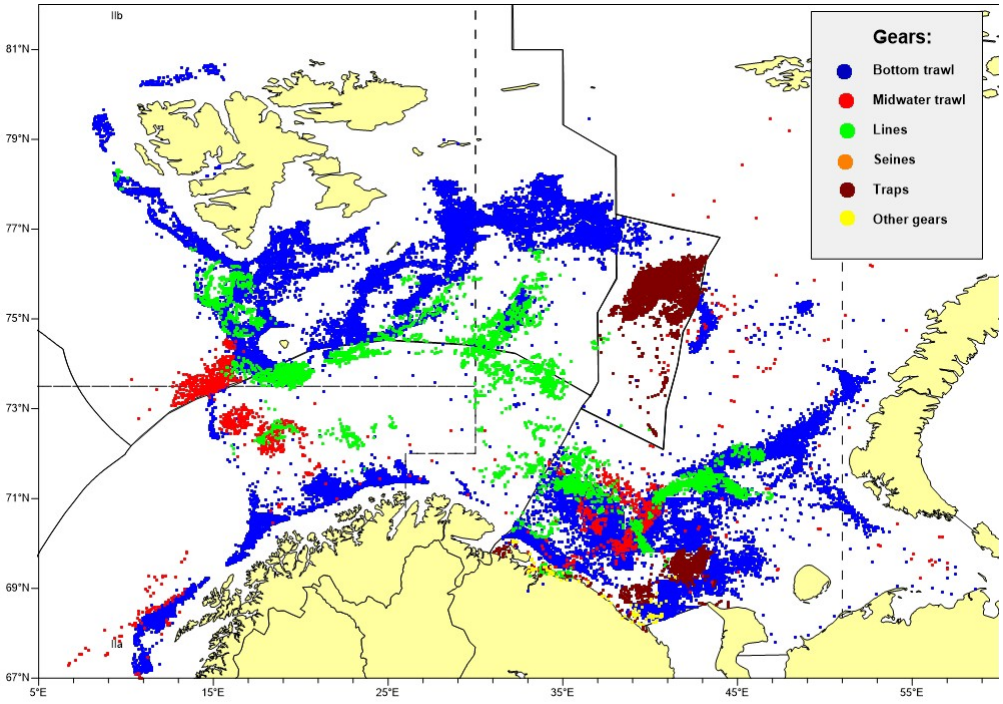

Figure 7 Russian and foreign commercial fishing activity in 2014 derived from VMS data as reported to the Russian authorities as published in the ICES WGIBAR report 2015 (includes fishing vessels used for research purposes)

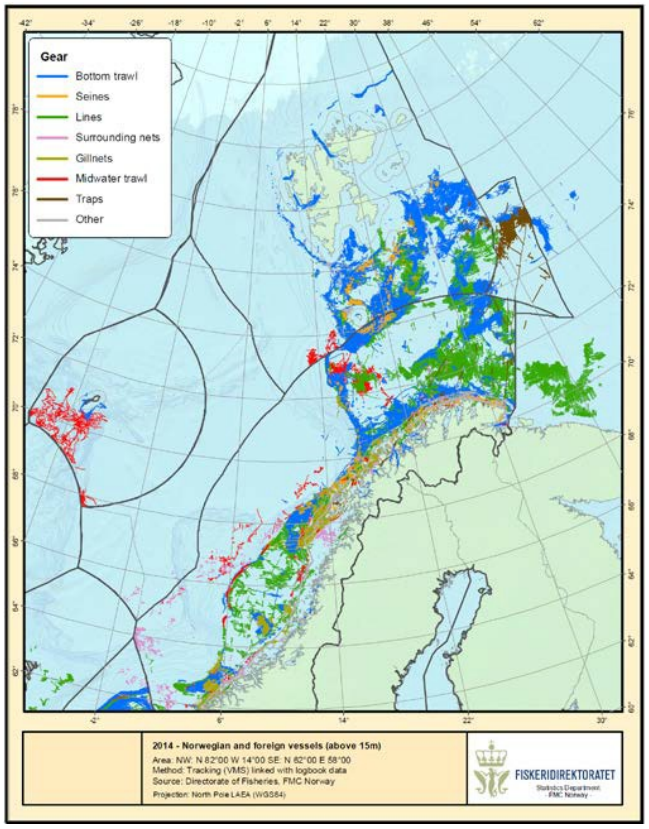

Figure 8 Norwegian and foreign commercial fishing activity in 2014 derived from VMS data as reported to the Norwegian authorities as published in the ICES WGIBAR report 2015 (includes fishing vessels used for research purposes)

Appendix 1 Super EBSAs in the Northeast Arctic

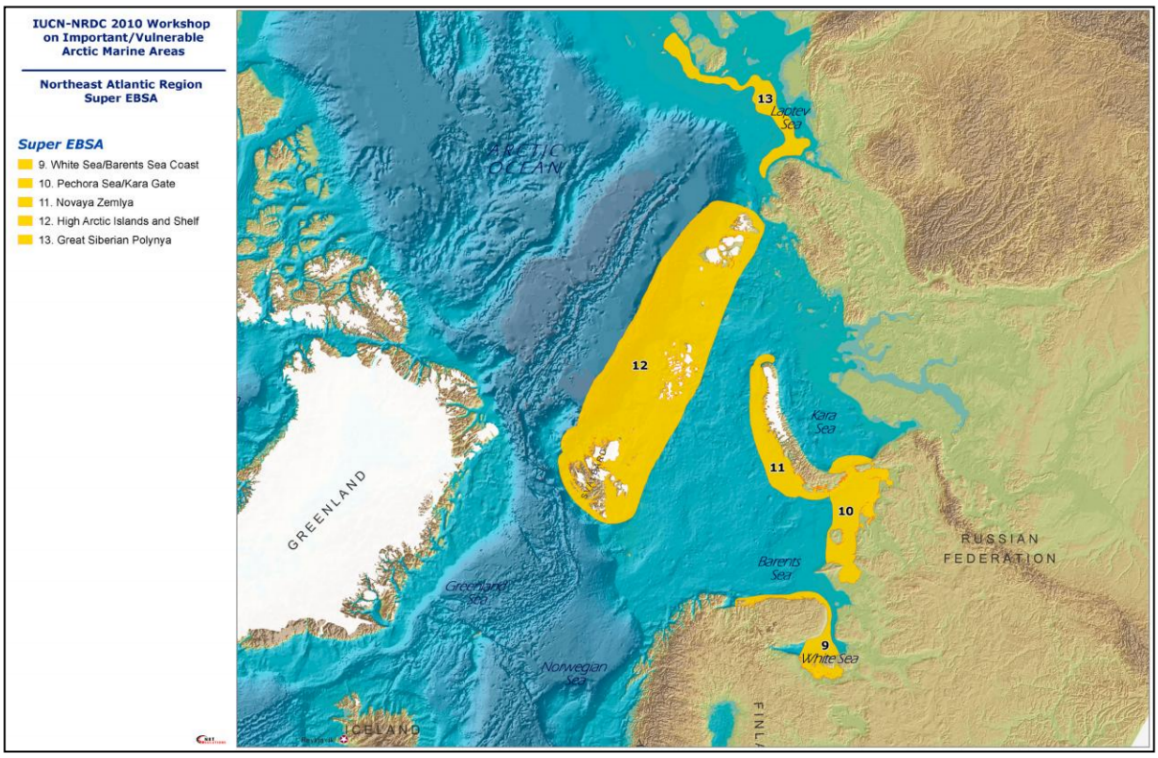

Figure 9 'Super Ecologically and Biologically Significant Areas' as described by Speer and Laughlin (2011) in the Northeast Atlantic region. The area labelled 12 'High Arctic and Shelf' corresponds in part to the North-eastern Barents- Kara Sea EBSA as defined in Convention on Biological Diversity (2014).

Appendix 2 Measures taken in the Norwegian fisheries to avoid habitat damage

The most vulnerable sea bed habitats in this region are considered to be deep-water corals (*Lophelia* reefs) and sponge habitats and regulations designed to protect these habitats are described in Nichols et al (2015). These include Marine Protected Areas and the requirement for vessels to report catches of more than 60 kg of corals or 800 kg of sponge per haul and the vessel must move a minimum of 2 miles before shooting the gear once more; it is an offence to fish where corals and sponges occur. This has recently (March 2016) been reduced to 30 kg of live corals and 400 kg sponges (Bakke pers com).

The current efforts to map the Norwegian sector under the Mareano project should help to understand the interactions between fisheries and benthos. Additionally ICES WGIBAR(2015) reports that work is currently going on to explore the possibility of using pelagic trawls when targeting demersal fish with a view to reducing benthic impact.

References

Mareano project http://www.mareano.no/en/news/news-2015

Nichols, J Lockwood, S Sverdrup-Jensen S, Meldre Pedersen G 2015 RE-ASSESSMENT REPORT Public Certification Report for the Norway North East Arctic cod and haddock fishery

https://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/north-east-atlantic/Norway-north-east-arctic-offshore-cod/reassessment-downloads/20151008_PCR_COD086.pdf

Appendix 3 International Maritime Organisation EBSA criteria and North-eastern Barents–Kara Sea EBSA description

Ecological and Biologically Sensitive Marine Area are;

"The EBSAs are special areas in the ocean that serve important purposes, in one way or another, to support the healthy functioning of oceans and the many services that it provides"

The International Maritime Organisation's scientific criteria (from Convention on Biological Diversity 2014) used to define the EBSAs take the following headings;

1. Uniqueness or Rarity

2. Special importance for life history stages of species

3. Importance for threatened, endangered or declining species and/or habitats

4. Vulnerability, Fragility, Sensitivity, or Slow recovery

5. Biological Productivity

6. Biological Diversity

7. Naturalness

The abstract to the description of the North-eastern Barents–Kara Sea EBSA area is as follows;

"The area is an example of a unique, pristine and vulnerable High Arctic marine cryopelagic ecosystem characteristic of the Atlantic region. Its bathymetry consists of an archipelagic shelf and adjacent shelf break with numerous deep-water canyons; a marginal ice zone moves through the area in the course of the year. Its surface waters are typical Arctic waters, with Atlantic waters flowing along the continental slope and enriching local communities and biological productivity. The area has a high abundance of typical Arctic species (e.g., seabirds, marine mammals, benthic invertebrates), with core areas for several globally threatened species of birds and marine mammals."

The meeting also described the "Marginal Ice Zone and Seasonal Ice Cover over the Deep Arctic Ocean" as meeting the EBSA criteria, however this is a dynamic area whose position varies from season to season and year to year (Figure 6). However it is clear that these conditions do occur in the North-eastern Barents–Kara Sea EBSA as the sea ice melts and re-forms seasonally.

The Helsinki meeting assessed the North-eastern Barents–Kara Sea area against criteria agreed by the International Maritime Organisation above. The criterion which is of most relevance to fisheries effects is 'Naturalness' for which the area is ranked as 'high'. This is explained as;

"This is a highly untouched area with no commercial fishing, low ship traffic, absence of current petroleum development. Benthic community structure shows signs of a pristine marine ecosystem."

The area is also contains areas which would be 'marginal ice zones' which is also considered to meet the EBSA criteria, but their location varies seasonally and from year to year dependent on the location of the ice margin.

Clearly the extension of fishing into this area particularly mobile seabed gear such as trawling which has the potential to abrade the seabed and alter the benthic community structure which would potentially affect this criterion.

Appendix 5 Data sources and analysis

In order to make a comparison between the distributions of fishing disturbance, sea ice and the EBSAs in this region, data were downloaded in the form of shape files (*.shp) from the following websites;

- Data on distribution of the **Ecologically and Biologically Significant Areas** from the Convention for Biodiversity website https://www.cbd.int/ebsa/

- **Fishing abrasion** from the ICES website www.ices.dk. A request was made by OSPAR to obtain fishing seabed disturbance information within the OSPAR area (Northeast Atlantic) derived from VMS (Vessel Monitoring Systems) data and these data are available on the ICES website. These data exclude data from Iceland, Greenland, the Faroe Islands and Russia which means that the data for the area under consideration would be derived predominantly from Norwegian fisheries and only pertain to larger vessels (<25 m from 2005 and < 15 m from 2010). The data are for the years 2009 to 2013. The data from the VMS pings was processed using a fishing abrasion pressure methodology that is based on very broad assumptions in terms of the area affected by abrasion with a single speed and gear width was applied across each gear category in most cases. These results are considered sufficient for the purpose of this analysis which is considering the spatial presence or absence of fishing abrasion.

- **Data on sea ice distributions** from the National Snow and Ice Data Centre http://nsidc.org/arcticseaicenews/. These data are available on a monthly basis as for 30 years data. The choice of years and months to use was made on the basis of ICES analysis of the relative sea ice coverage made by ICES in the Barents Sea (ICES WGIBAR, 2015). In most years September is the month in which the sea ice retreats furthest north so this was the month chosen as an indicator of the minimum extent of the sea ice cover.

These data were overlaid using a Geographical Information System programme and the results are shown in Figure 1 to Figure 6. To take into account Russian fishing effort in 2014 the data from ICES WGAFW 2015 is also shown in Figure 7 and Norwegian fishing effort from 2014 in Figure 8.