CBD

Convention on Biological Diversity

Distr.
GENERAL

UNEP/CBD/EBSA/WS/2014/1/5
20 May 2014**

ORIGINAL: ENGLISH

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

# REPORT OF THE ARCTIC REGIONAL WORKSHOP TO FACILITATE THE DESCRIPTION OF ECOLOGICALLY OR BIOLOGICALLY SIGNIFICANT MARINE AREAS[1]

## INTRODUCTION

1. 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).

2. In the same decision, the Conference of the Parties requested that the Executive Secretary make available the scientific and technical data, and information and results collated through the workshops referred to above to participating Parties, other Governments, intergovernmental agencies and the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) for their use according to their competencies.

** Reposted on 19 June for technical reasons.

[1] The designations employed and the presentation of material in this note do not imply the expression of any opinion whatsoever on the part of the Secretariat concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

/…

3. Subsequently, the Conference of the Parties, at its eleventh meeting, requested the Executive Secretary to further collaborate with Parties, other Governments, competent organizations, and global and regional initiatives, such as the United Nations General Assembly Ad Hoc Working Group of the Whole on the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socio-Economic Aspects, the International Maritime Organization, the Food and Agriculture Organization of the United Nations, regional seas conventions and action plans, and, where appropriate, regional fisheries management organizations, with regard to fisheries management, and also including the participation of indigenous and local communities, to facilitate the description of areas that meet the criteria for EBSAs through the organization of additional regional or subregional workshops for the remaining regions or subregions where Parties wish workshops to be held, and for the further description of the areas already described where new information becomes available (paragraph 12 of decision XI/17).

4. Pursuant to the above requests and with financial support from the Government of Finland, the Secretariat convened the Arctic Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas (EBSAs), in collaboration with the Arctic Council Working Group on the Conservation of Arctic Flora and Fauna (CAFF). The workshop was hosted by the Government of Finland and was held from 3 to 7 March 2014 in Helsinki, Finland.

5. With the financial support of the Government of Finland, the Secretariat of the Convention on Biological Diversity commissioned a technical team to support their scientific and technical preparation for the workshop. The results of this technical preparation were made available in the meeting document on Data to Inform the CBD Arctic Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas (UNEP/CBD/EBSA/WS/2014/1/3).

6. The workshop was attended by experts from Canada, the Kingdom of Denmark, Finland, Norway, Russian Federation, Sweden, United States of America, SBSTTA Bureau, Arctic Council Working Group on the Arctic Monitoring and Assessment Programme, Arctic Council Working Group on the Conservation of Arctic Flora and Fauna, Global Ocean Biodiversity Initiative (GOBI), International Council for the Exploration of the Sea, International Union for Conservation of Nature (IUCN) Global Marine and Polar Programme, Inuit Circumpolar Council, Marine Mammal Council, Natural Resources Defense Council, North East Atlantic Fisheries Commission, OSPAR Commission Secretariat, Saami Council, United Nations University – Institute of Advanced Studies, and WWF Russia. The full list of participants is attached as annex I.

## ITEM 1. OPENING OF THE MEETING

7. On behalf of the Government of Finland, as the host of the workshop, Mr. Timo Tanninen, Director General, Department of the Natural Environment, Ministry of the Environment, welcomed participants to the workshop. He noted that the scientific criteria for ecologically or biologically significant areas were crucial for improving the understanding of important ocean areas. Noting also that the data compiled provided a valuable, up-to-date source of information in support of the workshop's objectives, he thanked the Secretariat of the Convention on Biological Diversity and the organizations that contributed data for their long-term work and regional cooperation. Mr. Tanninen explained that the new Finnish National Biodiversity Strategy and Action Plan 2012-2020 emphasized the implementation of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets, including Target 11, which called for the protection of at least 10 per cent of coastal and marine areas, noting that Finland's aim was to establish an ecologically representative, effectively managed network of marine protected areas. Mr. Tanninen noted that in Finland's territorial waters, it had achieved the area-based objectives of the Baltic Sea Protected Areas (BSPA) network, based on the Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM). Likewise, in 2012 the Government decided to expand the Natura 2000 network with five new protected areas (totalling 30,000 hectares), situated both in Finland's territorial waters and in its exclusive economic zone (EEZ). He noted further that additional efforts were required to ensure adequate management and use plans for marine protected areas. He

concluded by noting that, since the impacts of climate change were likely to affect the Arctic sooner than the global average, cooperation and scientific advice for management were highly needed. He wished participants good luck in their deliberations.

8. On the second day of the workshop, Mr. Ville Niinistö, Minister of the Environment of Finland, delivered a special welcome address. Mr. Niinistö welcomed Mr. Braulio Ferreira de Souza Dias, Executive Secretary of the CBD, and all of the workshop participants to Finland. He emphasized the importance that Finland placed on Arctic issues and discussed Finland's Arctic Strategy, which was released in 2013. The Strategy set ambitious goals to work towards sustainable development in the region, including through the development of networks of nature conservation areas, with the goal of improving environmental protection while also clarifying the framework for economic activity. It paid particular attention to the protection of areas beyond national jurisdiction around the North Pole. He noted the timeliness of this workshop, given that the Arctic region had very rapidly become an area of great international and economic interest. He recalled the commitment made by States in the outcome document of the United Nations Conference on Sustainable Development (UNCSD) in 2012, *The Future We Want*, to address the urgent need to proceed with the issue of the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction, and highlighted the role of the CBD in implementing the ocean commitments emanating from UNCSD. He noted that he looked forward to taking part in the twelfth meeting of the Conference of the Parties to the Convention and wished the workshop fruitful deliberations.

9. On behalf of the Secretariat of the Convention on Biological Diversity, Mr. Braulio Ferreira de Souza Dias welcomed participants and thanked them for participating in this workshop, the seventh regional EBSA workshop convened by the Secretariat of the Convention. He thanked the Government of Finland for hosting this workshop and for their kind financial support, which had enabled the convening of this workshop and the participation of experts from the region. He also thanked the Arctic Council Working Group on Conservation of Arctic Flora and Fauna (CAFF) for their excellent cooperation in the scientific and technical preparation for this workshop, and for coordinating the scientific inputs from other relevant Working Groups of the Arctic Council. He stressed the critical role of Arctic marine biodiversity to the health and well-being of Arctic States and coastal communities, especially indigenous communities, and in supporting the healthy functioning of the world's oceans. He also noted the close link between healthy marine ecosystems and resilient coastal communities in the Arctic. He emphasized that the conservation and sustainable use of Arctic biodiversity were essential to the achievement of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets. Citing increasing global attention on the urgent need to effectively protect and preserve marine biodiversity, including in the ongoing United Nations Open Working Group on Sustainable Development Goals, he outlined the critical role of the regional EBSA workshops in describing ocean areas in need of special attention. He expressed his wish for successful deliberations.

10. On behalf of the Arctic Council Working Group on the Conservation of Arctic Flora and Fauna (CAFF), Mr. Tom Barry, Executive Secretary, delivered a statement. Mr. Barry highlighted the important role of the CBD as a global platform and policy framework to conserve and sustainably use Arctic biodiversity. He described the complementary role of CAFF, with respect to the CBD; it acts as a vehicle for knowledge and action in the Arctic region and helps inform the implementation of the CBD by providing information on the status and trends of Arctic biodiversity. He noted the Resolution of Cooperation between the Secretariats of the Convention and CAFF as an important means to strengthen the implementation of the Convention in the Arctic region. He also cited decisions X/13 and XI/6, which invited the Arctic Council to provide relevant information and assessments of Arctic biodiversity through CAFF and encouraged continued collaboration between CBD and CAFF. He also highlighted the contribution of CAFF to the CBD's Global Biodiversity Outlook reports, CAFF's upcoming participation in the twelfth meeting of the Conference of the Parties, and the scientific and technical contribution of CAFF to the current EBSA workshop as a demonstration of how such cooperation could contribute to

building and sharing knowledge, and enhancing capacity for implementation of the Convention in the Arctic.

## ITEM 2. ELECTION OF THE CO-CHAIRS, ADOPTION OF THE AGENDA AND ORGANIZATION OF WORK

11. After a brief explanation by the Secretariat of the Convention on Biological Diversity on procedures for electing the workshop co-chairs, Ms. Anita Mäkinen (Finland), who was offered by the hosting Government, and Mr. Jake Rice (Canada), who was proposed by an expert from Russia and seconded by an expert from Finland, were elected as the workshop co-chairs.

12. Participants were then invited to consider the provisional agenda (UNEP/CBD/EBSA/WS/2014/1/1) and the proposed organization of work, as contained in annex II to the annotations to the provisional agenda (UNEP/CBD/EBSA/WS/2014/1/1/Add.1) and adopted them without any amendments.

13. The workshop was organized in plenary sessions and break-out group sessions. The co-chairs nominated the following rapporteurs for the plenary sessions, taking into consideration the expertise and experience of the workshop participants and in consultation with the Secretariat:

- Agenda item 3 (workshop background, scope and output): Pat Halpin (Technical Support Team);
- Agenda item 4 (review of relevant scientific information): Lisa Speer (NRDC);
- Agenda item 5 (description of areas meeting EBSA criteria): Marjo Vierros (UNU);
- Agenda item 6 (identification of gaps): Tom Barry (CAFF Secretariat).

## ITEM 3. WORKSHOP BACKGROUND, SCOPE AND OUTPUT

14. Ms. Jihyun Lee (CBD Secretariat) provided an overview of the CBD's EBSA process and highlighted the workshop's objectives and expected outputs.

15. The workshop participants noted the following points regarding the guidance from the tenth and eleventh meetings of the Conference of the Parties and on the regional workshop process as well as the potential contribution of scientific information produced by workshops:

(a) The Conference of the Parties to the Convention (COP), at its tenth meeting, noted that the application of the scientific criteria in annex I of decision IX/20 for the identification of ecologically or biologically significant marine areas presents a tool which Parties and competent intergovernmental organizations may choose to use to progress towards the implementation of ecosystem approaches in relation to areas both within and beyond national jurisdiction, through the identification of areas and features of the marine environment that are important for conservation and sustainable use of marine and coastal biodiversity (paragraph 25 of decision X/29);

(b) The application of the EBSA criteria is a scientific and technical exercise, and the identification of EBSAs and the selection of conservation and management measures is a matter for States and competent intergovernmental organizations, in accordance with international law, including the United Nations Convention on the Law of the Sea (paragraph 26 of decision X/29);

(c) The EBSA description process is an open and evolving process that should be continued when there is sufficient advancement in the availability of scientific information (paragraphs 9 and 12 of decision XI/17);

(d) The request by the Conference of the Parties at its eleventh meeting, recalling paragraph 18 of decision IX/20 and paragraph 43 of decision X/29, for Parties and other Governments to further provide for inclusion in the repository or information-sharing mechanism, as determined by submitting Parties or Governments, scientific and technical information and experience relating to the application of the criteria for EBSAs or other relevant compatible and complementary nationally and intergovernmentally agreed scientific criteria in areas within national jurisdiction before the twelfth meeting of the Conference of the Parties (paragraphs 16 and 18, decision XI/17);

(e) Each workshop is tasked with describing areas meeting the EBSA criteria or other relevant criteria based on best available scientific information. As such, experts at the workshops are not expected to discuss any management issues, including threats to the areas; and

(f) The EBSA description process facilitates scientific collaboration and information-sharing at national, subregional and regional levels.

16. Mr. Jake Rice (Canada) delivered a presentation on the scientific criteria for EBSAs (annex I to decision IX/20, http://www.cbd.int/doc/decisions/cop-09/cop-09-dec-20-en.pdf) and the scientific guidance on the application of EBSA criteria, building upon the results of the Expert Workshop on Scientific and Technical Guidance on the Use of Biogeographic Classification Systems and Identification of Marine Areas beyond National Jurisdiction in Need of Protection (Ottawa, Canada, 29 September to 2 October 2009) (http://www.cbd.int/doc/meetings/mar/ebsa-np-01/other/ebsa-np-01-ewbcsima-01-02-en.pdf). He also shared experience from previous EBSA workshops in the North Pacific and North-East Atlantic regions.

17. Ms. Lisa Speer (NRDC) delivered a presentation on the IUCN/NRDC workshop on EBSA description in the Arctic region.

18. Mr. Tom Barry (CAFF Secretariat) delivered a presentation on relevant scientific programmes by CAFF and other working groups of the Arctic Council. In particular, he highlighted the results of the report *Identification of Arctic Marine Areas of Heightened Ecological and Cultural Significance: Arctic Marine Shipping Assessment (AMSA) IIC*.

19. Ms. Anita Irmeli Mäkinen (Finland) delivered a presentation on the report *Specially Designated Marine Areas in the Arctic High Seas: Arctic Marine Shipping Assessment (AMSA) IID*.

20. Ms. Emily Corcoran (OSPAR Commission Secretariat) provided an overview of the work undertaken by OSPAR and NEAFC to describe areas in the North-East Atlantic, including areas in the Arctic Region.

21. Ms. Polina Zhbanova (WWF) delivered a presentation on WWF's work on important marine areas in the Arctic region.

22. Ms. Marjo Vierros (UNU) provided an overview of traditional knowledge related to Arctic marine species and habitats, and perspectives on the incorporation of traditional knowledge into the EBSA criteria.

23. Mr. Michael Tetley (GOBI) provided a presentation on "Important Marine Mammal Areas", a parallel process to compile information and increase awareness on marine mammals, and on the development of a standardized IMMA protocol.

24. Mr. Pat Halpin (Technical Support Team) provided a regional overview of biogeographic information on open ocean water and deep-sea habitats and explained various considerations to be made in defining the geographic scope of the workshop, also noting the boundaries of the previous two workshops in the North-East Atlantic and North Pacific regions.

25. Summaries of the above presentations are provided in annex II below.

26. Building upon information provided by thematic presentations under this agenda item, the workshop co-chairs led a discussion on the geographic scope for the workshop. Experts from Parties and other Governments were first asked if there were any national processes for applying EBSA criteria or similar criteria within their respective countries and/or whether they wished to have this workshop undertake description of EBSAs in their respective marine waters within national jurisdictions.

27. The workshop agreed to take note of relevant national and/or regional processes applying EBSA criteria or other similar criteria for identifying marine areas of particular importance.

28. Those countries with relevant national processes applying EBSA criteria or similar criteria were invited to provide brief summaries of the national processes.

29. As such, the workshop noted:

(a) Canada's experience in applying the scientific criteria for EBSAs in marine areas within their national jurisdiction in the Arctic region, as presented by Ms. Lisa Loseto (Canada) and summarized in annex III;

(b) The work of Greenland (Kingdom of Denmark) on identifying Areas of Heightened Ecological Significance and Ecologically and Biologically Significant Marine Areas in Greenland, as presented by Mr. Tom Christensen and summarized in annex III;

(c) Norway's experience in identifying and managing valuable and vulnerable areas in Norwegian waters, as presented by Ms. Cecilie H. von Quillfeldt and summarized in annex III; and

(d) Work being undertaken in the United States of America relevant to describing EBSAs in the Arctic region, as presented by Mr. Philip Mundy and summarized in annex III.

30. The workshop participants agreed on the geographic scope for the workshop, in consideration of the following:

(a) The regional geographical delineation of CAFF. This constituted the starting geographic scope of the workshop;

(b) Marine areas within the national jurisdiction of the Russian Federation, as proposed by the experts from the Russian Federation based on national processes, except for the areas already considered by the North Pacific Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas (Moscow, Russian Federation, 25 February to 1 March 2013);

(c) Marine areas within the national jurisdiction (200 nautical miles) of Canada, Greenland (Kingdom of Denmark), Norway, and the United States were excluded from consideration by this workshop;

(d) In the Pacific, the Bering Strait was taken as a southern boundary for this workshop as no additional information to complement previous work done by the North Pacific workshop referred to above was identified;

(e) In the Atlantic, the CAFF boundary was retained as the southern boundary for the workshop. It was noted that some of the areas beyond national jurisdiction in central Arctic waters had been included in the scope of the Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas in the North-East Atlantic (Hyères, France, 8 and 9 September 2011). The participants agreed that the work at the current workshop would complement previous work in the area of overlap.

31. The participants agreed on the geographic scope of the workshop as illustrated in the map in annex IX.

## ITEM 4. REVIEW OF RELEVANT SCIENTIFIC DATA/INFORMATION/MAPS COMPILED AND SUBMITTED FOR THE WORKSHOP

32. For the consideration of this item, the workshop had before it two notes by the Executive Secretary: document UNEP/CBD/RW/EBSA/WS/1/3, containing data to inform the CBD Arctic Regional Workshop to Facilitate the Description of Ecologically or Biologically significant Marine Areas, which was prepared in support of the workshop deliberation, and document UNEP/CBD/EBSA/WS/2014/1/4, containing a compilation of the submissions of scientific information to describe ecologically or

biologically significant marine areas in the Arctic, submitted by Parties, other Governments and relevant organizations in response to the CBD Secretariat's notification 2013-106 (Ref. no. SCBD/SAM/DC/JL/JG/82923), dated 21 November 2013. The documents/references submitted prior to the workshop were made available for the information of workshop participants on the meeting website (https://www.cbd.int/doc/?meeting=EBSAWS-2014-01).

33. Mr. Pat Halpin provided a presentation on "Review of relevant scientific data/information/maps compiled to facilitate the description of EBSAs in the Arctic," based on document UNEP/CBD/EBSA/WS/2014/1/3. A summary of his presentation is provided in annex II.

34. Site-based submissions of scientific information on areas meeting EBSA criteria were presented by Ms. Cecilie H. von Quillfeldt (Norway), Mr. Vassily A. Spiridonov (Russian Federation), Ms. Maria Gavrilo (Russian Federation), Ms. Parnuna Egede (ICC), Mr. Stanislav Belikov (MMC), and Ms. Lisa Speer (NRDC). The information provided in these presentations was reviewed, augmented with additional information, and, as appropriate, incorporated into the description of areas meeting the EBSA criteria by the break-out groups. Each presentation describing areas meeting the EBSA criteria provided an overview of the areas considered, the assessment of the area against the EBSA criteria, scientific data/information available as well as other relevant information.

## ITEM 5. DESCRIPTION OF AREAS MEETING EBSA CRITERIA THROUGH APPLICATION OF THE SCIENTIFIC CRITERIA AND OTHER RELEVANT, COMPATIBLE AND COMPLEMENTARY NATIONALLY AND INTERGOVERNMENTALLY AGREED SCIENTIFIC CRITERIA

36. The meeting agreed that the four types of areas meeting the EBSA criteria described in the report of the above-mentioned North Pacific Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas, Moscow, Russian Federation (http://www.cbd.int/doc/meetings/mar/ebsa-np-01/official/ebsa-np-01-04-en.pdf) might be useful in reporting on areas meeting the EBSA criteria in the Arctic as well. These were:

(a) ***Spatially stable features whose positions are known and individually resolved on the maps.*** Examples include individual seamounts and feeding areas for sharks and seabirds. Such areas do not have to be used as important habitats all year round, nor does all the area have to be used every year. However, the feature(s) is entirely contained in the corresponding map polygons;

(b) ***Spatially stable features whose individual positions are known, but a number of individual cases are being grouped.*** Examples include a group of coastal areas, seamounts or seabird-breeding sites where the location of each is known but a single polygon on the map and corresponding description encompasses all the members of the group. The grouping may be done because there may be insufficient knowledge to evaluate each separately or the information is basically the same for all members of the group, so one description can be applied to all group members;

(c) ***Spatially stable features whose individual positions are not known.*** Examples include areas where coral or sponge concentrations are likely, based on, for example, modelling of suitable habitats, but information is insufficient to specify the locations of each individual concentration. Each such area may be represented by a single map polygon and description, but the entire area inside the polygon is *not* to be interpreted as filled with the feature(s) meeting the criteria. Narrative about these areas should stress the importance of getting better information on the spatial distribution of these features; and

(d) ***Features that are inherently not spatially fixed.*** The position of this feature moves seasonally and among years. The map polygon for such a feature should include the full range occupied by the front (or other feature) during a typical year. However, the description and its narrative should describe seasonal movement of the key feature(s). The text for description should also make very clear that at any given time, the ecological importance usually is highest wherever the feature is located at that time and often decreases as distance from the feature increases. It may even be the case that at any given time some parts of the total area contained in the polygon are ecologically little different from areas outside the polygon.

37. Correspondingly, each description for an area found to meet EBSA criteria includes clear statements about the degree to which the boundaries are fixed or mobile over time (at various scales, e.g., months, years), and how clearly the boundaries of the features can be specified with existing knowledge. The maps of the areas meeting EBSA criteria also use different symbols/colours to reflect the different types of areas meeting EBSA criteria.

38. The meeting noted that, based on the concepts of ecological or biological significance, EBSA criteria could be applied on all scales from global to local. Once a scale had been selected, however, the criteria were intended to be used to evaluate areas and ecosystem features in a context *relative to* other areas and features at the given scale (taking note of paragraph 41 below).

39. This workshop was mandated to evaluate areas regionally *within* the Arctic Ocean. However, the workshop considered that the entire Arctic Ocean has important features that need to be viewed on a global scale. At this global scale, ecological features of the Arctic justify a higher degree of risk aversion in the Arctic than would be the norm for many lower-latitude marine regions, if management is to keep human uses sustainable and adequately protect biodiversity. This perspective is presented in annex IV of this report.

40. The areas meeting EBSA criteria described in this report should be viewed relative to this overall context. Furthermore, an additional degree of precaution is needed for threats to the features that characterize the areas found to meet EBSA criteria on the scale of the Arctic as a whole .

41. Several of the countries bordering the Arctic Ocean have national processes for identification of EBSAs or for application of similar spatial criteria within their EEZs.[2] The progress or results of these processes were reported to this workshop, as summarized in annex III, as background information. The experiences of applying the EBSA criteria through national processes were useful in applying the criteria and interpreting scientific information in marine areas beyond national jurisdiction. However, the meeting also encountered some additional challenges in applying and interpreting criteria solely in areas beyond national jurisdiction, when many important features of the Arctic straddle these areas and national waters, or are shared among States with common borders. These challenges are discussed in annex V, where some suggestions to address these challenges in future work in describing EBSAs are proposed.

42. The workshop found it challenging to apply the EBSA criteria to the sea ice ecosystems of the Arctic. The sea ice is a very significant feature of the Arctic, and it is also highly dynamic both spatially and temporally. In addition, at any given time the ice is not a homogeneous feature structurally or ecologically, and the extent and nature of heterogeneity change seasonally. The nature of heterogeneity of sea ice has also been changing over time, most probably in response to climate change, with the ratio of multiyear ice to annual ice changing from 3:1 to 1:3 in the past decade. Finally, for substantial periods each year, most or all the Arctic (aside from a few leads or polynyas described as areas meeting EBSA criteria in the workshop or in reports from national processes), especially areas beyond national jurisdiction, is ice-covered. Hence, during those times of high ice coverage, the collective ecological feature of "sea ice", although ecologically or biologically significant in various ways in various places throughout the Arctic, is a feature of the Arctic as a whole, and not addressed well by criteria and a process intended to identify areas of *enhanced* ecological or biological significance *within* the Arctic.

43. The two "ice EBSAs", as described as areas 1 and 2 in the appendix to annex VIII, are the results of trying to capture the dynamic and heterogeneous properties of sea ice and associated ecosystem(s)

[2] For this report the experts used the 200 nautical mile boundary for countries that reported on results of national processes. This is intended to allow consistent scientific and technical practices to be followed in application of the criteria, and makes no judgement of the territorial borders of any States.

within the EBSA descriptions. These descriptions are, however, presented as a workable compromise rather than a perfect solution to how heterogeneous, dynamic, and periodically widespread ecological properties can be captured with explicit criteria or narrative descriptions and maps that use different colours to symbolize different areas meeting EBSA criteria.

44. Indigenous peoples have lived in the Arctic for millennia, and their knowledge of the Arctic and its biodiversity is deeply integrated with their culture and livelihoods. At this workshop it was clear that, notwithstanding efforts by countries bordering the Arctic to include this knowledge in their respective national EBSA processes, approaches that place arbitrary national borders on such knowledge are artificial. In addition, the slow progress on a framework for use of social and cultural criteria for areas in need of enhanced protection posed additional challenges to the work of the group. Annex VII discusses these issues in the context of the Arctic and their wider implications for the EBSA process.

45. The area defined as “the Arctic” for this workshop overlaps in the Atlantic with the area considered in the Joint OSPAR/NEAFC/CBD Scientific Workshop on the Identification of Ecologically or Biologically Significant Marine Areas in the North-East Atlantic (Hyères, France, 8 and 9 September 2011) and in the Pacific with the area considered in the North Pacific Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas, referred to in paragraph 30, above. The workshop did not re-evaluate any specific areas proposed as meeting EBSA criteria at either of those workshops. However, where ecological or biological features considered significant *in their own right* for the Arctic extended into these overlapping regions, the feature was treated as a consistent feature integral to the area being considered at this workshop.

46. Following discussion of the information to be captured in the maps and EBSA descriptions, the workshop participants were then split into several break-out groups, as follows:

(a) Given the importance of ongoing comparable processes at the national level, a break-out group was formed to reflect on the progress or results of these processes. The output of this break-out group is provided in annex III;

(b) A break-out group was formed with the task of articulating the unique qualities of the marine areas of the Arctic, with a focus on the ecological and biological significance of the region in a global context. The output of this break-out group is provided in annex IV;

(c) A break-out group also was formed to discuss the challenges encountered in applying and interpreting criteria solely in areas beyond national jurisdiction, when many important features of the Arctic straddle these areas and national waters, or are shared among States with common borders. The output of this break-out group is provided in annex V;

(d) Given the challenges discussed in paragraph 44 with regard to effectively capturing the knowledge and perspectives of indigenous and local communities (ILCs) through existing workshop processes, a break-out group was formed to address this issue. The output of this break-out group is provided in annex VI;

(e) A break-out group was also formed to discuss means to apply social and cultural criteria for the identification of areas relevant to the conservation and sustainable use of biodiversity in need of such enhanced measures. The output of this break-out group is provided in annex VII;

(f) A break-out group was formed to describe areas meeting EBSA criteria by capturing the dynamic and heterogeneous properties of sea ice and associated ecosystem(s). The output of this break-out group is reflected in the workshop’s description of EBSAs in annex VIII and its appendix;

(g) A break-out group was also formed to facilitate the organization and potential grouping of the EBSA descriptions that were put forth by the experts from the Russian Federation. The output of this break-out group is reflected in the workshop’s description of EBSAs in annex VIII and its appendix;

(h) The majority of the areas proposed prior to the workshop as meeting EBSA criteria were justified primarily by the biological and/or ecological significance of their physical or geomorphological features. There was also discussion on the need to ensure that appropriate consideration is given to critical types of biodiversity in the Arctic region, particularly birds, marine mammals and benthic biodiversity. A break-out group was formed to examine available data related to birds, marine mammals and benthic biodiversity in the Arctic to determine if the existing EBSA descriptions adequately incorporated important areas for these types of biodiversity or whether there was a need to discuss additional areas. The output of this break-out group is reflected in the discussion on the need for future scientific collaboration and data gathering under agenda item 6, in annex X.

47. Participants were assisted by the technical support team, including GIS operators, who made hard/electronic copies of the maps available for the break-out group discussions, and assisted group discussion with analysis and interpretation of scientific data compiled for the workshop.

48. During the break-out group discussions, participants who were working on the description of areas meeting EBSA criteria drew approximate boundaries of these areas on a map provided by the technical support team to keep track of opportunities to extend or merge areas and to identify areas that had yet to be considered.

49. The results of the break-out group discussions were reported at the plenary for consideration. At this time, workshop participants reviewed the description of areas meeting EBSA criteria that emerged from these discussions, which were recorded on templates provided by the CBD Secretariat, and considered them for inclusion on the final list of areas meeting EBSA criteria.

50. The workshop participants agreed on descriptions of 11 areas meeting EBSA criteria. They are listed in annex VIII and described in its appendix. The map of described areas is contained in annex IX.

## ITEM 6. IDENTIFICATION OF GAPS AND NEEDS FOR FURTHER ELABORATION IN DESCRIBING AREAS MEETING EBSA CRITERIA, INCLUDING THE NEED FOR THE DEVELOPMENT OF SCIENTIFIC CAPACITY AND FUTURE SCIENTIFIC COLLABORATION

51. Building on the workshop deliberations, the workshop participants were invited to identify, through break-out group sessions and open plenary discussion, gaps and needs for further elaboration in describing areas meeting EBSA criteria, including the need to develop scientific capacity and future scientific collaboration.

52. The results of the plenary and break-out group discussions are discussed in annex X.

## ITEM 7. OTHER MATTERS

53. No other matters were discussed.

## ITEM 8. ADOPTION OF THE REPORT

54. Participants considered and adopted the workshop report on the basis of a draft report prepared and presented by the co-chairs with some changes.

55. Participants agreed that any additional scientific information and scientific references would be provided to the CBD Secretariat by workshop participants within two weeks of the closing of the workshop in order to further refine the description of areas meeting EBSA criteria contained in annex VIII and its appendix.

## ITEM 9. CLOSURE OF THE MEETING

56. In closing the workshop, on behalf of the Government of Finland, Ms. Marina von Weissenberg (CBD national focal point) congratulated the hard work by the workshop participants through excellent collaboration throughout the week. She highly commended the able leadership of workshop co-chairs, excellent scientific and technical support by the technical support team, and the efficient and effective

servicing by the CBD Secretariat members as well as the contributions of all the rapporteurs to the report preparation. Workshop co-chairs and participants expressed their sincere thanks to the Government of Finland for its warm hospitality and excellent logistical support, which had enabled the workshop discussions to be very fruitful.

57. The workshop was closed at 7 p.m. on Friday, 7 March 2014.

*Annex I*

## LIST OF PARTICIPANTS

### CBD Parties

**Canada**

1. Ms. Lisa Loseto
Section Lead, Ecosystem Impacts Research
Fisheries and Oceans Canada
Freshwater Institute
Winnipeg, MB
Canada R3T 2N6
Tel: 1 204 983-5135
E-Mail: lisa.loseto@dfo-mpo.gc.ca

2. Mr. Jake Rice
Chief Scientist
Director General's Office, Ecosystem Science Directorate
Fisheries and Oceans Canada
200 Kent Street
Ottawa ON K1A 0E6
Canada
Tel.: +1 613 990 0288
Fax: +1 613 954 0807
E-Mail: jake.rice@dfo-mpo.gc.ca

3. Mr. Bill Williams
Arctic Oceanographer
Fisheries and Oceans Canada
Institute of Ocean Sciences
9860 West Saanich Road
Sidney, BC, V8L 4B2
Canada
Tel : +1 250 363 6343
E-Mail: bill.williams@dfo-mpo.gc.ca

**Kingdom of Denmark**

4. Mr. Tom Christensen
Advisor
Arctic Research Centre
Danish Centre of Energy and Environment
Aarhus University
Frederiksborgvej 399 4000
Denmark
Tel.: 00454630 1951
E-Mail: toch@dmu.dk

5. Mr. Thomas Juul-Pedersen
Research Scientist and Programme Manager
Greenland Climate Research Centre
PO Box 570, 3900 Nuuk
Greenland
E-Mail: ThPe@Natur.gl

**Finland**

6. Mr. Ville Karvinen
Researcher
Finnish Environment Institute (SYKE)
Mechelininkatu 34a / P.O. Box 140
FI-00251 Helsinki
Finland
Tel: +358 295 251 263
E-Mail: ville.karvinen@ymparisto.fi

7. Ms. Anita Irmeli Mäkinen
Chief Advisor, Environment
Finnish Transport Safety Agency (Trafi)
Kumpulantie 9 / PO Box 320
FI-00101 Helsinki
Finland
Tel.: +358 40 1624 592; +358 295 5346 590
Fax: +358 9 7740 1034E-Mail:
anita.makinen@trafi.fi

**Norway**

8. Mr. Jan Helge Fossa
Senior Scientist
Institute of Marine Research
P.O. Box 1870 Nordnes
Bergen N-5817, Norway
E-Mail: jan.helge.fossaa@imr.no

9. Ms. Cecilie H. von Quillfeldt
Environmental Adviser
Norwegian Polar Institute
Fram Centre
Tromso 9296, Norway
E-Mail: cecilie.quillfeldt@npolar.no

**Russian Federation**

10. Ms. Maria Gavrilo
Research Director
National Park Russian Arctic
Ministry of Natural Resources and Environment
57 Sovetskikh Kosmonatov
Archangelsk, 163000
Russian Federation
E-Mail: m_gavrilo@mail.ru

11. Mr. Vassily Spiridonov
Senior Scientist
P.P. Shirshov Institute for Oceanology
Russian Academy of Sciences
Moscow
Russian Federation
E-Mail: vspiridonov@ocean.ru, valbertych@mail.ru

**Sweden**

12. Mr. Bo Fernholm
Professor Emeritus.
Department of Vertebrate Zoology
Swedish Museum of Natural History
Box 50007
SE-104 05 Stockholm
Tel.: +46-8-5195 4110
E-mail: bo.fernholm@nrm.se

## Other Governments

**United States of America**

13. Mr. Philip R. Mundy
Director
Auke Bay Laboratories, Alaska Fisheries Science Center
National Oceanic and Atmospheric Administration
Ted Stevens Marine Research Institute
17109 Pt Lena Loop Rd
Juneau AK 99801
United States of America
E-Mail: Phil.mundy@noaa.gov

## SBSTTA Bureau

14. Mr. Alexander Shestakov
Director International Arctic Programme
WWF Global Arctic Programme
World Wide Fund for Nature (WWF)
30 Metcalfe St., Suite 400
Ottawa, ON K1P 5L4
Canada
Tel.: 1-613-232 2501
E-Mail: ashestakov@wwfcanada.org

## Local Observers

15. Ms. Marina von Weissenberg
Ministerial Adviser
Ministry of the Environment of Finland
Kasarmikatu 25 / PO Box 35
FI-00023 GOVERNMENT
Helsinki, Finland
Tel.: +358 295 250 321
Fax: +358 9 1603 9372
E-Mail: marina.weissenberg@ymparisto.fi

16. Ms. Penina Blankett
Ministerial Adviser
Ministry of the Environment of Finland
Kasarmikatu 25 / PO Box 35
FI-00023 GOVERNMENT
Helsinki, Finland
Tel: +358 295 250 058
E-Mail: penina.blankett@ymparisto.fi

17. Mr. Jan Ekebom
Senior Adviser
Metsähallitus Natural Heritage Services
Vernissakatu 9 / PO Box 94
FI-01301 Vantaa
Finland
Tel: +358 40 503 6211
E-Mail: jan.ekebom@metsa.fi

18. Ms. Henna Haapala
Ministerial Adviser
Ministry of the Environment of Finland
Kasarmikatu 25 / P.O. Box 35
FIN-00023 GOVERNMENT
Helsinki, Finland
Tel.: +358 295 250 070
E-Mail: henna.haapala@ymparisto.fi

## Organizations

**Arctic Monitoring and Assessment Programme**

19. Ms. Janet Pawlak
Deputy Executive Secretary
Arctic Monitoring and Assessment Programme
Gaustadalleen 21, N-0349
Oslo, Norway
E-Mail: jpawlak@dahm.dk
Web: www.amap.no

**Conservation of Arctic Flora and Fauna**

20. Mr. Tom Barry
Executive Secretary
Conservation of Arctic Flora and Fauna
600 Akureyri
Borgir, Nordurslod
Iceland
E-Mail: tom@caff.is

**Global Ocean Biodiversity Initiative Secretariat**

21. Mr. David Johnson
Coordinator
Global Ocean Biodiversity Initiative Secretariat
Belbins Valley
Belbins, Ramsey, Hampshire S051 0PE
United Kingdom of Great Britain and Northern Ireland
E-Mail: david.johnson@seascapeconsultants.co.uk

22. Mr. Michael J. Tetley
IUCN Joint SSC-WCPA Marine Mammal Protected Area Task Force (MMPATF)
Global Ocean Biodiversity Initiative Partner
Montague House,
Durham, Country Durham, DH1 2LF, UK
Tel.: +44(0)1915977068
United Kingdom of Great Britain and Northern Ireland
E-Mail: m.j.tetley@gmail.com

**International Council for the Exploration of the Sea (ICES)**

23. Mr. Mark Tasker
Vice-Chair
Advisory Committee
International Council for the Exploration of the Sea
c/o Inverdee House
Baxter Street
Aberdeen, Scotland AB11 9QA
United Kingdom of Great Britain and Northern Ireland
E-Mail: mark@ices.dk

**Inuit Circumpolar Council**

24. Ms. Parnuna Egede
Advisor on Environmental Issues
Inuit Circumpolar Council - Greenland
P.O. Box 204
Issortarfik 7B
DK-3900 Nuuk
Greenland
Tel.: (+45) 61302480
E-Mail: parnuna@inuit.org

**IUCN - Global Marine and Polar Programme**

25. Ms. Martha C. McConnell
Manager
Global Marine and Polar Programme
IUCN
Washington, DC
Tel.: +1 202-518-2051
E-mail: martha.mcconnell@iucn.org

**Marine Mammal Council**

26. Mr. Stanislav Belikov
Head of Laboratory
All-Russian Research Institute for Nature Protection
Moscow 117997
Russian Federation
E-Mail: sbelik40@mail.ru

**Natural Resources Defense Council**

27. Ms. Lisa Speer
Director
International Oceans Program
Natural Resources Defense Council
40 West 20th Street
New York NY 10011
United States of America
Tel.: 1-212-727-44-26
Fax: 1-212-727-1773
E-Mail: lspeer@nrdc.org

**North East Atlantic Fisheries Commission**

28. Mr. Birgir Hrafn Búason
Ministry for Foreign Affairs
Rauðarárstig 25
IS – 150 Reykjavík
Iceland
Tel. +345 545 9987
E-mail: birgir.buason@utn.stjr.is

**OSPAR Commission Secretariat**

29. Ms. Emily Corcoran
OSPAR Commission Secretariat
Victoria House
37-63 Southampton Row
London WC1B 4DA
United Kingdom of Great Britain and Northern Ireland
E-Mail: emily.corcoran@ospar.com

**Saami Council**

30. Ms. Gunn-Britt Retter
Head of Arctic and Environmental Unit
Saami Council
Seitatie 35
Utsjoki, Finland
E-Mail: gbr@saamicouncil.net

**United Nations University - Institute of Advanced Studies**

31. Ms. Marjo Vierros
Adjunct Senior Fellow
Institute of Advanced Studies
United Nations University - Institute of Advanced Studies
9105 Summer Lane
Whistler, BC V0N 1B9
Canada
Tel.: + 604 938-1512; 604 902 0877
E-Mail: vierros@ias.unu.edu

**WWF Russia**

32. Ms. Polina Zhbanova
Chief Project Coordinator
World Wide Fund for Nature – Russia
Moscow, Russian Federation
Tel.: +7 915 052 16 57
E-mail: pzhbanova@wwf.ru

## Technical Support

33. Mr. Patrick N. Halpin
Associate Professor of Marine Geospatial Ecology,
Director OBIS - SEAMAP
Nicholas School of the Environment
Duke University Marine Lab
Duke University
Durham, NC 27708-0328
United States of America
Tel.: +1 919 613 8062
E-Mail: phalpin@duke.edu

34. Mr. Jesse Cleary
Research Analyst
Nicholas School of the Environment
Duke University Marine Lab
Duke University
Durham, NC 27708-0328
United States of America
E-Mail: jesse.cleary@duke.edu

35. Mr. Ben Donnelly
Research Analyst
Nicholas School of the Environment
Duke University Marine Lab
Duke University
Durham, NC 27708-0328
United States of America
E-Mail: bendy@duke.edu

## Secretariat of the Convention on Biological Diversity

36. Ms. Jihyun Lee
Environmental Affairs Officer for Marine and Coastal Biodiversity
Science, Assessment and Monitoring
Secretariat of the Convention on Biological Diversity
413, Saint-Jacques Street W., Suite 800
Montreal, Quebec H2Y 1N9
Canada
E-Mail: jihyun.lee@cbd.int

37. Mr. Joseph Appiott
Associate Programme Officer for Marine and Coastal Biodiversity
Science, Assessment and Monitoring
Secretariat of the Convention on Biological Diversity
413, Saint-Jacques Street W., Suite 800
Montreal, Quebec H2Y 1N9
Canada
E-Mail: joseph.appiott@cbd.int

38. Ms. Jacqueline Grekin
Programme Assistant
Science, Assessment and Monitoring
Secretariat of the Convention on Biological Diversity
413, Saint-Jacques Street W., Suite 800
Montreal, Quebec H2Y 1N9
Canada
Tel.: 514 287-8705
E-Mail: jacqueline.grekin@cbd.int

*Annex II*

## SUMMARY OF THEME PRESENTATIONS

**Agenda item 3**

***CBD's EBSA process, workshop objectives and expected outputs/outcome (by Jihyun Lee, CBD Secretariat)***

Ms. Lee introduced the process for describing ecologically or biologically significant marine areas (EBSAs), beginning with the adoption of the EBSA criteria at the ninth meeting of the Conference of the Parties to the Convention on Biological Diversity and the call by the tenth meeting of the Conference of the Parties to organize a series of regional EBSA workshops. Ms. Lee explained that in accordance with the guidance provided by the eleventh meeting of the Conference of the Parties the summary report of the first two EBSA workshops had already been submitted to the United Nations General Assembly (UNGA) and its relevant processes. She informed the meeting that the results of subsequent workshops, including the present one, would be submitted to the forthcoming eighteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA 18) and twelfth meeting of the Conference of the Parties. She briefed the meeting that six previous regional workshops had been held thus far, involving a total of 92 countries and 79 regional and international organizations. She then highlighted the potential benefits of the EBSA process in further strengthening the region's existing efforts to meet its goals for marine biodiversity conservation, by facilitating scientific collaboration and increasing awareness.

***Criteria and guidance for EBSAs: protection and use of special marine places (by Jake Rice, Canada)***

Mr. Rice reviewed the seven criteria adopted by the Conference of the Parties to the Convention at its ninth meeting (decision IX/20) for the evaluation of ecologically or biologically significant areas. Mr. Rice first introduced the definition of each criterion, provided some context for the application of the criteria in the Arctic region, as well as some guidance on their use, as contained in annex I to decision IX/20. He then summarized some of the lessons that have been learned about the application of the criteria, based on experience with their use in other CBD workshops and national processes. Attention was given to the intent that the criteria are to be applied in a relative rather than absolute context, and relative to the general representation of the ecological features at the scale chosen for each workshop—in this case, at the scale of the Arctic. It was stressed that the criteria were designed to be applied individually with regard to their relative significance within the region under consideration, but results of the criteria application can be "layered" to build the full description of the ecological or biological significance of each area. He advised the workshop participants that both the maps of areas meeting the criteria and the narrative associated with maps should clearly describe how strongly each area reflects the properties of each criterion, and how many criteria may be met in which ways by each area.

***The IUCN-NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment (by Lisa Speer, Natural Resources Defense Council – NRDC)***

Ms. Speer outlined the approach and outcomes of the IUCN-NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment, which took place in 2010 and convened 34 scientists and members of indigenous and local communities with expertise in various aspects of Arctic marine ecosystems and species. Base maps showing the distribution of oceanographic and biological features and species distribution were prepared in advance using information from publicly available databases. The maps were made available to participants one month prior to the workshop, with provision for preliminary suggestions for EBSAs via a web-based GIS mapping programme. At the workshop, participants reviewed these preliminary maps and created new ones based on their expert knowledge and additional data they brought to the meeting. In the final plenary session, the idea emerged that some EBSAs are of particular importance due to the fact that they meet most or all of the CBD criteria, or meet one or more of them at a level of global significance. The participants decided to name these areas "Super EBSAs". The workshop produced a report consisting of a set of maps depicting 77 Arctic marine EBSAs and 13 "Super EBSAs", together with supporting references, a table indicating which of the EBSA criteria are met by each site, and descriptions of each of the "Super EBSAs". The report is available at https://portals.iucn.org/library/efiles/edocs/Rep-2011-001.pdf.

***Relevant scientific programmes by CAFF and other Working Groups of the Arctic Council (by Tom Barry, Secretariat of the Arctic Council Working Group on the Conservation of Arctic Flora and Fauna)***

Mr. Barry provided a brief overview of scientific activities conducted by the Arctic Council. The Arctic Council comprises six working groups and four task forces, each of which deals with a specific thematic area or topic. The groups of most relevance for this workshop in terms of providing actual data are those of CAFF, the Arctic Monitoring and Assessment Programme (AMAP), and Protection of the Arctic Marine Environment (PAME). Through these groups, a broad range of monitoring and assessment activites are conducted, resulting in a diverse range of data and information relevant to the Arctic EBSA process. Mr. Barry showed the boundary of the area covered by CAFF to provide an indication of the area covered by working group activities. Mr. Barry outlined the two monitoring programmes within the Arctic Council: the Circumpolar Biodiversity Monitoring Programme (CBMP) and the trends and effects monitoring programme. Of particular relevance is the CBMP marine plan, which is currently being implemented and will produce the first report on the state of the marine biodiversity in 2016. This will integrate existing circumpolar monitoring data sets and models to improve the detection and understanding of changes in Arctic marine biodiversity, and inform policy and management responses to these changes. He also noted a number of recently released assessment reports of relevance, including the Arctic Biodiversity Assessment (ABA). Involving more than 250 scientists, this report contains the best available science, informed by traditional ecological knowledge, on the status and trends of Arctic biodiversity and accompanying policy recommendations for biodiversity conservation, which will be critical in guiding the development of Arctic Council activities in the years to come. Information from the ABA has fed into the Arctic EBSA process. Finally, he introduced the Arctic Marine Shipping Assessment (AMSA) IIC report, which responded to the call for the Arctic Council "to identify areas of heightened ecological and cultural significance in light of changing climate conditions and increasing multiple marine uses, and where appropriate, to encourage the implementation of measures to protect these areas from the impacts of Arctic marine shipping". The report identifies 95 areas across each of 16 Arctic large marine ecosystems (LMEs), covering 12 million $km^2$ — more than half the total ice-covered area of the marine Arctic. These areas were selected on the basis of their ecological importance to fish, birds and/or mammals. This report will help inform the scientific basis for consideration of protection measures, including the need for specially designated Arctic marine areas as follow-up to AMSA recommendation IID.

***Arctic Marine Shipping Assessment (AMSA) IID report (by Anita Mäkinen, Finland)***

Ms. Anita Mäkinen briefly introduced the Arctic Marine Shipping Assessment's (AMSA) II D report on Specially Designated Marine Areas. This report, which follows up recommendation II(C) from the AMSA study, explores the need for internationally designated areas in the high seas area of the Arctic Ocean (beyond the 200 nautical mile exclusive economic zone) that warrant protection from the risks posed by international shipping activities. According to the report, the most feasible option may be to establish a "core sea ice area" as a sanctuary for unique and vulnerable Arctic high seas ecosystems and species, and to protect this through a Particularly Sensitive Sea Area (PSSA) designation by the International Maritime Organization (IMO), with areas to be avoided as an Associated Protective Measure (APM). This option ensures the protection of an increasingly important core area, but will likely not impede movement on the high seas. She also made reference to document MEPC 66/INF.6 of the Marine

Environment Protection Committee (MEPC), on "Ecologically and biologically significant marine areas (EBSAs)", which was submitted by the International Maritime Organization Secretariat to the upcoming meeting of its Marine Environment Protection Committee (MEPC), under agenda item 9: Identification and Protection of Special Areas and Particularly Sensitive Sea Areas.

***Information on areas meeting the CBD EBSA scientific criteria: North-East Atlantic (by Emily Corcoran, OSPAR Commission Secretariat)***

Ms. Corcoran updated the meeting on the joint OSPAR/NEAFC (Convention for the Protection of the Marine Environment of the North-East Atlantic / North East Atlantic Fisheries Commission) process to describe areas meeting the CBD EBSA criteria being undertaken for the North-East Atlantic region (as noted in CBD decision XI/17). She informed the workshop that this process has not yet concluded, and that relevant information from OSPAR/NEAFC's ongoing process was made available to the workshop participants, without prejudice to the workshop's deliberations on the extent of the area under consideration. The information provided to the workshop covers two areas that had been considered and are within the Arctic region of the OSPAR maritime area / NEAFC regulatory area.

***WWF-Russia's work on important marine areas (by Polina Zhbanova, WWF-Russia)***

Ms. Zhbanova outlined key activities of WWF's work in the marine areas of the Arctic that are relevant to the EBSA process. These include identification of sensitive/important marine areas; support to marine environmental research; development of spatial management tools; support to establishing marine protected areas; and identification and mitigation of threats to the marine environment. She explained the WWF-driven processes for identifying priority areas for biodiversity conservation in the Barents and Bering Seas, and provided a description of the Last Ice Area project. Several examples of marine environmental research were introduced, in particular the *Atlas of Marine and Coastal Biodiversity in the Russian Arctic*, and marine mammal research, monitoring and management. The spatial management tools RACER and ArcGIS were presented, and examples were provided of their practical use for the development of an integrated management plan for the Barents Sea, development of marine protected area proposals and methodology for vulnerability assessment.

***Traditional knowledge relating to Arctic marine species and habitats (by Marjo Vierros, United Nations University-IAS)***

Ms. Vierros's presentation focused on traditional knowledge related to Arctic marine species and habitats. She recalled paragraphs 23 and 24 of CBD decision XI/17 on the inclusion of relevant traditional knowledge in the EBSA process, as well as the use of existing CBD guidance on the approval and involvement of traditional knowledge holders in future descriptions of areas that meet EBSA criteria. She mentioned that there was still much work to be done to address this decision, and to consider how best to incorporate traditional knowledge into the EBSA process. The Arctic has rich cultural diversity and associated traditional knowledge acquired by indigenous peoples due to their long history of subsistence on the land and sea, and thus consideration of traditional knowledge was particularly relevant to this workshop. She then introduced a document submitted by the United Nations University Traditional Knowledge Initiative, which provides a compilation of published information about traditional knowledge of marine species such as bowhead and beluga whales, polar bears, walrus and fishes; information related to oceanography, marine habitats and climate change; and information related to human uses and culturally significant areas. She noted that this information is far from complete, given that most traditional knowledge is not published, and that what exists is fragmented and often difficult to access. She invited workshop participants to use the compiled information in their EBSA descriptions, as relevant. She also invited the participants to add any missing references to the list.

***Important Marine Mammal Areas (IMMAs): the need for a systematic and balanced approach for compiling and delivering marine mammal information for spatial management processes such as ecologically or biologically significant areas (EBSAs) (by Michael Tetley, GOBI)***

In his presentation, Mr. Tetley explained that data on the distribution, abundance and habitat use of highly migratory and mobile species, particularly marine mammals, is often difficult to obtain and employ in the context of large-scale spatial conservation strategies and initiatives, due to its widespread and disparate nature. At the Second International Conference on Marine Mammal Protected Areas (ICMMPA2, November 2011) and at the International Marine Protected Area Congress (IMPAC3, October 2013), the need for a standardized tool to assist with the compilation, delivery and use of marine mammal information was recognized. If developed, such a tool would need to complement and be comparative to other international processes, such as on Important Bird Areas (IBAs), Key Biodiversity Areas (KBAs) and ecologically or biologically significant areas (EBSAs). He explained that a process for developing Important Marine Mammal Areas (IMMAs), therefore, is currently being pursued, led by the IUCN Joint SSC-WCPA Marine Mammal Protected Area Task Force, with a plan to test criteria at the ICMMPA3 meeting in November 2014. Contributing to this effort to refine IMMAs, a meta-analysis of marine mammal information was conducted for the Arctic region on published range, presence and density estimates, compiled from a list of ~300 publications available. This information was further compared to cetacean species' range and richness estimates using published IUCN range maps and expert-reviewed *Relative Environmental Suitability* outputs from AquaMaps. Furthermore, a preliminary gap analysis was conducted to determine the features and areas already proposed via previous workshops applying EBSA criteria in this region (e.g. OSPAR/NEAFC workshop, IUCN/NRDC workshop) and additional areas for cetacean features not previously assessed (e.g., subarctic whale species). This assessment has led to the description of 19 areas that contain evidence for marine mammals, thereby contributing additional data to this workshop.

***Regional overview of biogeographic information on open ocean water and deep-sea habitats, and a proposed geographic scope of the workshop (by Pat Halpin, Jesse Cleary and Ben Donnelly, Technical Support Team)***

Mr. Halpin presented on biogeographic information that can be used by workshop participants to define the geographic scope of by this workshop. Considerations include providing an extent contiguous with previous workshop boundaries, regions covered by concurrent national processes, and the boundaries of relevant regional bodies/programmes, such as CAFF, that are active in the Arctic region.

**<u>Agenda item 4</u>**

***Review of relevant scientific data/information/maps compiled to facilitate the description of EBSAs in the Arctic (by Pat Halpin, Jesse Cleary, and Ben Donnelly, Technical Support Team)***

Mr. Halpin's presentation reviewed the compilation of scientific data and information prepared for the workshop. The baseline data layers developed for this workshop closely follow the data types prepared for previous EBSA workshops, to provide consistency between regional efforts, along with many data specific to the Arctic region. More than 75 data layers were prepared for this workshop. The presentation covered three general types of data: (1) biogeographic data, (2) biological data, and (3) physical data. The biogeographic data focused on the major biogeographic classification systems (i.e., global open oceans and deep seabed habitats–GOODS; marine ecoregions of the world–MEOW; and large marine ecosystems–LMEs). The biological data layers covered a variety of data sources to include data and statistical indices compiled by the Ocean Biogeographic Information System (OBIS). The physical data layers included bathymetric and physical substrate data, oceanographic features and remotely sensed data. Specific information on the data layers is provided in detail in the pre-workshop data report (UNEP/CBD/EBSA/WS/2014/1/3).

*Annex III*

## SHARING NATIONAL EXPERIENCES IN APPLYING EBSA CRITERIA OR SIMILAR CRITERIA

1. Four Arctic States — Canada, the Kingdom of Denmark, Norway and the United States — have respective national processes for identifying significant/sensitive marine areas. Descriptions of these processes and the marine areas identified were presented at the workshop.

2. The workshop recognizes that national processes and criteria used to identify important areas within their EEZs vary among States. Participants also recognized that any areas meeting the EBSA criteria may transcend international and national borders, because of natural habitats, migration routes and/or geophysical features (e.g., coastlines, bathymetry and sea ice extent).

3. The national processes, the areas identified, and the lessons learned are presented below by the experts from respective States that did not submit areas within their EEZs to the workshop for its deliberation.

### *Canada*

4. Fisheries and Oceans Canada (DFO) has led four EBSA processes, resulting in the identification of 59 Arctic EBSAs across five bioregions (DFO 2009). The first EBSA process began in 2005, and the most recent one was completed in 2013 (Paulic 2009, DFO 2010, 2011a, and in press). During this time, the process for identifying EBSAs has developed and improved. The Canadian process uses a set of criteria that are closely related to the CBD EBSA criteria (DFO 2004, 2011a; figure 1 below).

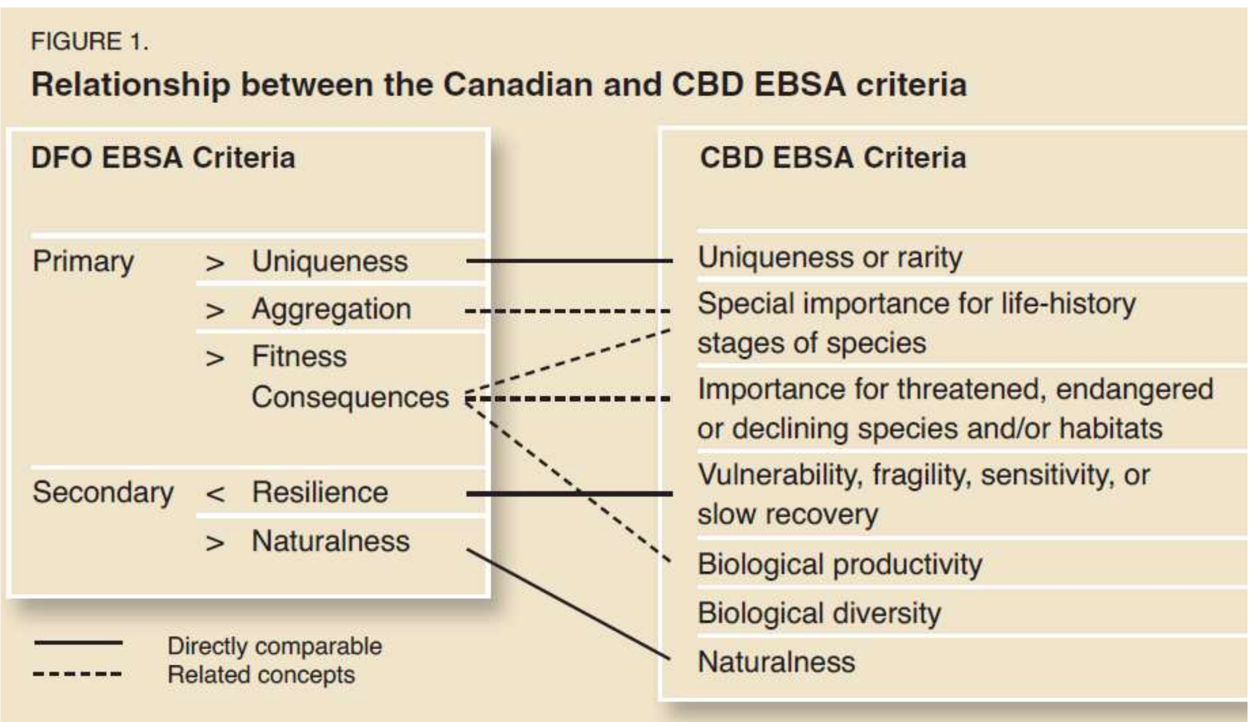



Figure 1. Relationship between the Canadian and the CBD EBSA criteria

5. Within the DFO guidelines for identifying EBSAs, the process for selecting EBSAs in the Arctic required modification of the criteria. Due to knowledge gaps, the resilience criterion was not adequately assessed; nor was the criterion for naturalness used, given that the majority of this region has not been significantly perturbed by human activity and hence the criterion did not differentiate areas within the larger region. The process takes a layering and Delphic approach. The layering gathers data from peer-

reviewed publications, technical documents and expert opinions that span both scientific and traditional ecological knowledge data sources. The Delphic approach is part of the national advisory process described below. Following the EBSA processes, strategies were developed to deal with challenges unique to the Arctic. Arctic EBSAs have been prioritized based on their global and national significance (DFO 2011a).

*Peer review and publication process of Canadian EBSAs*

6. The process of identifying EBSAs and publishing these data follow the Canadian Science Advisory Secretariat (CSAS) process for peer review (described in detail: http://www.dfo-mpo.gc.ca/csas-sccs/process-processus/process-processus-eng.htm). Briefly, the process brings together experts to a formal peer-review meeting that reviews proposed research documents; in these cases the documents included information on particular data layers, or on proposed EBSAs and their supporting data layers. Experts include anyone who is a key knowledge holder. This can include participants from the government, academia, industry, community or non-governmental organizations, however the experts do not represent the interests of their affiliated organizations. The peer review follows a rigorous process that results in an advisory document, a proceedings document detailing the meeting process and one or more supporting research documents to the advisory document. At the end of the peer review, publications are released on the CSAS website.

*Including traditional ecological knowledge in the EBSA process*

7. In all four EBSA processes, Canada used several means to include traditional ecological knowledge (TEK) in the identification of EBSAs. As the working draft EBSA document and supporting data layers were gathered, all pertinent published TEK papers and reports (e.g., community conservation plans such as: http://www.eirb.ca/pdf/ccp/Inuvik_CCP.pdf) were reviewed and used as valid data in the same manner that published scientific literature was reviewed (Paulic et al., 2009). In some cases further TEK data was gathered from community experts/knowledge holders to create additional data layers for review (Paulic et al., 2009, Hartwig 2009). In one case (Foxe Basin) EBSAs were finalized following a two-stage review process under CSAS; the first gathered scientific data to propose EBSAs and the second built on these layers and incorporated TEK gathered at a formal workshop to finalize the identification and selection of EBSAs (DFO 2010). Therefore, both published TEK data and knowledge derived directly from the holders of TEK are included in the EBSA process as data layers. The recent process to identify EBSAs in Nunavut used published TEK data and did not hold separate workshops to gather additional layers (Cobb 2011, DFO 2011a). The process to finalize the selection of EBSAs included Inuit representatives, however it was noted that more detailed knowledge was held by Inuit and would add to further refine boundaries of EBSAs. Once EBSAs were published as part of the formal CSAS process, they were presented to all communities for comment.

*Strategies and lessons learned*

8. The challenge of identifying EBSAs in the Arctic resulted in the modification of the process and associated output products that can guide future consideration for the identification of EBSAs in other Arctic regions. The two significant challenges identified during the EBSA process were the data deficiency for much of the region and the extremely high variability in the region (i.e., annually and seasonally), both of which hindered ability to draw hard boundaries for EBSAs. These two challenges cascaded on one another because the physical habitat features are typically key supporting habitats for high biodiversity and productivity. For example, marginal ice zones, polynyas and upwellings were often associated with high productivity and, in the absence of biological data, they were identified as key underlying features. The following approaches and output products resulted:

1) The layering approach began with an evaluation of the physical habitat features followed by the biological (i.e., bathymetry, sea ice features, oceanography, aggregation of species, migratory paths). This approach helped to fill data gaps in the biological realm with physical data, which is more available.

2) To address the highly seasonal and annual variability of features such as marginal ice zones, EBSA boundaries captured the maximum extents of the feature (e.g., Lancaster Sound) but the dynamic nature of the boundary is demonstrated with special symbols on the maps.

3) The importance of the EBSA criteria table was elevated relative to that of EBSA boundaries. The table served to highlight the key features of the EBSA warranting attention. As such it is advised that clients or managers considering management tools for the EBSA request a revisit of boundaries and how they define and incorporate key features.

4) The EBSA criteria table was modified to include more detailed information about the EBSAs to assist with interpretation of the feature(s). Seasonality and seasonal variability were captured in descriptions within criteria, and the following columns were added: Physical feature, rare/endangered species, level of confidence and heterogeneity.

5) An approach to address data deficiencies included a precautionary approach. At times the use of the precautionary approach together with high variability can result in apparently large boundaries, thus again highlighting the need for the user to understand the value of the criteria and feature defining the EBSA.

9. Finally, EBSAs in the western Arctic bioregion were re-evaluated to address new data collected in this region. While the outcomes did not significantly differ from the first EBSA iteration, the supporting table and criteria were much more detailed and rich, thereby providing additional information on which to base management decisions. Note that the re-evaluation focused on addressing and incorporating the new scientific data available and did not incorporate any additional TEK data for the area. It was proposed that communities consider an approach or analysis of new TEK data for the EBSA process. This is a significant undertaking that requires capacity not readily available at this time.

***Kingdom of Denmark***

*Valuable and vulnerable Arctic marine areas in Greenland*

10. Over the past decade the marine environment around Greenland (the EEZ of the rest of the Kingdom of Denmark is not addressed in this report) has been evaluated to identify marine areas and coastlines vulnerable to oil spills. This includes key habitats, migration routes and the population size and ecology of sensitive species and resources in Greenland. These investigations have resulted in a number of strategic environmental impact assessments (SEIAs) for hydrocarbon exploration and exploitation activities (Boertmann & Mosbech 2011, Boertmann et al. 2013, Boertmann. & Mosbech 2011, Frederiksen et al. 2012, Merkel et al. 2012). The SEIAs are conducted for the Greenland Bureau of Minerals and Petroleum by scientific environmental institutions (Danish Centre for Environment and Energy of Aarhus University, formerly the Danish National Environmental Research Institute–NERI; and the Greenland Institute of Natural Resources). The SEIAs build on peer-reviewed scientific literature and supplementary scientific studies.

11. In recent years these SEIAs have been used as platforms for different initiatives aiming to identify valuable ecosystems and biodiversity areas. Two recent parallel processes that build on the SEIAs have been conducted to identify ecologically valuable and sensitive marine areas around Greenland. The identification was based on IMO's Criteria for Particular Sensitive Sea Areas (PSSA) (Christensen et al. 2012; Mosbech, Christensen & Falk in AMAP/CAFF/SDWG 2013 – the AMSA II C report). A comparison between the 11 criteria for designating PSSAs with the EBSA criteria demonstrates that they are broadly similar (Skjoldal and Taropova 2010 & AMAP/CAFF/SDWG 2013).

12. The two processes mentioned above showed that most of the coastal and offshore waters around Greenland host sensitive marine resources at least part of the year. Twelve areas were identified as meeting the PSSA criteria and could be ranked in four priority categories. Half of the areas meet all 11 PSSA criteria. Within each area, particularly critical "core areas" are identified based on regular seasonal hotspots, mainly for sea mammals and seabirds (breeding or staging/moulting) combined with

information on areas mapped as sensitive to oil spills. Based on the characteristics, a priority system was established to rank the areas. Two areas – the North Water Polynya and Disko Bay/Store Hellefiskebanke – stand out, and are ranked priority 1. Four areas are ranked priority 2, three areas are ranked priority 3 and three areas are ranked priority 4. The outcome of the assessment is given in table 1 below. In addition, the table also lists areas proposed as EBSAs or "Super EBSAs" by IUCN/NRDC (2010) in their interpretation of the CBD criteria.

13. The Inuit Circumpolar Council–Greenland (ICC) submitted to this CBD workshop a proposal for including the North Water Polynya as a transnational EBSA, although this submission was not considered by the workshop. The ICC selection is based on a preceding workshop with Greenlandic and Canadian participation, including TEK as well as scientific inputs (see annex VI and its appendix).

14. In June 2010, an Arctic Environment Ministers meeting was held in Ilulissat, Greenland, with the Danish Minister for the Environment and the Member of Naalakkersuisut (Greenland Government) for the Ministry of Environment and Nature. The Kingdom of Denmark subsequently started work on identifying vulnerable marine areas and is looking at ways to protect them against the effects of shipping (Kingdom of Denmark Strategy for the Arctic 2011–2020). It was decided that six of the 12 areas identified in the AMSA IIC process and in Christensen et al. 2012 will be investigated more closely and that this work will initially focus on three high-priority fragile marine areas, namely:

(a) North Water Polynya (North-western Greenland);

(b) Disko Bay/Store Hellefiskebanke (West Greenland); and

(c) Ittoqqortoormii (Scoresby Sound) and surrounding areas (East Greenland).

**A**) Important areas for sea mammals; **B**) important areas for seabirds; and **C**) proposed designation of vulnerable sea areas (see number and names in table below). Within the general areas, especially important “core areas” are marked in red; however, in areas V7 and NØ4 the critical resources (e.g., whelping seals and foraging seabirds and whales) are associated with the marginal ice zone, which is highly dynamic within and between years, and increasingly so due to the impacts of climate change, and designation of core areas would have to be equally dynamic – and therefore no core areas are suggested here. Area V7 includes international waters.

Numbers refer to Table 1, where the 12 areas are prioritized in four categories: Priority 1: **red;** Priority 2: **orange;** Priority 3: **blue;** and Priority 4: **green**.

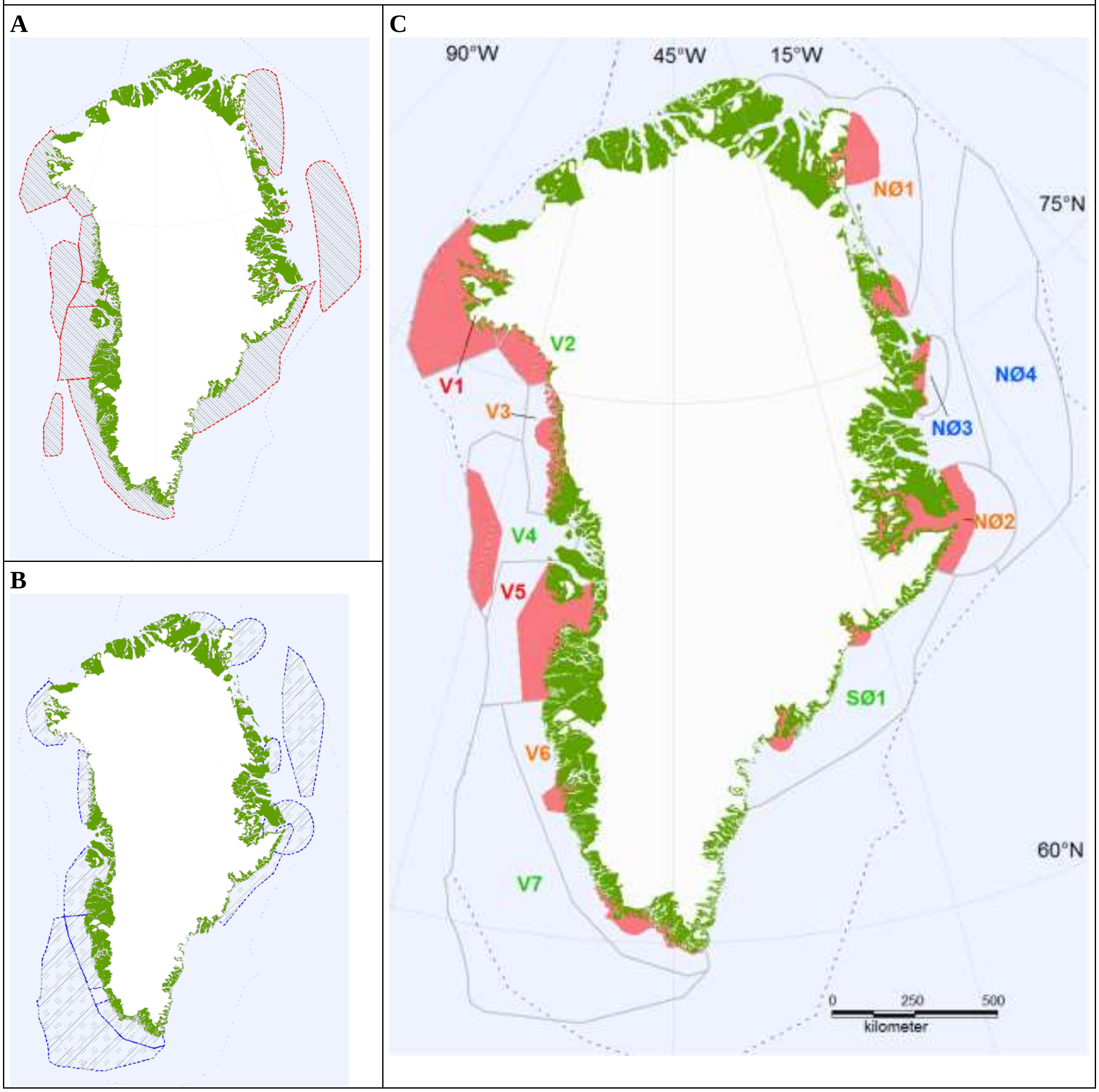



Figure 2. Ecologically valuable and sensitive marine areas around Greenland, Kingdom of Denmark. Figure from Christensen et al. 2012.

Table 1. Overview of sensitive marine areas in Greenlandic waters ranked as priority 1-4 (source: Christensen et al. 2012).

Overview of sensitive marine areas in Greenlandic waters with an overall "Priority" (in four categories, right column) based on an assessment of the IMO criteria for Particularly Sensitive Sea Areas; for each criterion it is indicated whether the area meets the criteria "*unequivocally*" (XXX), "*substantively*" (XX) or "*in part*" (X). The blue column specifies if the area is also proposed as an ecologically or biologically significant area (EBSA) or a "super EBSA" by IUCN/NRDC in their interpretation of the CBD designation.

| **Area** | | **PSSA criteria** | | | | | | | | | | | **EBSA** | **PRIORITY** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number<br>See map | Name / description | Uniqueness / rarity | Critical habitat | Dependency | Representa-tiveness | Diversity | Productivity | Spawning / breeding grounds | Naturalness | Integrity | Fragility | Biogeographic importance | EBSA<br>Super EBSA | |
| V1 | North Water Polynya area | XXX | XXX | XXX | XXX | XX | XXX | XXX | XXX | XXX | XXX | XXX | S | 1 |
| V2 | Melville Bay | XX | XX | XX | | | | X | XXX | | XX | X | E | 3 |
| V3 | Northwest Greenland shelf and ice shear zone | X | XXX | XXX | XX | XX | X | XX | XX | X | XX | XX | E | 2 |
| V4 | Central Baffin Bay drift ice and head of Uummaannaq Fiord | | XXX | XXX | | | | | XX | | | | | 4 |
| V5 | Disko Bay and Store Hellefiskebanke | XX | XXX | XXX | XX | XXX | XXX | XX | X | XX | X | XX | S | 1 |
| V6 | Southwest Greenland shelf area | X | XXX | XX | XX | XXX | XXX | XX | X | XX | X | X | E | 2 |
| V7 | Labrador Sea drift ice and marginal ice zone | | XX | XX | | | | XX | X | | | | E | 4 |
| SØ1 | Southeast Greenland – Danmark Strait | | X | X | | | | X | X | | | | (E)* | 4 |
| NØ1 | Northeast Water Polynya and NE Greenland | XX | XX | XX | XX | X | XX | XX | XXX | XXX | X | XX | E | 2 |
| NØ2 | Scoresby Sund and surrounding waters | XX | XXX | XX | XX | XX | XX | XXX | XXX | XX | X | X | E | 2 |
| NØ3 | Sirius Water Polynya/ Young Sund (Wollaston Forland, Clavering Ø) | X | X | X | X | XX | X | XX | XXX | X | XX | | E | 3 |
| NØ4 | Southwestern Greenland Sea and drift ice | | XX | XXX | | X | XX | XXX | XXX | | XX | | E | 3 |

***Norway***

*Management plans for valuable and vulnerable areas in Norwegian waters*

15. In the inaugural declaration of the Norwegian Government that came into force in 2001, ecosystem-based plans for all Norwegian Sea areas were declared. Within the area of the plans, the foundation was built for the integrated management of all human activities in order to ensure the continued health and safety of the entire marine ecosystem and the human communities dependent on them. The management plan for the Barents Sea and Lofoten area was set in place in 2006, for the Norwegian Sea in 2009 and for the North Sea and Skagerrak in 2013. The plans are revised every four to five years to take into account new knowledge and changes in the ecosystem or human activities.

16. In the management plans several areas are identified as particularly valuable and vulnerable. Criteria for selecting valuable areas were:

- Oceanographically/topographically special areas (e.g., fronts, strong currents, fjords);
- Important areas for life history (e.g., spawning/birthing/breeding grounds, drifting paths/migrating routes, feeding grounds, wintering grounds, moulting areas);
- Other criteria (key areas for endangered or vulnerable species or species for which Norway has a special responsibility or habitats for internationally or nationally endangered or vulnerable populations of certain species all year round or at specific times of the year).

17. Vulnerability was assessed with respect to specific environmental pressures such as oil pollution, fluctuation in food supply and physical impact within the plan area. When assessing vulnerability, the type of impact, duration and possible effects need to be considered. Differentiating between natural and human-induced pressures on the environment can be difficult. Furthermore, an area is usually not equally vulnerable all year round, and all species in an area will not be equally vulnerable to a specific environmental pressure. The most vulnerable areas were the particularly valuable areas—spawning and egg-laying grounds for fish, larva grounds for fish, breeding, feeding, moulting and wintering grounds for some animals and a few others. Negative pressures in these areas will in some cases affect a large proportion of a population or a large proportion of the ecosystem and might persist for many years.

*Svalbard*

18. Norway has proposed the marine part of seven national parks and four nature reserves in Svalbard as OSPAR Marine Protected Areas. The aim of designating these areas as OSPAR MPAs reflects that of the national regulation and also aims to protect and conserve several species and habitats on the OSPAR list in a part of the OSPAR maritime area not presently covered by existing OSPAR MPAs.

*Mainland Norway*

19. In addition, a network of smaller MPAs will be established along the coast of Norway, in order to maintain biodiversity and keep certain areas more or less undisturbed to facilitate research and monitoring. A plan for MPAs has been drawn up, but the selection of areas has not yet been finalized.

***United States of America***

20. The United States of America have several processes relating to the application of the scientific criteria for the identification of ecologically or biologically sensitive areas in the Arctic. In all cases scientific information on the locations of habitats supporting feeding, breeding, migration and permanent residency of individual species and of related assemblages of species is used to delineate areas within which the species may warrant exceptional protection. The species that warrant exceptional protection are of two types: potentially commercially exploitable populations and threatened, endangered or declining species. For example, in the case of whales, biologically important areas have been identified based on observations of feeding, breeding and migration in the US Arctic. Another process for defining ecologically, biologically and culturally sensitive areas in the United States is the establishment of marine areas that protect a variety of critically important habitats and species of concern. Two Arctic examples are the national wildlife refuges and specially restricted areas within the US fishery conservation zone

(EEZ). Finally, five biological hotspots with high levels of benthic productivity and/or species diversity have been designated in the Arctic to serve as marine observatories, where monitoring provides a method of tracking the effects of climate change on both the benthic and pelagic species assemblages.

***References for annex III***

AMAP/CAFF/SDWG, 2013. Identification of Arctic marine areas of heightened ecological and cultural significance: *Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp. ISBN-978-82-7971-081-3 http://www.amap.no/documents/download/1548.

Boertmann, D. & Mosbech, A. (eds.) 2011. *Eastern Baffin Bay - A strategic environmental impact assessment of hydrocarbon activities*. Aarhus University, DCE – Danish Centre for Environment and Energy, 270 pp. - Scientific Report from DCE – Danish Centre for Environment and Energy no. 9. http://www2.dmu.dk/Pub/SR9.pdf.

Boertmann, D., Mosbech, A., Schiedek, D. & Dünweber, M. (eds.) 2013. Disko West. *A strategic environmental impact assessment of hydrocarbon activities.* Aarhus University, DCE – Danish Centre for Environment and Energy, 306 pp. Scientifi c Report from DCE – Danish Centre for Environment and Energy No. 71. http://dce2.au.dk/pub/SR71.pdf.

Boertmann, D. & Mosbech, A. (eds.) 2011. *The western Greenland Sea, a strategic environmental impact assessment of hydrocarbon activities*. Aarhus University, DCE – Danish Centre for Environment and Energy, 268 pp. - Scientific Report from DCE – Danish Centre for Environment and Energy no. 22. http://www2.dmu.dk/Pub/SR22.pdf.

Christensen, T., Falk, K., Boye, T., Ugarte, F., Boertmann, D. & Mosbech, A. (2012*). Identifikation af sårbare marine områder i den grønlandske/danske del af Arktis*. Aarhus Universitet, DCE – Nationalt Center for Miljø og Energi. 72 pp. http://www2.dmu.dk/pub/sr43.pdf.

Cobb, D.G. 2011. Identification of Ecologically and Biologically Significant Areas (EBSAs) in the Canadian Arctic. *DFO Can. Sci. Advis. Sec. Res. Doc*. 2011/070. vi + 38 p.

DFO. 2004. Identification of Ecologically and Biologically Significant Areas. *DFO Can. Sci. Advis. Sec. Ecosystem Status Rep.* 2004/006.

DFO. 2009. Development of a Framework and Principles for the Biogeographic Classification of Canadian Marine Areas. *DFO Can. Sci. Advis. Sec. Sci. Advis. Rep.* 2009/056.

DFO. 2010. Proceedings of the workshop to select Ecologically and Biologically Significant Areas (EBSA) in northern Foxe Basin, Nunavut; 29 June 2009, 10 September 2009, 19 November 2009. *DFO Can. Sci. Advis. Sec. Proceed. Ser*. 2010/037.

DFO. 2011a. Ecologically and Biologically Significant Areas – Lessons Learned. *Can. Sci. Advis. Sec. Sci. Advis. Rep.* 2011/049.

DFO. 2011b. Identification of Ecologically and Biologically Significant Areas (EBSAs) in the Canadian Arctic. DFO Can. *Sci. Advis. Sec. Sci. Advis. Rep.* 2011/055.

Frederiksen, M., Boertmann, D., Ugarte, F. & Mosbech, A. (eds) 2012. *South Greenland. A Strategic Environmental Impact Assessment of hydrocarbon activities in the Greenland sector of the Labrador Sea and the southeast Davis Strait*. Aarhus University, DCE – Danish Centre for Environment and Energy, 220 pp. Scientific Report from DCE – Danish Centre for Environment and Energy No. 23 http://www.dmu.dk/Pub/SR23.pdf.

Hartwig, L. 2009. Mapping Traditional Knowledge Related to the Identification of Ecologically and Biologically Significant Areas in the Beaufort Sea. *Can. Manuscript Rep. Fish. Aquat. Sci.* 2895: iii+25p.

Merkel, F., Boertmann, D., Mosbech, A. & Ugarte, F (eds). 2012. *The Davis Strait. A preliminary strategic environmental impact assessment of hydrocarbon activities in the eastern Davis Strait*. Aarhus University, DCE – Danish Centre for Environment and Energy, 280 pp. Scientific Report from DCE – Danish Centre for Environment and Energy No. 15. http://www.dmu.dk/Pub/SR15.pdf.

Paulic, J.E., Papst, M.H., and Cobb, D.G. 2009. Proceedings for the Identification of Ecologically and Biologically Significant Areas in the Beaufort Sea Large Ocean Management Area. Can. *Manuscr. Rep. Fish. Aquat. Sci.* 2865: ii + 46 p.

*Annex IV*

## ECOLOGICAL OR BIOLOGICAL SIGNIFICANCE OF THE ARCTIC IN A GLOBAL CONTEXT

*"Arctic biodiversity is an irreplaceable cultural, scientific, ecological, economic and spiritual asset."*
*(CAFF 2013, p. 4)*

*"The challenges facing Arctic biodiversity are interconnected, requiring comprehensive solutions and international cooperation."*
*(Arctic Biodiversity Assessment Key Finding No. 9, 2013)*

1. The Arctic hosts a globally significant array of biodiversity, and the size and nature of Arctic ecosystems make them of critical importance to the biological, chemical and physical balance of the globe (ACIA 2005).

2. The marine waters of the Arctic are unique in that they contain a deep ocean basin which until recently was almost completely covered in multi-year ice. No other area in the world has such an ice-dominated deep ocean. That property alone would make conservation of the Arctic deserve the attention of Arctic States and the rest of the world. The increasing loss of the multi-year ice places the Arctic under increasing pressure and is exerting impacts on sensitive Arctic ecosystems. These pressures and impacts emphasize the urgency of adopting effective conservation and management measures. The Arctic, as defined by CAFF, covers 32 million $km^2$, 40.6% of which is composed of marine areas. The ecosystems of this vast area exhibit substantial biodiversity, comprising more than 21,000 known species.

3. Arctic species have developed remarkable adaptations to survive both extreme cold and highly variable climatic conditions. Iconic ice-adapted species such as polar bear, bowhead whale, narwhal, and walrus, live among thousands of lesser-known species that are adapted to greater or lesser degrees to exploit the habitats created by sea ice (Eamer et al. 2013). Some species have adapted to the point where they have become ice-dependent, making their population levels vulnerable to loss of sea ice. Sea ice is a generic term for a variety of critically important Arctic marine habitats, which include ice shelves, pack ice, and the highly mobile ice edge. The sea ice complements and modifies other types of habitats, including extensive shallow ocean shelves and towering coastal cliffs (CAFF/ABA 2013).

4. In addition to supporting a diversity of ice-adapted species, Arctic habitats are also remarkable for their roles in supporting globally significant populations, including more than half of the world's shorebird species. Millions of migratory birds breed in the Arctic and then fly to every continent on Earth, contributing to global biodiversity and ecological health (ABA 2013). During the short summer breeding season, 279 species of birds arrive from all corners of the Earth[3] to take advantage of the long days and intense period of productivity. Thirty species come from as far away as South Africa, 26 from Australia and New Zealand and 22 from South America. Several species of marine mammals, including grey and humpback whales and harp and hooded seals, also join the migration (CAFF 2010).

5. Recent changes in Arctic sea-ice cover, driven by rising temperatures, have affected the timing of ice break-up in spring and freeze-up in autumn, as well as the extent and type of ice present in different areas at specific dates. Overall, multi-year ice is rapidly being replaced by first-year ice. The extent of ice is shrinking in all seasons, but especially in the summer. The Arctic Ocean is projected to be virtually ice-free in summer within 30 years, with multi-year ice persisting mainly between islands of the Canadian Arctic archipelago and in the narrow straits between Canada and Greenland (Eamer et al. 2013).

6. Changes in ocean conditions also mean that subarctic species of algae, invertebrates, fish, mammals (Kaschner et al. 2011) and birds are expanding northwards into the Arctic, while some Arctic-adapted species are losing habitat along the southern edges of their ranges. Relationships among species

[3] Except for the interior of Antarctica.

are changing, with new predation pressures and shifts in diets recorded for some animals. To what extent Arctic species will adjust to these changes is uncertain. Changes are too rapid for evolutionary adaptation, so species with inborn capacity to adjust their physiology or behaviour will fare better. Species with limited distribution, specialized feeding or breeding requirements, and/or high reliance on sea ice for part of their life cycle are particularly vulnerable (Eamer et al. 2013).

7. Humans have long been part of Arctic ecosystems, and presently the Arctic is home to more than four million people (AHDR 2009). Arctic biodiversity has been the basis for ways of life of indigenous peoples for millennia and is still a vital part of their material and spiritual existence. The CBD recognizes this link, *inter alia* in the draft plan of Action for Article 10 (c), which states that biodiversity, customary sustainable use and traditional knowledge are intrinsically linked (CBD 2013). In addition to its intrinsic worth, Arctic biodiversity also provides innumerable services and values to people.

8. Industrial exploitation of renewable and non-renewable natural resources poses special challenges in the Arctic. Currently, commercial exploitation of natural resources, including fisheries, only takes place in waters under national jurisdiction in the marginal seas surrounding the Arctic Ocean. While the Arctic Ocean was once ice-covered for most of the year, climate change has reduced ice cover, creating the potential for utilization of natural resources, including fish stocks, in the central portion of the Arctic Ocean, i.e. marine areas beyond national jurisdiction (Lin et al. 2012). The newly seasonally ice-free areas of the Arctic Ocean contain protected species such as bowhead whales (Moore et al. 2011) and fish species that may support a commercial harvest (Lin et al. 2012). Among non-renewable natural resources, the Arctic is estimated to contain a fifth of the world's remaining oil and gas reserves, the development of which is expected to increase. Already, 10% of the world's oil and 25% of the world's natural gas is produced in the Arctic, predominantly onshore, with the majority coming from the Russian Arctic (AMAP 2007).

9. The foregoing makes clear that the Arctic is a region of global significance and that what happens there will have an effect felt far beyond its extent. The description of Arctic areas meeting EBSA criteria is important and necessary because this relatively pristine environment now faces threats from increased warming, ocean acidification and increased pollutants, causing among other things erosion of sea ice, changes in weather patterns, altered natural habitats, and the opening of areas for new development (ACIA 2005). These changes will have significant consequences for marine biodiversity and biological production, as well as for indigenous peoples' subsistence use of these resources. Describing ecologically or biologically significant marine areas in the Arctic is an essential process for informing policy and management and for establishing a scientific baseline for future observations and to better inform policymaking.

10. The Arctic Council is a regional body with a long history of effective cooperation on issues related to environmental conservation and sustainable development; it provides an important forum in relation to marine conservation, monitoring and research. Data generated through Arctic Council activities provide important inputs into the EBSA process, e.g., through the Arctic Biodiversity Assessment (ABA) and the Circumpolar Biodiversity Monitoring Programme (CBMP). Specific reports, such as AMSA IIC, demonstrate the important contribution of these activities. AMSA IIC identified areas of heightened ecological and cultural significance in light of changing climate conditions and increasing incidences of multiple marine uses, and encouraged the implementation of measures to protect these areas from the impacts of Arctic marine shipping.

11. In summary, when considering the EBSA process, the Arctic is unique relative to the rest of the world's marine and coastal areas for a number of reasons, including that:

(a) It supports unique cold- and ice-adapted species, biodiversity, habitats and ecosystems (ABA 2013);

(b) The Arctic is undergoing change at a more rapid rate than other places on the globe, threatening the existence of ecosystems such as multi-year sea ice. In the past 100 years, average Arctic temperatures have increased at almost twice the average global rate (IPCC 2007);

(c) When viewed on a global scale, the region as a whole meets several of the EBSA criteria: Uniqueness, naturalness, vulnerability, fragility, sensitivity and slow recovery, which can be found at many scales throughout the Arctic;

(d) Owing to cold temperatures, breakdown processes for anthropogenic contaminants occur more slowly than in a temperate and tropical climate (AMAP 2011);

(e) The Arctic is more clearly defined as a distinct and unique geographical region than other areas where the EBSA process has been applied; and

(f) In the Arctic, there exists a challenge for indigenous peoples and Arctic States in how to include traditional knowledge in the description of areas meeting EBSA criteria, as well as how to assess and include social and cultural significance, especially when these areas cross national borders.

12. These factors justify adopting a higher baseline level of risk aversion in managing of activities in the Arctic relative to the rest of the world. The challenges in maintaining the functionality and biodiversity of Arctic ecosystems are interconnected, requiring comprehensive solutions and international cooperation (ABA 2013), hence the importance of the EBSA process as a means of drawing attention to the Arctic and helping to inform responses to the challenges it faces.

**References and additional information**

ACIA (Arctic Climate Impact Assessment). 2005. *Arctic Climate Impact Assessment*. Cambridge University Press, Cambridge, UK, 1042 pp.

AHDR (Arctic Human Development Report) 2004. Akureyri: Stefansson Arctic Institute

AMAP 2011. *Snow, Water, Ice and Permafrost in the Arctic (SWIPA); climate change and the cryosphere*. Arctic Monitoring and Assessment Programme (AMAP), Oslo.

AMAP/CAFF/SDWG, 2013. *Identification of Arctic Marine Areas of Heightened Ecological and Cultural Significance: Arctic Marine Shipping Assessment (AMSA) IIc.*

AMAP 2007. *Oil and Gas Assessment (OGA).* Arctic Monitoring and Assessment Programme (AMAP), Oslo.

CAFF (Conservation of Arctic Flora and Fauna). 2010. *Arctic Biodiversity Trends: selected indicators of change*. Conservation of Arctic Flora and Fauna, Akureyri.

CAFF (Conservation of Arctic Flora and Fauna). 2013. *Arctic Biodiversity Assessment: Report for Policy Makers*. CAFF, Akureyri, Iceland.

CAFF (Conservation of Arctic Flora and Fauna). 2013. *Arctic Biodiversity Assessment: status and trends in biodiversity*. Conservation of Arctic Flora and Fauna, Akureyri.

CBD 2013. Ad Hoc Open-ended Intersessional Working Group on Article 8(j) and related provisions (recommendation 8/2).

Eamer, J. et al. Life Linked to Ice: A guide to sea-ice-associated biodiversity in this time of rapid change. CAFF Assessment Series No. 10. Conservation of Arctic Flora and ISBN: 978-9935-431-25-7.

Intergovernmental Panel on Climate Change (IPCC). 2007. Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.).

Kaschner K, Tittensor DP, Ready J, Gerrodette T, Worm B. 2011. Current and Future Patterns of Global Marine Mammal Biodiversity. *PLoS ONE* 6(5): e19653. doi:10.1371/journal.pone.0019653.

Lin et al. 2012. Composition and distribution of fish species collected during the fourth Chinese National Arctic Research Expedition in 2010. *Polar Biology* doi: 10.3724/SP.J.1085.2012.00116.

Moore et al. 2011. *Polar Biol.* 35:475–480 DOI 10.1007/s00300-011-1086-y.

*Annex V*

## SUMMARY OF DISCUSSION ON CHALLENGES IN APPLYING EBSA CRITERIA BY FOCUSING THE WORKSHOP DISCUSSION ON MARINE AREAS BEYOND 200 NAUTICAL MILES

1. The meeting noted that decisions of past meetings of the Conference of the Parties on EBSAs, especially decision X/29, have specified a clear process for application of scientific criteria for EBSAs in marine areas. That decision does not explicitly restrict this application process to marine areas beyond national jurisdiction (ABNJ – taken as the 200 nautical mile limit). It was, however, noted that this decision was negotiated in the context of decision VIII/24, referring to the limitations on competence of the CBD in ABNJ, and also it explicitly invited Parties to apply the EBSA criteria, or similar criteria, within their national waters.

2. At the beginning of each regional EBSA workshop, participants from CBD Parties and other Governments are invited to report on outcomes of any national EBSA or EBSA-like processes within their EEZ. They are also invited to include in the workshop report the results of the application of EBSA criteria in their respective national jurisdictions. Many types of responses have been received to these invitations. In a number of cases, countries have reported that there are national processes under way or completed applying the EBSA or similar criteria, within national waters, and therefore they prefer that the workshop only take note of the scientific methodologies and approaches, and results of their national processes, and otherwise not consider areas within their national jurisdiction at the workshop. In other cases, experts from countries have described EBSAs within their own EEZs, as well as EBSAs straddling the EEZs of several countries and areas beyond national jurisdiction as prior submissions and/or during CBD's regional EBSA workshops.

3. Accordingly, and following the guidance in decisions X/29 and XI/17, and overall CBD precedents regarding national prerogatives, when so requested the regional workshops have not considered possible areas meeting EBSA criteria within national jurisdiction. This precedent was followed in the Arctic regional workshop, but the constraints it imposed created some issues.

4. One issue, as discussed under agenda item 5 of this report, is that the EBSA criteria are inherently relative (areas are compared with other areas within the region). Consequently, the application of the criteria needs to be relative to some larger scale of regional ecological properties.

5. In the workshop, some countries only presented information about *how* areas meeting EBSA criteria (or areas identified using comparable criteria) were identified as a result of their national processes and did not encourage the workshop to discuss the actual ecological properties of those areas within national jurisdiction themselves nor relative to the total Arctic area. Some potentially very important information relative to "scale" of ecological properties in the Arctic was therefore unavailable, and the discussion of the *relative* criteria was correspondingly weakened.

6. This potential distortion of application of inherently relative criteria is amplified because the 200 nautical mile limit is ecologically arbitrary, and hence the excluded information may be ecologically relevant to the application of the criteria. Many of the oceanographic and biological features reflect gradients of change over space. Ecologically arbitrary boundaries, such as territorial borders, cut these ecological and oceanographic gradients at arbitrary locations and at different places along the ecological gradients in different parts of the Arctic.

7. Life histories of many species, as well as many migratory species, cross territorial borders into ABNJ, and consideration of life history processes and ecological connectivity are also arbitrarily disconnected, if consideration of these ecological processes cannot extend into national waters. Even when areas of relatively higher ecological or biological significance in ABNJ can be identified, this is done with the knowledge that areas of equal or even greater ecological or biological significance may be located within adjacent national waters.

8. Not only is consideration of ecological processes artificially truncated when application of the EBSA criteria cannot extend into national jurisdiction, but application of knowledge systems is disrupted and artificially limited as well. This is considered in greater depth in annex VI, but it is a clear challenge to producing best possible assessments, when discussion has to avoid consideration of ecological factors within national jurisdiction. For this workshop, a consequence was that no benthic areas meeting EBSA criteria were described.

9. None of these problems are unique to the Arctic area. However, they were all prominent in most of the assessments of areas against the EBSA criteria at this workshop. This may have occurred in part because the Arctic Ocean ABNJ is fully surrounded by continental or large island land masses and associated waters within national jurisdiction. Consequently, populations and ecological processes in ABNJ have very high connectivity with those in areas within national jurisdiction, and excluding consideration of areas within national jurisdiction impedes the adequate consideration of conservation issues when evaluating areas with the EBSA criteria.

10. Moreover, the pace of change in the Arctic has been particularly rapid in recent decades due both directly to climate change and indirectly to increased access to the Arctic due to the impacts of climate change. Hence, considering the ecological processes, and the functions of sea ice in particular, there is a need to take a whole-ocean perspective to take the ongoing changes into account. The exclusion of areas within national jurisdiction from the application of the EBSA criteria constrained our ability to apply such a perspective in the assessments.

11. If effectively coordinated, the national processes to apply EBSA and EBSA-like criteria within national jurisdiction and regional CBD workshops should result in a satisfactory treatment of the ecological complexity of concern, and inclusion of knowledge systems that do not follow national borders. The need for such coordination has been recognized, and the desire and possible opportunities to improve practice are also discussed in annexes III and VI.

12. Recognizing the need for greater coordination does not reduce the challenges for this and future workshops, if such coordination has not been built into the national processes. Rather, it makes the outcomes of this workshop (and workshops held under similar conditions) depend greatly on the standards and practices of the national processes. These are standards and practices over which a CBD workshop held afterwards can exercise little influence. Hence, there is no assurance that the aggregate outcomes of a workshop for ABNJ and diverse national processes reflect common interpretations of criteria and common standards of practice for different geopolitical parts of a larger region such as the Arctic — parts whose populations and ecological processes are highly interdependent.

13. This possible diversity of practices and standards among the separate processes to apply EBSA criteria has implications for how policy and management bodies can use the results of such workshops. Even though one can assume that each national process was conducted as an expert process, the potential for inconsistences among outputs of the several independent processes could result in fragmentation of the scientific baseline, with potential implications for future use and policy considerations. This fragmentation of ecologically or biologically significant areas may make it more difficult for relevant competent authorities who wish to use the products to design appropriate management approaches. In addition, the level of protection provided by piecing together the results of the separate processes cannot be known well, and may not be the “enhanced protection” intended at the regional scale.

14. From the CBD’s perspective, there is another aspect to the acknowledged need for greater coordination among national and CBD regional-level processes, and with the multiple knowledge systems. If neighbouring countries do conclude that there is a need to conduct more integrated applications of EBSA and EBSA-like criteria, there needs to be a forum for such an integrated approach.

15. The CBD’s EBSA process being undertaken in a series of regional workshops already provides such a forum, where work on populations and ecological processes that cross the borders of adjacent countries can be integrated with considerations of how they may extend beyond the 200 nautical-mile

limits of countries. Consequently, these CBD regional EBSA workshops warrant consideration as a pre-existing forum for such integration and coordination of national efforts, as well as for rigorous peer review of products of its own and other processes. A dialogue is encouraged on the possible role of these CBD regional EBSA workshops relative to bi-national or multi-national processes that may be created and operate in a more *ad hoc* manner, and with regard to possibilities for peer review of products from application of EBSA and EBSA-like criteria, whether produced by national processes or by regional workshops.

*Annex VI*

## SHARING EXPERIENCES AND CHALLENGES IN INCORPORATING TRADITIONAL KNOWLEDGE IN APPLYING EBSA CRITERIA OR SIMILAR CRITERIA AND SOME SUGGESTIONS TO ADDRESS IDENTIFIED CHALLENGES

### Value of traditional knowledge

1. The CBD EBSA process can greatly benefit from the input of indigenous and local communities (ILCs), which can contribute their traditional knowledge (TK) and observations of conditions and trends in areas or populations. This input can provide information in its own right or validate and add value to existing scientific information. With its often more holistic approach, TK can also increase knowledge of environmental linkages and inform better management decisions.

### Mandate

2. In consistency with CBD article 8 (j) and Aichi Biodiversity Target 18, together with decisions IX/20, X/29 and XI/17, there is a need to ensure the full, effective and meaningful participation of indigenous and local communities and the integration of TK into the EBSA process. The International Labour Organisation Convention no. 169 (ILO C169) and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) set up an overarching framework for such participation, including the need for national consultation based on the principle of free, prior and informed consent (FPIC).

### National experiences in applying EBSA criteria or similar criteria

3. The CBD process for organizing a series of regional workshops to facilitate the description of EBSAs is complemented by national processes for applying EBSA criteria or similar criteria. Parties may submit potential areas that meet the EBSA criteria to the workshop, so that they and additional experts from other countries and organizations can discuss the proposals and complement the national processes. In the national process, it is the responsibility of relevant national authorities to engage indigenous and local communities (ILCs) in an effective and meaningful way.

4. The case of Canada provides one example of a national process (see annex III). Published TK papers and reports were reviewed and used as data supporting the identification and finalization of EBSAs within Canada’s national EEZ. Additional layers of TK data were gathered when necessary from community experts/knowledge holders at workshops. Furthermore, indigenous peoples reviewed and commented later on in the process.

### Limitations and challenges at the regional workshop on applying EBSA criteria

5. Describing transboundary areas meeting EBSA criteria, due to migrating species or dynamic features, poses a challenge in the effort to engage indigenous and local communities (ILCs) in an effective and meaningful way. This is especially the case when the Arctic indigenous peoples themselves are residents of more than one Arctic State. The nature of indigenous peoples’ organizations often reflects this reality. For example, the organizational structures of the Inuit Circumpolar Council (ICC) and the Saami Council both cross over several national borders. Likewise, the capacity and perspective that Inuit and Saami can offer is not only at national scale in nature, but also transboundary.

6. The existing practice of conducting a national process when dealing with a transboundary issue may limit its scope and overall coherence. In the process of describing transboundary areas that meet EBSA criteria, the lack of coordination can undermine the provision of important information as well as the added value that indigenous and local communities (ILCs) can contribute.

7. As an example, prior to this workshop, ICC Greenland submitted a proposal to include Pikialasorsuaq / the North Water Polynya as an area meeting EBSA criteria (see appendix to this annex). This submission by an indigenous peoples’ organization provides both the added value of an indigenous transnational view and information on the area’s socio-cultural significance (see annex VII).

8. The area is located between Canada and Greenland, Kingdom of Denmark, in northern Baffin Bay, within the EEZs of both countries. It is one of the most biologically productive areas in the Arctic due to the mixing of different water masses originating from the Atlantic and Pacific oceans, and due to the formation of an ice bridge in Kane Basin — a major determinant for the opening of the polynya. The primary production supports marine life in the surrounding areas.

9. ICC Greenland held a workshop in September 2013 with more than 20 participants, including scientists and regional Canadian and Greenlandic representatives from communities that surround Pikialarsorsuaq / the North Water Polynya. The goal was to identify common visions for the conservation of the polynya, which is important for the biological diversity and productivity of the area, as well as for surrounding indigenous communities. The Inuit hunters and fishers from each side of the bay presented and compared their TK and observations of conditions and trends in the polynya and surrounding areas, and described its social and cultural significance for their livelihoods. Oceanographic, biological and geological features of the polynya were described, supporting its ecological significance. The role of the ice bridge in the immigration of Inuit from Canada to Greenland and the continued subsistence of local communities in Canada's Eastern Arctic and north-west Greenland confirmed the historical and present value of the polynya for the communities. The information gathered from this workshop was submitted to the present workshop as a contribution from ICC Greenland.

10. Independently from this indigenous input, the national processes in Canada and the Kingdom of Denmark have come to similar conclusions regarding the ecological importance of the polynya. Although Canada and the Kingdom of Denmark did not include areas within their national jurisdictions for consideration of this workshop, they acknowledge the great value of adopting a transboundary instead of national approach and including Inuit communities from each side of Baffin Bay.

**Suggested approaches**

11. At this workshop, several challenges were noted in ensuring the full, effective and meaningful engagement of indigenous and local communities (ILCs) in the EBSA process.

12. In addition to discussing possible EBSAs in ABNJ, regional EBSA workshops can be a useful venue for experts to discuss possible transboundary EBSAs. A challenge arises if Parties do not wish to include their national EEZs in the scope of the workshop. In such cases, transboundary EBSAs cannot be considered by the workshop. This challenge could be addressed if Parties were to allow their national EEZs to be included within the scope of the workshop, or at least allow for consideration of transboundary EBSAs within their national EEZs for this purpose.

13. Another challenge is the lack of capacity of indigenous peoples' organizations and institutions to participate in CBD's EBSA process being undertaken through a series of regional workshops or to conduct their own processes for identifying EBSAs. In COP paragraph 22 of decision XI/17, the reference to training and capacity-building and other activities related to EBSAs for indigenous and local communities (ILCs) as appropriate should not be interpreted only to apply to developing countries and to countries with economies in transition, but also to ILCs in developed countries.

14. In this context, it should be emphasized that there is no "one size fits all" solution to ensure the participation of indigenous and local communities (ILCs), and that the approach will need to be tailored to the specific circumstances and capacities of each community. In each case, however, it is likely that more data collection and documentation are needed, as well as capacity-building support for the communities involved.

15. Some suggestions can be made to facilitate the full, effective and meaningful engagement of indigenous and local communities (ILCs) in the EBSA process. These include the following:

(a) The template for EBSA description can be improved to provide for incorporation of TK (particularly in the section related to "Assessment of the area against CBD EBSA Criteria"), in accordance with paragraph 23 of decision XI/17;

(b) Continue to ensure full and effective participation of ILCs, as appropriate, when organizing training workshops for EBSAs in all regions;

(c) Compile lessons learned from above-mentioned experiences and develop guidance and best practices on full and effective participation of indigenous and local communities (ILCs) in the EBSA process, as well as integration of TK into this process;

(d) Implement training and pilot projects to facilitate more effective participation of ILCs in the EBSA process and incorporate TK into the process.

(e) Examine the feasibility of developing linkages to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) process on “indigenous and local knowledge systems” to assess whether information and methodologies developed by IPBES may also be useful for the EBSA process; and

(f) Organize a dialogue forum between EBSA scientific experts and experts from indigenous and local communities (ILCs) at the forthcoming meeting of the Subsidiary Body on Scientific, Technical and Technological Advice prior to the twelfth meeting of the Conference of the Parties to discuss areas of collaboration in support of the activities suggested above.

16. One model of a more inclusive engagement of ILCs in international fora is the Arctic Council. Indigenous peoples’ organizations are recognized as Permanent Participants with the right to sit at the table together with the Arctic States. As one Arctic State cannot address cross-border issues on its own in a coherent manner, this solution has proved effective in providing a regional approach to relevant issues.

*Appendix to annex VI*

## Pikialasorsuaq / The North Water Polynya

### Presented by

Parnuna Egede, Inuit Circumpolar Council – Greenland, Advisor on Environmental Issues, parnuna@inuit.org, and Bjarne Lyberth, Inuit Circumpolar Council – Greenland, Executive Science Advisor, ababsi@inuit.org

### Abstract

The Pikialasorsuaq / North Water Polynya is one of the largest and most productive polynyas in the Arctic. It is located between Canada and Greenland, Kingdom of Denmark, in northern Baffin Bay. Its high productivity is linked to the mixing of different water masses originating from the Atlantic and Pacific oceans, and the formation of an ice bridge in Kane Basin — a major determinant for the opening of the polynya.

ICC Greenland held a workshop in September 2013 with Canadian and Greenlandic representatives from communities that surround the polynya, and various scientists. Inuit hunters shared traditional knowledge and observations on conditions and trends in the area, and its social, cultural and historical significance was explored. Oceanographic, biological and geological features of the polynya were presented, supporting the ecological significance of the polynya.

### Introduction

ICC Greenland held a workshop in September 2013 with over 20 participants, including regional Canadian and Greenlandic representatives and scientists from communities that surround Pikialarsorsuaq / the North Water Polynya.

The goal was to identify common visions for the conservation of this area, which supports a high level of biological diversity and productivity and is important for the indigenous and local communities (ILCs) around the area.

Hunters from north-western Greenland (Kingdom of Denmark) and northern Baffin Island and Grise Fiord (Canada) shared their traditional knowledge and described observed changes in sea ice, snow conditions, and distribution and behaviour of marine mammals. They also noted that new species or subspecies have been recognized around Pikialasorsuaq during recent years.

### Location

The North Water Polynya is located between Greenland, Kingdom of Denmark, and Canada, in the region of Smith Sound and Nares Strait in northern Baffin Bay, within the EEZs of both countries. The polynya is one of the primary connections between the Arctic Ocean and the North Atlantic Ocean.

The polynya is located roughly between 76°N and 79°N, and between 70°W and 80°W.

### Feature description of the proposed area

While leading polar scientists have focused on the North Water Polynya in recent decades, the region has been recognized by Inuit for generations as a critical habitat for culturally important species. Indeed, Inuit use and occupation of north-eastern Canada and north-western Greenland are linked to the North Water Polynya and the abundance of marine life it supports. Historically, the formation of an ice bridge in Kane Basin played an important role in the immigration of Inuit from Canada to Greenland, Kingdom of Denmark, and the continued cultural link between both sides of the basin.

The mixing of different water masses originating from the Atlantic and the Pacific oceans, and their transformation along the journey in Arctic conditions, contribute to the area's extraordinarily high biological productivity. Water masses originating from the Pacific Ocean are driven through the Bering Strait, around the Polar Sea with the polar gyre and through the Fram Strait to Pikialasorsuaq as surface water (<200 m depth). Water masses from the Atlantic Ocean are driven in the deep layers through the Davis Strait along the west coast of Greenland, north towards Pikialasorsuaq. This mixing together of water masses, along with ice conditions, makes the area up to ten times more biologically productive than other areas in the Arctic.

The high biological productivity is highly dependent on the formation of an ice bridge in Kane Basin, which is a major determinant for the opening of the polynya. The ice bridge and the predominant northerly wind prevent ice floes from moving south over Pikialasorsuaq, leaving it open for light to reach the water and fuel primary production.

**Feature condition and future outlook of the proposed area**

For the North Water Polynya, several recent years show a decrease in periods of monthly mean sea ice coverage or earlier timing of ice breakup over the last years. As ice conditions are highly variable from year to year, overall trends are mostly noticeable when expressed as 10-year averages or when looking at adjacent areas in Kane Basin and Baffin Bay.

When the ice bridge is absent the productivity is much lower. Over the past two decades, the occurrence and timing of the polynya have changed significantly, affecting the timing, localization and intensity of the spring bloom.

Observations by and traditional knowledge of hunters working in and around the area will provide input and timely information about conditions and trends in the area.

**Assessment of the area against CBD EBSA criteria**

The Pikialasorsuaq / North Water polynya meets several CBD EBSA criteria, as well as the IMO's social, cultural and economic criteria on particularly sensitive sea areas (PSSAs). The polynya ranks high for five EBSA criteria and medium for two EBSA criteria; it also ranks medium for the IMO criteria, further supporting the significance of this polynya.

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness or rarity** | Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | | X |
| One of the largest and most productive polynyas in the Arctic, and globally unique with the formation of an ice bridge. | | | | | |
| **Special importance for life-history stages of species** | Areas that are required for a population to survive and thrive. | | | | X |
| Numerous species of seabirds and marine mammals use the area for feeding, moulting, migration, overwintering and breeding. For example, more than 80% of the world population of little auks depend on the area for some part of the year. | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Importance for threatened, endangered or declining species and/or habitats** | Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species. | | | X | |
| No endangered species depend on the North Water Polynya as a habitat, but several occur in the area part of the year. | | | | | |
| **Vulnerability, fragility, sensitivity, or slow recovery** | Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery. | | | | X |
| Marine mammals are quite sensitive to disturbance from increased shipping and resource development activities. Moulting seabirds are especially sensitive to oil spills. | | | | | |
| **Biological productivity** | Area containing species, populations or communities with comparatively higher natural biological productivity. | | | | X |
| It is one of the most biologically productive polynyas in the Arctic, due to mixing of different water masses and formation of an ice bridge, leading to upwelling. | | | | | |
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | | | X | |
| Numerous species of seabirds and marine mammals use the area part of the year. | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | | X |
| There is no use of living resources other than traditional hunting in the area and adjacent to it. There are no industrial activities or heavy shipping within the area itself. | | | | | |

**Sharing experiences and information applying other criteria (Optional)**

| **Other criteria** | **Description** | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **Don't know** | **Low** | **Medium** | **High** |
| *Social, cultural and economic criteria* | IMO criteria for Particularly Sensitive Sea Areas (PSSA), based on social or economic dependency, human dependency, and cultural heritage. | | | X | |
| The historical role of the ice bridge in the immigration of Inuit from Canada to Greenland and subsequent | | | | | |

movement and cultural ties between the two sides of the basin/bay.

Continued subsistence of local communities in north-eastern Canada and north-western Greenland, who rely on the marine life that the polynya supports for their livelihoods, both socially and economically.

**References**

Presentations at the Pikialasorsuaq workshop in Nuuk, September 2013. Presenters included:

Mads Ole Kristiansen, hunter, Qaanaaq, Greenland;

Qaerngaaq Nielsen, hunter, Savissivik, Greenland;

Larry Audlaluk, hunter, Grise Fiord, Nunavut, Canada;

Levi Barnabas, hunter, Arctic Bay, Nunavut, Canada;

James Simonee, hunter, Pond Inlet, Nunavut, Canada;

Dany Dumont, Université du Québec - Institut national de la recherche scientifique;

Mads Peter Heide-Jørgensen, Greenland Institute of Natural Resources, Nuuk, Greenland;

Mikkel Myrup, Greenland National Museum, Nuuk, Greenland;

Thomas Varming, Bureau of Minerals and Petroleum, Nuuk, Greenland.

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIC*. Arctic Monitoring and Assessment Programme (AMAP), Oslo.

Mads Peter Heide-Jørgensen, Louise M. Burt, Rikke Guldborg Hansen, Nynne Hjort Nielsen, Marianne Rasmussen, Sabrina Fossette and Harry Stern. 2012. The Significance of the North Water Polynya to Arctic Top Predators, *AMBIO*, 41(8), DOI 10.1007/s13280-012-0357-3.

**Maps and Figures**

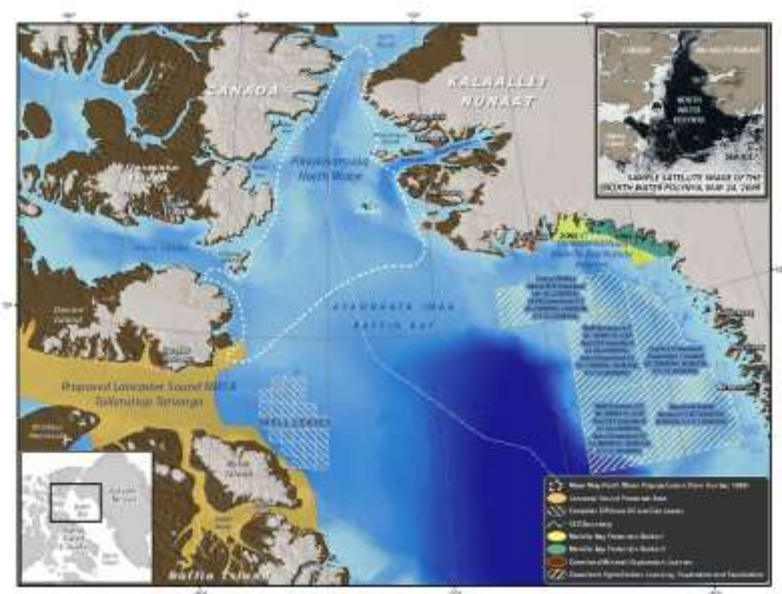



Figure 1. Map of the average outline of Pikialasorsuaq / the North Water Polynya (Oceans North Canada).

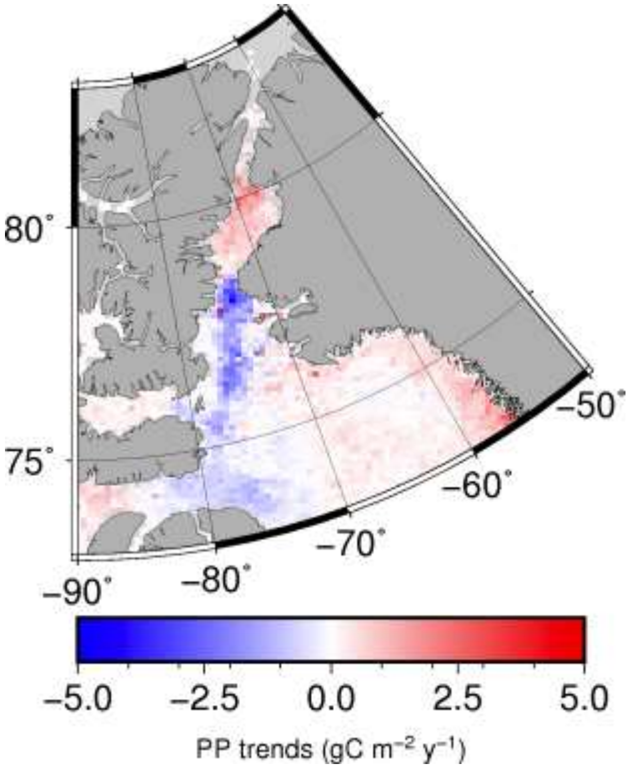



Figure 2. Trends in primary production in Pikialasorsuaq / the North Water polynya (Dumont, unpublished).

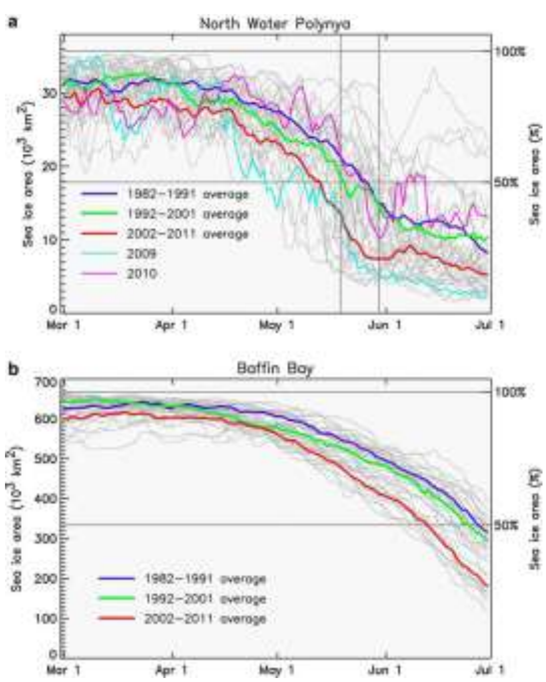



Figure 3. (a) Trends in sea ice area in Pikialasorsuaq / North Water polynya and (b) Baffin Bay during selected months with averages of several years (Heide-Jørgensen et al., 2012).

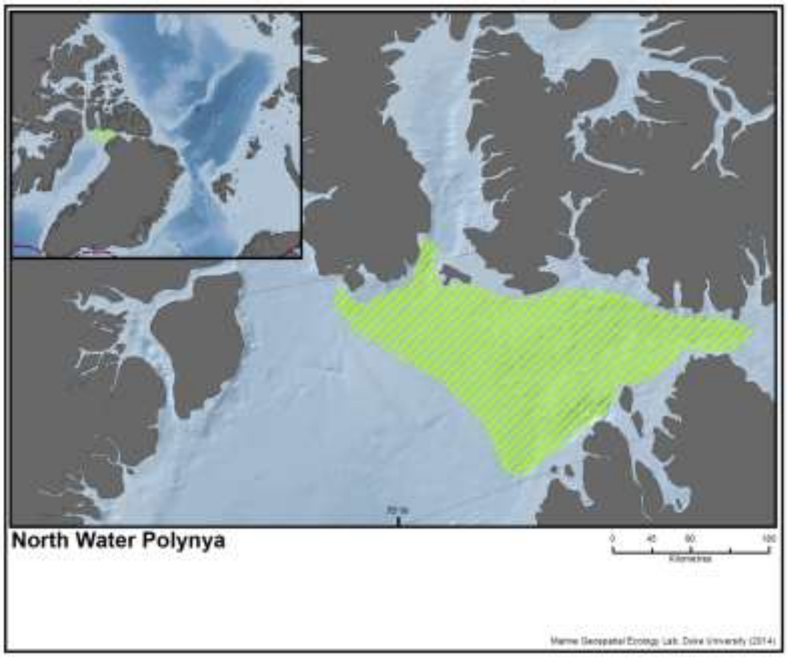



Figure 4. The North Water Polynya.

*Annex VII*

## SHARING EXPERIENCES AND CHALLENGES IN APPLYING SOCIO-CULTURAL CRITERIA AND SUGGESTIONS FOR BUILDING LINKAGE WITH THE CBD EBSA PROCESS

**Background**

1. Through decisions IX/20, X/29, and XI/17, the Conference of the Parties to the Convention on Biological Diversity has addressed the need to integrate social and cultural criteria into the description and identification of EBSAs.

2. In paragraph 27 of decision IX/20, the the Conference of the Parties called on Parties to integrate the traditional, scientific, technical and technological knowledge of indigenous and local communities, consistent with Article 8(j) of the Convention, and to ensure the integration of social and cultural criteria and other aspects for the identification of marine areas in need of protection as well as the establishment and management of marine protected areas.

3. In paragraph 47 of decision X/29, the Conference of the Parties requested the Executive Secretary to undertake, subject to availability of financial resources, a study, within a context of Article 8(j) and related provisions, to identify specific elements for integrating the traditional, scientific, technical and technological knowledge of indigenous and local communities, consistent with Article 8(j) of the Convention, and social and cultural criteria and other aspects for the application of scientific criteria in annex I to decision IX/20 for the identification of ecologically or biologically significant areas as well as the establishment and management of marine protected areas, and to make the report available at the eleventh meeting of the Conference of the Parties and transmit the findings to the relevant United Nations General Assembly processes, including the Ad Hoc Open-ended Informal Working Group.

4. Following this decision, the following report was prepared by the Secretariat of the CBD: Identifying Specific Elements for Integrating the Traditional, Scientific, Technical and Technological Knowledge of Indigenous and Local Communities, and Social and Cultural Criteria and Other Aspects for the Application of Scientific Criteria for Identification of Ecologically or Biologically Significant Areas (EBSAS) as well as the Establishment And Management of Marine Protected Areas (UNEP/CBD/SBSTTA/16/INF/10).

5. At its eleventh meeting, the Conference of the Parties welcomed this report in paragraph 23 of decision XI/17, noting that the best available scientific and technical knowledge, including relevant traditional knowledge, should be the basis for the description of areas that meet the criteria for EBSAs, that additional social and cultural information**,** developed with the full and effective participation of indigenous and local communities, may be relevant in any subsequent step of selecting conservation and management measures, and that indigenous and local communities should be included in this process, as appropriate, particularly in areas with human populations and pre-existing uses.

6. In paragraph 24 of the same decision, the Conference of the Parties invited Parties, other Governments, competent international organizations, and relevant indigenous and local communities to consider the use of the guidance on integration of traditional knowledge in the report with the approval and involvement of the holders of such knowledge, where applicable, in any future description of areas that meet the criteria for EBSAs and for the development of conservation and management measures, and report on progress in this regard to the twelfth meeting of the Conference of the Parties to the Convention.

7. In paragraph 25 of this decision, the Conference of the Parties noted that socially and culturally significant marine areas may require enhanced conservation and management measures, and that criteria for the identification of areas relevant to the conservation and sustainable use of biodiversity in need of such enhanced measures due to their social, cultural and other significance may need to be developed, with appropriate scientific and technical rationales.

8. Additionally, in paragraph 19 of the same decision, the COP requested the Executive Secretary to further refine the EBSA training manual and modules, as necessary, including further consultation with Parties and indigenous and local communities, and the development of training materials on the use of traditional knowledge.

**Limitations posed by the lack of a process for application of socio-cultural criteria**

9. As noted by the Conference of the Parties in paragraph 25 of decision XI/17 (see paragraph 7 above), criteria for the identification of areas in need of enhanced management measures due to their social and/or cultural significance may need to be developed, with appropriate scientific and technical rationales. To date, some national, regional and global processes already apply social and cultural criteria in the identification of significant areas. In the context of the Convention on Biological Diversity, there is a need to agree on a set of social and cultural criteria that can be used in conjunction with the EBSA process.

10. In some cases, an area may be ecologically or biologically significant in accordance with the current EBSA criteria but not of special social or cultural significance. In other cases, an area might be socially and/or culturally significant, and may or may not also be ecologically or biologically significant. Thus, there may be a need for two distinct categories of significant areas: one for socially and culturally significant areas and one for EBSAs. It needs to be explored whether different processes and approaches would be needed to apply the two sets of criteria. Furthermore, since some areas will be significant according to both types of criteria, there is also a need to call special attention to such areas, and, at some stage, to consider areas holistically, particularly when planning conservation and management measures.

11. The lack of adopted social and cultural criteria presents a limitation to considering the human dimension of ecosystems, in accordance with the guidance of the Conference of the Parties on the ecosystem approach. It also limits the consideration of the implications for biodiversity related to cultural and spiritual practices and traditional management systems. Reciprocally, it also limits consideration of the impacts on cultural and spiritual practices by other uses of biodiversity and institutional management systems. Establishing a linkage between culture and biodiversity is important, given that healthy and productive marine and terrestrial ecosystems are the foundation of indigenous cultures, traditions and identities.

12. It should be noted, in this context, that biodiversity in areas beyond national jurisdiction is important for indigenous peoples of the Arctic due to the close connections between coastal and offshore ecological systems. For example, ice edge ecosystems in offshore areas provide important feeding areas for fish that are utilized by indigenous peoples in their coastal areas. Similarly, whales, seals and polar bears are important for indigenous peoples, and migrate between nearshore and offshore areas.

13. According to the report of the eighth meeting of the of Ad Hoc Open-ended Intersessional Working Group on Article 8(j) and related provisions (recommendation 8/2), cultural and spiritual practices and traditional management systems are consistent with ecological values and are important in fostering the sustainable use of biological diversity. Accordingly, the cultural and spiritual values and practices of indigenous and local communities play an important role in the conservation and sustainable use of biodiversity and in transmitting its importance to the next generation. Without the opportunity to consider areas for their social and cultural values, their ecological values, and especially for both sets of values together, the linkages between the two are more difficult to make.

14. With regards to the EBSA process in the Arctic region, the lack of adopted socio-cultural criteria has prevented the workshop participants from considering available information on several types of areas that are of importance to indigenous peoples in the Arctic, such as customary use areas, areas of social and economic importance, cultural heritage sites, subsistence use areas and sacred sites.

15. In some cases, organizations or processes that apply socio-cultural criteria have sought input from indigenous peoples or organizations, but have not received it. This may be due to either lack of capacity

among indigenous peoples' institutions, or lack of understanding among scientists about how to work with indigenous peoples. Thus, capacity-building may be required for both indigenous peoples and other types of experts in this regard.

16. Social, cultural and spiritual information are of considerable importance to the conservation and sustainable use of biodiversity, as well as to the survival of indigenous peoples in the Arctic. Social and cultural considerations will not only add immediate value to the CBD EBSA process, but will also be vital for the success and long-term sustainability of the process, and the conservation and sustainable use of marine biodiversity in general.

**Recommendations for future incorporation of socio-cultural criteria**

17. It would be desirable for the CBD to agree, as a matter of priority, on a set of socio-cultural criteria to be used in conjunction with the CBD process for facilitating the description of EBSAs based on relevant criteria used in other processes, some of which have been discussed in document UNEP/CBD/SBSTTA/16/INF/10. It would also be useful for the CBD to compile information and experience on the practical application of socio-cultural criteria, and provide guidance and/or best practice for their application. All of the above may be achieved most effectively through the convening of an expert group on this topic.

18. Application of traditional knowledge (TK) may help identify areas that are socially and culturally significant. TK may also help to identify EBSAs. The template for EBSA description should provide for the inclusion of information related to TK in the description of EBSAs. Some areas identified as socially and culturally significant may not necessarily be ecologically or biologically significant, in the context of the EBSA criteria. Thus, there is a process needed to address socially and culturally significant areas on their own merit.

19. It will also be useful to learn from other processes, regional and international organizations, and national entities that already apply socio-cultural criteria. One such example is the International Maritime Organization (IMO). The IMO has considerable experience in incorporating social and cultural criteria, along with ecological criteria, in the identification of Particularly Sensitive Sea Areas (PSSAs). These experiences might be useful to consider in the CBD EBSA process.

20. The Arctic Council has produced a report titled *Identification of Arctic Marine Areas of Heightened Ecological and Cultural Significance* as a follow-up to the Arctic Marine Shipping Assessment (AMSA) recommendation II (c). The section on areas of heightened cultural significance uses the IMO PSSA criteria to identify examples of such areas in the Arctic. One case therein illustrates that the coastal fisheries are mainly conducted by the local fishing fleet, whose activities are limited by the fishing vessels' range and fisheries' settlement patterns. The seascape made visible through the mapping of fishing activities can be compared to a social landscape in the marine environment. Areas identified during the process are recognized both for their biological and social values; they represent areas where the use of fish resources is of particular social and economic importance for commercial and small-scale fisheries. This process demonstrates, as a lesson learned, that areas that are socially and culturally significant also prove to be ecologically or biologically significant, and that involvement of indigenous and local communities and their knowledge also helps in the identification of EBSAs.

*Annex VIII*

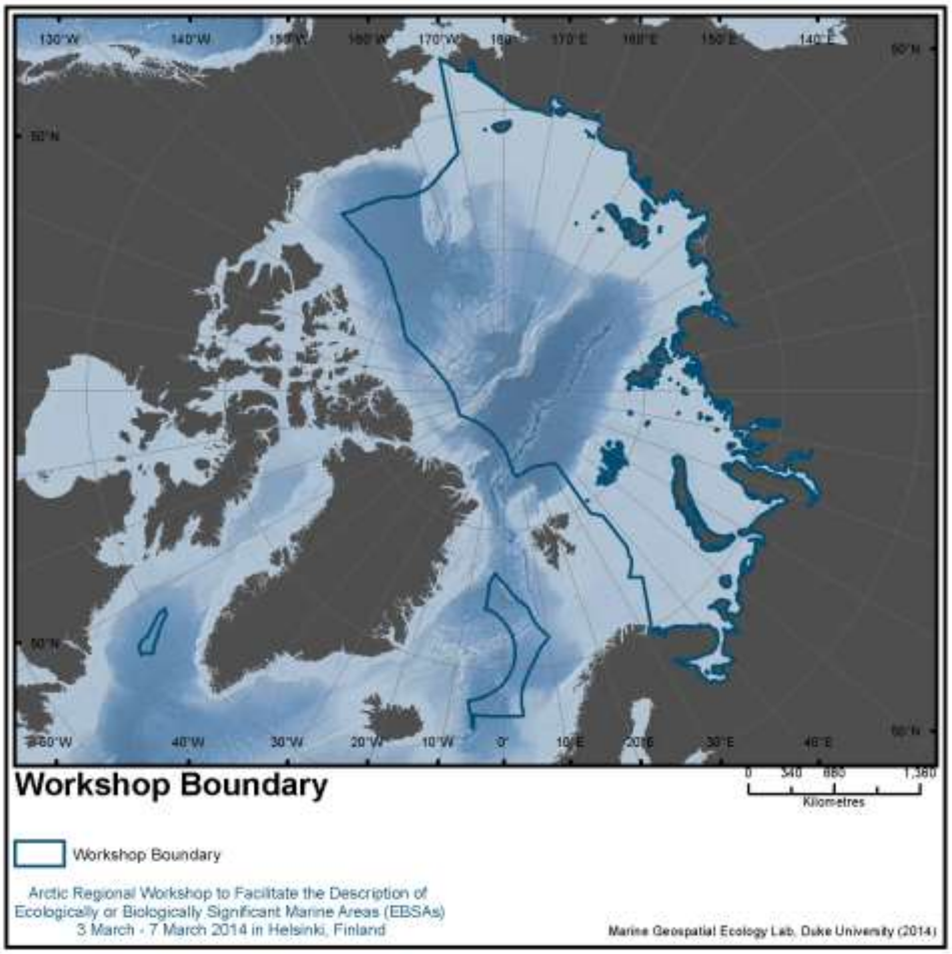
## DESCRIPTION OF AREAS MEETING THE EBSA CRITERIA IN THE ARCTIC AS AGREED BY THE WORKSHOP PLENARY

| **Area No.** | **Area Name**<br>(See the detailed description of each area in the appendix to this annex)[4] |
|---|---|
| 1 | The marginal ice zone and the seasonal ice-cover over the deep Arctic Ocean |
| 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 |
| 8 | Ob-Enisei River Mouth Area |
| 9 | Great Siberian Polynya |
| 10 | Wrangel and Gerald Shallows and Ratmanov Gyre |
| 11 | Coastal Waters of Western and Northern Chukotka |

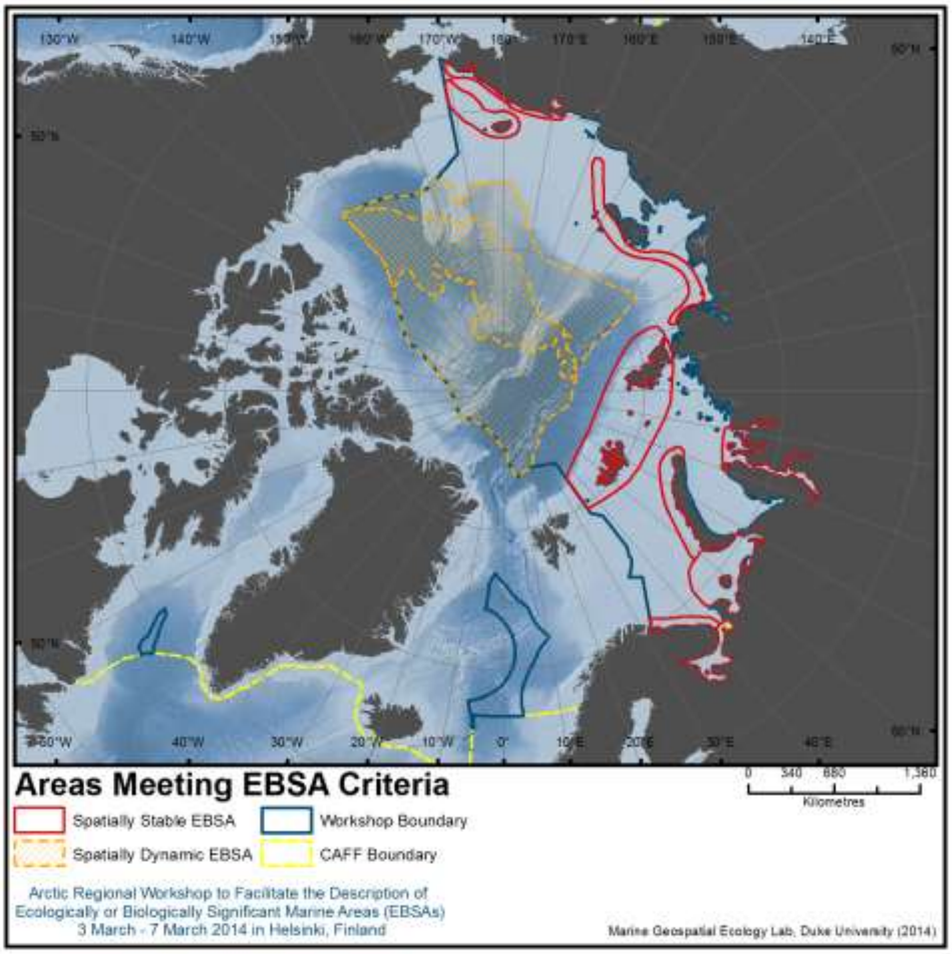
[4] The appendix to annex VIII appears at the end of this document.

*Annex IX*

## MAP OF THE WORKSHOP'S GEOGRAPHIC SCOPE AND AREAS MEETING THE EBSA CRITERIA IN THE ARCTIC AS AGREED BY THE WORKSHOP PLENARY




Map 1. Geographic scope of the workshop.




Map 2. Areas meeting the EBSA criteria in the Arctic.

*Annex X*

**SUMMARY OF THE WORKSHOP DISCUSSION ON IDENTIFICATION OF GAPS AND NEEDS FOR FURTHER ELABORATION IN DESCRIBING ECOLOGICALLY OR BIOLOGICALLY SIGNIFICANT MARINE AREAS, INCLUDING THE NEED FOR THE DEVELOPMENT OF SCIENTIFIC CAPACITY AS WELL AS FUTURE SCIENTIFIC COLLABORATION**

1. Many groups currently generate or collate data on Arctic biodiversity. This information is rarely coordinated and is often inaccessible. This workshop demonstrated the increasing demand for easily accessible, accurate and understandable information on biodiversity trends and their underlying causes. Consolidating the vast amount of disaggregated data across all Arctic subregions and biomes would facilitate access to up-to-date information on biodiversity trends and promote a deeper understanding of interrelationships at the local, regional, circumpolar and global scale. An example of progress in this regard is CAFF's Circumpolar Biodiversity Monitoring Programme (CBMP), which is working with partners across the Arctic to harmonize and enhance long-term marine monitoring efforts.

2. Arctic marine environments are experiencing, or are expected to experience, many human-induced and natural pressures from climate change, overexploitation, industrial development, contaminants, invasive alien species, tourism, disease and parasites, scientific research and commercial shipping. It is not certain how these pressures — alone and in combination — affect marine species and ecosystems because the Arctic's complexity and size make it difficult to detect and attribute changes in marine biodiversity. In addition, existing marine monitoring efforts are not connected on a circumpolar scale, which limits the ability to make effective management decisions efficiently.

3. There is a need for further development of CAFF's Arctic Biodiversity Data Service (ABDS) as a means of harmonizing and improving the accessibility of Arctic biodiversity data. Efforts such as these will contribute to more rapid detection, communication, and response to significant biodiversity-related trends and pressures affecting the circumpolar world. The ABDS will also function as a repository for the background data sets (with necessary permissions) submitted for this Arctic EBSA workshop.

**Gaps in data identified during the scientific preparation for the workshop**

4. In preparation for this workshop, an extensive data collection process was undertaken, and a data report was developed. Biological, physical, oceanographic and physiographic data were collected, as were data from global archives on biogeographic information. In addition, more specialized data sets and analyses specific to the Arctic region were also identified. Throughout this data collection process, a number of general data gaps were identified.

5. The most prominent data gaps involve the lack of consistent, region-wide surveys of biological data on marine species across taxa and trophic groups. Comparable surveys of biological data in the marine Arctic are sparse and often extremely limited in spatial extent and temporal representation. These data gaps are especially noticeable in ice-covered areas and winter seasons. Biological data are also often restricted to surface or shallow-water regions in and around coastal areas.

6. While information on ice cover, ocean productivity and other broad indices derived from remote sensing is fairly common, field validation data continues to be sparse across the region. Baseline data on species abundance and representation is especially difficult to accumulate at the regional scale. Indicators of species and ecosystem health are also lacking at the regional scale.

7. Questions were raised as to usability of climatological data sets prepared for the workshop. These are global models that were utilized in previous EBSA workshops and were not developed with the Arctic in mind. Therefore projections for the Arctic based on these data sets are distorted or visually unfamiliar. This problem could be addressed by focusing on specific areas and incorporating more relevant data sources.

8. Available additional data on species (mammals, birds and benthos) were reviewed during the workshop, with consideration given to the (1) North-East Atlantic subarctic; (2) migratory areas in the Chukchi Sea for mobile species in areas beyond national jurisdiction; (3) benthic faunal assemblages; and (4) birds. The following issues were identified:

(a) Further tagging and collation of data are needed in order to strengthen available data sets when considering possible areas meeting EBSA criteria in areas such as the Chukchi Sea cetacean population (Luque & Ferguson, 2010);

(b) Benthic sampling is needed in a broader range of areas in order to build upon and consolidate existing data;

(c) Data gaps for benthic fauna are primarily due to challenging sampling logistics (e.g., the northern section of the Lomonosov Ridge). Particular sampling gaps to note include the Arctic deep-sea invertebrate benthos (>3000 m) on the eastern side of the Canada Basin and in the mega-fauna fraction (Bluhm et al., 2011, p. 104);

(d) Within the Arctic, marine Important Bird Areas (IBAs) have only been identified comprehensively for Alaska. The network of sites for the rest of the Arctic remains incomplete. The work undertaken by Audubon Alaska to identify marine IBAs can be used as a model for the rest of the region, although the value of tracking data should be assessed in future updates. Ongoing work in the Russian Far East (by Birds Russia) is due to deliver a new assessment of seabird breeding colonies and associated foraging areas that qualify as IBAs in 2015. Ongoing work in Iceland (Fuglavernd) is identifying new marine IBAs around seabird breeding colonies, and a first assessment is expected to be completed in 2014. Additional information, which may support new marine IBAs in Greenland, has been compiled but has not yet been integrated into BirdLife databases (Christiansen et al., 2012). Work to identify marine IBAs is under way in Arctic areas of Canada, Norway and western Russia, although substantial information about seabirds exists in all these areas; and

(e) A number of known seabird, cetacean and pinniped-tracking data sets were not available for this workshop. The compilation of such data sets would contribute to a more complete assessment of the migration routes and movements of mobile species.

**Traditional knowledge**

9. The workshop acknowledged that there was a need to find a way to incorporate TK in the description and identification of EBSAs. The Conference of the Parties addressed this need in decisions IX/20, X/29, and XI/17, however, detailed guidance is yet to be provided on how to do so through the regional workshops and how the CBD EBSA process at both national and regional levels should be undertaken in conjunction with application of social and cultural criteria, with the full and effective participation of indigenous and local communities (ILCs), in addition to the application of ecological and biological criteria (refer to annexes VI and VII, which address traditional knowledge and socio-cultural criteria, respectively).

**Gaps in data relevant to specific areas in the Central Arctic Ocean beyond national jurisdiction**

10. Work conducted during the International Polar Year (IPY) (2007-2008) has greatly increased the body of knowledge on subsurface physical and biological oceanography. These observations collected from icebreakers have refined our knowledge of Atlantic and Pacific waters in the Arctic Ocean, as well as the adjacent continental shelves. Despite this progress, significant gaps remain, including the following:

(a) Basic scientific information is lacking for much of the Arctic Ocean in areas beyond national jurisdiction. Until recently, the entire area was covered in ice year-round, which seriously limited access to the region in the past. This new seasonal ice zone requires study;

(b) Most available information reflects conditions prevalent at only certain seasons or times of the year, and very little is known about various aspects of the marine environment in winter and spring;

(c) Physical, biological and ecological information along the ice edge during the spring bloom is a particularly important gap;

(d) Differences in methodology, reporting, and language between researchers operating out of different countries pose further challenges to assembling comparable and coherent data; and

**(e)** Because of the rapid rate of change of the Arctic, ecological data sets need to be updated frequently. Some important parameters, such as phenology and seasonal distribution of species, are in particular need of updating.

**References**

Arctic Biodiversity Data Service (ABDS), Arctic Council Working Group on the Conservation of Arctic Flora and Fauna (CAFF). Available at: www.abds.is.

Bluhm, B.A., Ambrose, W.G., Bergmann, M., Clough, L.M., Gebruk, A.V., Hasemann, C., Iken, K., Klages, M., MacDonald, I.R., Renaud, P.E., Schewe, I., Soltwedel, T. and Wlodarska-Kowalczuk, M. 2011. Diversity of the Arctic deep-sea benthos, *Marine Biodiversity*, 41: 87-107. doi: 10.1007/s12526-010-0078-4

Christensen, T., Falk, K., Boye, T., Ugarte, F., Boertmann, D. & Mosbech, A. (2012). *Identifikation af sårbare marine områder i den grønlandske/danske del af Arktis*. Aarhus Universitet, DCE – Nationalt Centre for Miljø og Energi. 72 pp

Luque, S.P. and Ferguson, S.H. 2010. Age structure, growth, mortality, and density of belugas (*Delphinapterus leucas*) in the Canadian Arctic: responses to environment? *Polar Biology*, Vol. 33(2), pp.163-178.

*Appendix to annex VIII*

## DESCRIPTION OF AREAS MEETING THE EBSA CRITERIA IN THE ARCTIC AS AGREED BY THE WORKSHOP PLENARY

### Area No. 1: The Marginal Ice Zone and the Seasonal Ice Cover over the Deep Arctic Ocean

**Abstract**

Large areas of the basins in the central Arctic Ocean now have annual ice and are thus ice edge and seasonal ice zones with a period of open water in summer. This significant new region of ice edge/seasonal ice and seasonal open water over the deep Arctic is highly dynamic both spatially and temporally. The marginal ice zone, which results from seasonal ice cover over the deep Arctic Ocean (deeper than 500 m), is a significant and unique feature in areas beyond national jurisdiction. This kind of ice habitat is found nowhere else in the Arctic. Changes in sea ice alter the amount, timing and location of primary production, both within the ice and in the water column, with potential cascading effects throughout the ecosystem. The area is important for several endemic Arctic species. Some of the ice-related species are listed as vulnerable by IUCN, and/or listed as under threat and/or decline by OSPAR. The marginal ice zone and leads are important feeding areas for ice-associated species. Sea ice is important breeding, moulting and resting (haul-out) habitat for certain marine mammals. It is noted that, given the dynamic nature of the geographic area covered by this description, it may, depending on changes in coverage of multi-year ice/marginal ice cover, partially overlap with an area meeting the CBD EBSA criteria that was described by the joint OSPAR/NEAFC/CBD workshop in the North-East Atlantic. Following peer review by ICES, the description of this area is currently under consideration by the Contracting Parties to OSPAR and NEAFC.

**Introduction**

The marginal ice zone, which results from seasonal ice cover over the deeper (>500 m) parts of the Arctic Ocean, is a globally and regionally significant habitat and a unique feature of the area beyond national jurisdiction (figure 1). This type of habitat is found nowhere else in the Arctic.

The dramatic reduction of multi-year ice area means that large areas of the basins now have annual ice and are thus ice edges and seasonal ice zones with a period of open water in summer. This significant new region of ice edge/seasonal ice and seasonal open water over the deep Arctic is highly dynamic both spatially and temporally.

The previously very low biological production of the deep basins may change in this region as light, temperature and storminess increase and currents shift. In addition, wind-driven mixing of the ocean is more efficient over open water and over the thinner, more-mobile, seasonal ice than over multi-year ice, with the potential to increase productivity as well.

As in other areas of the Arctic, the marginal ice zone provides critical feeding habitat for a variety of ice-dependent species, including endangered species. Unlike the rest of the Arctic, however, the ice margin and the seasonal ice in the Central Arctic Ocean beyond national jurisdiction extend uniquely over deep water. This ice supports the majority of production in the stratified, low productivity waters of the region and plays a major role in contributing to the overall productivity of the region. See figure 2 for a conceptual model of the ecosystem at the marginal ice zone.

It is noted that, given the dynamic nature of the geographic area covered by this description, it may, depending on changes in coverage of multi-year ice/ marginal ice cover, overlap partially with an area meeting the CBD EBSA criteria that was described by the joint OSPAR/NEAFC/CBD workshop in the North-East Atlantic. Following peer review by the International Council for the Exploration of the Sea (ICES), the description of this area is currently under consideration by the Contracting Parties to OSPAR and NEAFC.

**Location**

This area comprises the surface ice and related water column features associated with the marginal sea ice area in waters more than 500 m deep in areas beyond national jurisdiction. The marginal ice zone, at the edge of the ice pack, is a geographically and temporally dynamic feature that moves great distances seasonally from the minimum seasonal ice margin limit in the central Arctic (~September ice minimum) to the seasonal marginal ice maximum (~March ice maximum) (see Special note for Area No.1, below). It also changes in area, shape and geographic location from year to year, due to interannual variability of the Arctic ice pack. The multi-year marginal ice range provided (September – March climatology 1972-2007) in this description has been restricted to areas beyond national jurisdiction and waters greater than 500 m deep within the described Arctic workshop region.

**Feature description of the proposed area**

There is limited information about the ecosystems of the central Arctic Ocean. There is more literature describing the shallower, coastal areas of the Arctic (although these areas are also less studied than most shallow, coastal areas at lower latitudes). Where appropriate, this description includes some information from coastal Arctic areas.

*Production and lower trophic level communities*

Ice algal communities can be divided into communities on the surface, interior and bottom of the ice (Horner et al. 1992). The surface can then be divided into melt-pond and infiltration communities, the interior into diffuse, brine-channel and band communities and the bottom into interstitial and sub-ice communities. All, except for the band community, occur in annual ice. In addition to microalgae, bacteria are an important component of the ice-algal community, but many other groups of organisms (e.g., archaea, fungi, ciliates, kinetoplastids, choanoflagellates, amoebae, heliozoans, foraminiferans and some protists that belong to no known group) also occur in these ice communities (Lizotte 2003). Poulin et al. (2010) reported a total of 1027 sympagic taxa in the Arctic (including in coastal waters).

There are known sampling biases in unicellular eucaryotes, by location (more coastal), size (more larger), and season (Poulin et al. 2010), and these biases weaken or impede assessment of patterns and trends in these taxa.

In general, there are steep gradients in temperature, salinity, light and nutrient concentrations, creating different habitats throughout the ice; the bottom 0.2 m has the most favourable conditions for growth among the interior communities (Arrigo 2003). However, with respect to biomass and contribution to primary production, the sub-ice community is the most important in the annual ice. In the outermost, thinnest part of the sea ice, phytoplankton occur predominantly in the sub-ice community, especially centric diatoms, in addition to a few colony-forming pennate diatoms. The sub-ice community of old annual ice is characterised by the pennate diatom, *Nitzschia frigida,* but other species, such as *Nitzschia promare* can be important locally (Syvertsen 1991). *Melosira arctica* (a species typical of multi-year ice) may dominate sub-ice communities in some localities (von Quillfeldt et al. 2009). In addition there are seasonal trends and inter-annual variations in species composition, biomass and production as a result of several factors, among others, light, age and origin of the ice (e.g., distance to land and water depth). Thus, there is a high spatial heterogeneity when larger areas are considered. All of these factors make it difficult to estimate regional production (McMinn & Hegseth 2007).

Sea ice algae start to grow before phytoplankton. An extended growth season in Arctic areas forms ice algal communities that are grazed actively by both ice fauna and zooplankton and may be an important component of the diet of some species during the winter. Ice algae contribute 4 to 26% of total primary production in seasonally ice-covered waters (Gosselin et al. 1997, Sakshaug 2004). *Apherusa glacial* is probably the most numerous amphipod species in the central Arctic Ocean. *Onisimus glacialis* may be common in some areas.

The marginal ice zone is a highly productive area for phytoplankton (Sakshaug and Skjoldal 1989). Stable water masses due to sea-ice melt, coupled with high nutrient availability and light, result in an intense phytoplankton bloom. As water masses become stratified due to surface heating, nutrient flow from below is inhibited. Consequently, the bloom in marginal ice areas starts earlier than in areas never experiencing sea ice. The bloom follows the ice edge as it retreats in the spring. This "spring bloom" can occur in late August or even September in the areas of maximum ice retreat (Falk-Petersen et al. 2008). The ice-edge bloom is likely to weaken with time over the season (Wassmann et al. 2006). Arctic planktonic herbivores, such as *Calanus hyperboreus,* are able to utilize the vast area of the Arctic Ocean and to feed and store lipids for over-wintering until the sun disappears in October (Falk-Petersen et al. 2008). *Calanus hyperboreus* comprises up to half the zooplankton biomasses in the deep Arctic Ocean, and this is the only the *Calanus* speciesthat can remain established within the deep Arctic Ocean, (i.e., it can reproduce there) (Kosobokova 2012).

*Fish*

The fish diversity of the Arctic is described in the Arctic Biodiversity Assessment (Christiansen and Reist 2013, and literature quoted). The Arctic Central Basin has a disproportionately low taxa richness compared with the rest of the Arctic Ocean and adjacent sea regions, with only 13 species in four families and a proportion of Arctic species of around 92%. The number of species may be underestimated due to poor sampling, low abundances and unresolved taxonomy. Polar cod (*Boreogadus saida*), a keystone species in the marine Arctic, and ice cod (*Arctogadus glacialis*) are endemic to the Arctic and are the only fishes in the northern hemisphere that utilize sea ice as habitat and spawning substrate. Polar cod is the only marine fish species that is widespread throughout the entire Arctic Ocean and adjacent seas, including the Arctic Central Basin, i.e., it occurrs in areas with multi-year, annual sea ice and open water. Ice cod is much less abundant and is primarily associated with fjords and Arctic shelves. Melnikov and Chernova (2013) assumed that the scale of the under-ice swarming polar cod in the Central Arctic (pack ice areas) is comparable to that observed in the ice-free areas at the Arctic periphery.

*Birds*

There are limited data on seabird distribution in the central Arctic Ocean. The following 13 seabird species make use of the deep Arctic Ocean for feeding: Northern fulmar (*Fulmarus glacialis*), Red phalarope (*Phalaropus fulicarius*), Parasitic skua (*Stercorarius parasiticus*), Pomarine skua (*Stercorarius pomarinus*), Glaucous gull (*Larus hyperboreus*), ivory gull (*Pagophila eburnean*), Kittiwake (*Rissa tridactyla*), Ross's gull (*Rodosthetia rosea*), Sabine's gull (*Xema sabini*), Arctic tern (*Sterna paradise*), Little auk (*Alle alle*), Black guillemot (*Cepphus grille*) and Brunnich's guillemot (*Uria lomvia*) (Buinitsky 1946, Portenko1946, Paynter 1955, Rutilevsky 1957, Uspensky 1968, Blomqvist & Elander 1987, Parmelee & Parmelee 1994, Vuilleumier 1996, Hjort et al. 1997, Lunk & Joern 2007, Gilg et al. 2010a,b).

Among them, the most common is Ross's gull, which migrates post-breeding to feed on crustaceans in the pack ice of the Arctic Ocean on a regular base (Blomquist & Elander 1981, Hjort et al. 1997, Gavrilo, unpublished). Ivory gulls prefer to use the marginal ice zone (Gilg et al. 2010, Gavrilo, unpublished). Figures 3 to 5 show observations of ivory gull, Ross's gull and black guillemot.

*Mammals*

***Ringed seal***
The Arctic ringed seal *Pusa (Phoca) hispida* has a very large population size and broad distribution in the Arctic Ocean. Figure 6 shows encounters in the central Arctic Ocean. Ringed seals use sea ice exclusively for breeding, moulting and resting (haul-out), and feed on small schooling fish and invertebrates. In a co-evolution with one of their main predators, the polar bear, they developed the ability to create and maintain breathing holes in relatively thick ice, which makes them well adapted to living in ice covered waters. Kovacs et al. (2008) document declines in population size of this subspecies in parts of its range associated with a decrease in sea ice, and there are concerns that future changes in Arctic sea ice will have a similar negative impacts.

***Polar bear***

Polar bears (*Ursus maritimus*) are dependent on sea ice and are therefore particularly vulnerable to changes in sea ice extent, duration and thickness. Their circumpolar distribution, with 19 subpopulations, is limited by the southern extent of sea ice (Gorbunov & Belikov 2008). Figure 7 shows encounters in the central Arctic Ocean. In the summer, a great many of these subpopulations inhabit Arctic seas and use the marginal ice zone as an important feeding ground. In the winter, the polar bears are distributed more evenly throughout the Arctic ice, however with the highest abundance in areas with polynyas and leads. Preferred prey species of the polar bear are ringed seal and bearded seal, and in some areas harp seal.

***Narwhal***

Narwhals (*Monodon monoceros*) occur primarily in Arctic waters connected to the North Atlantic Ocean (Reeves et al. 2014). It is a highly ice-dependent species that could make use of the central Arctic Ocean, but there is no documented information on its distribution in these deeper waters. Narwhals are deep-diving benthic feeders and forage on fish, squid and shrimp, especially Arctic fish species, such as Greenland halibut, Arctic cod and polar cod at up to 1500 m depth and mostly in winter. A recent assessment of the sensitivity of all Arctic marine mammals to climate change ranked the narwhal as one of the three most sensitive species, primarily due to its narrow geographic distribution, specialized feeding and habitat choice, and high site fidelity (Laidre et al. 2008 in Jefferson et al. 2008).

***Beluga***

Belugas (*Delphinapterus leucas*) are an Arctic species that have been tracked using this area at the edge of a range that is predominantly over the shallower Chuchki and Beaufort seas off North America (Hauser et al. 2014). Luque and Ferguson (2010), although not explicitly examining belugas from this area, note that populations of belugas at higher latitudes have a larger body size than those further south.

***Bowhead whale***

Bowhead whale (*Balaena mysticetus*) is the third of the three ice-associated cetacean species that reside year-round in the Arctic, mostly connected to the marginal ice zone. So far there are no observations of this (heavily depleted) species in the central Arctic Ocean. The distribution of bowhead whales is nearly circumpolar, although the heavy ice conditions that have prevailed over the last millennium in the Arctic Basin have impeded (but not completely blocked) their movement in the Northwest and Northeast Passages. Some populations of bowhead whales are increasing (Reeves et al. 2014, and literature quoted).

**Feature condition and future outlook of the proposed area**

Replacement of thick, multi-year ice by thin, first-year ice as the Arctic warms may contribute to increases in the frequencies and magnitude of ice algal and phytoplankton blooms (Post et al. 2013).

Primary production of sea ice algae plays a crucial role in the life cycle of planktonic and benthic organisms (Gradinger 1995) in the Arctic Ocean, but the extent of this importance in annual ice in the deeper central Arctic Ocean has not been studied. However, a widespread deposition of ice algal biomass of on average 9 g C per $m^2$ to the deep-sea floor of the Arctic Central Basin has been observed (Boetius et al. 2013). When released from sea ice, ice algae may be an early (and only) seasonal food source for zooplankton. Thus, possible consequences of the observed thinning of the Arctic sea ice may be severe. If the sea ice disappears there will be a shift from a system dependent on sea ice species towards a system dependent on phytoplankton species.

A change in timing and duration of the ice edge bloom increases the probability of a “mismatch” in productivity, which may have severe consequences for zooplankton that are dependent on this bloom today, with potential cascading effects throughout the ecosystem. However, the timing of ice formation and melt also influences the distribution and intensity of the primary production in the water column. Such primary production is likely to increase in areas with less sea ice but may then become limited by nutrient availability. The extent of nutrient replenishment by vertical mixing during winter is especially important for the level of productivity in ice-free waters (Smetacek & Nicol 2005). Thus, changed ice conditions may affect the productivity over the deep ocean of the Arctic more severely than shelf areas.

Of the observed increase in annual primary production in the Arctic from 2006 to 2007, 30% was attributable to decreased minimum summer ice extent and 70% to a longer phytoplankton growing season (Arrigo et al. 2008). On the other hand, reduced sea ice cover coupled with an an increase in atmospheric low pressures cells (with more wind) may cause the upper mixing layer to deepen and in turn causes changes in the relative importance of the algal groups that dominate the phytoplankton community. It has been suggested that mixing in the upper layers (above 40 m) favours diatoms (i.e., areas often influenced by sea ice), mixing down to 60-80 m favours *Phaocystis pouchetii*, while mixing below 80 m favours small nanoflagellates (Sakshaug 2004). However, increased stratification (due to melting sea ice and river input) and nutrient depletion in the euphotic zone may cause shifts in the taxonomic composition of phytoplankton (Tremblay et al. 2012), as recently recorded by increasing abundances of small-sized (<2 μm in diameter) phytoplankton cells (Li et al. 2009).Thus, the quality of the food available for grazing communities will most probably change. The importance of the ice edge related production for higher predators will change, but may depend on other factors, for example seabirds may be also be influenced by distance from breeding colonies.

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness or rarity** | Area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | | X |
| *Explanation for ranking* The area is unique because the marginal ice and associated seasonal ice occurs over a deep ocean basin. Hence the dynamics of its nutrient supply are globally unique, with implications for the primary production in the area (Rudels et al. 1991). In addition, the importance of ice algae as a pathway of productivity into the food web (Gradinger 1995, Gosselin et al. 1997, Sakshaug 2004) is unique at least within the Northern hemisphere. | | | | | |
| **Special importance for life-history stages of species** | Areas that are required for a population to survive and thrive. | | | | X |
| *Explanation for ranking* Important for ice-dependent species such as polar cod (Christiansen and Reist 2013), ringed seal (Kovacs et al. 2008), polar bear (Gorbunov & Belikov 2008), possibly narwhal, Ross’s gull (Blomquist & Elander 1981, Hjort et al. 1997, Gavrilo, unpublished) and ivory gull (Gilg et al. 2010, Gavrilo, unpublished). The marginal ice zone is particularly important as a feeding ground for seals, polar bears and ivory gulls due to its enhanced productivity. <br><br> *Calanus hyperboreus* comprises up to half the zooplankton biomass in the deep Arctic Ocean and is the only *Calanus* species that can remain established within the deep Arctic Ocean (i.e.; it can reproduce there) (Kosobokova 2012). | | | | | |
| **Importance for threatened,** | Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of | | | X | |

| | | | | | |
|---|---|---|---|---|---|
| **endangered or declining species and/or habitats** | such species. | | | | |
| *Explanation for ranking*<br>Polar bear (IUCN vulnerable) (Gorbunov & Belikov 2008,Vongraven &Peacock 2011) and ivory gull (IUCN near threatened) (Gilg et al. 2010, Gavrilo, unpublished) depend on the sea ice throughout their life cycles. | | | | | |
| **Vulnerability, fragility, sensitivity, or slow recovery** | Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery. | | | | X |
| *Explanation for ranking*<br>The geographical extent of the seasonal ice cover is declining in the summer (IPCC 2013). | | | | | |
| **Biological productivity** | Area containing species, populations or communities with comparatively higher natural biological productivity. | | | | X |
| *Explanation for ranking*<br>Ice algae constitutes the second source of primary production in Arctic seas, with the highest relative contribution in the central Arctic Ocean (Gosselin et al. 1997). Increasing extent of annually formed sea ice over the Arctic Ocean, with vanishing and restricted multi-year ice limited to the northern regions of the Canadian Archipelago and Greenland (as reported for 2008 by the US National Snow and Ice Centre), may result in higher biomass of sympagic unicellular eukaryote taxa available for the upper trophic levels at the time of minimum irradiance reaching the polar surface waters (Poulin et al. 2010).<br><br>Productivity of both ice algae (Gosselin et al. 1997, Sakshaug 2004) and phytoplankton (Sakshaug & Skjoldal 1989) is higher in the marginal ice zone than in the more open waters, and deeper into the centre of the ice pack, so the marginal ice zone scores high on productivity *relative to* other areas of the Arctic. | | | | | |
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | | | X | |
| *Explanation for ranking*<br>In addition to microalgae, bacteria are an important component of the ice-algal community, but many other groups of organisms (e.g., archaea, fungi, ciliates, kinetoplastids, choanoflagellates, amoebae, heliozoans, foraminiferans, some protists that belong to no known group, Rotifera, Nematoda, Copepoda, Amphipoda) also occur in ice communities (Werner & Gradinger 2002, Lizotte 2003, Arndt & Swadling 2006, Bluhm et al. 2011, Kosobokova 2012). Consequently, biodiversity of the lower trophic levels in the ice is relatively high. | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | | X |
| *Explanation for ranking*<br>Very low impact from human activities (but vulnerable for climate change, which is already acting) (Meltofte et al. 2013, Eamer et al. 2013). | | | | | |

### References

Arndt C.E. & Swadling K.M. 2006. Crustacea in Arctic and Antarctic sea ice: distribution, diet and life history strategies. *Adv. Mar. Biol.* 51, 197-315.

Arrigo K.R. 2003. Primary production in sea ice. In D.N. Thomas & G.S. Dieckmann (eds.): *Sea ice. An introduction to its physics, chemistry, biology and geology.* pp. 143-183. Oxford: Blackwell Publishing.

Arrigo K.R., van Dijken G. & Pabi S. 2008. Impact of a shrinking Arctic ice cover on marine primary production. *Geophysical Research Letters* 35(19), L19603.

Blomquist S. & Elander M. 1981. Sabine's gull *(Xema sabini)*, Ross's gull *(Rhodostethia rosea)* and ivory gull *(Pagophila eburnea).* Gulls in the Arctic: A review. *Arctic* 34,122–132.

Bluhm B.A., Gebruk A.V., Gradinger R., Hopcroft R.R., Huettmann F., Kosobokova K.N., Sirenko B.I. & Weslawski J.M. 2011. Arctic marine biodiversity: An update of species richness and examples of biodiversity change. *Oceanography* 24(3), 232-240.

Boetius A., Albrect S., Bakker K., Bienhold C., Felden J., Fernandez-Mendez M., Hendricks S., Katlein C., Lalande C., Krumpen T., Nicolaus M., Peeken I., Rabe B., Rogacheva A., Rybakova E. Somavilla R., Wenzhofer F. & SC, R.V.P.A.-,- S. 2013. Export of algal biomass from the melting Arctic sea ice. *Science* (126), 1430-1432.

Buinitsky V.K. 1946. Birds and mammals observation logbook. Proceedings of drifting expedition of Glavsevmorput on ice-breaking steamer Georgy Sedov in 1937-1940. Moscow-Leningrad, 3, 5-13.

CAFF 2010. *Arctic Biodiversity Trends 2010* – Selected indicators of change. CAFF International Secretariat, Akureyri, Iceland. May 2010. Page 59.

Christiansen J.S. & Reist J.D. (lead authors) 2013. Chapter 6. Fishes. pp. 193-245 in Meltofte, H. (ed.) *Arctic Biodiversity Assessment. Status and trends in Arctic biodiversity*. Conservation of Arctic Flora and Fauna, Akureyri.

Eamer J., Donaldson G.M., Gaston A.J., Kosobokova K.N., Lárusson K.F., Melnikov I.A., Reist J.D., Richardson E., Staples L. & von Quillfeldt C.H. 2013. *Life Linked to Ice: A guide to sea-ice-associated biodiversity in this time of rapid change.* CAFF Assessment Series No. 10. Conservation of Arctic Flora and Fauna, Iceland. ISBN: 978-9935-431-25-7.

Falk-Petersen S., Leu E., Berge J., Kwasniewski S., Nygård H, Røstad A., Keskinen E., Thormar J., von Quillfeldt C., Wold A. & Gulliksen B. 2008. Vertical migration in high Arctic waters during autumn 2004. *Deep-Sea Research II* 55, 2275-2284.

Gilg O., Strøm H., Aebischer A., Gavrilo M.V., Volkov A.E., Miljeteig C. & Sabard S. 2010. Post-breeding movements of northeast Atlantic ivory gull *Pagophila eburnea* populations – *J. Avian Biol.* 41 (5), 532–542, doi: 10.1111/j.1600-048X.2010.05125.x

Gilg O., Strøm H., Gavrilo M.V., Boertmann D., Wiebe H. & Aebischer A. 2010. The ivory gull: a new flagship species to study the impact of climate change in Arctic Seas? Arctic Frontiers–2010. Living in the Far North. Unpublished presentation.

Gorbunov Y.A. & Belikov S.E. 2008. Observations of marine mammals and polar bear in the Arctic Basin. Marine mammals of the Holarctic. Collection of scientific papers after the fifth International Conference, Odessa, Ukraine, October 14-18, 2008. Odessa. pp. 220-222.

Gosselin M., Levasseur M., Wheeler P.A., Horner R.A. & Booth B.C. 1997. New measurements of phytoplankton and ice algal production in the Arctic Ocean. *Deep-Sea Res.* 44, 1623-1644.

Gradinger R. 1995. Climate change and biological oceanography of the Arctic Ocean. *Philosophical Transactions of the Royal Society of London Series A-Mathematical Physical and Engineering Sciences* 352 (1699), 277-286.

Hauser D.D.W., Laidre K.L., Moore S.E., Suydam R.S. & Richard P.R. 2014. Diving behaviour and distribution of beluga whales across diverse habitats of the Pacific Arctic. Presentation made available to workshop.

Hjort C., Gudmundsson G.A. & Elander M. 1997. Ross's gulls in the Central Arctic Ocean. *Arctic* 50(4), 289 – 292.

Horner R., Ackley S.F., Dieckmann G.S., Gulliksen B., Hoshiai T., Melnikov I.A., Reeburgh W.S., Spindler M. & Sullivan C.W. 1992. Ecology of Sea Ice Biota. 1. Habitat and terminology. *Polar Biology* 12, 417–427.

IPCC 2013. Summary for Policymakers. In: *Climate Change 2013: The Physical Science Basis.* Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

JeffersonT.A., Karczmarski L., Laidre K., O'Corry-Crowe G., Reeves R.R., Rojas-Bracho L., Secchi E.R., Slooten E., Smith B.D., Wang J.R. & Zhou K. 2008. *Monodon monoceros*. In IUCN 2011. IUCN Red List of threatened Species. Version 2011. 1. www.iucnredlist.org Downloaded on 31 August 2011.

Kosobokova K.N. 2012. *Zooplankton of the Arctic Basin: community structure, ecology, distribution patterns*. Moscow, GEOS 271 pp.

Kovacs K., Lowry L. & HärkönenT. 2008. *Pusa hispida*. In IUCN 2011. IUCN Red List of Threatened Species. Version 2011.1. www.iucnredlist.org. Downloaded on 31 August 2011.

Li W.K.W., McLaughlin F.A., Lovejoy C. & Carmack E.C. 2009. Smallest algae thrive as the Arctic Ocean freshens. *Science* 326, 539-539.

Lizotte M.P. 2003. The microbiology of sea ice. In D.N. Thomas & G.S. Dieckmann, (eds.) *Sea ice: An introduction to its physics, chemistry, biology and geology.* pp. 184-210. Oxford: Blackwell Publishing.

Lunk S. & Joern D. 2007. Ornithological observations in the Barents and Kara Seas during the summers of 2003, 2004 and 2005. *Russian Ornithological Journal. Express issue N,* 377 pp.

Luque S.P. & Ferguson S.H. 2010. Age structure, growth, mortality, and density of belugas (*Delphinapterus leucas*) in the Canadian Arctic: responses to environment? *Polar Biology* 33, 163-178.

McMinn A. & Hegseth E.N. 2007. Sea ice primary productivity in the northern Barents Sea, spring 2004. *Polar Biology* 30(3), 289-294.

Melnikov I.A. & Chernova N.V. 2013. Characteristics of Under-Ice Swarming of Polar Cod *Boreogadus saida* (Gadidae) in the Central Arctic Ocean. Journal of Ichthyology, 2013, Vol. 53, No. 1, pp. 7-15. © Pleiades Publishing, Ltd., 2013. Original Russian Text © I.A. Melnikov, N.V. Chernova, 2013, published in Voprosy Ikhtiologii, 2013, Vol. 53, No. 1, pp. 22–30.

Meltofte H. (ed.) 2013. *Arctic Biodiversity Assessment. Status and trends in Arctic biodiversity.* Conservation of Arctic Flora and Fauna, Akureyri.

Parmelee D.F. & Parmellee J.M. 1994. Bird sightings from a nuclear-powered ice breaker from across the Arctic Ocean to the geographic North Pole 90"N.-Ornithologists. - *Wilson Bull., 106(2),* 391-392.

Paynter R.A. Jr. 1955. Birds in the Upper Arctic. *Auk. 72,* 79 – 80.

Portenko L.A. 1946. *Birds of high latitudes of the Arctic Ocean.* Proceedings of drifting expedition of Glavsevmorput on ice-breaking steamer Georgy Sedov in 1937-1940. Moscow-Leningrad, Vol. 3, 19-29.

Post E., Bhatt U.S., Bitz C.M., Brodie J.F., Fulton T.L., Hebblewhite M., Kerby J., Kutz S.J., Stirling I. & Walker I. 2013. Ecological consequences of sea-ice decline. *Science* 341, 519-524.

Poulin M., Daugbjerg N., Gradinger R., Ilyash L., Ratkova T. & von Quillfeldt C.H. 2010. The pan-Arctic biodiversity of marine pelagic and sea-ice unicellular eukaryotes: A first-attempt assessment Marine Biodiversity. *Marine Biodiversity* 41, 13-28.

Reeves R.R, Ewins P.J., Agbayani S., Heide-Jørgensen M.P., Kovacs K.M., Lydersen C., Suydam R., Elliott W., Polet G., van Dijk Y, & Blijleven R. 2014. Distribution of endemic cetaceans in relation to hydrocarbon development and commercial shipping in a warming Arctic. *Marine Policy* 44, 375-389.

Rudels B., Larsson A.-M. & Sehlstcdt P.-I. 1991. Stratification and water mass formation in the Arctic Ocean: some implications for the nutrient distribution. pp. 19-31 in Sakshaug. E., Hopkins. C. C. E. & Oritsland. N. A. (eds.): Proceedings of the Pro Mare Symposium on Polar Marine Ecology, Trondhcim. 12-16 May 1YW. *Polar Research* 10(1), 19-31.

Rutilevsky G.L. 1957. Fauna of mammals and birds of the Central Arctic (based on observations of drifting stations). *Proc. of the AARI.Moscow* 205, 5–18.

Sakshaug E. 2004. Primary and secondary production in the Arctic Sea. pp. 57-81 in Stein R. & Macdonald R.W. (eds). *The organic carbon cycle in the Arctic Ocean.* Springer, Berlin.

Sakshaug E. & Skjoldal H.R. 1989. Life at the ice edge. *Ambio* 18, 60-67.

Slooten E., Smith B.D., Wang J.Y. & Zhou K. 2008. *Monodon monoceros*. In IUCN 2011. IUCN Red List of Threatened Species. Version 2011.1. www.iucnredlist.org. Downloaded on 31 August 2011.

Smetacek V. & Nicol S. 2005. Polar ocean ecosystems in a changing world. *Nature* 437, 362-368.

Syvertsen E.E. 1991. Ice algae in the Barents Sea: types of assemblages, origin, fate and role in the ice-edge phytoplankton bloom. *Polar Research* 10(1), 277-288.

Tremblay J.-E., Robert D., Varela D., Lovejoy C., Darnis G., Nelson R.J., Sastri A. 2012. Current state and trends in Canadian Arctic marine ecosystems: I Primary production. *Climate Change* DOI 10.1007/s10584-012-0496-3.

Uspensky S.M. 1968. Life in the High latitudes. Birds as an example. Moscow. 464 pp.

Vongraven D. & Peacock E. 2011. *Development of a pan-Arctic monitoring plan for polar bears: background paper.* Circumpolar Biodiversity Monitoring Programme, CAFF Monitoring Series Report No.1, January 2011, CAFF International Secretariat, Akureyri, Iceland. ISBN 978-9935-431-01-1.

von Quillfeldt C.H., Hegseth E.N., Johnsen G., Sakshaug E. & Syvertsen E.E. 2009. *Ice algae.* pp. 285-302 in Sakshaug E., Johnsen G. & Kovacs K. (eds) Ecosystem Barents Sea. Tapir Academic Press, Trondheim, Norway.

Vuilleumier F. 1996. Birds observed in the Arctic Ocean to the North Pole. *Arctic and Alpine Research* 28 (1): 18 – 122.

Wassmann P., Reigstad M., Haug T. Rudels B., Carroll M.L., Hop H., Gabrielsen G.W., Falk-Petersen S., Denisenko S.G., Arashkevich E., Slagstad D. & Pavlova O. 2006a. Food webs and carbon flux in the Barents Sea. *Progress in Oceanography* 71(2-4), 232-287.

Werner I. & Gradinger R. 2002. Under-ice amphipods in the Greenland Sea and Fram Strait (Arctic): environmental controls and seasonal patterns below the pack ice. *Marine Biology* 140(2), 317-326.

**Maps and Figures**

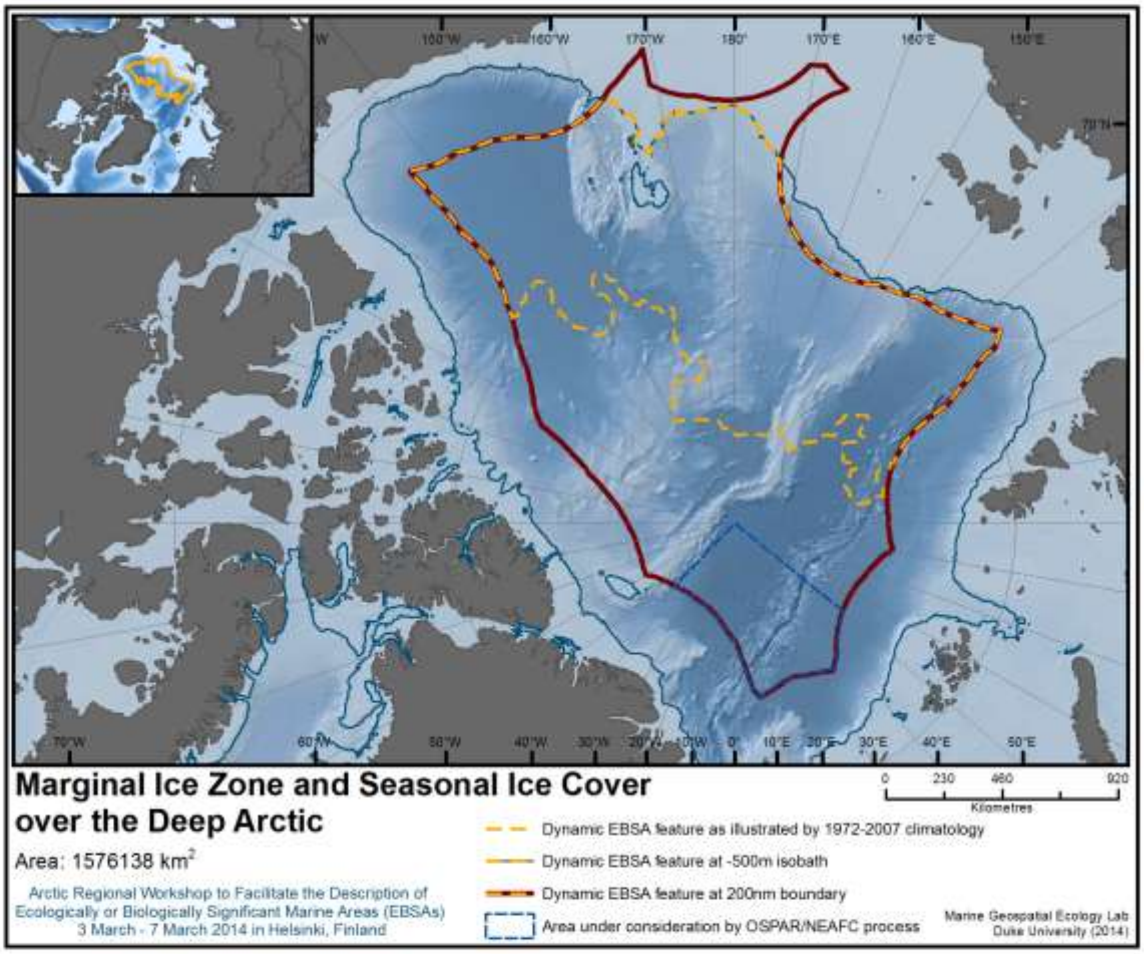



Figure 1. Area meeting EBSA criteria. Map of the maximum observed range (1972-2007) covered by the marginal ice zone and the seasonal ice-cover within the central Arctic in waters deeper than 500 m, beyond national jurisdiction.

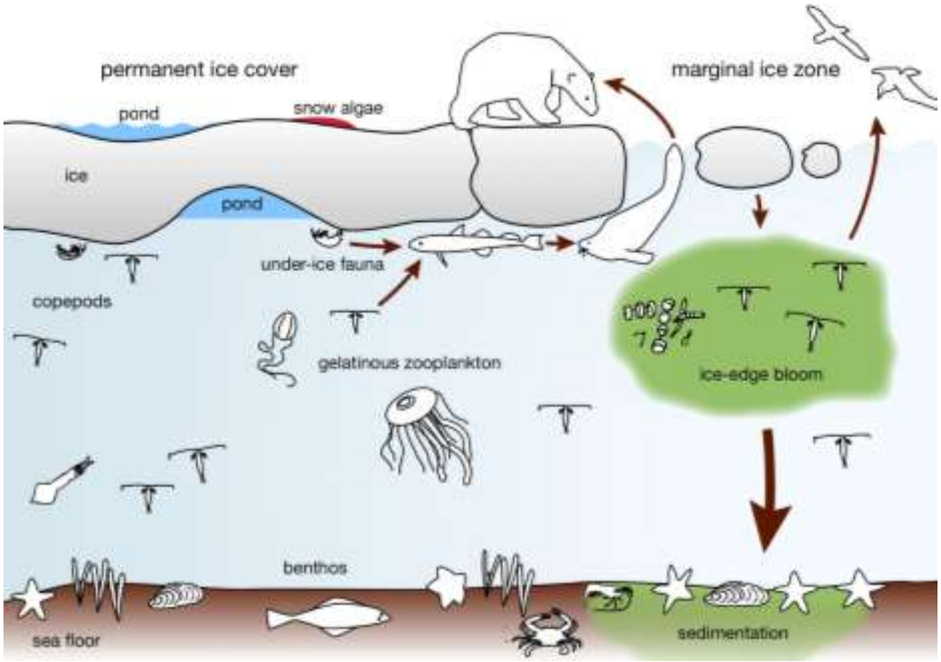



Figure 2. A conceptual model for the ecosystem at the marginal ice zone (CAFF 2010).

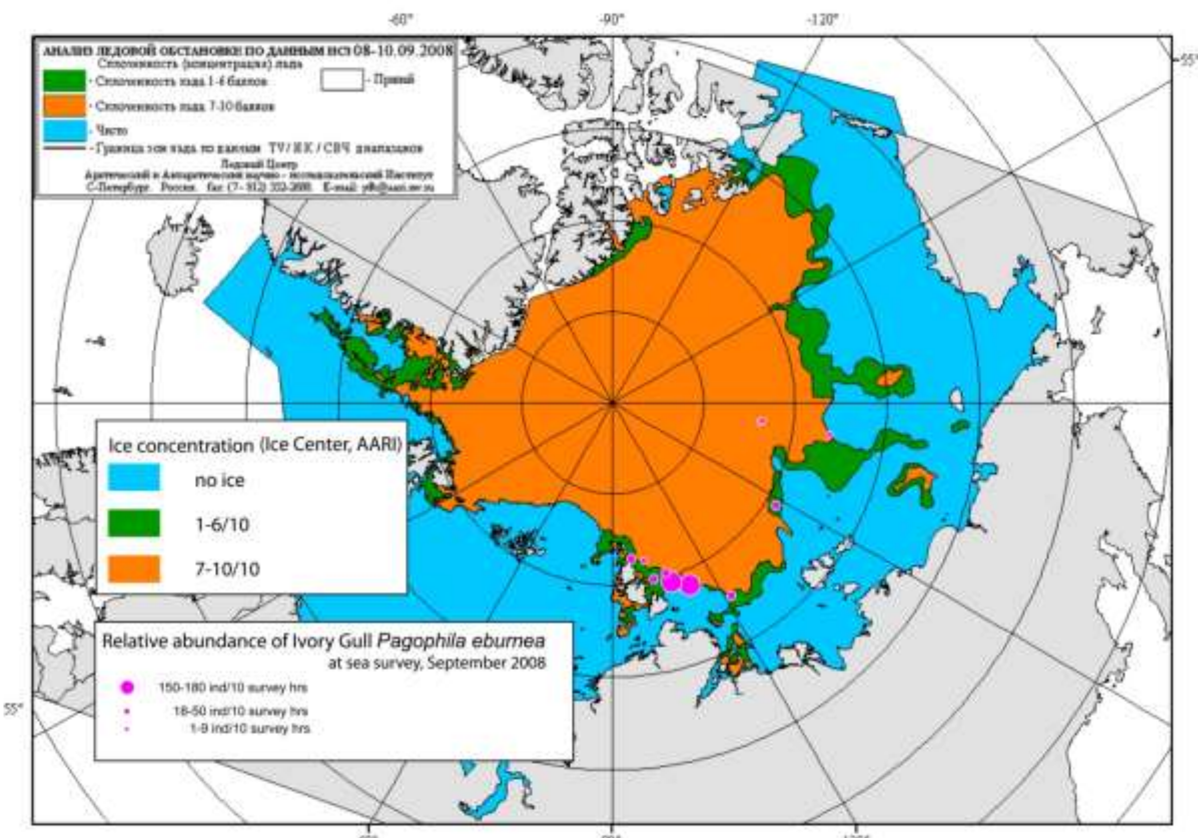



Figure 3. Ivory gull relative abundance during a ship-based survey in September 2008 (Gavrilo, 2010 unpublished presentation).

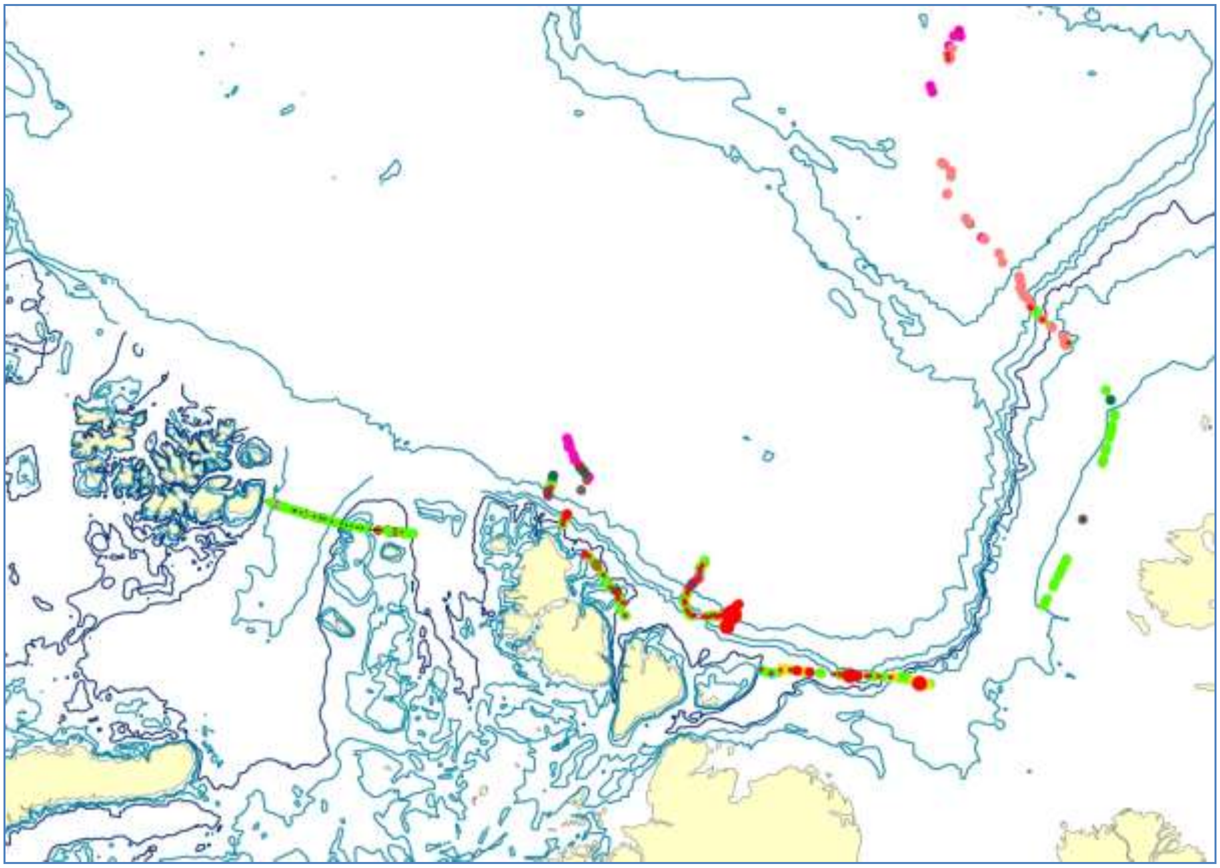


Figure 4. Seabird records from August to September 2008 (Gavrilo, unpublished). Pink – Ross's gull, red – ivory gull, bright-rose – black guillemot.

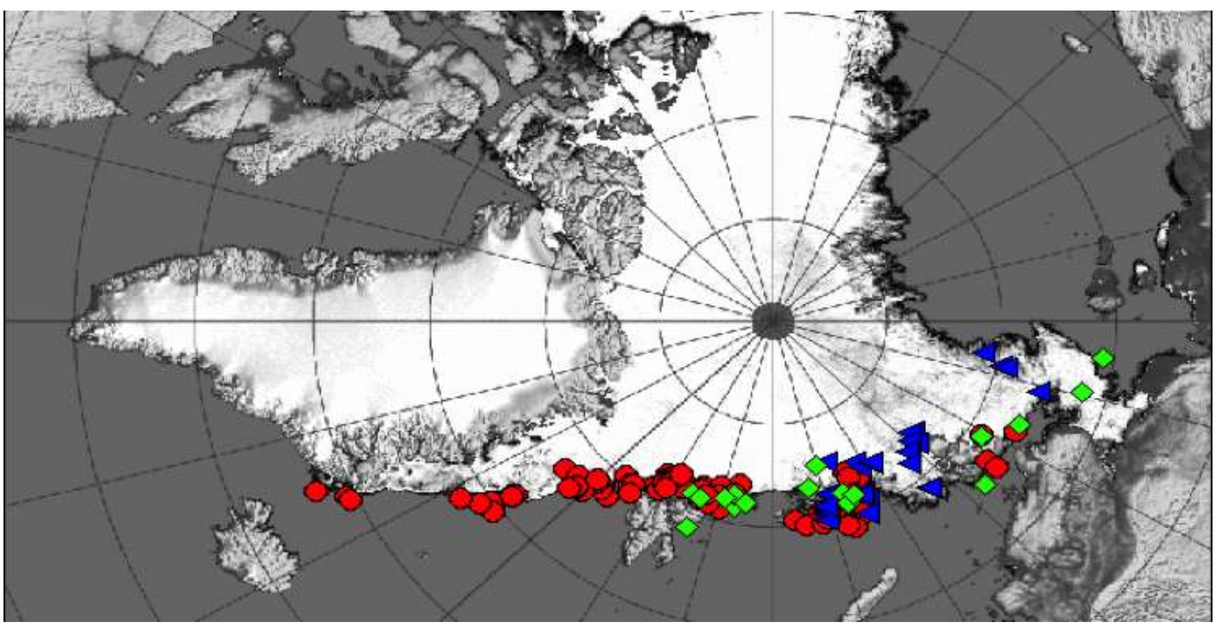


Figure 5. Map from Gilg et al. 2010 (locations of ivory gull according to satellite tagging, October).

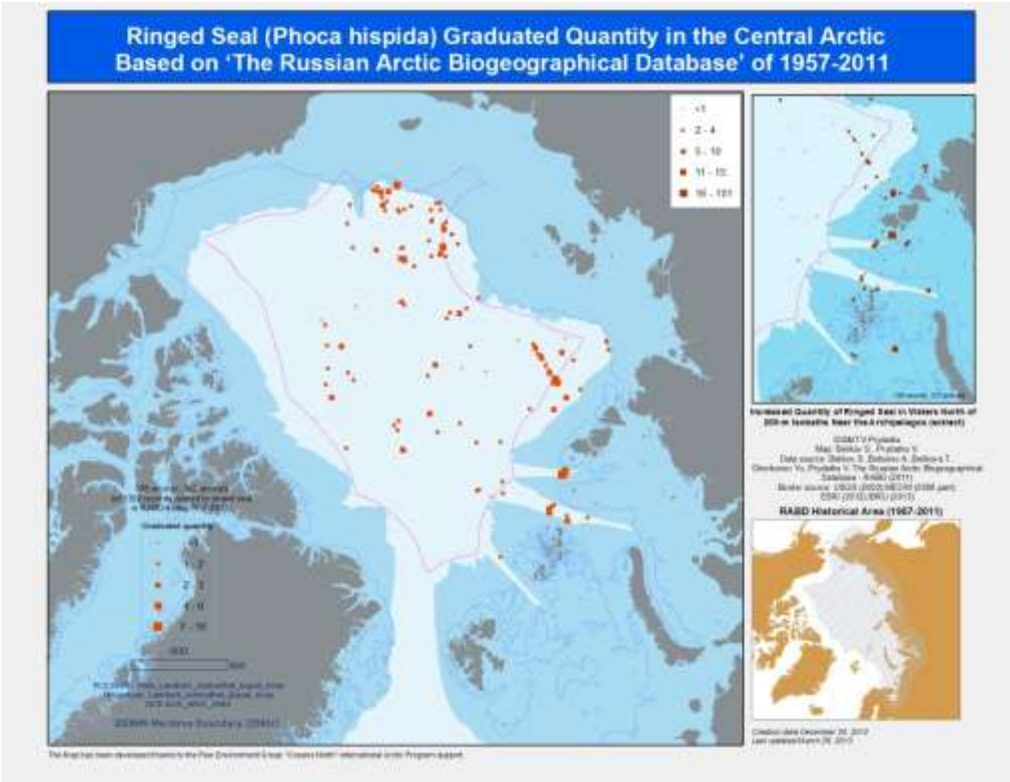



Figure 6. Year-round encounters of ringed seal (*Phoca hispida*) in the central Arctic Ocean. Based on the "The Russian Arctic Biogeographic Database" of 1957-2011. © The Pew Charitable Trusts 2012.

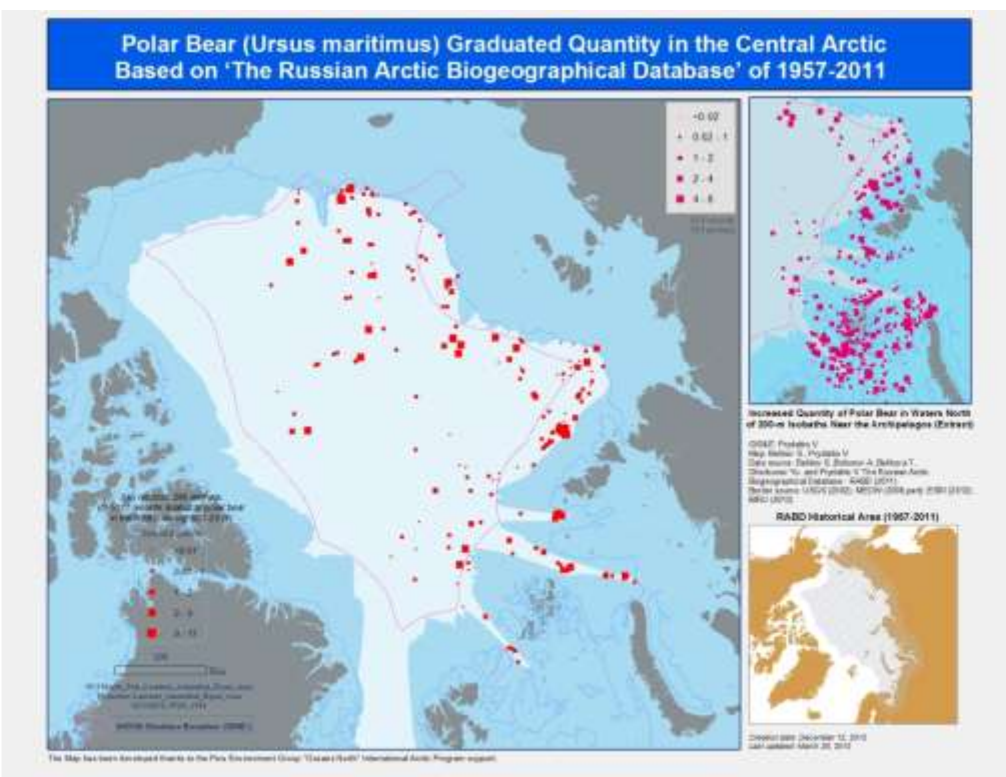



Figure 7. Year-round encounters of polar bears (*Ursus maritimus*) in the central Arctic Ocean. Based on the "The Russian Arctic Biogeographic Database" of 1957-2011. © The Pew Charitable Trusts 2012.

***Special note for Area No. 1: Marginal Ice Zone and Seasonal Ice Cover over the Deep Arctic Ocean***

This special note contains information on the use of sea ice climatologies to identify the location of the features described in areas no. 1 and 2 in the appendix to annex VIII. The primary data sources for these areal definitions are sea ice climatologies from the US National Snow and Ice Data Center.

**Definition of ice margin areas of the Arctic Ocean**

Sea-ice margin areas are extremely dynamic both within and between years. Also, there have been significant changes in their geographic range over the last several decades of observation. Sea-ice margin areas were identified using the NSIDC 1972 – 2007 climatologies.

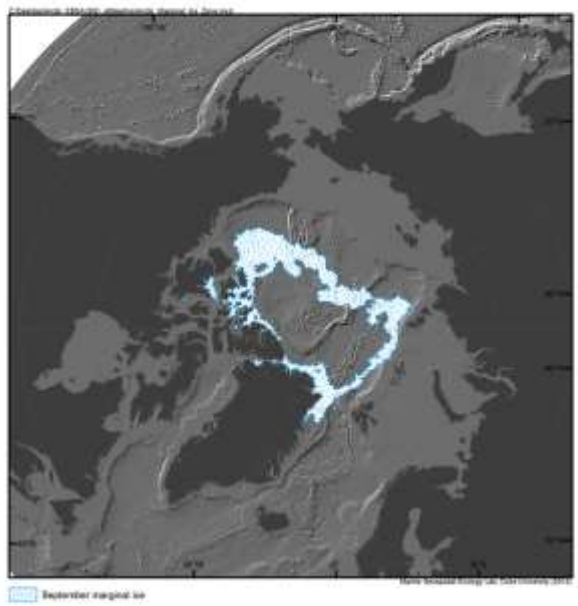



Figure 1. September marginal sea ice range (1972 – 2007).

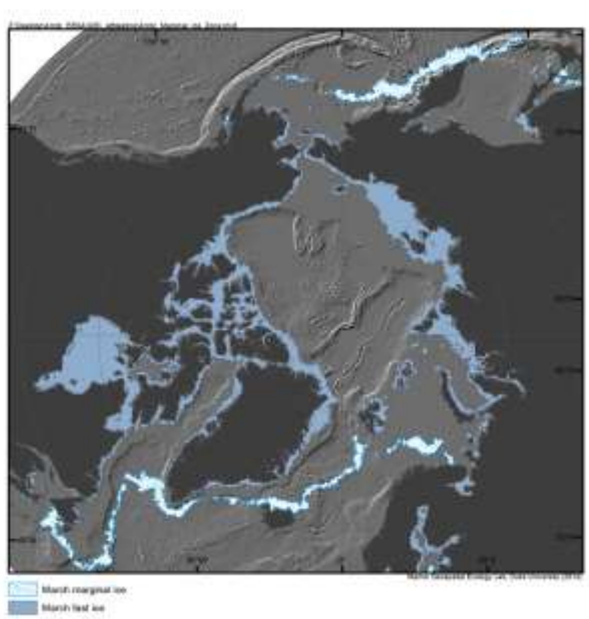



Figure 2. March marginal sea ice and fast ice (1972 – 2007).

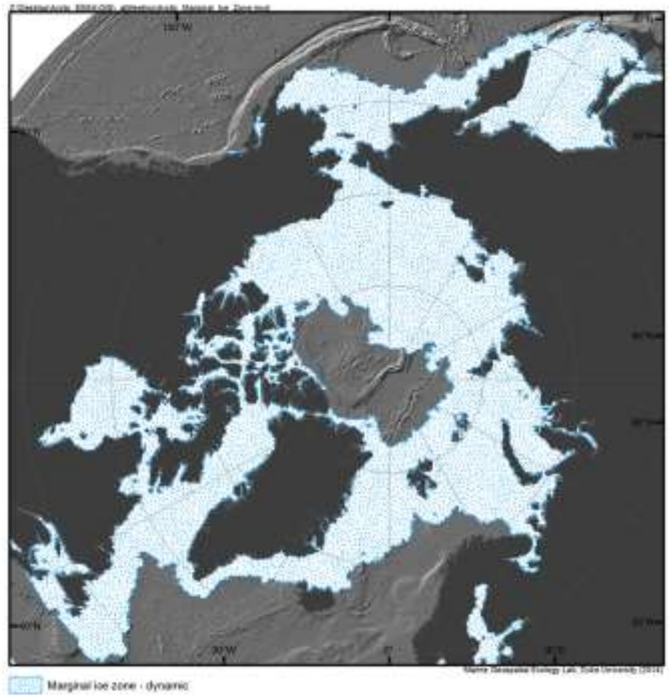



Figure 3. September – March marginal sea ice range (1972 – 2007).

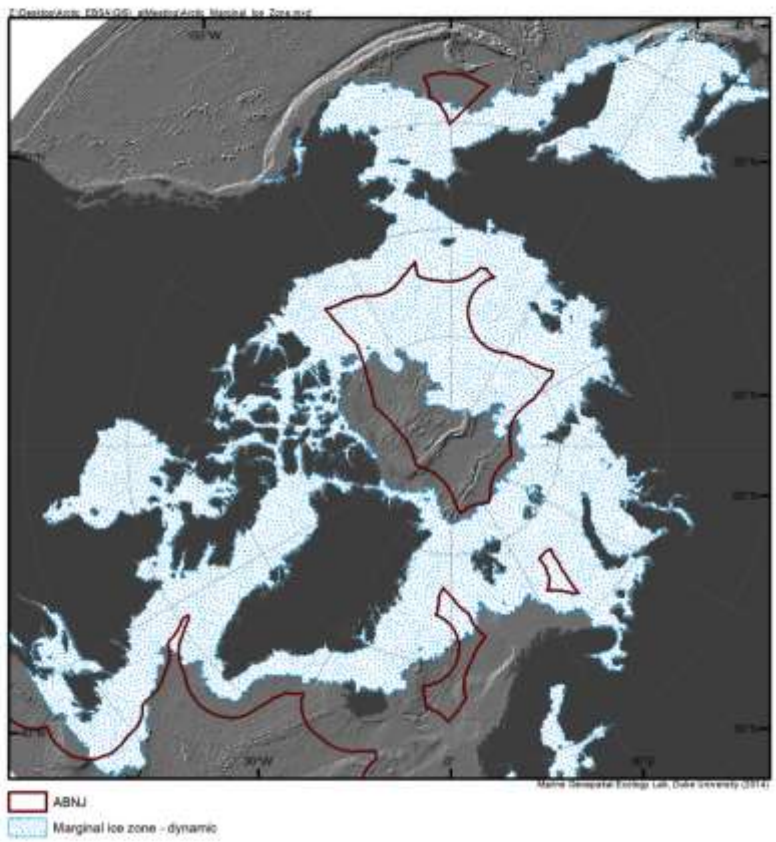



Figure 4. Marginal ice range and areas beyond national jurisdiction.

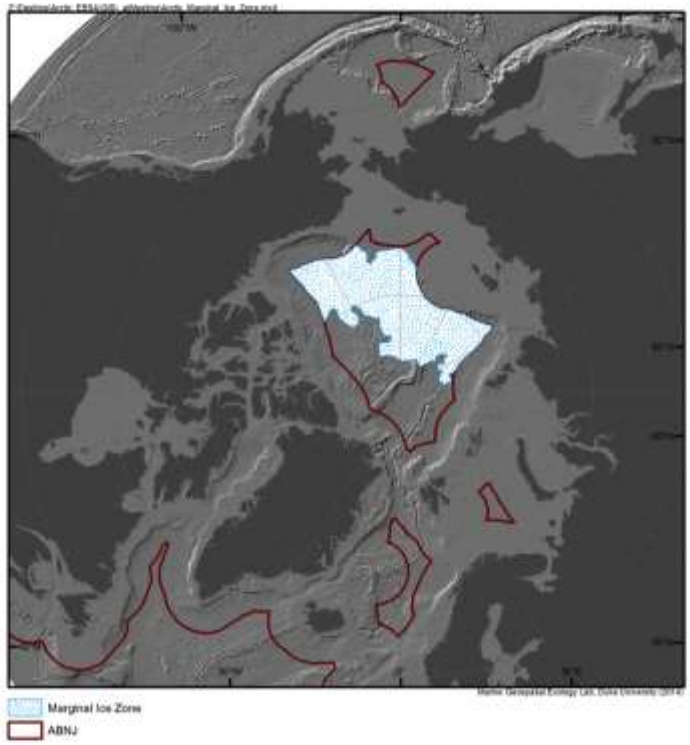



Figure 5. Marginal sea ice range limited to areas beyond national jurisdiction and >500 m depth in the High Arctic.

***Location***

This area comprises the surface ice and related water column features associated with the marginal sea ice area. This area is described as a geographically and temporally dynamic feature that is expected to change in area, shape and geographic location from year to year. The area is expected to extend from the minimum seasonal ice margin limit in the central Arctic (~September marginal ice minimum) to the seasonal marginal ice maximum (~March marginal ice maximum). The example climatological marginal ice range provided (September - March climatology 1972-2007) in this description has been restricted to the area beyond national jurisdiction within the described Arctic workshop region.

**Literature cited**

Maslanik, J., J. Stroeve, C. Fowler, *and* W. Emery *(*2011*)*, Distribution and trends in Arctic sea ice age through spring 2011, *Geophys. Res. Lett.*, *38*, *L13502*, doi:10.1029/2011GL047735.

National Ice Center. 2006, updated 2009. *National Ice Center Arctic sea ice charts and climatologies in gridded format*. Edited and compiled by F. Fetterer and C. Fowler. Boulder, Colorado USA: National Snow and Ice Data Center. http://dx.doi.org/10.7265/N5X34VDB.

## Area No. 2: Multi-year ice of the Central Arctic Ocean

### Abstract

The multi-year ice and associated marine habitats of the central Arctic Ocean beyond national jurisdiction provide a range of globally and regionally important habitats. Projections of changing ice conditions due to climate change indicate that the central Arctic Ocean beyond national jurisdiction and in adjacent Canadian waters is likely to retain ice longer than all other regions of the Arctic, thus providing refugia for globally unique ice-dependent species, including vulnerable species, as the ice loss continues. A shift towards less multi-year sea ice will affect the species composition and production of the primary producers in the area, with potential cascading effects throughout the ecosystem. In a situation with decreasing ice cover, the effects on the ice fauna will be strongest at the edges of the multi-year sea ice. Polar bears (*Ursus maritimus*) are highly dependent on the sea ice habitat and are therefore particularly vulnerable to changes in sea ice extent, duration and thickness. The multi-year ice habitat is especially important as breeding habitat for polar bears of the southern and northern Beaufort Sea subpopulations. It is noted that the geographic area covered by this description in part overlaps an area meeting the CBD EBSA criteria that was described by the joint OSPAR/NEAFC/CBD workshop in the North-East Atlantic. Following peer-review by ICES, the description of this area is currently under consideration by the Contracting Parties to OSPAR and NEAFC.

### Introduction

The multi-year ice in the Arctic Ocean (the ice that survives summertime melt) is globally unique and has dramatically decreased (in both extent and average thickness) in recent decades (AMAP 2011). Multi-year ice now occupies only the part of the deep area beyond national jurisdiction in the Arctic that adjoins the Canadian Arctic archipelago and the multi-year ice area described there (figure 1). It is noted that the geographic area covered by this description in part overlaps an area meeting the CBD EBSA criteria that was described by the joint OSPAR/NEAFC/CBD workshop in the North-East Atlantic. Following peer-review by ICES, the description of this area is currently under consideration by the Contracting Parties to OSPAR and NEAFC.

The multi-year ice that remains is also much younger than previously as the oldest multi-year ice classes have declined more than other classes (AMAP 2011), and even if conditions changed to allow the return of the lost/decreased ice cover were reversed, it would take many years to return to the state of just a few decades ago.

The multi-year ice and associated marine habitats of the central Arctic Ocean beyond national jurisdiction provide a range of globally and regionally important habitats. Projections of changing ice conditions due to climate change indicate that the central Arctic Ocean beyond national jurisdiction that adjoins Canadian waters near the Canadian Arctic archipelago are likely to retain multi-year ice longer than all other regions of the Arctic, thus providing refugia for globally unique ice-dependent species, including vulnerable species.

### Location

The area meeting EBSA criteria comprises the surface ice and related water column features associated with the multi-year sea-ice area. This area is described as a geographically and temporally dynamic feature that is expected to change in area, shape and geographic location seasonally and from year to year. The multi-year ice range provided (September 2012- March 2013) in this description refers to the area beyond national jurisdiction only (figure 1 and Special note for Area No. 2).

### Feature description of the proposed area

There is limited information about the ecosystems of the central Arctic Ocean—there is more literature describing the shallower, coastal areas. Where appropriate, this description includes some information from these coastal areas.

**Physical description of the area**

Multi-year ice is the ice that survives the summertime melt in the Arctic Ocean and so is re-defined each September, when sea-ice is at its minimum extent. It has been declining rapidly over the last 30 years, both in extent and age (Maslanik 2011) and in September 2012, ice more than two years old occupied only 42% of the area beyond national jurisdiction in the central Arctic; very little of this is now greater than five years old (figure 2). The multi-year ice area meeting EBSA criteria is defined by ice greater than two years old.

The circulation of sea ice in the Arctic Ocean is wind-forced, and, roughly, flows from the Eurasian side towards Greenland and the Canadian Arctic archipelago. Ice that then flows along the eastern coast of Greenland and through Fram Strait leaves the Arctic and melts. Ice that impinges on the north-western edge of the Canadian Arctic archipelago tends to be compressed there and accumulate, and is thus the oldest sea-ice in the Arctic Ocean and forms the core of the multi-year ice.

The multi-year ice in the deep Arctic basins overlays an ocean that is very strongly layered by salinity, comprising nutrient-poor surface waters that are freshened by the huge river runoff, largely from Siberia, and nutrient-rich waters below the seasonal euphotic zone that flow into the Arctic Ocean either from the Pacific Ocean, through the relatively shallow Bering Strait, or the Atlantic Ocean, through the deep Fram Strait and the Barents Sea. The higher strength, thickness and concentration of the multi-year ice tends to shield the underlying waters from the wind and attenuates light. Reduced wind forcing, combined with the high stratification provided by the river runoff, means that vertical nutrient fluxes are low. Low nutrient input and reduced light levels lead to very low annual primary production in this region.

**Primary production and lower trophic level communities in multi-year ice**

***Autotrohic and heterotrophic communities***

Ice algal communities can be divided into communities on the surface, interior and bottom of the ice (Horner et al. 1992). The surface can then be divided into melt-pond and infiltration communities, the interior into diffuse, brine-channel and band communities and the bottom into interstitial and sub-ice communities. All except for the band community occur in annual ice. In addition to microalgae, bacteria are an important component of the ice-algal community, but many other groups of organisms (e.g., archaea, fungi, ciliates, kinetoplastids, choanoflagellates, amoebae, heliozoans, foraminiferans and some protists that belong to no known group) also occur in ice communities (Lizotte 2003). Poulin et al. (2010) reported a total of 1027 sympagic taxa in Arctic waters (including coastal waters).

Due to its thickness and construction, multi-year ice is relatively difficult to research. The sub-ice community of two-year-old and multi-year ice is dominated by the centric diatom, *Melosira arctica*. Widespread deposition of this species has been found on the sea floor at depths of about 4000 m in the central Arctic Ocean, where it is eaten by different benthic organisms or broken down by bacteria (Boetius et al. 2013), thus creating a link between ice and benthic ecosystems. Solitary diatoms increase in abundance in many interior and surface communities, but there is at the same time a decrease in the relative importance of diatoms compared with other algal classes. Ice algae are estimated to contribute to more than 50% of the primary production in the permanently ice covered central Arctic (Gosselin et al. 1997, Sakshaug 2004).

The sympagic macrofauna is commonly divided into two groups, the autochtonous and allochthonous species (Lønne & Gulliksen 1991, Arndt & Swadling 2006). The former consists of the species that are believed to live their entire life connected to the sea ice (e.g., nematode worms, rotifers and other small soft-bodied animals within the ice and amphipodes on the underside), whereas the latter consists of species that are connected to the sea ice only during parts of their life cycle (e.g., larvae and juvenile stages of some organisms). Currently the most common amphipod species in the multi-year ice are *Gammarus wilkitzkii*, *Onisimus nanseni* and *Apherusa glacialis* (Werner & Gradinger 2002, Arndt & Swadling 2006). Among these, the former is by far more important in terms of biomass (Arndt & Swadling 2006). These are the important food items for polar cod. Multi-year ice is regarded as a critical habitat for long-lived ice-associated species, e.g., *G. wilkitzkii*, (Hop & Pavlova 2008). Multi-year ice is also essential for maintaining populations of several sea-ice nematode species, which form trophic chains within the ice environment, with smaller species feeding on autotrophs and the larger ones predating on smaller nematodes (Tchesunov & Riemann 1995, Tchesunov 2006).

*Fish*

The fish diversity of the Arctic is described in the Arctic Biodiversity Assessment (Christiansen & Reist 2013, and literature quoted). The Arctic Central Basin has a disproportionately low taxa richness compared with the rest of the Arctic Ocean and adjacent sea regions with only 13 species in four families and a proportion of Arctic species of around 92%. The number of species may be underestimated due to poor sampling, low abundances and unresolved taxonomy. Polar cod (*Boreogadus saida*), a keystone species in the marine Arctic, and ice cod (*Arctogadus glacialis*) are endemic to the Arctic and the only fishes in the northern hemisphere that utilize sea ice as habitat and spawning substrate. Polar cod is the most abundant and widespread fish in the Arctic, occurring both in areas with multi-year and annual sea ice. Ice cod is much less abundant than polar cod and is primarily associated with fjords and Arctic shelves. In the Central Arctic, which is covered by thick multi-year ice, the polar cod is usually found as single specimens or in small groups rather than large schools (Melnikov & Chernova 2013, and literature quoted).

*Mammals**: Polar bear***

Polar bears *Ursus maritimus* are highly dependent on sea ice and are therefore particularly vulnerable to changes in sea ice extent, duration and thickness. They have a circumpolar distribution, with 19 subpopulations. Polar bears are most commonly on ice over the continental shelves as this is where the preferred prey, young ringed seals, are found. Some also occur in the permanent multi-year pack ice of the Arctic Central Basin (Durner et al., 2009). Recently the number of polar bears in the northern Beaufort Sea was estimated at a density of 0.061 bears per 100 $km^2$ (McDonald 2012). The multi-year ice habitat is especially important as breeding habitat for the southern and northern Beaufort Sea subpopulations. In the last century, a significant proportion of these populations could breed in the multi-year ice, but there are no recent quantitative assessments to confirm if this is still the case (personal communication Stanislav Belikov). The thick, multi-year ice has, in the past, served as a refuge for marine mammals, including polar bears, during summers in years with extensive melt of first-year ice (AMAP 2011).

Due to low reproductive rates and long lifetime, it has been predicted that the polar bears will not be able to adapt to the current fast warming of the Arctic and become extirpated from most of their range within the next 100 years (Schliebe et al. 2008).

**Feature condition and future outlook of the proposed area**

***Production and possible ecosystem effects***

Reduced sea ice, especially a shift towards less multi-year sea ice, will affect the species composition in these waters. Seasonal/annual sea ice has to be colonized every year, as opposed to multi-year ice. In addition, multi-year ice has ice specialists that do not occur in younger sea ice (von Quillfeldt et al. 2009).

In a situation with decreasing ice cover, the effects on the ice fauna will be strongest at the edges of the multi-year sea ice. Sympagic fauna transported with the sea ice from the Arctic Ocean through the Fram Strait will, for example, probably be lost without possibility to re-colonize the ice (Werner et al. 1999). It has, however, been speculated that downwards vertical migrations, followed by polewards transport in deep ocean currents, are an adaptive trait of ice fauna (e.g., *Apherusa glacialis*) that both increases survival during ice-free periods of the year and enables re-colonization of sea ice when they ascend within the Arctic Ocean (Berge et al. 2012).

The transport of organic material out of the Arctic Ocean serves as an important food source for the pelagic and benthic food web in the Greenland Sea (Werner et al. 1999). With a decrease in sea ice cover also the transport of ice to the Greenland Sea will decrease and thus the export of organic material from the Arctic Ocean may diminish and alter the food web structure in the Greenland Sea.

Fauna heavily dependant on ice algae will be particularly affected by the reduction of sea ice (Gradinger 1999).

**Assessment of the area against CBD EBSA criteria**

<table>
<tr><td rowspan="2">CBD EBSA criteria<br>(Annex I to decision IX/20)</td><td rowspan="2">Description<br>(Annex I to decision IX/20)</td><td colspan="4">Ranking of criterion relevance<br>(please mark one column with an X)</td></tr>
<tr><td>No information</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td>Uniqueness or rarity</td><td>Area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>This is the largest multi-year ice feature of the world’s oceans, making it globally unique. The Arctic multi-year ice is mostly over the deep Arctic ocean basins and contains ice that is more than five years old (Maslanik et al. 2011). This contrasts with Antarctica, which only has small areas of coastal multi-year ice, which is no more than three-years old (Turner et al. 2009).<br><br>Multi-year ice-dependent communities, fauna and flora, e.g. endemic sea ice nematodes and amphipods (Homer et al. 1992, Werner & Gradinger 2002, Arndt & Swadling 2006, von Quillfeldt 2009, Poulin et al. 2010). Historical records indicate that this was key breeding habitat for a significant proportion of the southern and northern Beaufort Sea subpopulations of polar bear, although the current status of use of multi-year ice by these subpopulations is unknown (personal communication Stanislav Belikov). Multi-year ice normally has ice specialists that do not occur in younger sea ice (von Quillfeldt et al. 2009).</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>Historical records indicate that this was key breeding habitat for a significant proportion of the southern and northern Beaufort Sea subpopulations of polar bear, although the current status of use of multi-year ice by these subpopulations is unknown (personal communication Stanislav Belikov) Multi-year ice has autochtonous species that are believed to live their entire life connected to the sea ice (e.g., nematode worms, rotifers and other small soft-bodied animals within the ice and amphipodes on the underside) (Lønne & Gulliksen 1991, Tchesunov & Riemann 1995, Arndt & Swadling 2006, Tschesunov 2006).</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| Historical records indicate that this was key breeding habitat for a significant proportion of the southern and northern Beaufort Sea subpopulations of polar bear, although the current status of use of multi-year ice by these subpopulations is unknown (personal communication Stanislav Belikov). | | | | | |
| **Vulnerability, fragility, sensitivity, or slow recovery** | Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery. | | | | X |
| *Explanation for ranking*<br>Extremely vulnerable for a warming climate and human activities in general. Ice algae constitute the second source of primary production in Arctic seas, with the highest relative contribution in the central Arctic Ocean (Gosselin et al. 1997). The increased freshening of surface waters underneath multi-year ice likely impacts the sea-ice biota (Melnikov et al. 2002).<br>Multi-year ice has been declining rapidly over the last 30 years, both in extent and age (Maslanik 2011), and in September 2013, ice older than two years old occupied only 42% of the area beyond national jurisdiction in the central Arctic, very little of which is now greater than five-years old. | | | | | |
| **Biological productivity** | Area containing species, populations or communities with comparatively higher natural biological productivity. | | **X** | | |
| *Explanation for ranking*<br>Production levels are low, but ice-based production contributes a significant portion of the total multi-year ice ecosystem production Ice algae are estimated to contribute to more than 50% of the primary production in the permanently ice-covered central Arctic, forming a distinct community. (Gosselin et al. 1997, Sakshaug 2004). | | | | | |
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | | X | | |
| *Explanation for ranking*<br>Often higher biodiversity compared to annual ice in specific localities (Gradinger 1999, Melnikov et al. 2002, von Quillfeldt et al. 2009, Zheng et al. 2011).<br>The sub-ice community of two-year-old and multi-year ice is dominated by the centric diatom, *Melosira arctica*, which sinks and forms a link between ice and benthic ecosystems (Boetius et al. 2013). | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | | X |
| *Explanation for ranking*<br>Very low impact from human activities (but vulnerable for climate change, already acting) (Meltofte et al. 2013, Eamer et al. 2013). | | | | | |

## References

AMAP 2011. *Snow, Water, Ice and Permafrost in the Arctic (SWIPA): Climate change and the cryosphere*. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. Xii + 538 pp.

Arndt C.E. & Swadling K.M. 2006. Crustacea in Arctic and Antarctic sea ice: distribution, diet and life history strategies. *Adv. Mar. Biol. 51*, 197-315.

Berge J.,Varpe Ø., Moline M.A., Wold A., Renaud P.A., Daase M. & Falk-Petersen S. 2012. Retention of ice-associated amphipods: possible consequences for an ice-free Arctic Ocean. *Biol. Lett.* doi:10.1098/rsbl.2012.0517.

Bluhm B.A., Gebruk A.V., Gradinger R., Hopcroft R.R., Huettmann F., Kosobokova K.N., Sirenko B.I. & Weslawski J.M. 2011. Arctic marine biodiversity: An update of species richness and examples of biodiversity change. *Oceanography 24(3)*, 232-240.

Boetius A., Albrect S., Bakker K., Bienhold C., Felden J., Fernandez-Mendez M., Hendricks S., Katlein C., Lalande C., Krumpen T., Nicolaus M., Peeken I., Rabe B., Rogacheva A., Rybakova E., Somavilla R., Wenzhofer F. & SC, R.V.P.A.-,- S. 2013. Export of algal biomass from the melting Arctic sea ice. *Science (126)*, 1430-1432.

Christiansen J.S. & Reist J.D. (lead authors) 2013. Chapter 6. Fishes. Pp. 193-245 in Meltofte, H. (ed.) *Arctic Biodiversity Assessment. Status and trends in Arctic biodiversity.* Conservation of Arctic Flora and Fauna, Akureyri.

Durner G.M., Douglas D.C., Nielson R.M., Amstrup S.C., McDonald T.L., Stirling I., Mauritzen M., Born E.W., Wiig Ø., Deweaver E., Serreze M.C., Belikov S.E., Holland M.M., Maslanik J., Aars J., Bailey D.A. & Derocher A.E. 2009. Predicting 21st-century polar bear habitat distribution from global climate models. *Ecological Monographs 79 (1)*, 25-58.

Eamer J., Donaldson G.M., Gaston A.J., Kosobokova K.N., Lárusson K.F., Melnikov I.A., Reist J.D., Richardson E., Staples L. & von Quillfeldt C.H. 2013. *Life Linked to Ice: A guide to sea-ice-associated biodiversity in this time of rapid change.* CAFF Assessment Series No. 10. Conservation of Arctic Flora and Fauna, Iceland. ISBN: 978-9935-431-25-7.

Gosselin M., Levasseur M., Wheeler P.A., Horner R.A. & Booth B.C. 1997. New measurements of phytoplankton and ice algal production in the Arctic Ocean. *Deep-Sea Res. 44*, 1623-1644.

Gradinger R. 1999. Vertical fine structure of the biomass and composition of algae communities in Arctic pack ice. *Marine Biology 133*, 745-754.

Hop H. & Pavlova O. 2008. Distribution and biomass transport of ice amphipods in drifting sea ice around Svalbard. *Deep Sea Research II, 55*, 2292-2307.

Horner R., Ackley S.F., Dieckmann G.S., Gulliksen B., Hoshiai T., Melnikov I.A., Reeburgh W.S., Spindler M. & Sullivan C.W. 1992. Ecology of Sea Ice Biota. 1. Habitat and terminology. *Polar Biology 12*, 417–427.

Lizotte M.P. 2003. The microbiology of sea ice. Pp184-210 in D.N. Thomas & G.S. Dieckmann, (eds.) *Sea ice: An introduction to its physics, chemistry, biology and geology.* Oxford: Blackwell Publishing.

Lønne O.J. & Gulliksen B. 1991. Sympagic macro-fauna from multiyear sea-ice near Svalbard. *Polar Biology 11*, 471-477.

Maslanik J., Stroeve *J.* Fowler *C. &* Emery W. 2011. Distribution and trends in Arctic sea ice age through spring 2011, *Geophys. Res. Lett., 38, L13502, doi:*10.1029/2011GL047735.

McDonald T.L. 2012. *Aerial surveys for polar bears in offshore areas of the northern Beaufort Sea*.Western EcoSystems Technology, Inc. Wyoming, Canada. 6 pp.

Melnikov I.A., Kolosova E.G., Welch H.E. & Zhitina L.S. 2002. Sea ice biological communities and nutrient dynamics in the Canada Basin of the Arctic Ocean. *Deep Sea Research I, 49*, 1623–1649.

Melnikov I.A. & Chernova N.V. 2013. Characteristics of Under-Ice Swarming of Polar Cod *Boreogadus saida* (Gadidae) in the Central Arctic Ocean. Journal of Ichthyology, 2013, Vol. 53, No. 1, pp. 7–15. © Pleiades Publishing, Ltd., 2013. Original Russian Text © I.A. Melnikov, N.V. Chernova, 2013, published in Voprosy Ikhtiologii, 2013, Vol. 53, No. 1, pp. 22–30.

Meltofte H. (ed.) 2013. *Arctic Biodiversity Assessment. Status and trends in Arctic biodiversity.* Conservation of Arctic Flora and Fauna, Akureyri.

Poulin M., Daugbjerg N., Gradinger R., Ilyash L., Ratkova T. & von Quillfeldt C.H. 2010. The pan-Arctic biodiversity of marine pelagic and sea-ice unicellular eukaryotes: A first-attempt assessment Marine Biodiversity. *Marine Biodiversity 41*, 13-28.

Sakshaug E. 2004. Primary and secondary production in the Arctic Sea. Pp. 57-81 in Stein R. & Macdonald R.W. (eds). *The organic carbon cycle in the Arctic Ocean.* Springer, Berlin.

Schliebe S., Wiig Ø., Derocher A.E., Lunn N., 2008. *Ursus maritimus.* In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.1. www.iucnredlist.org Downloaded on 31 August 2011.

Tchesunov, A.V. & Riemann F. 1995. Arctic sea ice nematodes (Monhysteroidea), with descriptions of

*Cryonema crassum* gen. n., sp. n. and *C. tenue* sp. n. *Nematologica 41*, 35–50.

Tschesunov A.V. 2006. *Biology of marine nematodes.* Moscow, KMK Scientific Partnership Publishers, 367 pp. (In Russian).

Turner J., Bindschadler R., Convey P., di Prisco G., Fahrbach E., Gutt J., Hodgson J., Mayewski P. & Summerhayes C. 2009. *Antarctic climate change and the environment. A contribution to the International Polar Year 2007-2008.* Scientific Committee on Antarctic Research (SCAR). Cambridge, UK, 526 pp.

von Quillfeldt C.H., Hegseth E.N., Johnsen G., Sakshaug E. & Syvertsen E.E. 2009. *Ice algae.* Pp. 285-302 in Sakshaug E., Johnsen G. & Kovacs K. (eds) Ecosystem Barents Sea. Tapir Academic Press, Trondheim, Norway.

Werner I., Auel H., Garrity C. & Hagen W. 1999. Pelagic occurrence of the sympagic amphipod *Gammarus wilkitzkii* in ice-free waters of the Greenland Sea - dead end or part of life-cycle? *Polar Biology 22*, 56-60.

Werner I. & Gradinger R. 2002. Under-ice amphipods in the Greenland Sea and Fram Strait (Arctic): environmental controls and seasonal patterns below the pack ice. *Marine Biology 140(2)*, 317-326.

Zheng S., Wang G., Zhang F., Cai M. & He J. 2011. Dominant diatom species in the Canada Basin in summer 2003, a reported serious melting season. *Polar Record 47*, 244-261.

**Maps and Figures**

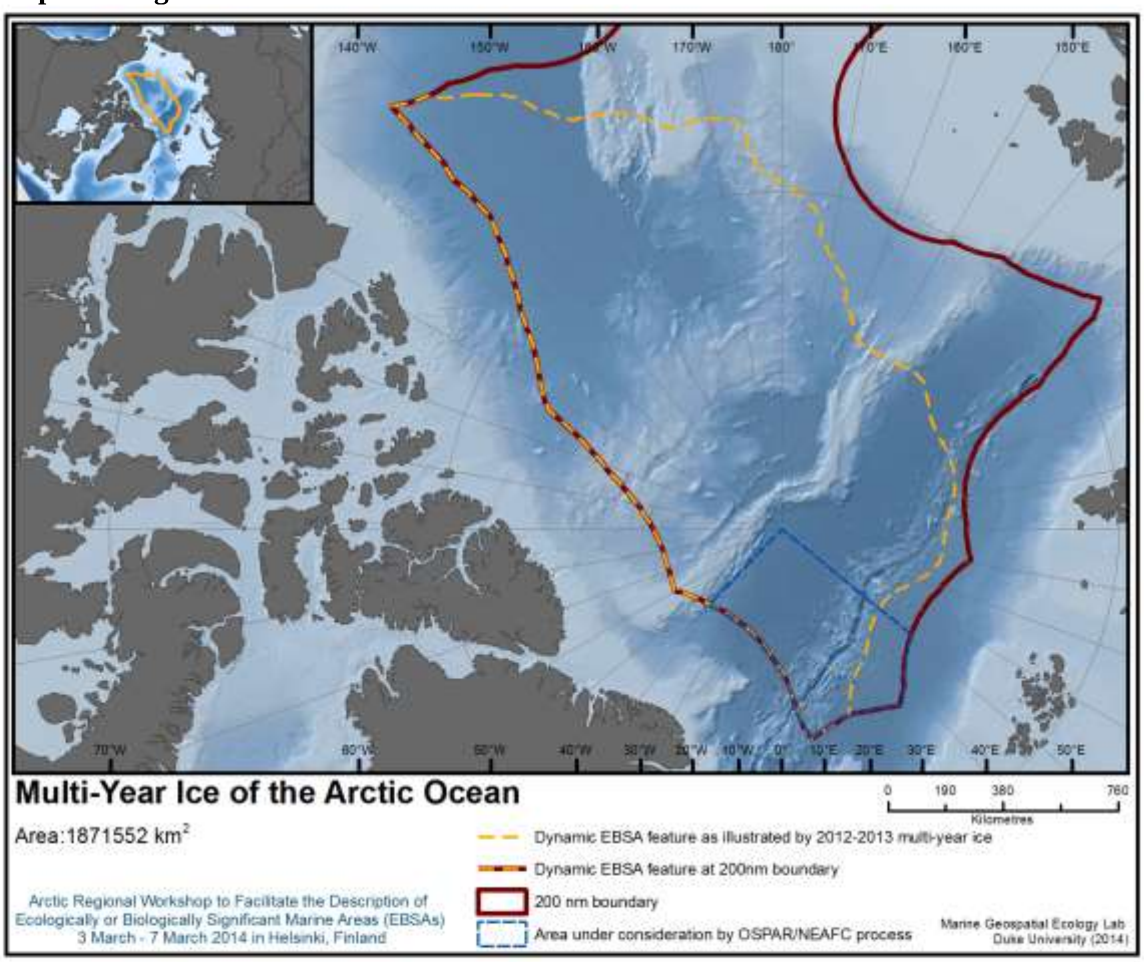
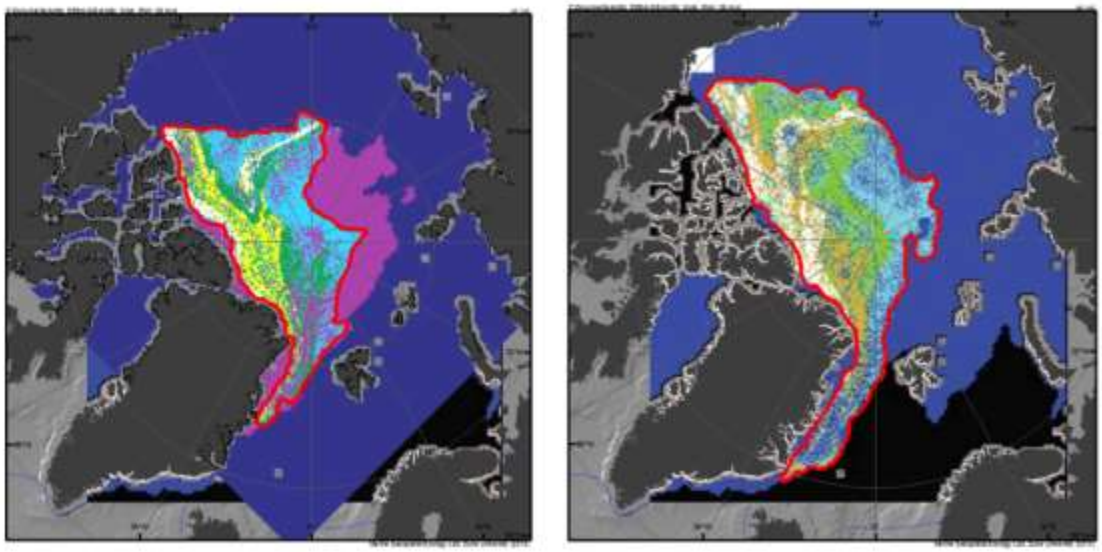



Figure 1. Area meeting EBSA criteria. Map of combined September 2012 and March 2013 multi-year ice areas within the central Arctic area beyond national jurisdiction.



**September 2012 multi-year ice (2-5 year)** **March 2013 multi-year ice (2-5 year)**

Figure 2. September 2012 and March 2013 boundaries containing ice at least two years old.

***Special note for Area No. 2: Multi-year Ice of the Central Arctic Ocean***

This special note contains information on the use of sea ice climatologies to identify the location of the features described in areas no. 1 and 2 in the appendix to annex VIII. The primary data sources for these areal definitions are sea ice climatologies from the US National Snow and Ice Data Center.

**Definition of multi-year ice of the Arctic Ocean**

The multi-year ice area in the Arctic is highly variable and has been exhibiting significant declines in area in recent years. Recent assessments have been published tracking trends in multi-year sea ice (Maslanik et al. 2011).

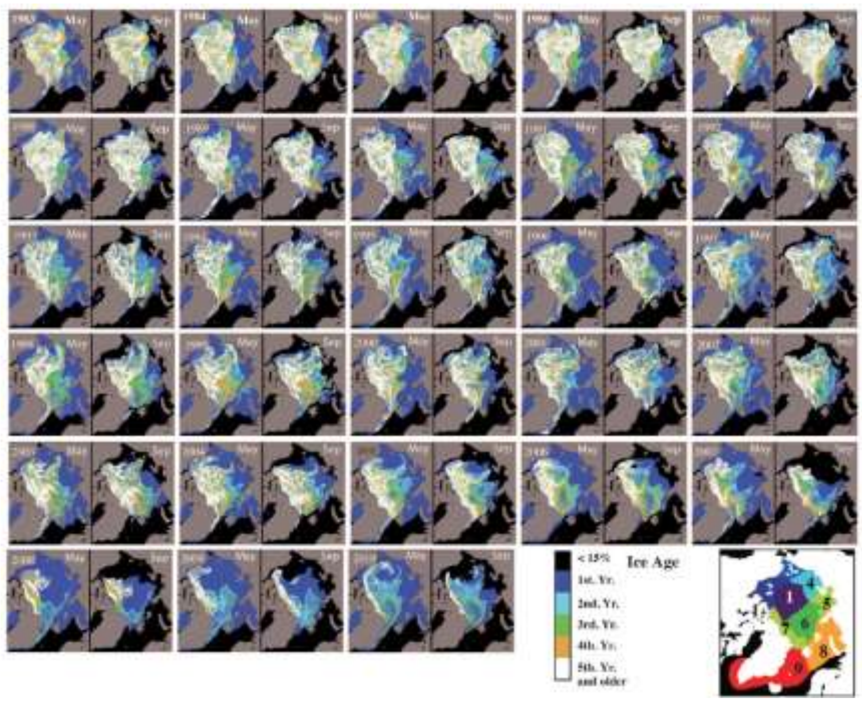
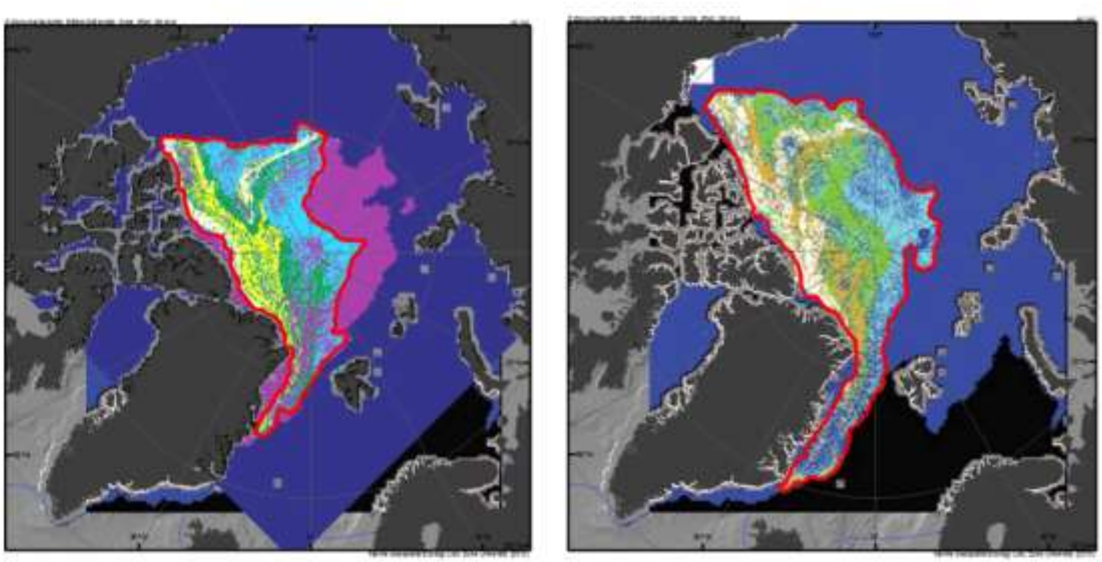



Figure 1. Multi-year Arctic sea-ice 1983 – 2010 (Maslanik et al. 2011).

For the purpose of this mapping exercise, the most recent September 2012 (i.e., seasonal minimum area) and March 2013 (i.e., seasonal maximum area) assessments of multi-year ice were used, updated from Maslanik et al. 2011.

The most recent seasonal sea ice age assessment date-pair (September 2012 and March 2013) was used to identify a contemporary example of the range of multi-year ice. (***Note:*** *the selection of the most recent annual date-pair captures a single temporal example of a dynamic feature, whose boundary may vary considerably between years.)*

Area boundaries containing two-year-old or greater sea ice ages were digitized for the September 2012 and March 2013 ice assessments.



**September 2012 multi-year ice (2-5 year)** **March 2013 multi-year ice (2-5 year)**

Figure 2. September 2012 and March 2013 boundaries containing ice at least two years old.

The September 2012 and March 2013 boundaries were combined (geographic union overlay) to identify an example of an annual geographic range of multi-year ice extent.

**September 2012 & March 2013 Ice Age**
**( 1 - 5 year)**

Figure 3. Combined September 2012 and March 2013 multi-year ice areas.

The area of (2012-2013) multi-year ice was then limited to areas beyond national jurisdiction. This area is the basis for the multi-year ice area described to meet the EBSA criteria (area no. 2).

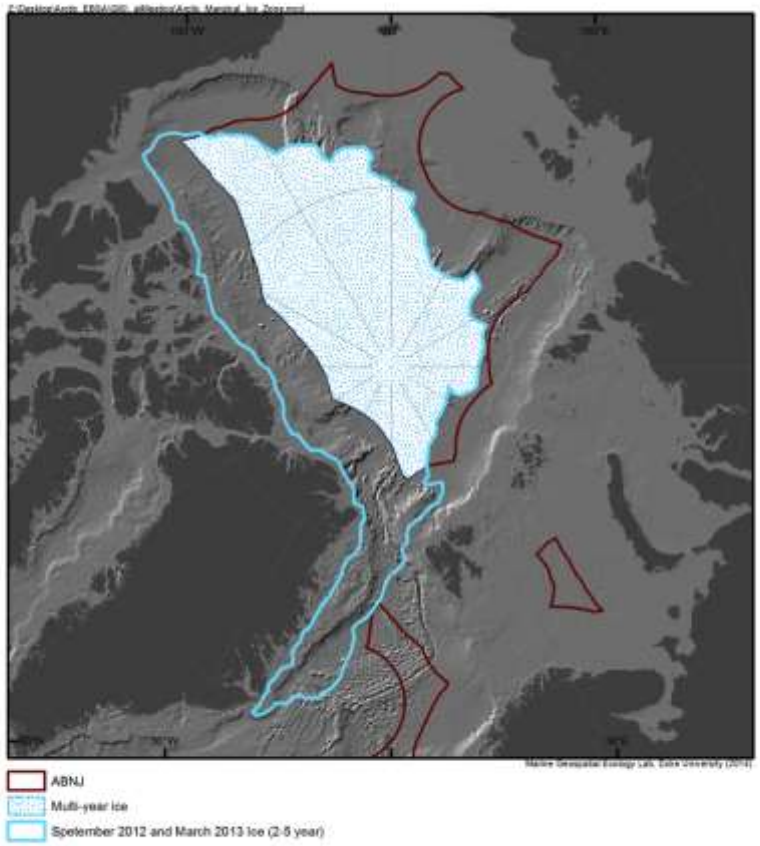



Figure 4. Multi-year ice area within areas beyond national jurisdiction.

***Location***

This area meeting EBSA criteria comprises the surface ice and related water column features associated with the multi-year sea ice area (area no. 2). This area is described as a geographically and temporally dynamic feature that is expected to change in area, shape and geographic location from year to year. The example multi-year ice range provided (September 2012- March 2013) refers to the area beyond national jurisdiction only.

**Literature cited**

Maslanik, J., J. Stroeve, C. Fowler, and W. Emery. 2011. Distribution and trends in Arctic sea ice age through spring 2011. *Geophys. Res. Lett., 38, L13502*, doi:10.1029/2011GL047735.

National Ice Center. 2006, updated 2009. *National Ice Center Arctic sea ice charts and climatologies in gridded format*. Edited and compiled by F. Fetterer and C. Fowler. Boulder, Colorado USA: National Snow and Ice Data Center. http://dx.doi.org/10.7265/N5X34VDB.

## Area No. 3: Murman Coast and Varanger Fjord

### Abstract

The description of the Murman coast and Varanger fjord in the Barents Sea is based on synthesizing, extending and updating the assessment done by the WWF Barents Ecoregion Biodiversity Assessment (Larsen et al., 2003), Barents Sea ecosystem status report (Stiansen 2009), and the IUCN/NRDC and AMSA IIc reports (Speer and Laughlin, 2011; AMAP/CAFF/SDWG, 2013). This area is characterized by very high productivity (9-13% of annual net primary production) (Makarevich and Druzhkova, 2010) as well as high benthic biomass. It is used as a spawning area by several species of pelagic fishes (e.g., capelin, sand eel), while the coast contains a large number of seabird colonies — more than 50,000 breeding pairs of different species. The large diversity of avifauna is due to the overlap of distribution ranges of eastern and western species. The coast of the Kola peninsula is used as a wintering area by many seabirds from the eastern part of the Barents Sea (Krasnov et al., 2002; Krasnov, 2004). It also plays an important role in maintaining marine mammal populations, serving as an important feeding and breeding area for grey seal *(Halichoerus grypus*) and a feeding area for minke whales, harbor porpoise (*Phocoena phocoena*) and orcas (*Orcinus orca*). The coastal waters of the Kola Peninsula are used by beluga whales (*Delphinapterus beluga*) as a migration corridor and feeding area. Other cetaceans listed on the IUCN Red List are also regularly observed here, such as humpback whales (*Megaptera novangliae*), sei whales (*Balaenoptera borealis*) and white-beaked dolphin (*Lagenorhynchus albirostris*) (Burdin et al., 2009).

### Introduction

The report titled *Identification of Arctic Marine Areas of Heightened Ecological and Cultural Significance: Arctic Marine Shipping Assessment (AMSA IIc) (*AMAP/CAFF/SDWG, 2013) revealed the coastal waters of the Barents Sea as an important area meeting several EBSA criteria. The IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment (see annex II) (Speer and Laughlin, 2011) identified an area named “White Sea/ Barents Sea Coast” as meeting nearly all EBSA criteria. “This region is characterized by highly productive coastal waters influenced by a coastal branch of warm current originating from the North-Atlantic current. The area supports diverse and productive benthic communities including kelp, provides important nursery habitat for several species of pelagic fishes, and supports Atlantic salmon as well as seabird colonies with diverse species composition. The area is important for breeding Common eiders and provides staging, molting and wintering grounds for three eider species, including Steller’s eider, which is considered globally vulnerable by IUCN” (Speer and Laughlin, 2011). In the following description we detail this assessment focusing on the EBSA criteria.

### Location

This area, which is within the national jurisdiction of Russia, covers part of areas 1, 2, and 3 of the Barents Sea LME identified in the AMSA IIc report (AMAP/CAFF/SDWG, 2013). In the east, the area is bounded by the White Sea, described as area no. 4 in this report. The western boundary of this area is the limit of the national jurisdiction of Russia. The offshore boundary is within the influence of the Murmansk Coastal Current, conventionally within 30 km from shore and generally shallower than 200 m depth. Although the Varanger fjord is divided between Russia and Norway, the area described here is completely within Russia’s jurisdiction. Although there are some continuous ecological features from Tromsø Bank to the northern White Sea, these areas have considerable specificity and may be divided in different ways, as was done for the purpose of describing this area.

### Feature description of the proposed area

In the western part of the area, Varanger fjord and the fjords of Rybachiy Peninsula and Motovsky Bay have a complex shoreline. A variety of fjords of different types and sizes, steep rocks and small beaches create a complex coastal environment. In the eastern part of the area, a low-lying, shallow coastline is typical of the south-eastern Barents Sea, but remnants of the western fjord and skerries system are still present. Groups of small islands and capes are found along the coast of the area. Complex tectonic and glacial processes along with the isostatic uplift of the Scandinavian shield create several fjord lagoons with limited water exchange with the sea (Semenov, 1988); on the coast of Kildin Island, there is also another type of water body that separated from the sea: Mogilnoe Lake, the only known anchialine lake in the Arctic (Strelkov et al., 2014).

The oceanographic regime of the area is dominated by the Murmansk coastal current (in the west also by the Norwegian coastal current), which transports the transformed water of Atlantic origin. Transformation leads to some freshening of the water and warming of surface and subsurface layers compared to the waters of the North Cape and the Murmansk currents transporting the Atlantic water in the more offshore part of the Barents Sea. The coastal waters are generally ice free; nutrient input from Atlantic waters and the seasonal cycle of stratification and mixing make the primary production regime different from the offshore Barents Sea. A complex system of oceanographic fronts develops in the southern Barents Sea (Kostianoy et al., 2004). The area is generally productive but distribution of phytoplankton is mosaic owing to numerous eddies and local fronts (Makarevich and Druzhkova, 2010). The bulk of zooplankton, which provides abundant food for fish and, to some extent seabirds, is formed due to *Calanus finmarchicus* and the larvae of benthic invertebrates (Kamshilov, 1958; Stiansen et al., 2009) but krill is also important (Zelikman, 1961). Bottom topography in the area is very complex. Together with mosaic distribution of different types of sediments, this provides conditions for fine-scale mosaics of hard- and soft-bottom habitats and respective communities (Derjugin, 1915; Sharonov, 1948; Pergament, 1957; Zatsepin, 1962; Zatsepin and Rittikh, 1968; Propp, 1971; Pereladov, 2003; Sokolov and Shtrik, 2003; Anisimova et al., 2010; Britayev et al., 2010). The coastal area has long been known for abundant fish, seabirds and mammal populations, many of them forming seasonal aggregations and having been exploited by indigenous Saami people, Russians and Norwegians for centuries (Lajus et al., 2005; Lajus and Lajus, 2010; Bohanov et al., 2013).

**Feature condition and future outlook of the proposed area**

The Barents Sea ecosystem is known for its fluctuating nature, which strongly depends on global processes and interactions between the atmosphere and the ocean (Stiansen et al., 2009). The decadal variation in oceanographic and biological characteristics is well documented and clearly shows different periods interfering with the impact of fishing on fish and benthic invertebrate communities (Borisov et al. 2001; Yaragina & Dolgov, 2009). Comparison of the Barents Sea ecosystem, with its broad shelf, to the neighbouring Norwegian Sea ecosystem indicate that the former may have higher resilience owing to longer trophic chains, providing more energy flow into their benthic assemblages (Yaragina and Dolgov, 2009). However, the coastal ecosystem is particularly more vulnerable to accidental oil pollution.

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness or rarity** | Area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | X | |
| *Explanation for ranking*<br>The area harbours no endemic species except the subspecies of Atlantic cod *Gadus morhua mogilniesis*, which liv in the anchialine Mogilnoe Lake, but some habitas are unique, namely Mogilnoe Lake itself | | | | | |

<table>
<tr><td colspan="6">(Derjugin, 1925) as the only anchialine marine basin in the Arctic (Strelkov et al., 2014).</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>The coastal waters of the Kola Peninsula are the main habitat for sand eel (Ammodites spp.), the most important spawning ground of capelin (Mallotus mallotus) (figure 2), and the feeding area for most key demersal fishes, such as cod (Gadus morhua), haddock (Melanogrammus aeglefinus), halibuts, walfish, and plaice, and, at certain periods of time, herring (Clupea harengus). The rivers of the Kola Peninsula retain importance for maintaining genetically diverse stocks of Atlantic salmon (Salmo salar) (Larsen et al., 2003; Stiansen et al., 2009).<br><br>At least seven colonies of 50,000-plus breeding pairs and a number of smaller colonies located on the coast from the Russia/Norway border to Sviatoi Nos Cape hold a broad range of species because distribution ranges of eastern and western species meet there, with kittiwake (Rissa tridactyla) being most numerous. The area is also important for the breeding of guillemots (Uria aalgae and U. lomvia, Cepphus grylle), herring and black-backed gulls (Larus argentatus and L. marinus), cormorants (Phalacrocrax aristotelis, P. carbo), and Atlantic puffin (Fratercula arctica). The islands also provide nesting habitats to common eider (Somateria molissima) (Krasnov et al., 1995; Bakken et al., 2000; Gavrilo, 2011; Krasnov and Goryaev, 2013; Ivanenko, 2013; Krasnov and Ezhov, 2013). The coastal waters, with their high productivity and seasonal mass shoreward migration of pelagic fishes, are also among the most important feeding areas of colonial seabirds (Krasnov et al., 1995; 2006; Ezhov, 2008; Krasnov et al., 2012; Krasnov, 2013; Krasnov and Ezhov, 2013) and marine mammals, such as bearded seal (Erignathus barbatus), ringed seal (Phoca hispida), harp seal (Pagophilus groenladicus) and minke whales (Balaenoptera acutorostrata) (Larsen et al., 2003; Stiansen et al., 2009; Krasnov et al., 2012) (figure 3). The coastal waters of the Kola Peninsula are also used by beluga whales (Delphinapterus beluga) as a migration corridor and feeding area.<br><br>With the onset of the sea ice season, most seabirds migrate from the eastern Barents Sea to the Kola Peninsula coast and the Norwegian shores of the Barents Sea (Krasnov et al., 2002; Krasnov, 2004). The coastal area of Kola and Rybachiy peninsulas and Varanger fjord form continuation of the wintering area of eiders and other seabirds, which is integrated with a similar wintering area in the northern part of the White Sea (figure 4). The common eider, which is most characteristic of this area, ranges more or less continuously along the Kola Peninsula coast, while the king eider (Somateria spectabilis) and Steller eider (Polysticta stelleri) congregate in several spots (Krasnov et al., 2004; Krasnov, 2013; Ivanenko, 2013).</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>The coast of the Kola Peninsula and Varanger fjord is home to a population of white-tailed sea eagle (Haliaeetus albicilla) and is a wintering area for Steller eider (IUCN VU), long-tailed duck (IUCN VU) and velvet scoter (IUCN VU). The area is important as a feeding and breeding area for grey seal (Halichoerus grypus), which is listed in Russia’s national red list, and a feeding area regularly visited by minke whales, harbor porpoise (Phocoena phocoena) orcas (Orcinus orca) and commonly by other cetaceans listed on the IUCN Red List, i.e., humpback whales (Megaptera novangliae) and sei whales</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| (*Balaenoptera borealis*) as well as white-beaked dolphin (*Lagenorhynchus albirostris*) (Burdin et al., 2009). | | | | | |
| **Vulnerability, fragility, sensitivity, or slow recovery** | Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery. | | | | X |
| *Explanation for ranking*<br>Overfishing, well-documented in the Barents Sea ecosystem (Borisov et al., 2001; Bohanov et al., 2013), has also impacted the survival and breeding success of the seabird colonies of the Murman Coast (Ktrasnov et al., 1995; Krasnov, 2013). Sensitive habitats in the area include benthic habitats with rich epifaunal communities (i.e., bryozoans, sponges, scallops) on hard and mixed substrates vulnerable to bottom-trawling and dredging (Denisenko, 2001; Denisenko and Zgurovsky, 2013). The coastal zone with its complex coastline is also highly vulnerable to oil spills. | | | | | |
| **Biological productivity** | Area containing species, populations or communities with comparatively higher natural biological productivity. | | | | X |
| *Explanation for ranking*<br>The coastal zone off Kola Peninsula comprises 3% of the shelf area but provides 9-13% of annual net primary production. Productivity of the narrow coastal band between 0 and 10 m, where macrophytes contribute to production, is especially high (Makarevich and Druzhkova, 2010). Coastal zooplankton may reach high biomass owing to local development and transport of dominant copepod species *Calanus finmarchicus*, seasonal development of meroplankton (Kamshilov, 1958) and aggregating of krill (Zelikman, 1961: Drobysheva, 1994). The benthic biomass and production is also particularly high, allowed the introduction to the ecosystem of a new generalistic predator: the Kamchatka (red) king crab *Paralithodes camtschaticus*. | | | | | |
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | | | | X |
| *Explanation for ranking*<br>The species richness of the coastal waters in the south-western and central Barents Sea is particularly high. In particular, 414 species of pelagic algae (not counting numerous forms and varieties) have been recorded in the coastal waters (Makarevich and Druzhkova, 2010). The Barents Sea is known for the highest species richness of fishes and macroinvertebrates in the Arctic seas (over 2300 species of macroinvertebrates, about 200 species of fish – Spiridonov, 2011; Spiridonov et al., 2011) – most of them occurring in the coastal zone of Kola and Rybachiy peninsulas. In a single fjord-like inlet sand and shell habitats alone harbour 190 species of macroinvertebrates (Sharonov, 1948). The coastal area belongs to a different biogeographical unit than the offshore Barents Sea regardless of what regionalization scheme is adopted (Spiridonov, 2011a), and it can be also considered a corridor for migration of Atlantic species to the East following periods of warming and increasing input of Atlantic water. The Barents Sea also harbours the greatest number of marine colonial, facultative colonial birds and sea ducks (30) in the Arctic seas, practically all of which nest or aggregate in the coastal area (Bakken et al., 2000; Spiridonov et al., 2011).<br><br>The coastal zone contains a variety of semi-isolated fjord-like inlets with a specific oceanographic regime, which are in the process of separating from the sea owing to isostatic rise (Semenov, 1988; Bobkov et al., 2010, 2013; Pereladov et al., 2013). Seasonal successions in coastal planktonic communities show considerable variation (Makarevich and Druzhkova, 2010). A variety of benthic habitats and biotopes includes particularly important kelp and calacareous algae communities, scallop banks, and hard-bottom communities dominated by bryozoans and sponges (Pergament, 1957). | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low | | | X | |

| | | | | | |
|---|---|---|---|---|---|
| | level of human-induced disturbance or degradation. | | | | |

*Explanation for ranking*
The biological resources of the coastal waters of the Barents Sea have been exploited for centuries (Lajus et al., 2005; Lajus and Lajus, 2010). In the 20th century the Barents Sea fishery experienced several crises (Borisov et al., 2001; Bohanov et al., 2013). In particular, large fluctuations in capelin abundance have been strengthened by an intensive fishery (Yaragina and Dolgov, 2009), which affected the seabird colonies of the Murman coast and reproductive success of particular bird species (Krasnov et al., 1995) while the bottom-trawling pressure apparently impacted benthic communities (Denisenko, 2001; Denisenko and Zgurovsky., 2013). However, most changes appear to be reversible. Kamchatka (red) king crab was introduced in the Barents Sea in the 1960s and became a component of the coastal ecosystem. Its impact on benthic communities varies temporally and spatially but generally can be considered moderate (Spiridonov et al., 2009; Britayev et al., 2010). Some bays, Kola Bay in particular, with its urbanized and industrialized coast, have been strongly impacted by pollution (Matishov, 2009). In spite of all the disturbances the coastal ecosystems appear to be operating in a natural mode and manner, even if there are disturbances from fisheries and other exploitation; so that naturalness can be qualified as medium.

**References**

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp.

Anisimova N.A., Jørgensen L.L., Lyubin P.A., Manushin I.E. 2010. Mapping and monitoring of benthos in the Barents Sea and Svalbard waters: Results from the joint Russian - Norwegian benthic programme 2006-2008. *IMR-PINRO Joint Report Series* 1-2010. 114 p.

Bakken V., Cherenkov A.E., Gavrilo M.V., Koryakin A.S., Krasnov J. (Yu). V., Nikolaeva N.G., Porkovskaya I.V., Semashko V.Yu., Tertitski G.M. 2000. Seabird colony databases of the Barents Sea region and the Kara Sea // *Norsk Polarinstitut Rapportserie*, 115: 1–78

Bobkov A.A., Strelkov P.P., Ilyina A. 2010. Tidal variability of oceanological conditions in underwater landscapes of the sublittoral in Guba Ivanovskaya. Vestnik of St. Petersburg State University, Ser. 7, 2010 # 10, pp. 86–99 (in Russian).

Bobkov A.A., Mai R.I. Lazareva E.I., Spiridonov V.A. 2013. Geomorphological peculiarities of the shores and hydrological regime of the inner part of Guba Ambarnaya (Kola Peninsula). *Izvestiya of Russian Geographical Society*, 145 (6), p. 44–52 (in Russian).

Bohanov D.V., Lajus D.L., Moiseev A.R., Sokolov K.M. 2013. *Assessement of threats to the Arctic marine ecosystem associated with commercial fishery: the Barents Sea case*. Moscow, WWF Russia, 105 p. (in Russian).

Borisov V.M., Ponomarenko V.P., Semenov V.N. 2001. Bioresources of the Barents Sea and fishery in the second half of XX century. In: Matishov G.G. (ed). *Ecology of commercial fish species of the Barents Sea*. Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 139–195 (in Russian).

Britayev T.A., Rzhavsky A.V., Pavlova L.V., Dvoretslij A.V. Studies on impact of the alien red king crab (Paralithodes camtschaticus) on the shallow water benthic communities of the Barents Sea. *Journal of Applied Ichtyology*, 26 (Suppl. 2), 2010. P. 66–73.

Burdin A.M., Filatova O.A., Hoyt E. *Marine mammlas of Russia. A guidebook*. Kirov, Regional Printin House, 206 p. (in Russian).

Denisenko S.G. 2001. Long-term changes of zoobenthos biomass in the Barents Sea. Zoolog-ical sessions (Annual report 2000). *Proceeding of the Zoological Institute Russian Academy of Sciences*, 289, pp. 59-66.

Denisenko S.G., Zgurovsky K.A. (eds) 2013. *Impact of trawl fishery on benthic ecosystems of the Barenst Sea and options to decrease the level of negative consequences*. Murmansk, WWF Russia, 52 p. (In Russian).

Derjugin K.N. 1915. *Fauna der Kola-Bucht und ihre Existenzbedignungen. Mémoires de l'Académie Impériale des Sciences de St.-Pétersbourg,* VIII ser, vol 34: 1-929 (in Russian with extended German summary)

Drobysheva S.S. 1994. *Euphausiids of the Barents Sea and their role in building up fishery productivity*. Murmansk, PINRO, 139 p. (In Russian).

Gavrilo M.V. 2011. Seabirds and most important seabird colonies. In: V. Spiridonov, M. Gavrilo, N. Nikolaeva, E. Krasnova (eds) *Atlas of the Marine and Coastal Biodiversity of the Russian Arctic. Moscow.* WWF Russia Publication, pp. 29–30.

Kamshilov M.M. 1958. Zooplankton of coastal zone of the Barents Sea. *Trudy (Proceedings) of Murmansk Marine Biological Station*, pp. 53-74.

Kostianoy, A.G., Nihoul, J.C.J., Rodionov, V.B. Physical oceanography of frontal zones in the subarctic seas. *Elsevier Oceanography Series*, 17 Elsevier: Amsterdam, 2004, 226 p.

Krasnov Yu.V. 2013. Birds of the Barents Sea. The history of national research. In: P.V. Makarevich (ed). *Birds of the northern and southern Russian seas*. Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 7–15 (in Russian).

Krasnov Yu.V., Ezhov A.V. 2013. Modern conditions of kittiwake (*Rissa tridactyla*) and and guillemot (*Uria aalgae*) population on Murman. In: P.V. Makarevich (ed). *Birds of the northern and southern Russian seas*. Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 102–117 (in Russian).

Krasnov Yu.V., Gavrilo M.V., Spiridonov V.A. 2011. Sea ice biotopes of southeastern Barents and the White seas. In: V. Spiridonov, M. Gavrilo, N. Nikolaeva, E. Krasnova (eds) *Atlas of the Marine and Coastal Biodiversity of the Russian Arctic.* Moscow, WWF Russia Publication, pp. 30–32.

Krasnov Yu.V., Goryaev Yu. I. 2013. Main tendencies of avifauna development in Kola Bay and its determinants. In: P.V. Makarevich (ed). *Birds of the northern and southern Russian seas.* Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 38–64 (in Russian).

Krasnov Yu.V., Matishov G.G., Galaktionov K.V., Savinova T.N. 1995. *Colonial seabirds of Murman*. St.Petersburg, Nauka, 226 p. (In Russian).

Krasnov Yu.V., Strom H., Gavrilo M.V., Shavykin A.A. 2006. Wintering of seabirds in polynyas near the Terskiy Coast of the White Sea and at East Murman. *Ornithology*. Issue 31. Moscow, MSU publishers, pp. 51–57. (In Russian).

Krasnov Yu.V., Spiridonov V.A., Dobrynnin D.V. 2012. Seabirds on the Eastern Murman and northern part of the White Sea in summer: features of distribution and differences in forage resources. In: G.G. Matishov (ed). *Ecology of seabirds in the White Sea*. Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 44–66 (in Russian).

Ivanenko N.Yu. 2013. Avifauna of West Murman by the example of Pechenga Bay and Islands of Ainov. In: P.V. Makarevich (ed). *Birds of the northern and southern Russian seas*. Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 64–101 (in Russian).

Lajus D.L., Dmitrieva Z.V., Kraikovski A. V., Lajus J.A.,Yurchenko A.Y., Alexandrov D.A. 2005. The use of historical catch data to trace the influence of cimate on fish populations: examples from the White and the Barents Sea fisheries in 17$^{th}$ – 18$^{th}$ centuries. *ICES Journal of Marine Science*, 62 (7), pp. 1426–1435.

Lajus D.L., Lajus J.A (eds). 2010. "The sea is our field". Quantitative data on fisheries of the White and the Barents Sea in XVII – early XX century. St.Petersburg, European University, 219 p. (in Russian).

Larsen T., Boltunov A., Denisenko N., Denisenko S., Gavrilo M., Mokievsky V., Nagoda D., Spiridonov V., Quillfeldt C. von and the participants at the St. Petersburg biodiversity workshop 12-13 May 2001. 2003. *The Barents Sea Ecoregion*. *A biodiversity assessment*. Oslo, WWF, 150 p.

Makarevich P.R., Druzhkova E.I. 2010. *Seasonal cyclic processes in coastal planktonic algocoenoses of northern seas*. Dostov on Don, Murmansk Marine Biologocal institute – Southern Science Centre of Russian Academy of Sciences, 279 p. (in Russian).

Matishov G.G. (ed). 2009. Kola Bay. *Development and rational nature management*. Moscow, Nauka, 381 p. (in Russian).

Pereladov M.V. 2003. Some aspects of distribution and behavior of red king crab in the Barents Sea shallow coastal waters. In: Sokolov VI, editor. *Bottom ecosystems of the Barents Sea. – Trudy* (Proceedings) VNIRO, 142, pp. 103-119 (in Russian).

Pereladov M.V., Spiridonov Vassily A., Anosov S.E., Bobkov A.A., Britayev T.A., Deart Yu.V., Labutin A.V., Simakova U.V., Spiridonov Victor A. 2013. Studies of the lagoons Linjalampi and Sisjarvi (Varanger fjord, southwestern part od the Barents Sea), general characteristics, bottom communities and the impact of introduced Kamchatka crab (*Paralithodes camtschaticus*). In: *Material of science conference "Marine biology, geology, oceanology – interdisciplinary studies on marine stations*". Moscow, Moscow State University, 27 February – 01 March 2013. Moscow, KMK Scientific Publications, pp. 241–245.

Pergament T.S. Distribution of benthos in the coastal zone of East Murman. *Trudy (Proceedings) of Murmansk Marine Biological Sation*, 3, pp. 75–89 (in Russian).

Propp M.V. 1971. *Ecology of the coastal bottom communities of the Murmansk coast of the Barents Sea*. Leningrad, Nauka, 128 p. (in Russian).

Semenov V.N. 1988. *Systematics and ecology of marine basins at different stages of isolation*. Apatity, Kola Science Centre of the Academy of Science of USSR, 90 p. (in Russian).

Sharonov I.V. 1948. Sublittoral benthic assemblages of Yarnyshnaya inlet. *Trudy (Proceedings) of Murmansk Marine Biological Sation*,1, pp. 153–163 (in Russian).

Sokolov VI, Shtrik VA. 2003. The biocenosis analysis of the coastal zone of Teriberscaya Bay, the Barents Sea, and the investigation of the influence of red king crab (*Paralithodes camtschaticus*) on the Barents Sea ecosystem. In: Sokolov VI, editor. *Bottom ecosystems of the Barents Sea. – Trudy (Proceedings)* VNIRO, 142: 6-24.

Speer L. and Laughlin T. (eds) 2011. *IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment*, La Jolla, California. 02-04 November 2010. 37 p.

Spiridonov V.A. 2011. Biogeographical regionalization. Species diversity in the Russian Arctic seas: pelagic and sea ice biota, micro- and meiofauna. Macrobenthos: species diversity and group domination in the communities. In: V.A. Spiridonov., M.V. Gavrilo, N.G. Nikolaeva, E.D. Krasnova (eds) 2011. *Atlas of the Marine and Coastal Biodiversity of the Russian Arctic*. Moscow, WWF Russia, pp. 16-21.

Stiansen J.E., Korneev O., Titov O., Arneberg P. (eds), Filin A., Hansen J.R., Hшines E., Marasaev S. (co-eds) 2009. *Joint Norwegian_Russian Environmental Status Report (2008) on the Barents Sea Ecosystem. Part II — Complete report*. IMR/PINRO Joint Report Series, 2009(3). Bergen: Institute of Marine Research. — 375 p.

Strelkov P., Shunatova N., Fokin M., Usov N., Fedyuk M., Malavenda S., Lubina O., Poloskin A., Korsun S. 2014. Marine Lake Mogilnoe (Kildin Island, the Barents Sea): one hundred years of solitude. *Polar Biology*, 37, pp. 297–310.

Yaragina N.A., Dolgov A.V. 2009. Ecosystem structure and resilience — A comparison between the Norwegian and the Barents Sea. *Deep-Sea Research II*, 56: 2141–2153.

Zatsepin V.I. 1962. Communities of the bottom invertebrate fauna of the Murmansk Coast of the Barents Sea and their relationships with the North Atlantic communities. *Trudy (Proceedings) of All-Union Hydrobiological Society*, 12, pp. 246–344 (in Russian).

Zatsepin V.I., Rittikh, L.A. 1968. Quantitative distribution of bottom fauna and its various ecological groups in the Murmansk coastal area of the Barents Sea. *Transactions of the Moscow Society of Naturalists*, 30: 49–82 (in Russian).

Zelikman E.A. 1961. On the ascent to the sea surface of the Barents Sea euphausiids and some features of their behaviour. In: *Hydrological and biological characteristics of the Murmansk coastal waters*, Murmansk, Murmanskoe Izdatelstvo, pp. 136-152. (In Russian).

**Maps and Figures**

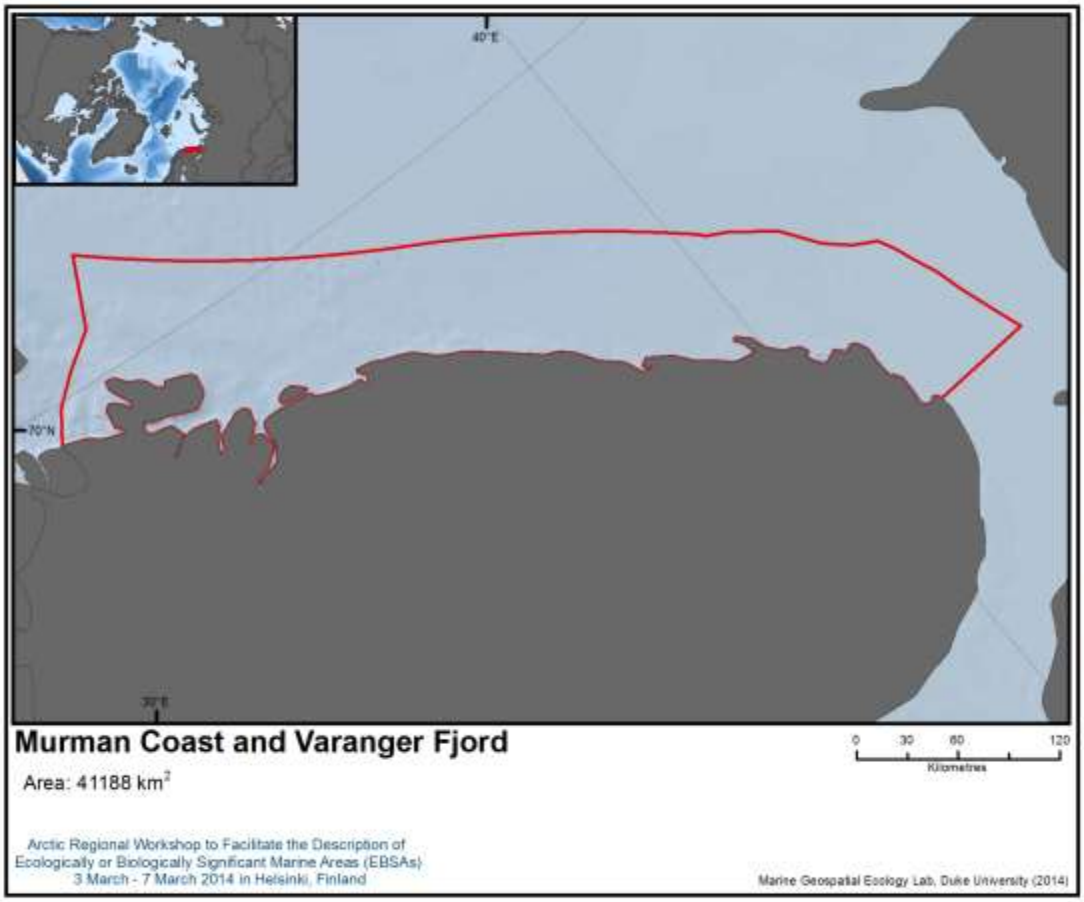



Figure 1. Area meeting EBSA criteria.

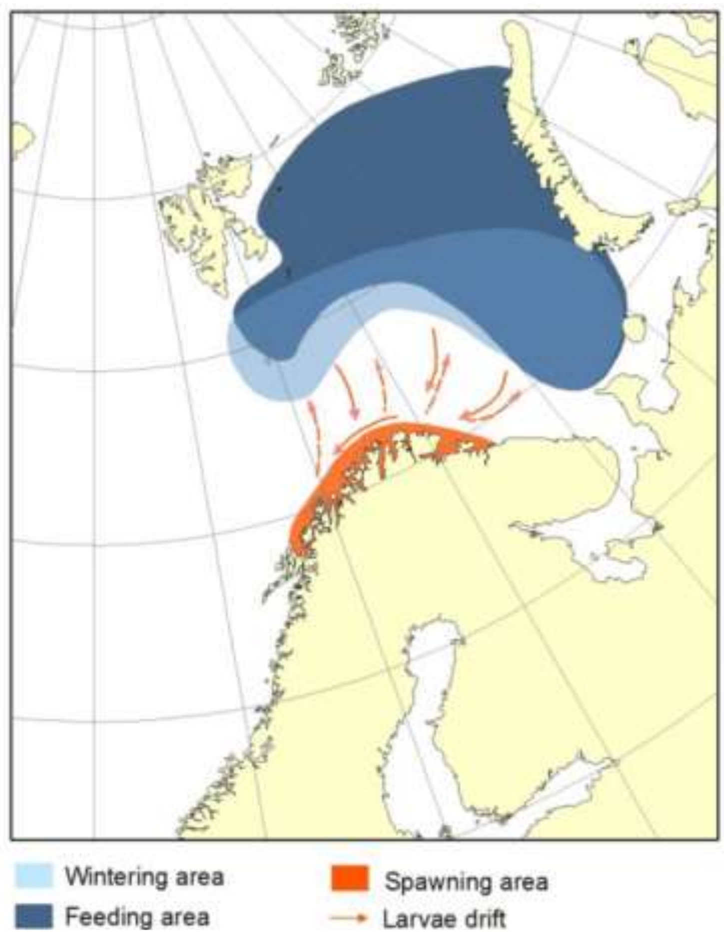



Figure 2. Spawning and migration areas of capelin (*Mallotus mallotus*) in the Barents Sea. Source: Stiansen et al., 2009.

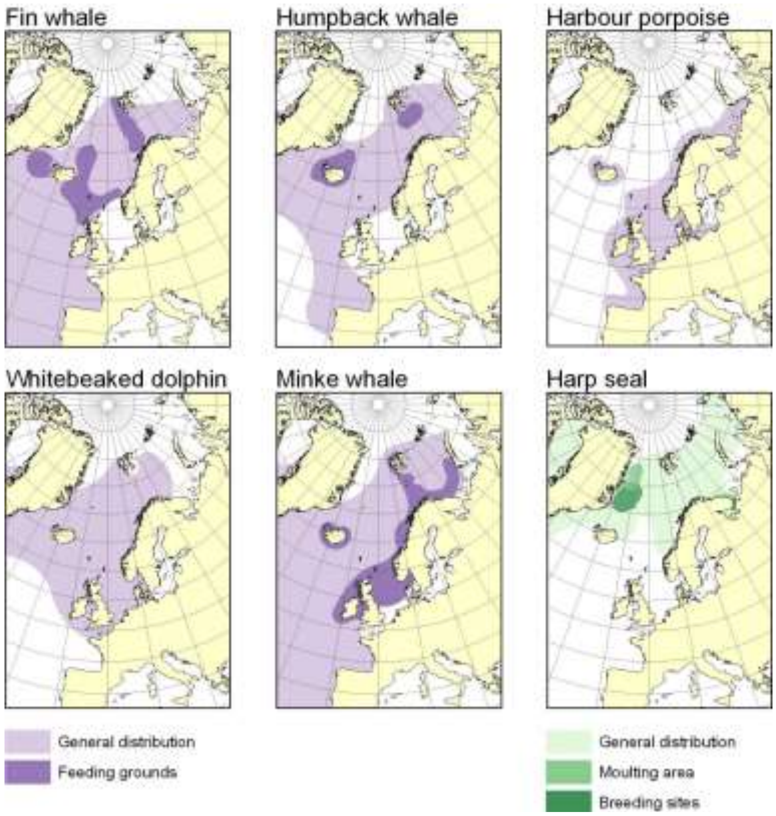



Figure 3. Generalized distribution of marine mammals in the Barents Sea.
Source: Stiansen et al., 2009.

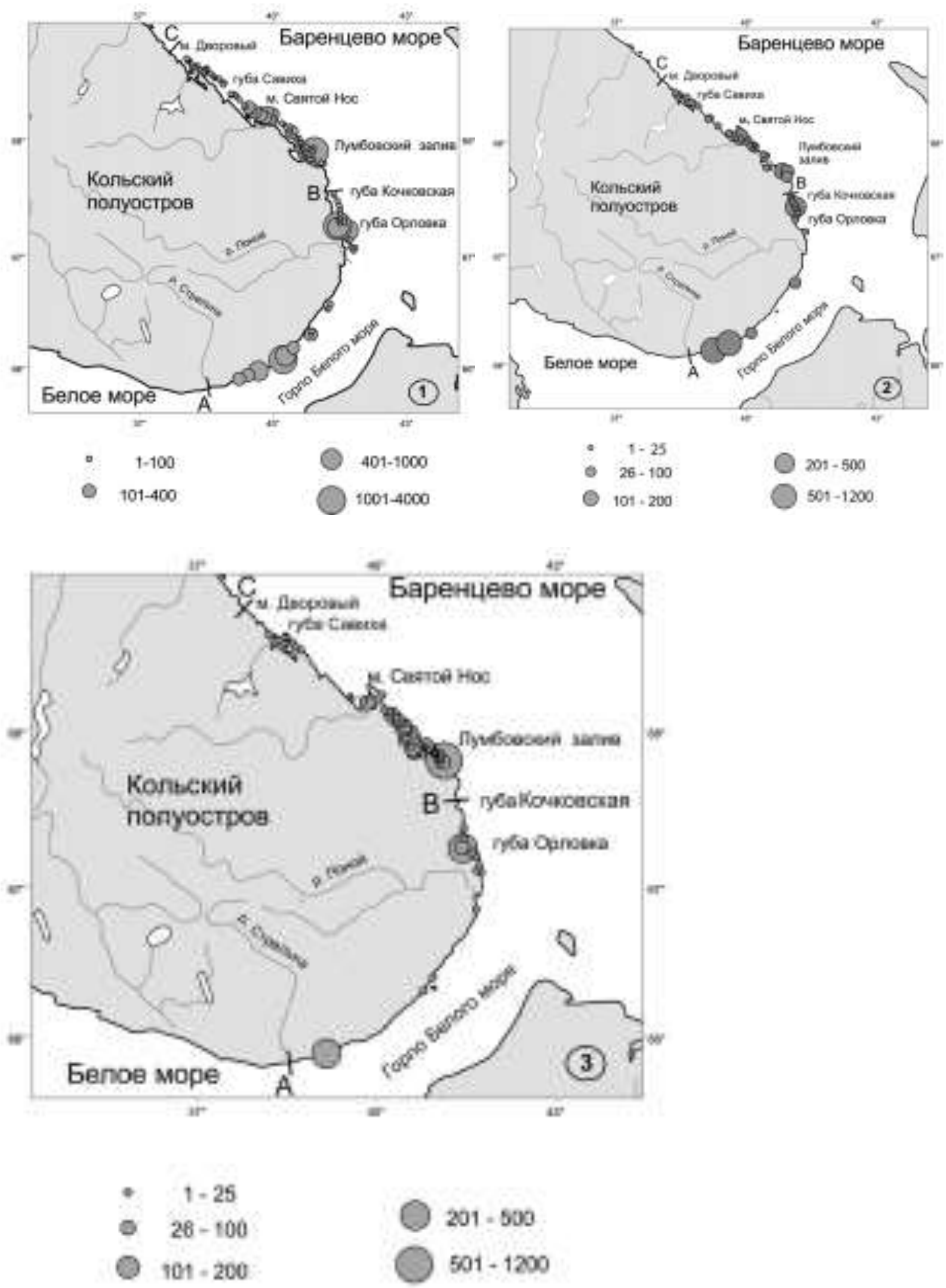



Figure 4. Distribution and numbers (individuals) of eiders wintering along north-east coast of Kola Peninsula as surveyed by helicopter: 1. Common Eider (*Somateria mollissima*), 2. King Eider (*Somateria spectabilis*), 3. Steller.s Eider (*Polysticta stelleri*). Source: Krasnov et al., 2004.

## Area No. 4: White Sea

**Abstract**

The White Sea, the youngest sea in Europe, has a peculiar oceanographic regime with cold, deep water formation in the Gorlo strait. The Gorlo area is characterized by strong tidal currents creating high turbulence and mixing the water column down to the seabed (Timonov, 1925; Naumov and Fedyakov 1991; Pantyulin 2003; Kosobokova et al., 2004). It spreads cold water to the south and fills the deep areas of the entire White Sea and retains sub-zero temperatures all year round (Timonov, 1950; Pantyulin, 2003; Kosobokova et al., 2004). These specific conditions form a biotic boundary that limits dispersal of fauna from outside the area into the White Sea (Derjugin, 1928; Naumov, 2006; Solyanko et al., 2011).

Deep areas filled with cold water provide habitats for pelagic and benthic biota, while upper layers and shallow areas host typical boreal fauna and macrophyte flora (i.e., kelp and seagrass) (Derjugin, 1928; Berger and Naumov, 2001; Naumov, 2001). In certain areas, the number of macrobenthic species exceeds 460 (Spiridonov et al., 2012), while number of phytoplankton species in the White Sea exceeds 440 (Ilyash et al., 2013). The White Sea harbours two endemic subspecies of fish, migration routes of Atlantic salmon and their abundant stocks (Studenov, 1991, 2011).

Bays and islands of the White sea provide breeding habitats for 17 species of aquatic birds (Semashko et al., 2012) and serve as nesting areas of common eiders (*Somateria molissima*). This area overlaps with the East Atlantic flyway and thus has huge importance as a migration corridor and staging area (Lehikoinen et al., 2006). The polynyas that develop in winter are important wintering grounds for several seabird species (Krasnov et al., 2010, 2011). With regards to marine mammals, the White Sea contains important feeding, whelping and moulting areas of harp seals (*Pagophilus groenladicus*) (Melentyev and Chernook, 2009; Svetochev and Svetocheva, 2011) and extremely important mating grounds of beluga whales (*Delphinapterus beluga*) (Svetochev and Sveticheva, 2011).

### Introduction

The AMSA IIc report on the *Identification of Arctic Marine Areas of Heightened Ecological and Cultural Significance* revealed the White Sea as an important area and identified particular areas within the White Sea as having special importance (AMAP/CAFF/SDWG, 2013). The White Sea is a complex area that includes areas that meet the EBSA criteria in different ways; a separate description is provided. The AMSA IIc report considered the northern part of the White Sea, the Kandalaksha and the Onega bays as separate areas (AMAP/CAFF/SDWG, 2013). However, for the purpose of using a comparable spatial scale with other areas discussed in this workshop, the White Sea is addressed as a single area meeting the EBSA criteria. Important differences that exist between the parts of the White Sea are highlighted as well.

### Location

This area covers areas 3 and 4 presented in the AMSA IIc report (AMAP/CAFF/SDWG, 2013: figure 5). It includes the entire White Sea except the northern part of Voronka, which is oceanographically close to the Barents Sea (Naumov and Fedyakov, 1991; Berger and Naumov, 2001; Pantyulin, 2003). It is located entirely within the exclusive economic zone of the Russian Federation, but contains international sea routes (figure 1).

### Feature description of the proposed area

The White Sea is an inland sea with a complex bottom topography and coastline, and contrasting oceanographic regimes (Voronka Inlet, Mezen Bay, Gorlo Strait, and Kandalaksha, Onega and Dvina bays). Oceanographically, its outermost section, called Voronka, is similar to the Barents Sea. The other outer section is the very shallow Mezen Bay, which is characterized by high tidal energy and the highest tidal magnitude in the western Arctic (up to 8 m). The Gorlo (the Russian word for “throat”) is a relatively narrow (about 40 km wide) and shallow (average depth of 37 m) strait connecting the outer part of the White Sea with its inner part (Berger and Naumov, 2001). It comprises about 10% of the total area of the White Sea (about 90,000 $km^2$) and receives about 20% of the tidal energy entering the White Sea. As a result, the tidal height in the Gorlo is 3 m while the velocities reach 100-120 cm $s^{-1}$ (Pantyulin 2003). Tidal mixing leads to an unstratified water column in most parts of the Gorlo and in the Mezen Bay (Timonov, 1950; Pantyulin, 2003; Kosobokova et al., 2004). Tidal velocities and heights are greater along the Terskiy Coast (Kola Peninsula) in the west, where the more saline mixed water of the Voronka is transported into the inner White Sea (the flow is called "Derjugin Current" by Naumov and Fedyakov,1991). This water is then transported along the eastern Zimniy (the Russian word for "Winter") coast, where the fresher water fed by the Dvina Current is advected out of the inner White Sea, predominately from the Dvina Bay (Derjugin 1928, Timonov 1950, Naumov and Fedyakov 1991). The latter flow called "Timonov Current" by Naumov and Fedyakov (1991) is characterized by lower salinity: 26–28 ppt in summer and up to 28.5 ppt in winter compared to 28.5-29 ppt in summer and up to 30 ppt in winter in the Derjugin Current area. The temperature in the mixed water column of the Gorlo increases from extreme sub-zero values (-1.57 ºC) from January to March to about 6-7 ºC from July to August. The most rapid increase takes place in June - early July (Anonymous, 1962-1968). Strong tidal currents, which change their direction, form local circulations, creating high turbulence and mixing the water column generally down to the seabed (Timonov, 1925; Naumov and Fedyakov 1991; Pantyulin 2003; Kosobokova et al., 2004). The Gorlo area is remarkable, owing to its specific role in forming the unique oceanographic regime of the White Sea, (i.e., formation of cold, deep water owing to winter mixing of the unstratified water column). This cold water spreads to the south and fills the deep areas of the entire White Sea at depths from 60-70 m to the maximum depth of about 330 m and retains sub-zero temperatures year round (Timonov, 1950; Pantyulin, 2003; Kosobokova et al., 2004).

The sea ice regime of the White Sea is very dynamic and variable. Landfast ice builds up in the bays and inlets, however the landfast ice zone is usually less than 1 km wide. The first stable ice forms in the mouth of the Mezen River as early as in October, with the latest freezing period observed in the highly dynamic areas off the Terskiy Coast. The entire sea is usually ice-free again by late May. An important feature of the sea ice regime of the White Sea is the regular export of the ice flows to the Barents Sea (Krasnov et al., 2011). The riverine discharge of Severnaya Dvina and the pattern of mesoscale water circulation combine to create spiral eddies; this is a prerequisite for the formation of large and stable ice floes in the Basin and the Gorlo of the White Sea. These ice habitats attract harp seals, which arrive in February and March from the Barents Sea and the adjacent North-East Atlantic to breed and moult (Melentyev and Chernook, 2009).

Water circulation and wind create a stable system of polynyas along Terskiy Coast. The distribution pattern of wintering birds in the polynyas of the Terskiy Coast depends on sea ice conditions and may considerably change from year to year (figure 2). In periods of heavy ice, most of the seabirds migrate to the northwestern part of Voronka (the outermost part of the White Sea) and to the Murman Coast (Krasnov et al., 2011). Extensive and variable polynyas are formed near Solovki Archipelago and in the southwestern part of the Onega Bay. These polynyas are of critical importance for wintering seabirds (Krasnov et al., 2010; Krasnov et al., 2011; Krasnov et al., 2013).

Kandalaksha Bay is the deepest of the bays and basins in the White Sea and is naturally divided into an inner shallow area and an outer deep area. It is bordered by rocky shores of fjord-like inlets (called "fiards", which are analogous to typical fjords but usually do not have such steep rocky shores). Some of these fjord-like inlets (inlet, cove, fjord ="guba" in Russian) have an internal depression and outer sills, so that there is limited water exchange and enclaves of cold water with Arctic species in the deep parts. Owing to the isostatic rise of the Fennoscandian shield, many such inlets are gradually losing the connection to the sea that makes them participants in an exiting natural experiment and provides extensive material for evolution of sedimentological, oceanographical, chemical and microbiological processes and changes of macrobiotic communities over time (Krasnova, 2013a,b). The deep (to 330 m) Kandalaksha Bay, in connection with the adjacent deep central part of the White Sea, may be considered a giant fjord separated from the outer part of the sea by the Gorlo Strait, the depth of which generally does not exceed 50 m. Owing to winter convection in the Gorlo, the deep depression is filled and ventilated with cold water that retains a temperature below zero degrees Celsius year round. The upper layer warms up in summer so that the water column, in contrast to the northern part of the White Sea and Onega Bay, is always markedly stratified owing to seasonal temperature and salinity differences (Babkov, 1998; Filatov et al., 2005). Deep areas filled with cold water provide habitats for pelagic and benthic biota, while upper layers and shallow areas host typical boreal fauna and macrophyte flora (i.e., kelp and seagrass) (Derjugin, 1928; Berger and Naumov, 2001; Naumov, 2001). Numerous islands in the inner part of the bay and along the Karelian coast build up a variety of shallow-water habitats along the coast and provide nesting grounds for eiders and other aquatic birds (Bianki, 1991; Krasnov, 2011a). Seasonally, Kandalksha Bay is covered with sea ice. The outer area of the bay is used by harp seals as a breeding area (although seals in this area primarily aggregate in the central part of the White Sea and in the Gorlo Strait). The coastal zone and the shoreline of the bay provide conditions for forming particular types of the fast ice used by ringed seals for wintering and breeding (Lukin et al., 2006). Kandalaksha Bay is the most-studied area of the White Sea. Currently there are three research stations in this area (operated by Moscow University, St. Petersburg University and the Zoological Institute of Russian Academy of Sciences) and the Kandalksha State nature reserve.

Onega Bay is the largest bay in the White Sea, with an area of 12,800 km$^2$. The depth of the bay is generally less than 50 m, with the exception of northern parts, where depths can reach 87 m. The bottom relief is uneven, especially along the coastline. Particularly complex bathymetry is observed along the bay's western coast, where numerous islands are concentrated. Onega Bay is characterized by a broad range of sediment types, but coarse and hard sediments with a small percentage of silt are the dominant substrata (Berger and Naumov 2001). Onega Bay is connected to the central part of the sea by two relatively broad straits, to the east and to the west of Solovki Archipelago, and the Western and Eastern Solovetsky Salma. The deep waters of the Salmas enable large volumes of water to enter the bay, generating strong tidal currents that are exacerbated by the shallow depths in the bay (Babkov, 1998; Filatov et al., 2005). Tidal amplitude increases towards the inner part of Onega Bay, from 1.5 to 3.0 m. In particular types of shorelines, tidal flats may extend to about 5 km. The bay is fed by several large rivers (Onega, Vyg and Kem') that contribute about 20% of its volume.

About 1,900 islands are located in Onega Bay, ranging in size from small rocks (< 5 ha) to the large islands of the Solovki Archipelago, the area of which is about 30,000 ha. The complex coastline and variety of islands create complex environmental conditions in the bay. Dvina Bay is also relatively shallow and is a very important part of the White Sea because it includes an extensive area with the greatest freshwater input the basin scale of Severnaya Dvina River.

**Feature condition and future outlook of the proposed area**

Characteristics such as sea ice and lithology are highly dynamic (Nevessky et al., 1977; Rybalko et al., 1989; Babkov, 1998; Berger and Naumov, 2001; Filatov et al., 2005) but the main physical features determining conditions in the area are constant: strong tidal currents and deep winter convections in the Gorlo leading to formation of the White Sea deep water. The coastal ecosystems have undergone some notable changes, in particular catastrophic decline of the seagrass population in the early 1960s. There are several indications, however, that it has since recovered (Bukina et al., 2010). In other aspects, the processes in the area appear to be stable, although they may be affected by recent observed changes in the sea ice regime.

Economic activity is low in this area, aside from shipping, which presents potential threats, such as fuel and hydrocarbon cargo spills. This area is especially vulnerable to these impacts, as it is home to important biological phenomena, including moulting and wintering of sea ducks and whelping of harp seals (*Pagophilus groenladicus*).

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No** | **Low** | **Medi** | **High** |

| | | | | | |
|---|---|---|---|---|---|
| decision IX/20) | | **informat ion** | | **um** | |
| **Uniqueness or rarity** | Area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | | X |

*Explanation for ranking*

The entire White Sea is unique as it is the youngest sea in Europe and has a peculiar oceanographic regime with cold, deep water formation in the Gorlo. Specific conditions of the Gorlo provide an example of a biotic boundary partly preventing dispersal of the outside fauna into the White Sea (Derjugin, 1928; Naumov, 2006; Solyanko et al., 2011). The White Sea also harbours two endemic subspecies of fish: the White Sea herring (*Clupea pallasii marisalbi*), which originated from the Pacific herring species in the Holocene time, and the non-migrating White Sea cod (*Gadus morhua marisalbi*).

Some rare and distinct habitats are present, namely semi-isolated inlets containing enclaves of cold-water biota of Arctic origin, including the largest basin of its kind, Babye More (Gurvich, 1936) and Dolgaya Guba on Solovetsky Archipelago, which has been studied since 1889. The co-existence of Arctic and boreal organisms, mosaic intergradations of benthic communities or temporal succession of the cold water and temperate water assemblages of plankton is a distinctive feature. Furthermore, peculiar meiofauna (nematodes) were described in the Kandalaksha Bay sea ice, which are different from sea ice nematodes of the High Arctic (Tschesunov, 2006). A residual population of harp seal is present near the town of Kandalaksha, where this species maintains unusual shore hauling-out behaviours in summer (Krasnov, 2011b).

There is an endemic sedentary White Sea population of common eider.

| | | | | | |
|---|---|---|---|---|---|
| **Special importance for life-history stages of species** | Areas that are required for a population to survive and thrive. | | | | X |

*Explanation for ranking*

Onega, and to a lesser extent, Kandalkasha Bay are important for maintaining rich benthic communities dominated by quahog (*Arctica islandica*), horse mussel (*Modiolus modiolus*) and Iceland scallop (*Chlamys islandica*) (Solyanko et al., 2011; Chikina et al., 2014).

The Tersky coast in the Voronka, southern coast of Mezen Bay and the Gorlo Strait are the only migration routes of Atlantic salmon (*Salmo salar*) into the White Sea, while the Ponoi, Kuloi and Mezen rivers in the northern part of the White Sea and Varzuga River in Kandlaksha Bay possess abundant salmon stocks (Studenov, 1991, 2011). In the past, there were abundant stocks of Atlantic salmon in Severnaya Dvina, Onega, Vyg, in smaller rivers of the Onega Bay, and in Keret’and Umba in Kandalaksha Bay. The stocks have declined recently, but nevertheless these areas are critical for the recovery of salmon populations (Studenov, 2011). Mezen Bay and the coastal waters of Kanin Peninsula and Onega and Dvina bays are the main spawning grounds of navaga (*Eleginus navaga*) (Stasenkov, 1991). Kandalaksha Bay is the most important part of the White Sea for the population of the White Sea cod (*Gadus morhua marisalbi*). Onega and Dvina bays are the most important spawning ground of the White Sea herring (*Clupea pallasii marisalbi*) some other fishes (Ivanchenko and Lajus, 1991).

67% of about 1,900 islands of the entire Onega Bay and 84% of the islands of Solovki archipelago are nesting areas of common eiders (*Somateria molissima*) and provide breeding habitats for another 17 species of aquatic birds (Semashko et al., 2012). The polynyas that develop in winter in the northern and the western parts of the bay are important wintering grounds for the common eider (including most of the

<table>
<tr><td colspan="6">White Sea population of common eider) and several other seabird species (Krasnov et al., 2010, 2011). Onega Bay has tremendous importance as a migration corridor and staging area of the East Atlantic Flyway (Lehikoinen et al., 2006). With regards to marine mammals, Onega Bay is a feeding area for the highest proportion of the ringed seal (Phoca hispida) population, hosting population densities of more than 10 individuals per 100 km$^2$ (Lukin et al., 2006).<br><br>The islands of Kandlaksha Bay (in particular those within the Kandalaksha State Nature Reserve) are important nesting and moulting areas for the White Sea population of common eider, herring gull and several other aquatic birds (Bianki, 1991; Krasnov, 2011a) and are of comparable importance to the islands of Onega Bay. Similarly to Onega Bay, the coastal zone of Kandalaksha Bay is an important migration corridor and staging area for aquatic birds migrating between Kola Peninsula and Bothnia Bay in the Baltic Sea (Bianki, 1991). Kandalaksha Bay is also the most important wintering and breeding ground for ringed seal in the White Sea (Lukin et al., 2006).<br><br>The Terskiy coast, from the mouth of the Strelna River to Sviatoi Nos Cape, is the most important moulting area for eiders: common eider of the Murman coast population, king eider (Somateria spectabilis) and Steller eider (Polysticta stelleri). This is the largest and most important moulting area for the migratory Atlantic population of king eider (Krasnov et al., 2006).<br><br>Three species of eider spend the winter in the polynyas along the Terskiy coast (Krasnov et al., 2011).<br><br>Finally, the sea ice flows in the northern part of the deep White Sea Basin and the Gorlo are the most important whelping and moulting areas of the Barents Sea population of harp seals, Pagophilus groenladicus (Melentyev and Chernook, 2009; Svetochev and Svetocheva, 2011).</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>The area has some importance for maintaining populations of endangered shorebirds of prey, such as white-tailed sea eagles (Haliaeetus albicilla). The area is extremely important as mating grounds of beluga whales, Delphinapterus beluga (Svetochev, Sveticheva, 2011) (IUCN near threatened). The coastal waters of Terskiy Coast are the principal moulting area and an important wintering ground of Steller eider (Polysticta stelleri) (Krasnov et al., 2006) (Krasnov et al., 2011).</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>The ecosystems of the northern part of the White Sea function in a severe environment, and many processes are strongly physically driven. The scale and impact of human activity cannot be compared to the force of the climatic, oceanographical and lithogenic processes that permanently affect habitats and biotopes of marine species (e.g., dynamics of sea ice biotopes, sediment transport). In this way, they can be called sensitive but the environmental impact largely remains within the normal variation and functioning of marine communities and ecosystems in the area. However, the coastal concentrations of sea ducks at moulting grounds in the near shore zone of the Terskiy coast in summer, and wintering concentrations in polynyas in the same area are vulnerable in two important ways. First, these aggregations and their habitats are extremely vulnerable to oil spills, which may cause significant declines in the entire regional populations of common, king and Steller eiders (Krasnov et al., 2006, 2011).</td></tr>
</table>

<table>
<tr><td colspan="6">Secondly, whelping concentrations of harp seals on sea ice in the Gorlo are highly vulnerable to sea ice conditions, and their breeding success is affected by changes in climate and sea ice regime and may be worsened by shipping (which destroys suitable ice flows) and oil spills.<br><br>In Onega and Kandlaksha bays, benthic communities dominated by long-lived bivalves (i.e., quahog, horse mussel and scallop) are currently stable, but are most likely slow recovering and susceptible to eutrophication and the impact of active fishing gears (Solyanko et al., 2011b). The other potential threat to the entire ecosystem would be introduction of alien species, i.e., comb jellies, clams or crabs associated with decreasing sea ice cover, although this is not expected in the near future, taking into account the current low intensity of shipping. Nesting grounds of aquatic birds on the islands are increasingly impacted by the development of unregulated tourism (Semashko et al., 2012), as are reproductive aggregations of beluga whales (Cherenkova, 2013). Wintering grounds of seabirds, in particular common eiders in the polynyas around Solovetsky Archipelago and in the western part of the bay are extremely vulnerable to oil spills in sea ice conditions.</td></tr>
<tr><td>Biological productivity</td><td>Area containing species, populations or communities with comparatively higher natural biological productivity.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>Primary production in different parts of the White Sea strongly varies but is generally lower than in the coastal waters of the Barents Sea (Rat’kova and Savinov, 2001; Romankevich and Vetrov, 2001) and so does benthic biomass as an indicator of long-term productivity conditions (Naumov, 2001; Solyanko, 2010).<br><br>Onega Bay appears to be the most productive area of the White Sea; the existing observations indicate a moderate to high 0.1 – 0.2 g C m-2 $day^{-1}$, and high— but not the highest — levels of phytoplankton biomass (Rat’kova and Savinov, 2001; Makarevich and Krasnov, 2005; Ilyash et al., 2011) (figure 3). The data for particulate organic matter indicate the concentration to be the highest for the region (Kravchishina, 2009). There is a very high patchiness of phytoplankton distribution, and probably numerous spots of high production associated with oceanographical phenomena, i.e., tidal and river plume fronts. Onega Bay harbours the richest kelp area in the White Sea, and the standing stock of kelp algae (Sacharina sacharina and Laminaria digitata) is an order of magnitude greater than in the Dvina Bay and about twice greater than in Kandalaksha Bay (Shoshina, 2011). The higher primary productivity of Onega Bay is reflected in the highest benthic biomass of the White Sea (Solyanko et al., 2011b).<br><br>In Kandalaksha Bay, primary production in the water column is at a moderate level (Rat’kova and Savinov, 2001), however proximity of deep areas facilitates maintenance of abundant stocks of zooplankton consisting of Arctic species, i.e. Calanus glacialis. Sea ice algae are particularly abundant and increasingly productive as daylight increases in late winter - spring; this production is likely consumed in the coastal ecosystem in spring (Sazhin et al., 2009, 2011). It is not yet known if the situation in other parts of the White Sea is much different.</td></tr>
<tr><td>Biological diversity</td><td>Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>The number of phytoplankton species in the White Sea amounts to 449 (Ilyash et al., 2013). This is little less than in the Barents Sea and currently higher than in any other sea of the Russian Arctic (Poulin et al., 2011; Ilyash et al., 2013).<br><br>The White Sea probably contains the highest diversity of species of different biogeographical origin, communities and habitats existing in proximity within a limited area in the Western Arctic.<br><br>Onega Bay contains the greatest number of habitat types in the entire White Sea: extensive saltmarshes, wadden shores and beaches (Sergienko, 2011), habitats typical of abrasive-accumulative coasts, rocky shores, fjord-like inlets with sills and inner deep depressions (Troitskaya and Dolgaya inlets at Solovki</td></tr>
</table>

Islands). The number of species of macrobenthic fauna is the highest in the White Sea: 464 species (Spiridonov et al., 2012). The number of nesting aquatic birds (17) is comparable to that of Kandalaksha Bay and is among the highest for the region (Semashko et al., 2012).

In spite of the harsh conditions, the macrobenthic fauna of the Gorlo is thus generally rich (over 350 species) but consists mostly of rarely occurring species (Solyanko, 2010; Solyanko et al., 2011a). The distribution of different types of benthic communities is highly mosaic, and this mosaic is clearly seen on all spatial and temporal scales (Naumov, 2001; Denisenko et al., 2006; Solyanko, 2010).

| | | | | | |
|---|---|---|---|---|---|
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | | X |

*Explanation for ranking*

The White Sea, Onega Bay in particular, was used by traditional and artisanal fishers and hunters for millennia, and a characteristic maritime cultural landscape has formed (Spiridonov et al., 2010) that is especially remarkable at Soloetskyi Archipelago with its famous monastery, a UNESCO World Heritage site (Cherenkova, 2013). With regard to land-based pollution and other kinds of contamination, the White Sea is likely exposed to lower levels of anthropogenic impacts than many other North-Eeast Atlantic seas, as the industrial activity in the area has never been particularly high and has decreased recently (Terzhevik et al. 2005; Moiseenko, 2010). The area has also experienced practically no impacts from active fishing gears and has shown relative stability of dominant species in benthic communities over decades (Solyanko et al., 2011). The nesting areas of aquatic birds located on islands that are close to coastal towns have been strongly impacted, while other parts of the islands are accessible to terrestrial predators, i.e., foxes; about 19% of the islands still provide good, protected natural habitas. Currently, the greatest actual threat is unregulated tourism (often associated with illegal hunting and the use of boats with powerful engines) (Semashko et al., 2012).

Shipping and oil transportation along the Gorlo Strait and to Arkhangelsk and Kandlaksha has recently intensified (Bambulyak and Frantzen, 2009), but fortunately has not yet significantly impacted the naturalness of the area.

## References

Anonymous 1968. *Marine hydrographical monthly bulletin. White Sea, 1962–1968*. Arkhangel (in Russian).

Babkov A.V. 1998. *Hydrology of the White Sea*. St. Petersburg, Belomorskaya biostantsiya. 94 p. (In Russian).

Bambulyak A., Frantzen B. 2009. *Oil transport from the Russian part of the Barents Region. Status per January 2009*. The Norwegian Barents Secretariat and AkvaplanNiva. 97 p.

Berger V.Y., Naumov A.D. 2001. General features. In: Berger V., Dahle S. (eds) *White Sea. Ecology and environment*. Derzhavets, St.Petersburg Tromsø, pp. 9–22.

Bianki V.V. 1991. Birds. In: Oceanographic conditions and biological productivity of the White Sea. Annotated atlas. Murmansk, PINRO, Pp. 191–201.

Bukina M.V., Ivanov M.V., Shatskikh E.V. 2010. Recovery of seagrass *Zostera marina* Linnaeus in the White Sea; contemporary stage. In: *Problems of studies, rational use and conservation of the natural resources of the White Sea*. Presentations of the international conference. St. Petersburg, 9–11 November 2010, pp. 27–29 (in Russian).

Cherenkova N.N. (ed). 2013. Ecological and economical justification of the landscape-marine natural reserve on Solovki Islands. Moscow, GEF/UNDP Project “Strengthening of marine and coastal protected areas of Russia” document, 149 p. (in Russian).

Chikina M.V., Spiridonov V.A., Mardashova M.V. 2014. Spatial and temporal variability of coastal benthic communities in the Keretsky Archipelago area and in Velikaya Salma Strait (Karelian coast, White Sea). Okeanologia, 54 (1), pp. 60–72 (in Russian; English version forthcoming).

Denisenko N.V., Denisenko S.G., Frolov A.A. 2006. Zoobenthos of the Gorlo and Voronka straits of the White Sea: structure and distribution patterns in coastal areas of the Kola Peninsula. Explorations of the fauna of the seas. *Zoological Institute of the Russian Academy of Sciences*, 56 (64): 15-34 (in Russian).

Derjugin K.N. 1928. Fauna des Weissen Meeres und ihre Existenzbedignungen. Exploration des mers d'U.R.S.S Fasc. 7 – 8: 1 - 511 (in Russian with extended German summary).

Filatov N.N., Pozdnyakov D.V., Ingebeikin Yu.I., Zdorovenov R.E., Melentyev V.V., Tolstikov A.V., Pettersson L.H. 2005. Oceanographical regime. In: Filatov N.N., Pozdnyakov D.V., Johannessen O.M. (eds) *White Sea. Its marine environment and ecosystem dynamics influenced by global change*. Chichester, Springer-Praxis, pp. 73–154.

Gurvich A.G. 1934. Distribution of animals in the littoral and sublittoral of Babye More. Explorations of the seas of USSR, 20, pp. 15–32 (in Russian).

Ilyash L.V., Rat'kova T.N., Radchenko I.G., Ghitina L.S. 2013. Phtoplankton of the White Sea. In: Lisitzin A.P., Nemirovskaya I.A. (eds). *The White Sea System. Volume II.Water column and interacting with it atmosphere, criosphere, the river runoff and the biosphere*. Moscow, Scientofic World, pp. 605–639 (in Russian).

Ivanchenko O.F., Lajus D.L. 1991. Herring. In: Oceanographic conditions and biological productivity of the White Sea. Annotated atlas. Murmansk, PINRO, pp. 116-123 (in Russian).

Krasnov Yu.V. 2011a. Seabirds, contemporary state of populations, distribution and trophic relationships. In: Berger V.Ya. (ed.) *Biological resources of the White Sea: exploration and exploitation*. *Explorations of the fauna of the sea*, 69(77). St. Petersburg, Zoological Institute of Russian Academy of Sciences, pp. 244–260 (in Russian).

Krasnov Yu.V. 2011b. Anomalous migrations of harp seal in the White Sea: ecological and social aspects. In: Berger V.Ya. (ed.) *Biological resources of the White Sea: exploration and exploitation. Explorations of the fauna of the sea*, 69 (77). St. Petersburg, Zoological Institute of Russian Academy of Sciences, pp. 286–293 (in Russian).

Krasnov Yu.V., Gavrilo M.V., Shavykin A.A., Vaschenko P.S. 2010. Sex and age structure of endemic common eider *Somateria mollissima* population. Doklady Russian Academy of Sciences, 435(4): 568–570 (in Russian).

Krasnov Yu.V., Goryaev Yu.I., Ezhov A.V. 2013. Sea birds and waterfowls of the White Sea: seasonal dynamics and distribution features. In: P.V. Makarevich (ed). *Birds of the northern and southern Russian seas.* Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 124–158 (in Russian).

Krasnov Yu.V., Strom H., Gavrilo M.V., Shavykin A.A. 2006. Wintering of seabirds in polynyas near the Terskiy Coast of the White Sea and at East Murman. Ornithology. Issue 31. Moscow, MSU publishers, pp. 51–57. (In Russian).

Krasnov Yu.V., Gavrilo M.V., Spiridonov V.A. 2011. Sea ice biotopes of southeastern Barents and the White seas. In: V. Spiridonov, M. Gavrilo, N. Nikolaeva, E. Krasnova (eds) *Atlas of the Marine and Coastal Biodiversity of the Russian Arctic*. Moscow, WWF Russia Publication, pp. 30–32.

Krasnov Yu.V., Spiridonov V.A., Dobrynin D.V. 2012. Seabirds on the Eastern Murman and northern part of the White Sea in summer: features of distribution and differences in forage resources. In: G.G. Matishov (ed). Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 44–66 (in Russian).

Krasnova E.D., Pantyulin A.N., Belevich A.D. et al. 2013a. Multidisciplinary studies of the separating lakes at different stage of ssolation from the White Sea performed in March 2012. *Oceanology*, 53 (5), pp. 639–642.

Krasnova E.D., Pantyulin A.N., Rohatykh T.A.,Voronov D.A. 2013b. Inventory of waterbodies in process of separation from the sea on te Karelian coast of the White Sea. In: Problems of studies, rational use and conservation of the natural resources of the White Sea. Pressentations of the international conference, 30 September – 4 October 2013. Petrozavodsk, pp. 16 –167 (in Russian).

Lehikoinen A., Kondratyev A., Asanti T., Gustafsson L., Laminsalo O., Lapshin N., Pessa J., Rusanon P. 2006. Survey of Srctic bird migration and staging at the White Sea, in autumna of 1999 and 2004. Helsinki, The Finnish Environment Institute, 107 p.

Lisitzin A.P. 2013. Introduction. In: Lisitzin A.P., Nemirovskaya I.A. (eds). The White Sea System. Volume II.Water column and interacting with it atmosphere, criosphere, the river runoff and the biosphere. Moscow, Scientofic World, pp. 13–18 (in Russian).

Lukin L.R., Ognetov G.N., Boiko N.S. 2006. *Ecology of ringed seal in the White Sea*. Ekaterinburg, Institute of Plant and Animal Ecology of Ural Branch of Russian Academy of Sciences. 165 p. (in Russian).

Makarevich P.R., Krasnov J.V. 2005. Aquatic ecosystem profile. In: Filatov N.N., Pozdnyakov D.V., Johannessen O.M. (Eds), *White Sea. Its Marine Environment and Ecosystem Dynamics Influenced by Global Change*. Chichester, Springer-Praxis Publishing, pp. 155–177

Melentyev V.V., Chernook V.I. 2009. Multi-spectral satellite_airborne management of ice form marine mammals and their habitats in the presence of climate change using a «hot_spot» approach // In:S.A. Cushman, F. Huetmann (eds). *Spatial complexity, informatics, and wildlife conservation*. Tokyo, Springer, pp. 409–428.

Moiseenko T.I. 2010. Pollution of surface waters of the watershed and key antropogenic processes. In: A.P. Lisitzin (ed.) *The White Sea System*. V. I. Warershed Environment. Moscow, Nauchnyi Mir, pp. 301–303 (in Russian).

Naumov A.D. 2006. Clams of the White Sea. Ecological and faunistic analysis. *Explorations of the fauna of the sea*, 59 (67). St. Petersburg: Zoological Institute of Russian Academy of Sciences: 1–351 (in Russian).

Naumov A.D., Fedyakov V.V. 1991. Peculiarities of the hydrological regime of the northern White Sea. Trudy (Proceedings) of the Zoological Institute of the Academy of Sciences of USSR, 233: 127-147 (in Russian).

Nevessky E.N., Medvedev V.S., Kalinenko V.V. 1977. *White Sea. Sedimentogenesis and history of development in the Holocene*. Moscow: Nauka, 236 p. (In Russian).

Pantyulin, A.N. 2003. Hydrological system of the White Sea. Oceanology, 43, suppl. 1: S1-S14.

Poulin M., Daugbjerg N., Gradinger R., Ilyash L., Rat'kova T., Quillfeldt C. 2011. The pan-Arctic biodiversity of marine pelagic and sea-ice unicellular eukaryotes: a first-attempt assessment. *Marine Biodiversity*, 41 (1): 13–28.

Romankevich E.A., Vetrov A.A 2001. *Cycle of carbon in the Russian Arctic Seas*. Moscow: Nauka, 302 p. (in Russian).

Rat'kova T., Savinov V. 2001. Phytoplankton. In: Berger V., Dahle S. (eds) *White Sea. Ecology and environment.* St.Petersburg – Tromsø, Derzhavets, pp. 23–28.

Rybalko A.E., Spiridonov M.A., Kropachev Yu.P., Moskalenko P.E.,Nechaev M.G., Takki D.F., Khan Yu.V. 1989. Processing and interpretation of the data of side scan sonar data for identification of material composition of shelf surface structures. Guidelines. Leningrad, A.P. Karpinsky All-Union Geologological Institute, (in Russian), 80 p.

Sazhin A.F., Mosharov S.A., Romanova N.D., Mosharova I.V. 2009. Primary and bacterial production in ice layer and under-ice water of the White Sea in early spring. In: *Proc. 20th IAHR International Symposium on Ice*. Lahti, Finland, June 14 to 18. ISBN 978-952-10-5979-7. Paper # 23, pp. 1–13.

Sazhin A.F., Rat'kova T.N., Mosharov S.A., Romanova N.D., Mosharova I.V., Portnova D.A. 2011. Biological components of seasonal ice. In: In: Berger V.Ya. (ed.) *Biological resources of the White Sea: exploration and exploitation. Explorations of the fauna of the sea*, 69(77). St. Petersburg, Zoological Institute of Russian Academy of Sciences, pp. 97–117 (in Russian).

Sergienko L.A. 2011. Marsh biotopes and plant communities of the White, Barents and the Kara Seas. In: V. Spiridonov, M. Gavrilo, N. Nikolaeva, E. Krasnova (eds) Atlas of the Marine and Coastal Biodiversity of the Russian Arctic. Moscow, WWF Russia Publication, pp. 42–43.

Semashko V. Yu., Cherenkov A.E. Tertitski G.M. Current breeding population of sea birds on islands of the Onega Bay of the Whitea Sea and and its trend. In: *Ecology of marine birds of the White Sea*. Apatity, Kola Science Centre of Russian Academy of Sciences, pp. 140–168 (in Russian).

Shoshina E.V. Macrophytes. In: Berger V.Ya. (ed.) Biological resources of the White Sea: exploration and exploitation. Explorations of the fauna of the sea, 69(77). St. Petersburg, Zoological Institute of Russian Academy of Sciences, pp. 132–148.

Solyanko K., Spiridonov V., Naumov A. 2011a. Benthic fauna of the Gorlo Strait, White Sea: a first species inventory based on data from three different decades from the 1920s to 2000s. *Marine Biodiversity*, 41 (3): 441-453. DOI 10.1007/s12526-010-0065-9.

Solyanko K., Spiridonov V., Naumov A. 2011b. Biomass, commonly occurring and dominating species of macrobenthos in Onega Bay (White Sea, Russia): data from three different decades. *Marine Ecology*, 32 (Suppl. 1): 36–48.

Speer L. and Laughlin T. (eds) 2011. *IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment*, La Jolla, California. 02-04 November 2010. 37 p.

Spiridonov V.A., Bogoslovskaya L.S., Suprunenko Yu.S. 2010. Maritine and coastal cultural landscapes of the White Sa and Chukotka as components of natural-cultural heritage of Russia. In: Study and conservation of marine heritage of Russia. Presentations of the First Scientific-Applied Conference, St. Petersburg, 27-30 October 2010. Kaliningrad, Terra Baltica, pp. 442–453 (in Russian).

Spiridonov V.A., Mokievsly V.O., Solynako E.Yu. 2012. Chronicle of field work and some results of the hydrobiological and oceanological investigations on board R.V. “Professor Vladimir Kuznetsov” in July 2006. In: Mokievsky V.O., Spiridonov V.A. Tzetlin A.B. and Krasnova E.D. (eds) Integrated study of the bottom landscapes in the White Sea using remote methods (Proc. N.A. Pertsov White Sea Biological Station. V. 11), Moscow, KMK Sci Press, pp. 112–120 9in Russian).

Stasenkov V.A. 1991. Smelt, plaice, capelin, walfish, cod, navaga, episodic migrants from the Atlantic. In: Oceanographic conditions and biological productivity of the White Sea. Annotated atlas. Murmansk, PINRO, pp. 134–151 (in Russian)

Studenov I.I. 1991 Semga (Atlantic salmon). In: *Oceanographic conditions and biological productivity of the White Sea*. Annotated atlas. Murmansk, PINRO, pp. 124–125 (in Russian).

Studenov I.I. 2011. Semga (Atlantic salmon). In: Stasenkov V.A. (Ed). Pomor fisheries. Arkhangel, SevPINRO, pp. 135–158 (in Russian).

Svetochev V.N., Svetocheva O.N. 2011. Marine mammals: biology, feeding, stocks. In: Berger V.Ya. (ed.) *Biological resources of the White Sea: exploration and exploitation. Explorations of the fauna of the sea*, 69(77). St. Petersburg, Zoological Institute of Russian Academy of Sciences, pp. 261–287 (in Russian).

Terzhevik A.Y., Litvinenko A.V., Druzhinin P.V., Filatov N.N. (2005) Economy of the White Sea watershed. In: Filatov N.N., Pozdnyakov D.V., Johannessen O.M. (Eds), *White Sea. Its Marine Environment and Ecosystem Dynamics Influenced by Global Change*. Chichester, Springer-Praxis Publishing, pp. 241–301.

Timonov, V.V. 1925. On hydrological regime of the Gorlo of the White Sea. *Issledovaniya russkikh morei (Investigations of the Russian Seas)*, 104(1): 1-56 (in Russian).

Timonov, V.V. 1950. The principal characteristics of the hydrological regime of the White Sea. In: *To the memory of Yu.M. Shokalsky. Moscow – Leningrad, Part. 2*, p. 206-235 (in Russian).

**Maps and Figures**

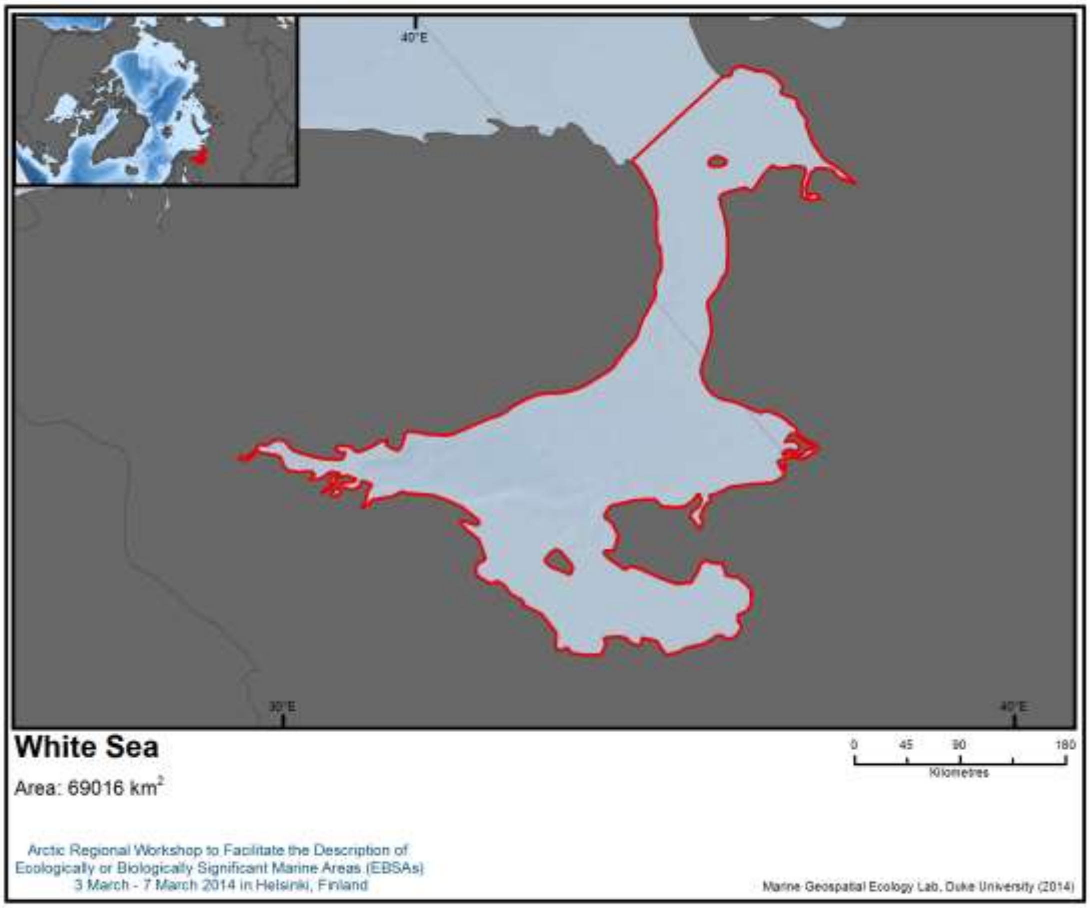



Figure 1. Area meeting EBSA criteria.

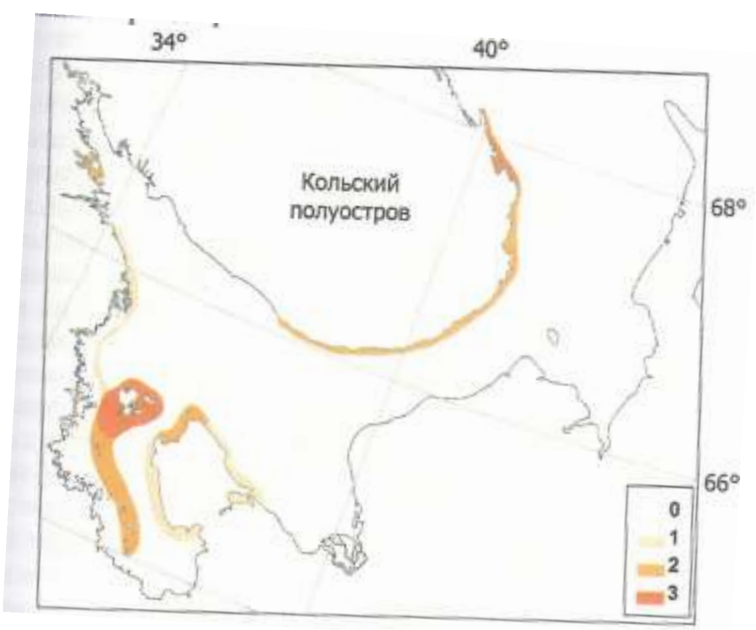



Figure 2. Seabird wintering areas (ranks of abundance 0 – 3) in the White Sea. Source: Karsnov et al., 2013.

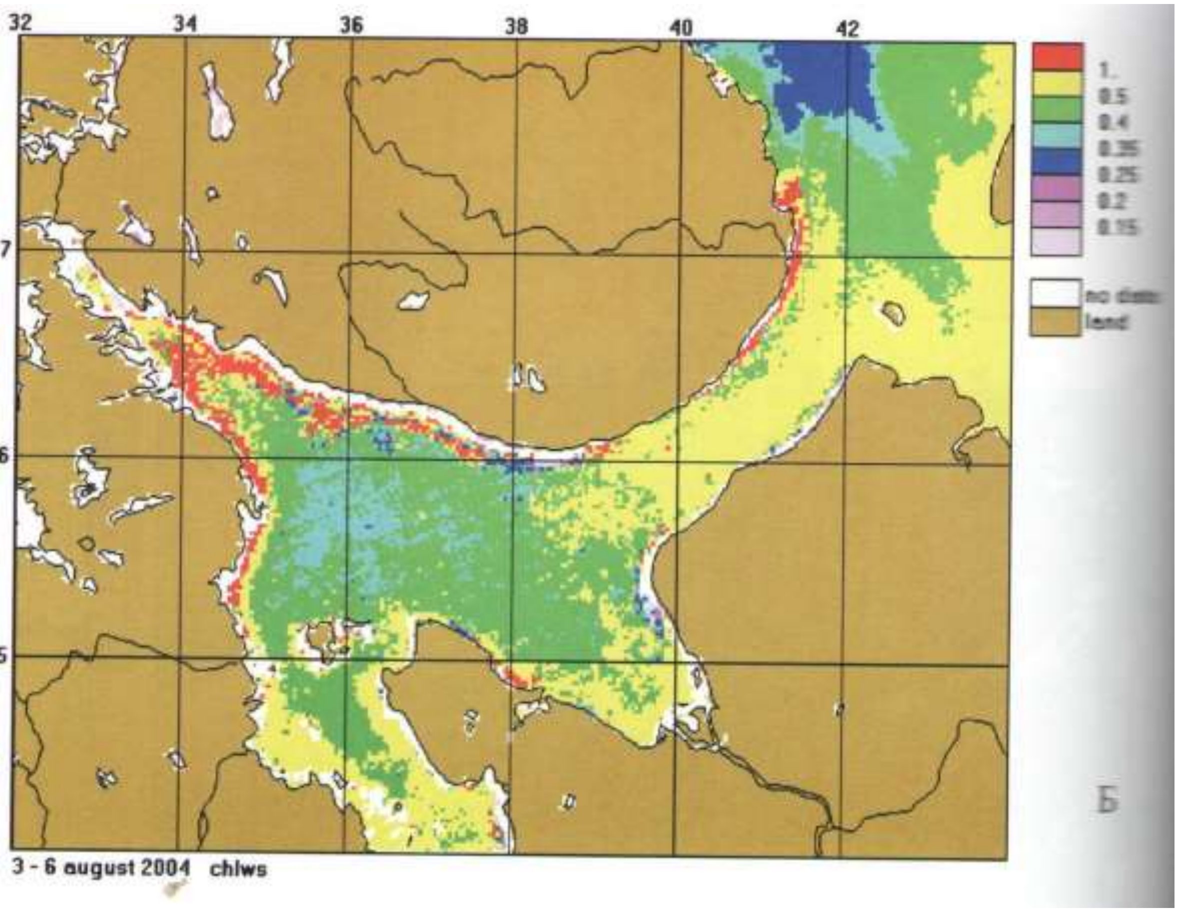



Figure 3. Summer distribution of chlorophyll a in the White Sea. Source: Lisitsyn, 2013.

**Area No. 5: The South-Eastern Barents Sea (The Pechora Sea)**

**Abstract**

The shallow, south-east portion of the Barents Sea, known as the Pechora Sea, has specific oceanography, hydrology, ice regime and a distinct ecosystem mainly based on benthic production. It differs from the rest of the Barents Sea by its more continental climate, lower salinity, shallow depths and lowland shores. The most outstanding environmental feature is the Pechora River — the second-largest river draining into the European part of the Arctic Ocean. Its discharge influences this area and justifies certain biological features. The Pechora Sea is known to hold rich and highly productive benthic communities supported by considerable nutrient influx transported by the Pechora River. The benthic fauna numbers more than 600 taxa. Total biomass recorded at the Kolguev shallow, in the Kara and Yugor Shar straits, exceeds 500 $mg/m^2$, which is the highest value found in the Barents Sea. This provides a good food base for benthic-feeding animals like sea ducks and walruses. Waterbirds represent another remarkable biological feature of the area. The Pechora Sea is located in the centre of the East Atlantic flyway and is a key stopover site for the majority of waterfowl species during the final stages of their migrations. Most of the waterfowl and other aquatic birds do not pass the area in transit but make extensive use of the rich food resources of sea shoals and sheltered bays, the littoral zone and adjacent coasts. Altogether, about 130 bird species are observed there. The Pechora Sea serves as a key habitat for Atlantic walrus and provides an important feeding ground and migration path for beluga whales (IUCN VU). Polar bears inhabit the area throughout the year. In addition to this, the Pechora Sea basin supports the only European stock of Arctic cisco (*Coregonus autumnalis*) and is an important migration area for the Pechora Atlantic salmon stock. It also serves as a principal spawning area for the polar cod.

**Introduction**

The Arctic Marine Shipping Assessment (AMSA IIc) report on Arctic marine areas of heightened ecological significance identified the Pechora Sea as one such area of heightened ecological significance that meets the International Maritime Organization (IMO) ecological criteria for particularly sensitive sea area (PSSAs) (AMAP/CAFF/SDWG, 2013). In addition, the IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment indicated the following:

**Location**

The area largely covers the south-eastern shallow region of the Barents Sea, which is influenced by the Pechora River discharge. This area is traditionally called the Pechora Sea, even though it is not formally recognized as the sea. It corresponds to area 1 of the Barents Sea large marine ecosystem described in the AMSA IIc report (AMAP/CAFF/SDWG, 2013) and lies entirely in the territorial waters and EEZ of the Russian Federation (figure 1).

**Feature description of the proposed area**

The south-eastern part of the Barents Sea, also known as the Pechora Sea, differs from the rest of the Barents Sea by its more continental climate, lower salinity, shallow depths and lowland shores. The most outstanding environmental feature is the Pechora River – the second-largest river draining into the European part of the Arctic Ocean. The Pechora River strongly affects different components and processes in the entire ecosystem of the region. It impacts the hydrological regime of the adjoining sea, provides a variety of habitats for a diverse biota, and transports both nutrients and pollutants gathered from the vast drainage basin.

The most peculiar feature of the hydrological regime of the Pechora Sea is a strong continental outflow. The Pechora River's annual run-off averages 130 $km^3$. The continental climate of the Pechora Sea and desalinated surface water favour increased ice formation and maintenance of ice cover for seven to eight months on average. The coastal zone is occupied by fast-ice less than 1 km wide, followed by a recurring flaw polynya. Annually, the Pechora River supplies the estuary with approximately 4,570 thousand $km^3$

of sediments and 12,500 tonnes of suspended matter that are gathered its from extended catchment area, covering ca. 330,000 $km^2$. The major portion of the fine sediment fraction is transported to the sea and accounts for high water turbidity in areas influenced by river discharge.

**Biological productivity.** In general, the hydrology and bottom topography of the Pechora Sea do not support highly productive pelagic ecosystems. The water column is highly stratified, due to continental outflow and extensive sea ice cover. On the other hand, shallow depths (less than 50 m over most of the sea area) prevent penetration of nutrient-rich waters from the Atlantic Ocean, which spread at depth and mix with the upper water column during autumn convection in deeper regions. Highly turbulent zones of interaction between warm Barents Sea water and cold water penetrating from the Kara Sea with the Litke Current in the northern outer part of the Pechora Sea are the only stable zones of enhanced pelagic biological productivity.

In contrast, benthic ecosystems seem to be highly productive, supported by the considerable nutrient influx transported by the Pechora River. The Pechora Sea is known to hold rich benthic communities. The benthos fauna numbers more than 600 taxa. Total biomass recorded at the Kolguev shallow, in the Kara and Yugor Shar straits, exceeds 500 $mg/m^2$, the highest values found in the Barents Sea. Shallow depths and bottom communities dominated in many zones by bivalves provide a good food base for benthic-feeding animals like sea ducks and walruses (figures 2 and 3).

Both ichthyofauna and marine fish resources of the Pechora Sea are less diverse and rich than the rest of the Barents Sea area. The fish list includes some 70 species, less than a half of those observed in the Barents Sea as a whole. The most numerous is the Polar cod *Boreogadus saida,* which is key species in the crypelagic ecosystem. Fish from the Kara Sea and eastern Barents Sea populations migrate in autumn to the Pechora Sea to spawn under the ice during winter. Their principal spawning grounds are located in coastal waters from the Kanin Peninsula to Vaigach Island, and at the Kolguev shallows. Another schooling fish with similar habitat preferences, the Navaga *Eleginus navaga,* is also plentiful in the area with spawning grounds located in coastal waters.Herring of the Chesh-Pechora stock spawn demersal eggs in shallow waters in Cheskaya Bay.

The Pechora River and its estuary are famous as a highly productive water system supporting rich resources of anadromous fishes, including various white fishes - Coregonidae (*Coregonus lavaretus, C. nasus, C. sardinella, C. automnalis, C. peled*, *Stenodus leucichthys nelma*). The Pechora Sea basin has the only Northern European stock of Arctic cisco (*C. autumnalis*), an anadromous species of white fish that spawns in the Pechora estuary. One of the largest Northern European stocks of Atlantic salmon (*Salmo salar*) migrates throughout the Pechora Sea to their major spawning grounds in the Pechora River. Birds, waterbirds in particular, are the most noticeable biological feature of the area. Among the 130 species, more than 50% rely on aquatic habitats (figures 5, 6 and 7).

Waterfowl and larger gulls are the dominant aquatic bird species, while true cliff-breeding seabirds are found in small numbers. Their breeding colonies are found only along the rocky shores of the Novaya Zemlya. Generally, analyses of colony distribution and structure, as well as data from offshore seabird censuses, support the conclusion about low productivity of the pelagic ecosystem of the Pechora Sea.

The only area with enhanced pelagic productivity is the northernmost outer portion of the sea bordered by the Novaya Zemlya trough — a topographical feature accounting for vertical circulation. This area supports important feeding grounds for seabirds and alcids during the postbreeding season. Another frontal zone characterized by high seabird densities is the pack ice edge.

A great number of water birds pass the area in spring, summer and autumn. Migrating flocks of birds flying both at sea and inland (along the Pechora River valley) meet in the Pechora Sea. Their breeding grounds extemd from Finnmark to Taimyr, while their winter quarters are found in the North Atlantic, Western Europe and the Caspian Sea. The Pechora Sea is located in the centre of the East-Atlantic Flyway and is a key stopover site for the majority of waterfowl species during the final stages of their migrations. Most of the waterfowl and other aquatic birds do not pass the area in transit but make extensive use of the rich food resources of sea shoals and sheltered bays, the littoral zone, and adjacent coasts. The Pechora Sea is a principal staging and moulting ground for king eiders and a stopover site for scoters and long-tailed ducks.

The shallow waters from Chesha Bay east of the Kanin Peninsula and along the southern shore of the Pechora Sea have fast ice in winter and are important breeding areas for ringed seals from the eastern Barents Sea as well as from the western Kara Sea. The pack ice in the southeastern Barents Sea is presumably important for young ringed seals that aggregate to feed on the polar cod that spawn under the ice in this area. The main wintering area for walrus of the “Kara Sea-southern Barents Sea-Novaya Zemlya” stock and for beluga of the large Karskaya stock is the pack ice in the Pechora Sea region. Some walruses remain in this area during summer with main haul-outs on Vaigach and Dolgy islands and adjacent small islands.

**Feature condition and future outlook of the proposed area**

This is a dynamic area that is changing under current conditions of global climate change. The most prominent changing features are the condition and distribution of ice, with summer ice edge shifting north over a great extent for the past decade. This has affected distribution patterns and foraging conditions of many ice-associated species, particularly all polar bears and Atlantic walrus. Further investigations are required.

The Pechora Sea is the key habitat for walrus. The developing oil and gas industry in the Pechora Sea presents a potential direct (noise, disturbance) and indirect (forage reserve loss and oil pollution of the coast due to oil spills) threat to walrus populations.

Commercial fisheries are poorly developed in the Pechora Sea. Nevertheless, the depletion of the Polar cod stock, overharvested in the Eastern Barents Sea in the 1960s and1970s, has likely affected the spawning population of the Pechora Sea. The pelagic salmon fisheries in the North Atlantic Ocean considerably reduced the Pechora spawning stock in 1970s. The Convention for the Conservation of Salmon in the North Atlantic Ocean (1983) banned pelagic gill net fishing, but now the Pechora salmon is threatened by illegal fishing during the spawning migration.

Directly influenced by one of the greatest rivers of Northern Europe, the Pechora Sea is a subject of local, regional and distant impacts. Major impact sources distributed all over the catchment basin are industrial activities related to exploitation of the Timan-Pechora oil-gas province and the Pechora coal basin. Analyses of the dynamics of the hydrochemical regime of the Pechora River mouth region have revealed long-term increased levels of nitrogen, phosphorus and pollutants. Oxygen shortage in water has been recorded frequently. The existing nutrient regime is characteristic for mesotrophic, and at some sites even eutrophic freshwater bodies. These changes can already be traced in zooplankton and fish community structure in the Pechora Bay. The overall hydrochemical status of the lower Pechora River is considered an “anthropogenic modified background”.

The ecosystems of the Pechora Sea are characterized by their high buffering capacity; therefore, for a given disturbance, it will take a long time for them to demonstrate changes in principal ecological characteristics. Thus, concentration levels of trace metals and micro-organic contaminants in sediments are rather low, corresponding to background values as compared to other Arctic seas. However, some parts of the Pechora Sea are already contaminated.

There are two sea ports in the Pechora Sea: Varandey and Naryan-Mar. The main cargo traffic goes through Varandey, an oil terminal. Oil is also reloaded at the Kolguev island terminal during summer navigation. Varandey’s main cargo traffic and shipping are connected with exporting oil, including from the Prirazlomnaya oil platform. As a result, a visible anthropogenic impact on the south-east Barents is growing. Disturbance and anthropogenic pollution of water and beaches are the main disturbing factors. The Pechora Sea is a habitat of rare and endangered species of fauna. The majority of the marine mammals of the Pechora Sea are red listed in Russia, with different conservation status. Atlantic walrus is under main concern as one of the most vulnerable species in the area.

The area meeting EBSA criteria is partly covered by federal specially protected areas (Nenetsky reserve), so monitoring and basic research are ongoing and planned for the future. Also, over the last several years, WWF and the Marine Mammal Council have conducted research on the Atlantic walrus and are planned research on benthic communities.

A high seasonal variability of the pelagic environment is characteristic of the Pechora Sea, affecting seasonal primary production. The variability can be increased under human impact and make ecosystems unsustainable and potentially dangerous for regional biota.

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness or rarity** | Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | **X** | |
| *Explanation for ranking*<br>This is a unique area within the European Arctic and on a circumpolar scale due to its combination of bottom topography, hydrological regime, biodiversity and productivity governed by impact of the Pechora River and its geographical location in the Eastern European Arctic. The Pechora Sea region supports a specific ecosystem important for the biological diversity of North-West Eurasia. | | | | | |
| **Special importance for life-history stages of species** | Areas that are required for a population to survive and thrive. | | | | **X** |
| *Explanation for ranking*<br>The area is a critically important non-breeding habitat for waterfowl species migrating from western and central Siberia via the East Atlantic Flyway, an important feeding ground for alcids during the postbreeding period, an important year-round habitat for the southern stock of recovering Atlantic walrus. The fast ice area is an important breeding ground for ringed seals.<br>The Pechora Sea basin supports the only European stock of Arctic cisco (*Coregonus autumnalis*) and is an important migration area for the Pechora Atlantic salmon stock. It is principal spawning area for the polar cod. | | | | | |
| **Importance for threatened, endangered or declining species and/or habitats** | Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species. | | | **X** | |
| *Explanation for ranking*<br>The area is important for the survival and recovery of the southern subpopulation of the Atlantic walrus. It provides an important feeding ground and migration path for beluga whales (IUCN VU). Polar bears inhabit the area throughout the year. | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| It is an important migration flyway, postbreeding stop-over and staging area for long-tailed ducks (IUCN VU), velvet scoter (IUCN EN), Steller's eiders (IUCN VU) and white-billed diver (IUCN VU). | | | | | |
| **Vulnerability, fragility, sensitivity, or slow recovery** | Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery. | | | | **X** |
| *Explanation for ranking*<br>The area harbours significant populations of ice-associated species of mammals and seabirds; ice habitats (flaw polynyas, ice edge) are sensitive to global warming. Mass aggregation of postbreeding seaducks and alcids, haul-out for walruses, as well as fry and larvae of polar cod, which are particularly vulnerable to oil spills. | | | | | |
| **Biological productivity** | Area containing species, populations or communities with comparatively higher natural biological productivity. | | | | **X** |
| *Explanation for ranking*<br>The area has one of highest benthic biomasses in the Barents Sea, which supports numerous populations of the benthic-feeding seabirds and walruses. Large stocks of white-fishes and Atlantic salmon. | | | | | |
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | | | X | |
| *Explanation for ranking*<br>The area is a hot-spot for avian diversity, especially for waterbirds, with the highest diversity of coregonid species in the European Arctic and the presence of Pacific elements in its fish fauna. | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | **X** | |
| *Explanation for ranking*<br>As a whole this is a pristine Arctic area, but it is one of the most developed areas of the Arctic in terms of shelf petroleum exploration (shelf oil extraction and transportation), relatively high ship traffic, pollutant discharge in the Pechora River. | | | | | |

**References**

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp.

Andriyashev, A.P., Chernova, N.V. 1994. "Annotated list of fish-forms and fishes of Arctic Seas and adjacent waters", *Problems of ichthyology* 34, No 4, 435. (In Russian)

Bakken Vidar. Seabird colony databases of the Barents sea region and the Kara sea. 2000. Born, E. W., J. Teilmann, M. Acquarone, and F. F. Rigét. 2004. Habitat use of ringed seals (Phoca hispida) in the North Water Area (North Baffin Bay). *Arctic* 57:129-142.

BelikovS.E. 2011. *Polar bear of the Russian Arctic. Terrestrial and marine ecosystems*. Paulsen Editions. Moscow - Saint-Petersburg. Pp. 263-291. In Russian.

Boltunov A.N., Belikov S.E., Gorbunov Yu. A., Menis D.T., Semenova V.S. 2010. *The Atlantic walrus of the southeastern Barents Sea and adjacent regions: review of the present-day status*. 29 p.

Borkin, I.V. *Breeding and early stages of the Polar cod Borogadus saida (lep.) of the Barents Sea*, Abstr., PhD thesis, Moscow (1990) 21. (In Russian)

Born, E.W., Dietz, R., Heide-Jorgensen, M.P. and L.O. Knutsen. 1997. Historical and present distribution, abundance and exploitation of Atlantic walruses (Odobenus rosmarus rosmarus L.) in eastern Greenland. *Bioscience*, 46. 73 pp.

Born, E.W., Gjertz, I and R.R. Reeves.1995. Population assessment of Atlantic walrus (Odobenus rosmarus rosmarus). *Norsk Polarinstittut Meddelelser*, 138. 100 pp.

Bryzgalo, V.A. and Ivanov, V.V. "Hydrochemical regime of Pechora River under conditions of anthropogenic influence," *Ecological chemistry* (1999) 8, No 2, 91 (In Russian)

Cameron, M., and P. Boveng. 2009. Habitat use and seasonal movements of adult and sub-adult bearded seals. *Alaska Fisheries Science Center Quarterly Report*, October-November-December 2009: 1-4.

Chernook V.I., Lydersen C., Glasov D.M., Trukhanova I.S, Kovacs K.M. 2012. Aerial survey of Atlantic walruses (Odobenus rosmarus) in the Pechora sea, August 2011. Marine mammals of Holarctic. *Collection of Scientific Papers*, vol. 2. Pp. 366-369.

Druzhkov N., Grönlund L., Kuznetsov L. The phytoplankton of the Pechora Sea, the Pechora Bay and the Cheshskaya Bay // *Pechora Sea Ecological Studies in 1992-1995: Final Report*. Finnish-Russian Offshore Technology Working Groupe. Rep. B13, 1997. P. 41-52.

Gavrilo M., M.Ekker, H.Strom, D.Vongraven 2000 The Pechora Sea region - a unique pristine environment at risk of oil and gas development, 5th International Conference "Health, safety, environment in oil and gas exploration and production", SPE publication # 61498

Grönlund L., Kuznetsov L., Druzhkov N. *Hydrology of the Pechora Sea, the Pechora Bay and the Cheshskaya Bay // Pechora Sea Ecological Studies in 1992-1995: Final Report*. Finnish-Russian Offshore Technology Working Groupe. Rep. B13, 1997. pp. 15-28.

Haug, T. & Nilssen, K.T. 1995. Observations of walrus (Odobenus rosmarus rosmarus) in the southeastern Barents and Pechora Seas in February 1993. *Polar Res*. 14:83-86.

Isaksen, K., Strøm, H., Gavrilo, M. and Krasnov, Yu. Distribution of seabirds and waterfowl in the Pechora Sea, with emphasis on post-breeding marine ducks. In: H. Strom, K. Isaksen, A.N. Golovkin (eds.) Seabirds and wildfowl surveys in the Pechora Sea during August 1998. *Norwegian Ornithological Society, Report No 2*-2000, pp. 7-44.

Joint Norwegian-Russian environmental status 2008. *Report on the Barents Sea Ecosystem. Part II – Complete report*. IMR/PINRO Joint Report Series, 2009. (3).

Kazakov, R.V. (Ed.) *The Atlantic Salmon*, Saint-Petersburg, Nauka (1998) 576. (In Russian)

Krasnov Yu.V., Goryaev Yu., Nikolaeva N.N., Gavrilo M.V. 2002 *Atlas of bird distribution in the Pechora Sea*. Apatity. 150 p. (In Russian)

Krasnov, Yu., Gavrilo, M., Nikolaeva, N., Goryaev, Yu., Strom, H. 2006. East-Atlantic flyway populations of seaducks in the Barents Sea region. In: Boere, G.C., Galbraith, C.A., Stroud, D.A. (eds). *Waterbirds around the world*. Edinburgh. Pp. 212–213

Krasnov, Yu.V. and Nikolaeva N.G. 1996. *Seabird distribution in the south-eastern Barents Sea in July 1993, Ecosystems, biological resources and anthropogenic pollution of Pechora Sea Seas*, Kola Scientific Center RAS, Apatity 98. (In Russian)

Krasnov, Yu.V., Gavrilo, M.V., Chernook V.I. 2004. Distribution of bird fauna over the Pechora Sea according to aerial survey data // *Zoologicheskiy zhurnal* – Vol 83, № 4, P. 449–458 (in Russian with English summary)

Krasnov, Yu.V., Gavrilo, M.V., Strom, H., & Shavykin, A.A. 2008 Distribution of birds on Kolguev island and adjacent Barents sea areas during late summer 2003. *Ornitologiya*, 35: 83–96 (in Russian with English summary)

Larsen T., Nagoda D., Andersen J.R. 2002. *The Barents Sea Ecoregion: A biodiversity assessment*, p. 151.

Novoselov A.P. 1999. Biological characteristics of Arctic cisco (*Coregonus autumnalis Pallas*) within the Barents and Karskoe Seas// YII International Symposium on the Biology and Management of Coregonid Fishes. The University of Michigan. Ann Arbor. USA. S. 66.

Novoselov A.P. 2002. The feeding of Arctic cisco (*Coregonus autumnalis Pallas*) in the south-western part of Kara Sea// *VIII International Symposium on the Biology and Management of Coregonid Fishes.* Rovaniemi. Finland. S. 41.

Pogrebov, V.B. et al. 1997. "Macrobenthic communities of the Pechora Sea: the past and the present on the threshold of the Prirazlomnoe oil-field exploitation", *Marine pollution bulletin* 35, No 7-12, 287.

Polar Bears. *Proc. of the 15th Working Meeting of the IUCN/SSC Polar Bear Spec. Group, 29 June 3 July 2009*. Copenhagen, Denmark. pp. 247.
Potanin, V.A., (Ed. in chief). 1996. *Ecosystems, biological resources and anthropogenic contamination of the Pechora Sea*, Kola Scientific Center RAS, Apaptity 161. (In Russian)
Spiridonov V.A., Gavrilo M.V., Krasnova E.D., Nikolaeva N.G. (Eds.) 2010. *Atlas of marine and coastal biological diversity of the Russian Arctic*. Moscow: WWF Russia, p. 60.

**Maps and Figures**

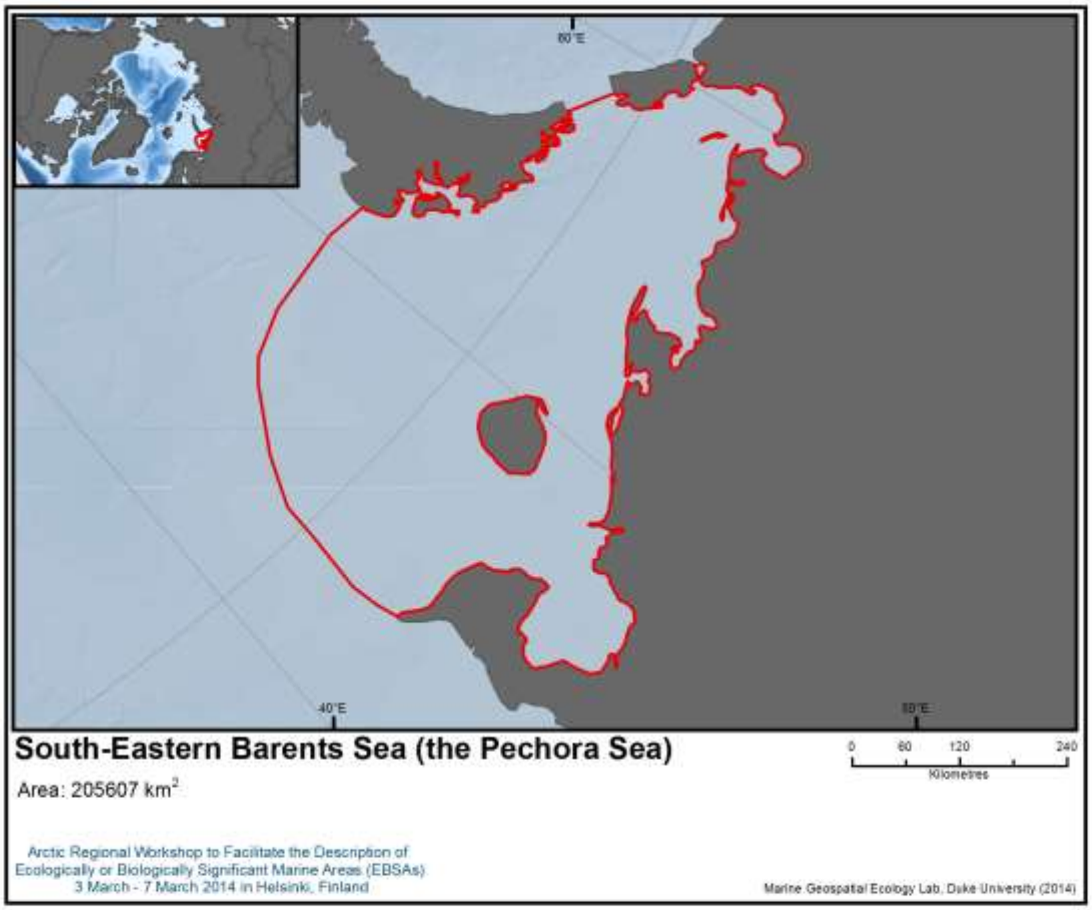



Figure 1. Map of the area meeting EBSA criteria.

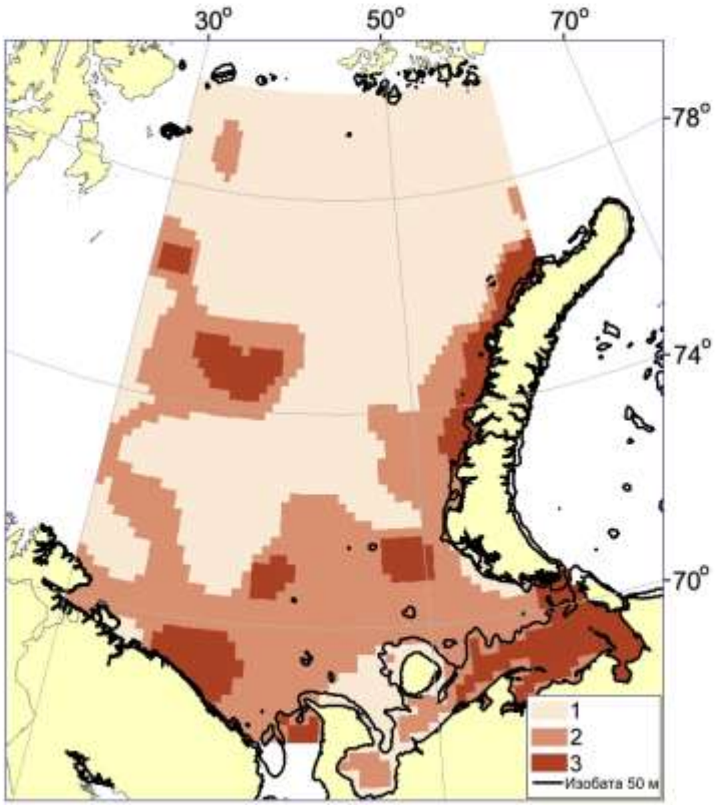



Figure 2. Biomass of macrobenthos in the Barents Sea.

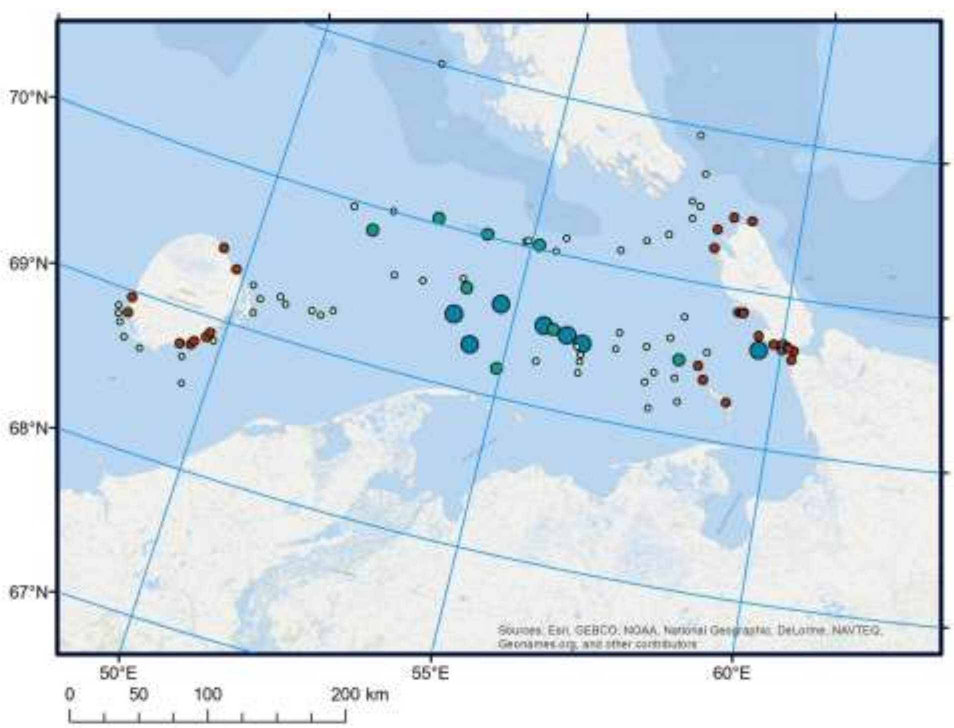



Figure 3. Coastal haul-outs of Atlantic walrus (red dots): the others dots are walruses on ice. Source: Marine Mammal Council.

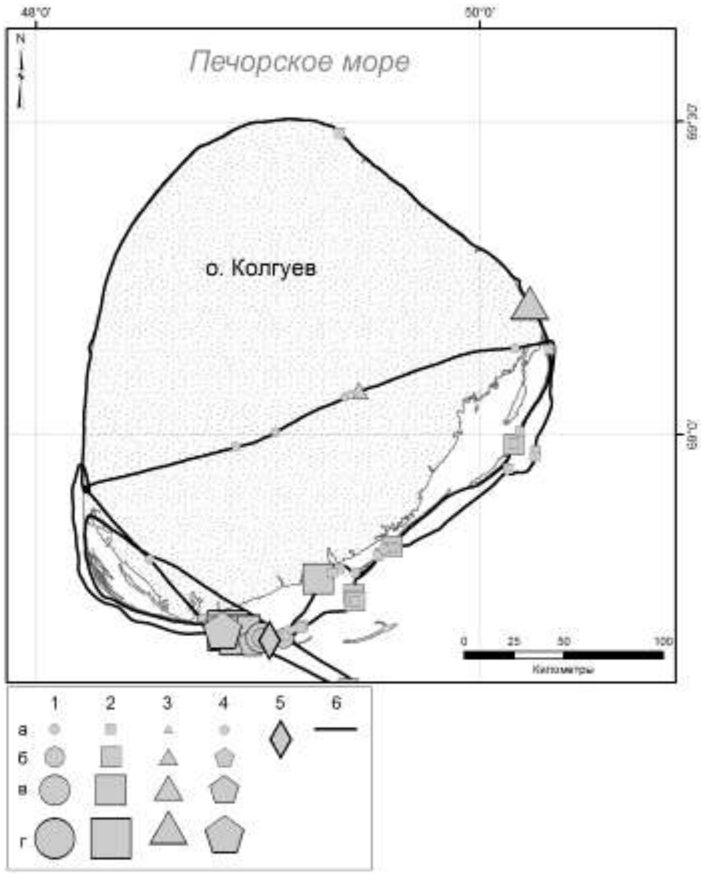



Figure 4. Distribution of seaducks in Kolguev Island area as obtained by aerial survey in August, 2003. 1 – *Mergus* spp.; 2 – King Eider (*Somateria spectabilis*); 3 – Long-Tailed Duck (*Clangula hyemalis*); 4 – ducks; 5 – Steller's Eider (*Polysticta stelleri*); 6 – aerial survey routes on 30-31 August, 2003. Source: Krasnov et al., 2008.

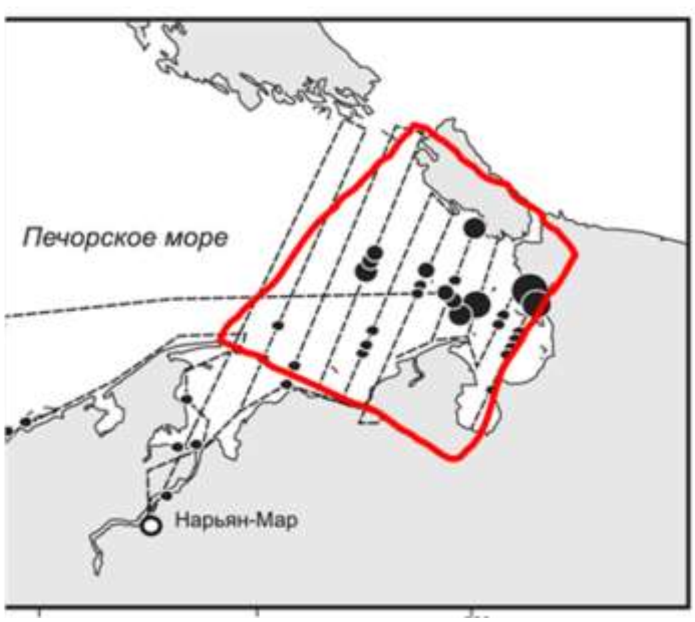



Figure 5. Distribution of scoter ducks in the Pechora Sea according to aerial survey data in August. Source: Krasnov et al. 2002.

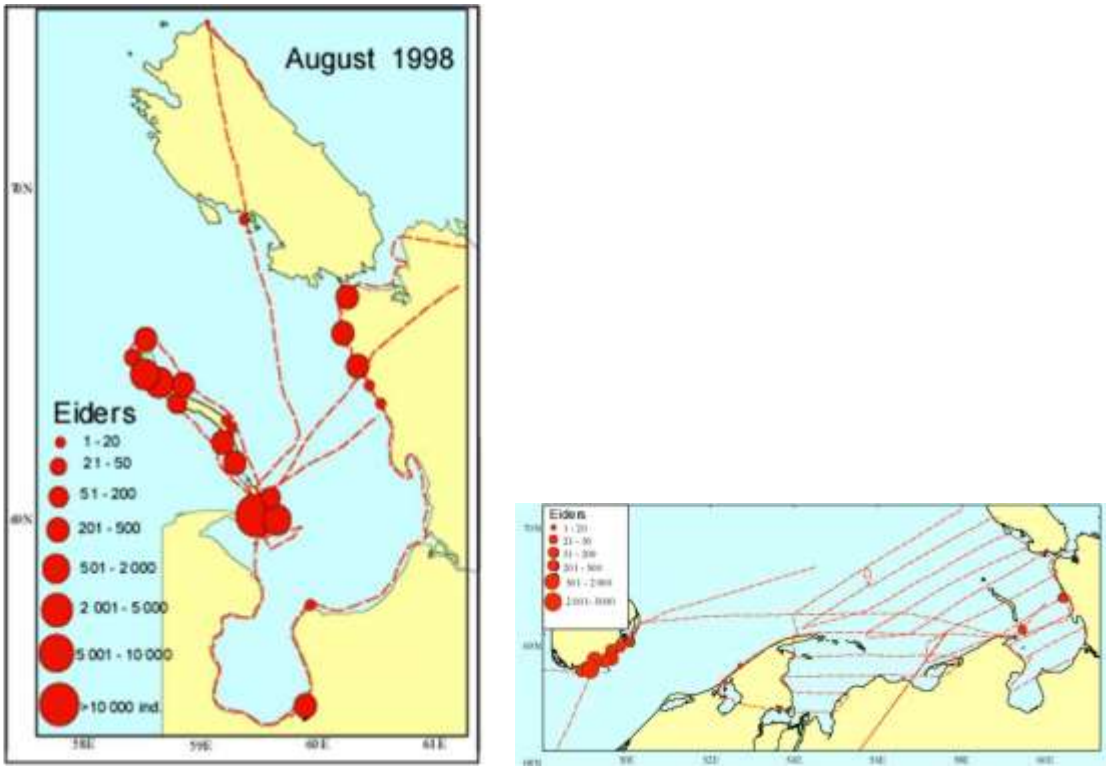
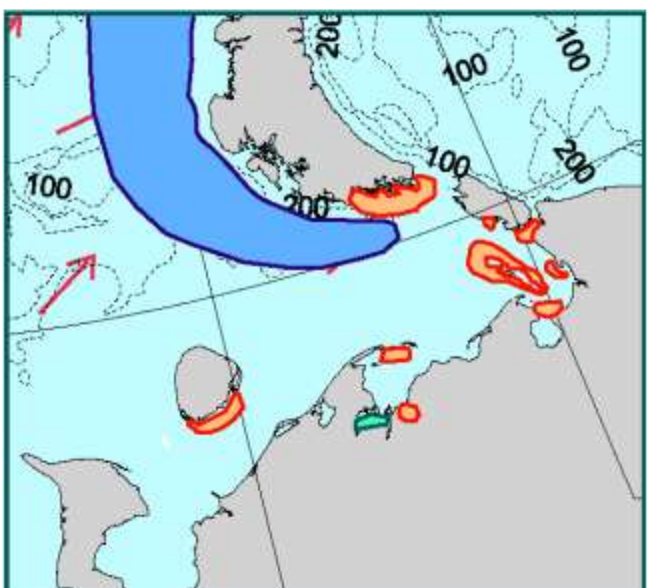



Figure 6. Eider distribution in the Pechora Sea in August 1998 according to aerial survey data. Source: Isaaksen et al., 2000.




– staging and moulting areas for seaducks;

– staging area of swans (*Cygnus* spp.);

– postbreeding staging area of Brunnich's guillemots (*Uria lomvia*);

Figure 7. Areas of major importance for waterbird populations during postbreeding season in the Pechora Sea.

## Area No. 6: The Coast of Western and Northern Novaya Zemlya

### Abstract

The coast of western and northern Novaya Zemlya in the Barents Sea is a highly productive marine area based on a fluctuating polar front zone and marginal ice zone. Atlantic and Arctic water masses meet here and form the polar front, which is characterized by strong gradients in both temperature and salinity, and its position fluctuates along the eastern Barents Sea, thus accounting for the enhanced productivity of the entire coast off western Novaya Zemlya. Another feature supporting high productivity is a marginal ice zone, which moves in the course of a season in the same area. The area provides feeding grounds for common species of Barents Sea pinnipeds and ceatceans as well as breeding grounds for bearded *(Erignathus barbatus*) and ringed *(Phoca hispid*a) seals. The system of shore leads and drift ice up along the west coast of Novaya Zemlya is supposed to constitute a spring migration route for beluga of the Kara stock and possibly for Atlantic walrus.

The high productivity of this marine area supports the largest seabird colonies in the North-East Atlantic, including a large breeding population of common eiders. Rare and threatened species/habitats include staging and moulting grounds for the threatened Steller's eider and long-tailed duck (Speers and Laughlin, 2010). Benthic biomass in some places exceeds 1000 g/m$^2$ at the western shore, and the area thus serves as an important feeding ground for Atlantic walruses. In winter the marginal ice zone, polynyas and leads off the west coast of Novaya Zemlya are important wintering areas for seabirds (Krasnov et al., 2011) and polar bears.

### Introduction

The *Arctic Marine Shipping Assessment* (AMSA IIc) report on Arctic marine areas of heightened ecological significance identified the marine areas around Western Novaya Zemlya as an area of heightened ecological significance that meets the International Maritime Organization (IMO) ecological criteria for particularly sensitive sea area (PSSAs) (AMAP/CAFF/SDWG, 2013).

The IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment (Speer and Laughlin, 2011) also identified the “Novaya Zemlya” as meeting nearly all CBD criteria. It is noted that, the western waters around Novaya Zemlya constitute a highly productive marine area that supports the largest seabird colonies in the North-East Atlantic, including a large breeding population of common eiders. It represents an area of high biodiversity for zooplankton, benthic species, fishes, seabirds, marine mammals. Rare and threatened species/habitats include staging and molting grounds for the threatened Steller's eider and Long-tailed duck, and the northern stock of the East-Atlantic meta-population of Atlantic walrus (Speers and Laughlin, 2010 with additions). As the area off Novaya Zemlya has not been sufficiently studied recently the following description largely follows the WWF Barents Ecoregion biodiversity assessment (Larsen et al., 2003) and Status of the Barents Sea Ecosystem (Stiansen et al. 2009).

### Location

This area corresponds to area 10 in the *Arctic Marine Shipping Assessment* (AMSA IIc) report (AMAP/CAFF/SDWG, 2013), with the exception of its southern part, which has been covered by area no. 5 in the present report. The area covers the fjordic coastal zone and the adjacent shelf generally within the 100 m isobath (with the exception of the very northern part of the north island of Novaya Zemlya, where greater depth occurs very close to the shore. This is the area located within Russia’s territorial sea and EEZ (figure 1).

### Feature description of the proposed area

The general pattern of water circulation (figure 2) is characterized by inflow of relatively warm Atlantic water and coastal water from the west, and inflow of relatively fresh, and cold Arctic water from the north-east. Atlantic and Arctic water masses meet and form the polar front, which is characterized by strong gradients in both temperature and salinity, and its position fluctuates along the eastern Barents Sea, thus accounting for the enhanced productivity of the entire coast off western Novaya Zemlya. Another feature supporting high productivity is a marginal ice zone, which moves in the course of a season in the same area (figure 3). There is large inter-annual variability in ocean climate related to the variable strength of the inflow of Atlantic water and exchange of cold Arctic water, and also due to variable ice conditions.

The system of shore leads and drift ice up along the west coast of Novaya Zemlya is supposed to constitute a spring migration route for beluga of the Kara stock and possibly also for walrus. Western Novaya Zemlya holds many fairly large seabird colonies, with thick-billed murre and black-legged kittiwake as the major species. Thick-billed murres perform a swimming migration south along Novaya Zemlya toward the Pechora Sea region (AMAP/CAFF/SDWG, 2013).

*Primary production, pelagic community and polar cod*

The effects of the marginal ice zone and local coastal fronts are major drivers of the increased productivity. The model-based distribution of primary production indicates particularly higher values in the coastal zone of Novaya Zemlya compared to the offshore water (Romankevich and Vetrov, 2001).

High phytoplankton productivity and accumulation resulting from the circulation pattern leads to increased biomass of zooplankton, including euphausiids (krill). This in turn is associated with high concentrations of immediate predators, primarily polar cod (*Boreogadus saida*) (Borkin, 1995), whose feeding area includes the coastal water of Novaya Zemlya (figure 4) and of organisms of higher trophic levels, i.e. piscivorous fishes, seabirds and marine mammals.

*Benthos*

The area of high benthic biomass coincides with the area with a 20% sea-ice concentration along the Spitsbergen— Medvezhii (Bear) Island — Novaya Zemlya — south-eastern Barents Sea line that can be explained by the enhanced flux of phyto-detritus (Denisenko, Titov, 2003). Even with its eastern position, Novaya Zemlya has a diverse and productive benthic fauna. Biodiversity is particularly high in the extreme north, south, and east of the Matochkin Shar strait, and towards the Kara Gate Strait. Benthic biomass in some places exceeds 1000 g/m$^2$ at the western shore (figure 5).

*Marine mammals*

The area provides feeding grounds for common species of the Barents Sea pinnipeds and ceatceans, as well as breeding grounds for bearded (*Erignathus barbatus*) and ringed (*Phoca hispida*) seals. For Minke whales (*Balaenoptera acutorostrata*), the coastal waters of Novaya Zemlya are particularly important as their feeding grounds are located in the southern portion of the area (figure 6).

*Seabirds*

The Barents Sea Region (here defined as the north-eastern part of the Norwegian andGreenland Seas, and the Barents and White Seas) supports some of the largest concentrationsof seabirds in the world (Norderhaug et al., 1977, Anker-Nilssen et al., 2000). About 20 to 25 million seabirds harvest approximately 1.2 million tonnes of biomass annually from the area(Barrett et al. 2002).

Western Novaya Zemlya along with Norwegian mainland and Spitsbergen are the three main breeding areas, supporting more than 80% of the total breeding populations in the region (figure 7). Brunnich's guillemots and kittiwakes account for the main populations in the Novaya Zemlya.A large population of common eiders breed on western Novaya Zemlya, as well.

The waters off Novaya Zemlya are critical habitats for seabirds, providing feeding grounds from spring to autumn; numerous populations winter along the ice edge. In coastal waters there are staging and moulting grounds for sea ducks, including the endangered long-tailed duck and Steller's eiders (figure 8).

**Feature condition and future outlook of the proposed area**

Novaya Zemlya forms a natural barrier between the Arctic oceans of Europe and Asia. The Barents Sea is influenced by the warm North Atlantic current, while the Kara Sea is a typical Arctic sea, ice-covered for most of the year.

Novya Zemlya has a high degree of naturalness, as vast areas are virtually, or completely, intouched by human activities. It is an important denning and nursery area for polar bears. Belugas (white whales) summer in the Kara Sea, migrating through three relatively narrow "channels" on their way to the important western wintering grounds on the Barents Sea coast: the Kara gate to the south, the Matochkin Strait between the northern and southern islands, and around Mys Zhelaniya to the very north. The same passages are also used by other marine mammals, such as the walrus. Six walrus haul-outs are known along the western and northern shores of Novaya Zemlya, but the number is probably higher.

Species and biotopes are still in a very natural state as a result of the lack of human-induced disturbance or degradation outside some very minor locations. The area has a variety of species, both benthic and fish, compared to similar Arctic habitats elsewhere. The Zhelaniya Cape as well as the straits are ecologically interesting migration corridors between the Arctic Kara Sea and the Atlantic-influenced Barents Sea.

***Current threats:***

**Nuclear waste.** Novaya Zemlya was a nuclear testing ground from 1954 to 1990. No elevated levels of radioactivity are detectable today, except for sediments in Chernaya Bay, an underwater testing area.

**Disturbance.** Former inhabitants and visitors to the islands had a massive impact on seabird colonies close to settlements (hunting, egg collection). Today, only a few military sites are inhabited. On the other hand these are rather built-up, with dense local road networks, harbours and military installations. Military presence is likely to cause impacts locally, particularly on Gusinaya Zemlya ("Goose Land").

**Pollution from the petroleum sector.** Oil and gas development in the eastern Barents Sea constitutes a threat both during the present exploratory phase and in future development phases. Different projects under development will bring offshore oil-drilling platforms and oil tanker traffic. Oil spills in ice-covered waters during winter will have adverse effects through the "absorption" of oil in the ice pack and consequent release of the oil during spring and summer.

**Pollution.** Due long-range transport and biomagnification of persistent organic pollutants (particularly PCBs), pollution is a problem for species at the top of food chains.

**Climate change.** Likely to cause notable changes in the local distribution of species and habitats.

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness or rarity** | Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | X | |
| *Explanation for ranking*<br>The area supports one of the biggest seabird colonies in the North-East Atlantic. | | | | | |
| **Special importance** | Areas that are required for a population to survive and thrive. | | | | X |

<table>
<tr><td>for life-history stages of species</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>The area’s high productivity makes it an important feeding and breeding place for polar cod and, respectively marine colonial birds breeding in the colonies of Novaya Zemlya, which, along with the Spitsbergen seabird colonies, are the largest in the Barents Sea region. Important breeding grounds for the large population of common eiders. In winter the marginal ice zone, polynyas and leads off the west coast of Novaya Zemlya are important wintering areas for seabirds (Krasnov et al., 2011) and polar bears. Important feeding grounds for Minke whales.</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>Some rare or endangered species occur in the area (i.e., Steller’s eider staging areas), which is also important for Atlantic walrus haul-outs; polar bear feeding areas located off the north island, but more information is needed in order to rank this area against this particular criterion.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>Significant aggregations of breeding, feeding and wintering seabirds make the area vulnerable to large-scale offshore human activities, such as oil and gas exploration, production and transportation with a potential threat of oil spills.</td></tr>
<tr><td>Biological productivity</td><td>Area containing species, populations or communities with comparatively higher natural biological productivity.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>The polar front zone and marginal ice zone fluctuating across the area in the course of the year are features that account for its high bioproductivity. The area supports high numbers of breeding and feeding seabirds and foraging Minke whales, based on schooling fishes. Available data indicate enhanced benthic biomass off western Novaya Zemlya. (Stiansen et al., 2009).</td></tr>
<tr><td>Biological diversity</td><td>Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>Little data are available for the low trophic level diversity in the coastal areas. Most of sampling in the last decades has been conductedbeyond the 12-mile zone of Novaya Zemlya.</td></tr>
<tr><td>Naturalness</td><td>Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.</td><td></td><td></td><td>X</td><td></td></tr>
</table>

| *Explanation for ranking* |
|---|
| Vast areas are undisturbed by human presence. Apart from military bases, only single locations on the southern shores have historically been settled by humans. Novaya Zemlya has been under military administration since nuclear test sites were conducted in 1954. For all practical purposes, the armed forces are still in command of the archipelago. As a consequence, ecosystems have remained fairly undisturbed, but seabird colonies were overexploited in the mid-20th century and were also affected by overfishing on the wintering grounds; the long-range transport of pollutants presents a potential threat. |

**References**

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp.

Bakken V., Cherenkov A.E., Gavrilo M.V., Koryakin A.S., Krasnov J. (Yu). V., Nikolaeva N.G., Porkovskaya I.V., Semashko V.Yu., Tertitski G.M. 2000. Seabird colony databases of the Barents Sea region and the Kara Sea // *Norsk Polarinstitut Rapportserie*, 115: 1–78.

Borkin I.V. 1995. Ichthyofauna. Arctic cod. In: *Habitats and ecosystems of Novaya Zemlya (archipelago and shelf)*. Apatity: Kola Science Centre of Russian Academy of Sciences, pp. 121–132. (In Russian).

Denisenko S.G., Titov O.V. 2003. Distribution of zoobenthos and primary plankton production in the Barents Sea. *Okeanologia*, 43 (1): 78–88. (In Russian).

Krasnov Yu.V., Gavrilo M.V., Spiridonov V.A. 2011. Sea ice biotopes of southeastern Barents and the White seas. In: V. Spiridonov, M. Gavrilo, N. Nikolaeva, E. Krasnova (eds) *Atlas of the Marine and Coastal Biodiversity of the Russian Arctic.* Moscow, WWF Russia Publication, pp. 30–32.

Larsen T., Boltunov A., Denisenko N., Denisenko S., Gavrilo M., Mokievsky V., Nagoda D., Spiridonov V., Quillfeldt C. von and the participants at the St. Petersburg biodiversity workshop 12-13 May 2001. 2003. *The Barents Sea Ecoregion. A biodiversity assessment*. Oslo, WWF, 150 p.

Romankevich E.A., Vetrov A.A. 2001. *Carbon cycle in the Arctic seas of Russia*. Moscow, Nauka, 301 p. (In Russian).

Speer L., Laughlin T. (eds) 2011. *IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment*, La Jolla, California. 02-04 November 2010. 37 p.

Stiansen J.E., Korneev O., Titov O., Arneberg P. (eds), Filin A., Hansen J.R., Hшines E., Marasaev S. (co-eds) 2009. *Joint Norwegian_Russian Environmental Status Report (2008) on the Barents Sea Ecosystem. Part II — Complete report*. IMR/PINRO Joint Report Series, 2009(3). Bergen: Institute of Marine Research. — 375 p.

**Maps and Figures**

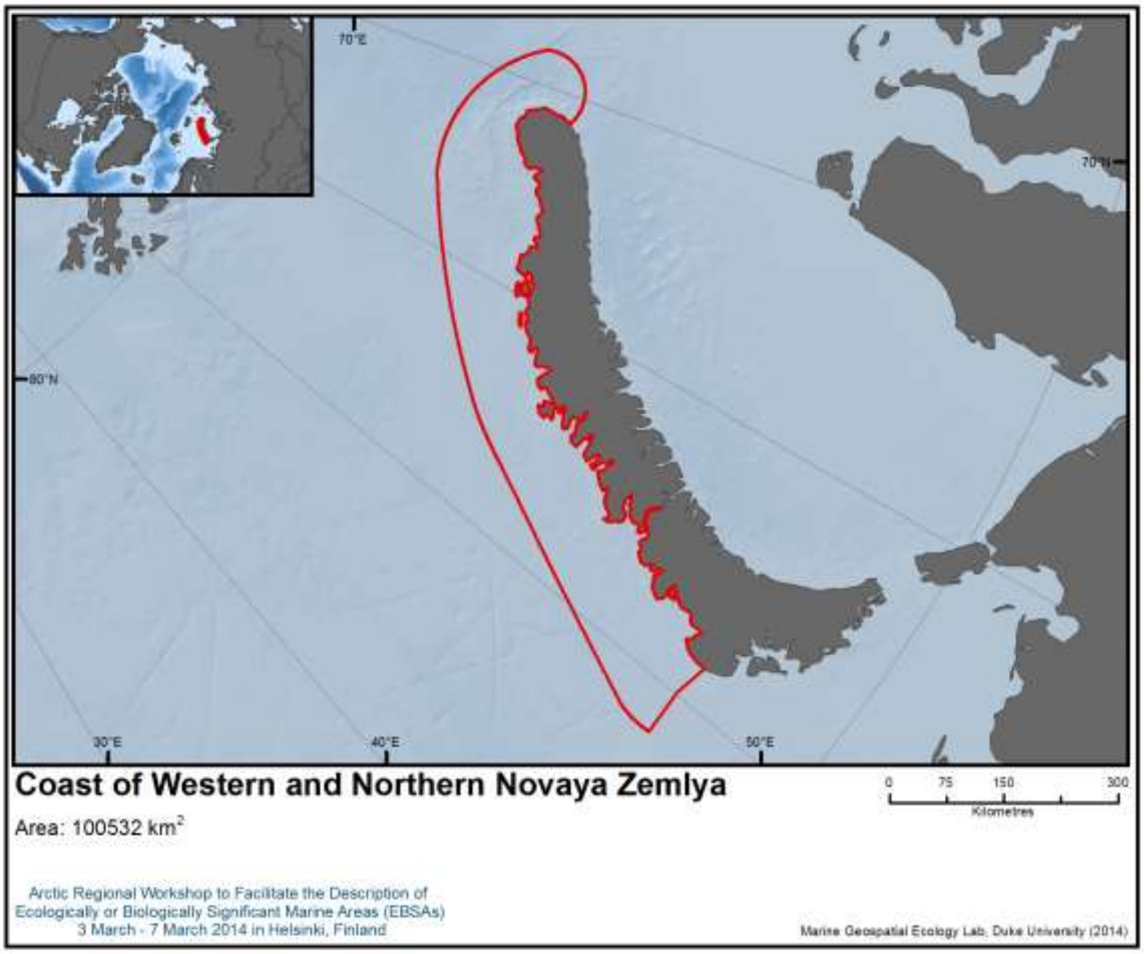



Figure 1. Area meeting EBSA criteria.

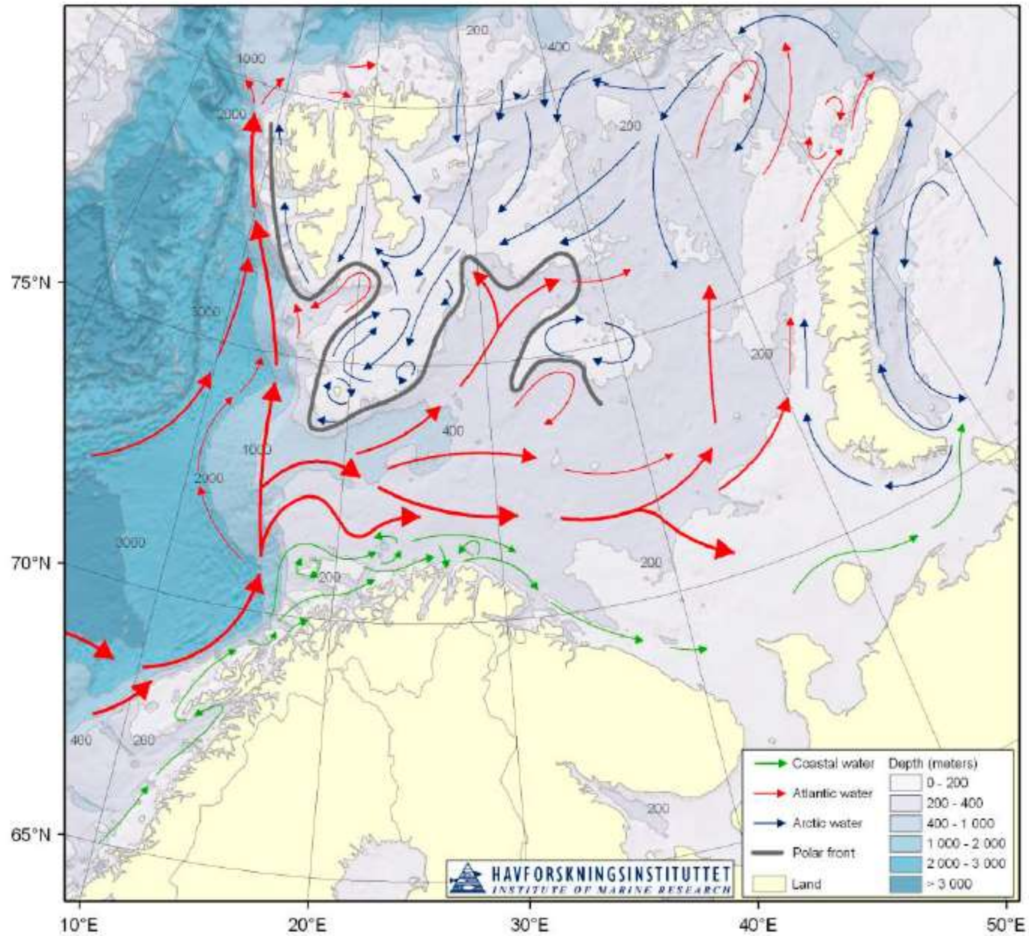



Figure 2. Circulation of water masses in the Barents Sea. Source: Stiansen 2009.

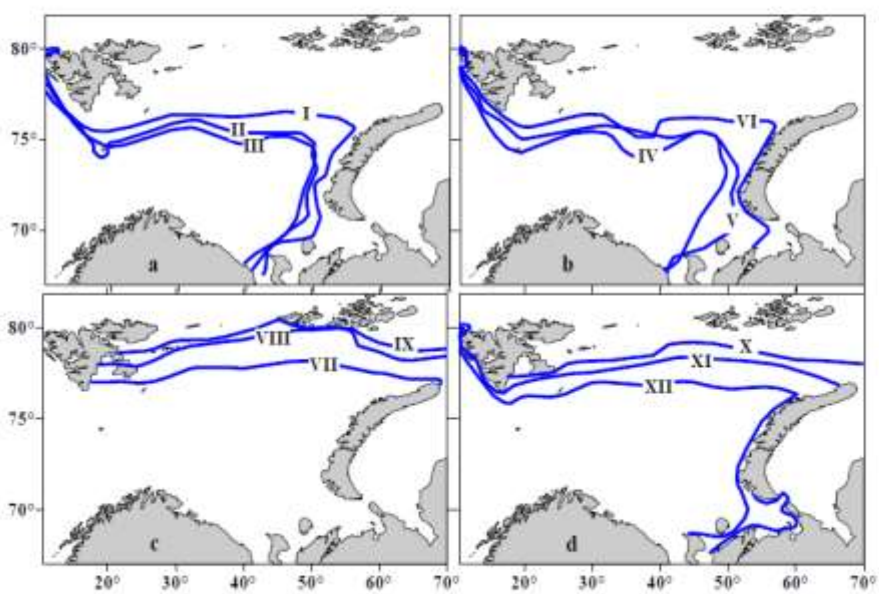



**Figure 2.3.10**. Long-term mean position of the ice edge in the Barents Sea during the first (a), second (b), third (c) and fourth (d) quarters.

Figure 3. Dynamic of the marginal ice zone in the area. Source: Stiansen 2009.

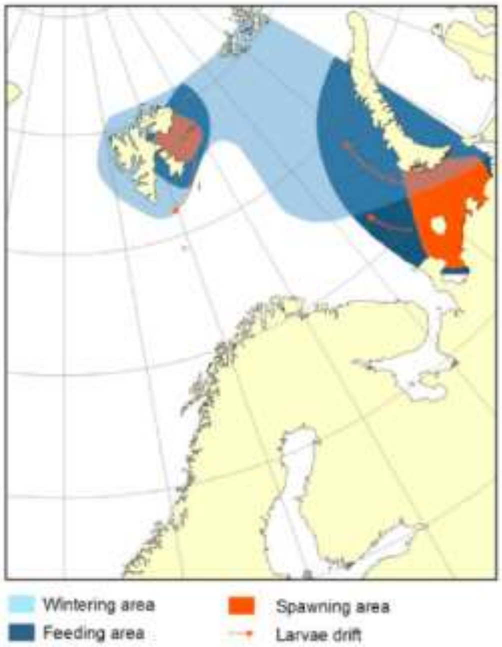



**Figure 2.4.24**. Distribution area for polar cod.

Figure 4. Distribution area for polar cod. Source: Stiansen 2009.

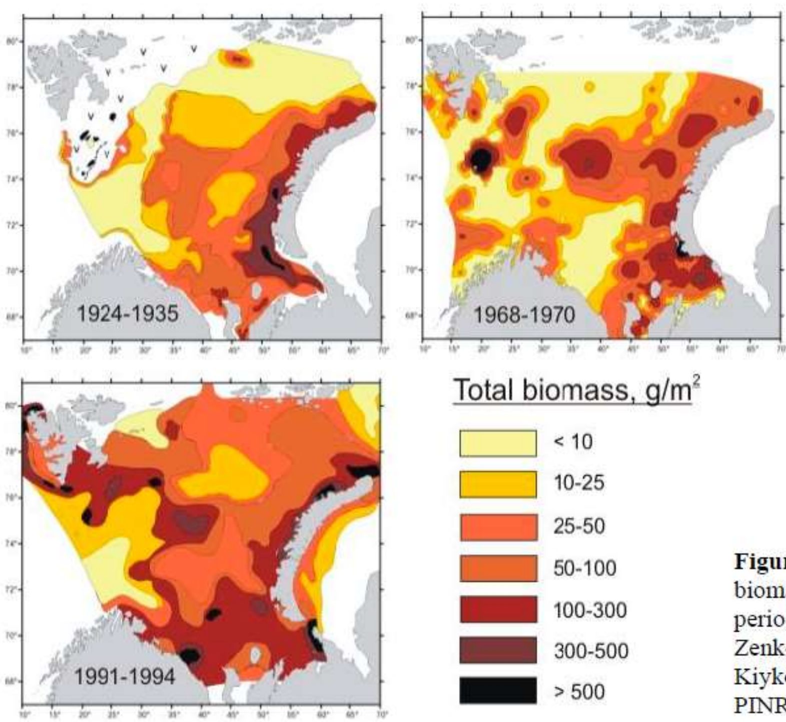



**Figure 2.4.8**. Distribution of the benthic biomass of the Barents Sea at different periods of researches (After Brotskaya & Zenkevich, 1939; Antipova, 1975b; Kiyko and Pogrebov, 1997a) (Source: PINRO).

Figure 5. Distribution of the benthic biomass in different decades of research.
Source: PINRO, from Stiansen 2009.


Figure 6. Summer distribution of the Minke whale.
Source: Stiansen 2009.

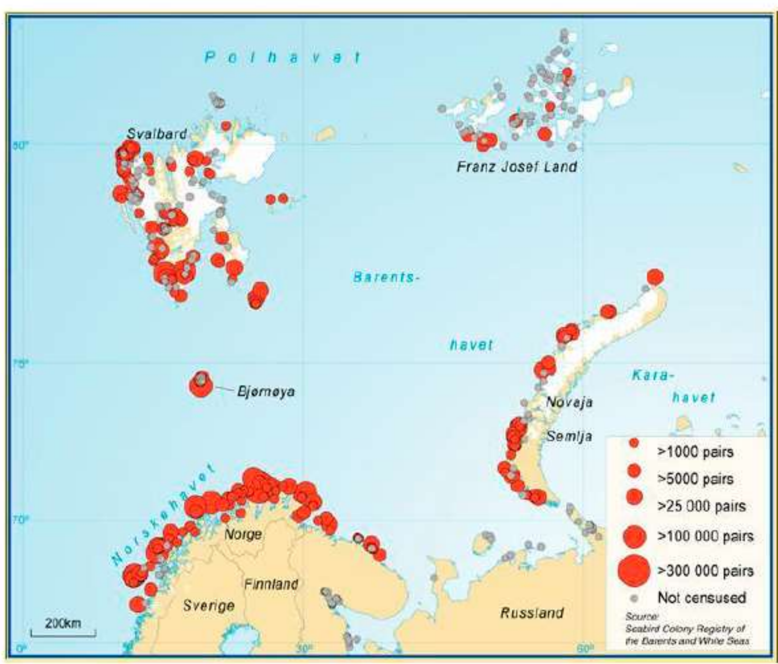



**Figure 2.4.28**. Seabird colonies in the Barents Sea Region. Source: The Seabird Colony Registry of the Barents and White Seas and NINA.

Figure 7. Seabird colonies in the Barents Sea.
Source: Stiansen 2009.

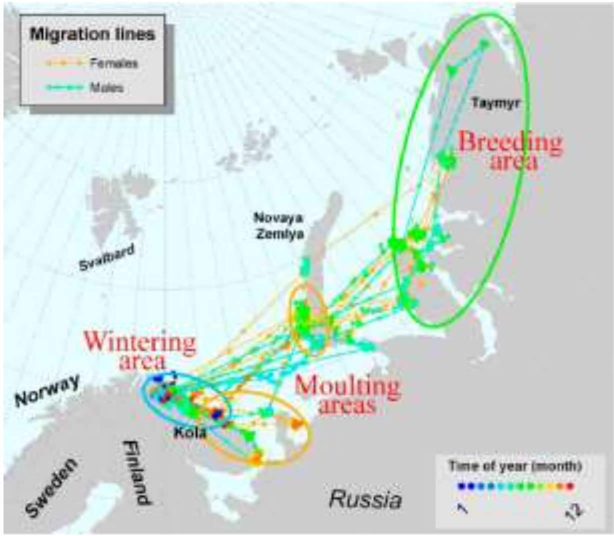



**Figure 2.4.29**. Steller's Eider migration patterns (Source: www.seapop.no).

Figure 8. Migration patterns of Steller's eider.

## Area No. 7: North-eastern Barents – Kara Sea

### Abstract

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.

### Introduction

The report titled *Identification of Arctic Marine Areas of Heightened Ecological and Cultural Significance: Arctic Marine Shipping Assessment (AMSA IIc) (*identified the marine areas around Franz-Josef Land archipelago, as well as the polynyas west and east of the Severnaya Zemlya archipelago, as areas of heightened ecological significance that meet the IMO ecological criteria for PSSAs (AMAP/CAFF/SDWG, 2013). The IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment (Speer and Laughlin, 2011) identified an area named “High Arctic Islands and Shelf” as meeting nearly all CBD criteria. The workshop report noted that, “This area includes a mix of large and small islands that together are the northern-most archipelago in the Russian and Norwegian Arctic. The region harbors abundant and diverse coastal benthic communities, and supports colonies of high Arctic seabirds, ice-associated marine mammals and polar bears. Atlantic water masses along the continental shelf break in the northern part of the area are associated with summer ice edge habitat supporting abundant and diverse zooplankton and polar cod (*Boreogadus saida*). It is a key area for the endangered Spitsbergen stock of bowhead whale, the northern stock of the East-Atlantic meta-population of Atlantic walrus (*Odobaenus rosmarus rosmarus*), and most of the world’s breeding population of the threatened ivory gull (the region provides post-breeding staging grounds for ivory gulls from all North-East Atlantic populations)” (Speers and Laughlin, 2011). As the above-mentioned EBSA is a large, non-uniform area that includes different sub-areas that meet the EBSA criteria in different ways, here we give descriptions and updated information for the part of the area located off Russian islands, including areas corresponding to several “elementary” EBSAs mapped and listed in annexes 1 and 2 to the IUCN/NRDC workshop report.

### Location

The area covers the High Arctic Russian archipelagos of Franz-Josef Land and Severnaya Zemlya, and several offshore islands, internal archipelagic waters and inland seas, the adjacent Russian territorial waters and exclusive economic zone (figure 1).

### Feature description of the proposed area

The seabed topography is complex and includes archipelagic shelf and adjacent shelf break. This High Arctic ecosystem is enhanced by Atlantic water masses flowing along the continental shelf break. The area is characterised by higher abundances of zooplankton as compared to adjacent waters (Kosobokova 2012, figure 2).

The prominent feature is marginal ice zone associated with this area, including recurrent flaw polynyas (off Franz Josef Land, west and east off Severnaya Zemlya) and the edge of drifting ice which has a seasonal distribution, shifting from south of the area in winter to the north, where it coincides in summer with the shelf break (figure 3), i.e. providing physical drivers for enhanced biological productivity (Eimer et al., 2013). In other words, the area is a dynamic marginal ice zone on an annual basis (see climatic ice extent charts in National Ice Center 2006, updated 2009).

The marginal ice zone and offshore polynyas developing around the archipelagos (Popov and Gavrilo, 2011) are generally associated with enhanced primary production. The regional maxima of primary production around the archipelagos of Franz Josef Land and Severnaya Zemlya are particularly important in spring (April – May) when surrounding areas are under ice and show low productivity (Vetrov and Romankevich, 2011). Enhanced regional productivity and advection of zooplankton with the Atlantic water (Kosobokova, 2012) supports higher trophic levels, including polar cod and top predators, seabirds and marine mammals.

The area is abundant in seabird colonies typical of the High Arctic (dominated by Dovkies/Little auks, Thick-billed murres/Brunnich's guillemots, and Kittiwakes), ice-associated marine mammals and polar bears. It is the principal area for endangered Spitsbergen stock of owhead whale (IUCN EN) (Reeves et al., 2014) with the highest known densities (Gavrilo, unpublished data), northern stock of the East-Atlantic meta-population of Atlantic walrus *Odobaenus rosmarus rosmarus*, most of the world's breeding population of the threatened ivory gull (IUCN NT) (Gavrilo, 2011), post-breeding staging grounds for ivory gulls from all of the North-East Atlantic populations (Gilg et al. 2010, figure 4).

The coastal marine ecosystem of Franz-Josef Land is very rich and diverse, with benthic communities showing signs of pristine marine ecosystems (recent studies, 2013, National Geographic Pristine Seas – Franz-Josef Land expedition – 2013, under preparation).

**Feature condition and future outlook of the proposed area**

This is dynamic area with evidence of current changes under conditions of global climate change. The most prominent changing features are the conditions and distribution of ice, with the summer ice edge shifting north for a great extent over the past decade. This has affected distribution patterns and foraging conditions of many ice-associated species, primarily polar bears, ice-associated seals, and ivory gulls. The recent changes may favour some species, such as bowhead whales and Atlantic walrus, but further investigations are required.

This area is partly covered by federal specially protected areas (National Park Russian Arctic, Franz-Josef Land federal reserve (*zakaznik*), Severozemelsky federal reserve), so monitoring and basic research are ongoing and planned for the future. Some spots around abandoned polar stations and military bases have high concentrations of remnants of the previous epoch of Arctic exploration and exploitation industrial waste. Of particular danger for the environment are barrels with remaining fuel, which are gradually being cleaned up. Actual (on Franz Josef Land) and potential areas of tourism development are considered hotspots for disturbance.

The major developing threat to the area is the booming shelf petroleum exploration and coming exploitation. Recently issued petroleum licences partly overlap with the area described and even overlap with some already existing federally protected areas (Franz-Josef Land federal refuge, Great Arctic reserve, Severozemelsky federal refuge).

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness or rarity** | Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | **X** | |
| *Explanation for ranking*<br>There is an endemic species of coastal *Gymnelus taeniatus*, described in Franz-Josef Land (Chernova, | | | | | |

<table>
<tr><td colspan="6">1999). Also the coastal zone of this archipelago is home to the northernmost kelp communities.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>Due to its enhanced productivity and appropriate coastal habitats, the area supports one of the most important seabird colonies and marine mammal breeding and feeding habitats in the High Arctic.</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>Core area for survival and recovery of endangered Spitsbergen stock of bowhead whales (IUCN, EN), core area supporting up to 75% of the world population of the threatened ivory gull. Core denning area for Barents-Kara Sea population of Red Listed polar bear. Summer feeding area for beluga whales (IUCN, VU).<br><br>Core area of highest known abundances and year-round presence of endangered Spitsbergen stock of bowhead whales (IUCN, EN), core area supporting up to 75% of the world's breeding population of the threatened ivory gull, core stop-over foraging area for post-breeding migrating ivory gull from entire North-East Atlantic breeding grounds. Core area for reproduction of northern stock of North-East Atlantic metapopulation of Atlantic walrus. Area of highest summer abundances of Barents-Kara Sea population of Red Listed polar bear.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>Significant portions (in the western Russian Arctic) of ice-associated species of mammals and seabirds, ice habitats (e.g., flaw polynyas, ice edge) sensitive to climate change.</td></tr>
<tr><td>Biological productivity</td><td>Area containing species, populations or communities with comparatively higher natural biological productivity.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>Shelf break zone associated with the marginal ice zone in summer provides conditions for enhanced biological productivity There are also productive inshore benthic communities of Franz-Josef Land shelf area (Golikov and Averintsev, 1977).</td></tr>
<tr><td>Biological diversity</td><td>Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>There is no comprehensive information with which to rate the biodiversity of this area in comparison with other areas on the scale of the circumpolar Arctic.</td></tr>
<tr><td>Naturalness</td><td>Area with a comparatively higher degree of naturalness as a result of the lack of or low</td><td></td><td></td><td></td><td>X</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| | level of human-induced disturbance or degradation. | | | | |

*Explanation for ranking*
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.

**References**

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp.

Chernova N.V. 1999. Four new species of *Gymnelus* (Zoarcidae) from the Arctic region. *Journal of Ichthyology*, V. 39, No 5, p. 343-352.

de Korte J., Volkov A.E., Gavrilo M.V. 1995. Bird observations in Severnaya Zemlya, Siberia. - *Arctic*. Vol. 48, N 3: 222-234.

Eamer, J., Donaldson, G.M., Gaston, A.J., Kosobokova, K.N., Larusson, K.F., Melnikov, I.A., Reist, J.D., Richardson, E., Staples, L., von Quillfeldt, C.H. 2013. *Life Linked to Ice: A guide to sea-ice-associated biodiversity in this time of rapid change*. CAFF Assessment Series No. 10. Conservation of Arctic Flora and Fauna, Iceland.

Gavrilo M. 2009. Breeding distribution of ivory gull in the Russian Arctic: difficulty when studying range of a rare and sporadically breeding high arctic species. *Problemy Arktiki and Antarctiki Iss.* 3 (82): 127 – 151. (In Russian).

Gavrilo M.V. 2010. Bird fauna and population of selected high-latitudinal Western Arctic islands. Based on data obtained during IPY 2007/08 study. Matishov G.G., Tishkov A.A. (Eds.) Terrestrial and marine ecosystems. Russian input into the IPY 2007/08, Moscow: European Publishers (Paulsen Ltd.), 210–230. (In Russian).

Gavrilo M.V. 2010. On the modern distribution of Atlantic walrus (Odobaenus rosmarus rosmarus) in the northern Kara-Barents Sea region. *Marine Mammals of the Holarctic. Collection of Scientific Papers*. Kaliningrad, 125–129.

Gavrilo M.V. *Ivory gull Pagophila eburnea (Phipps, 1774) in the Russian Arctic: breeding patterns of species within the current species range optimum*. PhD abstract. Saint-Petersburg, 2011, 20 pp. [In Russian]

Gavrilo M.V. Wildlife. *The Franz-Josef Land* / Boyarsky P.V., Ed. in chief. Moscow Paulsen, 2013. Pp. 533–553 [In Russian]

Gavrilo M.V. (Ed.) *Scientific Report on marine researches of the expedition Pristine Seas Franz-Josef Land – 2013 and Russian Arctic – 2013 on the Federal State Refuge Franz-Josef Land*. Archangelsk, 2014. 250 pp. [In Russian]

Gavrilo M.V. 2014. Improvement of conservation measures for marine mammals and polar bears in the Franz-Josef Land Refuge. Report on the Russian Geographical Society project "Investigation of importance of Franz-Josef Land Federal Refuge for the maintaining of rare species of marine mammals and polar bears". Archangelsk. 56 pp. (Unpublished report)

Gavrilo, M., Bakken, V., Isaksen, K. (Eds.) 1998. *The distribution, population status and ecology of marine birds selected as valued ecosystem components in the northern sea route area*. Oslo: The Fridtjof Nansen Institute. INSROP Working Paper No. 123, II.4.2: p. 136 and Appendix.

Gavrilo M.V., Ershov R.V. 2010. *Notes on Cetaceans of the Franz-Josef Land – Victoria region. Marine Mammals of the Holarctic.* Collection of Scientific Papers. Kaliningrad, 120–125.

Gavrilo M.V., Popov A.V. 2011. Sea Ice biotopes and biodiversity hotspots of the Kara and the north-east Barents seas. In:. Spiridonov V.A., Gavrilo M.V., Krasnova E.D., Nikolaeva N.G. (Eds.) 2010. *Atlas of marine and coastal biological diversity of the Russian Arctic*. Moscow: WWF Russia, pp. 34–35.

Gilg O., Strøm H., Aebischer A., Gavrilo M.V., Volkov A.E., Miljeteig C., Sabard S. Post-breeding movements of northeast Atlantic ivory gull *Pagophila eburnea* populations – *J. Avian Biol.* 41: 1–11, 2010 doi: 10.1111/j.1600-048X.2010.05125.x.

Golikov A.N., Averintsev V.G. 1977. Biocoenoses of the upper shelf of the Franz Josef Land Archipelago and some regularities of their distribution. In: Biocoenoses of the Franz Josef Land shelf and fauna of the adjacent waters. Leningrad, Nauka, pp. 5–54 (in Russian).

Joint Norwegian-Russian environmental status 2008. *Report on the Barents Sea Ecosystem. Part II – Complete report*. IMR/PINRO Joint Report Series, 2009. (3).

Kosobokova, K.K. 2009. Plankton communities of the Eurasian sector of the Arctic Basin: zooplankton species composition and quantitative distribution in mid-90s. In Kassenss H. at al. (Eds.) *System of the Laptev Sea and adjacent Arctic Seas. Modern and past environment.* Moscow: Moscow University Press, 173 – 186 (in Russian).

Kosobokova, K.N. 2012. *Zooplankton of the Arctic Basin: community structure, ecology, distribution patterns.*/ Moscow: GEOS. 271 p.

Larsen T., Nagoda D., Andersen J.R. (eds) 2002. The Barents Sea Ecoregion: A biodiversity assessment. 151 p.

National Ice Center. 2006, updated 2009. *National Ice Center Arctic sea ice charts and climatologies in gridded format.* Edited and compiled by F. Fetterer and C. Fowler. Boulder, Colorado USA: National Snow and Ice Data Center. http://dx.doi.org/10.7265/N5X34VDB

Pavlov, V. K., L.A. Timokhov, G. A. Baskakov, M.Yu. Kulakov, V.K. Kurazhov, P.V.Pavlov, S.V. Pivovarov and V.V. Stanovoy. 1996. *Hydrometeorological regime of the Kara, Laptev and East-Siberian seas.* Technical Memorandum APL-UW TM 1-96. Seattle, Applied Physics Laboratory, University of Washington, p.183.

Reeves R.V., Ewins P.J., Agbayani, S., Heide-Jørgensen M.P., Kovacs K.M., Lydersen C., Suydam R., Elliott W., Polet G., van Dijk Y., Blijleven R. 2014 Distribution of endemic cetaceans in relation to hydrocarbon development and commercial shipping in a warming Arctic. *Marine Policy* 44 375–389.

H.R. D. A. T. M. J.M. E. K.2012.

Spiridonov V.A., Gavrilo M.V., Krasnova E.D., Nikolaeva N.G. (Eds.) 2010. *Atlas of marine and coastal biological diversity of the Russian Arctic*. Moscow: WWF Russia, p. 60.

Vetrov A.A., Romankevich E.V. 2011. Primary production and fluxes of organic carbon to the seabed in the russian Arctic seas as a response to the recent warming. *Oceanology*, 51(2): 266–277.

**Maps and Figures**

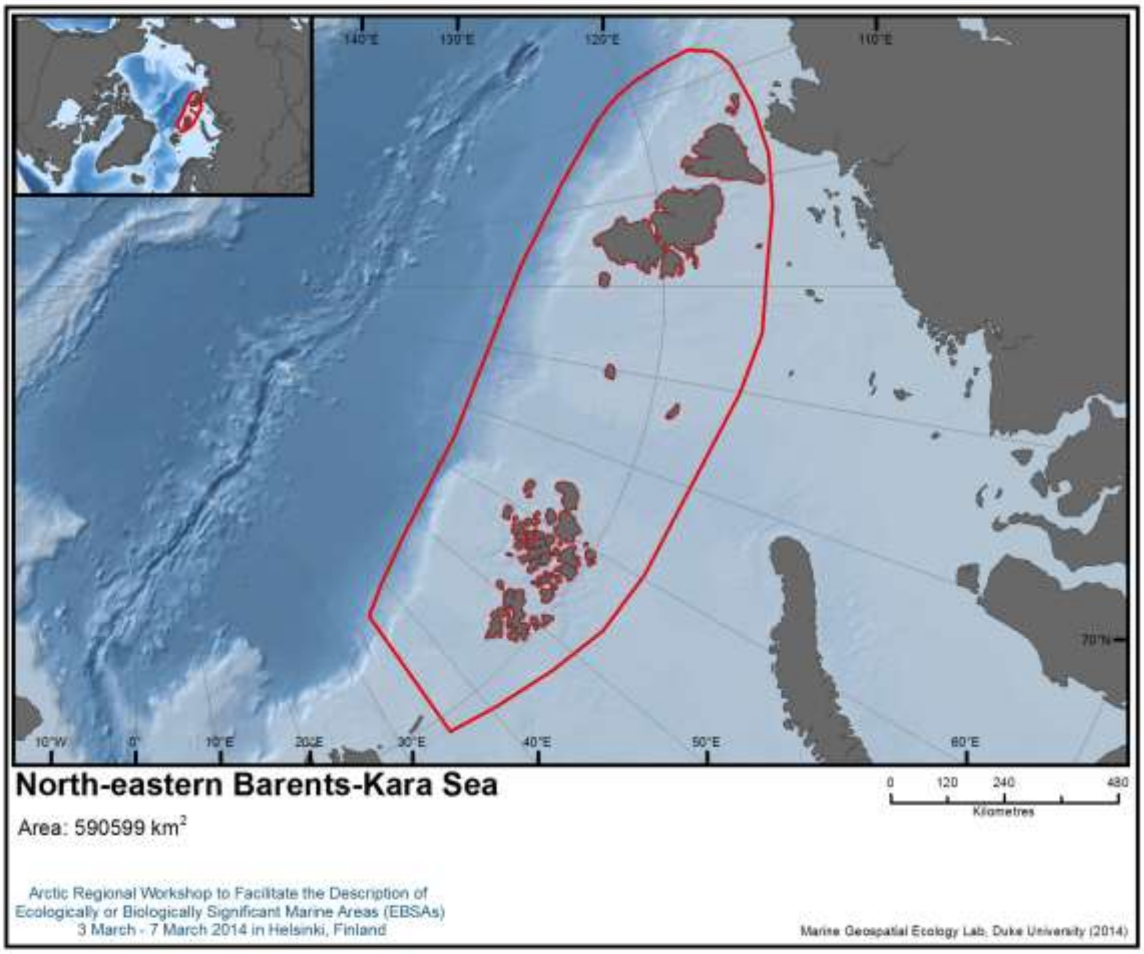



Figure 1. Area meeting EBSA criteria.

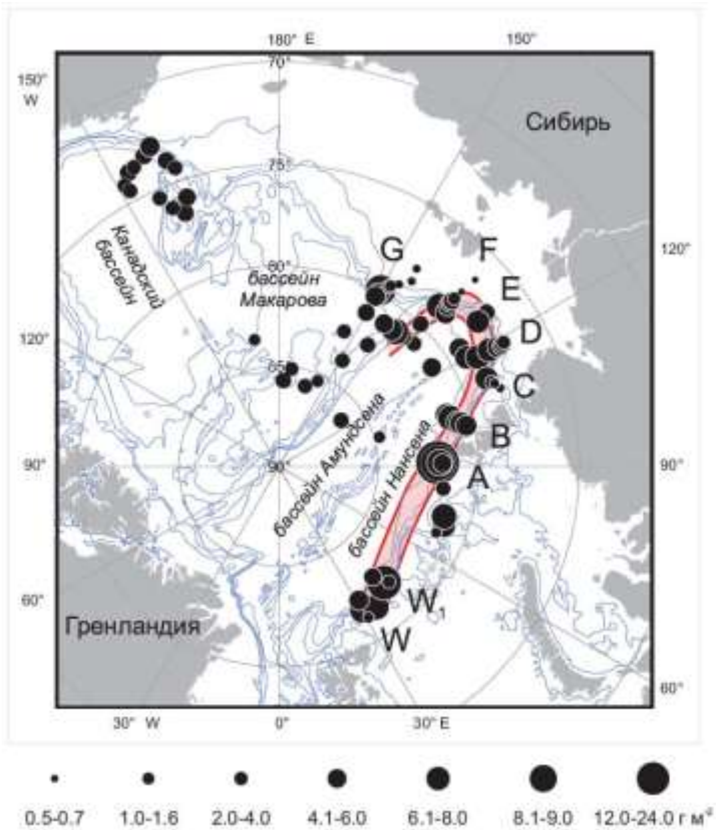



Figure 2. Spatial distribution of total zooplankton biomass (g m-2, dry mass). Pink strip marks band of elevated biomass above the continental slope (from Kosobokova, 2012).

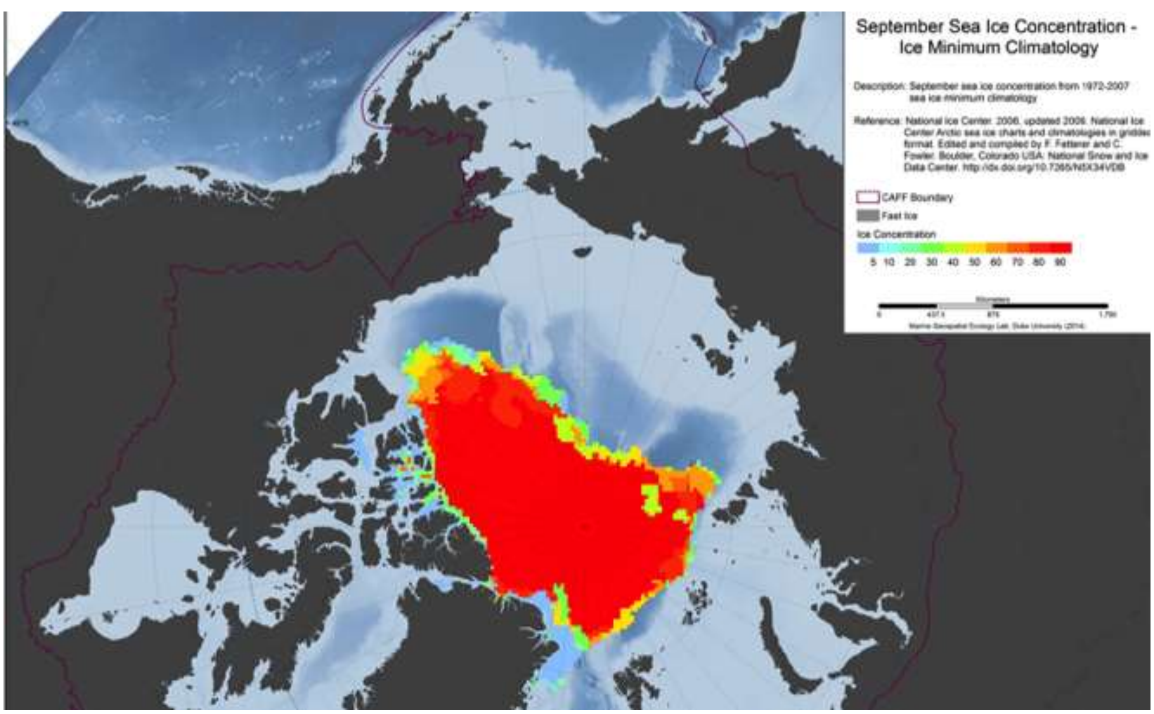



Figure 3. September Sea-Ice Concentration – Minimum (National Snow and Ice Data Center. http://dx.doi.org/10.7265/N5X34VDB).


Figure 4. Post-breeding movements (arrows) of the ivory gull from its breeding areas (pink areas) to its wintering grounds (blue areas; variable during the winter and between years according to the extension of the sea ice), synthesized from published sources and the present study. Despite their large extent, the wintering areas in the Bering and Okhotsk seas (roughly delimited with a broken line after Artyukhin 2006, Mallory et al. 2008) probably only host a small fraction of the world population. The three dotted areas present the post-breeding staging areas. Black arrows present the confirmed dispersal and migration routes. Grey arrows with question marks refer to another possible but yet unconfirmed minor flyway to the Bering Strait. The area of highest summer concentration of nitrogen in the region is also given by the green area between North Greenland and Severnaya Zemlya. Background map presents the average sea ice extents in September (light blue) and March (grey blue) between 1979 and 2007 (data from the National Snow and Ice Data Center, Boulder, Colorado; [http://nsidc.org/](http://nsidc.org/)).

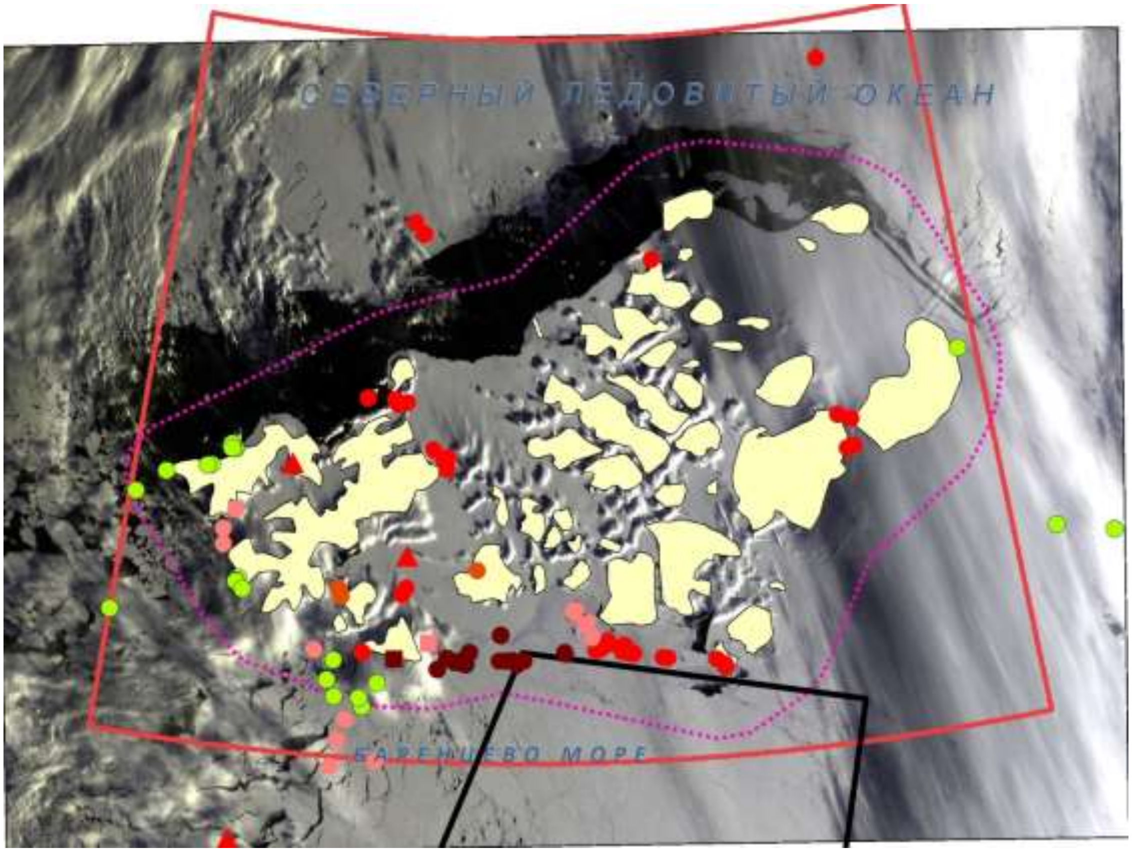


Figure 5. Example of overlap of petroleum licence and specially protected areas (SPAs) (Gavrilo, 2014, unpublished report).

Whale records: spring, Aug - Sep, – Bowhead whale, other shapes – Minke and Finwhale (Gavrilo, unpublished data)

Background – ice conditions in April with polynya located on the western coast, other years / situations – it could be at the south-western corner next to George Land; Red solid – current border of Franz-Josef Land federal refuge (*zakaznik*), Purple dotted line– planned park core area, limited by Russian territorial waters; black is a conflict with a commercial petroleum licence

**Rights and permissions**

Figure showing whale records and conflict area of overlapping petroleum licence and Franz Josef Land SPA is unpublished data; contact person: Maria Gavrilo, m_gavrilo@mail.ru.

**Area no. 8: Ob-Enisei River Mouth Area**

**Abstract**

The Ob and Enisei gulfs form the largest estuarine area in the Arctic. The continental outflow here is the greatest recorded in the Arctic seas. A large amount of fresh, warm river discharge causes an unstable saline regime in the upper layer of the largest part of the Kara Sea. Primary production in the frontal areas is high, which supports large stocks of freshwater and semi-anadromous fishes, aquatic birds and waterfowl. Anadromous and semi-anadromous species perform seasonal migrations through the estuary, while fast ice in the outer part of the river mouth zone serves as an important spawning area for the polar cod. The coastal zone of the area is characterized by exceptionally high biological and landscape diversity (coastal systems of transient habitats from sandy beaches to tundra, or "laidas"). It is the area where most of the biological hotspots are observed.

The area supports a variety of aquatic bird species. Most of them have closer relations to the marine habitats during non-breeding seasons. These include globally threatened species like Steller's eider (*Polysticta stelleri),* velvet scoter (*Melanitta fusca)* and long-tailed duck (*Clangula hyemalis),* which breed in tundra but make extensive use of coastal waters during the non-breeding period. The estuary also provides moulting and feeding habitats for sea ducks, geese and swans, including king eider, long-tailed ducks, scoters, dark-bellied Brent goose and Bewick's swan. The area also serves as an important summer feeding ground for beluga whales, and polar bears occur in the outer part of it.

**Introduction**

The Ob and Einsei river mouth area is a globally unique feature of the Eurasian Arctic that exerts a tremendous impact on the oceanographical regime and ecosystems of the shelf seas. The *AMSA IIc report* (AMAP/CAFF/SDWG, 2013) identified this large estuarine system as an area meeting most of the EBSA criteria.

**Location**

The area includes deltas and estuaries of the great Siberian rivers Ob and Yenisey, along with their outer maritime zones. It corresponds to AMSA IIc areas 6 – 7 (figure 1).

Ob Gulf is the largest estuary in the Russian Arctic, nearly 1000 km long from the Ob Delta to the opening to the south-central Kara Sea in north. Enisei Gulf is the second-largest, after the Ob.

**Feature description of the proposed area**

Ob and Enisei are the largest rivers in Russia, accounting for 75% of the freshwater inflow to the Kara Sea. One of the specific features of the Kara Sea is a strong continental outflow, which is the greatest recorded in the Arctic seas. The annual river run-off to the sea averages 1.350 $km^3$, which is 2.8 times higher than in the Barents Sea and constitutes almost half of the total river water discharge into the Russian Arctic seas.

Receiving a great amount of fresh and warm river discharge, the Kara Sea is characterized by an unstable saline regime in the upper layer. Surface water outside the Ob and Enisei river estuarine zones has a salinity of 7–10‰ and a temperature of 5-8° C. Below the heated and desalinated surface layer, a drop in temperature and an increase in salinity are recorded in the entire Kara Sea. The influence of the desalinated surface layer can be followed fora distance of hundreds kilometres from the river mouths. River plume fronts are present at the interface between the outflow of the Ob and Enisei rivers and the adjacent Kara Sea waters, however, they are subject to great seasonal and inter-annual variability.

The coastal zone of the area is a good example of the *land – sea* ecotone and is characterized by exceptionally high biological and landscape diversity (coastal systems of transient habitats from sandy beaches to tundra, or so-called *laidas*, are characteristic). It is the area where most of the biological hotspots are observed, and it is the area where sea oil spills may penetrate far inland due to well-developed water channel networks connected to the sea.

A specific aquatic ecosystem exists in the brackish water zone developing under the influence of river runoff. The principal ecological factors affecting species composition, distribution patterns and functioning of marine and coastal biota of the area are the following:

- Harsh climate conditions.
- Seasonal ice cover (from October/November to June/July on average) with wide distribution of land-fast ice.
- Shallow waters.
- Soft bottom and coastal sediments, low coasts.
- Strong impact of river runoff (including dominance of katabatic currents, desalination of seawater, complicated inter-annual, seasonal and diurnal dynamics of salinity, warming effect, huge sediment runoff).
- Specific oxygen rate regime and winterkill phenomenon in the Ob River and Ob Gulf.

Estuarine ecosystems differ considerably from both marine and fresh water ecosystems by species composition and food web structure; biological productivity of estuarine ecosystems is often high. Euryhaline species, which are adapted to wide fluctuation in salinity play important roles in the estuarine ecosystems, however the overall biodiversity is low compared to open-sea areas.

*Hydrobiology*

The pelagic ecosystem is strongly governed by oceanographical fronts. The estuarine front is located in the mouth of the gulf and extends to a distance of about 100 km. This front separates nutrient-rich waters discharged by the Ob, which fuel a high level of activity of brackish water phytoplankton, the productivity of which is not affected much by the turbidity and low transparency of the waters (figure 2). The maximum productivity of the brackish water phytoplankton in the frontal zone is reached in summer time (figure 2) when turnover of nutrients coming from dying off phytoplankton cells is particularly high, while the production of freshwater phytoplankton is limited by pre-vegetational nutrient reserves (Lapin, 2012). At the inshore periphery of the estuarine front, enhanced biomass of estuarine zooplankton (dominated by copepods: *Senecella sibirica*, *Jaschnovia tolli*, *Limnocalanus grimaldii*, *Drepanopus bungei* and mysids – *Mysis oculata)* (Vinogradov et al. 1994) is several times higher than in the adjacent waters (P.P. Shirshov Institute of Oceanology RAS unpublished data). Plankton abundance rapidly decreases both downstream and upstream. Quantitative distribution patterns of the plankton in the Ob Bay as a whole prove its enhanced biological productivity, which is, for example, considerably higher than the productivity observed in the Enisei Gulf.

Freshwater and brackish water zooplankton die and sink to the bottom as soon as they occur in the saline zone, thus increasing the flux of organic matter to the benthic communities. In summary, the food web of the area functions primarily by detritus but not by pastoral succession type. *Calanus* spp. dominates plant-eating marine zooplankton while carnivorous zooplankton consists principally of Coelenterata and Chaetognatha (Kulakov et al., 2004).

The benthic biodiversity of the Ob River decreases as the river meets the bay (Kuzikova 1988a,b, Kuzikova et al. 1989); however, within the Ob Gulf, benthic diversity and biomasses increase northwards following the increase in water salinity, in the following manner: in the inner segment of the Bay, the number of benthic species in a sample does not exceed 20, being as low as 3 to 4 in some samples, while maximal values – over 70 species in a benthic sample – are observed in the seaside segment of the Gulf.

The total biomass and density of zoobenthos are exceptionally low in the freshwater portion of Ob Bay, being 2.5 g/m$^2$ and 1500 ind./m$^2$ respectively. In waters with salinity 6–10‰ these parameters vary within the limits of 7.4–12.4 and 700–1200 respectively. The benthic biomass reaches 100 g/m$^2$, and abundance ca. 300 ind./m$^2$ in the mouth segment of the Ob Gulf with dominance of bivalves and polychaets, the proportion of which exceeds 50% of the total biomass (Denisenko et al., 1999). There are remarkable gradients of alpha and beta diversity increasing from the brackish water zone towards offshore areas north of Yamal Peninsula; the distribution of benthic communities appears to follow the estuarine front climatology (Kozlovsky, 2012).

*Fishes*

The estuarine ichthyofauna numbers approximately 40 fish and fish-like (Siberian lamprey *Lethenteron kessleri*) species of 13 families. By their present status the fish populations of the Ob estuary can be divided into two major groups: permanent inhabitants and migrants. Non-migrating species (cyprinids, pike, and ruffe**)**, immature and adult cohorts of sturgeon and semi-anadromous coregonids, which use the area for fattening, comprise the first group. The migrant group consists of anadromous and semi-anadromous species (Acipenseridae, Salmonidae, Coregonidae, and Osmeridae) performing seasonal (wintering, spawning, fattening) migrations through the estuary. Fast ice in the outer part of river mouth zone is an important spawning area for the polar cod.

Largest stocks of different coregonid white fish species as well as threatened Ob stock of Siberian sturgeon have feeding and wintering grounds in this area, or pass it during anadromous migration to their spawning grounds in the rivers.

The oxygen content of the Ob River and Gulf also varies seasonally, with attendant impacts on winterkills. Formation of winterkill zones strongly affects distribution of wintering ground of fishes, including valuable species of Coregonids and Sturgeon. This natural feature accounts for sensitivity of the area to additional human pollution and disturbances to hydrological and sedimentation regimes.

*Birds*

The area supports a variety of aquatic bird species. Most of the regional waterbirds have closer relations to the marine habitats during non-breeding seasons. Gulls, terns, skuas and divers nesting on coastal tundra forage in marine areas.

The following are typical breeding species in marine coastal habitats on mainland and inshore islands: West-Siberian gull *Larus hueglini* and Glaucous gull *Larus hyperboreus*, Arctic terns *Sterna paradisaea*. The following water birds are the most common and in some places are abundant breeders on coastal tundra: divers *Gavia* spp., swans *Cygnus* spp., bean goose *Anser fabalis*, greater white-fronted goose *A.albifrons*, Brent goose *Branta bernicla bernicla*, sea ducks including king eider *Somateria spectabilis*; greater scaup *Aythya marila*, and common scoter *M. nigra*, Skuas *Stercorarius* spp., as well as diverse waders. Among globally threatened species, the Steller's eider *Polysticta stelleri*, velvet scoter *Melanitta fusca* and long-tailed duck *Clangula hyemalis* breed on tundra but make extensive use of coastal waters during the non-breeding period. The Ob Delta is recognized as an important ground for moulting and autumn-staging dabbling and diving ducks, geese and waders. The estuary also provides moulting and feeding habitats for sea ducks, geese and swans, including king eider, long-tailed ducks, scoters, dark-bellied Brent goose and Bewick's swan (figures 3 and 4).

*Mammals*

Among pinnipeds, ringed seal is the most abundant in the Kara Sea, and bearded seal is common as well. They occur almost everywhere in the Kara Sea during the ice-covered period. Vast land-fast ice formation in the south-western Kara Sea provides a favourable environment for ringed seal reproduction, whose principal breeding grounds adjust to the Yamal-Gydan coasts, including Ob Gulf and further east to the Enisei Gulf.

The beluga whale (IUCN VU) is a characteristic and seasonally abundant cetacean in the area, and is considered to be possibly separated stock. Belugas make intensive use of the area, where they prey on polar cod and coregonids. Principal late summer feeding grounds of belugas are located along the mainland coasts of the Kara Sea, including Ob Gulf and Enisei Gulf.

**Feature condition and future outlook of the proposed area**

The study area is considered the most developed coastal region of the Russian Arctic. Rich natural resources, both biological and mineral, of the Yamal Peninsula and adjacent shelf have been extensively explored for decades. The major human activities in the region are as follows: extraction and transportation of hydrocarbons, shipping and fisheries. The cumulative effect of local activities and long-range transportation of pollutants gathered on the vast drainage basin of the Ob River have resulted in remarkable changes in some biological components and their environment. Thus, major negative factors related to previous and modern human activities in the study area and affecting local biological systems are pollution and unsustainable exploitation of biological resources (primarily unsustainable fishing). Industrial exploration and development of petroleum activity in the study region peaked from 1976 to 1981. Since that time, hydrocarbon extraction has been spreading along the different coastal segments, followed by transport infrastructure. In particular, it is the westernmost segment of the Northern Sea Route including Ob Gulf and south-western Kara Sea that was first opened for year-round navigation in the 1970s. Extensive disturbance of ice cover in coastal areas, especially in fast ice zone, apparently impacted seal-breeding grounds in the region (Wiig et al. 1996).

In Ob Gulf, in spite of the outflow of pollutants from its watershed, the water quality is evaluated as being slightly or moderate polluted according to its ecology-sanitary and hydrobiological parameters (Semenova et al. 1997, 2000). According to the analyses carried out in 1994–1996, the bottom sediments of Ob and Taz Gulfs are slightly polluted with oil products and polluted with heavy metals. In the Ob River mouth, Ob and Taz Gulfs, the threshold limit values (TLV) of heavy metals, phenols, pesticides, and detergents, established for fishery waters, are exceeded(Semenova et al. 1997, 2000).

Despite the presence of heavily polluted local areas, the ecosystems of the Ob Gulf as a whole are able to resist the current anthropogenic load. Diverse aquatic biota, relatively low average values of saprobity and stable structure of plankton and zoobenthos communities prove this evaluation. No reliable changes in species composition, relative abundance and share of major ecological groups of zoobenthos were found while comparing with corresponding parameters observed from 1930 to the 1950s. Thus, the general status of the entire ecosystem is considered satisfactory. According to their hydrobiological parameters the waters of Ob Gulf are evaluated as being clean or moderately polluted (Leshchinskaya 1962, Kuzikova et al. 1989, Kuzikova 1995, Semenova et al. 2000). The ecological status of the Ob Gulf itself is more satisfactory than that of the lower and especially middle reaches of the river.

The Ob Gulf, along with its tributaries, is home to the most important fishery both in the Yamalo-Nenetsk Autonomous Region (YaNAO) and in the entire Russian Arctic. Fish resource status is one of the region's key ecological indicators. At present, fish resources and catches have considerably decreased due to bad environmental conditions as well as to changes in fishery management. Extensive pollution of the Ob-Irtysh River basin resulted in remarkable degradation of breeding and feeding habitats of fishes and corresponding catch reduction of most fish species (Andrienko et al. 1997). For example, the decline of Siberian sturgeon resources has been observed since the late 1980s. This decline is a combined result of unsustainable fishery, hydroplant construction, water pollution from human activities, destruction of spawning grounds by hydroplants, gravel extraction, wood rafting, and others. Multiple pathologies, including female sterility, were observed in this species. Recently, Siberian Sturgeon populations have been heavily affected by illegal fishing. The status of coregonid fish populations is more sustainable. Resources of most whitefishes and ciscoes are stable but undergo periodic fluctuations.

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness** | Area contains either (i) unique ("the only one | | | | X |

| | | | | | |
|---|---|---|---|---|---|
| **or rarity** | of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | | |
| *Explanation for ranking*<br>The area is the biggest estuary system in the Arctic, affecting the entire adjacent marine ecosystem of the Kara Sea. The huge river run-off has a great impact on the Arctic Ocean, influencing hydrology, ice regime and geochemistry. Some populations of semi-anadromous fish are particular to this area, i.e., Ob Sturgeon, but there are no endemic species of fish, seabirds or marine mammals. | | | | | |
| **Special importance for life-history stages of species** | Areas that are required for a population to survive and thrive. | | | | X |
| *Explanation for ranking*<br>Estuaries are important staging areas for aquatic birds, important habitat for white fishes (feeding, migrating, wintering); the maritime zone, with fast-ice, is an important spawning area for polar cod, while the fast ice in the gulfs is a breeding ground for ringed seals. | | | | | |
| **Importance for threatened, endangered or declining species and/or habitats** | Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species. | | | X | |
| *Explanation for ranking*<br>Important summer feeding grounds for beluga whales (IUCN near threatened), important staging areas for long-tailed duck (IUCN, VU) and velvet scoters (IUCN, EN); Steller’s eiders (IUCN VU) make use of the area, and polar bears (UICN VU) occur in the outer part of the area. | | | | | |
| **Vulnerability, fragility, sensitivity, or slow recovery** | Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery. | | | X | |
| *Explanation for ranking*<br>The dynamic hydrological regime acts as a buffer for many external impacts; animals such sea ducks and white fishes have long life expectancy and low reproductive rates, thus slow recovery rate; sea ducks and polar cod fry are particularly vulnerable to oil spills, while the estuarine ecosystem in general may be vulnerable to changes in the salinity regime caused by large-scale bar dredging for port construction (Lapin, 2012). | | | | | |
| **Biological productivity** | Area containing species, populations or communities with comparatively higher natural biological productivity. | | | | X |
| *Explanation for ranking*<br>Owing to high primary production at the frontal zones (Lapin, 2012) ~~areas~~ the area supports large stocks of freshwater and semi-anadromous fishes, aquatic birds and waterfowl. | | | | | |
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or | | X | | |

| | | | | | |
|---|---|---|---|---|---|
| | species, or has higher genetic diversity. | | | | |
| *Explanation for ranking*<br>Biodiversity of the lower trophic levels is relatively low due to a variable hydrological regime and vast zone of brackish waters; however, there are remarkable gradients towards offshore areas (Kozlovsky, 2012) while waterfowl and shorebirds are relatively diverse. | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | X | |
| *Explanation for ranking*<br>The Enisei river estuary is rather pristine while Ob Gulf is already experiencing shipping traffic, geological explorations and onshore infrastructure construction in several points.<br>Rivers bring considerable amounts of pollutants (on the Arctic scale) from their vast watersheds. | | | | | |

**References**

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp.

Andrienko E.K. *Current status of resources and fishery of the Least Cisco in the Ob and Taz Gulfs basins*. Resources of wildlife of Siberia. Fishes // Collection of scientific papers. Novosibirsk: Nauka, Siberian Department, 1990. – Pp. 39–41.

Andriyashev A.P., Chernova N.V. Annotated list of fish-like and fishes of the Arctic Seas and adjacent waters // *Voprosy ihtiologii.* 1994. Vol. 34, Iss. 4. Pp. 435–456.

Antonov S.G., Chernova N.V. Ichthyofauna composition // Matishov et al. (Eds.) Ecology and biological resources of the Kara Sea. Apatity, 1989. – Pp. 95–99.

Brusynina I.N., Krokhalevsky E.K. Current status of the ecosystem of Ob River and its tributaries under conditions of anthropogenic impact // Collection of the scientific proceedings of GosNIORKH. - 1989. - Iss. 305. - Pp. 3–22.

Bryzgalo V.A., Ivanov V.V. *Ecological effects of anthropogenic impacts upon mouth zones of the rivers of basins of the Russian Arctic seas.* // Ecological chemistry. – 1999. – Kudersky L.A. Fish resources of the great Siberian rivers and exploration of the Arctic natural resources. Biological resources of the Russian Arctic. Materials to the symposium. Moscow: 2000.

Bustnes J.O., Mosbech M., Sonne C.,· Systad, G.H. 2010. Migration patterns, breeding and moulting locations of king eiders wintering in north-eastern Norway. *Polar Biol* (2010) 33:1379–1385

Decker M.-B., Gavrilo M., Mehlum F., Bakken V. 1998. Distribution and abundance of birds and marine mammals in the Eastern Barents Sea and the Kara Sea, late summer 1995. – *Meddeleser* No 155, Oslo, 83 pp.

Denisenko, S., Sandler, H., Denisenko, N., and Rachor, E. 1999. Current state of zoobenthos in two estuarine bays of the Barents and Kara Seas. – *ICES Journal of Marine Research,* 56 Supplement: 187–193.

Khlebovich V.V. *Critical salinity of biological processes*. - Leningrad: Nauka, 1974. - 235 pp.

Kozlovsky V.V. 2012. Macrozoobenthos of the upper shelf of the southwestern Kara Sea. Moscow: P.P. Shirshov Institute of Oceanology, 25 p. (in Russian).

Kulakov M.Yu., Pogrebov V.B., Timofeyev S.F., Chernova N.V., Kiyko O.A. *Ecosystem of the Barents and Kara Seas coastal segment // The Global Coastal Ocean*. Interdisciplinary Regional Studies and Syntheses / Edited by A.R. Robinson and K.H. Brink. The Sea: Ideas and Observations on Progress in the Study of the Seas. Vol. 14. Harvard University Press. Cambridge, MA, 2004. P. 1135-1172.

Lapin S.A. 2012. Spatio-temporal variability of the hudrological and hydrochemical characteristics of the Ob Gulf as the basis of its bio-productivity. Ph.D. Thesis. Moscow: Moscow State University, Faculty of Geography, 25 p. (in Russian).

Matishov G.G., Shparkovsky S.L. et al. (Eds.) 1989 Ecology and bioresourses of the Kara Sea. Apatity Kola Sci. Center of the RAS, 189 pp. (In Russian)

Pavlov, V. K., L.A. Timokhov, G. A. Baskakov, M.Yu. Kulakov, V.K. Kurazhov, P.V.Pavlov, S.V. Pivovarov and V.V. Stanovoy. 1996. Hydrometeorological regime of the Kara, Laptev and East-Siberian seas. Technical Memorandum APL-UW TM 1-96. Seattle, Applied Physics Laboratory, University of Washington. 1996. 183 pp.

Petersen M.R., Bustnes J.O., Systad GH. 2006. Breeding and moulting locations and migration patterns of the Atlantic population of Steller's eiders *Polysticta stelleri* as determined from satellite telemetry. Journal of Avian Biology 37: 58-68.

Ruban G.P. Population status of sturgeons of Siberian water bodies and perspectives of their commercial exploitation // Biological resources of the coastal zone of the Russian Arctic. Symposium materials. – Moscow: VNIRO, 2000. – pp. 123–129.

Ruban, G. & Bin Zhu 2010. *Acipenser baerii*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on 7 March 2014.

**Maps and Figures**

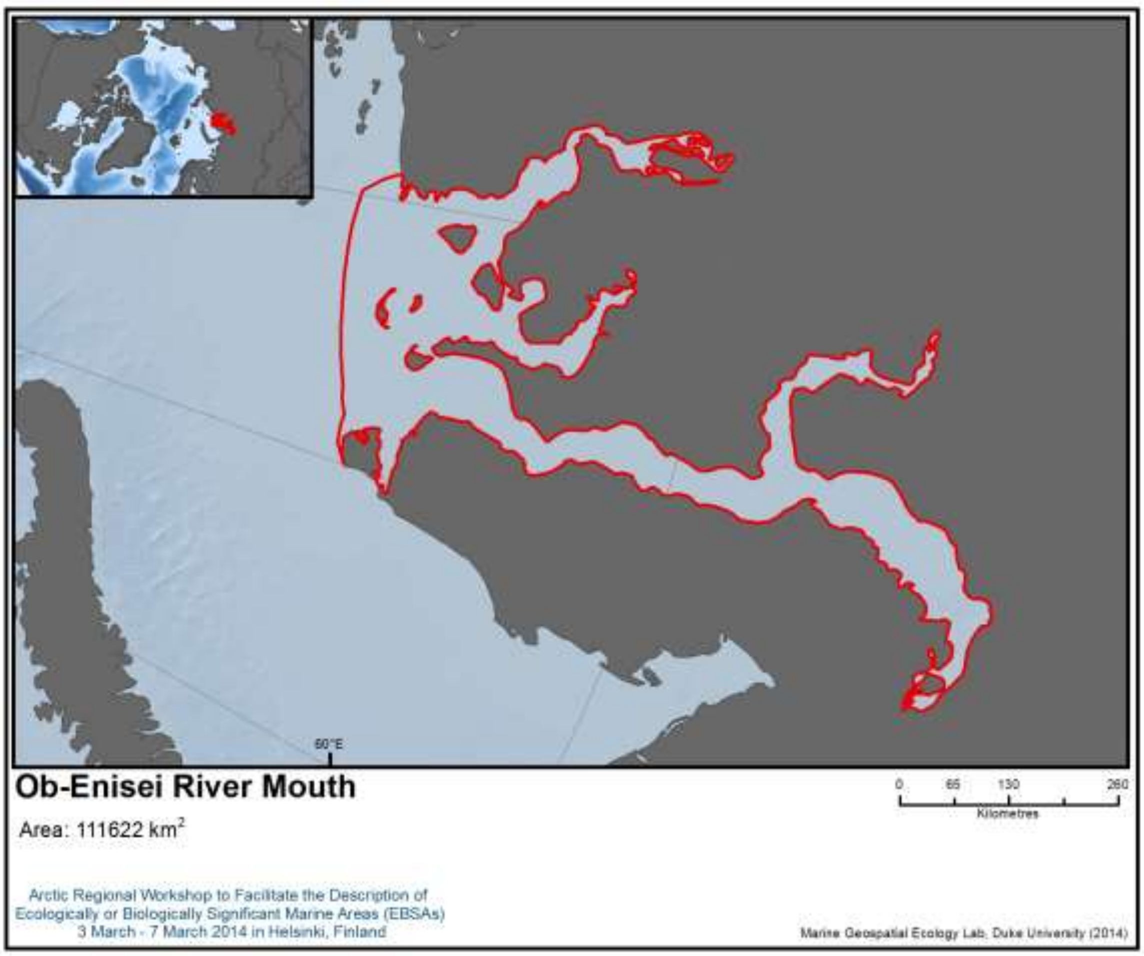



Figure 1. Area meeting EBSA criteria.

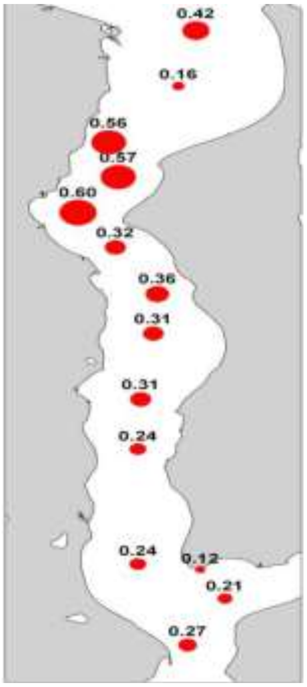



Figure 2. Distribution of primary production in Ob Gulf in summer, g C $m^{-2}$ $day^{-3}$ (Lapin, 2012).

**Fig. 1** Spring migration, including staging and potential breeding areas of 6 king eiders (females = triangles and males = pentagons) from mid April to mid July 2008. Encircled positions indicate potential breeding locations. The birds were caught in Båtsfjord, north-eastern Norway in February 2008


Figure 3. From Bustnes et al., 2010.

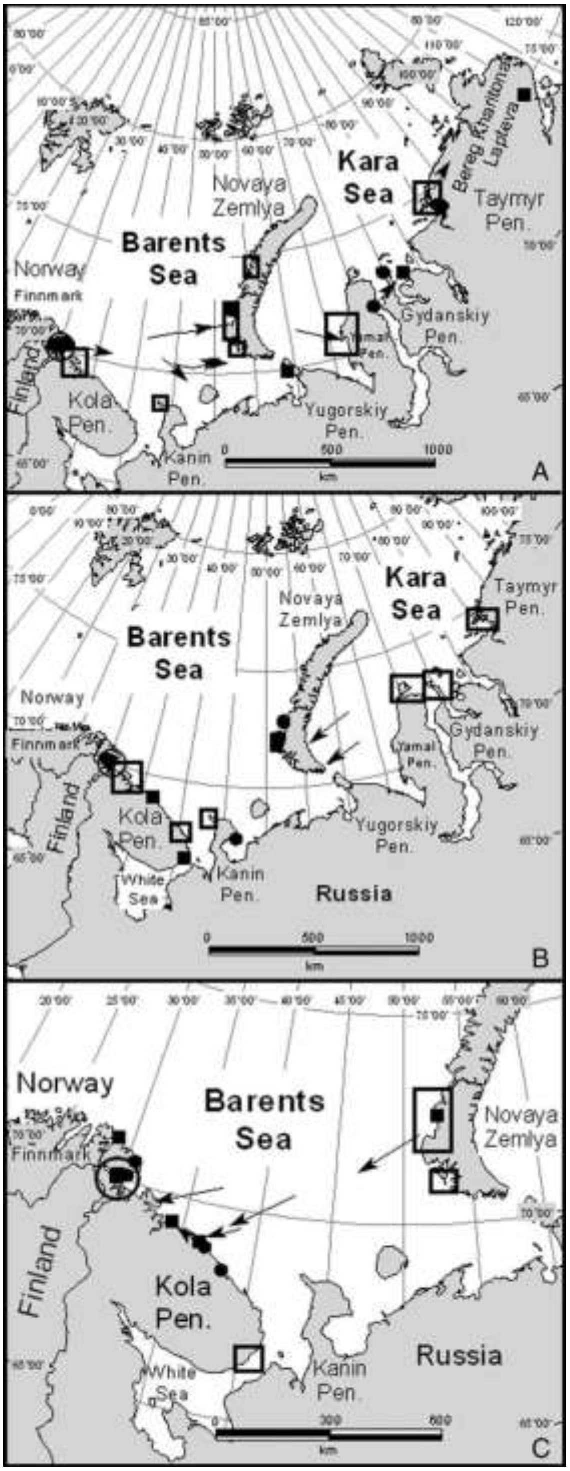



Figure 4. Areas used by Steller's eiders May 2001-February 2002. From Petersen et al., 2006.

A - spring migration paths, staging areas, and possible nesting locations; B - moult migration paths, staging areas, and moult locations; and C - autumn migration paths, staging areas, and last locations in winter. Clear circle: location; arrow: migration paths; rectangle: staging areas; black circle: females; and black square: males. Each migration path represents the distance and general direction of the movement of an individual during a single transmitting period.

## Area No. 9: Great Siberian Polynya

### Abstract

The system of polynyas in the Laptev Sea and specific conditions of the waters of New Siberian Islands form an ecologically and biologically significant area with a high degree of naturalness, with limited shipping as the only human activity. Its most remarkable feature is the Laptev walrus. It was previously considered an endemic subspecies (*Odobenus rosmarus laptevi)*, but the latest molecular genetic studies have failed to prove its isolation from the Pacific subspecies (*O. rosmarus divergens*) (Lindquist et al., 2008). However, the Laptev walrus is indeed a peculiar population differing from the neighbouring Pacific populations by the absence of long seasonal migrations and the location of wintering grounds.

This area plays an important role in the recruitment of polar cod (*Boreogadus saida)*, which is a key food item for most of the top predators in the High Arctic ecosystem. Laptev polynyas support a chain of colonies dominated by thick-billed murre (*Uria lomvia*) and black-legged kittiwake (*Rissa tridactyla*). These polynyas are used by birds, in particular, Steller's eider, during the spring migration period (Solovieva, 1999; Gavrilo et al., 2011). The Laptev polynya network also sustains stable, high populations of seals, which in turn draw its main predator: the polar bear (Gavrilo et al., 2011).

### Introduction

Polynyas in the Russian Arctic have been recognized as extremely important for ecosystem processes and maintaining biodiversity (Spiridonov et al., 2011). The report on identifying Arctic marine areas of heightened ecological significance (AMSA IIc) identified the "Great Siberian Polynya" as an area that corresponds to most of the EBSA criteria (AMAP/CAFF/SDWG, 2013, fig. 7). The IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment also highlighted the importance of this area (Speer and Laughlin, 2011).

### Location

This area covers EBSA 13 in the Laptev Sea as mapped in section C of the IUCN/NRDC Workshop Report (Speers and Laughlin, 2011) and in figure 7 in the AMSA IIc report (AMAP/CAFF/SDWG, 2013). The area corresponds to the maximum extent of the polynyas developing in the middle shelf of the Laptev Sea between East Taymyr and the area north of New Siberian Islands (on the boundary with the East Siberian Sea). This area is located entirely within the jurisdiction of the Russian Federation (figure1).

### Feature description of the proposed area

The area occupies the central part of the Laptev Sea shelf. Near the Asian shore of the Laptev Sea, depth varies between 10 m and 40 m. Seabed topography of the Laptev Sea shelf is relatively smooth in contrast with western Arctic seas. It gently slopes to the north of the accumulative-denudation plain, which is disrupted by three trenches of approximately 40 m depth. On the shelf muddy sediments dominate that are substituted by sand around the River Lena delta (Nikiforov, 2006). Sediments largely determine the distribution of benthic communities and thus together with seabed topography can be regarded as an important driver that shapes composition and biomass of benthos (Pogrebov et al., 2002; Petryashov et al., 2004), which in turn are critical factors affecting walruses and semi-anadromous fish populations.

The Laptev Sea is covered with ice for nearly nine months of the year, from October to June. Owing to the system of flaw polynyas the Laptev Sea plays a major role in production of drifting ice in the Arctic Ocean (Popov and Gavrilo, 2011). One of the remarkable features of the Laptev Sea shelf region is a constant, to a varying degree, stratification of the water column regardless of its shallow depth. In summer a warm intermediate layer is formed and can persist until the beginning of next summer. It can be observed under the colder and fresher water layer from the River Lena discharge. Around polynyas, this intermediate layer is degraded and substituted by a different structure due to cooling and salinization during constant ice formation (Bauch et al., 2009).

Polynyas are very dynamic (figure 2) but develop in particular areas with high regularity. At present, six flaw polynyas have been identified in the Laptev Sea (Zakharov, 1996; Popov and Gavrilo, 2011; Gavrilo et al., 2011). Mean monthly occurrence frequency of the Laptev polynyas is high over the entire cold period (57 to 100%). As a result, all these polynyas are classed as either recurring or stable depending on the month. In November the frequency of occurrence is generally lower than in other months, and all polynyas are considered stable. The Great Siberian Polynya developing in the south and east of the Laptev Sea occurs most frequently (not less than 65-70%). The Anabar-Lenskaya and the Western Novosibirskaya polynyas are least stable in early winter, while in February their frequency of occurrence reaches its maximum (96-100%). The western Novosibirskaya polynyas have a second maximum of occurrence in April. The appearance of the northern Novosibirkskaya polynyas is at its minimum in January and at its maximum in April-May (96%).

Phytoplankton distribution values calculated by Vetrov et al. (2008) have shown significant seasonal fluctuations. In April-May there is an increase in primary productivity (up to 200-300 mg C day$^{-1}$), which can be observed in areas where flowing polynyas can be found (Anabar-Lenskaya and Novosibirskaya polynyas) (figure 3).

**Feature condition and future outlook of the proposed area**

The Laptev Sea is affected by a general trend towards decreasing of summer sea ice and average thickness of ice (Frolov et al., 2009; Gavrilo and Spiridonov, 2011; http://www.nasa.gov/content/goddard/arctic-sea-ice-minimum-in-2013-is-sixth-lowest-on-record/#.Uvf3p4U1W5U), and increasing intrusion of the Atlantic water that even penetrates to the 20 m depth contour (Dmitrenko et al., 2010). However for developing scenarios of environmental changes in teh region winter processes appear to be not less important. Flaw polynyas of the Laptev Sea and their spatial-temporal inter-annual variability are a product of the interaction of processes associated with three atmospheric centres: the Icelandic Minimum, the Arctic and the Siberian Maxima. Deepening of the Icelandic Minimum intensifies the Atlantic cyclones, which receive their energy from the Kara Sea polynyas, to cross the Taymyr Peninsula and form a wind system which facilitates the development of polynyas in the western Laptev Sea (Popov, Gavrilo, 2011; Gavrilo et al., 2011). Strengthening of the Arctic Maximum leads to the development of polynyas in the eastern Laptev Sea.

Comparison of the characteristics of the Laptev Sea polynyas during the period 1936–1970 with the modern day indicates that the frequency of occurrence and the numbers of recurring polynyas in the last two decades have increased. In particular, the episodic (30–40%) Eastern Severozemelskaya (in May) and the Eastern Taymyrskaya polynyas (in April and May) have now become stable (Gavrilo et al., 2011).

Trends in productivity changes throughout 2003–2007 were considered in the Kara, Laptev, and East Siberian seas using satellite and field data. According to the MODIS data, slight positive trends of average and total phytoplankton production were revealed in the Laptev Sea, i.e. 4.1 and 2.5% respectively in relations to the average values over the observation period. On the other hand total ice algae production has shown a slight decrease, and thus the resulting overall production remains almost unchanged (Vetrov and Romankevich, 2009; 2011).

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness or rarity** | Area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) | | | | X |

<table>
<tr><td></td><td>unique or unusual geomorphological or oceanographic features.</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>The Great Siberian Polynya is the most persistent and largest polynya system in the Eurasian Arctic and is comparable to North Water Polynya. Walruses that winter in the polynyas from East Taymyr to the north of the New Siberian Islands have been long time considered as an endemic subspecies Odobenus rosmarus laptevi. The latest molecular genetic studies have failed to prove its isolation from the Pacific subspecies (O. rosmarus divergens) (Lindquist et al., 2008). However, the Laptev walrus is indeed a peculiar population differing from the neighbouring Pacific populations by the absence of long seasonal migrations and the location of wintering grounds.</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>Polynyas play a particularly important role in the recruitment of polar cod, Boreogadus saida, which is a key food item for most of the top predators in the high Arctic ecosystems. If polynyas open up early, polar cod could start spawning as early as January. Open water provides the first-feeding larvae with the minimum light necessary to detect and capture plankton prey and thereby obtain better nutrition. Thus they grow to larger pre-winter sizes and provide protection against predators. On the whole, years with well-developed polynyas tend to be characterized by the highest levels of polar cod recruitment (Bouchard and Fortier, 2008). Laptev polynyas support a chain of colonies dominated by Thick-billed murre (Uria lomvia) and Black-legged kittiwake (Rissa tridactyla) that stretches from Preobrazheniya Island in Khatanga Gulf across Stolbovoy and Belkovsky islands through to De Long islands in the Novosibirsk archipelago. All polynyas are used by birds during the spring migration period (Solovieva, 1999; Gavrilo et al., 2011). The Laptev polynyas network also sustains stable, high populations of seals which in turn draw in its main predator: polar bear (Gavrilo et al., 2011).</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>Laptev Sea polynyas support the regional non-migrating population of walruses which are listed in the Russian Red Book and the IUCN Red List (Chapsky, 1941, Belikov et al., 1998; Gavrilo et al., 2011). Polynyas are also migration areas for Steller’s eider.</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>Sea ice habitats and communities are extremely vulnerable to climate changes. Polynyas as corridors that are shared by both wildlife and vessels susceptible to all threats associated with intensive ship traffic, including noise pollution, and, of course catastrophic oil spills which consequences can hardly be underestimated.</td></tr>
<tr><td>Biological</td><td>Area containing species, populations or</td><td></td><td></td><td></td><td>X</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| **productivity** | communities with comparatively higher natural biological productivity. | | | | |
| *Explanation for ranking*<br>In ice-covered seas, polynyas are often regarded as oases. Early, for the Arctic, and lasting through the growing season in the Laptev Sea, polynyas support high productivity, substantial zooplankton growth and population stability at high trophic levels (Gavrilo et al., 2011). Due to strong vertical circulation and organic matter inflow into the near bottom water layers and sediments, benthic communities in polynya regions also have high productivity and species richness (Gukov, 1999; Petryashov et al., 2004; Schmid et al., 2006). | | | | | |
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | | | X | |
| *Explanation for ranking*<br>With regard to the number of species in marine fauna and sea ice flora, the Laptev Sea holds an intermediate position among the Arctic seas of Eurasia. The species richness is lower than in the Barents and Chukchi seas because the latter two are open either to the Atlantic or to the Pacific species inflow. On the other hand, it is higher than in the Kara and East Siberian Seas (Sirenko, 2001; Petryashov et al., 2004; Ilyash and Zhitina, 2009; Spiridonov et al., 2011). Similar trends can be observed in marine vertebrate species (fish, shore-nesting seabirds and marine mammals) richness from the Barents Sea towards the seas of the Siberian shelf. At Kara Sea, it is half what it was in the Barents Sea; it remains more or less similar in the Laptev Sea (54 species of fish, 13 species of obligate- and facultative colonial seabirds and 8 mammals). Most of these fish species and nearly all seabirds and marine mammals are associated with the polynya system. | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | | X |
| *Explanation for ranking*<br>The area holds high degree of naturalness, with limited shipping as the only human activity. | | | | | |

## References

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp.

Bauch D., Dmitrenko I., Kirillov S., Wegner S., Hölemann J., Pivovarov S., Timokhov L., Kassens H. 2009. Eurasian Arctic shelf hydrography: exchange and residence time of southern Laptev Sea waters. Continental Shelf Research, 29: 1815-1820.

Belikov S., Boltunov A., Belikova T., Belevich T., Gorbunov Yu. 1998. Marine mammals //The distribution of marine mammals in the Northern Sea Route area // INSROP Working Paper No 118-1998. Oslo: The Fridtjof Nansen Institute. – 49 p.

Belikov S.E., Boltunov A.N., Gorbunov Yu.A. 2002. Seasonal distribution and migration of cetaceans in the Russian Arctic according to the results of multiyear observations of the sea ice recoinassance and drifting stations “Severnyi Polyus”. A.A. Aristov, V.M. Belkovich & V.A. Zemsky et al. (eds) Marine Mammals (Results of research in 1995-1998). Moscow, Marine Mammals Council, pp. 21-50 (in Russian).

Bouchard C., Fourtier 2008. Effects of polynyas on the hatching season, early growth and survival of polar cod *Boreogadus saida* in the Laptev Sea. Marine Ecology Progress Series, 355: 247–256.

Chapsky K. 1941. Marine mammals of the Russian Arctic. Leningrad, Glavsevmorput’ Pulishing House, 187 p. (in Russian).

Dmitrenko I.A., Kirillov S.A., Tremblay L.B., Bauch D., Hölemann J.A., Krumpen T., Kassens H., Wegner C., Heinemann G., Schröder D. 2010. Impact of the Arctic Ocean Atlantic water layer on

Siberian shelf hydrography. Journal of Geophysical Research, 115, C08010, 17 PP., doi:10.1029/2009JC006020/.

Frolov S.V., Fedyakov V.Ye., Tretiakov V.Yu, Klein A.E., Alekseev G.V. 2009. New data on changes in ice thickness in the Arctic Basin // Doklady RAN, 425 (1): 104–108. (In Russian).

Gavrilo MV, Popov AV, Spiridonov VA (2011) Sea ice biotopes and biodiversity hotspots in the Laptev Sea. In: V. Spiridonov, M. Gavrilo, N. Nikolaeva, E. Krasnova (eds) Atlas of the Marine and Coastal Biodiversity of the Russian Arctic. Moscow, WWF Russia Publication, pp. 36-37.

Gavrilo M.V., Spiridonov V.A. Sea ice habitats and associated ecosystem. In: V. Spiridonov, M. Gavrilo, N. Nikolaeva, E. Krasnova (eds) Atlas of the Marine and Coastal Biodiversity of the Russian Arctic. Moscow, WWF Russia Publication, pp. 25-26.

Gilg O., Strøm H., Aebischer A., Gavrilo M.V., Volkov A.E., Miljeteig C., Sabard S. 2010. Post-breeding movements of northeast Atlantic ivory gull *Pagophila eburnea* populations. Journal of Avian Biology, 41:1–11.

Gukov A.Yu. 1999. Ecosystem of the Siberian polynya. Moscow, Nauchnyi Mir, 344 p. (in Russian).

Ilyash L.V., Zhitina L.S. 2009. Comparative analysis of the species composition of sea ice diatoms in the Russian Arctic. Zhurnal Obschei Biologii, 70(2): 143-154 (in Russian).

Kosobokova K. N., Hanssen N, Hirche H. J.1998. Composition and distribution of zooplankton in the Laptev Sea and adjacent Nansen Basin in the summer 1993. Polar Biology,19: 63-76.

Lindqvist C., Bachmann L., Andersen L. W., Born E. W., Arnason U., Kovacs K. M., Lydersen C., Abramov A. V., Wiig Ш. 2008. The Laptev Sea walrus *Odobenus rosmarus laptevi*: an enigma revisited. Zoologica Scripta, 38: 113–127.

Mironov A.N., Dilman A.B. 2010. Influence of the East Siberian Barrier on the dispersal of echinoderms in the Arctic Ocean. Okenologiya, 50 (3): 371-386 (in Russian).

Nikiforov S.L. 2006. Bottom relief of the Russian Arctic Seas Shelf. Dr. of Science Dissertation Thesis, Moscow, Institute of Oceanology of Russian Academy of Sciences, 34 p.

Petryashov V.V., Golikov A.A., Schmid M., Rachor E. 2004. Macrobenthos of the Laptev Sea shelf. Explorations of the Fauna of the Seas, vol. 54(2). St. Petersburg, Zoological Institute of the Russian Academy of Sciences, pp. 9-26 (in Russian).

Pogrebov V.B., Panteleimonov T.V., Negulayeva S.V. 2002. Ecological factors forming the structure of benthos in the marine coastal zone and estuaries of the Russian Arctic: analysis of impact based on the results of self-organizing modeling. Problem of Arctic and Antarctic, issue 73: 117-134 (in Russian).

Popov A.V., Gavrilo M.V. 2011. Flaw polynyas. In: V Spiridonov, M Gavrilo, N Nikolaeva, E Krasnova (eds) Atlas of the Marine and Coastal Biodiversity of the Russian Arctic. Moscow, WWF Russia Publication, pp. 28-29.

Romankevich E.G., Vetrov A.A. 2001. Carbon cycle in the Arctic seas of Russia. Moscow, Nauka, 300 p. (in Russian).

Schmid M., Piepenburg D., Golikov A.A., Juterzenka K. von, Petryashov V. V., Spindler M. 2006. Trophic pathways and carbon flux patterns in the Laptev Sea. Progress in Oceanography, 71: 314-330.

Speer L., Laughlin T. (eds) 2011. IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment, La Jolla, California. 02-04 November 2010. 37 p.

Sirenko B., Denisenko S., Deubel H., Rachor E. 2004. Deep water communities of the Laptev Sea. Explorations of the Fauna of the Sea, St. Petersburg: Zoological Institute of the Russian Academy of Sciences, 54 (62): 28-73.

Sirenko B.I. 2001. Introduction. In: B.I.Sirenko (ed).List of species of free-living invertebrates of Eurasian Arctic seas and adjacent deep waters. Explorations of the Fauna of the Seas, vol. 51 (59), St. Petersburg. Zoological Institute of Russian Academy of Sciences, pp. 5-10.

Skjoldal H.R., Chrisnesen T., Ericksen E., Gavrilo M., Mercier F., Mosbech A., Thurston D., Andersen J., Falk K. 2012. Identifying Arctic Marine Areas of Heightened Ecological Significance. A follow-up project to Recommendation IIC of the Arctic Marine Shipping Assessment, 2009. Prepared for PAME by national experts with assistance from AMAP, CAFF, and SDWG. 181 p.

Solovieva D.V. 1999. Spring stopover of birds on the Laptev Sea polynya. In: Kassens H. et al. (eds) Land-Ocean Sysyem in the Siberian Arctic. Dymamica and history. Berlin, Heidelberg, Springer Verlag, pp. 189–195.

Spiridonov V.A., Gavrilo M.V., Nikolaeva N.G., Krasnova E.D. (eds) 2011. Atlas of the Marine and Coastal Biodiversity of the Russian Arctic. Moscow: WWF Russia, 78 p.

Vetrov A.A. Romankevich E.A., Belyaev N.A. 2008. Chlorophyll, primary production, fluxes, and balance of organic carbon in the Laptev Sea, Geokhimiya, 2008, No. 10, 1122–1130 [Geochemistry International, 46 (10): 1055–1063].

Vetrov A.A., Romankevich E.G. 2009. Production of phytoplankton in the Arctic Seas and its response on recent warming. In: J.C.J. Nihoul & A.G. Kostianoi (eds). Influence of Climate Change on the Changing Arctic and Sub-Arctic Conditions NATO Science for Peace and Security Series, 2009, 95-108, DOI: 10.1007/978-1-4020-9460-6_8.

Vetrov A.A., Romankevich E.G. 2011. Primary production and fluxes of organic carbon to the seabed in the Russian Arctic seas as a response to the recent warming. Oceanology, 51: 255–266.

Zakharov V.F. 1996. Sea ice in the climate system. St. Petersburg, Gidrometeoizdat, 213 p. (in Russian).

**Maps and Figures**

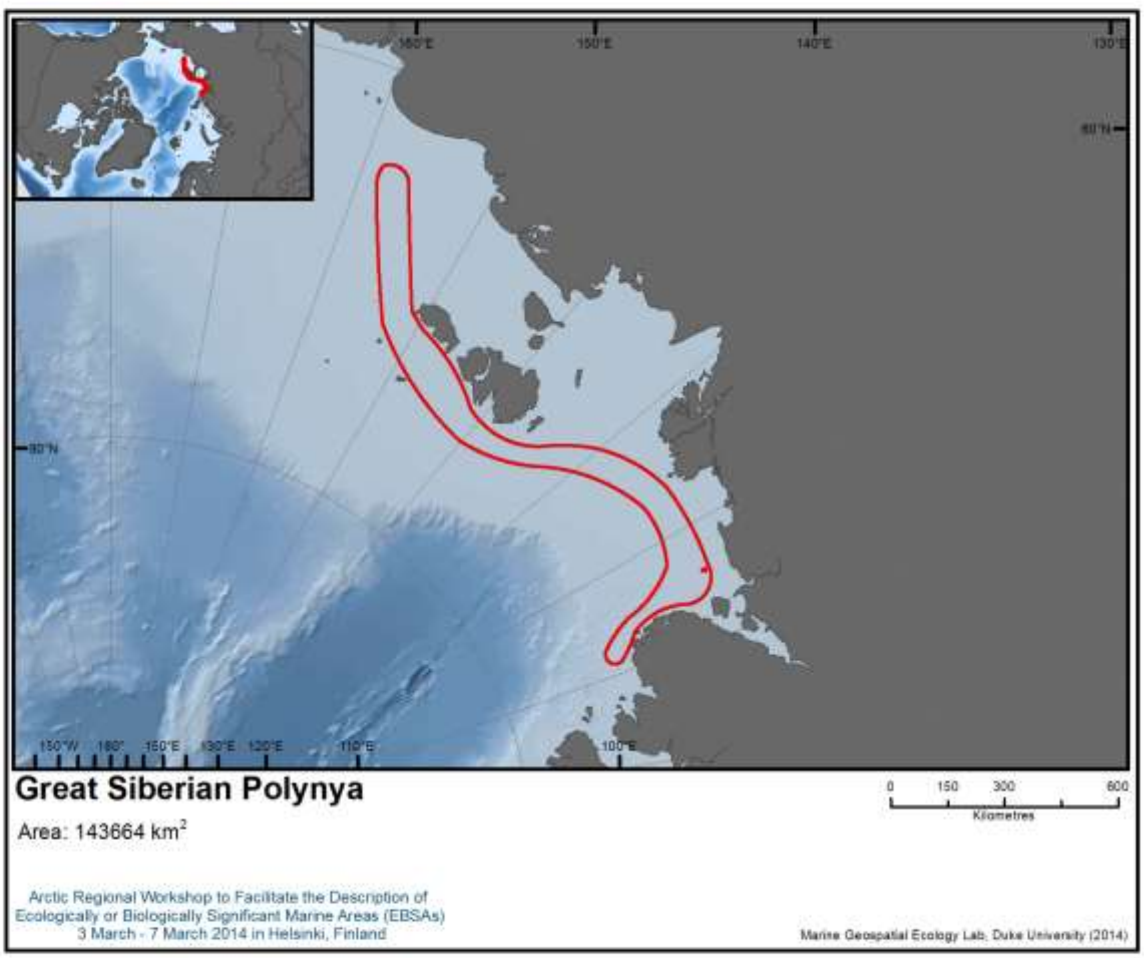



Figure 1. Area meeting EBSA criteria.

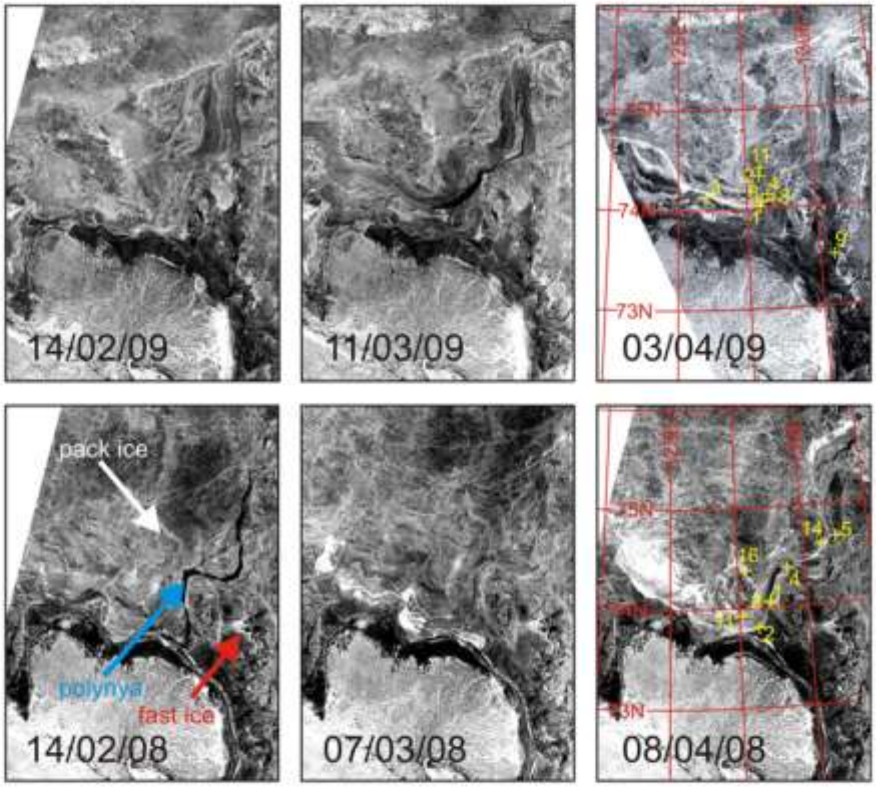



Figure 2. The Envisat ASAR satellite imagery from February to April 2009 (top) and 2008 (bottom) shows the evolution of ice conditions in the area of the coastal polynya in the vicinity of the Lena Delta. The black narrow strip at the bottom left indicates the open water of the polynya that separates the land-fast ice to the southeast from the pack ice to the northwest (Dmitrenko et al., 2010).

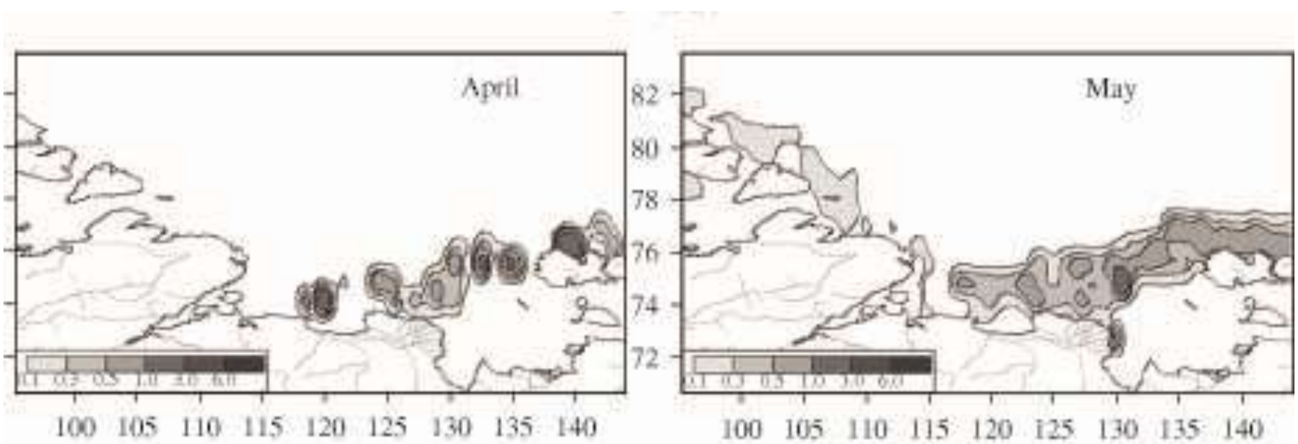



Figure 3. Average daily primary production mg C per day per square m (Vetrov, 2008).

## Area No. 10: Wrangel and Gerald Shallows and Ratmanov Gyre

**Abstract**

The Wrangel – Gerald Shallows and Ratmanov Gyre is a shelf area in the Russian part of the Chukchi Sea. Unlike most shelves in the Russian Arctic seas, it is not influenced by the discharge of great Eurasian rivers. Most of the area is filled by water originating from the Bering Sea, which enters through the Bering Strait in seasonal pulses and circulates in the Chukchi Sea (Zalogin and Kosarev, 1999). There is a large, stable gyre in the eastern part of this area (known as the Ratmanov Gyre), which stabilizes the conditions, provides a significant supply of nutrients and high primary production that fluxes to the bottom, and is the basis for stable and persistent benthic communities (Sirenko et al., 2009a). The biomass of benthic infauna and epifauna is very high (Speer and Laughlin, 2011: A). Around Wrangel Island, landfast ice and polynyas are formed. The formation of polynyas off Wrangel Island is a result of the interaction between the Arctic and the Siberian anticyclones. The area is largely untouched by human activities.

This area provides a spring migratory pathway for hundreds of bowhead whales daily, as well as beluga whales, polar bears, Pacific walrus and gray whales during summer and autumn (Speer and Laughlin, 2011: A). There are no proven endemic species in the area, however, several species have been described in the Chukchi Sea that are thus far known only in this region (Sirenko, 2009). In winter, the polynyas adjacent to Wrangel Island form an area with a high concentration of ringed (*Phoca hispida*) and bearded (*Erignathus barbatus*) seals and their predators — polar bears (*Ursus maritimus*) (Belikov et al., 1998). The area serves as a feeding area for seabirds, walruses and cetaceans.

### Introduction

The report on identifying Arctic marine areas of heightened ecological significance (AMSA IIc) revealed the waters off Wrangel Island and the central shelf of the Chukchi Sea as important areas (AMAP/CAFF/SDWG, 2013: figures 9 A and B, table 14, areas 5 and 6). Here, it is considered as a single area meeting EBSA critiera. Wrangel and Gerald Shallows and Ratmanov Gyre is relatively well covered by historical Russian data and the information from the recent RUSALKA Project. The IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment (Speer and Laughlin, 2011) also identified an area named “Chukchi and Beaufort Sea Coast” as meeting nearly all the CBD criteria.

### Location

The area extends from the waters around Wrangel Islands, along the midline of De Long Strait to 180 W, then along the 30 m isobaths to Gerald Island, including part of Gerald Trench, and to the latitude somewhat east of Cape Serdtse-Kamen’ at 173 W. The northern boundary conventionally follows the 100 m isobaths. This area lies within the EEZ and territorial sea of the Russian Federation (figure1).

### Feature description of the proposed area

The area covers the coastal zone of Wrangel and Gerald islands, along with an extensive shelf area, which, unlike in most Russian Arctic seas, is not influenced by the discharge of great Eurasian rivers. Rivers entering the western Chukchi Sea are generally small, and their signal does not extend further than the narrow zone along the continental coast (Zalogin and Kosarev, 1999). The bottom topography is relatively complex compared to the Siberians seas and includes moderately deep (to 50 – 70 m) trenches. Most of the area is filled by water originating in the Bering Sea, which enters through the Bering Strait in seasonal pulses and circulates in the Chukchi Sea, generally in an anti-clockwise direction (Zalogin and Kosarev, 1999). The water column is relatively homogenous in winter; rapid stratification develops in spring owing to the metlint of sea ice and the warming of opening water, while later in the summer both salinity and temperature of the surface waters increase as a result of further warming and greater input of Pacific water (Zalogin and Kosarev, 1999).

A large, stable gyre in the eastern part of this area, first discovered by Ratmanov in 1937, is an important characteristic of the area (figure 2). This feature is referred to mere as the Ratmanov Gyre, although this name is not widely accepted in the oceanographical literature. This gyre stabilizes the conditions, provides a significant supply of nutrients and high primary production that fluxes to the bottom, and is the basis for stable and persistent benthic communities (Sirenko et al., 2009a) (figure 3).

The area is ice-covered for most of the year but recently the duration of the ice-free season has been increasing. Around Wrangel Island, landfast ice and polynyas are formed. The formation of polynyas off Wrangel Island is a result of the interaction between the Arctic and the Siberian Anticyclones. The different and changing year-to-year interactions of the processes originating in these centres of atmospheric activity explain the inter-annual variability of polynyas in the East Siberian and the Chukchi seas. During warm years the Arctic Anticyclone weakens and shifts to the Canadian sector of the Arctic, resulting in the dominance of a system favouring polynya development in the Chukchi Sea (Gavrilo and Popov, 2011).

The lead system at the transition between landfast and drifting ice has been described as “a wonder of nature,” providing a spring migratory pathway for hundreds of bowhead whales daily, as well as beluga whales, polar bears, Pacific walrus and gray whales during summer and autumn. The Chukchi Sea has massive phytoplankton blooms, which, along with annual sea ice algae production, cannot be fully exploited by the zooplankton communities. Hence, much of this high production is exported unmodified to the benthos, resulting in an impressively high biomass of benthic infauna and epifauna” (Speer and Laughlin, 2011: A).

**Feature condition and future outlook of the proposed area**

The conditions in the area appear to be dynamic, and ecological processes are very sensitive to changes in climate, in particular variability in sea ice.

A potential threat is related to offshore oil and gas exploration, which will likely take place within the next decade.

**Assessment of the area against CBD EBSA criteria**

<table>
<tr><td rowspan="2">CBD EBSA criteria<br>(Annex I to decision IX/20)</td><td rowspan="2">Description<br>(Annex I to decision IX/20)</td><td colspan="4">Ranking of criterion relevance<br>(please mark one column with an X)</td></tr>
<tr><td>No information</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td>Uniqueness or rarity</td><td>Area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td colspan="6">Explanation for ranking<br>There are no proven endemic species in the area, however several species have been described from the Chukchi Sea that are thus far known only in this region (Sirenko, 2009). Benthic communities in the south-eastern part of the area within the Ratmanov Gyre are very distinct owing to its unusually high biomass for the Arctic (Sirenko and Gagaev, 2007; Sirenko et al., 2009 a, b).</td></tr>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td></td><td>X</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| *Explanation for ranking*<br>In winter, the polynyas adjacent to Wrangel Island form an area with high concentration of ringed (*Phoca hispida*) and bearded (*Erignathus barbatus*) seals and their predators: polar bears (*Ursus maritimus*) (Belikov et al., 1998). The area serves as a feeding area for seabirds, walruses and cetaceans. Of particular importance for walrus feeding could be rich benthic communities located within the Ratmanov Gyre off Serdtse-Kamen' Cape (Sirenko et al., 2009a). | | | | | |
| **Importance for threatened, endangered or declining species and/or habitats** | Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species. | | | | X |
| *Explanation for ranking*<br>Gray whales (*Eschrichtius robustus*) of the Californian-Chukchi population and bowhead whales (*Balaena mysticetus*) migrate from their wintering grounds and move to the Chukchi Sea in June.<br>In summer and autumn bowhead whales forage and travel up to Wrangel Island and further east (Bogoslovskaya et al., 1982; Belikov et al., 2002; Gavrilo and Popov, 2011). | | | | | |
| **Vulnerability, fragility, sensitivity, or slow recovery** | Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery. | | | | X |
| *Explanation for ranking*<br>Sea ice habitats are particularly sensitive to climate change; polar bears are particularly suffering from decreasing sea ice. | | | | | |
| **Biological productivity** | Area containing species, populations or communities with comparatively higher natural biological productivity. | | | | X |
| *Explanation for ranking*<br>The Chukchi Sea shows increased pelagic primary production and carbon flux to the bottom in comparison to the seas of the Siberian shelf, and there is a trend to its increase (Vetrov and Romakevich, 2011). The areas near Wrangel Island and within the Ratmnanov Gyre are of particular importance. Most of the pelagic production contributes to the benthic flux and is utilized for building up an unusually high benthic biomass, in particular in the communities dominated by *Macoma clacarea* (Sirenko and Gagaev, 2007; Sirenko et al., 2009a) (figures 2, 3). | | | | | |
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | | | | X |
| *Explanation for ranking*<br>The Chukchi Sea has a considerably higher richness of marine species than the seas of the Siberian shelf (Sirenko, 2009, Spiridonov, 2011; Spiridonov et al., 2011), and the present area holds most of the species known in the area. The area holds the broadest range of benthic community types known for the Chukchi Sea (Sirenko et al., 2009a,b). | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | | X |
| *Explanation for ranking*<br>This is largely untouched area. | | | | | |

**References**

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp.

Belikov S., Boltunov A., Belikova T., Belevich T.,Gorbunov Yu. 1998. Marine mammals. The distribution of marine mammals in the Northern Sea Route area. INSROP Working Paper No 118–1998. Oslo: The Fridtjof Nansen Institute. — 49 p.

Belikov S.Ye., Boltunov A.N., Gorbunov Yu.A. 2002. Seasonal distribution and migrations of whales of the Russian Arctic based on results of long_term observations by aerial ice reconnaissance and drifting stations "North Pole". In: A.A. Aristov, V.M. Belkovich, V.A. Zemsky, V.A. Vladimirov and I.V.Smelova (eds). Marine mammals (Results of researches conducted in 1995–1998). Moscow: Marine Mammals Council. — Pp. 21–50. (In Russian).

Bogoslovskaya L., Votrogov L., Krupnik I. 1982.The bowhead whale off Chukotka: migrations and aboriginal whaling. Reports of the International Whaling Commission, 32: 391–399.

Gavrilo M.V., Popov A.V. 2011. Sea ice biotopes and biodiversity hotspots in the East Siberian Sea and the waters of Chukotka. In: V.A. Spiridonov., M.V. Gavrilo, N.G. Nikolaeva, E.D. Krasnova (eds) 2011. Atlas of the Marine and Coastal Biodiversity of the Russian Arctic. Moscow, WWF Russia, pp. 38–39.

Golikov A.N., Sirenko B.I., Petryashov V.V., Gagaev S.Yu. 2009. Distribution of bottom communities in the Chukchi Sea from results of diving investigations. In: B.I. Sirenko (ed) Ecosystems and biological resources of the Chukchi Sea and adjacent areas. Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 64 (72),pp. 56–62 (in Russian).

Sirenko B.I. 2009a. The present state of investigations of the Chukchi Sea fauna. In: B.I. Sirenko (ed) Ecosystems and biological resources of the Chukchi Sea and adjacent areas. Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 64 (72), pp. 5–27 (jn Russian).

Sirenko B.I., Bluhm B., Iken K. Crain K., Gladish V. 2009b. ROV investigations on the composition and quantitative distribution of epifauna in the Chukchi Sea. In: B.I. Sirenko (ed) Ecosystems and biological resources of the Chukchi Sea and adjacent areas. Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 64 (72), pp. 20 –212.

Spiridonov V.A. 2011. Biogeographical regionalization. Species diversity in the Russian Arctic seas: pelagic and sea ice biota, micro- and meiofauna. Macrobenthos: species diversity and group domination in the communities. In: V.A. Spiridonov., M.V. Gavrilo, N.G. Nikolaeva, E.D. Krasnova (eds) 2011. Atlas of the Marine and Coastal Biodiversity of the Russian Arctic. Moscow, WWF Russia, pp. 16-21.

Vetrov A.A., Romankevich E.V. 2011. Primary production and fluxes of organic carbon to the seabed in the russian Arctic seas as a response to the recent warming. Oceanology, 51(2): 266–277.

**Maps and Figures**

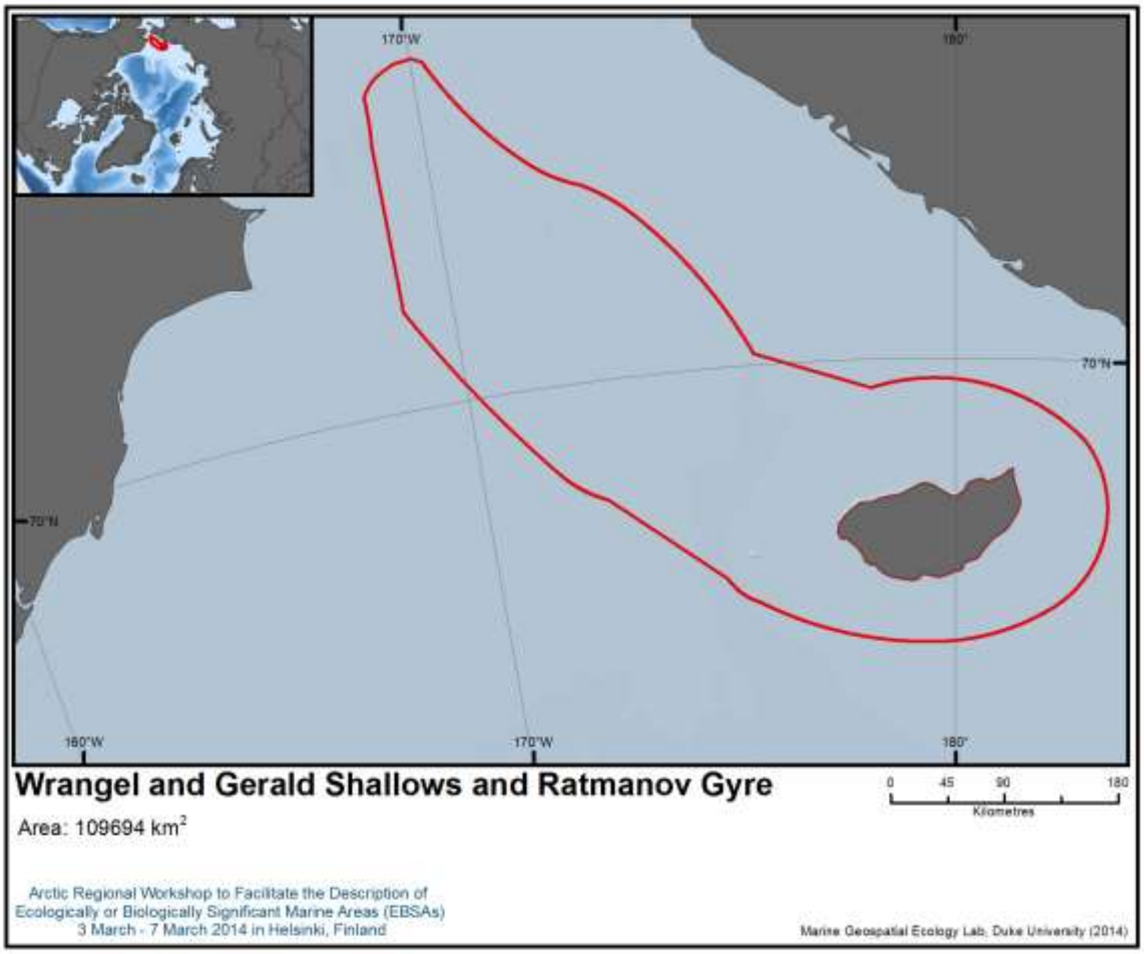



Figure 1. Area meeting EBSA criteria.


Рис. 11. Границы сообщества *Macoma calcarea* + *Ennucula tenuis*, нанесенные на схему течений Чукотского моря по материалам рейса р/т «Красноармеец» в 1933 г. (Ратманов, 1937). Хорошо заметно совпадение центра сообщества с центром большого циклонического круговорота, описанного Ратмановым

Figure 2. Boundaries of high benthic biomass in the communities dominated by *Macoma calcarea* and the scheme of currents indicating the position of the Ratmanov Gyre (Sirenko et al., 2009a).

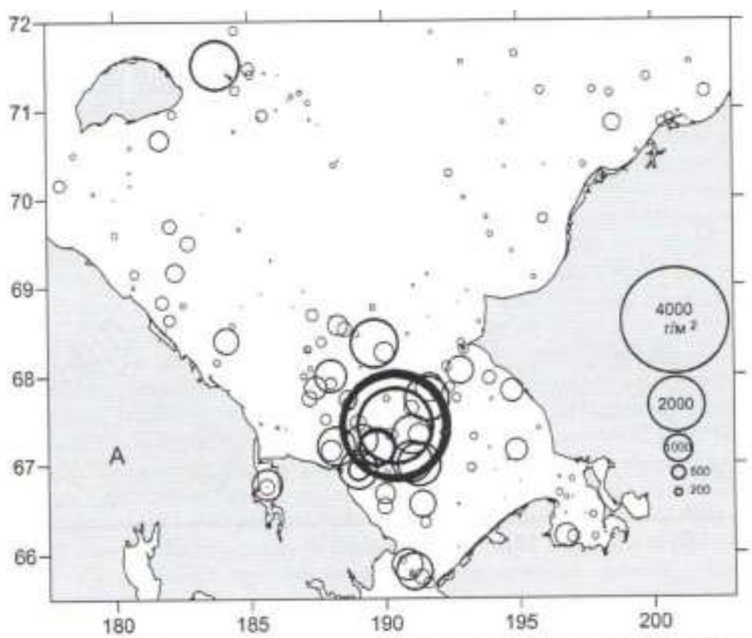



Рис. 10. Биомасса зообентоса в Чукотском море по данным российских и американских исследований в 1986–2006 гг. (диаметр окружностей пропорционален величине биомассы)

Figure 3. Biomass of zoobenthos in the Chukchi Sea according to Russian and American research conducted from 1986 to 2006. The area with the highest biomass marks the position of the Ratmanov Gyre in the southern Chukchi Sea (from Sirenko et al., 2009a).

## Area No. 11: Coastal Waters of Western and Northern Chukotka

### Abstract

These waters are ice-covered for most of the year, however sea-ice conditions differ from west to east and from south to north. The coastal Chukchi Sea differs from the seas of the Siberian shelf by its increased pelagic primary production and the flux of carbon to the sea floor (Vetrov and Romakevich, 2011). Chaun Bay and other inlets and lagoons harbour kelp communities (Golikov et al., 1994; 2009), which significantly increase productivity in coastal areas compared to most part of the Siberian shelf seas. Benthic biomass in the coastal areas is high in protected bays and inlets (Sirenko et al., 2009; Denisenko, 2010; Denisenko et al., 2010). Some communities are particularly rare, i.e., the fucoid communities, kelp and mussel beds along the eastern shore of Chaun Bay, which are relics of the warmer Holocene conditions (Golikov et al., 1994).

Shallow bays, with their specific regime, and the marshes along the coast serve as staging, moulting and nesting areas for numerous aquatic birds, including eiders, long-tailed ducks (*Clangula hyemalis*) and alcids (Gavrilo and Popov, 2011). In winter, most of the Chukotka Peninsula coastal zone forms an area of high concentration of ringed (*Phoca hispida*) and bearded (*Erignathus barbatus*) seals and their predators: polar bears (*Ursus maritimus*) (Belikov et al., 1998). The area also serves as a migration route for gray whales (*Eschrichtius robustus*) of the Californian-Chukchi population and bowhead whales (*Balaena mysticetus*).

### Introduction

The report on identifying Arctic marine areas of heightened ecological significance (AMSA IIc) revealed the importance of the coastal waters of the eastern part of the East Siberian Sea, i.e., Chaun Bay (Chaunskaya Guba, in Russian), and the coastal waters of the Chukotka Peninsula in the Chukchi Sea (AMAP/CAFF/SDWG, 2013: figures 8, 9 A and B; tables 13, 14). The IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment (Speer and Laughlin, 2011) identified an area named “Chukchi and Beaufort Sea Coast” as meeting nearly all CBD criteria. Based on subsequent analysis, emphasis was placed on the continuity of environmental conditions and changes in these conditions in this area, and hence they were combined in a single area meeting the EBSA criteria.

### Location

The area extends from the western and northern extremities of Ayon Island in the East Siberian Sea, includes the Chaun Bay (Chaunskaya Guba, in Russian), Kolyuchin Bay (Kolyuchinskaya Guba, in Russian) and conventionally extends to 35 miles from the typical shore. It lies entirely within Russia’s jurisdiction (internal marine waters of inlets, territorial sea and EEZ) (figure 1).

### Feature description of the proposed area

The coastal zone of western and northern Chukotka extends from the large Chaun Bay with its own oceanographic regime in the East Siberian Sea to the south-western Chukchi Sea. It is not strongly impacted by the freshwater input of great Siberian rivers and maintains marine conditions except for a limited number of estuaries and lagoons. This is a shallow shelf area lying entirely within 50 m isobaths (usually less than 20 m). In the East Siberian Sea, stratification of coastal waters is generally weak but may increase owing to summer warming and surface transport of estuarine waters. The upper layer warms up in summer to 0 – 2° C but in the inner part of the Chaun Bay and other estuarine habitats temperature may increase to 4 – 8° C (Denisenko et al., 2010). Salinity of both surface and near bottom layers increases from west to east (28 psu in the bottom layer of the Chaun Bay and yet 32 psu in the De Long Strait) The current goes generally eastward, and part of the East Siberian water enters the Chukchi Sea through De Long Strait (Zalogin and Kosarev, 1999; Denisenko et al., 2010). Bottom topography is relatively even, and sediment is largely muddy sand in the East Siberian Sea and sand in the Chikchi Sea so that the proportion of mud particles generally decreases from Chaun Bay to the Chukchi Sea (Denisenko et al., 2010). In the inshore zone, hard substrates are also present (Golikov et al., 2009).

The waters are covered with ice for most of the year, however sea ice conditions differ in the west to east and the south to north directions. On the eastern boundary the Ayon sea ice massif is formed, and in previous years, it persisted nearly year round. The bays and coastal waters have been covered with fast ice for about nine months a year to about the 10 m isobath, but the ice-free period has been increasing.

The formation of flaw polynyas in the East Siberian Sea is a result of the interaction between the Arctic and the Siberian Anticyclones. Strengthening of the Arctic Anticyclone creates a wind pattern that facilitates the development of polynyas in the western part of the East Siberian Sea and, simultaneously, their depression in the eastern part of the East Siberian Sea and the Chukchi Sea. Development of polynyas in the Chukchi Sea is supported by cyclones originating in the Aleutian Low. The different and changing year-to-year interactions of the processes originating in these centres of atmospheric activity explain the inter-annual variability of polynyas in the East Siberian and the Chukchi seas. During warm years the Arctic Anticyclone weakens and shifts to the Canadian sector of the Arctic, resulting in the dominance of a system favouring polynya development in the Chukchi Sea. The monthly mean frequency of polynya occurrence is significant throughout the entire cold season of the year but it is on average lower than in the neighbouring Laptev Sea and varies from 41 to 89% (Gavrilo and Popov, 2011).

The coastal Chukchi Sea is characterized by relatively high pelagic primary production most of whih reach benthic communities as a particle flux (Vetrov and Romakevich, 2011) and supports high benthic biomass used by sea ducks, walruses, bearded seals and grey whales. Protected inlets and lagoons harbour kelp communities (Golikov et al., 1994; 2009), which significantly increase productivity in coastal areas compared to most part of the Siberian shelf seas. Benthic biomass in the coastal areas is high in protected bays and inlets (i.e., Chaun Bay, Kolyuchin Bay and decreases by order of magnitude in the open areas (Sirenko et al., 2009; Denisenko, 2010; Denisenko et al., 2010).

**Feature condition and future outlook of the proposed area**

The conditions in the area appear to be dynamic, and ecological processes are very sensitive to climate change, particularly variability in sea ice.

An important potential threat is oil and gas exploration, which will begin in the coming decade. Part of the area (Kolyuchin Bay) is now protected within the new Beringia National Park, established in 2013.

**Assessment of the area against CBD EBSA criteria**

| **CBD EBSA criteria** (Annex I to decision IX/20) | **Description** (Annex I to decision IX/20) | **Ranking of criterion relevance** (please mark one column with an X) | | | |
|---|---|---|---|---|---|
| | | **No information** | **Low** | **Medium** | **High** |
| **Uniqueness or rarity** | Area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features. | | | X | |
| *Explanation for ranking*<br>There are no proven endemic species in the area, however several species have been described in the Chukchi Sea that are thus far known only in this region (Sirenko, 2009). Some communities are particularly rare, i.e., the fucoid communities, kelp and mussel beds along the eastern shore of Chaun Bay, which are relics of the warmer Holocene conditions and are maintained owing to the bay’s particular oceanographic regime (Golikov et al., 1994). | | | | | |

<table>
<tr><td>Special importance for life-history stages of species</td><td>Areas that are required for a population to survive and thrive.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>In winter, most of the Chukotka Peninsula coastal zone and the polynyas adjacent to Wrangel Island form an area of high concentration of ringed (Phoca hispida) and bearded (Erignathus barbatus) seals and their predators: polar bears (Ursus maritimus) (Belikov et al., 1998). The system of polynyas and leads along the Chukotka coast serves as a spring migration path for cetaceans and seabirds, including eiders, long-tailed ducks (Clangula hyemalis) and alcids (Gavrilo and Popov, 2011). Shallow bays, with their specific regime, and the marshes along the coast serve as staging, moulting and nesting areas for numerous aquatic birds.</td></tr>
<tr><td>Importance for threatened, endangered or declining species and/or habitats</td><td>Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>Gray whales (Eschrichtius robustus) of the Californian-Chukchi population migrating from their wintering grounds show up near the eastern coast of Chukotka in the second half of May. Most of them move to the Chukchi Sea in June. In this season both gray and bowhead (Balaena mysticetus) whales use polynyas and leads for migration. In summer and autumn bowhead whales forage and travel up to Wrangel Island and along the Chaunskaya Guba — as far as the ice edge allows (Bogoslovskaya et al., 1982; Belikov et al., 2002; Gavrilo and Popov, 2011); in particularly favourable years (when the ice massif to the west of Ayon Island breaks up in summer) bowhead whales may reach the New Siberian Islands (Gavrilo and Tretyakov, 2008).</td></tr>
<tr><td>Vulnerability, fragility, sensitivity, or slow recovery</td><td>Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>Sea ice habitats are particularly sensitive to climate change; polar bears are particularly suffering from the melting of sea ice. Both sea ice habitats and bays are extremely vulnerable to oil spills that can potentially happen in the area if oil and gas exploration starts.</td></tr>
<tr><td>Biological productivity</td><td>Area containing species, populations or communities with comparatively higher natural biological productivity.</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td colspan="6">Explanation for ranking<br>The coastal Chukchi Sea is characterized by increased pelagic primary production and the flux of carbon to the bottom in comparison to the seas of Siberian shelf (Vetrov and Romakevich, 2011). Chaun Bay and other inlets and lagoons harbour kelp communities (Golikov et al., 1994; 2009), which significantly increase productivity in coastal areas compared to most part of the Siberian shelf seas. Benthic biomass in the coastal areas is high in protected bays and inlets (i.e., Chaun Bay, Kolyuchin Bay and decreases by order of magnitude in the open areas (Sirenko et al., 2009; Denisenko, 2010; Denisenko et al., 2010). However, in areas with moderate biomass, amphipods (Golikov et al.), which have a high P/B coefficient and biomass turnover rate, are particularly important.</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| **Biological diversity** | Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. | | | | X |
| *Explanation for ranking*<br>Species richness is relatively low in the East Siberian Sea, with some hotspots such as Chaun Bay (Golikov et al., 1994). Species richness increases in the Chukchi Sea, where many species of Pacific origin occur (Sirenko, 2009, 2010, Spiridonov, 2011; Spiridonov et al., 2011). The diversity of habitats, communities and ecosystems along the east-west and local gradients of oceanographical and sedimentological conditions is significant (Golikov et al., 1994; 2009; Sirenko et al., 2009; Denisenko et al., 2010). | | | | | |
| **Naturalness** | Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation. | | | | X |
| *Explanation for ranking*<br>This is a largely untouched area except for the localized impact of pollution in the Chaun Bay (Golikov et al., 1994). | | | | | |

**References**

AMAP/CAFF/SDWG, 2013. *Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc*. Arctic Monitoring and Assessment Programme (AMAP), Oslo. 114 pp.

Belikov S., Boltunov A., Belikova T., Belevich T.,Gorbunov Yu. 1998. *Marine mammals. The distribution of marine mammals in the Northern Sea Route area*. INSROP Working Paper No 118–1998.Oslo: The Fridtjof Nansen Institute. — 49 p.

Belikov S.Ye., Boltunov A.N., Gorbunov Yu.A. 2002. Seasonal distribution and migrations of whales of the Russian Arctic based on results of long_term observations by aerial ice reconnaissance and drifting stations “North Pole”. In: A.A. Aristov, V.M. Belkovich, V.A. Zemsky, V.A. Vladimirov and I.V.Smelova (eds). *Marine mammals (Results of researches conducted in 1995–1998).* Moscow: Marine Mammals Council. — pp. 21–50. (In Russian).

Bogoslovskaya L., Votrogov L., Krupnik I. 1982. *The bowhead whale off Chukotka: migrations and aboriginal whaling*. Reports of the International Whaling Commission, 32: 391–399.

Denisenko S.G., Sirenko B.I., Gagaev S.Yu., Petryashov V.V. 2010. Bottom communities: structure and spatial distribution in the East Siberian Sea at depth more than 10 m. In: B.I. Sirenko, S.G. Denisenko (eds) *Fauna of the East Siberian Sea, distribution patterns and structure of bottom communities*. Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 66 (74), pp. 130–143 (in Russian).

Denisenko S.G. 2010. Bioresources and production of zoobenthos in the East Siberian Sea. In: B.I. Sirenko, S.G. Denisenko (eds) *Fauna of the East Siberian Sea, distribution patterns and structure of bottom communities*. Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 66 (74), pp. 144–159 (in Russian).

Gavrilo M.V., Popov A.V. 2011. Sea ice biotopes and biodiversity hotspots in the East Siberian Sea and the waters of Chukotka. In: V.A. Spiridonov., M.V. Gavrilo, N.G. Nikolaeva, E.D. Krasnova (eds) 2011. *Atlas of the Marine and Coastal Biodiversity of the Russian Arctic*. Moscow, WWF Russia, pp. 38–39.

Golikov A.N., Sirenko B.I., Petryashov V.V., Gagaev S.Yu. 2009. Distribution of bottom communities in the Chukchi Sea from results of diving investigations. In: B.I. Sirenko (ed) *Ecosystems and biological resources of the Chukchi Sea and adjacent areas*. Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 64 (72), pp. 56–62 (in Russian).

Sirenko B.I. 2009. The present state of investigations of the Chukchi Sea fauna. In: B.I. Sirenko (ed) *Ecosystems and biological resources of the Chukchi Sea and adjacent areas*. Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 64 (72), pp. 5–27 (jn Russian).

Sirenko B.I. 2010. The present state of fauna investigations in the East Siberian Sea. In: B.I. Sirenko, S.G. Denisenko (eds) *Fauna of the East Siberian Sea, distribution patterns and structure of bottom communities*. Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 66 (74), pp. 5– 7 (in Russian).

Sirenko B.I., Denisenko S.G., Gagaev S.Yu., Golikov A.A., Petryshov V.V. 2009. Bottom communities of the Chukchi Sea shelf at depth below 10 m. In: B.I. Sirenko (ed) *Ecosystems and biological resources of the Chukchi Sea and adjacent areas.* Explorations of the Fauna of the Sea, St. Petersburg, Zoological Institute of RAS, 64 (72), pp. 32–55 (In Russian).

Spiridonov V.A. 2011. Biogeographical regionalization. Species diversity in the Russian Arctic seas: pelagic and sea ice biota, micro- and meiofauna. Macrobenthos: species diversity and group domination in the communities. In: V.A. Spiridonov., M.V. Gavrilo, N.G. Nikolaeva, E.D. Krasnova (eds) 2011. *Atlas of the Marine and Coastal Biodiversity of the Russian Arctic*. Moscow, WWF Russia, pp. 16-21.

Vetrov A.A., Romankevich E.V. 2011. Primary production and fluxes of organic carbon to the seabed in the russian Arctic seas as a response to the recent warming. *Oceanology*, 51(2): 266–277.

**Maps and Figures**

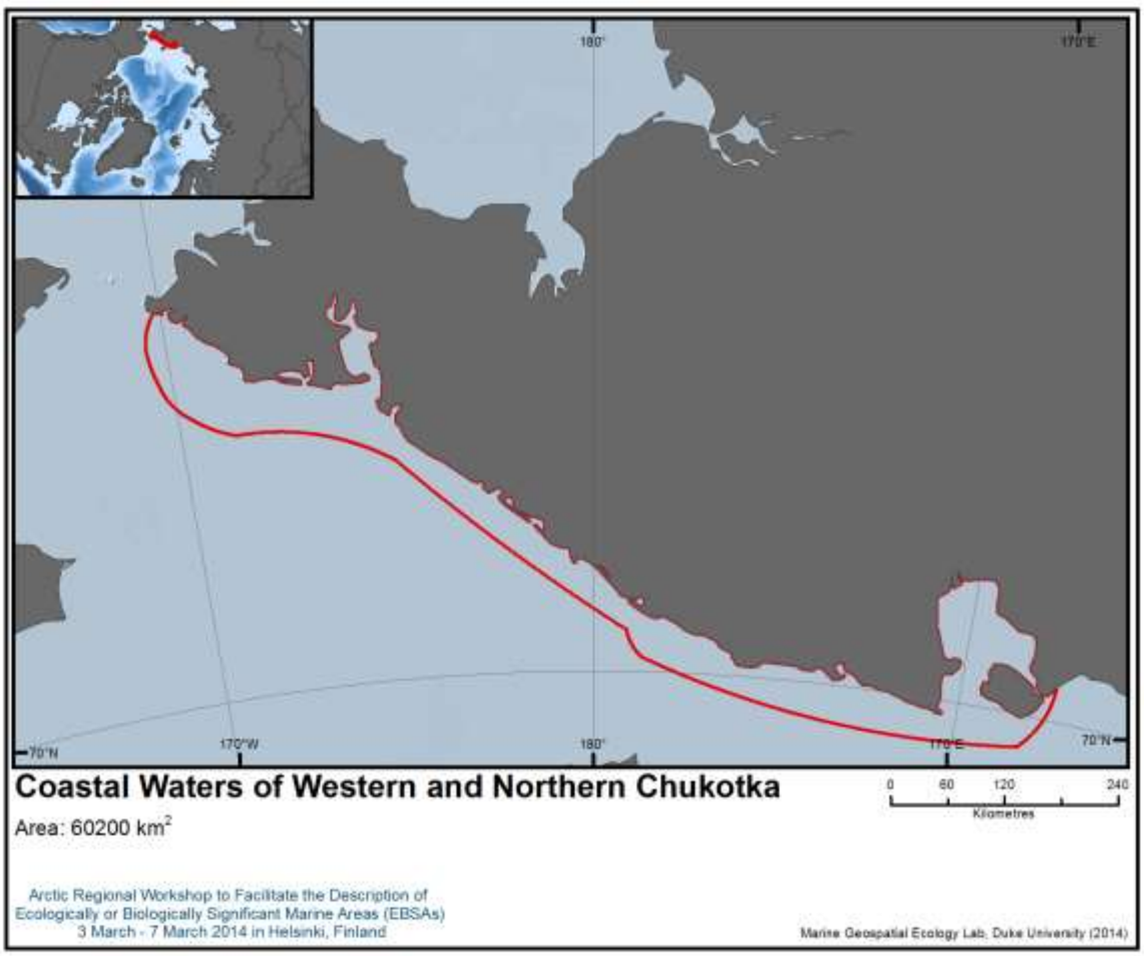



Figure 1. Area meeting EBSA criteria.

-----