CAFF
Conservation of Arctic Flora and Fauna

Experts´ Workshop on Sea Ice Associated Biodiversity
St. Petersburg Workshop, March 5-6, 2012

Acknowledgements

CAFF Designated Area

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Welcoming Remarks/Introduction of Participants, Maria Gavrilo

Arctic sea ice. Photo: Sergey Vasilyev/Shutterstock.com

Presentation, Janet Hohn, U.S. Fish and Wildlife Service

History of Arctic Council development was presented starting from 1996. Chair is elected every two years (currently – in Sweden). AC has several working groups, permanent participants (members), observers for the council (about 22 organizations).
CAFF – biodiversity working group of AC. International secretariat is in Iceland. Currently Russia chairs the group. There are permanent participants invited to every meeting and event.

Development of Sea Ice Associated Biodiversity project history was highlighted. It was important to ensure that there're no overlapping with other ice-related projects and programs. There's focus on trends that are already taking place and could be seen. The task is to produce recommendation for CAFF and for AC. There's a workshop in Vancouver, where the main issued to be addressed in the report were agreed. The workshop had N. American focus so it's important to pay attention to Russian situation. The report will be drafted during this meeting.

Garry Donaldson proposed to proceed with the discussion in order to express as many ideas as possible during the workshop. So the presentation stage will be quick enough.

The results of Vancouver workshop were presented. The out-line of the meeting was as follows – project context, overview of arctic biodiversity state, current and future state of the sea ice etc. Several reports on project context were discussed. Arctic sea ice trends and issues were addressed as well as changes in species, trophic levels and biodiversity in general. There are very few ice dependent species, those which could adapt for ice conditions. So the existing biodiversity is very fragile. As the climate is warming more areas are becoming available for more southern species which will move to the north occupying new areas.

It's important to understand what we can expect in terms of changes in ice extend and its effect on ice related species. We can expect some changes in species between oceans. At v. workshop the issued faced by ice associated species were discussed. The problem of multy-year ice loss was discussed. Changes in seasonal ice extent might affect biodiversity most. Changes in ice quality are also take place and biodiversity also respond to such changes. It was discussed how we can consider conservation issues in the future, perhaps some protected areas will not be useful in the future as the conditions are changing. We have to consider monitoring and collaboration in the sphere of polar research.

Igor Smirnov: Who's going to make investments into such research? Up to now all support is only on paper.

Garry Donaldson and Tom Barry: the funding could be considered at different levels (AC, universities, NGO…). It's possible to use decisions (recommendations) taken by all circumpolar countries as a tool to get support, to make proposal attractive to government. It's needed to find out where the resources needed are, may be not within your country at all.

Christine Michel: It's important to decide which level of support is important for the research.

Trish Hayes: There's an opportunity to make a joint proposal from several countries – Canada, Russia, US….

Tom Barry: We can use CAFF secretariat in order to apply for funding, to use our recommendations.

Other identified issue was to use indigenous knowledge in our research.

In Garry Donaldson's experience the greatest success was obtained in the areas where the networks were established.

The report is to be very relevant, of use. It has to be kept in relevant context in order to be used by government, NGOs etc. The list of key messages has to be efficient and short enough, easy to understand. The outline of the report has been already structured and drafted. The timeline for the report is October. Draft has to be ready for the review by CAFF. After that it'll be reviewed by AC.

Eugeny Syroechkovsky – welcoming words on behalf of the Ministry of Natural Resources.

Xenia Kosobokova: We have to define the borders of Arctic, which we are looking at now.

Tom Barry, Christine Michel, Garry Donaldson: The CAFF approach is to let each country to decide. Or in general it's max sea ice extent in any season (not including glacial etc.). It's possible to use available maps of ice extent to distinguish the geographic scope of the project.

Igor Smirnov: In winter sea ice extent is close to the shore, but in summer very soon we'll probably have no ice in the area.

Xenia Kosobokova: It's reasonable to consider the winter sea ice extent as project scope.

Trish Hayes: The boundary of the area will depend on the timeframe you want to consider.

Boris Vdovin: The local population in the Arctic is diverse: we have state borders, political, biodiversity conditions are different. Maybe it's better to distinguish different sectors within the area and study them separately (maybe even within every country)?

Garry Donaldson: Now we use ecosystem approach and we try to consider the whole region within the project. But human dimension sector is important. And it's important to discuss political issues as well. It's a good point to bring up political reality.

Maria Gavrilo: In Russia we consider regional differences on the basis of ecosystem. When we come to human dimension we have to combine both social and ecosystem approach. Ecosystem approach takes into account environmental differences of the Arctic region.

Boris Vdovin: I made a point mostly on social groups not political issues.

Report outline

We have to design key messages, put other available reports in to the context of the recommendations and see what this report contributes compared to the others. Introduction defines different types of ice to readers, discusses status, trends and changes in ice conditions. Gives an understanding of current situation.

Trish Hayes: we don't want to separate human dimension section from scientific part – we want to combine them.

Human dimension section provides info on role of ice for local communities.

Then we have to be able to predict what will happen in the future, to model the situation. A lot of what we recommend will depend on what we can expect in the future. Recommendation section is an important part of the report, key element making it different from other similar reports.

Now we have a chance to broaden our report for Eurasia, to see if we miss something.

Stas Belikov: we have to take into account changes in other ice features – physical aspects such as fragmentation, extent etc.

Trish Hayes: It has been included into workshop proceedings in Vancouver.

Eugeny Syroechkovsky: we can assess different scenarios such as min and max scenarios.

Garry Donaldson: it's a good idea to consider different scenarios although some recommendations could be applicable to different scenarios. AS you review the document you can consider different scenarios in different areas.

There's a list of text boxes which we can review during the workshop, to extend key messages.

Igor Smirnov: the report has to be not only for policy makers but for the public as well.

There's a communication part in the report discussing the outreach.

Tom Barry, Trish Hayes: We have communication plan for all CAFF project so we plan to deliver our messages to policy makers and other interested parties.

Kittewakes Photo: Gail Johnson/Shutterstock.com

Building the report

Introduction section is not written yet. A lot of biology experts collected date: birds, polar bears.

Gap is in zooplankton, algae, fish. Human dimension section is well developed. Future projection section is in process. What other models can we develop? Recommendations for science, communications

should be developed. Recommendation section is a lit bit ready. Text boxes are flexible. Sometimes they are the first thing people read.

Introduction and context part: gives a snapshot on what we're hoping to do, biological and geographical background, why it's important to focus on ice associated biodiversity. Why does the reader want to be engaged? The report considers potential solutions. We can't fix everything that there're some work we can do to make conditional as favorable as possible for species. We can plan the protected area e.g. to be a refuge for species. Report talks about effect of changes in sea ice.

In introduction we have to indicate what will be discussed in the report (a bit of results?).

Tom Barry: we have to outline the boundaries: spatial and temporal boundaries incl. budget.

Igor Smirnov question: in western literature it's said that it's important to investigate ecosystem separately, but based on Russian literature ecosystem and biodiversity have to be considered together, we have to explain this in introduction, 'cause biodiversity is a part of ecosystem.

Maria Gavrilo: It's needed to define all the terms and scopes at the very beginning.

Garry Donaldson: we talk about what's happening with biodiversity but we have to consider what's happening with the ecosystem in general as well.

Contribution to biodiversity associated with ice

Template form is to be filled by the contributors with the ideas important to add to the report. The text should be brief enough (key points). Important data sets (extra files) should be included into the discussion as well. It should be submitted electronically. Extra boxes for additional information and comments for other sections could be created.

Maria Gavrilo: there's a presentation on polynias which are an important feature describing ice habitat and changes in it.

Presentation, Andrey Popov

There's an Atlas produced in the frames of WWF project (available on WWF website).

Arctic polynias are one of the most interesting phenomenon influencing arctic conditions including temperature. They are located along arctic fast ice. Arctic and Antarctic institute traditionally studies 21 polynias. They have different repeatability in time. We'll give an example of Kara sea. We monitor area, min, max and average extent. Repeatability of the polynia is measures every several days. Some of them are open

Seal. Photo: gnohz/Shutterstock.com

only temporally, some are permanent. Recently there's a tendency to decrease of polynias' areas which influences summer ice conditions. Anabar'-Lena polynia is the greatest one in Russian Arctic. Recently it is increasing in area. Every year Andrey makes a forecast based on polynias' area for summer ice extent. Predictability is quite good. Polynias are the only source of energy from water to the air during winter time. There a good correlation found between polynias' area and coefficient of geographical oscillation. So called distance effects originate from the polynias as well.

Large amount of fresh water is accumulated in ice forming in the polynias and then it's distributed by currents to other areas inducing anomalies in ice extent and salinity in other seas. Climate develops in cycles and polynias could be used as an indicator for the ice system changes.

Garry Donaldson: Are there models predicting how polynias may react in case of climate changes?
Andrey Popov: Polynias are the product of the climate formed by certain cyclonic activities. On the other site cyclones tend to come to the polynias area because of heat production above them. So it's interrelated process. Polynias provide meridian transport of energy and heat and they can transform temperature fields.

Igor Smirnov: In 2007 summer half of the ocean was ice free. What was the open sea role in climate forming?

Andrey Popov: this was not polynia – just open ocean. In 2007 polynias of eastern sector reached their maximum as well. To large spring polynias' areas in spring warm cyclones come. Winter polynia initiates ice retrieval process in summer. Amount of the heat produced by polynias is comparable with the entire cooling effect of the Arctic sea ice cover.

Evgeny Syroechkovskiy: is that correct that there's a scientific evidence that there could be not decrease but increase of ice cover in some areas?

Angey: yes, because of fresh water anomalies there's ice cover extent in some areas in Canada and in Chukchi sea.

Stas Denisenko: Why the salinity in polynias is 40 °%?

Andrey Popov: because the salt originates from freezing water.

Trish Hayes: are there any data on changes in biodiversity in relation to polynias area?

Maria Gavrilo: polynias area is easier to observe than changes in food chain.Proportion of Ivory gull population breeding in a particular year depends on polynias area since they need polynia as a foraging area in prebreeding season.

Polynia areas are also related to fresh water input from the rivers.

Xenia Kosobokova: Is there upwelling in polynias? If there's upwelling you can expect that zooplankton is brought to the surface which is a food source for birds.

Andrey Popov: Yes there's a convection process including upwelling bringing organic to the surface.

Trish Hayes: Is there similar data from other circumpolar parts?

Andrey Popov: I personally didn't see such data.

Maria Gavrilo: We have a different features of the seas (location of land etc.) in Russia, so the polynia

development could be different. We have no monitoring data on polar bears and other mammals concentrating in polynias area. Arctic walrus population survives winter only due to polynias. Eiders species change their wintering grounds according to polynias distributions.

Trish Hayes: do we need the third category of polynias (not only seasonal ice and multiyear ice)?

Garry Donaldson: This is something to consider in the document.

Maria Gavrilo: I feel that most of the data we have is related to seasonal ice. So we know very little both about multiyear ice and polynias.

Evgeny Syroechkovskiy, Maria Gavrilo, Malin Daase: Clarifications on polynia's definition: Polynias are water surrounded by fast ice either by seasonal or multiyear. They produce young ice. Polynia is a marginal ice zone. It's a hot spot in the ice where biota congregates.

Igor Smirnov: polynias are more or less stable category among ice related habitats. But we need to explain why we include this third category.

Garry Donaldson: we want as much as we can to explain the situation within the polynia and we have enough biological data we can describe this as well.

Igor Smirnov: We need to add a couple of words on polynias to the introduction as well.

Garry Donaldson: we need to describe how polynia could change over the time, how we can predict it.

Garry Donaldson: is there anything we can say about biodiversity based on polynias trends?

Maria Gavrilo: we can speculate. We can use polynias data in part 5 "Future projections".

Polynias do not move. They are rather stationary but they can change in size. They could be better or worse developed.

Garry Donaldson: is there any information on lower trophic (taxonomic) levels?

Malin Daase: compared to ice covered area we can get earlier algae bloom or larger subsequent zooplankton concentration in polynias area.

Maria Gavrilo: but it could be just an effect of marginal ice zone… not the polynia itself. Plus light condition plays its role. In the darkness polynia won't play a role in production increase.

Igor Smirnov: to my mind polynias play a role in the ecosystem so we need to include them in the report.
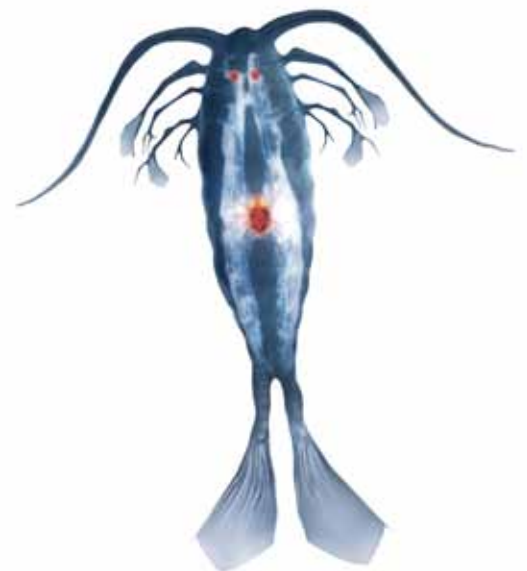
Copepod. Photo: digitalbalance/ Shutterstock.com

Human dimensions: is there any data on polynias use by locals in Russia?

Boris Vdovin: the most active marine mammal hunt takes place along the ice edge. Exception is Sireniky polynias. Locals use bioresources of the polynia with the help of small boats, they hunt whales and walruses. There's a local population of grey whales staying there all year round.

Maria Gavrilo: there's local settlement close to Chukotka coast related to polynia location. On the other hand polynia area is the area where the early shipping starts in the season plus oil exploration will be first developed soon. In Atlas we consider human activities development in the Arctic - it's good reference to have. We emphasize mostly habitat issues. Rich and diverse ecosystems are more attractive to human activities so they are more vulnerable. Polynias are a hot spot in terms of animal consecration.

Garry Donaldson: Northern sea route will be available earlier this year. It's interesting to consider in biodiversity perspective.

Polynias issue was not discussed in Vancouver.

General trend between 1983 and 2011 is decreasing of multiyear ice and increasing of first year ice.

Stas Belikov: what will happen with Arctic biodiversity due to Arctic climate change. We have to predict what will happen. There're two scenarios which have to demonstrate. Warming climate or cycling?

Maria Gavrilo: all the graphs we have are based on recent data (satellite age), but we have to consider broader perspective. I follow the cycling hypothesis. So the actions to be done can be different in case of cooling climate and warming climate. But the differences in actions are not big. We have just to consider both ways of situation development.

Evgeny Syroechkovskiy: It's good to have plan A or B. But let us listen to Andrey's opinion on the situation.

Fishing hole in Greenland. Photo: Lawrence Hislop/ UNEP-GRID Arendal

Since it's more a political approach - stressing on climate warming.

Andrey Popov: Even on the graphs we can find short climate cycles. If we remember salinity anomalies times we'll sey that they coincide with these climate cycles. Such anomalies influence greatly all climatic processes and now we can expect increase in amount of multiyear ice and fast ice. Russian climatologist Zakharov has demonstrated that it's almost impossible for all multiyear ice to be become seasonal due to desalinated ocean water in Arctic. Dissemination of such fresh water lens to Atlantic will change position of atmospheric water zones and trajectory of the cyclone.

Evgeny Syroechkovskiy: the longer data set you have the more fluctuations (waves) you'll see. So most of these alarming pictures of this warming are taken in certain part of the curve. If you consider the whole XX century you'll see that the trend is gentler. Nobody doubts that for the moment there's some ice decline and warming but in larger scale the situation is not that critical. This is our Russian Arctic scientists' beliefs.

Maria Gavrilo: we got papers stating that the climate changes are mostly related to solar activities.

Stas Belikov: all the models use green house as a major reason for climate change, but natural factors are more powerful.

Garry Donaldson: it's important for the document to decide what timeframe we use.

Maria Gavrilo: it's not our task to predict the events and build the scenarios - we have to deal with them both and to consider human impact on biodiversity as an additional process under changing climate conditions. We just have to be aware about the situation, no to analyze the situation.

Garry Donaldson: we are not climate experts so we can't predict what'll happen.

Evgeny Syroechkovskiy: are those 2 scenarios considered within CBNP?

Tom Barry: they are not considered as two separate scenarios but future predictions are made.

Garry Donaldson: we have to address the biodiversity within warming scenario but to consider the possibility that we deal with the cycles as well.

Multiyear ice situation

What impact changes in multiyear ice could have on biodiversity? Which species use multiyear ice? Multiyear ice is not an enormous concern in term of species survival.

Areas between MY ice and seasonal ice are habitat for some mollusks species and benthos (the highest production zones). Due to vertical organic flow in Barents sea and Chukchi sea we can find a lot of zooplankton eating fish species such as cod or pollock.

Large amount of MY ice becomes a limiting factor of high productivity but when it's replaced by seasonal ice it's no longer a limiting factor.

Xenia Kosobokova: Central part of the ocean is covered with thick MY ice which prevents light penetration. Even if ice becomes thinner then we will still have very little food for zooplankton due to nutrients. The highest biomass of zooplankton is found along ice shelf and it correlates with ice thickness. We could lose species diversity in lower taxonomical levels but in zooplankton the changes will not be that severe since Arctic has never been that productive.

06.03.2012

Summary of the first working day, Garry Donaldson

Presentation: Multiyear Ice, Xenia Kosobokova

The material was received from drifting stations and icebreakers. Study area – deep central Arctic Ocean where we can expect to have MY ice. The map of zooplankton distribution was obtained. Usually the values of the biomass are higher in Eurasian Arctic. The nutrition conditions are the best in those areas. There's a belt of elevated biomass along the perimeter of the ocean. MY ice restricts local primary production. In the Canadian Arctic we don't have any connection with Atlantic Ocean – hence only local populations. And we expect that general distribution of biomass will remain the same in the nearest future.

Arctic communities in winter

Entire community spends winter with low activity level. Zooplankton is able to accumulate energy in lipids. Our knowledge about species survival in winter season is based on summer observation. The data was collected from drifting stations, from cruises near Spitsbergen, from research station in the White Sea and from the icebreakers in the Kara and Barentz sea. In March a number of taxa in the Barentz sea was very active and has already started to reproduce.

Some copepods were very active already in February in Kara sea.

In the White Sea some benthic and plankton species were reproducing in April already.

So we concluded that quite a portion of zooplankton is awake during the second part of the winter.

Igor Melnikov: There's a station next to North Pole run by Washington specialists. There're data about intrusion of Atlantic species in to the Arctic

Xenia Kosobokova: there's an intrusion of Atlantic water but the species even if there're usually die very fast due to different ocean condition. But we had no observation of new species.

Stas: Is decreasing of biomass of zooplankton to the south connected to frontal zone?

Xenia Kosobokova: It could be but the frontal zone is not marked very well. Marginal seas are comparatively less productive comparing to the open sea, so biomass is decreasing to the south.

Reindeer herder in Northern Russia, Komi Republic.
Photo: Pecold/Shutterstock.com

Presentation: Seasonal Ice, Igor Smirnov

What may happen with seasonal ice through the time – warming or cooling of climate?

Differences in biology of MY and seasonal ice. MY ice is self supported system, more than 100 species (used to be), now – about 20 species. Seasonal ice is formed in winter during dark period - hence there's no photosynthesis. Since MY ice proportion decreases in Arctic it's becoming more similar to Antarctic system.

MY system consists of 2 types of communities – surface community (a lot of fresh water algae) and marine system. Inside of the ice there used to be 100 species including invertebrates.

Stability of the system: during the summer upper part of ice cover melts but in winter this layer is compensated by the growing layer underneath. Meanwhile the organisms colonize lower layers. So the structure remains the same. The algae inhabiting ice produce organic to be used by invertebrates.

The number of species in MY ice decreased from over 80 to less than 30. The question is if the changes are local (Canadian Arctic) or they take place in the whole Arctic?

Around the North Pole species number decreased from 60 to 20 in 2007-2011.

About 80% of ice in Arctic now is seasonal ice with no algae. 6% is MY ice.

We need summer observations in order to observe seasonal ice.

Garry Donaldson: what do you expect to find during summer observation? Why would we need that information?

Igor Smirnov: We want to sample ice course, to study thin layer of water isolating seal ice from "real" sea water. We need to study biological communities and upper part of water column. Ocean now is a new system

Stas Belikov: Are there any data from the previous periods which will allow to compare modern period and previous one?

Igor Smirnov: There were Soviet Union and Canadian drifting stations. But there're no data for plankton.

Maria Gavrilo: Most ivory gull sightings are related to marginal ice zone which coincides in space with shelf break and Atlantic water. So it's a good feeding habitat for ice associated species.

When ice edge will be retreated to upper ocean it will coincide with lower production zone. If the ice extends further south the marginal area will become less productive. So too much ice could have negative consequences as well.

Xenia Kosobokova: zooplankton can't actively move against the currents so they are dependent on the water movements and can't change their distribution under changing conditions. Unlike for example birds which can follow the ice.

Evgeny Syroechkovskiy: The situation for the ringed seal, ivory gull and polar bear is the best ever possible based on your report?

Maria Gavrilo: I wouldn't say the best but under current climate conditions this marginal zone is the best area for these species.

Human dimension

Boris Vdovin: We can focus on 4 countries where indigenous people support themselves using sea ice: Chukotka, Alaska, Canada, Greenland. In other areas people do not depend that much on marine environment. There are differences in environmental conditions in those 4 areas (climate factors…). For ex. Chukotka is affected by Sibirian anticyclone. We found out that warming or cooling periods depend on intensity of the cyclonic activity. In Alaska the picture is different. The main climate driver is transport of cyclonic activity along Aleutian deep. Canada is located in rather continental climatic zone and affected by anticyclone. Canada can be divided into 2 sections – Manaut and Hudson Bay. Greenland has two subregions – east and west coast. Bering strait currents also influence environmental conditions. There are warmer currents along the Alaska coast.

We participated in SIKU program (ice in Eskimo language). Boris Vdovin was responsible for meteorological issues. Besides they organized monitoring with help of locals combining traditional and scientific knowledge. The results obtained were not encouraging because too different approaches. So these two approaches can only supplement each other. We can't set meteostation in any place, the place should be certain. Locals monitor nature very actively so we can get additional data for the areas where they hunt for example.

In Chukotka we organized this work with the help of Beringia park stuff. We got rather broad data and are analyzing it.

"Scientific and traditional knowledge in the Bering Strait"

There was an idea that warming in the Arctic is more significant in winter time but our data for Chukotka region didn't show that. Probably this situation is like that in Alaska.

Based on Arctic and Antarctic institute data ice maximum for the Bering sea was in late 70th and late 90th (coincide with cooling period). The interannual variations in ice conditions are significant.

Stas Belikov: the preferable food source for indigenous Chukotka people changed from ringed seal in spring and summer to walruses because of increasing number of walruses along Chukotka coast. Ringed seal is hunted now only in winter time. It was noted that walruses became thinner in general, the body condition is worse, probably since they have to travel a lot through the open water areas now.

Seals. Photo: TTPhoto/Shutterstock.com

Future projections

The idea was to look at the situation with ice associated biodiversity in three areas – MY ice, seasonal ice and polynia and to build on what possibly will be happening in the longer time frame with these. It's more of speculating about the future trends.

Stas Belikov: representatives from Arctic and Antarctic institute could probably show predictive models. Tom Barry: distributed the forms to be filled in order to provide a contribution to the report. The timeline is the middle of April. It could be in any language.

The results of the workshop will be sent out to the participants afterward in order to facilitate contribution process and data exchange. There'll be several review period – everybody will be able to see how the information will be use. There'll be CAFF review, national review and finally Arctic Council review (end of July).

Evgeny Syroechkovskiy: It'll be very important that before the document submission all the contributors agree on what's written in the report.

Recommendations

In Vancouver recommendations for science, conservation, policy, communication were formulated.

Stas Belikov: we should better say "conservation and management". We have to clarify for whom these recommendations are addressed.

Tom Barry: our recommendations will go to AC and only after that will be forwarded further.

Igor Melnikov: sometimes it's difficult to involve younger generation in to polar research. We have to consider this issue as well.

Science recommendations

Shift research focus more to lower trophic level. Megafauna is object that is easy to attract funding for. Use models for trends in sea ice changes.

We have to take into consideration potential impact sources. We should use local knowledge and involve local communities into the process.

Maria Gavrilo: shift research completely – is too strict phrase. The point could be just to improve or enhance capacity of such research, to use ecosystem approach in order to cover all levels.

Igor Melnikov: it's important to use standard methods and tools since the material needs to be comparable (for example plankton nets mesh size).

Malin Daase: we need more data on winter time situation with some species, we know very little about polar night period.

Mapping, spatial analysis, remote sensing

Identifying sensitive habitats, use them as focal areas for vulnerable (in terms of vulnerability to changes

in ice situation) species…remote sensing measures as a proxy for biodiversity. Identify biodiversity hotspots for developing further conservation activities.

Xenia Kosobokova: we still know very little about such fragile special as jelly fish and other gelatinous species. They are understudied. Use of new devices (such as ROV) is very expensive so we have to highlight this in the document, improve the methodology to cover the entire ecosystem.

Maria Gavrilo: if we talk about timing mismatch then we have to add spatial mismatch as well.

Stas Belikov: change of the preferable habitat is an important issue for the marine mammals including polar bears. New problem is dissemination of new diseases and invasive of alien species. Higher level of trophic chain depends on the processes in lower levels – we should to study the possible effects on largeк animals as well.

Garry Donaldson: probably the point is mostly in availability of the habitat.

Xenia Kosobokova: Increase of temperature in general will decrease the size of zooplankton cells so the prey size for bigger animals will also decrease. We cannot comment of phytoplankton right now but shift in size is also possible.

Maria Gavrilo: I think that the level of details is too high. We have to address it in more general way – like to study processes taking place in the ecosystem (structure and functions).Decreasing in cell size is just one of the phenomena to be studied.

Evgeny Syroechkovskiy: we have to decide on the size and structure of the recommendation keeping in mind the target audience of the report.

Tom Barry: this should be relevant for policy makers so there will probably be a summary of the report as well. We have to present to AC say 20 pages of very detailed recommendation and we sure want to get a positive response.

It's really important to enhance the coordination of monitoring.

Malin Daase: "proof consistently" should be stressed since if it's a monitoring it should be continuous work.

Evgeny Syroechkovskiy: community based monitoring is a good tool but it's not universal. It's good for monitoring only a limited number of issued. In many cases it's not working. So we have to make sure that this tool is properly used. It could be waste of time or giving a wrong message to the local community.

Stas Belikov: Primary production should be monitored in the whole ice covered area with a special attention to the deep basin area.

Conservation and management recommendations

Stas Belikov: under Russian conditions we have to speak not about local communities but regional authorities or settlements. Plus sometimes we have to include tourism as a threat not only industrial activities.

Maria Gavrilo: maybe it's not enough just to learn about industrial activities planned.

Evgeny Syroechkovskiy: unsustainable use of resources is a threat in general. Sustainable use of resources could be a separate point in relation to fisheries for ex.

Maria Gavrilo: if we are talking about ice biodiversity then the question arise - how do local authorities prevent loss of sea ice?

Evgeny Syroechkovskiy: there might be some mechanisms for protection of marine environment in general in the world. Should we go in details in this conservation issue?

If we are going to protect dynamic zone, moving animals, moving zones we have to develop a tool for that which we do not have yet. The recommendation could be to look at the examples of the other non Arctic areas.

Christine Michel: we could you examples of fisheries, having temporal restrictions for fishing. But of course it's easier for megafauna.

Malin Daase: for some species any protected habitats are important (such as polar bears or ivory gulls). We can identify hot spots and identify the important areas based on that.

Maria Gavrilo: we have to improve conservation approach to certain types of the areas.

Policy recommendations

Ecosystem based management is important.

We have to keep in mind that this section is what AC will first look at. We should develop policy recommendations in linkage with the scientific ones. Conservation and communication recommendations should be reflected as well.

Communication recommendation

Protection of any ecosystem needs special measures if it's mobile or shared between several states. The information should have a target audience. Probably we should involve communication experts to contribute to report preparation

We have to make sure that the information on lower trophic levels is available for public as well.

Presentation: Distribution of zoobenthos biomass in the Barents Sea, Stas Denisenko

The biomass was lower in 2.5 times in 70th. The max biomass will coincide with ice cover.

Stas Belikov: should we monitor the shift of arctic species distribution to the Arctic? It's a stressful factor for Grey whales since some amphipods are important food source for them.

Stas Denisenko: during warm period some species can penetrate to the Arctic areas faster than arctic species can penetrate in opposite direction. Amphipods are very movable in general.

Garry Donaldson: question on sea ice association. Can you show the connection between changes in sea ice and benthos species?
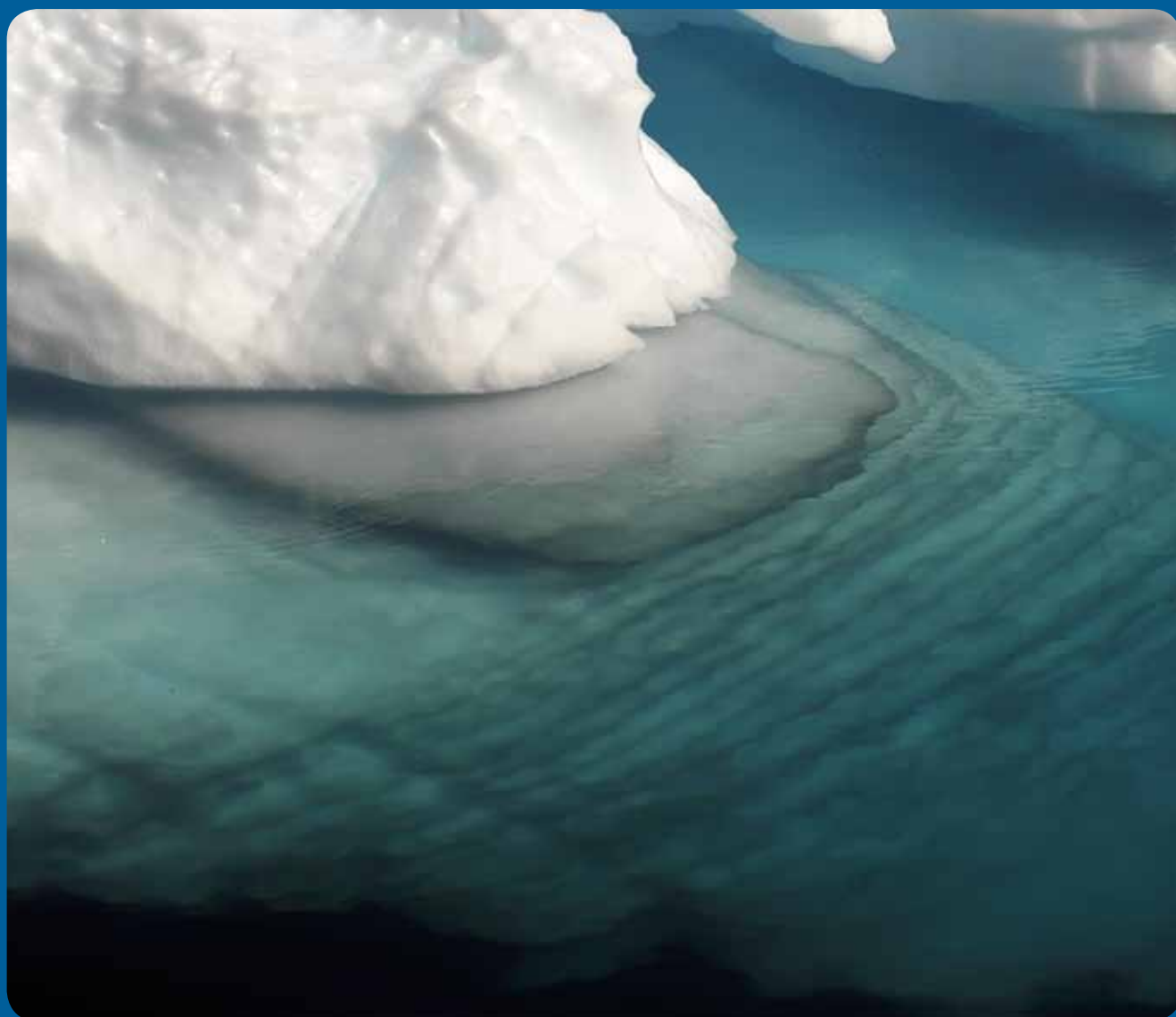
Stas Denisenko: zooplankton in the Barentz sea doesn't like cold water. When the ice melts it cal make the water cooler which will affect the species abundance.

Further discussion

The materials should be prepared by April 15th (filled templates and any other important information). The material should be evidence based so provide references. Figures and maps are appreciated. The presentations could be uploaded to the website.

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