



Arctic Biodiversity Congress Bulletin

Summary of the Arctic Biodiversity Congress 2014

Published by the International Institute for Sustainable Development (IISD) in collaboration with the Arctic Council's Conservation of Arctic Flora and Fauna (CAFF)



ONLINE AT [HTTP://WWW.IISD.CA/BIODIV/ARCTIC/2014/](http://www.iisd.ca/biodiv/arctic/2014/)
VOLUME 88, NUMBER 5, SUNDAY, 7 DECEMBER 2014

SUMMARY OF THE ARCTIC BIODIVERSITY CONGRESS: 2-4 DECEMBER 2014

The Arctic Biodiversity Congress was held from 2-4 December 2014 in Trondheim, Norway. It was organized and hosted by the Arctic Council's Conservation of Arctic Flora and Fauna (CAFF) working group in co-operation with the Norwegian Environment Agency, and was co-chaired by Risa Smith, CAFF Chair, Tom Barry, CAFF Secretariat, and Finn Katerås, Norwegian Environment Agency.

The Congress addressed the conservation and sustainable use of Arctic biodiversity through dialogue among all relevant stakeholder groups. The meeting brought together around 450 representatives from academia, governments, industry, civil society and indigenous peoples.

The Congress aimed, among other things, to: present and discuss the main scientific findings in the 2013 Arctic Biodiversity Assessment (ABA); provide different stakeholder groups the opportunity to collaborate around the themes of the ABA; advise CAFF on "Action for Biodiversity: Implementing the Recommendations of the ABA 2013-2021," which will be presented to the Arctic Council Ministers in April 2015; highlight the work of CAFF and the Arctic Council in circumpolar biodiversity conservation and sustainable development; and mainstream biodiversity and ecosystem services ensuring that the ABA recommendations are implemented widely and across sectors.

The Congress focused on three main themes: Arctic change, resilience and adaptation; mainstreaming biodiversity and linking Arctic ecosystems to society; and understanding cumulative effects and managing impacts. Additional sessions addressed case studies and scenario planning.

A BRIEF HISTORY OF THE ARCTIC BIODIVERSITY CONGRESS

The Arctic Biodiversity Congress was convened to address the outcomes of the Arctic Biodiversity Assessment (ABA), a region-wide assessment of threats to Arctic biodiversity conducted by the Conservation of Arctic Flora and Fauna (CAFF) working group of the Arctic Council. This brief history outlines the origins of the Arctic Council, CAFF and the ABA, with reference to key Arctic Council Ministerial Meetings and relevant meetings of the Convention on Biological Diversity (CBD).

The Arctic Council is comprised of the eight Arctic states (the Russian Federation, Canada, the US, Denmark (including Greenland and the Faroe Islands), Norway, Sweden, Finland and Iceland) and six organizations with permanent participant status, representing the indigenous peoples of the Arctic: the Inuit Circumpolar Council, Saami Council, Aleut International Association, Russian Association of Indigenous Peoples of the North (RAIPON), Arctic Athabaskan Council and Gwich'in



Participants fill the room for the opening plenary

International. Observers organizations from non-Arctic states, inter-governmental, inter-parliamentary and non-governmental organizations also contribute to the Council's work.

The Council was formally established through the Ottawa Declaration of 1996, as a high-level, consensus-based, intergovernmental forum to provide a means for promoting cooperation, coordination and interaction among the Arctic states, with the involvement of the Arctic indigenous communities and other Arctic inhabitants on common Arctic issues. Biennial declarations of the Arctic ministers set the agenda and mandate of the Arctic Council.

The majority of the Arctic Council's activities are conducted in six working groups: CAFF, Arctic Contaminants Action Program (ACAP), Arctic Monitoring and Assessment Programme (AMAP), Emergency Prevention, Preparedness and Response (EPPR), Protection of the Arctic Marine Environment (PAME), and the Sustainable Development Working Group (SDWG). Their work covers a broad range of fields, from biodiversity to climate change to emergency response.

CAFF was established in 1991 under the Arctic Environmental Protection Strategy (AEPS, a precursor to the Arctic Council) in order to promote the conservation of Arctic biodiversity. CAFF was subsequently incorporated into the Arctic Council.

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The *Arctic Biodiversity Congress Bulletin* is a publication of the International Institute for Sustainable Development (IISD) <info@iisd.ca>, publishers of the *Earth Negotiations Bulletin* © <enb@iisd.org>. This issue was written and edited by Nienke Beintema, Kate Neville, Ph.D., and James Van Alstine, Ph.D. The Digital Editor is Kate Harris. The Editor is Brett Wertz <brett@iisd.org>. The Director of IISD Reporting Services is Langston James "Kimo" Goree VI <kimo@iisd.org>. Funding for coverage of this meeting has been provided by CAFF. IISD can be contacted at 161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba R3B 0Y4, Canada; tel: +1-204-958-7700; fax: +1-204-958-7710. The opinions expressed in the *Bulletin* are those of the authors and do not necessarily reflect the views of IISD. Excerpts from the *Bulletin* may be used in other publications with appropriate academic citation. Electronic versions of the *Bulletin* are sent to e-mail distribution lists (in HTML and PDF format) and can be found on the Linkages WWW-server at <<http://www.iisd.ca/>>. For information on the *Bulletin*, including requests to provide reporting services, contact the Director of IISD Reporting Services at <kimo@iisd.org>, +1-646-536-7556 or 300 East 56th St., 11D, New York, New York 10022, USA.



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CAFF's mandate is to address the conservation of Arctic biodiversity and to communicate its findings to the governments and residents of the Arctic, helping to promote practices that ensure the sustainability of the Arctic's living resources. It provides a mechanism to develop common responses on issues of importance for the Arctic ecosystem, such as development and economic pressures, conservation opportunities and political commitments. CAFF is governed by a rotating Chair and a Management Board, and supported and coordinated by the International CAFF Secretariat.

Arctic Council Ministerial Meetings: Arctic Council Ministerial Meetings take place every two years, and mark the hand-over of the chairmanship of the Arctic Council.

The need to identify and fill knowledge gaps on various aspects of Arctic biodiversity and monitoring was identified by a number of reports and assessments, including CAFF's "Strategic Plan for the Conservation of Arctic Biological Diversity," welcomed and endorsed at the first Ministerial Meeting in Iqaluit, Canada, in 1998, and CAFF's report on "Arctic Flora and Fauna, Status and Conservation," welcomed by the Arctic Council at the third Ministerial Meeting in 2002, in Inari, Finland. The 2004 Arctic Climate Impact Assessment recommended the expansion and enhancement of long-term Arctic biodiversity monitoring, and led to the development of the [Circumpolar Biodiversity Monitoring Programme \(CBMP\)](#), which was endorsed by the Arctic Council at its fourth Ministerial Meeting in Reykjavik, Iceland, in 2004.

The Arctic Biodiversity Assessment (ABA) was endorsed at the Arctic Council's fifth Ministerial Meeting in Salekhard, Russian Federation, in 2006. At the eighth Arctic Council Ministerial Meeting in Kiruna, Sweden, in 2013, the Arctic Council welcomed the ABA, approved its recommendations and encouraged Arctic states to follow up on its recommendations, and instructed its Senior Arctic Officials to ensure the development of a plan for further work under the Arctic Council to support and implement its recommendations.

The ABA serves as a baseline upon which the CBMP will build, providing up-to-date status and trends information to support ongoing decision making and future assessments of Arctic biodiversity. It 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. The ABA has been an inclusive process that has harnessed the efforts of over 250 scientists from ten countries, including both Arctic and non-Arctic states.

In accordance with the Kiruna Declaration (2013), CAFF developed an eight-year implementation plan, "Action for Biodiversity: Implementing the recommendations of the ABA 2013-2021," to ensure concrete actions are taken based on the policy recommendations arising from the ABA. This plan will guide Arctic Council efforts to address biodiversity in the coming decade. It will be presented to the Arctic Council ministers at their ninth Ministerial Meeting in Iqaluit, Canada, in April 2015. The Arctic Biodiversity Congress, organized by CAFF, was a key step to receive guidance and feedback on the development of this plan.

CBD meetings: The CBD has recognized the importance of Arctic biodiversity in a global context, and highlighted the need for continued collaboration between the CBD and CAFF.

At its tenth Conference of the Parties (COP10), held in 2010 in Nagoya, Japan, CBD invited CAFF, through COP Decision X/13, to provide information and assessments to the CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). Against this background, CAFF submitted to SBSTTA the first deliverable from the ABA process, which was the 2010 "Arctic Biodiversity Trends: Selected Indicators of Change," which presented a preliminary assessment of status and trends in Arctic biodiversity. At its fifteenth meeting,

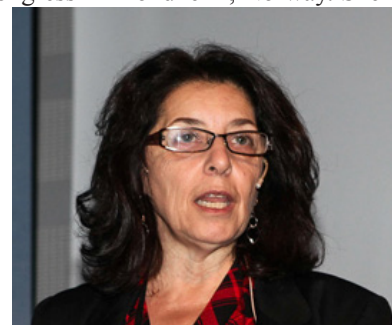
held in November 2011 in Montreal, Canada, SBSTTA discussed and recognized this report, and decided on a series of recommendations for the COP, which recognize the importance of Arctic biodiversity in a global context and highlight the need for continued collaboration between the CBD and CAFF. CBD COP11 welcomed the report and noted its key findings.

REPORT OF THE MEETING

OPENING OF THE CONGRESS

On Tuesday, Risa Smith, Chair of the Arctic Council's Conservation of Arctic Flora and Fauna (CAFF) Working Group and Congress Co-Chair, welcomed participants to the first Arctic Biodiversity Congress in Trondheim, Norway. She highlighted the Congress as an opportunity to influence the actions of Arctic states over the next decade on conservation and sustainable use, noting the Congress outcomes would be presented to the Arctic Council Ministerial Meeting in April 2015.

Tom Barry, Congress Co-Chair, remarked on the diversity of Congress participants.



Risa Smith, Conservation of Arctic Flora and Fauna (CAFF) Chair and Arctic Biodiversity Congress Co-Chair

PLENARY STATEMENTS

On Tuesday, Tine Sundtoft, Minister of Climate and Environment, Norway, identified climate change as the most serious threat to Arctic biodiversity. She added that climate change makes the Arctic more accessible to industrial activities, which also brings other stressors to the region. She noted the 20th Conference of the Parties (COP) to the UN Framework Convention on Climate Change (UNFCCC) is taking place concurrently in Lima, Peru, stating that the "long-term fate of Arctic biodiversity depends on our abilities to reduce greenhouse gas emissions." Highlighting the Arctic Biodiversity Assessment (ABA) as a "landmark report" that incorporates contributions from scientists and holders of traditional knowledge, Sundtoft underscored ongoing work on an action plan to implement the ABA recommendations.

Vincent Rigby, Chair of the Senior Arctic Officials of the Arctic Council, called CAFF's work essential to the Arctic Council's aims of environmental protection and sustainable development. He noted the Arctic Council

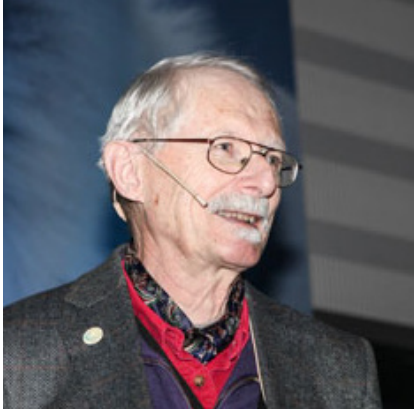


Vincent Rigby, Chair of the Senior Arctic Officials of the Arctic Council

has become action-oriented and involved in shaping policy, such as through its contribution to the development of the Minamata Convention on Mercury. Rigby underscored the importance of the Congress in setting the Arctic biodiversity agenda for the next decade, highlighting the need for a positive vision and cross-disciplinary, multi-stakeholder approach, as well as actions that Arctic states will find "credible and implementable."

Áile Jávo, President of the Saami Council, welcomed delegates to Sápmi, the homeland of the Saami people. She called for increased efforts to address the needs of the Saami people, particularly the preservation of their traditional culture and livelihoods and the right to own land. Highlighting the cumulative effects of the oil, gas and mining industries on ecosystems and reindeer husbandry, and the fact that these effects are often ignored, she stated that there can be no co-existence between reindeer husbandry and mining.

Hans Meltofte, ABA Chief Scientist, outlined the ABA's key results, noting the Assessment drew on more than 4,500 scientific papers and involved over 250 scientists. Identifying climate change as "by far" the most serious threat to biodiversity, he pointed to impacts including the loss of snow and ice cover at rates exceeding initial projections and "Arctic squeeze," whereby Arctic species are pushed further north by southern species. He highlighted that the ABA synthesis offers 40 suggestions for improved Arctic biodiversity conservation, of which 10 are listed as priority actions.



Hans Meltofte, Chief Scientist, Arctic Biodiversity Assessment

Mette Wilkie,
UN Environment

Programme (UNEP), described the diversity of Arctic peoples and ecosystems, outlined key challenges linked to climate change and human activities, and emphasized actions to address these challenges. She pointed to potential for The Economics of Ecosystems and Biodiversity (TEEB)'s Arctic Scoping Study to offer a valuation of Arctic biodiversity that could be incorporated into national policies and programmes. She also encouraged awareness raising and advocacy, collaboration and participation across international and regional conventions, and climate change mitigation and adaptation.

Braulio de Souza Dias, Executive Secretary of the Convention on Biological Diversity (CBD), said global issues that are relevant to the CBD, such as climate change, ocean acidification and overfishing, and that they are also compromising the fragile ecosystems and critical services of the Arctic. Noting that Arctic biodiversity must be seen as a global issue, and underlining the synergies between the ABA and the CBD, he stressed the need to scale up and speed up actions outlined in ABA and CBD recommendations, including the CBD's Aichi Biodiversity Targets and Pyeongchang Roadmap 2020.



Braulio F. De Souza Dias,
Executive Secretary, Convention
on Biological Diversity (CBD)

On Wednesday morning, highlighting the vulnerability of the Arctic and the pressures on the region, Janos Pasztor, WWF International, underscored the need to implement the ABA policy recommendations. To translate recommendations into action, he called for active support for international efforts on climate change, including international agreements and the development of renewable energy, low-carbon energy

systems and green economies. He suggested incorporating resilience and adaptation into development, for instance by using WWF's "Rapid Assessment of Circum-Arctic Ecosystem Resilience" mapping tool and participating in the TEEB Arctic scoping study. He also advised adopting an ecosystem-based management (EBM) approach, which he said allows the participatory and inclusive integration of social, environmental and economic policies and practices. On mainstreaming biodiversity and safeguarding ecosystems, he encouraged governments and industry to develop pan-Arctic networks of specially managed and protected areas and northern refugia, including the possibility for a UN Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site in the region and an Arctic marine protected area (MPA) framework. Adding that Arctic Council working groups engage in useful research but cannot compel action, Pasztor urged Arctic states to develop their own accompanying national plans and present implementation progress reports.

PANEL DISCUSSION

Arctic ecosystems in a global perspective: On Tuesday morning, delegates engaged in a panel discussion entitled "Arctic ecosystems in a global perspective," with representatives from the Arctic Council states, permanent participants and observers. The panel discussion was moderated by Else Berit Eikeland, Norway's Senior Arctic Official, Norway, and addressed two main questions: how do changes in Arctic ecosystems affect ecosystems outside the Arctic; and how do actions taken outside the Arctic affect Arctic ecosystems?

Okalik Egeesiak, chair of the Inuit Circumpolar Council (ICC), stressed that Inuit interests and traditional knowledge must be incorporated in policy-making processes. She lamented the large influence of industry and business in development planning.

Pernille Møller, Government of Greenland, stressed that changes in the Arctic affect the entire world. She cited several examples, including long-range bird migration and the wider effects of climate change in the Arctic, and also described significant changes already observed in Arctic ecosystems due to climate change.

Tómas Orri Ragnarsson, Ministry of Foreign Affairs, Iceland, underlined the importance of the ABA findings and policy recommendations, stressing that these should be used as key instruments for concerted action. He emphasized the role of observers in the Arctic Council discussions.

Bud Cribley, Bureau of Land Management, US, described recent changes to ecosystems in Alaska, including the increased occurrence of wildfires as a result of climate change. He drew attention to the effects of other threats, including population growth and the oil and mining industries, and called for caution regarding new shipping routes.

On sustainable development in the Arctic, Ragnarsson highlighted the importance of fisheries management and opportunities for renewable energy such as geothermal energy; Møller noted concerns with changes in fisheries such as increasing mackerel catches and tuna being caught in Greenlandic waters for the first time this year; and Cribley stressed the importance of public involvement by local communities in oil and gas development on Alaska's North Slope.

Maarten Loonen, University of Groningen, stressed that "we don't have to go to the Arctic to affect the Arctic," noting that farming practices in the Netherlands have positively affected populations of geese. Underscoring the interconnectedness of issues, he said that migratory birds carrying bird flu might be an issue with regard to poultry farming.



Second round of panelists for the "Arctic ecosystems in a global perspective" discussion. L-R: Moderator Else Berit Eikeland, Norwegian Ministry of Foreign Affairs; Maarten Loonen (Netherlands), Arctic Centre, University of Groningen; Masaki Uchida (Japan), National Institute of Polar Research; and Choon Beng How (Singapore), National Parks Board.

Masaki Uchida, National Institute of Polar Research, Japan, discussed the objectives of the Arctic Climate Change Research Project within the Green Network of Excellence (GRENE) programme in Japan. He noted progress made on protecting wetlands in Japan and the potential impact of extreme events such as severe earthquakes on migrating birds.

How Choon Beng, National Parks Board, Singapore, highlighted Singapore's efforts to protect migratory bird habitat. He discussed ongoing work to bring together data collected from migratory bird sites in the region.

On questions related to the effects of changing weather on animal and plant composition and migration in coastal areas, How said changing weather has not affected marine mammal migration in Singapore, and Uchida said Japan is collecting data on the impacts of changing weather on animal and plant composition.

International cooperation and global conventions: addressing Arctic biodiversity: On Thursday afternoon, delegates engaged in a panel discussion on "International cooperation and global conventions: addressing Arctic biodiversity," with representatives from multilateral environmental agreements (MEAs) and indigenous organizations. The discussion was moderated by Inge Thaulow, Government of Greenland.

Spike Millington, East Asian-Australasian Flyway Partnership, stressed that migratory birds exemplify how the Arctic is linked to the rest of the world. He used the nearly extinct spoon-billed sandpiper as an example, saying that the major threats to the species occur not in the Arctic but in its staging area in China, particularly because of land reclamation.

Mette Wilkie, UNEP, highlighted several of UNEP's collaborative partnerships to advance Arctic biodiversity conservation. She cited examples of UNEP's work, including raising awareness beyond the Arctic, in particular in relation to climate change, chemicals and waste, air pollution and marine litter. She stressed the importance of making information available in local languages.

Tobias Salathé, Ramsar Secretariat, described ongoing developments under the Convention on Wetlands of International Importance (Ramsar Convention) with relevance to Arctic biodiversity, noting recent collaboration between Ramsar and several Arctic states. He called for increased effort to implement the ABA recommendations, moving from assessment to action on the ground.



Mette Wilkie, Director, Division of Environmental Policy Implementation, UN Environment Programme (UNEP)

Gunn-Britt Retter, Saami Council, said the Arctic Council is a unique international forum, serving as a worldwide example of how to incorporate the interests of indigenous peoples and local communities. She noted increasing use and understanding of traditional knowledge, and linkages between the Arctic Council and the international arena, including through the CBD and Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).

Jacques Trouvilliez, African-Eurasian Migratory Waterbird Agreement (AEWA) Executive Secretary, elaborated on activities under the AEWA relevant to CAFF and the Arctic Council. He highlighted the Arctic Migratory Birds Initiative (AMBI) and activities on the sustainable use of waterbird species. He also flagged an upcoming review of AEWA in relation to seabird species, and stated that AEWA aims to be a practical instrument, including through its single-species action plans.

Citing examples of how CAFF and the Arctic Council could engage with other MEAs, Anne-Hélène Prieur-Richard, DIVERSITAS, highlighted opportunities through IPBES task forces that address, among other things, how to use indigenous and local knowledge along with scientific knowledge, and how to improve dialogue between scientists and other knowledge holders.

Braulio de Souza Dias, CBD Executive Secretary, highlighted that the Aichi Biodiversity Targets, adopted throughout the UN system, provide a common framework for action. Pointing to a regional plan in the Pacific that links protected area action with the Aichi Targets, he encouraged the development of a regionally relevant policy framework for the Arctic that links ABA recommendations and the Targets.

In the ensuing discussion, panelists addressed questions on, among other things: barriers to the Arctic Council and its states leading the way on the implementation of the Aichi Targets; engagement with actors outside the Arctic and biodiversity communities, including through the strategic timing of key events; and opportunities provided by the sustainable development goals (SDGs) and the post-2015 development agenda. They also recalled the need for better information sharing, in order to reduce reporting burdens, and commented on the importance of traditional knowledge, participatory monitoring and community involvement.

ROUNDTABLE DISCUSSIONS

On Wednesday morning, participants engaged in a brainstorming exercise in a roundtable setting, which was identified as "a broad, multi-disciplinary and participatory space" for discussing the ABA and its recommendations. The discussion was facilitated by Natasha Walker, Natasha Walker Associates, and focused on ABA recommendations.

Debating which of the 17 ABA recommendations require immediate actions, participants prioritized the recommendations on "identifying and safeguarding important areas for biodiversity and developing communication" and "outreach tools and methodologies to better convey the importance and value of Arctic biodiversity and current changes." Many, however, remarked that all 17 ABA recommendations are urgent enough to be addressed immediately, and that all recommendations require long-term actions. Underlining that implementation is "doable" and already underway, they called for an integrated and collaborative approach. Some participants felt that the recommendations were too generic, particularly those on mainstreaming biodiversity and improving knowledge and public awareness.

On Wednesday afternoon, delegates resumed their discussions in the roundtable setting, focusing on mainstreaming biodiversity. In order to increase the extent to which biodiversity considerations underpin their work, they



Participants filled the room for a plenary talk and roundtable discussions

suggested: increased efforts to demonstrate why biodiversity is important for people, including through outreach and education; more funding for biodiversity research; linking biodiversity to other scientific issues, and extending it to a landscape scale; and avoiding the misuse and misrepresentation of scientific results.

Among barriers to mainstreaming biodiversity, they identified: a lack of long-term political will and commitment; a gap between science and practice; that biodiversity is deemed less important than development, and biodiversity conservation is seen as too expensive; tension between use value and intrinsic value; structural impediments, such as institutional rigidity, sectoral silos and scale mismatches; the lack of human, technological and financial capacity; and unresolved issues surrounding data ownership and rights.

On Thursday, participants resumed their roundtable discussions to talk about “innovative and effective policies” to ensure conservation of Arctic biodiversity and its sustainable use, with attention to how these might be implemented. Their suggestions included: creating positive competition for action among Arctic nations, for instance to be the first to implement CBD targets; adopting true co-management approaches that recognize equality across different value systems; bringing traditional knowledge and other scientific approaches together at the knowledge generation stage; and maximizing the educational benefits of tourism, such as through the integration of tourism and citizen science.

Participants also recommended: refining the ABA recommendations and making them more strategic for policy, including categorizing and reducing the number of recommendations; developing pilot implementation projects and “piggy backing” onto existing regional policies; engaging with policy actors beyond government agencies and the national level; and improving knowledge-based communication and support for better biodiversity policy.

PARALLEL SESSIONS

Three main themes guided the flow and organization of the Congress: Arctic change, resilience and adaptation; mainstreaming biodiversity and linking Arctic ecosystems to society; and understanding cumulative effects and managing impacts. Parallel sessions on these overarching themes ran throughout the Congress, with special sessions focusing on case studies and scenarios.

ARCTIC CHANGE, RESILIENCE AND ADAPTATION: How to preserve the tundra in a changing climate: This session on Tuesday afternoon was chaired by Johan Olofsson, Umeå University.

Sonja Kivinen, Turku University, discussed current and future climate conditions and vegetation in Northern Fennoscandia. Using representative concentration pathways, which are new greenhouse gas scenarios from the Intergovernmental Panel on Climate Change’s Fifth Assessment Report, she noted the impact on vegetation in the Fennoscandian tundra according to four possible climate scenarios.

Elina Kaarlejärvi, Umeå University, explored the effect of herbivores on vegetation composition and tundra plant diversity in a warming Arctic, highlighting that the impact of climate warming on tundra plant diversity depends on herbivory. She said warming decreases species richness in the absence of mammalian herbivores, while warming may increase species richness in grazed areas.

Jane Jepsen, Norwegian Institute for Nature Research (NINA), discussed birch forest resilience to insect outbreaks at the forest-tundra ecotone. Jepsen concluded that trees in the year-round grazed regime have lower survival and capacity to shoot following moth outbreaks and that short-term exclusion of reindeer promotes forest regeneration but only under year-round grazing.

Mariska te Beest, Umeå University, discussed the influence of reindeer grazing on shrub growth, and its consequences for albedo, a measure of the reflectivity of a surface that is important for understanding climate change. She noted higher albedo on heavily grazed areas, although she said this differed by vegetation type.

Cécile Ménard, Finnish Meteorological Institute, discussed herbivory and modeling of the energy budget in Fennoscandia with reference to the “butterfly effect,” where small changes in complex systems can have large effects elsewhere. She



Participants representing different stakeholder groups came together to address the ABA recommendations.



The challenges of mainstreaming biodiversity kept delegates engaged and involved through the afternoon.

highlighted that topography may attenuate the effect of changes in vegetation cover and that more data is needed to assess the initial conditions and responses of the system.

Tim Horstkotte, Turku University, presented on integrating science and policy in the socio-ecological systems of Northern Fennoscandia. He stressed the need for the co-production of practice-oriented knowledge by science and society for policy decisions. He called for the development of novel institutions, stating that Sápmi could gain a more prominent role and position as a region.

Participants asked questions on a variety of issues, including the resilience and resistance to change of governance systems, invasive species and challenges of measuring the number of grazing reindeer.

Measuring current and future impacts of changing Arctic biodiversity: a pan-Arctic perspective: This session on Wednesday was chaired by Louise McRae, Zoological Society of London.

Stefanie Deinet, Zoological Society of London, addressed trends in Arctic migratory birds. She presented preliminary results of a global analysis of trends for 1970-2011, commissioned by CAFF and the Convention on the Conservation of Migratory Species of Wild Animals (CMS). Noting that the total abundance of 160 reference species increased until 1990, and then showed a subsequent slight decrease, she emphasized that there are different trends by taxonomic group and per flyway. She pointed out that while waterfowl abundance increased by 120% since 1970, there is a marked global decline in shorebirds, and although the flyways of the Americas and Eurasia show a slight increase, the Central and East Asian flyways show a steady decline. Noting the need to improve monitoring of land birds and seabirds, and of vast areas in Asia and Russia, she stressed that global collaboration is needed.

Donald Reid, Wildlife Conservation Society, addressed mammal distributions, noting diverse effects of global warming. He said some animals, including some cetaceans, now have suitable habitat that extends beyond historical boundaries, while other animals, including ice-dependent species such as polar bear and walrus, now face food and habitat limitations from stress and disease. Among necessary actions, he suggested: designating terrestrial and marine protected areas; minimizing disturbance, including through spatial buffers, timing windows and limits on tourism; and ensuring sustainable long-term subsistence use, by combining monitoring and co-management with local knowledge.

Niels Martin Schmidt, University of Aarhus, addressed collapsing lemming cycles in Greenland, focusing on predator-prey interactions. He showed how collapses in historical four-year lemming cycles resulted in productivity changes in snowy owl (98% decline), long-tailed skua (85% decline), and Arctic fox (27% decline), although there are significant local

differences. He said in the longer term, snowy owls may move away, while Arctic foxes may turn to alternative sources of food, and noted that long-term monitoring is needed to truly understand the system.

Pieter Beck, European Commission Joint Research Centre, presented multiple lines of evidence for increased Arctic shrub abundance. Noting that models predict a “biome shift,” whereby current vegetation zones will shift northwards, he said these predictions are now backed by tree ring and satellite data on spruce from Alaska. Beck identified positive feedback mechanisms that facilitate the “drastic redistribution of vegetation” driven by climate change, including: permafrost thaw that will release more greenhouse gases into the atmosphere; albedo changes that will allow the earth’s surface to absorb more solar heat; and snow accumulation around shrubs that will increase the shrubs’ temperature and therefore enhance their growth. Beck said increased carbon capture by future vegetation will not offset these effects.

Identifying and safeguarding important/sensitive areas: This session on Wednesday was co-chaired by Tom Christensen and Hans Meltofte, Aarhus University.

Meltofte discussed mapping and prioritizing the protection of biodiversity hotspots in the Arctic. He noted that, as evidenced from the ABA, there is a lack of knowledge on the locations of unique Arctic species, and said this underscores the importance of mapping.

Mette Frost, WWF Denmark, discussed WWF’s Last Ice Area project, which mapped resilient summer sea ice using global climate models. She highlighted that WWF views a precautionary approach to sea ice conservation is warranted given that “life is linked to ice.”

Henry Huntington, The Pew Charitable Trusts, called for more detailed analyses of polynyas, areas of open water surrounded by sea ice. He stated that such analyses could help identify pressing spatial and temporal challenges. He recommended that an interactive and collaborative Arctic polynyas atlas be developed as a planning and communication tool.

Anna Kuhmonen, Barents Protected Areas Network (BPAN), noted that the BPAN project promotes and supports the establishment of a representative network of protected areas in the Barents region. She stressed the links with CBD Aichi Biodiversity Target 11, which aims to protect 17% of terrestrial and inland water areas and 10% of marine and coastal areas by 2020. She stressed the need for the prompt establishment of planned protected areas and conservation of the remaining intact forests.

Mikhail Stishov, WWF Russia, discussed the evolution of the Russian Arctic network of protected areas. He highlighted that the network grew rapidly in the early 2000s, but that the distribution of protected areas in the Russian Arctic remains uneven with significant gaps. He noted that WWF would like to see the protected area network guarantee the conservation of Arctic biodiversity under current conditions by eliminating or minimizing human impacts, and increase to cover 26% of the total Russian Arctic.

Christensen highlighted international efforts to identify important biodiversity and ecosystem areas using examples from Greenland. He compared selected criteria through, for example, the CBD Ecologically or Biologically Significant Marine Areas, IUCN MPAs, IUCN Key Biodiversity Areas, and



Anna Kuhmonen, Finnish Environment Institute

International Maritime Organization (IMO) Particularly Sensitive Sea Areas (PSSAs). He also outlined a desk-based study to establish criteria for identifying important biological areas in Greenland.

Participants offered questions engaging various issues including: accounting for climate change in protected areas planning; focusing on marine, not just terrestrial protected areas; the role of tourism in driving demand for protected areas; the impact of changing Russian Federation politics on WWF's work; and the use of criteria under the International Finance Corporation-related concept of "critical habitat."

Global consequences: changing climate conditions for water-related ecosystems in the Arctic: Tobias Salathé, Ramsar Secretariat, moderated this session on Thursday, noting that using Ramsar's broad definition of wetlands, more than 60% of the Arctic can be defined as wetland areas.

Michael Becker, McGill University, described his work on ground ice thermokarst in the Canadian High Arctic, explaining the development of "polar oases" within polar desert landscapes from the melting of ice. He clarified this was a case where the threat was not to a wetland landscape but to a polar desert biome.

Chelsea Chisholm, Copenhagen University, outlined her work on plant communities and interactions in the Arctic and Subarctic, noting that climate change may not affect plant phenology in expected ways and that the region demonstrates great heterogeneity in impacts. On monitoring and measuring change, she underscored the need for work on a broader array of species in the Arctic, noting many species remain understudied.

Sergius Kuzmin, Russian Academy of Sciences, described amphibian and reptile diversity and change in the Arctic. He advised: establishing effective surveys and inventories of Arctic amphibian and reptile populations; establishing species monitoring programmes; studying the impacts of long-term habitat change on these species in the Arctic; and determining key territories of importance.

Hilary White, Wilfrid Laurier University, spoke on her work on characterizing the influence of climate change on shallow lakes in a Subarctic ecological transition zone in Canada. She highlighted the measurement tools used to assess change in a region with rapid change, detailing the use of isotopic tracers in water and sediment samples.

Ray Valente, Shell Global Solutions, discussed a partnership between Shell and Wetlands International on conserving wetlands and mitigating the potential impacts of Shell's Arctic development activities. On monitoring, he underscored the need for baseline data, and on public awareness, he highlighted the importance for Shell of increasing its own understanding of the importance of environmental protection.

Participants discussed, *inter alia*: uneven drying trends across the Arctic, drawing on experiences from different study areas; whether industry data are publicly available; shifting baselines; and the importance of historical analyses in climate and biodiversity projections.

The following sessions were also held on Arctic change, resilience and adaptation:

- How to approach collaborative research on herbivory: an ecological interaction of key importance, chaired by Virve Ravolainen, Norwegian Polar Institute, on behalf of The Herbivory Network;
- Pathogen diversity in the Arctic area: implications for ecosystem sustainability and human health under accelerating change, co-chaired by Eric Hoberg, US Department of Agriculture (USDA), and Susan Kutz, University of Calgary;
- Adaptive ecosystem-based approaches to monitoring in the Arctic, chaired by Rolf Anker Ims, University of Tromsø;

- Arctic arthropods: practical and profitable, chaired by Toke Høye, Aarhus University;
- A horizon scan of the management of Eurasian reindeer, chaired by Jon Moen, Umeå University;
- Value and endangered vegetation habitats in the Arctic: criteria and approaches to conservation, co-chaired by Natalia Koroleva, Russian Academy of Sciences, Marc Roekaerts, Council of Europe, and Kristine Westergaard, Norwegian Institute for Nature Research (NINA);
- DNA barcoding and meta barcoding of Arctic biodiversity: current insights and future prospects, co-chaired by Torbjørn Ekrem and Elisabeth Stur, Norwegian University of Science and Technology (NTNU) University Museum; and
- Tools for monitoring, assessing and managing, chaired by Kári Fannar Lárusson, CAFF Secretariat.

MAINSTREAMING BIODIVERSITY AND LINKING ARCTIC ECOSYSTEMS TO SOCIETY: Partnerships in the Arctic: examples of mutual engagement for biodiversity conservation: On Tuesday, session chair Robert Blaauw, Shell International, underscored the value of partnerships for Shell to enhance industry performance and improve relationships with key stakeholders. He expressed hope that the Congress would allow for a "balanced debate" on Arctic oil and gas.

Frank Hoffmann, Wetlands International, described Wetlands International's collaborative approach with corporations, calling them a "critical friend," and underscoring that the organization's central goal is to safeguard and restore wetlands. He noted that most oil and gas development takes place in wetland areas and that the search for oil and gas is extending into "pristine regions" such as the Arctic.

Offering perspectives from an independent consulting company, Igor Semenov, EthnoExpert, described his firm's interdisciplinary, field-based approach to assessing the impacts of Arctic oil and gas exploration on indigenous communities and traditional land use, with a focus on Russia.

Louis Bruzy, Shell Exploration and Production, described a collaborative "Baseline Studies Program" developed in collaboration with communities on Alaska's North Slope. He explained the programme aims to address information gaps and community concerns about offshore exploration, as well as incorporate traditional ecological knowledge into Shell's decision-making processes.

Tatiana Minayeva, Wetlands International, discussed regional partnerships for Arctic wetlands biodiversity restoration, with an example from the Nenets region in northeastern Russia. Describing Wetlands International's science-based approach to its work, Minayeva noted the need for partnerships to fund and support pilot studies.

In the discussion, moderated by Inge Thaulow, Government of Greenland, panelists were challenged to further explain their motivations for working with partners. Minayeva clarified that while Wetlands International does not support oil development in the Arctic, if development moves forward, it wants to minimize the impacts on wetlands and ecosystems.



Participant discussions during the session on a "horizon scan of the management of Eurasian reindeer."



Attentive participants in a session

Blaauw reiterated the value of actions that benefit all stakeholders, and Brzuzy noted the value of partnerships in meeting Shell's sustainability goals. Panelists also discussed, *inter alia*: whether partnerships will contribute to meeting global biodiversity goals; resources made available through partnerships with industry; and how divisions within indigenous communities can challenge partnerships.

Practices in ecological characterization and monitoring in relation to energy exploration and development: On Wednesday, session chair Louis Brzuzy, Shell Exploration and Production, described the challenges involved in characterizing and monitoring Arctic environments, particularly offshore regions. He underscored the need for "real-time information" for management and operations when activity is compressed into a short open-water season, and noted these challenges are driving innovation.

Koen Broker, Shell Global Solutions, outlined Shell's work on monitoring and mitigating the effects of Arctic oil and gas operations on marine mammals, with a focus on acoustic disturbances. He presented a framework for monitoring, which involves identifying: species occurrence; exposure to disturbance; responses to disturbance, particularly behavioral responses; and consequences for species. Broker provided details of sound disturbance modeling and monitoring efforts with a focus on seismic surveys in Greenland and Alaska. For Greenland's Baffin Bay, he noted that ice movements in water produce high levels of ambient noise, and indicated that although seismic testing increased the sound level within the licensing area, at a 100km radius the seismic activity had no impact.

Pat Halpin, Duke University, presented work conducted through the CBD on Ecologically and Biologically Significant Areas (EBSAs), including the development of EBSA criteria, regional workshops and a global repository of EBSAs. He also highlighted that, unlike protected areas, EBSAs are identified as important but entail no mandated management implications. Using overlaid maps, he underscored the spatial and temporal overlaps between areas of oil and gas potential and EBSAs in the Arctic, as well as new Arctic shipping lanes and deep sea fishing areas. Adding that the Arctic also faces shifting baselines, variability in knowledge and new conditions and trajectories, Halpin emphasized the need for dynamic ocean management that can respond quickly to change.

During discussions, participants considered, among other things: existing mechanisms for industry to participate in data sharing; future work on overlaying significant subsistence use areas with EBSAs and areas of oil and gas potential; the role of traditional knowledge in identifying EBSAs; the need for stakeholder engagement in future work on EBSAs; and cumulative impact assessments.

Sustainable management of polar bear in a changing world: This session on Tuesday was co-chaired by Gregor Gilbert, Makivik Corporation, and John Cheechoo, Inuit Tapiriit Kanatami.

Cheechoo presented on Inuit commitments to the conservation, management and sustainable use of polar bear. He described the past 40 years as a period of immense change for Inuit, referring to changes in lifestyle and land rights. Highlighting that several successful agreements are in place, he noted the importance of: researcher-hunter-community relations; inclusion of Inuit throughout the research and management processes; building on common objectives; and communication in all phases. He underlined the impact of inaccurate polar bear publicity on polar bear management.

Frank Pokiak, Inuvialuit Game Council, presented the 1988 Inuvialuit-Inupiat Polar Bear Management Agreement, as an example of community-driven management of a species across the Canada-US border. He noted that it aims to, *inter alia*: maintain viable populations; manage polar bear on a sustainable yield basis; provide increased protection for female bears; incorporate traditional knowledge; and promote data collection and exchange.

Adamie Delisle Alaku, Makivik Corporation, discussed Nunavimmiut perspectives on polar bears in times of change. He pointed out differences between traditional knowledge and Western science, noting that there is no evidence of decreasing polar bear numbers, litter size or condition. He said polar bear health is not dependent on sea ice, as the animals are opportunistic predators that also use land-based food sources. He added that the continued use of the polar bear as an icon to mainstream Arctic biodiversity risks losing the engagement of indigenous people and their trust in science, and that it ultimately will not benefit polar bears or Inuit.

Gilbert, on behalf of James Goudie, Nunatsiavut Government, Canada, addressed the Nunatsiavut Land Claim Agreement, which grants Inuit the exclusive right to harvest animals, including polar bears, throughout the area. He elaborated on the management system, including sampling and enforcement, and noted a 100% compliance rate.

Anne Kendrick, Inuit Tapiriit Kanatami, on behalf of Seth Stapleton, University of Minnesota, highlighted pros and cons of various methods for monitoring polar bears, including physical capture, aerial surveys, genetic capture-mark-recapture and remote sensing. She noted that all alternative methods provide less detailed information than capture-based programmes.

In the ensuing discussion, participants addressed: examples where science works alongside traditional knowledge; the relation between sea ice coverage and polar bear abundance on land; and ways to judge whether polar bear numbers are



Koen Broker, Shell Global Solutions

actually rising. Some participants stated there are more polar bears on land even when sea ice conditions are good, and said the increasing number of polar bears illustrate the success of polar bear management. Others countered that some traditional hunters have identified the changing sea ice as a cause for increased presence of polar bears on land.

The Economics of Ecosystems and Biodiversity (TEEB) for the Arctic: On Wednesday, session chair Alexander Shestakov, WWF Global Arctic Programme, clarified the session would address ecosystem services broadly, considering TEEB as one of several tools for assessing ecosystem values.

Shestakov described the outcomes of the TEEB Arctic Scoping Study, including an inventory of ecosystem services, case studies and a possible plan for moving ahead with further TEEB work. Among challenges, he identified integrating scientific and traditional ecological knowledge and the need to work at multiple scales across countries. He encouraged participants to consider ecosystem services in the ABA implementation plan.

Henry Huntington, The Pew Charitable Trusts, spoke on the evaluation of ecosystem services within the ABA, explaining the focus was on provisioning and cultural services. He identified challenges involved in measuring, collecting and comparing data across the region.

Huntington challenged participants to consider how ecosystem services analyses are applied, noting, for instance, that scarcity might increase some species and habitat values, thus increasing their vulnerability.

Johan Svensson, Swedish University of Agricultural Sciences, spoke on efforts to assess and value ecosystem services in mountain and boreal forest landscapes in Fennoscandia. He said the work uses existing monitoring data and information, and delivers information on ecosystem services to use in land-use decision making. Svensson explained that the project draws on the National Inventory of Landscapes in Sweden (NILS), which has access to extensive field inventory data, as well as on data from reindeer herding communities.

Raychelle Daniel and Carolina Behe, ICC, jointly offered an Inuit perspective on the concept of ecosystem services. They described Inuit traditional knowledge and ways of life, where people are part of the Arctic ecosystem and systems are connected through a food web, and compared it with an ecosystem services approach, which they said is “deconstructive” and tends to exclude biocentric values. They noted that tools to identify costs and benefits can be useful, but underscored the challenges of reconciling two different systems of knowledge.

In discussions, participants addressed the benefits and dangers of identifying and communicating values in economic terms and the multiple dimensions and additional types of ecosystem services. Participants commented, among other things, that: figures are needed in some policy settings where the default value of biodiversity is zero; the Arctic Council and CAFF should show leadership by insisting on expressing values in non-monetary terms; and industrial development does not always involve an all-or-nothing trade off with ecosystem services.



Alexander Shestakov, WWF Global Arctic Programme

Promoting public education and outreach for improved Arctic conservation:

This session on Wednesday was co-chaired by Heather Mariash, McGill University and Association of Polar Early Career Scientists (APECS), and Margaret Beckel, Canadian Museum of Nature and Arctic Natural History Museums Alliance. Five presenters shared experiences with outreach and engagement to advance Arctic conservation. Mariash outlined that APECS seeks to stimulate interdisciplinary and international research collaborations and develop effective future leaders in polar research, education and outreach. She highlighted outreach activities such as a Polar Week in March and September each year, an Antarctic Day and activities of national APECS committees. Beckel discussed the outreach activities of the Canadian Museum of Nature. She noted a variety of activities including: visitor engagement through galleries; temporary and traveling exhibits; public programmes; school programmes on and off site; parties in the museum for young professionals; events targeting scientists; and the extensive use of social media.

Martin Sommerkorn, WWF Global Arctic Programme, discussed his organization’s outreach efforts including: external and internal publications; polar bear campaigns; youth outreach activities such as Voyage for the Future; strategic engagement with the

Arctic Council; and online tools such as the Arctic mapping, communication and learning portal Arkgis.org. He stressed that efforts to translate science to policy need to be better institutionalized to deal with the current environmental challenges.

Inger Greve Alsos, University of Tromsø, discussed outreach activities of the Tromsø University Museum, which is digitizing its collections and making them accessible online through the Norwegian Biodiversity Information Centre and the Global Biodiversity Information Facility. She explained the process of DNA barcoding, noting how species can be compared around the world and how this work has influenced tourism guidelines on the dangers of invasive species in the Arctic.

Gabriela Ibarguchi, University of Calgary, discussed the benefits of citizen science programmes such as eBird, which is a portal where people can upload casual bird observations. She stressed the value of having multiple expert and non-expert observers monitoring bird populations.

Beckel led a participatory activity utilizing a floor map of the Canadian Arctic to demonstrate a school outreach programme and asked roundtable groups to identify lessons learned from outreach experiences. Ensuing discussion identified successful and unsuccessful case studies, and common themes including tailoring engagement to the audience and collaborating with the end users of outreach activities, such as teachers. Some participants recommended establishing an International Arctic Day.

What happens in the Arctic doesn’t stay in the Arctic:

civil society views on Arctic protection: This session on Wednesday, chaired by Neil Hamilton, Greenpeace, brought together speakers from four different civil society organizations (CSOs) to discuss alternate views and approaches to



Martin Sommerkorn, WWF Global Arctic Programme

conservation and development in the Arctic. Hamilton offered a brief description of the term “civil society,” noting its diversity and multiple meanings. He added that the North is an area of interest and concern for many people beyond the region.

Geoff York, Polar Bears International, said CSOs and non-governmental organizations (NGOs) can offer a voice to those who have no voice, including species and ecosystems, and can conduct and fund research, provide community support, and engage in education, outreach and direct action. He described



Neil Hamilton, Greenpeace

Polar Bears International’s single-species focus, noting the organization works to inspire action, enhance government and community conservation efforts and minimize industry impacts.

Tatiana Saksina, IUCN, described IUCN as a neutral forum that brings together diverse stakeholders for

inclusive dialogue on the environment. She said IUCN’s polar programme works at the regional level, and its efforts include addressing oil pollution in the Bering Sea through voluntary measures for shipping and identifying possible Arctic marine World Heritage Sites. She called for the development of a proactive, rather than reactive, approach to Arctic development.

Martin Sommerkorn, WWF Global Arctic Programme, said WWF acts as a facilitator of a proactive approach to shaping the human-nature relationship, not as a neutral information broker. He highlighted the need for the development of a “new global norm,” stressing this requires addressing global boundaries and unevenly distributed risks and opportunities. He noted that decisions about the Arctic are often made in places that are far from where the impacts are felt, and called for connecting governance across scales.

Hamilton explained that Greenpeace acts as a campaigning organization, noting it is distinct from other environmental NGOs through its use of non-violent direct action, and described its origins in contesting nuclear testing as well as the polarization of opinions about its approaches. He said that Greenpeace aims to ban oil extraction in the Arctic, along with unsustainable industrial fishing in the high Arctic. He underscored the need for trust, transparency and openness, noting Greenpeace’s efforts to rebuild relationships with communities in the Arctic.

In discussions, participants commented on, *inter alia*, the potential for civil society to effect change in the context of well funded, politically-powerful industry actors and the need for a radical shift in values. A representative from Shell queried how Greenpeace could reconcile its campaigning and direct actions with its stated interest in dialogue with industry. One Inuit representative underscored the need for CSOs to respect local people, noting the former have often rushed into the Arctic with their own agenda. Panelists also discussed the need for human-centered approaches to conservation and development pathways that are not based on Arctic oil.

Arctic Migratory Birds Initiative (AMBI): This session on Thursday was chaired by Spike Millington, East Asian-Australasian Flyway Partnership, and Victoria Johnston, Environment Canada, on behalf of the AMBI Steering Group. Johnston introduced AMBI, noting that it aims to promote Arctic seabird and shorebird conservation worldwide. She identified habitat destruction and degradation, unsustainable harvest and fisheries by-catch as priority issues, and highlighted the red knot and dunlin as priority species. She

announced that work plans are being completed for four relevant flyways, which will be presented to the CAFF Board and Arctic Council Ministerial Meeting in 2015.

Grant Gilchrist, Environment Canada, presented the draft work plan for the Circumpolar Flyway, noting that it aims to, *inter alia*: develop and implement at-sea surveys and tracking; identify overlap between key habitat and resource exploitation sites; participate in current initiatives to facilitate marine bird and habitat protection; perform by-catch assessments in key regions; develop, test and implement by-catch mitigation measures in the Arctic; and address unsustainable harvest issues.

Nicola Crockford, BirdLife International, presented the draft work plan for the Eurasian Flyway, noting that it uses AEWA as a framework for priorities and builds on AEWA parties’ existing commitments. She highlighted links with the Wadden Sea Flyway Initiative and collaboration with the Ramsar Convention, the World Heritage Convention, the CBD and the Bern Convention on the Conservation of European Wildlife and Natural Habitats.

Rob Clay, Western Hemisphere Shorebird Research

Network, presented the draft work plan for the Americas Flyway. He said it aims to, *inter alia*: identify the magnitude, mechanisms and effects of white goose habitat destruction; understand traditional ecological knowledge and Inuit perspectives on impacts of overabundant goose populations; document the scope of hunting at key sites; publish web-based Best Management Practices regarding rice and shrimp farming; and ensure that key shorebird site information is considered in multilateral agreements and World Bank decision tools.



Nicola Crockford, BirdLife International/RSPB

Evgeny Syroechkovskiy, All-Russian Institute for Nature Conservation, presented the draft East Asian-Australasian Flyway work plan, drawing attention to the decline of waterbirds along the East Asian coast, with Arctic birds comprising the majority of those under threat. Noting that in China alone, 20 million migratory birds are hunted each year, he said the work plan aims to, among other things, ensure protection of three main sites in the region and strengthen intertidal monitoring and research.

Delegates discussed input into the draft work plans, which would be finalized in a post-Congress workshop and forwarded to the CAFF Board meeting in February 2015.

Community conservation: human-polar bear conflict management: Femke Koopmans, WWF Netherlands, chaired this session on Thursday. Geoff York, Polar Bears International, on behalf of Dag Vongraven, Norwegian Polar Institute and IUCN Polar Bear Specialist Group, presented on the status of polar bear sub-populations since 2001. Comparing polar bears in the Chukchi region to those in the Southern Beaufort region, he noted the non-linearity of polar bear sub-population responses to climate change, which he said are influenced by changing sea ice patterns and productivity.

Rascha Nuijten, Radboud University, discussed a circumpolar assessment of threats to polar bears. Considering the relationship of polar bear population density to multiple stressors, including ice cover, human population, harvest and pollution, she concluded that pollution was a significant

variable. While ice cover differences did not explain variation in populations, she stressed this does not mean climate change has no effect on polar bears.

Koopmans presented on community-based human-polar bear conflict management. Highlighting an increase of range-wide attacks and attempted attacks on people since the 1960s, she outlined a variety of management schemes and tools to minimize human-polar bear conflict, such as electric fences, food storage containers, deterrents and education and awareness raising. Koopmans highlighted a variety of community-based programmes that WWF supports in eastern Russia, North Slope Borough, Nunavut and East Greenland.

Eric Regehr, US Fish and Wildlife Service (USFWS), introduced the Polar Bear-Human Information Management System (PBHIMS), which is a tool used by the five polar bear range states to analyze human-polar bear conflicts at national and regional scales. He gave examples of how PBHIMS can facilitate adaptive management, for example by highlighting the need to manage attractants, as one third of human-polar bear conflicts in the Chukchi Sea region were related to human food and garbage. Regehr called for actions to implement effective strategies to address human-polar bear conflicts in the face of predicted climate change.

A panel discussion was held on improving human-polar bear conflict management, integrating local and circumpolar conflict management interventions and linkages to ABA recommendations and CAFF. Panelists included: Regehr; York; Qaiyaan Harcharek, North Slope Borough; Andrei Boltunov, Marine Mammal Council; and Alexander Shestakov, WWF Global Arctic Programme. Discussions engaged with issues such as: the importance of collecting data and developing databases; integrating industrial activity and data streams into PBHIMS; assessing the effectiveness of human-polar bear conflict mitigation tools; communicating human-polar bear interactions to the general public; the need for special polar bear deterrents in remote Russian regions; and producing a CAFF report on recommendations to avoid or mitigate human-polar bear conflict.



Femke Koopmans, WWF
Netherlands

the Biodiversity Indicators Partnership. He said that to make assessments relevant to policy, there must be clear baselines, goals and targets, and a way to assess progress.

Reflecting on the ABA process, Mark Marissink, Swedish Environmental Protection Agency, highlighted “windows of opportunity” in the policy world, and stated that an imperfect answer is often better than no answer for policy makers, urging colleagues to “dare to give an answer” when asked for information. Marissink also underscored the need for open data access.

Tim Wilkinson, UNEP-World Conservation Monitoring Centre (WCMC), offered examples of efforts to speed up data collection, sharing and accessibility through the use of new technologies. Among these, he described: Species+, a centralized online portal for accessing information on species of global concern; Protected Planet, a global database of terrestrial and marine protected areas; and the Blue Carbon Mapping Tool, a mapping system for assessing the impacts of development on carbon stored in coastal ecosystems. He stressed the need for open, standardized environmental data to ensure data is valuable to decision makers.

Tom Barry, CAFF Secretariat, commented on challenges related to translating information into action, lauding the high quality, scientifically credible data produced by the ABA but lamenting the long time period needed for that work. He discussed CAFF’s efforts to shorten its response time and ensure ongoing relevance of its biodiversity work, including using the Circumpolar Biodiversity Monitoring Programme (CBMP) to provide targeted and focused assessments of emerging trends and developing the Arctic Biodiversity Data Service as an open access data platform.

During discussions, participants deliberated on the challenging relationship between science and policy, with diverging views expressed on how scientists should engage with policy makers. Among other issues, participants also considered: mechanisms for harmonizing and sharing data, especially at the international level and over time; the challenges of using sectoral national policies to address the cross-cutting issue of biodiversity; mapping policy effectiveness; and the need for trust.

The following session was also held on Mainstreaming Biodiversity and Linking Arctic Ecosystems to Society: Arctic biodiversity data management and delivery, chaired by Kári Fannar Lárusson, CAFF Secretariat.

UNDERSTANDING CUMULATIVE EFFECTS AND MANAGING IMPACTS: The Circumpolar Biodiversity Monitoring Programme (CBMP), Freshwater: This session on Tuesday was co-chaired by Willem Goedkoop, Swedish University of Agricultural Sciences, and Joseph Culp, University of New Brunswick/Environment Canada, on behalf of the CAFF’s CBMP Freshwater Steering Group.

Tom Christensen, Aarhus University, introduced the CBMP, which aims to expand Arctic biodiversity monitoring, strengthen information and bridge the information-policy gap. He said the programme includes marine, coastal, terrestrial and freshwater groups, and uses an ecosystem-based approach.

Goedkoop said freshwater ecosystems are “mirrors of the landscape,” closely reflecting changes in environment and land use.

Kirsten Christoffersen, University of Copenhagen, gave examples of how freshwater monitoring data can be applied, and outlined how snow and ice cover affect freshwater ecosystems.

Jon Ólafsson, Institute of Freshwater Fisheries, Iceland, addressed the impacts of global warming on Arctic freshwater ecosystems, noting that the complex array of species interactions within the ecological network makes predictions difficult. He described potential effects when systems reach a tipping point.



Qaiyaan Harcharek, North Slope
Borough, US

The future of Arctic Biodiversity Assessments: exploring new ways to shorten the time between information and action:

On Thursday session chair Mike Gill, Canadian High Arctic Research Station/Group on Earth Observations Biodiversity Observation Network (GEOBON), stressed the need to streamline information delivery to decision makers.

Braulio de Souza Dias, CBD Executive Secretary, discussed the CBD’s processes, mechanisms

and tools for linking biodiversity assessments and policy, including the fourth Global Biodiversity Outlook, the Aichi Biodiversity Target framework, the development of IPBES and

John Brittain, University of Oslo, outlined the challenges associated with freshwater monitoring, highlighting case studies from Norway.

Gudni Gudbergsson, Institute of Freshwater Fisheries, Iceland, elaborated on Arctic char monitoring in Iceland, and noted a decline in Arctic char since the 1990s.

Hanna-Kaisa Lakka, University of Helsinki, addressed monitoring of Arctic tadpole shrimp, which she said is an ecologically important but fragile species that is a good indicator for water quality.

Culp described the ongoing process of combining data from national freshwater expert networks to produce the first "State of the Arctic" circumpolar freshwater report by 2017. He underlined the potential role of traditional knowledge and remote sensing, and the need for synergies in monitoring terrestrial and freshwater sites.

In the ensuing discussion, participants addressed: genetic diversity; prioritizing different freshwater ecosystems, for instance small standing waters, glacial systems and newly formed ponds; better cooperation with Russian partners, for instance by involving early-career Russian scientists; monitoring geographical changes in the habitat in cooperation with experts; and linking bottom-up and top-down initiatives.

The Circumpolar Biodiversity Monitoring Programme (CBMP), Marine: effects of stressors and drivers of relevance to biodiversity: This session on Wednesday was co-chaired by Reidar Hindrum, Norwegian Environment Agency, and Thomas Juul-Pedersen, Greenland Institute of Natural Resources, on behalf of the CBMP Marine Steering Group.

Kit Kovacs, Norwegian Polar Institute, presented the findings of a circumpolar monitoring network for ringed seal, focusing on the effects of sea ice loss. She said ringed seals need thick, stable, snow-covered ice for their reproduction, and feed on ice-associated fish species. She said they are already displaying dramatic changes in behavior that show that they are "working much harder." Kovacs highlighted the first global Arctic marine mammal database, initiated by CAFF's Ringed Seal Network.

Edda Johannesen, Norwegian Institute of Marine Research, detailed Atlantic cod predation on polar cod under warmer conditions in the Barents Sea. She explained that polar cod is an ice-associated Arctic fish that plays an important role in Arctic food webs, noting that it has shown a strong decline in the past decade after Atlantic cod moved into the Barents Sea due to temperature changes.

Diana Krawczyk, Greenland Institute of Natural Resources, discussed factors affecting microplankton in Greenlandic waters, including water temperature, salinity, sea ice cover and ocean currents, which in turn are impacted by larger climate patterns. Referring to studies of microfossils preserved in sediments, she noted a rapid glacial retreat in Greenland, beyond the ice cover minimum of the past 10,000 years. She said some observed changes in microplankton are due to increased influx of meltwater, and others due to the warmer seawater, and called for additional offshore monitoring stations.

Lis Lindal Jørgensen, Norwegian Institute of Marine Research, addressed a long-term monitoring plan to identify stressors on benthic (seafloor-associated) biodiversity in the

Barents Sea. Among many stressors, she highlighted climate change, bottom trawling and invasive species. She noted that the distribution of cold- and warm-water indicator species is shifting. On bottom trawling, she said knowledge is lacking on the survival and regeneration of benthic species, but they are likely to be vulnerable. Highlighting the work of the CBMP's Benthos Expert Network, she called for robust indicators, research into cumulative effects of stressors on benthos, and the development of an advisory tool.

Kristine Arendt, Greenland Institute of Natural Resources, discussed ocean-fjord-glacier interactions. She described biological, chemical and physical monitoring in relation to sea ice cover, inflow of warm Atlantic water and glacial melt. She said increased runoff from glaciers influences fjord circulation and species composition, and recommended offshore monitoring, studies on interactions with higher trophic levels and satellite mapping of sea ice.

Delegates discussed, among other things, the need to study interactions between biotic and abiotic factors and human influences, the impact of industry in East Greenland and the impact of pathogens and parasites from warmer waters.

The Circumpolar Biodiversity Monitoring Programme's (CBMP) Arctic Terrestrial Biodiversity Monitoring Plan: an invitation to engage: This session on Thursday was co-chaired by Tom Christensen, Aarhus University, and Mora Aronsson, Swedish University of Agricultural Sciences, on behalf of CAFF's CBMP Terrestrial Steering Group.

Christensen introduced the Group's work, noting that CBMP, a "network of networks," aims to bridge information-policy gaps, uses an ecosystem-based approach and starts from management questions. Aronsson elaborated on development of the CBMP Arctic Terrestrial Biodiversity Monitoring Plan, including cooperation with the International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT).

Gabriela Ibaguchi, University of Calgary, addressed bird monitoring, focusing on the interactions between climate, ecological and anthropogenic effects. She identified several criteria for selecting monitoring priorities, and stressed the need to monitor abundance, distribution and how changes affect birds and ecosystems.

Jesper Madsen, Aarhus University, presented the "first global audit" of Arctic goose populations. He said many goose species populations have increased dramatically in the last century, as geese have adapted to new sources of winter food, notably agricultural crops, but he identified taxonomic and regional differences in trends. He underlined that monitoring the abundance of Arctic geese is important for many reasons, including that the recent "superabundance" of geese is affecting sensitive tundra habitats.

Aleksandr Sokolov, Russian Academy of Sciences, presented on terrestrial biodiversity monitoring in the Yamal Peninsula in Russia, on the border of Europe and Asia. He highlighted some key outcomes, involvement of young researchers and local communities, and outreach activities. Among future priorities, he identified: wider discussion and use of robust standards for data collection; long-term interdisciplinary collaboration; use of an ecosystem approach; and communication with indigenous people.

Don Russell, CircumArctic Rangifer Monitoring Network (CARMA), presented an integrated landscape model to assess cumulative effects of development and climate change on migratory tundra *Rangifer* (reindeer and caribou). He described ways to predict future population sizes of wild herds based on factors such as animal movement, land use and current population size, in combination with data on climate, land cover, infrastructure and harvest, and animal physiological strategies and parameters.



Edda Johannesen, Institute of Marine Research, Norway



Mora Aronsson, Swedish University of Agricultural Sciences

Delegates discussed: the impact of geese “superabundance” on other Arctic bird species; deducing animal diet from vegetation distribution; how to align modeling and monitoring; the importance of invertebrate monitoring; using molecular techniques in monitoring; and involving nature museums in cataloguing specimens and monitoring data.

The Circumpolar Biodiversity Monitoring Programme (CBMP),

Coastal: monitoring and understanding change in Arctic coastal zones: This session on Thursday was co-chaired by Carl Markon, US Geological Survey, and Donald McLennan, Canadian High Arctic Research Station, on behalf of CAFF’s CBMP Coastal Expert Monitoring Network (CEMN).

Tom Christensen, Aarhus University, introduced the CBMP. He emphasized that following the Arctic Climate Impact Assessment, the CBMP moved from a species-oriented to an ecosystem approach, highlighting ongoing efforts towards adopting a holistic approach, integrating the work of its four steering groups.

Noting that the CBMP CEMN only started its work in 2014, Markon said its objectives are to develop a multi-disciplinary, multi-knowledge-based, integrated, pan-Arctic, long-term biodiversity monitoring plan, using both traditional knowledge and science. He presented ongoing work on a background paper and implementation plan, announcing that a first draft of the full monitoring plan is expected in 2015.

McLennan addressed opportunities and challenges for implementing long-term coastal monitoring in Canada’s Arctic, highlighting overlap between the coastal, marine and terrestrial monitoring domains. Among challenges, he identified: efficient collaboration with other monitoring domains, existing initiatives and local communities; the scale and inaccessibility of the area to be monitored; the complexity of the processes driving change; a relative lack of research compared to marine and terrestrial ecosystems; and the high vulnerability of coasts and increasing risk from climate change.

Liudmila Sergienko, Petrozavodsk State University, elaborated on the structure and dynamics of coastal ecosystems of the Russian Arctic, noting that Russia’s Arctic coastline makes up around half of the total Arctic coastline. She described the dynamics of salt marshes on a geological timescale and in relation to recent changes in climate.

Vassily Spiridonov, Russian Academy of Sciences, presented on a network for long-term monitoring of Arctic marine and coastal biodiversity in Russia. He gave a historical overview of research, monitoring and conservation efforts in the region, including the establishment of research stations and marine and coastal protected areas, and described a newly established commission on marine stations and protected areas. Among constraints, he highlighted limited human capacity.

Tatiana Minayeva, Wetlands International, presented on the methodology for the assessment of ecosystem sensitivity in Arctic coastal habitats. She described a theoretical framework for this type of monitoring, highlighting potential outcomes and constraints, and showcased different approaches to classifying Arctic coastal wetlands and defining stability, sensitivity and value.

Invasive species in the Arctic – prevention, detection and response priorities: This session on Tuesday was co-chaired by Brooks Kaiser, University of Southern Denmark, and Denny Lassuy, North Slope Science Initiative.

Lassuy outlined the main ABA recommendations regarding invasive species, including the calls for: more baseline surveys for credible comparisons; early detection monitoring networks; avoidance of intentional introductions; and biological studies of potential invaders. He said each year rats kill more Alaska seabirds than were killed in the Exxon Valdez oil spill.

Linda Fernandez, Virginia Commonwealth University, discussed economic issues pertaining to marine invasive species, including potential motivators for industry to avoid introductions. She stressed the need to quantify these economic motivators.

Matthew Carlson, University of Alaska-Anchorage, addressed patterns of, and vulnerabilities to, non-native plant invasion in Arctic and Subarctic Alaska. Noting that the rate of establishment of non-native weeds is increasing and now numbers eight new species a year, he presented several modeled predictions for future infestations.

Kaiser addressed management challenges with respect to invasive species. She pointed out that both intentional and unintentional introductions are increasing with trade, but this is not the only important factor.

Delegates discussed, among other things, measuring the costs of the introduction of the king crab in the Barents Sea, and developing the infrastructure to address knowledge gaps through science and monitoring.

Planning for risk: use of oil spill modeling, vulnerability assessments, and understanding of environmental effects to support spill response planning and conservation decision making across the Arctic: This session on Tuesday was

chaired by John Payne, North Slope Science Initiative. Mathijs Smit, Shell Global Solutions, discussed managing the risk of Arctic oil spills. He noted that although the likelihood of oil spills in the Arctic is small, concern is high. In order to understand the consequences of oil spills, Smit stressed the need to develop knowledge on the vulnerability of resources, the resilience of habitats, populations of resources and the size of the oil spill.

Rune Bergström, Norwegian Coastal Administration, presented a vulnerability assessment and discussed the probability of ship accidents that cause oil spills in the waters around Svalbard and Jan Mayen. He noted that the most likely ships to have accidents in the areas are fishing vessels and passenger ships, and said estimated oil spills per year are “very low.” He recommended the need for better sea maps, traffic control to all main ports and establishing “precautionary areas.”

Dan Slavic, WWF Canada, and Alexey Knizhnikov, WWF Russia, presented findings from a WWF study modeling oil spills in the Beaufort, Bering and Barents Seas. They said the project sought to inform preparation for oil spill response planning and oceans management and planning. They also said key WWF recommendations included: increased investment in knowledge generation and monitoring; implementing an ecosystem approach at national and eco-region scales; mandatory oil spill modeling; environmental risk assessments;



Liudmila Sergienko, Petrozavodsk State University



Participants listening to a presentation

implementing appropriate spatial and temporal measures to reduce disturbance to significant areas; and improving oil spill response coordination.

Camilla Spansvoll, DNV GL, presented on species vulnerability measures and their use in oil spill risk assessments. She discussed the development of an agreed methodology for the Norwegian oil and gas sector on calculating environmental risk for the marginal ice zone and highlighted vulnerability modeling for seabirds.

In ensuing discussion, participants highlighted, *inter alia*: the need for assessments of oil spill vulnerability to be updated regularly, given the rapidly changing climate; the Polar Code as a step in the right direction for oil spill planning; and the need for accurate and targeted data communications.

Consequences of interacting climate and non-climate drivers on Arctic biodiversity: This session on Wednesday was chaired by Jon Fuglestad, of the Arctic Council's contaminants and climate working group, the Arctic Monitoring and Assessment Programme (AMAP). Marianne Kroglund, Norwegian Environment Agency, introduced the AMAP-led project "Adaptation Actions in a Changing Arctic (AACA)." She noted that previous studies often focused on single drivers, such as health, oil and gas exploration and biodiversity, but said there is still lack of information on how these drivers interact. She said the overarching goal of AACA is to enable more informed, timely and responsive policy and decision making in a rapidly changing Arctic. She also said: focusing on the Barents, Baffin Bay and Davis Strait, and Bering-Chukchi-Beaufort regions, the project will develop regional reports with chapters on the drivers of change, regional scenarios, consequences of change resilience and adaptation options; and the project is expected to be completed by the 2017 Arctic Council Ministerial Meeting. Ensuing discussions considered the integration between the planned reports and regional contexts, and linkages with related work on resilience.

Robbie Andrew, Center for International Climate and Environmental Research, presented on non-climate drivers of change in the Arctic. He outlined a number of drivers of mining and oil and gas development in the Arctic, including reduced sea ice, changing sovereignty, high commodity prices and improved technology. He also identified constraints, such as the difficulty of marine and land access, high startup costs and reliance upon high commodity prices. He summarized that: human population is likely to increase in some Arctic areas and decline in others, such as the Russian Arctic; resource extraction is likely to increase, although its extent remains highly uncertain; the potential for Arctic shipping is overstated but likely to increase; and tourism is likely to increase.

Åshild Ønvik Pedersen, Norwegian Polar Institute, presented on tundra ecosystem responses to climate change in Svalbard. She highlighted that Svalbard is presently on the

verge of a "novel climate" characterized by winters without very low temperatures and summers with longer growing seasons. She highlighted the increase in rain-on-snow events due to warm spells. Citing research on Arctic fox, reindeer, voles, rock ptarmigan and three migratory species of geese, Pedersen outlined how rain-on-snow events have affected the entire Svalbard ecosystem.

Noting that the growing season in Svalbard in 2100 is projected to be as long as that of Denmark in 1980, she stressed that there will be huge challenges in the face of "vast and fast" ecosystem and biodiversity changes. She called for coordinated, circumpolar, long-term, ecosystem-based adaptive monitoring programmes to ensure documentation of these changes as they occur. Participants engaged with issues related to climate data, early warning on vegetation change and comparability to other Arctic regions.

Ecosystems and fisheries: understanding cumulative effects and managing change: This session on Thursday was moderated by Denny Lassuy, North Slope Science Initiative.

Bjarte Bogstad, International Council for the Exploration of the Sea (ICES) Arctic Fisheries Working Group (AFWG), gave an overview of ICES and AFWG. He said that few fisheries management systems move beyond single-species approaches to consider species interactions and climate change.

Edda Johannesen, ICES Working Group, described a new ICES Working Group on Integrated Assessment of the Barents Sea, explaining that it is one of seven integrated ecosystem assessment working groups in the ICES system.

Shannon MacPhee, Fisheries and Oceans Canada, provided an overview of the Beaufort Regional Environmental Assessment Marine Fishes Project, highlighting that it works to establish baseline data on fish biodiversity, represents the first comprehensive ecosystem sampling of fish and habitats in the Canadian Beaufort Sea and was catalyzed by proposed oil and gas development in the region.

Nengye Liu, University of Dundee, spoke on the role of international legal regimes in regulating fisheries, and called for Arctic and other fishing states to develop effective, sustainable regimes. He underscored the EU is an "important player" in the Arctic, noting that one-third of fish caught in the Arctic are sold in European markets.

Calling it a "system of knowledge," Phillip Mundy, US National Oceanic and Atmospheric Administration (NOAA), US, described ecosystem-based management (EBM), also known as the ecosystem approach, noting that it integrates scientific and traditional knowledge. He explained its elements, highlighting that it involves learning and frequent integrated assessments, and can help identify cumulative effects and manage change in ecosystems and fisheries.

Qaiyaan Harcharek, North Slope Borough, detailed the importance of fishing to communities on the North Slope of Alaska. Using a series of photos from the region, and noting that fishing is exclusively for subsistence in the region, Harcharek outlined the success of the region's traditional management system in ensuring sustainable harvesting.

Elling Lorentsen, Norwegian Fishermen's Association, gave an overview of the fisheries industry in Norway. On potential climate change impacts on fish stocks and species, he said fishing fleets would likely be able to adapt quickly, but



Marianne Kroglund, Norwegian Environment Agency

that coastal communities, where most fish processing takes place, need support in predicting changes to fisheries and transitioning their processing capacities.

The role of wildlife harvest in Arctic biodiversity conservation: Henry Huntington, The Pew Charitable Trust, chaired this session on Thursday. Annette Watson, College of Charleston, and Chief Michael Stickman, Arctic Athabaskan Council, presented on managing salmon and food security across the Yukon River drainage communities. Noting 80% of subsistence resource use derives from fish in Alaska's interior, Watson stressed that "we are not just talking about salmon but salmon peoples." She outlined the challenges of meeting the escapement goals for Chinook salmon along the Yukon River drainage, and Chief Stickman highlighted fishing practices in his village. They noted that in 2014, the Yukon River Inter-Tribal Fish Commission agreed on a moratorium on all Chinook fishing in order to meet the escapement goals.

Hans Meltofte, Aarhus University, discussed the competing pressures of hunting and tourism in Greenland. He outlined the challenges of managing thick-billed murre and walrus populations in West Greenland, which have declined significantly over the last century, and called for new management plans for these species. He said that the "take it now" strategy of the Inuit is not compatible with "motor boats and efficient weapons." Meltofte stated that tourism is needed in Greenland, but will require the re-establishment of "rich wildlife" to attract wealthy international tourists.

Jesper Madsen, Aarhus University, discussed the adaptive harvest management of the Svalbard pink-footed goose population. Highlighting the species' rapid increase over the last 50 years, and associated increased agricultural and tundra damage, he underscored the need to start managing the population through hunting. Madsen outlined the process of establishing and implementing an International Species Management Plan for the species, which he said is the first European test case of an adaptive flyway management plan. The plan aims to, *inter alia*: maintain a favorable conservation status of the pink-footed goose population at the flyway level, while taking into account economic and recreational interests; and maintain a population size of 60,000 birds while ensuring sustainable hunting practices in Norway and Denmark.

Julia Newth, Wildfowl and Wetlands Trust, discussed efforts to reduce illegal shooting of Bewick's swans in the Russian Arctic. Highlighting that shotgun pellets have been found in one third of x-rayed swans between 2009 and 2013, she noted that there has been a 38% decline of Bewick's swan populations between 1995 and 2010. With a focus on the Russian Arctic, Newth outlined a work programme to engage with local communities and other wetland users along the flyway to identify best approaches and implement activities for reducing the illegal shooting of Bewick's swans.



Ensuing discussions addressed: the interaction between hunting and tourism in Greenland; contributions of hunters to the conservation of geese; the social construction of harvesting targets; the complexity of resource management; and the interaction between ecosystem-based management, science and traditional knowledge.

The following sessions were also held:

- Circumpolar marine biodiversity in the Arctic, co-chaired by Knut Eirik Jørstad, Institute of Marine Research, Jørgen Schou Christiansen, University of Tromsø and Hein Rune Skjoldal, Norwegian Institute of Marine Research;
- The Circumpolar Biodiversity Monitoring Programme, Sea Ice Biota Expert Network: effects of reduced sea ice cover and increased heat transport on the ice-associated ecosystem in the Arctic Ocean, chaired by Haakon Hop, Norwegian Polar Institute, Bodil Bluhm, University of Tromsø, Michel Poulin, Canadian Museum of Nature, and Cecilie von Quillfeldt, University of Tromsø, on behalf of the CBMP Sea Ice Biota Expert Network; and
- Cumulative effects in the Arctic: challenges and opportunities in a changing environment, co-chaired by Jamie Trammell, University of Alaska, and Scott Slocombe, Wilfrid Laurier University.

CASE STUDIES AND SCENARIO PLANNING:

Traditional knowledge and the co-production of knowledge: creating partnerships for better decisions and actions: This session, which spanned two time slots on Tuesday, was co-chaired by Henry Huntington, The Pew Charitable Trusts, and Carolina Behe, ICC. Speakers presented on various aspects of local and traditional knowledge (TK). Behe discussed the development of the Atlas of Community-Based Monitoring (CBM) in a Changing Arctic, which inventories and reviews CBM projects and practices in the circumpolar Arctic. Behe also presented definitions of TK, and a "multiple evidence-based" approach to connecting different knowledge systems, underscoring the need for trust, respect and reciprocity.

Doug Klassen, Sustainable Development working group, Arctic Council, introduced his working group's project on developing recommendations for the "consistent inclusion" of TK into the work of the Arctic Council, noting this is coherent with longstanding goals of the Arctic Council.

Gunn-Britt Retter, Saami Council, noted that TK offers a "holistic and shared understanding" of the Arctic environment. She also highlighted the need to engage with communities and TK holders in their own languages.

Ravdna Biret Marja Eira, Saami University College, joined the Congress by videoconference, presenting her institution's educational programme on ways of collecting, documenting, systematizing and teaching Saami traditional knowledge.

Frank Pokiak, Inuvialuit Game Council, discussed the Polar Bear Traditional Knowledge Project, which is an example of TK gathering for wildlife management decision making. He stressed that it is premature to conclude that there is a decline in polar bear abundance and condition in the Beaufort Sea area and underscored that polar bears will move to where the ice conditions are good.

In the ensuing discussion, participants addressed: the need to generalize TK so that it is useful in circumpolar decision making; the plurality of TK; that TK used in conjunction with science is a powerful safeguard for biodiversity; the transfer of TK to youth; bringing scientists and hunters together through the co-production of knowledge; the need to integrate TK into

research from the beginning; concerns about campaigns to list the polar bear under CMS; and the importance of combining knowledge with activism and attending policy-making arenas.

Beyond Arctic biodiversity conservation: ecosystem stewardship and resilience: On Tuesday, session co-chair Martin Sommerkorn, WWF Global Arctic Programme, explained the session would consider conceptual frameworks for achieving a more sustainable human-nature relationship, moving beyond biodiversity conservation. Henry Huntington, The Pew Charitable Trusts, and Joel Clement, US Department of Interior, also co-chaired the session.

Phillip Mundy, NOAA, proposed using an ecosystem-based management (EBM) approach, explaining it is a system of knowledge that connects biodiversity and resilience. Mundy noted the EBM expert group of the Arctic Council had presented its recommendations to the Arctic Council's Senior Arctic Officials in 2013, and called EBM "fundamental" to implementing the ABA recommendations. Sommerkorn advocated for an ecosystem stewardship approach, which he described as a concept based on ethics and aimed at informing policy and action. He said a stewardship approach provides a framework for managing ecosystem resilience and human well-being, where the aim is to steer social decisions and manage people rather than resources.



Sharon Mercurief, Aleut International Association

Sarah Cornell, Stockholm Resilience Centre, presented on the Arctic Council's Arctic Resilience Report, pointing to the concept of resilience as useful for understanding the complexity of human and ecological systems, and highlighting the dynamic relationship between resilience and biodiversity. Cornell said previous approaches to conservation and management are ill-suited to a system with changing baselines, and called for precaution, provisionality and participation.

Identifying climate change and oil and gas development as drivers of change in the Arctic, Janos Pasztor, WWF International, called the region a "frontier" with interconnected challenges. He stated that biodiversity conservation must be mainstreamed, noting the ABA recommendations are consistent with this approach, and said low oil prices offer "interesting opportunities" for change.

Speakers discussed the coherency and contradictions in their proposed approaches, with participants noting, among other things, the need to: translate the abstract concepts into language useful to policymakers and communities; have Arctic Council chairs use concepts that carry over beyond their two-year mandates; find communities of practice that implement the proposed governance concepts; and encourage greater interaction between science and policy communities. Speakers also considered the importance of institutional structures and regulatory agencies in integrated Arctic management, as well as the potential to use small-scale projects to demonstrate the value of new approaches.

Using scenario planning for better decisions and reduced risk in the Arctic: This session on Thursday was chaired by John Payne, North Slope Science Initiative (NSSI). Payne outlined the objectives of the NSSI, an intergovernmental effort to increase collaboration at the local, state and federal levels to address research, inventory and monitoring of development activities on the North Slope of Alaska. He

introduced a scenario identification process for decision makers to target research and monitoring efforts for resource management under uncertain future conditions.

Grace Beaujean and Sharon Mercurief, Aleut International Association, introduced the Community Observation Networks for Adaptation and Security (CONAS) project, an international community-based monitoring project for the Bering Sea in Russia and the US. Beaujean noted that CONAS is in the process of developing biological, physical and social adaptive capacity indicators of socio-ecological change, and that it uses a "dashboard model" of aggregating indicator scores to facilitate decision making.

Mercurief described livelihood activities on St. George Island in the Bering Sea within the context of changing socio-ecological systems.

Brien Reep and Mark Brundage, ExxonMobil, discussed ecosystem management on Alaska's Arctic coast using examples from ExxonMobil's Point Thomson project. Reep stressed that safety and environmental core values, which include "nobody gets hurt" and "protect tomorrow today," drive project decision making. He noted the importance of transparent and credible communications. Brundage outlined a variety of initiatives to support culture, health and education in local communities, including: conflict avoidance using vessel tracking technology; improving traditional food storage using engineered ice cellars; and wildlife conservation and monitoring, such as polar bear den detection.

Tom Arnbom, WWF Sweden, discussed ongoing WWF work in the county of Västerbotten, Sweden. He illustrated the competing pressures from dams, tourism, mining, wind power, forestry and reindeer herds, among others, noting Västerbotten's fragmented landscape.

Arnbom said that although dialogue takes a long time, "if you can get trust you can start getting things done."

Questions engaged with a variety of issues including: the short "shelf life" of scenarios; the challenge of landscape planning given the nature of land ownership; the technicalities, environmental baseline data and communities contributions associated with the Point Thomson project; and development of scenarios for Västerbotten.

The following sessions were also held on Understanding Cumulative Effects and Managing Impacts:

- How an ecoregional model of the Barents Sea lends support to science-informed decision making, chaired by JoLynn Carroll, Akvaplan-niva;
- Arctic NBICs in 2035: the political economy of biodiversity in the high north, chaired by Mikå Mered, French Polar Cluster, POLARISK Group;
- The Chukchi Sea Environmental Studies Program (CSESP): an integrated ecological investigation of the Arctic system, chaired by Louis Brzuzy, Shell Exploration and Production;
- Biodiversity of Beringia: past present and future, co-chaired by David Payer, USFWS, and Eric Hoberg, USDA;
- How to set up a land-use scenario and linking it with biodiversity, chaired by Wilbert van Rooij, Netherlands Environmental Assessment Agency; and
- Exploring locally driven adaptation strategies to climate and environmental change: experiences from western Alaska, co-chaired by Beth Kersey and Natasia Levi, Village of Lower Kalskag.



Wilbert van Rooij, Plansup, Netherlands

CLOSING PLENARY

In a brief closing address, Congress Co-Chair Smith said the Congress had served as a large focus group, to gather views on potential follow-up actions, to be presented at the next Arctic Council Ministerial Meeting, 23-25 April 2015. She said that several specific messages had emerged from the discussions, including: that CAFF and the Arctic Council should be “bolder and stronger,” initiating actions that will have a significant impact on the ground; that the Arctic Council has an opportunity to lead the world towards sustainable development, and must place the ABA recommendations in a broader framework; and that the ABA is a beginning, not an end, and must be acted upon.

She said CAFF and the Arctic Council had been empowered by this Congress “to start now,” and encouraged the continued engagement of all stakeholders in CAFF and Arctic Council activities. She closed the Congress at 6pm.

UPCOMING MEETINGS

Arctic Frontiers: Held annually in Tromsø, Norway, this meeting brings together academia, government and business to create a stronger foundation for decision making and sustainable economic development in the Arctic. The 2015 meeting, scheduled for 18-23 January, will focus on climate and energy, with dedicated days to focus on each of three pillars: policy, business and science. Past Arctic Frontiers conferences have addressed themes including: challenges for oil and gas development in the North; the concept of tipping points as it applies to social, economic, and ecological systems in the North; and health, society and environment and maritime operational challenges in the Arctic. **dates:** 18-23 January 2015 **location:** Tromsø, Norway **contact:** Ole Øvretveit, conference manager **phone:** +47 77 75 03 00 **email:** secretariat@arcticfrontiers.com **www:** <http://www.arcticfrontiers.com/>

Third Session of the Intergovernmental Platform on Biodiversity and Ecosystem Services

(IPBES-3) Plenary: This session’s plenary will review progress made on the adopted IPBES work programme for 2014–2018, including the related budget and institutional arrangements for its implementation. The session will consider the initial work programme of the Platform, including task forces on capacity building, knowledge and data and indigenous and local knowledge systems. In addition, IPBES-3 will select the members of the Multidisciplinary Expert Panel based on nominations received from governments. The event will be preceded by consultations and a stakeholder day on 10-11 January. **dates:** 12-17 January 2015 **location:** Bonn, Nordrhein-Westfalen, Germany **venue:** World Conference Centre **contact:** IPBES Secretariat **e-mail:** secretariat@ipbes.net **www:** <http://ipbes.net/plenary/ipbes-3.html>

Jokkmokk Winter Conference 2015: Participants will gather for the Jokkmokk Winter Conference from 2-4 February 2015, under the theme “communicating energy and climate science: delivering benefits to Northern communities!” This annual international forum draws students, decision makers, entrepreneurs and others to address climate change, energy and sustainable development with the aim of creating new strategies and initiatives for the North. The Saami perspective and reindeer herding is an important pillar of the conference. The Conference outputs are shared with governmental representatives from the EU, Sweden, Norway, Finland, Russia, Canada and the US. **dates:** 2-4 February 2015 **location:** Jokkmokk, Norrbotten, Sweden **venue:** Ája-Ájtte Sámi Museum **e-mail:** jwc@jokkmokk.se **www:** <http://www.uarctic.org/news/2014/10/call-for-participation-to-the-jokkmokk-winter-conference-2015/>

14th Session of the UN Permanent Forum on Indigenous Issues (PFII 14): The Permanent Forum on Indigenous Issues (PFII) will follow up on the outcome of the World Conference on Indigenous Peoples (WCIP) and include discussions on the post-2015 development agenda and the possibility of an optional protocol to the UN Declaration on the Rights of Indigenous Peoples (UNDRIP). **dates:** 20 April - 1 May 2015 **venue:** UN Headquarters, New York City **location:** New York City, US **contact:** PFII Secretariat **phone:** +1 917 367 5100 **fax:** +1 917 367 5102 **e-mail:** indigenous_un@un.org **www:** <http://undesadspd.org/indigenouspeoples.aspx>

Arctic Science Summit Week: The Arctic Science Summit Week (ASSW) is an annual gathering of international organizations engaged in supporting and facilitating Arctic research. Bringing together scientists, students, policy makers and other professionals, the Summit provides opportunities for coordination, collaboration and cooperation in all areas of Arctic science. The ASSW 2015 will include the Fourth International Symposium on the Arctic Research (ISAR-4), with the theme “rapid change of the Arctic climate system and its global influence,” and the Third International Conference on the Arctic Research Planning (ICARP III), with the theme “integrating Arctic research: a roadmap for the future.” The event also marks the 25th anniversary of the International Arctic Science Committee (IASC). **dates:** April 23-30 2015 **location:** Toyama, Japan **venue:** Toyama International Conference Center **contact:** Kazuyuki Shiraishi, National Institute of Polar Research **email:** assw2015-office@nipr.ac.jp **www:** <http://www.assw2015.org/>

2015 Arctic Council Ministerial Meeting: Arctic Council Ministerial Meetings take place every two years, and mark the hand-over of the chairmanship of the Arctic Council. The 2015 Ministerial Meeting will mark the conclusion of Canada’s chairmanship (2013-2015) and the beginning of



A panel discussion on “International cooperation and global conventions: addressing Arctic biodiversity” featured representatives from Multilateral Environmental Agreements and indigenous organizations. L-R: Inge Thaulow, Government of Greenland; Spike Millington, East Asian-Australasian Flyway Partnership; Mette Wilkie, UNEP; Tobias Salathe, Ramsar; Gunn-Britt Retter, Saami Council; Jacques Trouvilliez, AEWA; Anne-Hélène Prieur-Richard, DIVERSITAS; and Bráulio de Souza Dias, CBD.

the United States' chairmanship (2015-2017). The meeting, scheduled to be held from 24-25 April 2015 in Iqaluit, Canada, will bring together ministers of the Arctic states and high-level representatives of the Indigenous Permanent Participant organizations to set the Council's objectives for the coming two years. It will be preceded by an event in Ottawa on 23 April to showcase the Council's accomplishments during Canada's chairmanship. **dates:** 24-25 April 2015 **location:** Iqaluit, Nunavut, Canada **contact:** Arctic Council Secretariat **email:** acs@arctic-council.org **www:** <http://www.arctic-council.org/index.php/en/resources/news-and-press/news-archive/935-2015-arctic-council-ministerial-meeting-announced>

SC COP-7: The seventh meeting of the Conference of the Parties to the Stockholm Convention (SC COP-7) will be held from 4-15 May 2015 back-to-back with the twelfth meeting of the Conference of the Parties to the Basel Convention (BC COP-12) and the seventh meeting of the Conference of the Parties to the Rotterdam Convention (RC COP-7). The meetings will include joint sessions among two or three of the conferences of the parties on joint issues, and focus on the theme "from science to action, working for a safer tomorrow." **dates:** 4-15 May 2015 **location:** Geneva, Switzerland **venue:** Centre International de Conférences Genève (CICG) **contact:** Stéphanie Cadet, Secretariat of the Basel, Rotterdam and Stockholm Conventions, UNEP **phone:** + 41 22 917 8324 **fax:** + 41 22 917 8098 **e-mail:** stephanie.cadet@brsmeas.org **www:** <http://synergies.pops.int/2015COPs/InformationforParticipants/tabid/4240/language/en-US/Default.aspx>

Ramsar COP-12: The 12th Meeting of the Conference of the Contracting Parties to the Ramsar Convention on Wetlands (COP-12) will take place in June 2015, in Punta del Este, Uruguay. **dates:** 1-9 June 2015 **venue:** Conrad Resort and Casino **location:** Punta del Este, Maldonado, Uruguay **contact:** Ramsar Secretariat **phone:** +41 22 999 0170 **fax:** +41 22 999 0169 **e-mail:** ramsar@ramsar.org **www:** <http://www.ramsar.org/about/next-cop>

Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) MOP6: The sixth session of the Meeting of the Parties (MOP6) to AEWA is scheduled to take place from 9-14 November 2015 in Bonn, Germany. The year 2015 marks the 20th anniversary of AEWA. Among the MOP6 agenda items for consideration by the Parties are progress on the implementation of the AEWA Strategic Plan and support for the development of the International Waterbird Census (IWC). **dates:** 9-14 November 2015 **location:** Bonn, Germany **contact:** Catherine Lehmann, Associate Programme Officer **email:** clehmann@unep.de **www:** <http://www.unep-aewa.org/en/node/2570>

UNFCCC COP 21: The 21st session of the Conference of the Parties to the UNFCCC is expected to take place in December 2015, in Paris, France. **dates:** 30 November - 11 December 2015 **location:** Paris, Ile-De-France, France **contact:** UNFCCC Secretariat **phone:** +49 228 815 1000 **fax:** +49-228-815-1999 **e-mail:** secretariat@unfccc.int **www:** http://unfccc.int/meetings/unfccc_calendar/items/2655.php?year=2015

2016 IUCN World Conservation Congress: The International Union for Conservation of Nature (IUCN) World Congress meets every four years to bring together leaders from government, the public sector, NGOs, business, UN agencies and indigenous and grass-roots organizations to discuss and decide on solutions to environment and development challenges worldwide. The event will hold a public forum consisting of debates, workshops, dialogues, round-table discussions, training courses, music and exhibitions, as well as a Members' Assembly that will deliberate on IUCN resolutions and recommendations regarding key conservation issues.

dates: 1-10 September 2016 **venue:** Hawaii Convention Center **location:** Honolulu, HI, US **contact:** Ewa Magiera, IUCN Media Relations **phone:** +41 76 505 33 78 **e-mail:** ewa.magiera@iucn.org **www:** <http://www.iucn.org/?14840/Hawaii-to-host-the-next-IUCN-World-Conservation-Congress>

CBD COP 13: The Thirteenth meeting of the Conference of the Parties (COP 13) to the Convention on Biological Diversity (CBD) will be held in Los Cabos, Mexico, in November 2016. **dates:** November 2016 [tentative] **location:** Los Cabos, Baja California Sur, Mexico **contact:** CBD Secretariat **phone:** +1 514 288 2220 **fax:** +1 514 288 6588 **email:** secretariat@cbd.int **www:** <http://www.cbd.int/cop/>

GLOSSARY

ABA	Arctic Biodiversity Assessment
AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
AMAP	Arctic Monitoring and Assessment Programme
AMBI	Arctic Migratory Birds Initiative
CAFF	Conservation of Arctic Flora and Fauna
CBD	Convention on Biological Diversity
CBMP	Circumpolar Biodiversity Monitoring Programme
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CSO	Civil society organization
EBM	Ecosystem-based management
EBSAs	Ecologically or biologically significant areas
ICC	Inuit Circumpolar Council
ICES	International Council for the Exploration of the Sea
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
MEA	Multilateral environmental agreement
MPA	Marine protected area
NGOs	Non-governmental organizations
TEEB	The Economics of Ecosystems and Biodiversity
TK	Traditional knowledge
UNFCCC	UN Framework Convention on Climate Change
UNEP	UN Environment Programme
WCMC	World Conservation Monitoring Centre

