

CAFF Circumpolar Biodiversity Monitoring Programme Monitoring Biodiversity Across the Arctic

Becci Anderson, U.S. Geological Survey

EA International Conference
Fairbanks, AK
25 Aug 2016

Conservation of Arctic Flora and Fauna



- Biodiversity Working Group of the Arctic Council
- Board members from eight Arctic countries six Indigenous organizations
- Observers from non Arctic countries, international organizations

Mandate:

- to address the conservation of Arctic biodiversity, and to communicate its findings to the governments and residents of the Arctic, helping to promote practices which ensure the sustainability of the Arctic's living resources



CAFF Area



32 million km²

- 6 % of earth's surface
- 57% marine/43% terrestrial
- Over 21,000 species
- Key global role

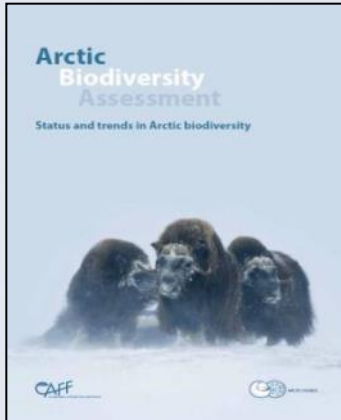


CAFF Activities

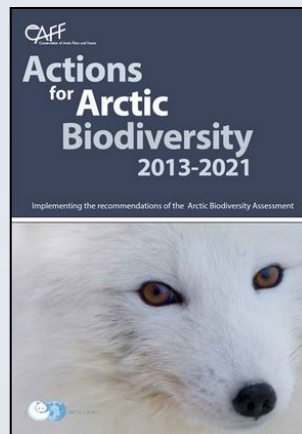
- Assessment
- Monitoring
- Data management
- Conservation strategies & Action plans
- International cooperation
- Education and outreach



Arctic Biodiversity Assessment



- Approved Ministerial May 2013
- Scientific assessment of Arctic biodiversity with Indigenous perspectives of biodiversity change included
- Summary for Policy Makers
- Actions for Arctic Biodiversity 2013-2021; Implementing the ABA recommendations *and* Inform and guide Arctic Council actions on biodiversity



Previous Arctic Biodiversity Monitoring Efforts

Limitations

- Uncoordinated efforts operating in isolation
- Lack long term commitment and funding
- Inaccessible information
- Lack of local involvement

Shortcomings lead to

- Lack of circumpolar perspective
- Incomplete coverage
- Limited ability to detect change
- Reduced ability to inform policy makers

The Challenge

- How do we **better harness our knowledge and capacity** to help make **informed, timely and effective decisions** in the face of **cumulative and accelerating change**?



Circumpolar Biodiversity Monitoring Programme (CBMP)

- International monitoring network of existing networks improving detection, understanding and reporting of Arctic biodiversity trends
- Focal point for current and credible Arctic biodiversity information
- Bridging the information-policy gap

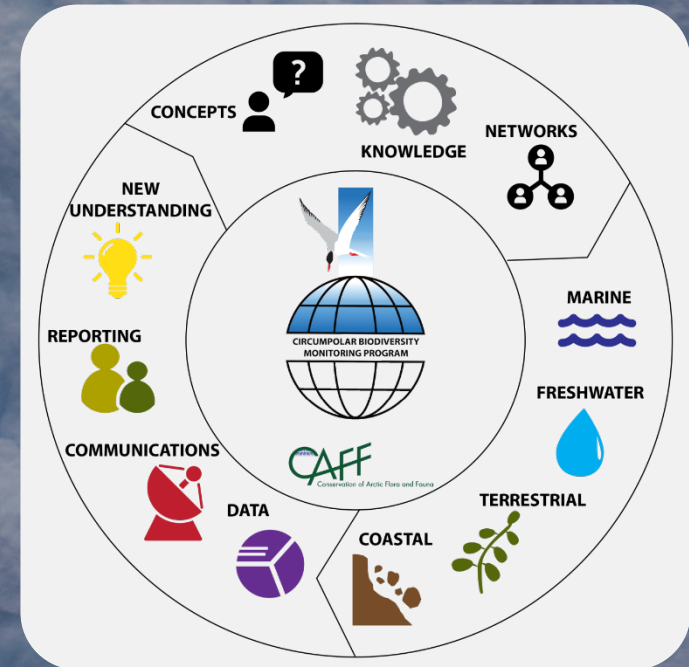


www.cbmp.is



CBMP Characteristics

- A long term and adaptive **ecosystem-based** monitoring program
- Builds on **existing** monitoring efforts
- **Network-of-networks** = international network of scientists and community experts (more than 250 experts involved)
- **Coordinate, standardize** and **harmonize** existing monitoring activities and data = cost savings and value-added for current investment
- Up- and downscaling = Bring ground monitoring up on a **regional** and **international** scale
- Delivers faster and more targeted assessments: Detect and report on change within a **management “time frame”**



CBMP – Four Year Strategic Plan



- CBMP currently led by Greenland / Denmark and US
- Four year Strategic Plan approved in 2013
- Guides the CBMP until 2017, focus on:
 - CBMP/ CAFF as international Focal Point for data on Arctic Biodiversity
 - CBMP as a tool for ABA implementation
 - Harmonization and standardization of monitoring within CAFF
 - Development of first State of the Arctic Biodiversity reports

Next CBMP Strategic Plan 2017 – 2021 is under development: Published in 2017

CAFF and CBMP

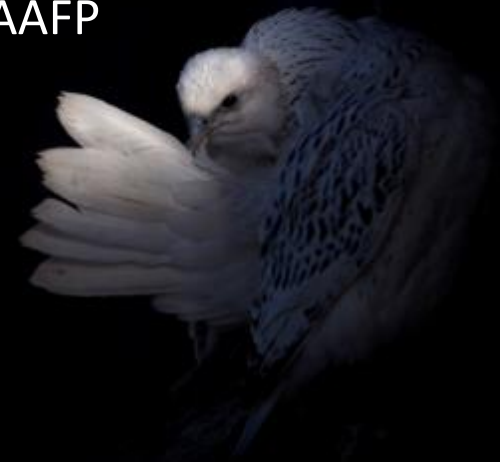
International Linkages

Continued implementation of the CBMP

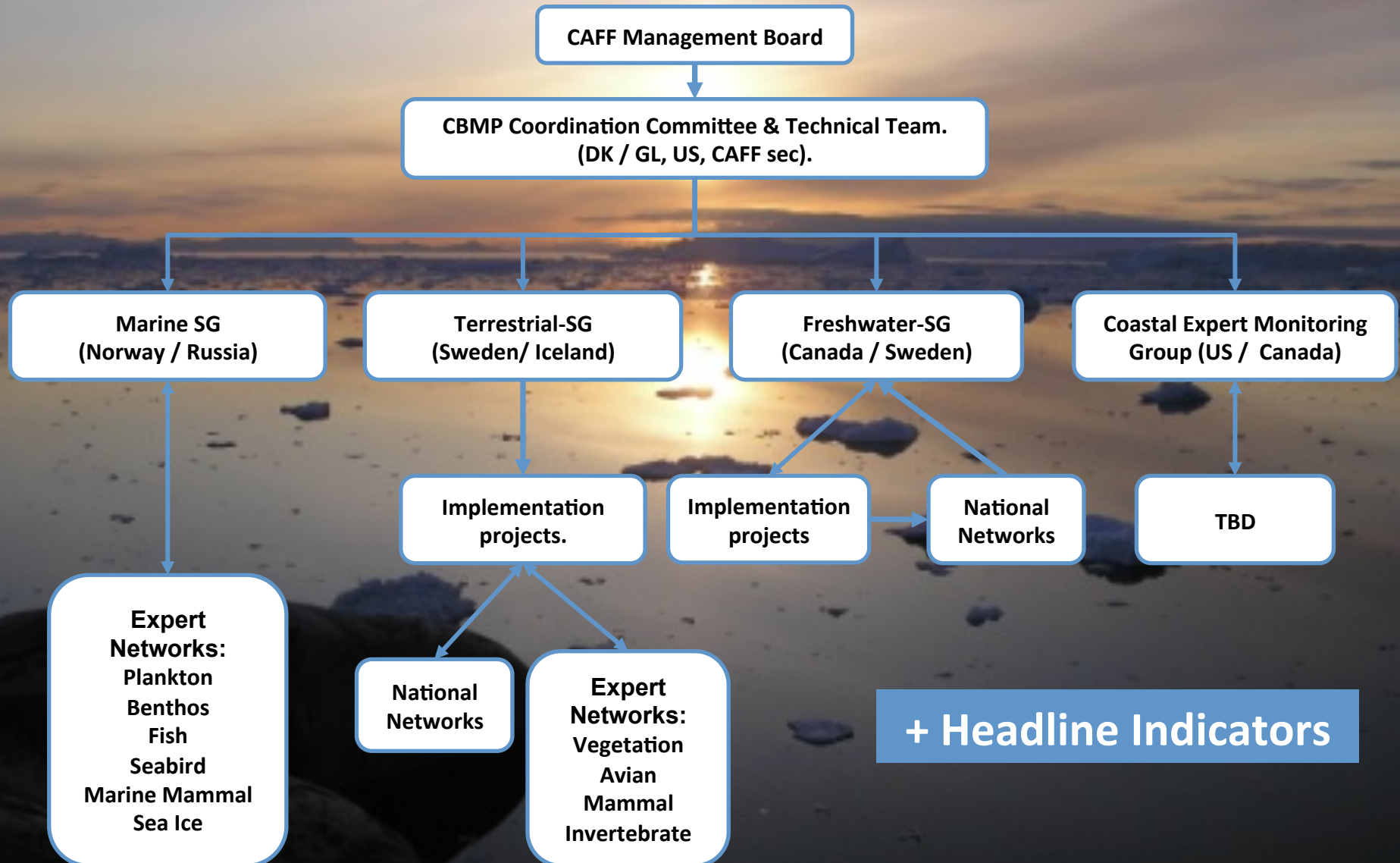
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) – and input to assessments
- Arctic BON of GEOBON
- Global Biodiversity Information Facility (GBIF)
- UNEP Biodiversity Indicator Partnership (BIP)

CAFF Resolutions of Cooperation with

- CBD, Ramsar (incl. NorBalWet), CMS, AEWA, EAAFP



Structure of CBMP, March 2016



Headline Indicators



- Suite of indices and indicators
- Species, habitats to ecosystem processes including
 - Arctic Species Trend Index
 - Migratory birds Index
 - Protected Areas
 - Land cover change (based on remote sensing)



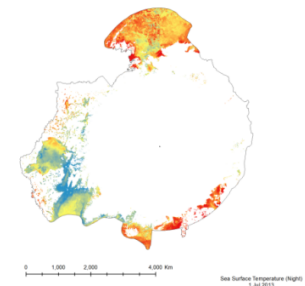
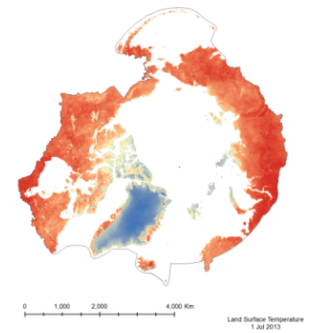
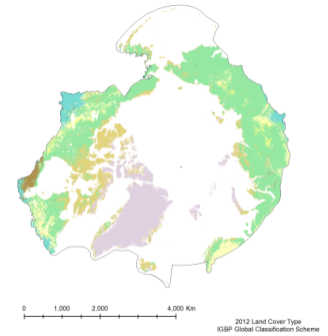
Headline Indicator: Land Cover Change Index

A framework to harness the potential of remote sensing for use in Arctic biodiversity monitoring and assessment activities.

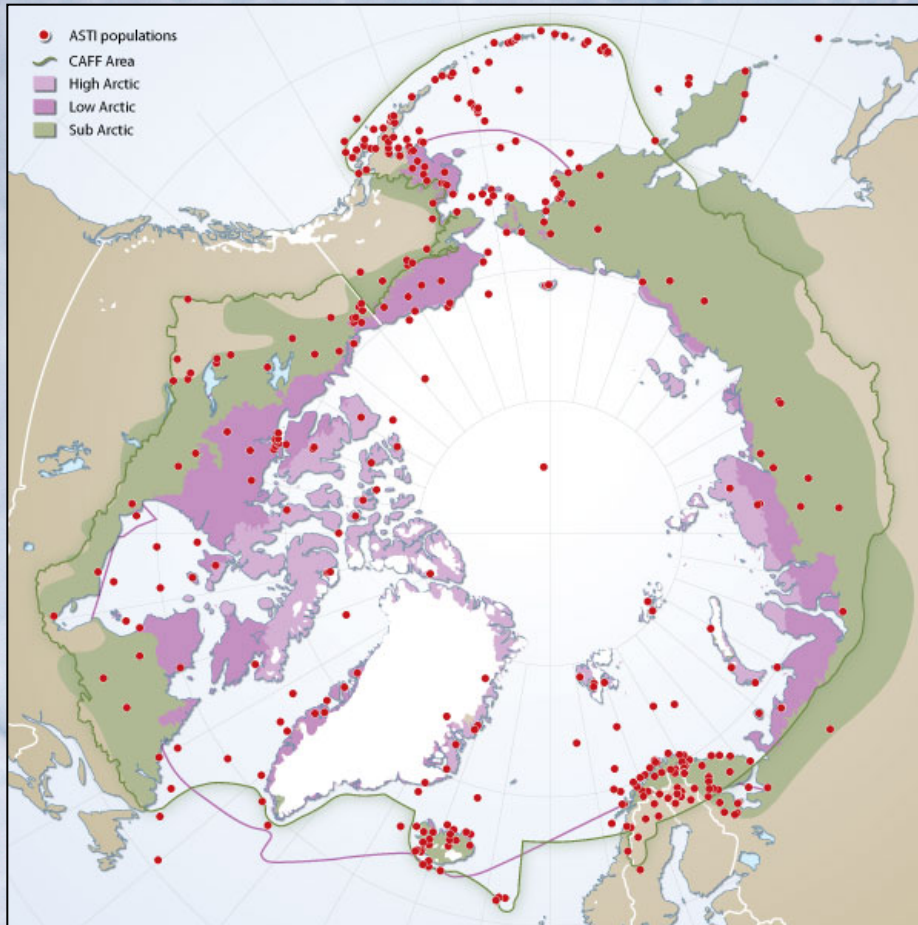
Data have been made available through initial holdings of MODIS satellite standard products from 2002-2012 including data on:

- Vegetation Indices (incl. NDVI)
- Land Cover Type
- Snow Covered Area
- Sea Surface Temperature (SST)
- Marine Chlorophyll-a

Next step to use for more advanced analysis including the development and use of satellite-based indices and indicators



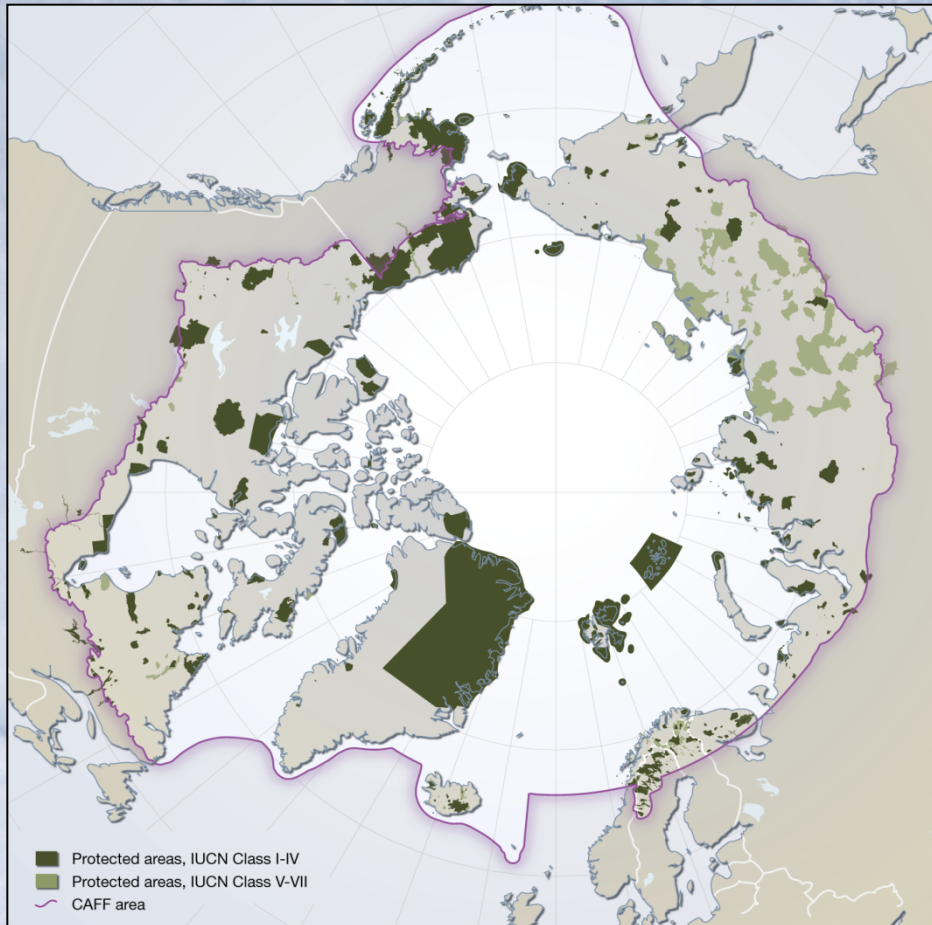
Headline Indicator: Arctic Species Trend Index (ASTI)



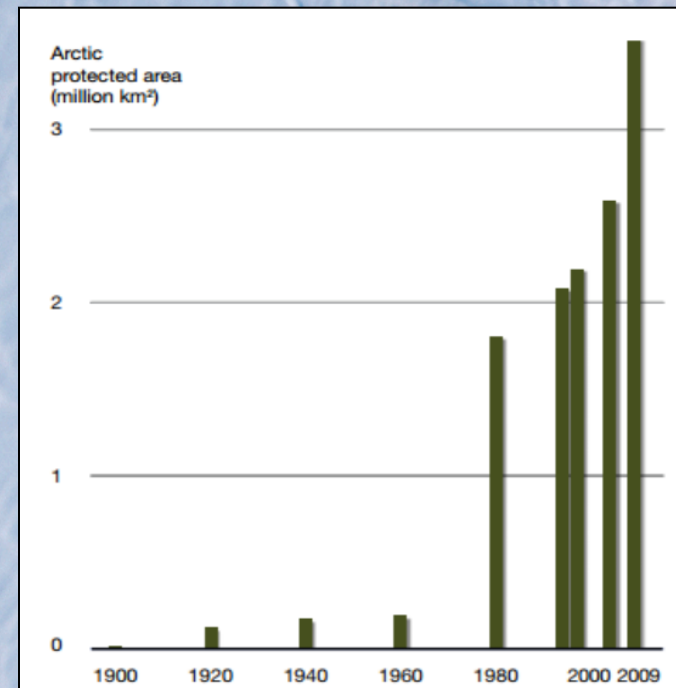
- Tracks over 900 Arctic vertebrate population datasets
- 37% of Arctic vertebrate species
- 323 species
- Trends in vertebrate populations- fish, birds, mammals
- The most representative regional index of the global Living Planet Index



Headline Indicator: Protected Areas Index



- 11% protected
- Primarily terrestrial



CBMP Reporting



Regular assessments: State of Arctic Biodiversity report, including status reports (Scientific and TK information)

Outputs as scientific publications, either by discipline or multidisciplinary

Various summaries and other communications material

Input to the ABDS (www.abds.is) that will be an important tool for faster and timely reporting

Continued updates and development of Headline Indicators

Coming soon...

- State of Arctic Marine Biodiversity (2017)
- Arctic Coastal Biodiversity Monitoring Plan (2017)
- State of Arctic Terrestrial Biodiversity (2019)
- State of Arctic Freshwater Biodiversity (2019)



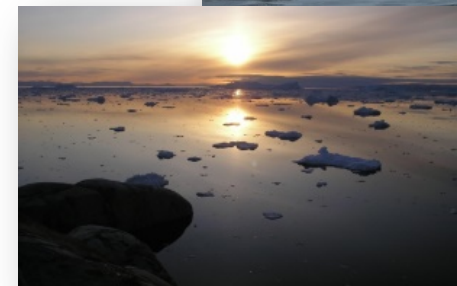
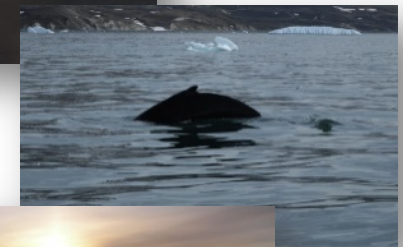
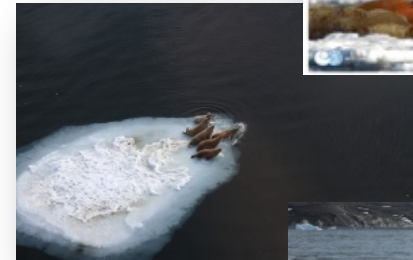
State of The Arctic Marine Biodiversity Report (SAMBR)

SAMBR will be published in 2017 and will be ~120 pages describing:

- The baseline conditions for Focal Ecosystem Components (FECs: Indicators), if possible
- The status of the monitoring and advice for future ecosystem based monitoring
- Spatial comparisons, where possible, within the region

Will include:

- Key findings on status (and trends) on FECs and status on monitoring on these FECs
- Key findings and advice related to monitoring priorities



CBMP Output: Arctic Biodiversity Data Service

ABDS
Arctic Biodiversity Data Service

The Arctic Biodiversity Data Service
The online source for scientists, practitioners, managers, policy makers and others to access and explore various Arctic biodiversity data layers.

Explore Species
Access status, trends, distribution and population data on Arctic marine, freshwater and terrestrial species.
Latest data addition:
Lemmings
Lichens

Explore Stressors
Access data on variables that may affect Arctic biodiversity species and ecosystems.
Latest data addition:
Emerging issues and challenges
Shipping
Disturbance
Development

Explore Indices & Networks
Access data on scientific indicators from circumpolar networks and aspects.
Latest data addition:
Linguistics

Explore Ecosystems
Access data on ecosystems.
Latest data addition:
Freshwater
Marine
Terrestrial

Partners
ABDS list of partners

Dynamic data sets
Find the latest dynamic data sets and web mapping services. Sign up to receive updates and layers.

Data
Download and analyse the latest data from circumpolar networks and assessments.

Maps
Download maps for use in publications and reports.

DRAFT - Seabird Information Network: Circumpolar Seabird Data Portal

Map: Seabird colonies

Download/summarize/bounded data

Seabird layers

Species filters

- Seabird colony register
- Seabird population trend index
- Seabird productivity index

Species

Species	Count
Alaskan Tern	110
Ancient Murrelet	109
Arctic Tern	1384
Atlantic Puffin	212
Audubon's Shearwater	1
Barnacle Goose	141
Black Gull	1010
Black Oystercatcher	792

Polar bear

Polar bears, *Ursus maritimus*, are distributed throughout the ice-covered waters of the circumpolar Arctic. The top-level predator is hunted because it is an iconic species of the Arctic and one that is particularly vulnerable to changes in sea ice. They are fundamentally dependent upon sea ice as a platform for hunting seals, traveling, feeding, mating, and breeding. Changes in the distribution, duration, and extent of sea-ice cover and in the patterns of freeze-up and break-up have the potential to significantly influence the population ecology of polar bears. (Arctic Biodiversity Trends 2010.)

The site is in its initial stages and data will be added as it becomes available. Information can be downloaded and used provided proper citation is given. By downloading data the user acknowledges to provide correct citation for the data/graphic. If you have any comments or queries then please contact us at caff@caff.is. If you have any data you would like to contribute to the ABDS please contact caff@caff.is.

Dynamic data

Data

Explore

- Southern Hudson Bay
- Northern Beaufort Sea
- Western Hudson Bay
- Orange Island
- Churchill-Bird Bay

Links

- Summary of polar bear population status per 2010 Arctic Biodiversity Trends 2010
- ICMCC's Polar Bear Secretariat Report
- Arctic Biodiversity Trends in marine populations (2012)
- Arctic Biodiversity Trends
- Trends in 2010
- Global Biodiversity Information Facility (GBIF)
- Polar Data Catalogue

Publications

Maps

Seabird Information Network (SIN)

The Seabird Information Network focuses on the development of a data entry and analysis portal system that will allow for circumpolar seabird colony information to be contributed, mapped, and shared by scientists and monitoring programs around the Arctic. Data will be compiled to generate a circumpolar seabird colony assessment.

The site is in its initial stages and data will be added as it becomes available. Information can be downloaded and used provided proper citation is given. By downloading data the user acknowledges to provide correct citation for the data/graphic. If you have any comments or queries then please contact us at caff@caff.is. If you have any data you would like to contribute to the ABDS please contact caff@caff.is.

Dynamic data sets

Data

SIN Portal

Links

- CAFF
- Seabird Monitoring Framework
- Seabird Assessments
- Seabird Conservation Strategies
- Seabird Information Network

Publications

- Arctic Seabirds Breeding in the African-Eurasian Waterfowl Agreement (AEWA) Area
- Seabird Information Network (SIN) Concept Paper

Maps

CBMP Output: Communications

The Arctic Freshwater Biodiversity Monitoring Plan

Conservation of Arctic Flora and Fauna

ARCTIC COUNCIL

0:00 / 4:19

Arctic Freshwater Biodiversity Monitoring Plan

Integrated circumpolar monitoring to improve detection, understanding and response to changes in Arctic river and lake ecosystems

Introduction

- Arctic freshwater biodiversity is under growing pressure from climate change and resource development, yet established monitoring programs remain largely uncoordinated, lacking the ability to effectively monitor, understand and predict biodiversity trends at the circumpolar scale.
- To meet these challenges the Freshwater Expert Monitoring Group (FEMG) of the Circumpolar Biodiversity Monitoring Program (CBMP) is working to harmonize and enhance long-term Arctic biodiversity monitoring efforts to facilitate detection, communication and response to significant ecological trends related to the pressures of human-induced stressors.
- The FEMG includes scientific experts from all Arctic countries who are designing optimal sampling schemes, common parameters and standardized monitoring protocols for application across circumpolar Arctic freshwaters.

What is the CBMP?

- The CBMP is an international network of scientists, government agencies, Indigenous organizations and conservation groups working together to harmonize and integrate efforts to monitor the Arctic's living resources. It is the cornerstone program of the Arctic Council's Conservation of Arctic Flora and Fauna (CAFF) Working Group. The CBMP has been endorsed by the Arctic Council, and is the biodiversity component of the Sustaining Arctic Observing Networks and the Group on Earth Observations. It is an information provider to the UN Convention on Biological Diversity.

What does the Arctic Freshwater Biodiversity Monitoring Plan identify?

- Important scientific questions and user needs;
- Specific monitoring and management objectives;
- Focal ecosystem components and indicators for circumpolar implementation;
- Key abiotic parameters that need to be monitored;
- Existing monitoring capacity and information (scientific community-based, Traditional Knowledge);
- Gaps in monitoring coverage (elemental, spatial & temporal);
- One set of standardized protocols; and
- Means for implementation of long-term monitoring plan.

Key questions

- What is the current status of freshwater biodiversity in the Arctic?
- Can biodiversity status be measured through simple variables and indicators and, if so, what suite of these should we apply?
- Is biodiversity changing and, if so, are species increasing, declining, moving or disappearing?
- What are the primary environmental and anthropogenic drivers causing this change?
- Are boundaries of the Arctic and sub-Arctic ecosystems shifting?

Workshop Approach

- Arctic Freshwater Biodiversity Monitoring Plan developed by experts at workshops in Sweden and Canada. Workshops focused on identifying Focal Ecosystem Components, impact hypotheses, statements, indicators and data availability. Participants attended from Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and USA.

Benefits

- Report on the state of Arctic freshwater biodiversity
- Input to national/international management decisions and reporting
- Information for effective management (e.g., stressors, conservation)
- International status and trends summary and improved scientific understanding
- Influence national and international program direction for biomonitoring of the Arctic
- Opportunity to use the 2013 Arctic Biodiversity Assessment to benefit FEMG implementation

Impact Hypotheses

- The potential effect of environmental drivers on key lake and riverine FECs was established through a set of impact hypotheses that describe the expected response relationships of the FECs to various drivers. Fifteen impact hypotheses were identified for lakes and rivers.

Example Driver	Lake Example Impact Hypothesis	River Example Impact Hypothesis
SHR in nutrient regime from permafrost degradation	Human enrichment → increased nutrient availability and increased light → changes in food availability and quality → shift in relative importance of benthic and pelagic processes; microbial food web changes; shift in community composition and functional diversity; change in productivity	Increased turbidity, high in substrate, confluence towards fine particles, increased embeddedness → decreased light, loss of substrate diversity, shifts in habitats and food web structure; increased change in phytoplankton; degradation of habitat → change in community composition and functional diversity; change in productivity

Used Adaptive Environmental Assessment and Management approach to:

- Identify key Focal Ecosystem Components (FECs) of importance to ecosystems (or humans);
- Identify key drivers affecting FECs and develop impact hypotheses;
- Determine key variables that should be monitored for production of indices and/or metrics;
- Determine focal areas for monitoring based on data availability, sensitivity to change, importance to humans, etc;
- Produce a conceptual framework for the Freshwater Plan.

More information:
www.cbmp.is/freshwater
www.caff.is

A program of the Circumpolar Biodiversity Monitoring Program, the cornerstone program of the Arctic Council's Conservation of Arctic Flora and Fauna working group

Arctic Marine Biodiversity Monitoring Plan USA 2012 Implementation

The Arctic Marine Biodiversity Monitoring Plan (the Marine Plan) is the first of four pan-Arctic long-term, integrated biodiversity monitoring plans produced by the Conservation of Arctic Flora and Fauna (CAFF)'s Circumpolar Biodiversity Monitoring Program (CBMP). Approved by the Arctic Council in 2011, the Marine Plan will integrate existing circumpolar monitoring datasets and models to improve the detection and understanding of changes in Arctic marine biodiversity, and inform policy and management responses to these changes.

Development of the plan was co-led by Norway and the United States and was the result of extensive discussions and consultations involving experts from Arctic coastal nations, Permanent Participants and other Arctic Council working groups. The Marine Plan identifies eight Arctic Marine Areas (AMAs) and Focal Ecosystem Components (FECs) to monitor at various trophic levels using specific methodologies, parameters, indicators and sampling designs drawn from existing monitoring capacity (programs), best practices and data.

The Marine Plan is designed to provide comprehensive and timely circumpolar information on Arctic marine biodiversity to decision makers. Its implementation is currently co-led by Canada and Greenland.

Links with National Priorities

The United States Interagency Arctic Research Policy Committee (IARPC) is charged with developing the year-plan for U.S. government funded research in the region. For the years 2013-2017 the IARPC objectives that match those of the Marine Plan are:

- Sea ice and marine ecosystems studies
- Observing systems

The U.S.A. will pursue four activities that contribute to the Marine Plan. They are:

- Develop a Framework of observations and modelling to support forecasting of sea ice extent
- Identify and study sites in the Beaufort and Chukchi Seas and the contiguous Arctic Ocean where climate feedbacks are active
- Complete deployment of a Distributed Biological Observatory (DBO) in the U.S. and neighboring Arctic Ocean to create long-term data sets on biological physical and chemical variability and ecosystem response
- Develop integrated ecosystem processes research in the Beaufort and Chukchi Seas region

Top CBMP Marine Priorities in 2012

- Funded the U.S. portion of the CBMP-Marine data management effort (2006). Worked on identifying, providing access to and aggregating datasets including legacy data.
- Contributed to the CBMP-Marine Steering Group and choose U.S. scientists to participate in the Expert Networks. Dr. Kathleen Crane, NOAA appointed U.S. Chair. Dr. Sue Moore, NOAA co-chair. Selected the following members to represent Expert Networks: Dr. Rolf Gradinger, Dr. Boell Bluhm, Sea Ice Biota; Dr. Russ Hopcroft, Plankton; Dr. Kjetil Iken, Beaufort; Dr. Kitty Mecklenburg, Fish; Dr. Peter Thomas, and Dr. Rosa Meahan, Marine Mammals.
- Led the Plankton Expert Network, (Dr. Russ Hopcroft)
- Co-Led the Fish Expert Network (Dr. Kitty Mecklenburg)
- Funded the Alaskan Inuit Circumpolar Council Representative who is a member of the Fish Expert Network.

www.caff.is/marine

Coordinated Circumpolar Monitoring of Arctic Sea Life

The Arctic Marine Biodiversity Monitoring Program

The Circumpolar Biodiversity Monitoring Program (CBMP) is the cornerstone program of the Arctic Council's Conservation of Arctic Flora and Fauna (CAFF) working group.

e-CBMP Newsletter Fall 2013

Circumpolar Biodiversity Monitoring Program

Volume 7 Issue 2

Coastal Plan Approach

- Ecosystem-based approach
- Existing monitoring capacity and information
- Include multiple types of knowledge systems and information sources – TK, science, local ecological knowledge – at all stages of plan development
- Identify a suite of coastal biodiversity indicators linked to key drivers and stressors - ecosystematic
- Identify gaps in existing monitoring programs

6 Main EA Elements

Identify the ecosystem
Describe the ecosystem
Set ecological objectives
Assess the ecosystem
Value the ecosystem
Manage human activities

CBMP Components

CBMP plan areas
Develop FECs
Develop monitoring plans
State of the Arctic
Reports
(not formalized)

Thank you!

For more information please visit:

www.caff.is

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