



Arctic Council SAO Plenary meeting  
22-23 March 2018, Levi, Finland  
Meeting code: SAOFI202

Document Title

Circumpolar Biodiversity Monitoring Program Strategic Plan: 2018-2021

Agenda item number

Info Doc 5

Submitted by

CAFF

Document filename

SAOFI202\_2018\_LEVI\_InfoDoc05\_CBMP-Strategic-Plan-2018-2021

Number of pages, not including this cover sheet

25

CAFF Monitoring Series Report No. 29  
February 2018

## **Circumpolar Biodiversity Monitoring Program Strategic Plan: 2018-2021**



# Acknowledgements

## CAFF Designated Agencies:

- Norwegian Environment Agency, Trondheim, Norway
- Environment and Climate Change Canada, Ottawa, Canada
- Faroese Museum of Natural History, Tórshavn, Faroe Islands (Kingdom of Denmark)
- Finnish Ministry of the Environment, Helsinki, Finland
- Icelandic Institute of Natural History, Reykjavik, Iceland
- Ministry of Foreign Affairs, Greenland
- Russian Federation Ministry of Natural Resources, Moscow, Russia
- Swedish Environmental Protection Agency, Stockholm, Sweden
- United States Department of the Interior, Fish and Wildlife Service, Anchorage, Alaska

## CAFF Permanent Participant Organizations:

- Aleut International Association (AIA)
- Arctic Athabaskan Council (AAC)
- Gwich'in Council International (GCI)
- Inuit Circumpolar Council (ICC)
- Russian Indigenous Peoples of the North (RAIPON)
- Saami Council

This publication should be cited as: Christensen, T., S. Longan, T. Barry, C. Price, and K.F. Lárusson. 2018. Circumpolar Biodiversity Monitoring Program Strategic Plan 2018-2021. CAFF Monitoring Series Report No. 29. Conservation of Arctic Flora and Fauna, Akureyri, Iceland. ISBN: 978-9935-431-71-4.

The authors wish to acknowledge Jason Taylor, (US NPS), and the CBMP Marine, Freshwater, Terrestrial and Coastal Steering Groups and Expert Networks for their contributions to and/or review of this Strategic Plan.

Cover photo: Caitlin Bailey, GFOE, The Hidden Ocean 2016- Chukchi Borderlands

Back cover: Caitlin Bailey, GFOE, The Hidden Ocean 2016- Chukchi Borderlands

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— CAFF Designated Area

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## 1. Introduction

The Circumpolar Biodiversity Monitoring Program (CBMP) is the biodiversity monitoring program of the Conservation of Arctic Flora and Fauna (CAFF<sup>1</sup>), the biodiversity Working Group of the Arctic Council. The CBMP coordinates, collects and synthesizes existing monitoring data from the Arctic States.

This Strategic Plan is intended to explain the overarching goals of the CBMP for the period 2018-2021, and to outline actions to deliver on those goals. It will guide the management of the program and help ensure the program's continued relevance to the needs of the Arctic States, Permanent Participants, scientific and Arctic communities, and other partners.

The CBMP plays a key role in supporting CAFF's mandate to address the conservation of Arctic biodiversity, communicate findings to the governments and residents of the Arctic, helping to promote practices that ensure the sustainability of the Arctic's living resources.

The CBMP has been recognised by the Arctic Council and the UN Convention on Biological Diversity, and is the official Arctic Biodiversity Observation Network of the Group on Earth Observations Biodiversity Observation Network (GEOBON).

## 2. The Circumpolar Biodiversity Monitoring Program (CBMP).

As the Arctic continues to experience a period of intense and accelerating change it has become increasingly important to have better information on status and trends of Arctic biodiversity. However, current monitoring practices in the Arctic are largely fragmented and incomplete. The Arctic Council has recommended that long-term monitoring efforts and inventories should be increased and focused to address key gaps in knowledge to better facilitate the development and implementation of conservation and management strategies (CAFF 2013, CAFF/AMAP/IASC 2004). CAFF has developed the CBMP in response.

The overall goal of the CBMP is to facilitate more rapid detection, understanding, prediction, communication, and response to the significant biodiversity-related trends and pressures in the Arctic. The resulting information is designed to be used to assist policy and decision-making at global, national, regional and local levels. The CBMP organizational chart can be found in Figure 1.

The CBMP utilizes existing monitoring capacity in the Arctic through enhanced coordination and integration of already established monitoring resources. Through the enhanced coordination of existing monitoring resources, there is an improved ability to identify priority gaps in current capacity, and improves, comprehensive and cost-effective monitoring. To this end, the CBMP is leveraging monitoring activities to establish linkages to global biodiversity initiatives.

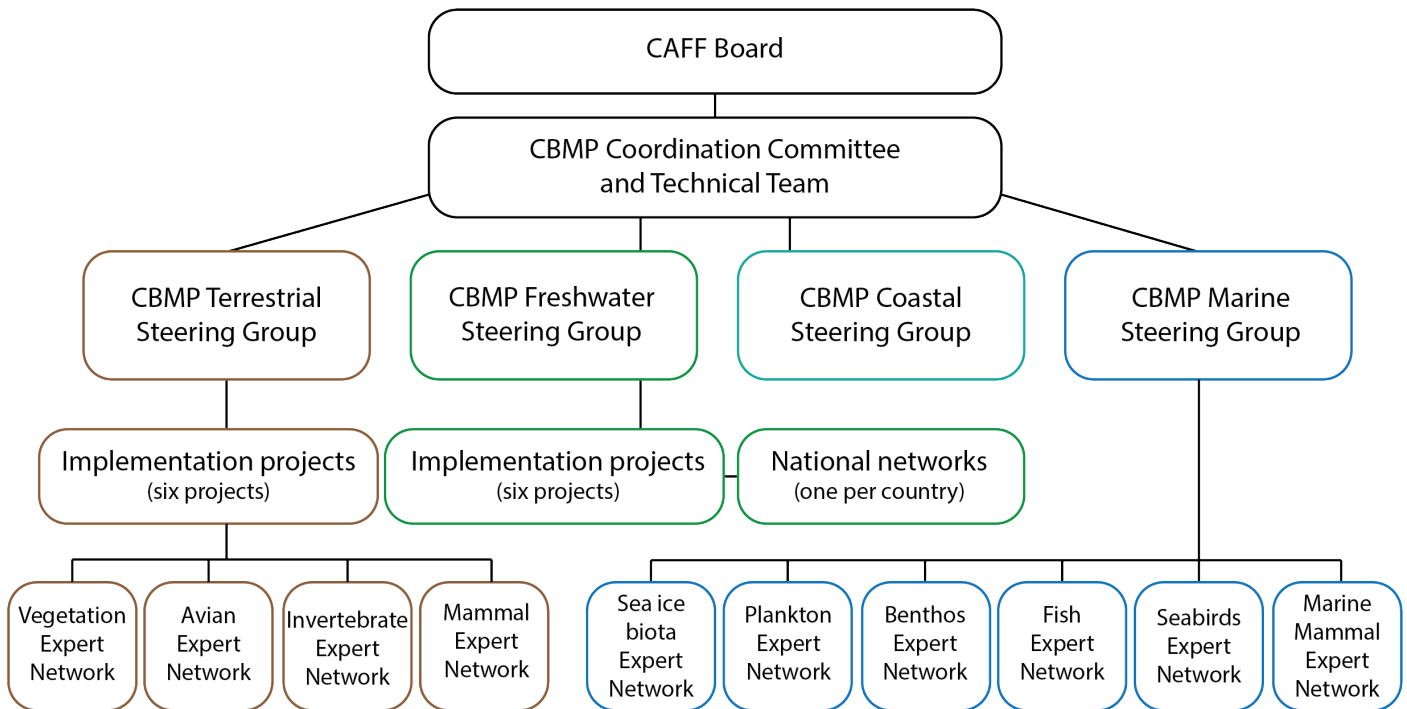
The CBMP is an international network of scientists, governments, Indigenous organizations and conservation groups working to harmonize and integrate efforts to monitor the Arctic's living resources. It organizes its efforts around the major ecosystems of the Arctic: marine, freshwater, terrestrial and coastal. The CBMP emphasizes data management (through the Arctic Biodiversity Data Service – ABDS), capacity building, reporting, coordination and integration of Arctic monitoring, communications, education and outreach.

Arctic Biodiversity Monitoring Plans are being developed for each of the four ecosystems to improve the ability to detect and understand changes. This includes standardizing and coordinating monitoring as well as synthesizing essential data. Currently, Arctic Biodiversity Monitoring Plans are being implemented for three ecosystems (marine, freshwater and terrestrial) with the coastal plan scheduled for completion in 2018.

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<sup>1</sup> CAFF is the biodiversity Working Group of the Arctic Council and serves as a vehicle to cooperate on species and habitat management and utilization, share information on management techniques and regulatory regimes, and facilitate more knowledgeable decision-making. 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'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 which ensure the sustainability of the Arctic's living resources. It does so through various monitoring, assessment and expert group activities. CAFF provides an interface between science and policy and is well positioned to help establish Arctic conservation priorities.

Fig 1. The CBMP organizational chart. The CAFF Board directs the development of the CBMP. A committee of CBMP co-leads and the CAFF Secretariat is responsible for CBMP coordination. For each of the Arctic Biodiversity Monitoring Plans a Steering Group provides direction. Expert Networks have been established under each Steering Group to conduct implementation activities.



## 2.1 CBMP is an adaptive monitoring program

The approach adopted in the four Arctic Biodiversity Monitoring Plans follows the steps required for an adaptive and ecosystem-based monitoring program, and includes a consideration of what future priority questions and user needs the program should address (Fig. 2). This ecosystem-based approach integrates information across ecosystems, species, and their interactions, and lends itself to monitoring key aspects of ecosystems, called Focal Ecosystem Components (FECs). This approach considers the integrity of entire ecosystems and their interaction with other ecosystems.

Each Arctic Biodiversity Monitoring Plan describes expected outcomes and reporting, including the development of State of the Arctic Biodiversity Reports (SABR) as a major output. The first CBMP State of the Arctic Biodiversity Report was released in 2017 (CAFF) by the Marine Group.

The CBMP has also developed a suite of indicators that provide a broad picture of the state of Arctic biodiversity— from species to habitats, and ecosystem processes to ecological services. These types of indicator reports are prepared ad hoc and are called “headline indicators” that are independent of, but relevant to the four Arctic Biodiversity Monitoring Plans. Community-based monitoring and citizen science can make significant contributions to circumpolar monitoring efforts, and therefore the CBMP incorporates both where possible.

**Traditional Knowledge** is a systematic way of thinking and knowing that is elaborated and applied to phenomena across biological, physical, cultural and linguistic systems. Traditional Knowledge is owned by the holders of that knowledge, often collectively, and is uniquely expressed and transmitted through indigenous languages. It is a body of knowledge generated through cultural practices, lived experiences including extensive and multigenerational observations, lessons and skills. It has been developed and verified over millennia and is still developing in a living process, including knowledge acquired today and in the future, and it is passed on from generation to generation. The CBMP supports the inclusion of TK and LK holder expertise into CBMP activities e.g. through participation of the Permanent Participants representing the Indigenous Peoples of the Arctic (Ottawa Principles 2014)

Fig 2. The CBMP takes an adaptive ecosystem-based approach to monitoring and data creation. This figure illustrates how management questions, conceptual ecosystem models, and existing monitoring networks guide the four CBMP Steering Groups (Marine, freshwater, terrestrial, and coastal) in their development. Monitoring outputs (data) feed into the assessment and decision-making processes (data, communication and reporting). The findings are feeding back into the monitoring program making adaptive changes possible.



### 3. CBMP Strategy 2018-2021

This Strategic Plan is intended to explain the overarching goals of the CBMP for the period 2018-2021, and to outline actions to deliver on those goals. This Strategic Plan was informed by consultations with the CAFF Board, the CBMP Steering Groups, other experts engaged in application of the CBMP's Arctic Biodiversity Monitoring Plans, the CBMP Chairmanship teams and the CAFF Secretariat.

This is the third in a series of CBMP Strategic Plans and aligns with the Actions for Arctic Biodiversity 2013-2021: implementing the recommendations of the Arctic Biodiversity Assessment. It is also designed to feed into other Arctic Council initiatives and strategies such as Sustaining Arctic Observing Networks (SAON), the Arctic Marine Strategic Plan (PAME 2015); and initiatives focused on developing an ecosystem approach to the Arctic.

The overarching goals of the CBMP Strategic Plan 2018-2021 are that the CBMP:

- ▶ is relevant to Arctic States, Permanent Participants, the scientific community, Traditional and Local knowledge communities and other partners;
- ▶ supports decision-making and facilitates coordinated monitoring;
- ▶ is an adaptive monitoring program; and
- ▶ is sustainable (defined by organization, capacity and finances).

A series of objectives and related actions have been identified to serve as metrics for measuring effectiveness towards achievement of the goals.

## 4. CBMP Goals, Objectives and Actions 2018 - 2021

### ***Goal 1: The CBMP is relevant to the Arctic States, Permanent Participants, the scientific and Traditional and local knowledge communities, and other partners.***

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The implementation of the CBMP is guided by multi-year Strategic Plans, which provide a framework to guide implementation of the CBMP, helping focus implementation actions to allow the CBMP to achieve greater impact, meet new challenges, and take advantage of opportunities that arise. The following are objectives to ensure continued relevance of the CBMP:

#### **Objective 1.1: Align CBMP to support CAFF input on Arctic biodiversity into national, regional, and global reporting needs for information to support decision-making.**

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CAFF has established a framework of strategic partnerships (e.g. Resolutions of Cooperation) with relevant international and regional organizations and institutions, multilateral environmental agreements<sup>2</sup> and international information partnerships<sup>3</sup> relevant to Arctic biodiversity to facilitate input to national, regional and global reporting. The CBMP is a key tool allowing CAFF to have more frequent and policy-responsive updates into these processes, including:

- dynamic forward-looking analysis;
- coordinated monitoring;
- standardized science-based monitoring;
- assessment tools for biodiversity change in Arctic ecosystems; and
- efficient data sharing on different levels, e.g. through the ABDS.

#### **Actions to attain this objective:**

- CBMP Co-Leads and CAFF Secretariat to work with the CAFF Board to determine reporting needs for each State and Permanent Participant where CBMP information could be used to support decision-making;
- Through a case study explore how CBMP data might fit in to other reporting requirements, e.g. EU directives;
- Take national, circumpolar and also global needs into account when planning follow-up to the SABRs;
- Deliver key findings and recommendations from the CBMP to CAFF's partners (e.g., by ensuring that the SABRs, and their indices and indicators are made available, easy and accessible to relevant partners);
- Establish new partnerships through the CAFF Working Group as appropriate, to ensure that the CBMP is aligned to support CAFF input to local, national, circumpolar and global needs;
- Work for enhanced Permanent Participant engagement in the CBMP; and
- Continue to work with existing partners (e.g., GEOBON, GBIF, OBIS) to further ensure information on Arctic biodiversity is available and feeds into relevant fora.

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2. The United Nations Convention on Biological Diversity (CBD), the Convention on the Conservation of Migratory Species of Wild Animals (CMS), and its Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) under the CMS Convention, the Convention on Wetlands of International Importance (Ramsar Convention).

3. The Global Biodiversity Information Facility (GBIF); Group on Earth Observations Biodiversity Observation Network (GEOBON); and UNESCO's Ocean Biogeographic Information System (OBIS).

## Objective 1.2: Align CBMP with ABA implementation

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The CBMP is key to implement several ABA recommendations, so an important objective of this Strategic Plan is to ensure alignment between CBMP activities and ABA implementation. This will help ensure relevance of CBMP to the:

- National agencies and institutes by helping inform policy and management actions;
- Arctic communities, Indigenous organizations and Permanent Participants by addressing conservation and research priorities identified in the ABA
- Scientific community by addressing conservation and research priorities identified in the ABA; and
- Arctic Council by linking CBMP activities to policy priorities identified in the ABA and approved by ministers.

### Actions to attain this objective:

- Map each CBMP activity to the Actions for Arctic Biodiversity 2013–2021 and consider how they are currently contributing to ABA implementation and how the CBMP might advance CAFF activities in the future (e.g. how the CBMP might contribute to implementation of the Arctic Invasive Alien Species (ARIAS) Strategy and Action Plan (2017));
- Map how CBMP activities help support the UN Sustainable Development Goals;
- Report on changes in Arctic species, ecosystems, and the effects of stressors through SABRs;
- Evaluate upon completion of the planned SABRs how these reports have responded to ABA conservation and research priorities;
- Evaluate how the most efficient and relevant reporting can be structured in future upon completion of the planned SABRs; and
- Map how CBMP reporting, including on the FECs identified in each CBMP Arctic Biodiversity Monitoring Plan, aligns with each other and with the Actions for Arctic Biodiversity 2013–2021.

## Objective 1.3: Include Traditional and Local Knowledge in CBMP when possible

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Traditional and Local knowledge (TLK) are important sources of information for understanding Arctic biodiversity and developing effective conservation strategies and facilitating their successful implementation. However, documenting TLK and using these systems of knowledge appropriately along with scientific and management settings is not a simple task. The Arctic Biodiversity Monitoring Plans include efforts and strive to better utilize different sources of information and support the inclusion of TLK from the inception of projects through analysis of information gained, and to build a strong and diverse network of experts within both science and TLK.

### Actions to attain this objective:

- When developing CBMP products, gather information from diverse sources of knowledge and analyze them together with appropriate experts where possible;
- Build a platform to allow for a co-production of knowledge process between Indigenous peoples and scientists;
- Include TLK and science in any revisions of Arctic Biodiversity Monitoring Plans (e.g., when considering follow-up on the State of the Arctic Marine Biodiversity Report);
- Seek participation from TK and LK holders, and support their capacity to participate meaningfully; and
- Continue to highlight the relevance of TLK in communication and outreach efforts.

## **Objective 1.4: Promote the usefulness of the CBMP to the scientific community and facilitate their engagement**

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Engagement of the scientific community is crucial to the successful implementation of the CBMP. Key to this is an active communication approach to ensure that the value of the CBMP and its outcomes are highlighted in scientific fora, conferences and workshops.

### **Actions to attain this objective:**

- Support production of special journal issues, as needed, to serve as the scientific foundations for the SABRs;
- Proactive use of all resources to promote CBMP products including how the CAFF Board can be strategically engaged;
- Encourage the development of journal articles based upon CBMP products;
- Support interdisciplinary networks within the CBMP to engage and conduct research that integrates monitoring and predictive science;
- Continue to produce regular editions of the CBMP newsletter to keep the scientific community informed of CBMP news, events and initiatives;
- Find ways to facilitate increased engagement of young scientists and TLK holders, e.g. building upon the agreement between CAFF and the Association of Polar Early Career Scientists (APECS);
- Continue annual meetings that serve as tools for improved networking and coordination;
- Support Expert Networks to strengthen coordination of monitoring;
- Focus on increasing observer country participation in the CBMP and investigate what scientific and/or financial contributions they may make to the program; and
- Seek opportunities to support internships related to the CBMP activities.

## **Objective 1.5: Continue development of existing and new headline indicators**

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Continued development, refinement and implementation of the four Arctic Biodiversity Monitoring Plans is a long-term process. This should also take into consideration the indicators for the CBD Strategic Plan for Biodiversity 2011-2020 and the Sustainable Development Goals<sup>4</sup>. A strategy for reporting on broad-scale indices and/or indicators to track status and trends in Arctic biodiversity elements was developed to ensure the CBMP is able to produce products useful to target audiences in shorter, regular timeframes (Gill and Zockler, 2008). In addition, this suite of indicators and indices facilitates the reporting of progress in the Arctic towards the CBD's global targets (Aichi Targets<sup>5</sup> and any future targets) and can inform the development of the anticipated post-2020 global strategy for biodiversity.

### **Actions to attain this objective:**

- Review the Strategy for developing indices and indicators for monitoring Arctic biodiversity in the Circumpolar Biodiversity Monitoring Program to ensure it reflects the CBD Aichi Targets and the Sustainable Development Goals and any post-2020 global biodiversity strategy that might be adopted in 2020 ; and
- Continue to report on existing indices/indicators of Arctic biodiversity, e.g., the Arctic Species Trend Index and protected areas indicator; and develop new ones, e.g. the Land Cover Change Index (LCC) and, in particular, indicators that can be used to understand cumulative effects.

4. Sustainable Development Goals: <http://www.un.org/sustainabledevelopment/sustainable-development-goals>

5. UN CBD Aichi Targets: <https://www.cbd.int/sp/targets/>

## ***Goal 2: CBMP results support decision making and facilitate coordinated monitoring.***

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CAFF serves as a vehicle to cooperate on species and habitat management and utilization, to share information on management techniques and regulatory regimes, and to facilitate more knowledgeable decision-making. Since it operates at the interface between science and policy it is important that accurate, credible, and timely information on current and predicted changes in the Arctic's ecosystems reach decision makers according to their timelines and preferred channels. In order to accomplish this, standardized and relevant monitoring, good coverage, and effective inclusion of TK are needed.

Enhanced coordination and spatial coverage of Arctic biodiversity monitoring via the CBMP is yielding an improved ability to detect important trends, link these trends to their underlying causes, predict future trends and scenarios for Arctic biodiversity, and thereby provide more timely and credible information to support decision making at multiple scales (local, regional, national and global). For example, through CBMP cooperation, benthic experts have secured space onboard fish research vessels in the North Atlantic to identify specific species and collect samples to advance benthic monitoring work in the region. This increased coordination will result in reduced costs, compared to the cost of multiple, uncoordinated approaches that stop at regional or national boundaries.

For example, the implementation of relevant legal instruments, such as the EU Water Framework Directive (WFD), has led to development of ecosystem-based assessment systems for freshwater and coastal waters with monitoring programs providing relevant environmental data. These systems are used to assess and report on ecological status, detect environmental problems and their causes, and as a tool for planning environmental measures. For Arctic areas in Nordic countries, CBMP-activities could be coordinated with relevant activities in the implementation of the WFD, and work related to other EU directives, and these assessment systems developed in the EU-countries could be useful tools in other areas of the Arctic.

The following are objectives to encourage that CBMP results continue to support decision making and facilitate coordinated monitoring:

### **Objective 2.1: Complete development of the Arctic Biodiversity Coastal Monitoring Plan, the Terrestrial and Freshwater SABRs, and the next phase of the Marine Plan implementation.**

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Completion of the freshwater and terrestrial SABRs will provide much needed syntheses of the State of knowledge about biodiversity, detectable changes, and important gaps in our ability to assess status and trends in biodiversity across Arctic freshwater and terrestrial ecosystems. Completion of the Arctic Biodiversity Coastal Monitoring Plan will address coastal information needs and establish the CBMP as a comprehensive program across all Arctic ecosystems.

In 2017, the CBMP produced The State of the Arctic Marine Biodiversity Report (SAMBR), its first integrated reporting outcome. The SAMBR describes status and trends of key elements of the marine ecosystem, gives an overview of Arctic biodiversity monitoring and provides advice for future monitoring.

#### **Actions to attain this objective:**

- Complete the Arctic Coastal Biodiversity Monitoring Plan;
- Continue to improve and implement the Arctic Marine Biodiversity Monitoring Plan, including incorporating advice for monitoring from the State of the Arctic Marine Biodiversity Report (CAFF 2017); and
- Complete the State of the Arctic Freshwater and Terrestrial Biodiversity Reports;

## **Objective 2.2: Communicate CBMP results to stakeholders with content, form, and style meaningful to the audience**

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The ability to communicate the outcomes from CBMP activities is crucial to ensuring the support of decision-makers and the buy-in of stakeholders. To ensure effective communication and raise awareness of the results from CBMP activities, CAFF has developed a Communications Strategy (CAFF 2011) that provides guidance on how to develop, package, deliver and evaluate communications activities pertaining to CAFF projects and programs. CAFF communication goals include to:

- Provide target audiences with timely, accurate, clear and complete information on conservation issues for use in policy and scientific decision-making;
- Increase the understanding and profile of Arctic biodiversity amongst target audiences and work to incorporate biodiversity conservation across various sectors, ensuring the sustainable use of the Arctic's natural resources;
- Raise the CBMP's profile amongst target audiences as a credible, reliable and authoritative voice in Arctic biodiversity monitoring; and
- Strategically employ a variety of ways and means to communicate about the above goals, recognizing user needs and the effectiveness of various channels.

Target audiences are relatively homogenous groups of people (in terms of current knowledge, attitudes or practices or interest in the issue). Each target audience requires a different communication approach according to their motivations. Target audiences are instrumental in helping solve the problem of biodiversity loss. Specific target audiences listed below have been identified as major actors that can utilize CAFF information to help halt biodiversity loss. Messaging to these audiences will centre on their values and motivations pertaining to biodiversity. Target audiences could include: 1) Policy and decision makers at the international, regional, sub-regional and national level that influence natural resource, land and wildlife management in the Arctic, 2) Arctic wildlife and ecosystem research and monitoring communities, 3) Arctic residents, 4) Influential business and industry working in the Arctic and 5) interested citizenry in Arctic and non-Arctic countries. Note that Indigenous and non-Indigenous peoples are found across all target audiences.

### **Actions to attain this objective:**

- Provide a "big picture" view that clarifies the relevance of the CBMP in the context of rapid changes and emerging issues in the Arctic;
- Be responsive to target audience information needs and communications channels (i.e., language, medium, timeline);
- Ensure that target audiences (e.g. decision-makers, public) have access to relevant information;
- Continue development of communications tools, including the CBMP newsletter, social media, short films and awareness-raising at conferences and workshops;
- Support, where possible and specifically useful, the translation of key documents and findings from CBMP activities into languages other than English;
- Continue development of the ABDS to make data and graphics from the CBMP products accessible;
- Continue release of annual CBMP Terrestrial-, Freshwater-, Marine- and Coastal monitoring group progress reports and workplans;
- Continue to develop peer-reviewed scientific articles based on CBMP efforts to ensure access in scientific literature of CBMP outcomes and provide support to expert's who work on CBMP-related activities; and
- Continue release of national one-page updates on activities related to each of the CBMP monitoring plans.

### **Objective 2.3: Continue to identify and support Expert Networks relevant to the CBMP**

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While most Arctic biodiversity monitoring networks are, and will remain, national or sub-national in scope, there is immeasurable value in establishing circumpolar connections among monitoring networks. This is something that the CBMP is strategically and uniquely able to facilitate. In addition, coordination through the CBMP is resulting in more rapid uptake of new technologies and methodologies. For example, the development and implementation of the Arctic Marine Biodiversity Monitoring Plan has improved monitoring efficiencies, filled knowledge gaps by applying novel solutions to emerging opportunities and continued identification and cooperation of networks with relevance to the CBMP.

#### **Actions to attain this objective:**

- Engage national monitoring networks that feed into CBMP activities;
- Identify other relevant networks and invite them to participate in the CBMP; and
- Provide support to networks e.g. through facilitating meetings, data support, securing funding, arranging meetings and bringing people together.

### **Objective 2.4: Facilitate and test implementation of CBMP Arctic Biodiversity Monitoring Plans in the field**

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To coordinate monitoring at a circumpolar scale we need to ensure that the Arctic Biodiversity Monitoring Plans function as intended in the field and provide data meaningful to the questions being asked. To this end, the CBMP is working with the International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT) to test how the Arctic Freshwater and Terrestrial Biodiversity Monitoring Plans can be used to develop new site-specific monitoring at field stations in the Arctic.

#### **Actions to attain this objective:**

- Establish an efficient working interface between CBMP and INTERACT, through a work package in the EU financed INTERACT project;
- Test the Arctic Freshwater and Terrestrial Biodiversity Monitoring Plans at three locations in the field in accordance with relevant CBMP protocols;
- Identify gaps in relation to the CBMP monitoring program at the three stations;
- Conduct field trials on selected FECs in the monitoring programs at these three stations; and
- Consider how to replicate this work with the Marine and Coastal (once completed) Monitoring Plans.

### **Objective 2.5: Develop user manual(s) for implementing the CBMP in the field**

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Ensure that the Arctic Biodiversity Monitoring Plans are user-friendly, and facilitate their widespread use, and their ability to guide the development of site specific user manual(s) and more detailed common protocols, as part of the CBMP implementation.

#### **Actions to attain this objective:**

- Complete case studies where site specific user manual(s) are developed based on the Arctic Freshwater and Terrestrial Biodiversity Monitoring Plans and common protocols as appropriate;
- Consider how to replicate this at other stations or field sites across the Arctic, and
- Consider how to replicate and/or incorporate this kind of work with regards to the Marine and Coastal (once completed) Arctic Biodiversity Monitoring Plans.

## **Objective 2.6: Increase access to Arctic biodiversity data for the common good of science, decision-making, Arctic residents, and other stakeholders both inside and outside of the Arctic.**

The Arctic Biodiversity Data Service (ABDS) is an online, interoperable data management system that serves as a focal point and common platform for all CAFF programs and projects as well as a dynamic source for up-to-date circumpolar Arctic biodiversity information and emerging trends. The ABDS is helping to ensure that biodiversity data generated by CAFF are organized to guarantee a legacy in a manner that facilitates:

- Data discovery and accessibility;
- Increased understanding;
- Informed and more rapid decision-making;
- The widest possible exchange of relevant data;
- Ongoing research; and
- The visibility of CAFF activities and cooperative work with its partners

### **Actions to attain this objective:**

- Further develop the interoperability of the ABDS with national and global data centers;
- Continue to make data retrieved through the CBMP accessible via the ABDS and ensure that it is interoperable with data partnerships where possible, e.g., GBIF and OBIS;
- Provide support to CBMP to ensure data it generates conforms to recognized standards and has metadata applied;
- Focus on data harmonization;
- Continue to work with Steering Groups, Expert Networks, and partners such as the Arctic Spatial Data Infrastructure (SDI) to consider issues of data access, visualization, metadata and standardization;
- Rescue older data from previous CAFF activities and make it accessible on the ABDS;
- Develop a data management manual describing the flow of data from the field to CAFF assessments, including the harmonization of data across sites and scales;
- Increase the understanding and profile of the ABDS amongst target audiences and partners; and
- Expand the funding base and increase decision-maker support for the ABDS by engaging private and public funding agencies and identifying partners with complimentary mandates for cost and benefit sharing.



### **Goal 3: The CBMP is an adaptive monitoring program.**

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The CBMP takes an adaptive integrated ecosystem approach to monitoring and data creation. Figure 3 illustrates how management questions, conceptual ecosystem models, and existing monitoring networks guide the four Steering Groups in their development of monitoring refinement and reporting. Monitoring outputs (data) feed into the assessment and decision-making processes (data, communication, and reporting). The findings are fed back into the monitoring scheme to guide adjustments that may be needed to achieve greater impact, identify gaps, to meet new challenges or issues of concern, and to take advantage of opportunities that arise.

#### **Objective 3.1: Integrate lessons learned from CBMP implementation to inform and adjust future work processes, including within the Arctic Biodiversity Monitoring Plans.**

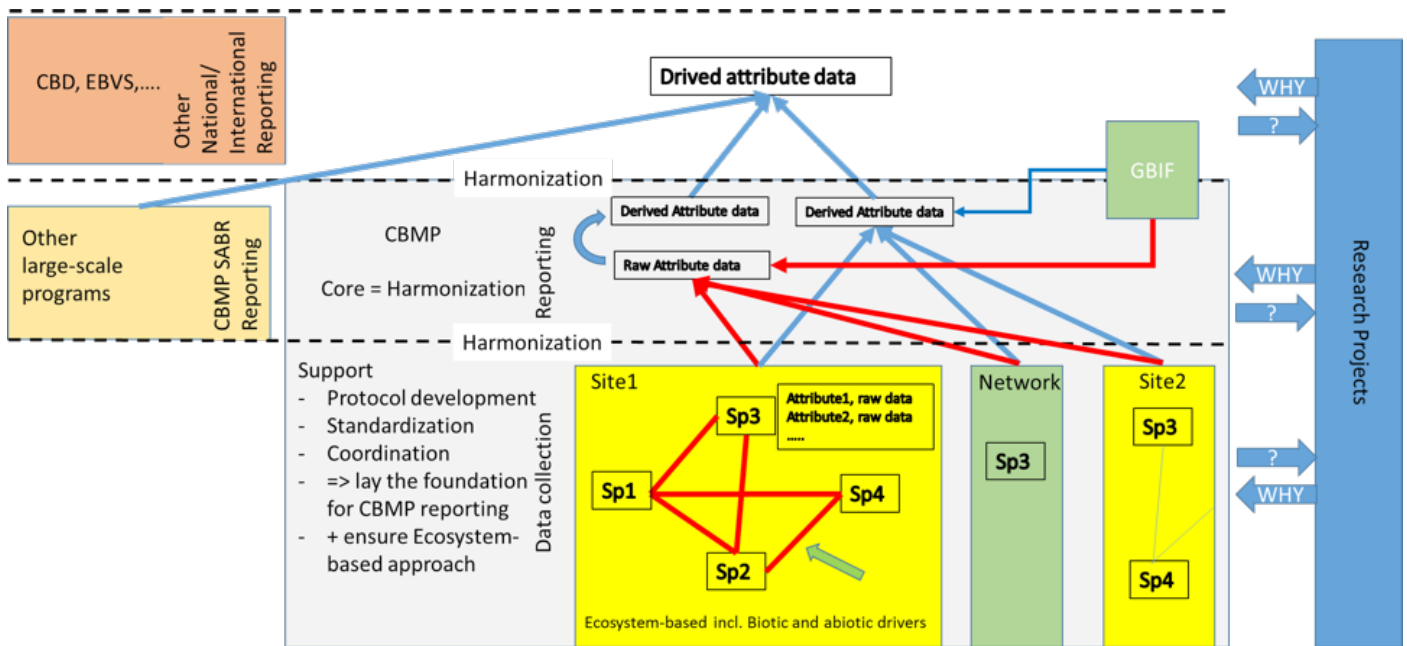
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Each of the four Steering Groups are working in parallel but offset by multiple years. The Marine Steering Group was the first established and thus is a year or more ahead in implementation. Their experiences have provided learning opportunities that have benefitted other Steering Groups. Integrating lessons learned, providing advice for future monitoring, and discovering new questions that may need to be addressed is at the core of the CBMP functioning as an adaptive monitoring program. This approach will ensure that the CBMP meets the needs of end users as those needs evolve and ensures the relevance and sustainability of the program. The already completed review of initial lessons learned from the SAMBR has already been completed (in concert with early lessons learned from the other monitoring groups) and has guided much of the content of this strategic plan. Lessons learned will continue to emerge and should aim to be reflective of an adaptive approach. This objective is an ongoing task.

#### **Actions to attain this objective:**

- Each Steering Group, at its annual meeting, will review and compile lessons learned from the previous year for dissemination to other monitoring groups;
- In turn, each Steering Group will review and consider lessons-learned from other Steering Groups each year, when developing annual work plans;
- Evaluation of the CBMP Strategic Plan will be a standing item on the CAFF agenda every second year, where the CAFF Board will review progress, recommend actions to the CBMP Co-Leads, and make revisions as necessary;
- CBMP co-leads will consider lessons learned from previous years when developing subsequent CBMP strategic plans;
- Coordinate activities between CBMP Expert Networks and Steering Groups to ensure alignment of activities and synergies where appropriate (including meetings, teleconferences, etc. as appropriate);
- Coordinate activities between CBMP Steering Groups to ensure alignment of activities and synergies where appropriate (including meetings, teleconferences, etc. as appropriate) for example on integrating FECs across monitoring plans
- Consider impacts of stressors and drivers within reviews of the Arctic Biodiversity Monitoring Plans; and
- Continue development and implementation of the CBMP and its Arctic Biodiversity Monitoring Plans, e.g. through the development of annual work plans and progress reports (see also 2.2).

Fig 3: CBMP “core” function of reporting on selected FECs within an integrated SABR, while supporting myriad other functions and networks required for ecosystem based monitoring, and broader national and international reporting needs.



### Objective 3.2: Utilize advice for monitoring based on the SABRs to provide guidance on future monitoring

Completion of the SABRs will provide much needed syntheses of the State of knowledge about Arctic biodiversity monitoring. Furthermore, they provide, an opportunity for the CBMP to guide its program of work.

#### Actions to attain this objective:

- Long-term monitoring efforts that have successfully allowed for priority pan-Arctic status and trend reporting in the SABRs will be summarized and presented to the CAFF Board for discussion regarding possible continuation of these efforts in four-year cycles;
- Biodiversity status and trends identified in the SABR will be summarized and presented to the CAFF Board for discussion on how to address these concerns;
- Priority monitoring gaps identified by the SAMBR will be summarized and presented to the CAFF Board for discussion on how to address these gaps;
- The Freshwater and Terrestrial Steering Groups, upon completion of their SABRs, will follow a similar pattern to provide guidance on monitoring as determined from their SABR; and
- Through engagement with the Arctic States and Permanent Participants ensure that the CBMP answers the most relevant questions they may have.

### **Objective 3.3: Develop integrated and targeted State of the Arctic Biodiversity Reporting**

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The SABRs are the cornerstone product of the CBMP, an ecosystem-based program of work that considers biodiversity elements, system drivers, and interactions within and across the marine, coastal, freshwater, and terrestrial environments. Working to achieve a single, circumpolar, interdisciplinary SABR as a “core,” focal priority will allow for the CBMP to:

- More closely align activities between each of its monitoring groups allowing for more effective coordination including integrated responses to and understanding of status and trends in Arctic biodiversity; and
- Advance the ecosystem-based nature of the program to produce a core, cornerstone product expected by decision makers and scientists on a regular, re-occurring basis.

Future reports should ideally be shorter and more targeted but should continue to build on robust science and/or TLK-based monitoring.

#### **Actions to attain this objective:**

- Complete SABRs for freshwater and terrestrial (marine is complete);
- Decide how and in which format the first coastal SABR should be completed based on lessons learned and new information;
- Each Steering Group will develop a process to evaluate and prioritize FECs reported in each SABR and work together to develop an integrated CBMP SABR, and select the highest priority FECs that best serve as indicators of the State of their system;
- Each Steering Group and Expert Network to consider how relevant journal articles, and/or special journal issues could support the CBMP;
- CBMP co-leads to work closely with the Marine Steering Group as they emerge from completing their SABR and work toward selecting priority FECs for future reporting. This will be reported to the other groups; and
- Evaluate and consider lessons learned from previous processes in support of developing future or integrated SABRs.

### **Objective 3.4: Evaluate the effectiveness of remote sensing as a tool to support biodiversity monitoring and assessment**

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The use of satellite data to track status and trends in biodiversity is underutilized in the Arctic (CAFF 2015). There is a desire among various scientific disciplines to use remote sensing to support ongoing biodiversity assessments and monitoring. In addition, remote sensing data also have value for site-specific and regional applications. CAFF is creating a framework to harness remote sensing potential for use in Arctic biodiversity monitoring and assessment activities and to produce a series of satellite-based remote sensing products focused on the circumpolar Arctic.

#### **Actions to attain this objective:**

- Expand the current CAFF remote sensing database to include additional temporal/spatial scales;
- Use the expanded remote sensing database to conduct time-series analysis;
- Conduct a multi-scale analysis at case-study locations to provide information on parameter scaling to further inform the Land Cover Change Index and CAFF stakeholder participants; and
- Use the remote sensing database and its analysis to support the development of SABRs and headline indicators;

### **Objective 3.5: Each CBMP Steering Group will implement the Strategic Plan within their work plans.**

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This Strategic Plan is intended to provide the CBMP with guidelines for the future. The Strategic Plan defines the vision and need, i.e., the “what”, while the CBMP Co-Leads and Steering Groups will work collaboratively to define “how” to achieve the goals and objectives. This work will start in 2018 and will be reflected in work plans

#### **Actions to attain this objective:**

- Each Steering Group will, in their future work plans, include implementation actions related to this strategy, starting at their respective 2018 annual meeting;
- CBMP Co-Leads will provide guidance as to how this might be done e.g. a checklist-template to compare against existing monitoring plan(s) or completed SABRs;
- Coordinate activities between Steering Groups to advance alignment of activities and synergies where appropriate (including meetings, teleconferences, etc. as appropriate); and
- To enable the adaptive process of the CBMP, and to guide the Expert Networks, the Steering Groups will describe how the adaptive process will be carried out within the CBMP.

### ***Goal 4: The CBMP is sustainable (defined by organization, capacity and finances)***

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A more sustainable funding strategy is needed to ensure that all the goals and objectives of this strategy are achieved. The contents of this Strategic Plan are a first step toward a revised model for more efficient and coordinated delivery of the CBMP. The Strategic Plan provides goals and objectives to ensure relevance of the CBMP, that its core priorities are primary objectives, that lessons learned are continually leveraged toward relevance and sustainability, that the work of CBMP is moving toward an integrated model, and that discussion about capacity and funding are at the fore.

### **Objective 4.1: Refine program coordination and organization**

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As the CBMP evolves, and more regular and targeted assessments with key findings and monitoring advice are produced, there is an increased need to establish a more sustainable framework for the CBMP.

#### **Actions to attain this objective:**

- Work to strengthen the CAFF Secretariat’s capacity related to CBMP implementation, e.g. by integrating the CBMP Co-Leads closer to the Secretariat, to secure a more sustainable performance of key operations.
- Continue to support and develop the organizational framework of Co-Lead States supported by the CAFF Secretariat.
- Work to ensure that each Steering Group has a designated scientific assistant to help with key deliverables;
- Continue to coordinate and improve outreach with other Arctic Council Working Groups and subsidiary bodies as relevant; and
- Maintain strategic links with current organizations and initiatives and grow linkages with organizations as relevant (see objective 1.1)

## **Objective 4.2: Refine progress reporting for the CBMP**

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Performance reports and work plans will be submitted to the Arctic Council through CAFF on an annual basis. These reports will detail the steps that have been taken to implement the various Arctic Biodiversity Monitoring Plans and outline the implementation status of the CBMP. The work plans will outline work that is anticipated to be completed during the following year including identifying links to other Arctic Council programs and initiatives.

### **Actions to attain this objective:**

- Continue to produce regular progress reports, work plans and national progress reports for each Steering Group, implementing a refined template for annual CBMP Steering Group reports;
- Annual national implementation reports to be provided for each Arctic Biodiversity Monitoring Plan; and
- Conduct a program review in 2020 to evaluate and adjust as needed the CBMP and its four Monitoring Plans with subsequent reviews occurring every five years. Review results may adjust FECs, attributes, sampling methods, data management and analysis, and reporting.

## **Objective 4.3: Secure sustainable funding**

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Activities under the CBMP Strategic Plans have contributed to better coordination of existing biodiversity monitoring efforts. Also, the establishment of the ABDS has increased accessibility of CBMP data, which is relevant for future reporting to the Arctic Council and data users. A focus on continued coordination of monitoring efforts and integration of the collected data is paramount. Further investments are required to support these on-going efforts to fill priority data gaps and help ensure the collected information will reach decision-makers, local experts, the scientific community, and the public.

### **Actions to attain this objective:**

- CBMP Co-Leads and CAFF Secretariat develop a sustainable funding strategy.

## 5. Milestones, activities and anticipated costs:

The following tables outline the major milestones, activities and average annual investment necessary for the successful development of the CBMP over the next four years to implement this strategic plan.

Table 1: Major activities and deliverables

Milestone	Activities and deliverables	Marine Plan	Freshwater Plan	Terrestrial Plan	Coastal Plan	Headline Indicators	Goals and Objectives
1. Plan published	a. Final plan endorsed by CAFF Board and published	2011	2012	2013	Scheduled for 2018	NA	Goal 1: 1.1; 1.5 Goal 2: 2.1; 2.2 Goal 3: 3.2 Goal 4: 4.1
	b. Communication and outreach	Ongoing	Ongoing	Ongoing	Ongoing	ongoing	Goal 1: 1.4
2. Governing structure activated and implementation	a. CBMP Steering Groups established	Operational	Operational	Operational	Scheduled for 2018	NA	
	b. National and/ or other potential Expert Networks established	Operational	Operational	Operational	Scheduled for 2018	NA	Goal 1: 1.1; 1.4 Goal 2: 2.2; 2.3 Goal 4: 4.1; 4.2; 4.3
	c. Engagement of Observer States and organisations	Planned	Planned	Planned	Planned	NA	
	d. Secure sustainable funding	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	
3. Data management	a. Continue development and maintenance of ABDS technical framework	ongoing	ongoing	ongoing	NA until after 2018	ongoing	Goal 1: 1.4 Goal 2: 2.2; 2.7 Goal 4: 4.4
	b. Data management support for CBMP expert groups including making expert group data accessible on ABDS and application of metadata and standards	ongoing	ongoing	ongoing	planned	ongoing	Goal 1: 1.4 Goal 2: 2.2; 2.7
4. Focal Ecosystem Component	a. Agreed upon, including attributes and parameters to monitor and / or report on	Completed	Completed	Started in 2018	planned	NA	Goal 1: 1.3; 1.4
	b. Existing data identified and analysed in SABRs	Done in Previous Plan	2018	2018/19	planned	NA	Goal 1: 1.3, Goal 3: 3.2, Goal 4: 4.2
	c. FEC list revised based upon outcomes from SABRs	2018	2019	2019/20	planned	NA	Goal 1: 1.3
	d. FECs used to inform headline indicators	planned	planned	planned	planned	planned	Goal 3: 3.2

Milestone	Activities and deliverables	Marine Plan	Freshwater Plan	Terrestrial Plan	Coastal Plan	Headline Indicators	Goals and Objectives
5. Coordinated monitoring in each country	a. Recommended monitoring protocols developed by monitoring networks	completed	completed	completed	planned	NA	Goal 1: 1.1 Goal 4: 4.1
	b. Field testing of monitoring protocols and implementation in the Arctic countries	Ongoing	Ongoing Pilot study 2017-2021	Ongoing Pilot study 2017-2021	planned	NA	Goal 1: 1.1 Goal 2: 2.4; 2.5
	c. Arctic-based monitoring networks adopt parameters and sampling approaches	Ongoing	Ongoing	Ongoing	planned	NA	Goal 1: 1.1 Goal 2: 2.4 Goal 4: 4.1
6. Reporting and communication	a. Annual performance reports and work plans with focus on implementing this <i>CBMP Strategic Plan</i>	Ongoing	Ongoing	Ongoing	planned	NA	Goal 1: 1.1 Goal 2: 2.2 Goal 3: 3.1; 3.4 Goal 4: 4.2
	b. Complete the first State of the Arctic Biodiversity Reports	2017	2018	2019	2021	NA	Goal 2: 2.1 Goal 3: 3.3
	c. Align and integrate SABR (update - incorporating new monitoring data) –and subsequently every four years	2021	2021	2021	2021	NA	Goal 1: 1.1 Goal 2: 2.1 Goal 3: 3.1; 3.3
	d. Headline indicators	Input as needed	Input as needed	Input as needed	Input as needed	Ongoing	Goal 1: 1.1; 1.5 Goal 4: 4.4
	e. Input to Aichi 2020 reporting	planned	planned	planned	planned	planned	Goal 1: 1.1; 1.4
	f. Scientific publications	ongoing	Ongoing (Special journal issue 2018)	Ongoing (Special Journal issue 2018/19)	ongoing	As needed	Goal 1: 1.4
	g. Mapping anticipated CBMP outputs to support input to national, regional and global needs. e.g. (1) the Aichi Targets and indicators; (2) Monitoring Plan attributes to the GEOBON Essential Biodiversity Variables (3) Biodiversity Action Plan and other processes (based on guidance from CAFF Board)	2018 - 2019	2018 - 2019	2018 - 2019	2021?	2018 - 2019	Goal 1: 1.1; 1.2; 1.4
	h. Input to Arctic Biodiversity Congress	2018	2018	2018	2018	2018	Goal 1: 1.1; 1.4 Goal 2: 2.2
	i. Communications and outreach, including CBMP newsletter	ongoing	Ongoing	Ongoing	ongoing	ongoing	Goal: 1.4, Goal 2: 2.2 Goal 4: 4.2

Milestone	Activities and deliverables	Marine Plan	Freshwater Plan	Terrestrial Plan	Coastal Plan	Headline Indicators	Goals and Objectives
7. Program review	a. Internal review based on completion on first SABRs and lessons learned. Including use of TLK and citizen science	2018	2016	2015+	Planned	NA	Goal 1: 1.1; 1.3 Goal 3: 3.1; 3.2 Goal 4: 4.1
	b. second internal review - Based on outcomes of the aligned SABR (four years after initial review and subsequently every five years) Review of monitoring plan parameters, sampling approaches, data management approach, analysis, sustainable funding and reporting	2022	2022	2022	Planned	NA	Goal 1: 1.1 Goal 3: 3.1; 3.2 Goal 4: 4.1
	c. External independent review of parameters as part of the development of the next four-year CBMP Strategic Plan	2022	2022	2022	2022	2022	Goal 1: 1.1 Goal 4: 4.1; 4.2; 4.3

Milestone	Description of Activities and Deliverables	Estimated Annual Cost (USD)	Current Investment (Annually)	Investment Needed
1. Program Office Shared between CAFF secretariat and CBMP co-leads.	<p>Three Programme Officers (CBMP-Co-leads) and three country desk offices, CAFF Ex. Sec., CAFF Program Manager, Communication Manager, Data Manager.</p> <p>Manage and coordinate overall program activities, including:                      Communication to CAFF board; guiding and assisting the four Steering Groups; technical program deliveries; communication deliverables and activities; Lead of some development projects; coordinate reporting; general data management; ABDS</p>	<p>420 (Salary)                      +100K Travel and administration costs</p>	<p>Denmark: \$ 110k (Based on average input since 2013. Salary + travels)                      U.S.: \$110 k (annually)                      CAFF Sec: App. 270k per year (salary + travels &amp; admin costs)                      340 K INTERACT project Work Package 7. 2017-2021, from EU.</p>	200k per year
2. Arctic Biodiversity Monitoring Plans	a. Implementation of <i>Marine Plan</i> - (including activation of Steering Group governing structure (see table 1)	<p>2018: 450 K                      2019: 450 K                      2020: 450 K                      2021: 450 K</p>	Some costs related to CAFF/CBMP are covered under 1 (Programme office)	65 K per country per year
	b. Implementation of <i>Terrestrial Plan</i> - (including activation of Steering Group governing structure (see table 1)	<p>2018: 450 K                      2019: 450 K                      2020: 450 K                      2021: 450 K</p>		
	c. Implementation of <i>Freshwater Plan</i> - (including activation of Steering Group governing structure (see table 1)	<p>2018: 450 K                      2019: 450 K                      2020: 450 K                      2021: 450 K</p>		
	d. Develop <i>Coastal Plan</i> implementation (see table 1)	<p>2018: 180K (Salary) + 120K (O&amp;M) includes travel, meeting, workshop and admin costs                      2019 – 2021: To be defined</p>		
3. The Arctic Biodiversity Data Service	Development and maintenance of Arctic Biodiversity Data Service	50K (O&M)		50K per year
4. Headline indicators	Continue to maintain and develop new indicators as possible	100K (average annually)		50k
5. Communications	Guidance, coordination, organization and production of the writing, editing, layout, printing, translations, and dissemination of reports, websites, social media, presentations, graphics, videos, newsletters, side events, promotional products, media relations and more	100K (O&M)		100K

Table 3: CBMP reports, target audiences, frequency and timing

	Primary target audience	Arctic Council	National and regional authorities	Local communities	Scientific community	Other international organizations	Partners and collaborators	NGOs and the public	Timing/ Frequency
Type of report	State of Arctic Biodiversity report	X	X	X	X	X	X	X	2018/ 19, 2021 (aligned and integrated update), and subsequently every four years
	Scientific output as scientific publications, either by discipline or multidisciplinary				X	X	X		Ongoing
	Performance reports and work plans	X	X		X				Annually
	Various summaries and other communications material	X	X	X	X	X	X	X	Ongoing
Primary target audience	Arctic Council	National and regional authorities	Local communities	Scientific community	Other international organizations	Partners and collaborators	NGOs and the public	Timing/ Frequency	

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ISBN: 978-9935-431-71-4