

Emerging issues and challenges

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Since the publication of *Arctic Flora and Fauna: Status and Conservation* [1] in 2001, many changes have occurred in the Arctic environment. Most notably, the significance of climate change as an impact factor has been greatly elevated, in the Arctic as well as at a global scale. A warming climate in the Arctic is projected to set off many environmental changes including melting sea ice, increased runoff, and an eventual rise in sea level with immense coastal implications. Some of these changes are already being felt. Increasing temperatures are already showing many effects on Arctic biodiversity including the northward movement of more southern species, shrubbing and greening of the land, changing plant communities and their associated fauna, increases in migrating invasive species displacing native Arctic inhabitants, and the emergence of new diseases [2]. Additionally, changes in the timing of events (phenology) are an aspect of change which may lead to mismatches between related environmental factors [3]. As a result, some local biodiversity may be in imminent danger of extinction [4].

Although we have learned much since 2001, many questions remain unanswered. We do not know enough about the effects of climate change on biodiversity, what these changes mean to local flora and fauna, and what effects they have on natural resources, many of which are of great importance to local peoples. The Arctic Climate Impact Assessment clearly demonstrated a general lack of information on quantified effects of climate change on biodiversity [5]. It is not enough to show that climate change results in changes to the physical environment. Directly or indirectly, the peoples of the Arctic live off the biological products of land, freshwater, and sea through hunting, fishing, and agriculture. It is vital that we are able to detect changes and how they vary geographically, between species, populations, and biological communities. We need to understand the complex interactions between climate and communities of Arctic species [6]. Although this information is beginning to surface, the accumulation of data on biodiversity is still trailing climate modeling and the gathering of information on the abiotic environment.

A number of challenges are envisaged for Arctic biodiversity. With a warming climate, shipping and resource development (e.g., oil and gas exploration) are likely to increase, with a potential for increased pollution and disturbance to Arctic biodiversity. More development



Prince William Sound, Alaska, USA Lars Johansson/iStockphoto

may lead to different human settlement patterns and changes in resource use. Decreased ice cover may increase the number of areas accessible to fisheries and make new species economically available and so create both opportunities as well as challenges for sustainable use. Many Arctic species also migrate great distances throughout the world and so are subject to environmental changes during their travels, including carrying pollutants back to the north in their bodies. Because they



Nuuk, West Greenland Carsten Egevang/Arc-Pic.com

move through Arctic as well as non-Arctic territories, international cooperation beyond the Arctic is needed for their concerted and sustained conservation.

One response to greater human pressures in the Arctic is the creation of protected areas. Although improving, current protected areas are still inadequate in representation of habitats and ecosystems. For instance, it is generally recognized that marine protected areas are particularly scarce. Even a full overview of biologically sensitive areas in the Arctic marine ecosystem, including on the high seas areas beyond national jurisdictions, is lacking. However, protected areas are only one aspect of biodiversity conservation as climate change inevitably calls for greater attention to more general conservation measures due to shifts in distributions and new introductions into local flora and fauna.

Addressing the pressures facing Arctic biodiversity requires better and more coordinated information on changes in biodiversity. Through the Circumpolar Biodiversity Monitoring Program, CAFF has brought together numerous datasets that indicate changes in biodiversity. This program is an effective response to the many challenges that are envisaged in the wake of climate change in and changing human use of the Arctic regions. Much data already exists on Arctic biodiversity but the challenge is to bring these data together, to analyze and identify the gaps in circumpolar monitoring, and put them to use to facilitate better informed policy

decisions. The aim of the CBMP is to cover all ecosystems at all levels, from the genetic to the ecosystem level, using the latest technologies, as well as traditional ecological knowledge of the northern peoples. The CBMP is a process that cannot be implemented all at once but is well underway with the establishment of monitoring networks, indicators and indices, and management tools such as the Circumpolar Seabird Information Network. The CBMP is a definite response to the international commitments that the Arctic countries have undertaken on halting loss of biodiversity. The results are of practical use for the many questions facing the Arctic countries and the Arctic Council in their deliberations. The current challenge is to use the data available in a better and more coordinated way, fill gaps in knowledge, and increase the geographic coverage of Arctic information for the conservation and sustainability of the environment, as well as for the benefit of decision-makers, Arctic peoples, the science, and the global community at large.

Aspects of vanishing local knowledge, such as Arctic languages and traditional ecological knowledge, need to be fully recognized and acted upon. Climate change and all the associated issues – be they of the natural environment or human-related – pose a new suite of challenges for biodiversity and peoples of the Arctic. Taking care of the environment poses major challenges for the Arctic Council and all other stakeholders interested in the north. CAFF, as the biodiversity arm of the Arctic Council, contributes towards seeking appropriate solutions to those challenges.