# Key findings

In 2008, the United Nations Environment Programme (UNEP) passed a resolution expressing 'extreme concern' over the impacts of climate change on Arctic indigenous peoples, other communities, and biodiversity [1]. It highlighted the potentially significant consequences of changes in the Arctic. *Arctic Biodiversity Trends – 2010: Selected Indicators of Change* provides evidence that some of those anticipated impacts on Arctic biodiversity are already occurring. Furthermore, although climate change is a pervasive stressor, other stressors, such as long range transport of contaminants, unsustainable harvesting of wild species, and resource development are also impacting Arctic biodiversity. These key findings reflect the information in the 22 indicators presented in this report. A more complete scientific assessment of biodiversity in the Arctic will emerge from the full Arctic Biodiversity Assessment, currently in preparation.

FINDING **1**

## Unique Arctic habitats for flora and fauna, including sea ice, tundra, thermokarst ponds and lakes, and permafrost peatlands have been disappearing over recent decades.

Sea ice supports of vast array of life in the Arctic and represents a critical habitat for many species. Sea ice, however, is being lost at a faster rate than projected by even the most pessimistic of climate change scenarios, such as those reported by the Intergovernmental Panel on Climate Change (IPCC). Early warning signs of losses in the sea-ice food web include declines in populations of some species associated with sea ice, such as ivory gulls and polar bears.

The plant communities that make up tundra ecosystems – various species of grasses, sedges, mosses, and lichens – are, in some places, being replaced by species typical of more southern locations, such as evergreen shrubs. Trees are beginning to encroach on the tundra and some models project that by 2100 the treeline will have advanced north by as much as 500 km, resulting in a loss of 51% of the tundra habitat. Depending on the magnitude of change, the resulting ecosystems may no longer be considered "Arctic". The result may be that many of the species that thrive in the Arctic today may not be able to survive there in the future.

Thermokarst lakes[1] and ponds are the most biologically diverse aquatic ecosystems in the Arctic. While drainage and appearance of thermokarst lakes is a relatively common and natural occurrence, over the past 50 to 60 years, studies have shown a net loss of these lakes in some places such as the continuous permafrost zone of northern Alaska and northwestern Canada, and the discontinuous permafrost zone of Siberia. Meanwhile, a net gain of thermokarst lakes has been observed in the continuous permafrost zone of Siberia. The effects of these habitat shifts on local aquatic populations, migratory species, and vegetation are the subject of continuing investigations.

Permafrost peatlands represent unique ecosystem diversity, provide key habitats for some species, maintain hydrology and landscape stability, and hold an enormous stock of organic carbon. Climate change combined with other impacts is leading to a decrease in the extent and duration of permafrost in northern peatlands. Melting permafrost and peatland degradation release greenhouse gases that create a positive feedback for further climate change.

1. Thermokarst lakes and ponds are formed by the thawing of permafrost.

FINDING 2

## Although the majority of Arctic species examined in this report are currently stable or increasing, some species of importance to Arctic people or species of global significance are declining.

Wild reindeer and caribou are very important to the livelihoods of Arctic peoples. Since the 1990s and early 2000s, however, herds have declined by about one-third, from 5.6 to 3.8 million. While this may be a result of naturally occurring cycles, the ability of these populations to rebound is uncertain given the multiple stressors to which they are now exposed, such as climate change and increased human activity.

Although much has been learned, information is deficient on many species and the relationship to their habitat. Even for charismatic animals such as the polar bear, trends are known for only 12 of 19 subpopulations; eight of these are declining.

Arctic shorebirds, such as the red knot, migrate long distances to breed in the Arctic. Evidence indicates that shorebird populations are declining globally. Of the six subspecies of red knot, three are declining while the other three are either suspected of being in decline or their status is unknown.

The Arctic Species Trend Index (ASTI), which provides a snapshot of vertebrate population trends over the past 34 years, shows a moderate 10% overall decline in terrestrial vertebrate populations. The decline partially reflects declining numbers of some herbivores, such as caribou and lemmings, in the high Arctic. In the low Arctic, vertebrate populations have increased, driven by dramatically increasing populations of some goose species, which have now exceeded the carrying capacity of the environment to support them.

Populations of some very abundant seabirds, such as common eiders, are generally healthy. Some Arctic seabird populations, such as murres, may be showing divergent trends. Their populations fluctuate in relation to major climate regimes in the Northern hemisphere, while others are still affected by overharvesting.

Freshwater Arctic char populations appear to be healthy in comparison to those in more southern locations. For marine fish, there is evidence of a northward shift in the distribution of some species in both exploited and unexploited stocks. The shifts appear to be the result of climate change, in addition to other pressures, such as fishing.

FINDING 3

## Climate change is emerging as the most far reaching and significant stressor on Arctic biodiversity. However, contaminants, habitat fragmentation, industrial development, and unsustainable harvest levels continue to have impacts. Complex interactions between climate change and other factors have the potential to magnify impacts on biodiversity.

The life cycles of many Arctic species are synchronized with the onset of spring and summer to take advantage of peaks in seasonal productivity. Earlier melting of ice and snow, flowering of plants, and emergence of invertebrates can cause a mismatch between the timing of reproduction and food availability. In addition, warming sea temperatures in some areas has led to a northward shift in the distribution of marine species, such as some fish species and their prey. These changes have been implicated in massive breeding failures for some seabirds, and subsequent population declines.

Arctic biodiversity is impacted by factors outside the Arctic, including the long-range transport of contaminants through air and water, habitat changes along migratory pathways, and invasive alien species. Increasing contaminant loads have been documented in some polar bear subpopulations, possibly as a result of dietary shifts due to declining sea ice. Red knots are highly dependent upon a limited number of key stopover and wintering sites making them vulnerable to habitat changes occurring outside of the Arctic.

FINDING 4

## Since 1991, the extent of protected areas in the Arctic has increased, although marine areas remain poorly represented.

Between 1991 and 2010, the extent of the Arctic that has some form of protected status doubled from 5.6% to 11%. There are now 1,127 protected areas covering 3.5 million km2 of the Arctic. 40% of these areas have a coastal component but it is not possible at present to determine the extent to which they incorporate the adjacent marine environment. With rapid climate change and the emerging potential for multiple human impacts in the Arctic, there is a pressing need to assess the effectiveness of current terrestrial protected systems as a conservation tool. In the marine environment, where there are far fewer protected areas, the urgent need is for the identification and protection of biologically important marine areas.

FINDING 5

## Changes in Arctic biodiversity are creating both challenges and opportunities for Arctic peoples.

Declines in Arctic biodiversity may affect the availability of traditional foods. Coupled with decreasing access to freshwater and the unpredictability of winter ice, sustaining traditional ways of life may become more difficult. On the other hand, range extensions of southern species, shifting habitats, changes in resource use, among other factors, may provide opportunities to harvest new species.

FINDING 6

## Long-term observations based on the best available traditional and scientific knowledge are required to identify changes in biodiversity, assess the implications of observed changes, and develop adaptation strategies.

Significant difficulties were encountered in preparing this report because most countries do not have internal long-term biodiversity monitoring programs. Where such programs do exist, the data collected is not consistent across the circumpolar region.

In a few cases where coordinated monitoring efforts have a long history (e.g., seabirds), trend information is reliable and conservation strategies based on the results of monitoring have been successful. The 2005 Arctic Climate Impact Assessment recognized that long-term monitoring would greatly help detecting early warning signals and development of adaptation strategies.

Generations of biodiversity knowledge and its uses are contained in traditional Arctic languages, but many of these languages are facing an uncertain future. Twenty Arctic languages have become extinct since the 1800s, and ten of these extinctions have taken place after 1990 indicating that the rate of loss is increasing. Their loss represents not only a loss of culture but also a loss of historical biodiversity knowledge.

The Circumpolar Biodiversity Monitoring Program, which encompasses scientific, traditional ecological knowledge, and community-based monitoring approaches, is being implemented by the Conservation of Arctic Flora and Fauna working group of the Arctic Council, to address these urgent needs for monitoring

FINDING 7

## Changes in Arctic biodiversity have global repercussions.

The importance of Arctic ecosystems for biodiversity is immense and extends well beyond the Arctic region. The Arctic, for example, supports many globally significant bird populations from as far as Australia and New Zealand, Africa, South America, and Antarctica. Declines in Arctic species, therefore, are felt in other parts of the world.