



National Aboriginal Health Organization (NAHO)
Organisation nationale de la santé autochtone (ONSA)
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ARCTIC BIODIVERSITY AND INUIT HEALTH



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Inuit Tuttarvingat



Cathleen Knotsch
James Lamouche

March 2010

Arctic Biodiversity and Inuit Health

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Under the *Canadian Constitution Act, 1982*, the term Aboriginal Peoples refers to First Nations, Inuit and Métis people living in Canada. However, common use of the term is not always inclusive of all three distinct people and much of the available research only focuses on particular segments of the Aboriginal population. NAHO makes every effort to ensure the term is used properly.



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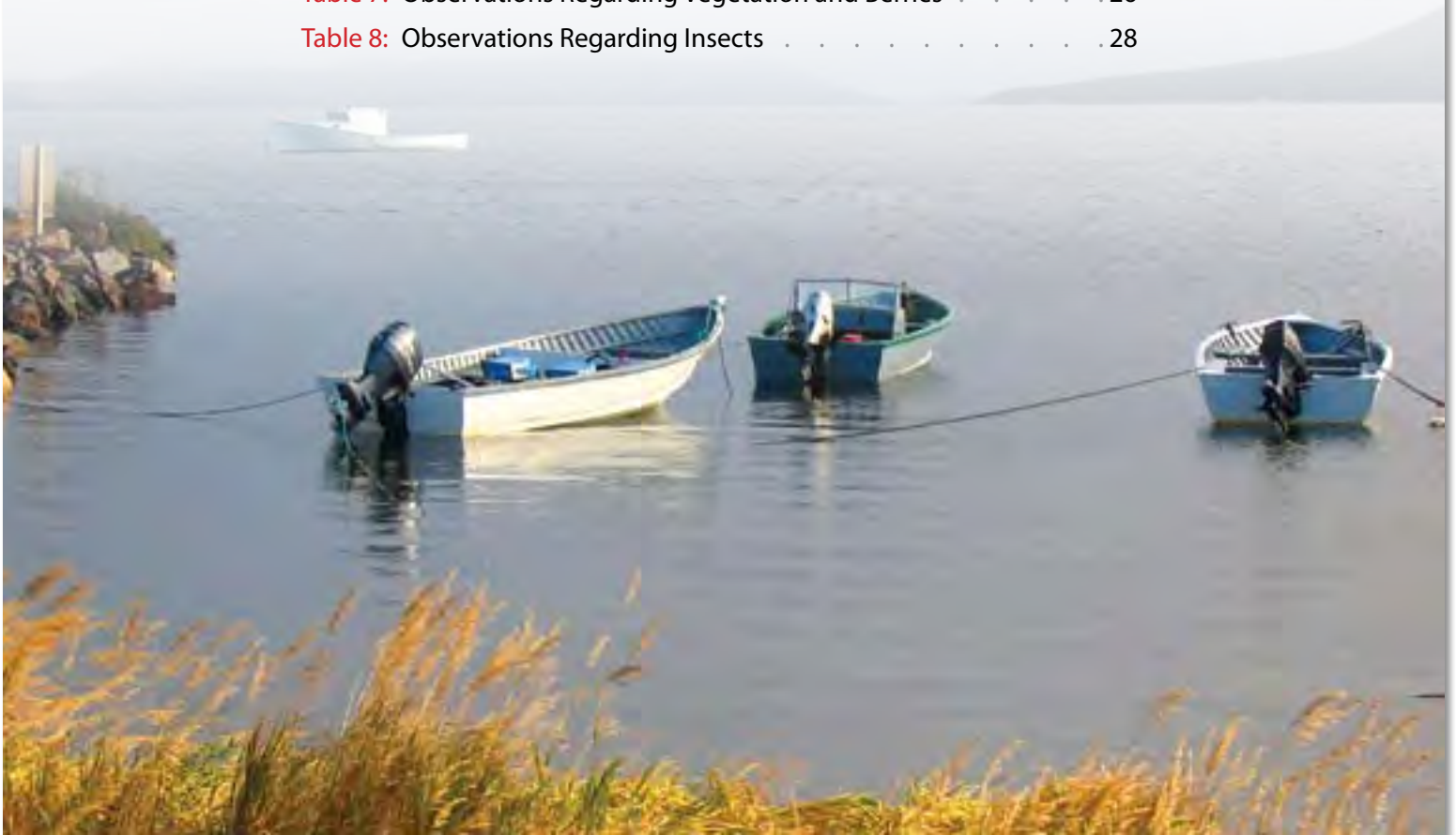
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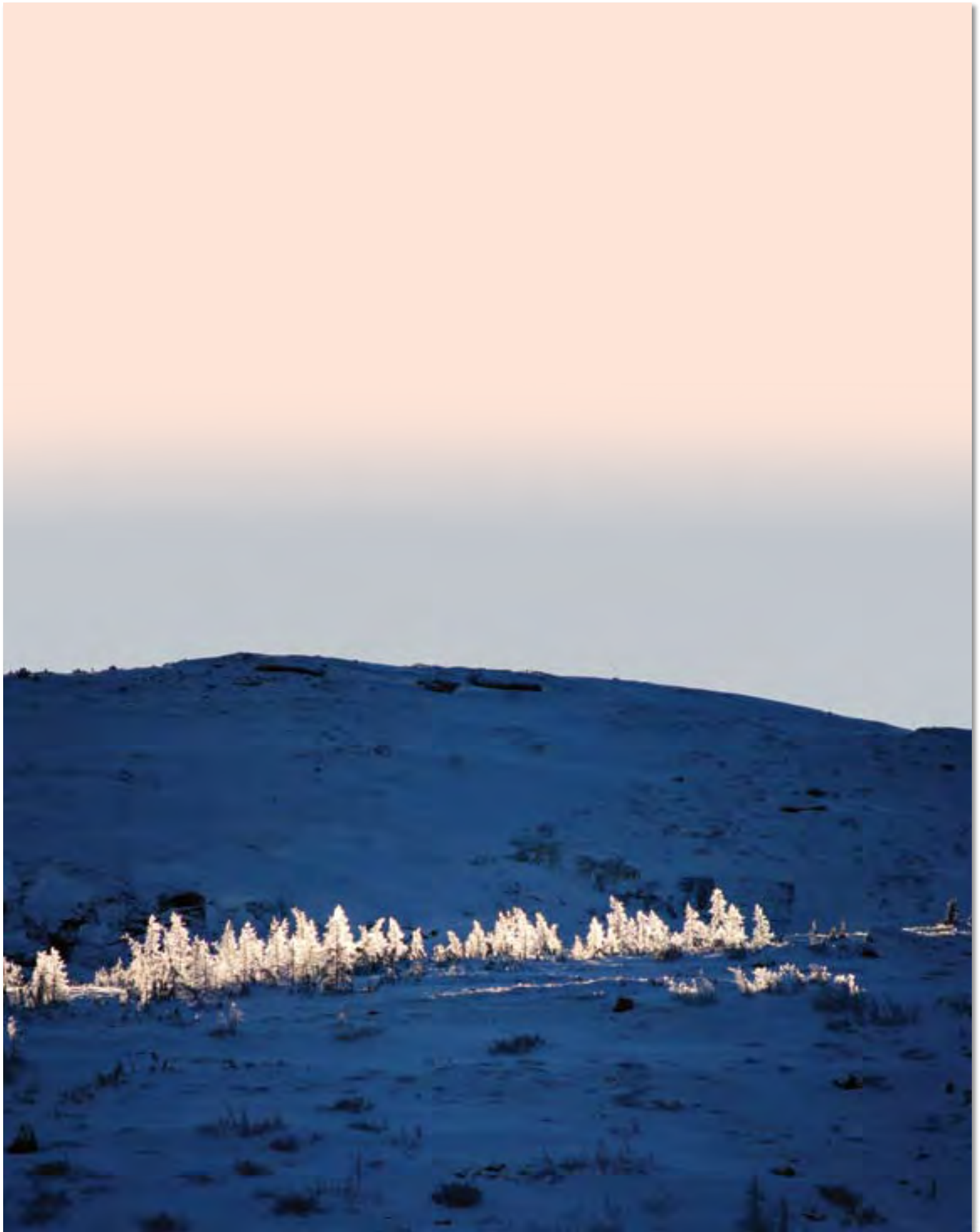
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In this publication, we show the link between environmental change, based on Inuit perspectives and direct observations, and biodiversity, which is the sum of all living beings and things. We summarize the many changes Inuit have reported as impacting biodiversity, such as the appearance of insects formerly not seen, and at the same time examine how local knowledge is crucial to adapting to changes in biodiversity. Finally, we discuss the connection between biodiversity and Inuit health and why changes in Arctic biodiversity will mean changes to human life in the Arctic.

Inuit have been reporting environmental changes in the Arctic, such as differences in sea-ice thaw and freeze-up, for years and several publications have documented these observations from various regions of the circumpolar world. The most comprehensive approach to document these observations in Canada is found in the book *Unikkaaqatigiit — Putting the Human Face on Climate Change: Perspectives from Inuit in Canada* (Nickels et al., 2006). *Unikkaaqatigiit* summarizes what Inuit have said about environmental change. It is also one of the first published records of Inuit adaptations to climate change in that it reports on how communities and individuals are responding to change and adjusting to it in their daily lives.

The main findings in our report rely upon published materials on biodiversity. The core of this report is based on materials produced under international and national biodiversity programs and documentation of Indigenous insights into climate change. The tables provide hands-on examples of how local observations can be organized to have relevance in discussions of biodiversity.

Changes in climate and weather events in the Arctic and their subsequent effects on the biological systems of the region have impacts on food security and economic well-being of Inuit. Limited access to caribou, seal, fish, berries and other 'country foods' leads to greater reliance on imported store-bought foods. Aside from a change in diet, which can be stressful for the human body, the transition from nutrient-dense country foods to less nutritious store-bought foods may have an even more significant impact on the health of Inuit, in the short and long term.

The link between the loss of biological diversity and the parallel loss of cultural diversity is only now beginning to be recognized. The Arctic is homeland to Inuit, not only in Canada but circumpolar, and Inuit are the first to see and feel the changes in ice, water and land. The pace of change has quickened and we can observe changes in temperature, plant growth and wildlife behavior within several calendar years instead of over centuries. Changes to the living resources of the Arctic translate into rapid changes in the lifestyles of local human populations and increased stress on the health and well-being of Inuit.

We hope that this publication and others like it will draw attention to the importance of biodiversity in the circumpolar Arctic and that the world will be guided by the knowledge and wisdom of Inuit regarding the homelands, environment and biodiversity upon which they rely.

“Environmental changes are coming at a rate that may exceed our capacity to respond. The Arctic is melting. We fear for our future as Inuit and we fear for the planet.”

From a speech given by Mary Simon, President of Inuit Tapiriit Kanatami, on Arctic Indigenous Peoples Day, December 18, 2009.

THE REGIONS IN INUIT NUNANGAT

Source: Inuit Tapiriit Kanatami

2010 INUIT UKIUNGAT YEAR OF INUIT ANNÉE DES INUIT

“2010 Year of the Inuit is an educational campaign spearheaded by Inuit Tapiriit Kanatami, the national organization representing Canadian Inuit. Its goal is to increase awareness among the general Canadian population about issues facing the Inuit of Canada and celebrate Inuit accomplishments and achievements.”

www.inuit2010.ca/

The year 2010 has been declared as both “Year of Inuit” and “International Year of Biodiversity” and what better time to document how Inuit perspectives on environmental change provide information on changes in biodiversity. Inuit living in Canada have growing concerns about the impacts to their environment, health and culture stemming from various forms of environmental change, particularly climate change. This report is intended to examine Inuit observations of environmental change and its impact upon biological diversity, and subsequently, upon the health of Inuit culture, communities and individuals.



Inuit are a circumpolar people and inhabit regions in Greenland, Canada, Alaska and Russia. They are united by a common language and culture. In Canada, the four Inuit regions are spread across the Arctic and encompass more than 40 per cent of the country’s entire land mass. Inuit Nunangat (the Inuit homeland) reaches from the Inuvialuit Settlement Region in the northern Northwest Territories, over Nunavut and Nunavik (northern Quebec) to Nunatsiavut (Labrador) in the east. A total population of over 50,000 Inuit (2006 Census) live in 53 communities spread across these regions.

Indigenous and western scientific observations of environmental change in the Arctic provide evidence of a larger scale change in the earth’s climate; they also provide evidence of changes in the earth’s life-systems. When western scientific research was used to systematically organize all observations, strong recommendations emerged to identify and monitor continuing changes in these life-systems, ecosystems and the biodiversity of the Arctic and elsewhere.

Biodiversity refers to all living plants, animals, microorganisms and the relationships between them – and looks at the number and variety of organisms

2010 INTERNATIONAL YEAR OF BIODIVERSITY

"The United Nations declared 2010 to be the International Year of Biodiversity. It is a celebration of life on earth and of the value of biodiversity for our lives. The world is invited to take action in 2010 to safeguard the variety of life on earth: biodiversity." Biodiversity is life
Biodiversity is our life

www.cbd.int/2010/welcome/

found within a given geographic region. The more diverse a given area is, or the more variants of life we find in it, the better suited this area is, as a system, to survive any threats to its existence.

Climate change and biological diversity are concepts created by Western science and the frameworks of observation, reductionism, categorization, hypothesis, and theoretical testing come with a set of methodologies to choose from. Inuit knowledge is based on observation, experimentation and hypothesis testing and can draw upon detailed historical knowledge within large areas of regional geography. While Inuit knowledge differs from Western scientific knowledge in the experiences, the sources of information used and the responses developed, Inuit knowledge adds new insights to the "best available knowledge" provided by scientists.

The close connection of Inuit to the lands, waters and territories of the Arctic increases their exposure to detrimental effects of change while at the same time making Inuit best placed to observe and report on these changes.

"[...] a significant portion of Inuit still hunt and fish for part of their diet. Inuit have valuable knowledge that can help researchers and policy makers to understand and address environmental change issues in the North. Clearly, the most important and reliable information in the Arctic is Inuit themselves" (Nickels et al., 2006, p.53).

The Nation-States of the earth's circumpolar regions, including Canada, are developing specific monitoring programs of Arctic biodiversity and are identifying factors that lead to changes in the number of species that exist in Arctic ecosystems. Climate change is one of the factors that has an increasing impact not only on individual animals and plants but also on the ways in

BIODIVERSITY

Biodiversity refers to all living plants, animals, microorganisms and the relationship among them – and looks at the number and variety of organisms found within a given geographic region. The more diverse a defined area is, or the more variants of life we find in it, the better suited this area is, as a system, to survive any threats to its existence.

According to the Circumpolar Biodiversity Monitoring Program, the Arctic's ecosystems are under pressure from climate change and resource development. The Convention on Biological Diversity states that growing populations and how much humans are consuming may affect our planet's ability to further provide the foods and goods humans need to live.

ECOSYSTEMS



Ecosystem refers to the community of living organisms and the materials of their surroundings. Therefore it includes plants, animals, microorganisms, rocks, soil, minerals, water, and air. An ecosystem can be very small or very big, depending on definition or purpose of research.

The ecosystem approach is a tool and provides the framework needed to implement the objectives of the Convention on Biological Diversity. The Circumpolar Biodiversity Monitoring Program, for example, aims at producing a strategic list of ecosystem components that should be monitored.

Sources: the Web sites of Encyclopedia Britannica, Intergovernmental Panel on Climate Change, Convention on Biological Diversity

which groups of living things interact with each other. For example, changes in the quality and quantity of lichen, the main food of caribou, have a significant effect on the distribution and health of caribou herds. As such, climate change in the Arctic has been identified as a significant threat to the current state of biodiversity (Helander-Renval et al., 2005).

Arctic Biodiversity and Inuit Health was prepared as a collaboration by two staff members at the National Aboriginal Health Organization: Cathleen Knotsch of Inuit Tuttarvingat, and James Lamouche of the Communications and Research Unit. Inuit Tuttarvingat focuses specifically on Inuit health and wellness issues, while the Communications and Research Unit works on health and wellness of the wider Aboriginal population. Working jointly on this report, we were able to provide an overview of the impact of documented environmental changes on Arctic biological diversity, changes in biodiversity, and their impact on Inuit and Inuit communities. This report is based on published materials on biodiversity and Inuit observations of biodiversity, and refers to documents produced under international and national biodiversity programs as well as documentation of Indigenous insights into climate change. Our goal is to make the link between biodiversity and Inuit health, and we do this by presenting Inuit perspectives on the connection between environmental change and biodiversity. An earlier draft of the paper was shared with the National Inuit Committee on Climate Change.

2010 marks an important year for Inuit regions in terms of biodiversity because of many international, circumpolar and national initiatives. The parties to the Convention on Biological Diversity committed in April 2002 to achieve by 2010 "a significant reduction of the current rate of biodiversity at the global, regional and national level as a contribution to poverty alleviation and to the benefit



CLIMATE CHANGE

Climate change refers to weather that when measured over a period of time shows a change. This can be a change in the average weather, such as average temperatures or can be a change in events occurring in cyclical patterns, such as the El Niño, a warm water current flowing north along the South American pacific coast which impacts the fishery in the regions. Climate change encompasses frequency of extreme weather events, temperature, sea-level changes and changes in precipitation patterns.

of all life on Earth” (United Nations, Convention on Biological Diversity Web site). These targets will be assessed this year by the Convention on Biological Diversity. Also, the United Nations Convention on Biological Diversity will be undergoing a major review this year. Finally, the Circumpolar Biodiversity Monitoring Program (CBMP), established following recommendations of the 2004 Arctic Climate and Impact Assessment, is carrying out a five-year implementation plan to monitor the circumpolar region which includes the four Inuit regions of Canada (Gill et al., 2009).

In light of these current and ongoing national and international efforts concerning biodiversity, we hope this document can be used to spark discussions on biodiversity and climate change, related issues such as ecosystem protection and conservation, and how these issues relate to human and community health.



Many of the Inuit observations of changes to biological diversity that are presented in our paper are based on content from the *Unikkaaqatigiit* report. The authors also consulted national and international publications for the theme of biodiversity, such as the United Nations Convention on Biological Diversity and other United Nations materials. Reference is also made to materials from the Arctic Council (www.arctic-council.org), such as the *Arctic Climate Impact Assessment* (ACIA 2004), and its programs: the Arctic Monitoring and Assessment Program (AMAP) and Conservation of Arctic Flora and Fauna (CAFF).

The authors reviewed the published sources to identify Inuit observations of changes to biological diversity and/or any subsequent effects on the health of Inuit. Only published sources were used in this review, and selected documents were related either geographically or with respect to time frame (approximately 1995 to present) and because they were based upon reports and observations of Inuit.

The tables in our chapter “Inuit Observations of Changes in Arctic Biodiversity,” page 15, provide hands-on examples for community members of how local observations can be organized to have relevance in discussions of biodiversity. Based on observations summarized in *Unikkaaqatigiit—Putting the Human Face on Climate Change: Perspectives from Inuit in Canada* (Nickels et al., 2006) and several other sources of publicly documented Inuit knowledge, the tables provide an overview and checklist of biodiversity impacts that have been documented elsewhere in contexts of environmental observation and climate change.

ORGANIZATION OF THIS DOCUMENT

We begin with a description of climate change as a concern to Inuit followed by a description of biodiversity and related scientific concepts. We present Inuit observations of change in biodiversity captured in eight tables organized by groups of species. We then elaborate on particular examples of how changes in biodiversity impact upon Inuit life. While these impacts are wide ranging, the authors focus on those related to human health, such as access to food, the movement of species into geographic areas previously avoided (invasive alien species) and the consequences of this, and drinking water safety. A conclusion rounds the document by highlighting the importance of biodiversity for the future of Inuit and of all humanity.



There are some striking realities that have brought attention to the circum-polar Arctic, including the fact that the largest freshwater resources on Earth are found in the Arctic and Antarctic together, or that seven of the world's 10 largest wilderness areas are located in the Arctic region. Arctic ecosystems play a key role in maintaining the planet's biological, chemical and physical balance (Gill et al., 2009, p.3).

The Canadian Arctic is far more diverse and has much more biomass and biodiversity than the uniform, dry and barren landscape usually associated with the far North. Biological productivity is low which means that plants and animals reproduce slowly, and it takes longer than elsewhere for their population to grow in numbers. Low biological productivity also means that these plants and animals reproduce later in their lifecycle (slow sexual maturation) and that they live longer (long life spans). Environmental changes taking place now affect not only the physical environment (ice conditions, permafrost melt, etc.) but also the many, diverse species living in these environments as well. Indigenous and western scientific observations of environmental change in the Arctic point to continued large-scale change in climate and in the Arctic's life-systems.

THE DIVERSITY OF SPECIES LIVING IN THE ARCTIC



Arctic Canada.

Source: Hebert PDN, ed. *Canada's Polar Environments* [Internet]. CyberNatural Software, University of Guelph. Revised 2002.

An estimated 20 **mammal** species live in Canada's Arctic. The largest meat eaters (carnivores) are the polar bear and arctic wolf. Smaller meat eaters include the arctic fox, ermine, and wolverine. The largest herbivores are caribou and musk ox and smaller ones include the snowshoe hare, arctic hare, brown lemming and collared lemming. The largest herds of caribou on the planet (George River and Leaf River herds), with nearly a million animals, wander



across the southern Arctic in Nunavik in search for food, shelter and freedom from predators and insects.

In the summer, **migratory marine mammals**, such as beluga whales, narwhal, orca, bowhead whale, walrus, various seals, and polar bears migrate north into the Arctic Archipelago as they follow the retreating ice edge to feed. Canada's Arctic Basin, which lies in the waters north and west of Ellesmere Island, the Queen Charlotte Islands, Banks Island, and the Beaufort Sea, is in fact a thick layer of ice floating on the Arctic Ocean which acts like a huge land mass with a strong cooling effect on global weather. As food for birds and marine mammals, the unique adaptations of plankton, algae, and crustaceans living right below the ice play an important role. Little is known about the ecosystem and biodiversity of the ocean floor.

The waters surrounding the Arctic Islands as well as Hudson Bay and James Bay are more shallow than the Arctic Basin and tend to be ice free during the summer. During the summer months there is greater biodiversity of marine life near polynyas and shore leads – areas where deeper water mixes with the layers above, and in areas where fresh water enters the Beaufort Sea and Hudson and James Bays. Kelp beds are found in the southern intertidal zones. These Arctic oases are major feeding grounds for sea birds and are the calving areas for marine mammals. These areas also support such fish as arctic cod, arctic char, arctic cisco, arctic lamprey, pink salmon, and chum salmon as well as various molluscs and crustaceans such as stone crab and various shrimp.

Waterfowl includes snow goose, brant, Canada goose, common eider, oldsquaw duck, red-throated loon, arctic loon and king eider. **Shore and seabirds** include the northern fulmar, red phalarope, parasitic jaeger, red knot, dunlin, long-tailed jaeger, glaucous gull, white-rumped sandpiper, black-bellied plover, common and little ringed plovers, and ruddy turnstone. The gyrfalcon, rough-legged hawk, and snowy owl are birds of prey. Other birds include the willow ptarmigan, rock ptarmigan, hoary redpoll, snow bunting, Lapland longspur, and horned lark.

The Mackenzie River is the longest river in Canada and supports many of the wetlands mentioned above. **Freshwater species** here include landlocked and anadromous arctic char, whitefish, lake trout, northern pike, cisco, coney, sticklebacks and others.

The Arctic islands have the least precipitation and are considered a polar desert. While most Arctic areas lie above the tree line, there are approximately 150 different plant species present. The vegetation is characterized as herb-lichen tundra. The poorly drained lowlands and wetlands are the most fertile and support sedges and mosses.

The ground of the northern Arctic lands is continuously frozen. This permafrost covers most of the Arctic Islands of Nunavut and the Northwest Territories as well as the eastern mainland areas of Kitikmeot and the northern Ungava Peninsula in Nunavik. Plants found in the area include purple saxifrage, mountain avens, arctic poppy, arctic willow, lichens, sedges, cotton grass, moss and arctic bladder campion, dwarf birch, northern Labrador tea, arctic lousewort, mountain sorrel, pygmy buttercup, and chickweed.

The mountaneous Arctic in Canada's east is the only area with permanent ice caps and glaciers. It runs along the northeastern fringe of Nunavut and Labrador, notably the Ellesmere and Devon Island ice caps, the Baffin Island Mountains and coastal lowlands, and the Torngat Mountains on the Labrador Peninsula. It is extremely cold and dry with continuous permafrost. The growing season is short and cool, though there are long periods of daylight. Three quarters of the land is barren rock where even lichen rarely grows. Tiny species of plants often grow in thick insulating mats or are covered in thick hairs that act as insulation.

Arctic black spruce, arctic willow, cottongrass, sedges, mosses, and various rush species, purple saxifrage, arctic poppy, mountain avens, mountain sorrel, bilberry, and arctic white heather are some of the other plant species present. The most southern areas of Nunavik and Nunatsiavut are situated within the tree line and black spruce dominates with the presence of alder, willow and larch groves in boggy areas. Permafrost is also not continuous here.

BIODIVERSITY AND HUMAN HEALTH

Biological diversity or biodiversity is defined as the diversity, or range of difference, within any given species, between species, and between ecosystems.¹ These living organisms may interact in very complex ways. Generally, biodiversity can be used as a measure of the overall health of a particular environment or ecosystem and it also has a significant and direct impact on human culture and well-being. These impacts are especially apparent with respect to Indigenous Peoples who generally maintain a close relationship to their environment – which is expressed through traditional practices of food production and harvesting, technological uses of biological products as well as their philosophical understanding of the universe and the place of humans in it.

Biodiversity is closely linked to human health. A healthy environment is essential to a healthy community, just as a healthy diet is essential for individual health. For example, many pharmacological and most traditional medicines are derived from biological sources. Recognizing the importance of biodiversity, protecting it, and using it in a sustainable manner are essential to sustaining human communities into the future.

¹ United Nations Convention on Biological Diversity, Article 2.

What is Biological Diversity?

- Often called 'biodiversity', biological diversity refers to the variety of species and ecosystems on Earth and the ecological processes that they are part of.
- Three components of biodiversity are: ecosystem, species and genetic diversity.
- Ecosystems perform functions that are essential to human existence, such as soil and oxygen production and water purification.

Source: *Canadian Biodiversity Strategy 1995, p.5,*
www.cbin.ec.gc.ca/documents/national_reports/cbs_e.pdf

Biodiversity can affect health directly because a diverse and healthy ecosystem provides a number of different sources of nutritional and medicinal products. The extinction or extirpation (the removal of species from a particular territory or range) of a particular source of food will have a significant and direct impact upon the health of local human populations.²

Biodiversity also can be associated with the health of a culture. Among Canada's Aboriginal Peoples, and Indigenous Peoples around the world, cultural identity is often linked to key natural resources. For Inuit, the harvesting of caribou, seal, char, and whale are important elements of cultural identity, which in turn, reinforce personal and community pride and feelings of well-being. The survival of indigenous animal species reinforces cultural survival.

The link between the loss of biological diversity and the parallel loss of cultural diversity is only now beginning to be recognized. Many studies have shown that there is a direct link between the presence of Indigenous Peoples and recognition of their rights over territories, and the presence of biological diversity within those territories. Also, the loss of biodiversity impacts Inuit to a greater degree because of their increased contact with, and reliance upon, the natural environment. This loss will have effects on, among other issues, the harvesting of foods (i.e., hunting and fishing rights), the use of natural resources (forestry, ecotourism, and others), the collection of traditional medicines, access to and control over traditional territories, as well as the storage and transmission of traditional knowledge, culture and information regarding these issues.

As we lament the collapse of biological diversity, we pay too little heed to a parallel process of loss, the demise of cultural diversity, the erosion of what might be termed the ethnosphere, the full complexity and complement of human potential as brought into being by culture and adaptation since the dawn of consciousness (Davis, 2001, p. 6).

² See EnviroZine, Issue 58 (Environment Canada) :
www.ec.gc.ca/EnviroZine/english/issues/58/feature2_e.cfm

Biodiversity and climate change are linked, and each has an impact on the other.¹ Canadians have paid close attention to the international climate change negotiation process, but much less attention is given to the international processes to protect biological diversity.

Efforts to protect biodiversity and deal with climate change are not always easy to coordinate or manage. Parks Canada, for example, developed a climate change impact assessment for parks in 2000, and is the only agency responsible for protecting areas that has actually set formal targets to reduce greenhouse gas emissions in the department's operations. Following a 2008 survey on Protected Areas and Climate Change, it was "found that while protected areas managers strongly believe climate change is an important management issue, relatively little progress has been made to date in developing relevant climate change strategies or policies" (Canada's 4th National Report to the United Nations Convention on Biological Diversity, 2009, p. 169).

Impacts of climate change on Arctic regions are expected to be significant and result in even more change, even though not all details are known. Warming temperatures are putting the current functioning of the world's oceans at risk and are affecting water temperature, levels of salinity, and atmospheric and oceanic circulation. Other effects include erosion of coastal topography and geographic features, such as the disappearance of beaches into the ocean, and changes in life forms found in coastal zones, to name just a few.

Inuit have been reporting environmental changes in the Arctic for years and several publications present these observations from various regions of the circumpolar world. The most comprehensive approach in Canada is found in the book *Unikkaaqatigiit — Putting the Human Face on Climate Change: Perspectives from Inuit in Canada* (Nickels et al., 2006). This publication summarizes what Inuit in 17 Arctic communities have said about environmental change. It is one of the first published records of Inuit adaptations to climate change in that it reports on how communities and individuals are responding to change and adjusting to it in their daily lives. *Unikkaaqatigiit* is also a milestone report in that it marks a shift to interpreting local knowledge in the social sciences.

Around the same time as *Unikkaaqatigiit*, several other key scientific reports were published, all with relevance to Inuit and the Arctic region. The most comprehensive report and likely the one that received most public attention is *Arctic Climate Impact Assessment (ACIA)* published in 2004. Commissioned by the Arctic Council, this report presented the first comprehensive



¹ See Climate Change and Biodiversity section on the Convention on Biological Diversity Web site: www.cbd.int/climate

interdisciplinary study of Arctic environmental change. The *ACIA* is a milestone report because it indicated a shift to more of a population-focus within climate change research. In 2009, the Arctic Monitoring and Assessment Program (AMAP) provided member countries with the report *Update on Selected Climate Issues of Concern* (AMAP, 2009).

Canada also produced two national assessment reports on climate change that included Indigenous Arctic perspectives. It is significant that both reports address human health and well-being. The first assessment, *Climate Change and Adaptation: A Canadian Perspective* (Lemmen and Warren, 2004), focused on strategies for adaptation to climate change and their potential in reducing health and other risks for humans. The second Canadian assessment, *Human Health in a Changing Climate: A Canadian Assessment of Vulnerabilities and Adaptive Capacity*, was published by Health Canada and devoted one chapter to the health impacts of climate change in Canada's North:

"Aboriginal hunters and Elders have reported significant warming throughout the North in recent decades, corroborating these scientific observations ... According to both scientific measurements and local knowledge, these climatic changes have led to significant decreases in the extent and thickness of winter sea ice throughout Canadian Arctic waters, melting and destabilization of permafrost, increased coastal erosion of low-lying areas, and shifts in the distribution and migratory behavior of some Arctic wildlife species" (Furgal, 2008, p.307).

A follow-up report, *From Impacts to Adaptation: Canada in a Changing Climate 2007*, foresees that "maintaining and protecting aspects of traditional and subsistence ways of life in many Arctic Aboriginal communities will become more difficult in a changing climate" (Lemmen et al., 2008, p.6).



Inuit have been observing and adapting to the effects of a changing environment for thousands of years. Their perspectives on the environment are not the same in all communities and regions. Understandably, the observations are not uniform but they point to unprecedented changes in the Arctic environment.

With respect to biodiversity, Inuit have observed that the flora and fauna are not the same as they once were. Some of this may be due to changes in climate but it is also important to note that many changes from multiple sources are being introduced into a dynamic and complex group of systems. For example, contaminants are being found in the Arctic environment, as a result of resource extraction processes, chemical spills, etc. These contaminants then affect the Arctic biological systems. Also, contaminants in southern Canada can end up in the Arctic by travelling in prevailing winds and ocean currents. Again, these then make their way into the Arctic biological systems. While these are not, strictly speaking, changes in biodiversity, they are examples of changes which may increase or amplify the effects of other processes.

As would be expected, the significant changes that have been taking place in Inuit regions have resulted in observations of changes in all aspects of the biological systems of the Arctic. All Inuit regions have reported observable changes in the occurrence, migration and/or distribution and overall health of vegetation, marine wildlife, terrestrial wildlife, birds, fish and insects. Documentation includes reports of some plants growing taller and being more abundant than before. Observations also include changes in health, behavior and distribution of animals, as described in *Unikkaaqatigiit*:

General observations/trends common to all regions include: an increased number of abnormalities and decreased level of health among marine and terrestrial wildlife as well as various species of fish; changes in the migration and distribution patterns of marine and terrestrial wildlife and birds; and the appearance of new species of marine and terrestrial wildlife, birds, fish and insects, as well as the movement of certain species further north than ever before (Nickels et al., 2006, p.65).

Vegetation on the land, such as the growth of berries, has been impacted negatively by environmental change. Changes in rainfall, more intense heat from the sun, drier land conditions, increased erosion and other factors have been listed as reasons for fewer berries and berries of lesser quality (Nickels et al., 2006, p.64).





Map of the northern hemisphere showing the Arctic conservation area.

“The Conservation of Arctic Flora and Fauna, (CAFF) is a working group under the Arctic Council, for the countries of Russia, Denmark, USA, Canada, Sweden, Iceland, Norway and Finland and indigenous peoples. Monitoring, assessment, protected areas and conservation strategies are all tasks under this working group. The area that the working group primarily addresses is presented in this map.”

Source: Hugo Ahlenius, UNEP/GRID-Arendal.
<http://maps.grida.no/go/graphic/arctic-conservation-area-caff-topographic-map>

The following tables outline observations of Inuit with a specific focus on biological diversity throughout the Canadian Arctic. The authors relied heavily on observations documented in *Unikkaaqatigiit* and, in addition, reviewed the following documentation of Inuit observations: *Conservation of Arctic Flora and Fauna report* (CAFF); *Inuit Observations of Climate Change* (IISD, 2001); *Voices from the Bay* (MacDonald, 1997), the *Aklavik Inuvialuit Describe the Status of Certain Birds and Animals on the Yukon North Slope* [Wildlife Management Advisory Council (North Slope) and the Aklavik Hunters and Trappers Committee, 2003].

In some cases, the earlier publications mentioned place names that have since changed or referred to regions and not communities. In both cases, we documented the observations under the appropriate current place name. For example, observations from Port Harrison applying to the region Hudson Bay are listed in our table under the place name of Inukjuaq under the region of Nunavik.

TABLES: INUIT OBSERVATIONS OF CHANGES IN ARCTIC BIODIVERSITY

Table 1: Observations Regarding General Impacts on Biodiversity

Table 2: Observations Regarding Fish

Table 3: Observations Regarding Mammals

Table 4: Observations Regarding Waterfowl

Table 5: Observations Regarding Birds

Table 6: Observations Regarding Terrestrial Mammals

Table 7: Observations Regarding Vegetation and Berries

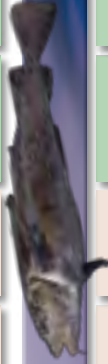
Table 8: Observations Regarding Insects



OBSERVATIONS

Regarding General Impacts on Biodiversity

REGION	INUVALUIT SETTLEMENT REGION (NWT)					KITIKMEOT (NU)							
Community	Paulatuk	Ulukhaktok	Aklavik	Tuktoyaktuk	Inuvik	Ikaahuk	Kugaaruk	Cambridge Bay	Repulse Bay	Arviat	Salliq	Tikirarjuaq	Chesterfield Inlet
New species of wildlife/insects/fish birds or vegetation	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Decrease in health among marine or terrestrial wildlife or fish	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES



OBSERVATIONS

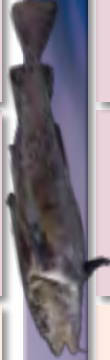
Regarding Fish

Arctic char of poorer quality (deformed, soft flesh, skinny)	YES				YES								
Arctic char have decreased in number													
Arctic char are larger in size						YES							
Salmon are smaller in size													
Salmon have increased in number	YES				YES								
Capelin are no longer found													
Cod are no longer found									YES				
Cod have decreased in number						YES				YES	YES		
Cod have increased in number	YES												
Cod are larger in size													
Whitefish are of poorer quality													
Turbot have increased in number													
Whitefish have decreased in number	YES												
Herring are skinnier													

OBSERVATIONS

Regarding General Impacts on Biodiversity

REGION	QIKIQTAALUK (NU)			NUNAVIK (QC)				NUNATSIAVUT (NL)	
	Arctic Bay	Clyde River	Cape Dorset	Puvirnituq	Kangiqsujuaq	Ivujivik	Inukjuak	Akuiivik	Nunatsiavut
Community									
New species of wildlife/insects/fish birds or vegetation	YES	YES	YES	YES	YES	YES	YES	YES	YES
Decrease in health among marine or terrestrial wildlife or fish	YES	YES	YES	YES	YES	YES	YES	YES	YES



OBSERVATIONS

Regarding Fish

Arctic char of poorer quality (deformed, soft flesh, skinny)				YES	YES	YES				
Arctic char have decreased in number							YES			
Arctic char are larger in size										
Salmon are smaller in size										YES
Salmon have increased in number										
Capelin are no longer found										YES
Cod are no longer found										YES
Cod have decreased in number									YES	
Cod have increased in number										
Cod are larger in size										
Whitefish are of poorer quality										
Turbot have increased in number										
Whitefish have decreased in number										
Herring are skinnier										

OBSERVATIONS

Regarding Marine Mammals



REGION	INUUVIALUIT SETTLEMENT REGION (NWT)					KITIKMEOT (NU)			KIVALLIQ (NU)				
	Paulatuk	Ulukhaktok	Aklavik	Tuktoyaktuk	Inuvik	Ikaahuk	Kugaaruk	Cambridge Bay	Repulse Bay	Arviat	Salliq	Tikirarjuag	Chesterfield Inlet
Seal have less fat		YES							YES				
Seal have bad livers													
Seal have increased in number						YES							
Seal have decreased in number													
Ringed Seal have decreased in number													
Ringed Seal are less healthy													
Beluga Whale have decreased in number									YES	YES		YES	
Bowhead Whale have increased in number									YES				
Narwhal no longer enter bay													
Killer Whale have increased in number									YES				
Walrus have decreased in number										YES		YES	
Walrus are no longer found													
Walrus have increased in number						YES					YES		YES
Polar Bear have increased numbers in summer									YES				
Polar Bear are closer to town	YES												

OBSERVATIONS

Regarding Marine Mammals



REGION	QIKIQTAAALUK (NU)				NUNAVIK (QC)				NUNATSIAVUT (NL)	
	Arctic Bay	Clyde River	Cape Dorset	Puvirnituq	Kangiqsujaq	Ivujivik	Inukjuak	Akuiivik		Nunatsiavut
Seal have less fat										
Seal have bad livers	YES									
Seal have increased in number										
Seal have decreased in number				YES						
Ringed Seal have decreased in number						YES				
Ringed Seal are less healthy				YES						
Beluga Whale have decreased in number				YES	YES		YES		YES	
Bowhead Whale have increased in number	YES	YES	YES							
Narwhal no longer enter bay	YES									
Killer Whale have increased in number										
Walrus have decreased in number				YES						
Walrus are no longer found										
Walrus have increased in number			YES							
Polar Bear have increased numbers in summer					YES				YES	
Polar Bear are closer to town										

OBSERVATIONS

Regarding Waterfowl



REGION	INUUVIALUIT SETTLEMENT REGION (NWT)						KITIKMEOT (NU)				KIVALLIQ (NU)			
	Paulatuk	Ulukhaktok	Aklavik	Tuktoyaktuk	Inuvik	Ikaahuk	Kugaaruk	Cambridge Bay	Repulse Bay	Arviat	Salliq	Tikrarjuaq	Chesterfield Inlet	
Community														
King Eider have decreased in number		YES	YES	YES	YES									
Common Eider have increased in number		YES												
Japanese Goose are new to area														
Grey Legged Goose are new to area														
Snow Goose have increased in number	YES		YES		YES		YES		YES					
Snow Goose are arriving earlier														
Snow Goose have decreased in number				YES										
Snow Goose are less healthy														
Swan have increased in number							YES							
Swan are new to area														
Pintail Duck have increased in number						YES								
Mallard Duck have increased in number						YES								
Harlequin Duck have decreased in number														



OBSERVATIONS

Regarding Waterfowl

REGION	QIKIQTAALUK (NU)			NUNAVIK (QC)					NUNATSIAVUT (NL)	
	Arctic Bay	Clyde River	Cape Dorset	Puvirnituq	Kangiqsujaq	Ivujivik	Inukjuak	Akuliivik		Nunatsiavut
Community										
King Eider have decreased in number										
Common Eider have increased in number										
Japanese Goose are new to area						YES				
Grey Legged Goose are new to area						YES				
Snow Goose have increased in number										
Snow Goose are arriving earlier										YES
Snow Goose have decreased in number										
Snow Goose are less healthy						YES				
Swan have increased in number										
Swan are new to area										YES
Pintail Duck have increased in number										
Mallard Duck have increased in number										
Harlequin Duck have decreased in number										YES

OBSERVATIONS

Regarding Birds



REGION	INUVIALUIT SETTLEMENT REGION (NWT)					KITIKMEOT (NU)				KIVALLIQ (NU)			
	Paulatuk	Ulukhaktok	Aklavik	Tuktoyaktuk	Inuvik	Ikaahuk	Kugaaruk	Cambridge Bay	Repulse Bay	Arviat	Salliq	Tikrarjuaq	Chesterfield Inlet
Community													
Raven have increased numbers in winter							YES						
Arctic Jaeger have decreased in number							YES						
Sand Piper have decreased in number													
Plover have decreased in number													
Crow have significantly increased in number			YES										
Snipe have decreased in number													
Spruce Hen have increased in number					YES								
Ivory Gull have decreased in number													
Ptarmigan have decreased in number				YES									
Barn Swallow are new to area						YES							
Arctic Tern have decreased in number							YES						
Red Winged Black Bird are new to area													
Robin are new to area													
Burrowing Owl are new to area													
Chickadee are new to area													
Sparrow have increased in number													YES

OBSERVATIONS

Regarding Birds



REGION	QIKIQTAAALUK (NU)				NUNAVIK (QC)				NUNATSIAVUT (NL)	
	Arctic Bay	Clyde River	Cape Dorset		Puvirnituq	Kangiqsujuaq	Ivujivik	Inukjuak	Akuiivik	Nunatsiavut
Raven have increased numbers in winter										
Arctic Jaeger have decreased in number										
Sand Piper have decreased in number					YES					
Plover have decreased in number					YES					YES
Crow have significantly increased in number										
Snipe have decreased in number										
Spruce Hen have increased in number										
Ivory Gull have decreased in number	YES									
Ptarmigan have decreased in number					YES		YES			
Barn Swallow are new to area										
Arctic Tern have decreased in number					YES					
Red Winged Black Bird are new to area							YES			
Robin are new to area					YES		YES			
Burrowing Owl are new to area							YES			
Chickadee are new to area							YES			
Sparrow have increased in number										

OBSERVATIONS

Regarding Terrestrial Mammals



REGION	INUVALUIT SETTLEMENT REGION (NWT)					KITIKMEOT (NU)				KIVALLIQ (NU)			
	Paulatuk	Uluqhaktok	Aklavik	Tuktoyaktuk	Inuvik	Ikaahuk	Kugaaruk	Cambridge Bay	Repulse Bay	Arviat	Salliq	Tikirarjuaq	Chesterfield Inlet
Community													
Caribou are less healthy	YES						YES		YES				
Caribou have decreased in number			YES	YES		YES							
Caribou have increased in number										YES			
Musk Ox have increased in number		YES			YES								
Moose have increased in number													
Wolverine have returned to area													
Rabbit have decreased in number													
Brown Bear are invading camps	YES			YES									
Brown Bear have increased in number		YES			YES								
Black Bear are invading camps													
Fox have increased in number													
Wolf are closer to town	YES	YES											
Wolf have increased in number													

OBSERVATIONS

Regarding Terrestrial Mammals



REGION	QIKIQTAAALUK (NU)			NUNAVIK (QC)				NUNATSIAVUT (NL)	
	Arctic Bay	Clyde River	Cape Dorset	Puvirnituq	Kangiqsujaq	Ivujivik	Inukjuak	Akuliivik	Nunatsiavut
Community									
Caribou are less healthy	YES					YES			YES
Caribou have decreased in number									
Caribou have increased in number					YES				
Musk Ox have increased in number									
Moose have increased in number									YES
Wolverine have returned to area									YES
Rabbit have decreased in number									YES
Brown Bear are invading camps									YES
Brown Bear have increased in number									
Black Bear are invading camps									YES
Fox have increased in number									
Wolf are closer to town									
Wolf have increased in number									

OBSERVATIONS

Regarding Vegetation and Berries



REGION	INUUVIALUIT SETTLEMENT REGION (NWT)					KITIKMEOT (NU)			KIVALLIQ (NU)				
	Paulatuk	Ulukhaktok	Aklavik	Tuktoyaktuk	Inuvik	Ikaahuk	Kugaaruk	Cambridge Bay	Repulse Bay	Arviat	Salliq	Tikrarjuag	Chesterfield Inlet
Community													
Willows have increased in number	YES			YES	YES		YES						
Willows are taller	YES			YES	YES		YES						
Decrease in quantity and quality of all berry species	YES	YES	YES	YES	YES	YES	YES		YES				
Spruce have increased in number					YES								
Blueberries are larger					YES								
Blueberries have decreased in number		YES		YES			YES		YES				
Cranberries have decreased in number					YES								
Yellowberries have decreased in number					YES								
New lichen species have moved into area								YES					
Lichens have increased in number								YES					
Mushrooms have increased in number	YES												

OBSERVATIONS

Regarding Vegetation and Berries

REGION	QIKIQTAALUK (NU)			NUNAVIK (QC)					NUNATSIAVUT (NL)
	Arctic Bay	Clyde River	Cape Dorset	Puvirnituq	Kangiqsujuaq	Ivujivik	Inukjuak	Akuliivik	Nunatsiavut
Community									
Willows have increased in number									
Willows are taller									
Decrease in quantity and quality of all berry species	YES			YES	YES	YES			YES
Spruce have increased in number									
Blueberries are larger									
Blueberries have decreased in number	YES								
Cranberries have decreased in number									
Yellowberries have decreased in number									
New lichen species have moved into area									
Lichens have increased in number									
Mushrooms have increased in number									

OBSERVATIONS

Regarding Insects



REGION	INUVIALUIT SETTLEMENT REGION (NWT)					KITIKMEOT (NU)			KIVALLIQ (NU)				
	Paulatuk	Ulukhaktok	Aklavik	Tuktoyaktuk	Inuvik	Ikaahuk	Kugaaruk	Cambridge Bay	Repulse Bay	Arviat	Salliq	Tikirarjuaq	Chesterfield Inlet
Community													
Mosquito are present for longer season			YES	YES	YES	YES							
Mosquito are larger			YES	YES	YES								
Mosquito have decreased in number	YES	YES											
Sand Fly are present for longer season			YES		YES								
Black Fly are larger				YES									
Dragonfly are new to area				YES									
Bumblebee are new to area	YES			YES									
Grasshopper have increased in number	YES												
Spider have increased in number	YES												

OBSERVATIONS

Regarding Insects



REGION	QIKIQTAALUK (NU)		NUNAVIK (QC)				NUNATSIAVUT (NL)		
	Arctic Bay	Clyde River	Cape Dorset	Puvirnituq	Kangiqsujaq	Ivujivik	Inukjuak	Akuiivik	Nunatsiavut
Mosquito are present for longer season									
Mosquito are larger									
Mosquito have decreased in number									
Sand Fly are present for longer season									
Black Fly are larger									
Dragonfly are new to area									
Bumblebee are new to area									
Grasshopper have increased in number									
Spider have increased in number									

Note To Readers: There were no observations documented in the sources that we consulted.

Human health can be impacted directly and immediately, such as increased injury while traveling or working on the ice due to changing ice conditions. Impacts can also be broad and subtle and can affect people's mental health, in that they may feel anxiety and stress related to the many unknowns and concerns about the future. An individual's confidence about her or his traditional knowledge, a changing level of certainty in predicting weather and on-the-land survival might impact that individual's overall well-being. Due to lack of access to country foods, Inuit men's and women's ability to make contributions to family and community are also affected. For example, if an increased presence of disease in caribou results in poorer quality of caribou skins, women who make traditional clothing will either not be able to work with the materials as planned, have to adjust the way the clothing is made, or will not be able to prepare the clothing. Lesser quality in skins also means that high quality skins will become more expensive because the hunters will have to go more often or adjust the methods to reach healthier animals. As noted in *Unikkaaqatigiit* and other documents, the impacts are far reaching on Inuit.

ACCESS TO FOOD AND FOOD SECURITY



Changes in climate and weather events in the Arctic and their subsequent effects on the biological systems of the region have a direct impact on food security and economic well-being of Inuit. As reported in *Unikkaaqatigiit*,

...the changes taking place in the Arctic environment have far-reaching impacts on many aspects of Inuit life. Key changes in the environment, such as an increase in the unpredictability of weather and weather systems, is seen as influencing such diverse components of daily life as travel, the generation and exchange of knowledge, human safety and security, food security, local economies, and individual health (Nickels et al., 2006, p. 88).

Many different environmental changes have caused subsequent declines in the biological diversity of the Arctic and are impacting the food security of Inuit. When we speak of 'food security', we note that the World Health Organization recognizes three pillars of food security:

- food availability: sufficient quantities of food available on a consistent basis;
- food access: sufficient resources to obtain appropriate foods for a nutritious diet; and
- food use: appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation.¹

In addition to food accessibility, availability and quality, it is important to consider the role of wildlife among Indigenous Peoples. For Inuit, food security

¹ See Food Security section of the World Health Organization's Web site: www.who.int/trade/glossary/story028/en/



must be considered in relationship with northern environments and cultural practices. This definition stresses the importance of the food system from a social perspective, acknowledging the importance of all aspects of harvesting, preparing and consuming traditional foods. Sharing is an important cultural practice: it helps ensure that others have enough food, yet it also acts as a way to bond with others. The Inuit relationship to traditional food must be recognized not only for its importance for physical health, but also for its connection to emotional, spiritual, social and cultural well-being.

Inuit have identified many changes that have had an impact on their ability to harvest, process, and store food. Food security can be jeopardized through negative impacts to each of these processes. Environmental changes that prevent harvesting or make harvesting more difficult will also reduce the amount of country foods consumed and result in increased likelihood of malnourishment and/or chronic conditions (obesity, diabetes, hypertension, etc.) through an increased reliance on store-bought and generally highly processed foods. This will also have socio-economic effects by further increasing the percentage of household budgets directed toward purchased food.

Much of the Inuit diet comes from wildlife, plants and fish. The 2006 Aboriginal Peoples Survey, a follow-up survey to the national Census, confirmed that harvesting meats and plants plays a big role in Inuit communities and contributes positively to Inuit health in many ways. In 2005, 68 per cent of adults living in Inuit Nunangat harvested country food (Tait, 2008, p.22).

Although often overlooked, the physical nature of harvesting activities also plays an important part in providing exercise and outdoor activity. Many types of employment require hours of office work and other elements of modern lifestyles limit exercising the body, which can have negative impacts on human health. For example, increased rates of obesity have been linked to decreased opportunity for engaging in harvesting activities (Young, 2007).

The general well-being of individuals is also impacted by their participation in food harvesting and collection activities. For example, the act of hunting or gathering requires collective way of harvesting, processing, distributing and preparing foods, reflecting values of cooperation and sharing. Harvesting activities strengthen social connections between family and community members. The Aboriginal Peoples Survey also showed that eight in ten Inuit households share food with others.

Country food provides nutrients to the body and Inuit country foods are rich in essential nutrients and low in unhealthy fats and sugars. Consumption of harvested foods is high in all Inuit regions. "In 2006, 65 per cent of Inuit in Inuit Nunaat² lived in homes where at least half of the meat and fish consumed was country food" (Tait, 2008, p.23).

2 At the time that these statistics were published, the Inuit regions in Canada were referred to as Inuit Nunaat. In 2009, the national Inuit organization, Inuit Tapiriit Kanatami, officially changed the term to Inuit Nunangat.

The well-being of caribou is of major concern for all Inuit regions as it is an important source of protein intake for humans, among other things. There have been changes noted in the diet of caribou, specifically in the amount of lichen they are eating, which is a primary food for this species. Changes in the quality of snow cover and increased icing are preventing caribou from accessing lichen as much. Inuit hunters have reported unhealthy and thin animals with increased abnormalities in the meat and suspicions of infection by parasites. As a result, these meats are not consumable for humans and need to be discarded (Nickels et al., 2006, p.77). In addition, the actual hunting effort (time and resources spent), including the economic investment in the hunting trip, brings a lower return for the hunters than previously and not only reduces the amount of food harvested but also makes hunting caribou very expensive.

Changes in biodiversity that impact Inuit food security



- Changes in number and distribution of certain species of animals (e.g., beluga, seals) require changes in hunting methods.
- Changes in migration and distribution of animals have forced residents to travel new and longer routes, resulting in an increased amount of time needed and money spent on hunting.
- Decreases in certain species (e.g., capelin, cod) have reduced harvesting opportunities.
- Because of the decrease in certain species residents are concerned about potential loss of cultural knowledge on ways of hunting and way of life on the land.
- Shortage of fresh country foods available during the year because of changes in the availability and accessibility of wildlife.
- Changes in migration/distribution of wildlife cause people to rely more on store-bought food.
- People are more selective of the animals they harvest due to concerns about the general health of the wildlife and a lowered confidence in the safety of wild meat.
- Berries do not taste as good and are not eaten as much as in the past.
- There are fewer berries to eat and use in traditional foods. Fewer berries means there are less to go around; Elders especially used to enjoy them as a delicacy.

(Source: Nickels et al., 2006)

OTHER HEALTH IMPACTS

'Invasive alien species' are plants and animals whose introduction and/or spread beyond their natural location threaten the balance in the ecosystem. Invasive species "create an imbalance in nature by competing for the same resources that native species need to survive.³ These can directly affect human health, for example, when infectious diseases are transmitted (vectored) by species of birds, rodents and insects not previously present in an ecosystem. There is the chance that these species also carry a virus that potentially can infect humans and cause zoonotic (animal to human transmitted) diseases. Species-to-species infection can increase in warmer temperatures, for example. Inuit are concerned about eating wildlife and country foods that are infected or carry parasites. Infectious diseases and parasites can settle in native species of plants and animals and with warming temperatures, can grow faster and more widely and eventually cause gradual ecological changes. Inuit have witnessed an increase in existing insects as well as new insects in the Arctic. Residents worry these might bring diseases such as West Nile virus infection. Now, protection measures such as window screens or insect repellent are needed (Nickels et al., 2006, p.86).

The very smallest parts of an ecosystem, things you can only see with a microscope or 'microscopic biological diversity', can be affected by environmental changes. Microbial species that come into areas where they had never been before can certainly affect the ecosystems, and eventually have an affect on human health. For instance, changes in microscopic life in fresh water used for human consumption could result in new or increased presence of bacteria. Also, changes in microscopic flora and fauna can have significant impacts upon the technology and techniques used to purify and treat drinking water. A change in the composition and number of microorganisms in water can reduce their effectiveness in removing bacteriological contaminants as well as actually having the potential to introduce or increase chemical contamination into water systems.

Access to clean and safe drinking water is a fundamental requirement for good health. Inuit have reported a noticeable drop in the quality of their fresh water, due to warming water temperatures and more algae growth. Changes in the drinking water and source water quality are particularly impacting elders, who are not used to drinking chlorine with their water, as documented in *Unikkaaqatigiit*:

Concerns expressed by community residents were particularly focused on the impacts that these changes to water quality are having on the health of Elders in their communities (Elders access much of their drinking water from natural sources because they are not used to boiling water for safety and do not like the taste of chlorinated water.) (Nickels et al 2006, p. 86).

³ See The Threat of Invasive Species section on the Government of Canada's Invasive Species Web site:www.invasivespecies.gc.ca

Examples of biodiversity changes with an impact on drinking water

- Increase in algae growth impacts water quality.
- Fewer useable sources of water on land.
- The town water plant needs maintenance more often because of the increase in algae growth (Aklavik).
- Changes to water quality of freshwater (dust in water) were observed in Kugaaruk.
- Less snow impacts the quality and quantity of freshwater in lakes and rivers.
- There is particular concern for elders, who are not used to practices of boiling water for safety.
- There are increased costs associated with water treatment.

A growing concern about drinking water quality from natural sources on the land has led people to take bottled water to hunting camps and purchase imported bottled water (Moquin, 2005). Both of these adaptations (changes in behavior) significantly increase Inuit's reliance on expensive, external, and non-sustainable resources.

There are a number of agencies and organizations that focus on and/or monitor continuing changes to the earth's life-systems, ecosystems and the biodiversity of the Arctic. These institutions can provide a means for Indigenous Peoples, including Inuit, to protect the biodiversity of their lands and waters.

AT THE CIRCUMPOLAR LEVEL

At the circumpolar level, the Arctic Council is the premier organization for Arctic countries and Indigenous organizations to engage on Arctic issues. The Arctic Council has taken the lead in researching biodiversity, and the Arctic Biodiversity Assessment and the Circumpolar Biodiversity Monitoring Program are two programs that are responding to recommendations for improved monitoring. Member states of the Arctic Council are Canada, Denmark/Greenland/Faroe Islands, Finland, Iceland, Norway, Sweden, the Russian Federation, and United States of America. Arctic Council membership is open to Arctic organizations of Indigenous Peoples. The category of Permanent Participant provides for participation and consultation with Indigenous representatives. Currently, there are six Permanent Participants with the Arctic Council: Saami Council, Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North, Aleute International Association, Gwich'in Council International, and the Arctic Athabaskan Council.

Through the Permanent Participant status, Arctic Indigenous Peoples have been able to participate in directing the work of the Council's scientific working groups, six of which focus on issues such as climate change, monitoring, assessing and preventing pollution in the Arctic, biodiversity conservation and sustainable use, emergency preparedness and prevention, and living conditions of the Arctic residents.

Each of the Arctic Council member states have implementation plans for tasks coming from the Arctic Monitoring and Assessment Program. For example, Canada's implementation plan on environmental contaminants for the year 2008/09 included research conducted under the Northern Contaminants Program (NCP) comprising 51 research projects, ArcticNet comprising 26 projects and the national research program under the International Polar Year (IPY) which comprises 44 research projects (Canadian National Implementation Plan for contaminants under AMAP 2008/2009).

Many voices have articulated the need for further research. For example, *Unikkaaqatigiit* research recommendations included the call for local-scale standardized monitoring of observations of change and their related impacts as well as for research and monitoring to identify new species carrying diseases and abnormalities (Nickels et al., 2005, Appendix 2, Table 7).



AT THE GLOBAL LEVEL

The Millennium Ecosystem Assessment reports, published by the United Nations in 2005, present a comprehensive scientific study on the consequences of changes in the world's ecosystems. Considering that human well-being is dependent on what these ecosystems provide to humans, such as food and drinking water, these reports help people take action to minimize degradation in the environment.

The Convention on Biological Diversity (CBD)¹ is an international treaty to protect earth's biodiversity from pollution, urbanization and climate change. The Convention recognizes that biodiversity has intrinsic value and is essential to:

- a clean and healthy environment
- global food security
- social and economic development
- the production of medicines.

As of 2010, all but three countries have ratified the Convention. The CBD recognizes the need to protect traditional knowledge and encourages the equitable sharing of the benefits from the use of such knowledge. One subsection in the Convention, namely Article 8(j), commits member countries to respect, promote and preserve traditional knowledge, practices and creations of Indigenous Peoples.

ARTICLE 8(j) of the Convention on Biological Diversity:

"Each contracting Party shall, as far as possible and appropriate: subject to national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices."

With this article, this international Convention recognizes the close inter-relationship that exists between biological resources and Indigenous communities.

In October 2010, in Nagoya, Japan, as part of the Conference of the Parties (COP) of the Convention on Biological Diversity, participating countries will discuss strategic issues for evaluating how nations have progressed toward their goals of protecting biodiversity. This meeting follows up on a commitment in April 2002 to achieve "a significant reduction of the current rate of

¹ The CBD was created in 1992 during the United Nations "Earth Summit" in Rio de Janeiro. Any country can become Party to the CBD by ratifying it, i.e., by agreeing to the commitments stated in the Convention.

biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth” by 2010 (United Nations, Convention on Biological Diversity Web site). These targets will be assessed and results published in the CBD’s upcoming *Global Biodiversity Outlook 3*.

At the COP meeting, it is also hoped that negotiations will result in an “International Regime on Access and Benefit-sharing”. Under the same Convention, during the *International Year of Biodiversity*, the United Nations will bring a treaty forward that is of interest to Indigenous Peoples because it is about access and benefit sharing of scientific and commercial use of genetic and other biological resources. This regime will determine who has the right and capacity to determine access to biological materials, such as plants, animals, and fish, including their genetic material or resources. Participants will also discuss traditional knowledge related to genetic resources and the sharing of the benefits of the use of these resources. These negotiations will also focus on countries’ plans for facilitating use of genetic materials for industrial purposes (e.g., medicines, beauty products, fertilizer, etc). Benefits arising from Indigenous knowledge such as the discovery and production of new medicine shall be shared with the Indigenous knowledge holders. The Government of Canada as well as Inuit are preparing for the COP,² and these negotiations will have far reaching and significant effects on Indigenous Peoples, including Inuit.

AT THE NATIONAL LEVEL

The Canadian Biodiversity Strategy presents the Canadian response to the Convention on Biological Diversity. It acknowledges Indigenous communities and the fact that agreements between governments and Aboriginal authorities have led to the creation of cooperative management regimes for wildlife.

Sub-national biodiversity strategies exist in six provinces and the Northwest Territories. *A Biodiversity Outcomes Framework for Canada* documents how Canada will manage activities to protect the country’s biodiversity, reduce human impacts on ecosystems and work toward sustainable use of biological resources (such as plants, animals, etc.).

A national reporting process commits all countries to report on the status of their activities. Canada’s 4th and latest National Report was produced in 2009. One of its findings is that:

“[...] focus will be required in Canada’s northern and boreal regions, where governments have a unique opportunity to protect intact functioning ecosystems” (p.169).

² For updates on these significant negotiations, check the Convention on Biological Diversity Web site, www.cbd.int/2010-target.

CONCLUSION

Inuit are at the front lines in witnessing the many environmental changes occurring in the Arctic and will continue to feel the direct and significant impacts of these changes on their economic wellbeing, culture and health. Governmental and organizational responses must be guided by the knowledge and wisdom of Inuit regarding their homelands – the environment and the biodiversity upon which they rely.

Securing our future will require a closer look at the changes occurring in Arctic biodiversity, based in part on Inuit observations and concerns. Countries committed to the protection of Indigenous traditional knowledge now have the opportunity to balance cultural practices and beliefs with knowledge sharing to advance scientific research, in ways that are respectful of the rights of the knowledge holders.



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