DRAFT MINUTES
Mar 29-31, 2004
Hudson Bay Ocean Working Group[1] Meeting, Rankin Inlet, NU

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ACRONYMS

BSIMPI	Beaufort Sea Integrated Management Planning Initiative
CCG	Canadian Coast Guard, DFO
CSSP	Canadian Shellfish Sanitation Program
CCIARN	Climate Change Initiatives and Alternatives Research Network
CG&T	Community Government and Transportation
CFIA	Canadian Food Inspection Agency
CHS	Canadian Hydrographic Services, DFO
CMAC	Canadian Marine Advisory Council
COS	Canada's Oceans Strategy
CWS	Canadian Wildlife Service
CG&T	Community Government and Transportation
DFO	Department of Fisheries and Oceans
DIAND	Department of Indian Affairs and Northern Development
DSD	Department of Sustainable Development
EC	Environment Canada
EMAN	Ecological Monitoring and Assessment Network
FLCN	Fox Lake Cree Nation
GPA	Global Programme of Action for the protection of the marine environment from land-based activities
GN	Government of Nunavut
HBOWG	Hudson Bay Ocean Working Group
HC	Health Canada
IM	Integrated Management
IQ	Inuit Qaujimajatuqangit
KIA	Kivalliq Inuit Association
KWB	Kivalliq Wildlife Board
MB	Manitoba
MEQ	Marine Environmental Quality
MKO	Manitoba Keewatinowi Okimakanak
MPA	Marine Protected Area (DFO)
NCP	Northern Contaminants Program
NDC	Nunavut Development Corporation
NIRB	Nunavut Impact Review Board
NMC	Nunavut Marine Council
NMCA	National Marine Conservation Area (PC)
NPA	National Programme of Action for the protection of the marine environment from land-based activities
NPC	Nunavut Planning Commission
NRCAN	Natural Resources Canada
NRI	Nunavut Research Institute
NMC	Nunavut Marine Council
NPW&GS	Nunavut Public Works and Government Services
NWA	National Wildlife Area
NWB	Nunavut Water Board
NWMB	Nunavut Wildlife Management Board
NWT	Northwest Territories
NTI	Nunavut Tunngavik Inc.
PC	Parks Canada
SEC	Sanikiluaq Environmental Committee
SSHRC	Social Sciences and Humanities Research Council
TC	Transport Canada
TK	Traditional Knowledge
WG	Working Group
YF FN	York Factory First Nation

MARCH 29, 2004

ArcticNet Meets its Northern Partners

Community Hall

On our first night in Rankin Inlet, the Hudson Bay Ocean Working Group (HBOWG) together with Nunavut Sustainable Development hosted a community reception to introduce a new collaborative Hudson Bay research project entitled ArcticNet. Brock Junkin (HBOWG Chair) got things started by introducing the HBOWG and welcoming the audience to this special event. David Barber followed with an overview of ArcticNet and a few words about climate change in Hudson Bay.

Entertainment for the evening included throat singers and a skills competition in Inuit Games demonstrated by Rankin Inlet youth.

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MARCH 30 & 31, 2004

1. Welcome – Brock Junkin
2. Opening prayer – Jerome Tattuinee
3. Review purpose of meeting and agenda
   - The draft agenda was approved as circulated.
4. Review minutes, action items from Sept 9-11 meeting
   - Minutes were approved by the HBOWG.
5. ArcticNet meets its northern Partners: It is our practice to have a theme for each of our HBOWG meetings and to involve interested parties in our integrated management planning. A variety of interesting ideas and perspectives were presented by our HBOWG members over the course of this meeting. Summaries of their presentations can be found in Appendix 1.
   - Hudson Bay Traditional Ecological Knowledge and Management Systems Study – Miriam Fleming
   - Hudson Bay Ecosystem Overview – Bruce Stewart
   - Wildlife Disease and Demographic Training in the Kivalliq – Mitch Campbell
   - Climate Change and Human Health – Daniel Martin
   - Community Connections to the Land in Arviat – Sherrie Blakney
   - Marine Mammals and Climate Change – Steve Ferguson and Magaly Chambellant
   - Tapaminamahk Koyask Mantou Kaki Minokoyahk "We have to take care of what the creator gave us" – Stewart Hill and Jocelyn Cheechoo
   - How we do things in Nunavut – Laura Kowmuk
   - Hudson Bay Marine Ecosystem – David Barber

- ArcticNet Community-Based Monitoring – Robert Hodgson
- People, Land and Freshwater in the changing Arctic – Milla Rautio
- Adapting to change in the Canadian Arctic – Knowledge Transfer, Policies and Strategies – Jaime Dawson
- Inuit Qaujimajatuqangit in the Management, Research and Monitoring of National Parks – Vicki Sahanatien

6. On our second evening in Rankin Inlet, Ollie Ittinuar, a Rankin Elder, talked to our group about the bounty of the sea and land and his experiences as a hunter growing up in the Kivalliq Region. The highlight of the evening was most certainly the Arctic Fashion Show, featuring beautiful seal-skin designs modeled by local Rankin Inlet youth.

7. Closing Comments – Brock Junkin
8. Prayer – Ollie Ittinuar
9. Adjourn

Appendix 1:

Presentation Summaries

Hudson Bay Traditional Ecological Knowledge and Management Systems (TEKMS) Study

Presenter: Miriam Fleming
Date: March 30, 2004
Location: Rankin Inlet, NU

An overview of the Hudson Bay Traditional Ecological Knowledge and Management Systems (TEKMS) study was provided to:

1. Inform ArcticNet scientists of a large, system-wide study that was conducted by the Environmental Committee of the Municipality of Sanikiluaq as part of the Hudson Bay Programme in the early 1990s.
2. Encourage ArcticNet to seek common ground with Hudson Bay communities upon which to address both the concerns and interests of ArcticNet scientists and Arctic indigenous peoples regarding climate change.

The Hudson Bay TEKMS study was designed, developed and implemented from within Hudson Bay by the community of Sanikiluaq in response to the proposed Great Whale hydroelectric complex, and in association with 27 other coastal and island indigenous communities, the Canadian Arctic Resources Committee and the Rawson Academy of Aquatic Science. It was funded in part by several private foundations, Government of Canada, Government of Northwest Territories, three regional aboriginal organizations, a public wildlife management board and two public utilities.

Nine areas of traditional ecological knowledge identified by community participants in a study workshop were researched: rivers, animals, shorelines, currents, sea ice, snow conditions, weather, traditional management, and human health. Each area of knowledge was addressed through semi-directed questions and discussion by each of six working groups from the six sub-regions of the Hudson Bay bioregion: Northwestern Hudson Bay, Western Hudson Bay, Eastern James Bay, Western James Bay, Eastern Hudson Bay and Hudson Strait. Some specific processes and changes discussed included:

- Drying up of rivers and wetlands in Hudson and James bays;
- Weakening of currents along eastern Hudson Bay into Hudson Strait;
- Annual formation and development of river and sea ice;
- Animal and fish population dynamics;
- Bird, animal, and fish migration patterns;
- Coastal and shoreline habitat changes;
- Airborne pollutants;
- Climatic change, and changes in environmental indicators used to forecast weather; and
- Human ecological relations

Following the first set of working group meetings, mapping and oral information was digitized, translated and/ or transcribed and synthesized for verification by each working

group in a second set of meetings. System-wide maps were then created for disclosing traditional ecological knowledge of the Hudson Bay ecosystem. Two examples of the system-wide maps were presented: one illustrating surface current activity and changes as of 1993, and the other showing changes in Canada goose flyways as of 1993.

In closing, Miriam emphasized the indigenous peoples of Hudson and James bays are more than a source of information for scientific inquiry, and have a contribution to make to defining and understanding environmental problems as well as seeking solutions incorporating their knowledge, beliefs, and traditional practices. The hope is maintained that to this effect, ArcticNet will find ways to work with the communities by:

- Developing a well-informed communications program that encourages a two-way flow in dialogue between researchers and interested parties in the Hudson Bay bioregion;
- Aiding Inuit elders and active lands people in documenting climatic observations and knowledge of their localities; and
- Reaching points of agreement where scientific researchers and indigenous knowledge holders can collaborate on joint studies that enable both schools of thought to benefit from developing a mutual understanding on the potential impacts of climatic change.

Hudson Bay Ecosystem Overview

Presenter: Bruce Stewart
Date: March 30, 2004
Location: Rankin Inlet, NU

Information on the Hudson Bay marine ecosystem, which includes James Bay and Hudson Bay, is scattered and often inaccessible. Consequently, people from different areas and backgrounds may have widely different understanding of how the ecosystem operates and of how it may be affected by various activities. This affects the quality of decision-making, and cooperation among stakeholders.

The primary purpose of this overview, funded by DFO, is to summarize knowledge of how the parts of the Hudson Bay marine ecosystem interact with each other and their environment. The geological and climatic forces that have shaped, and continue to influence, the Hudson Bay basin are discussed first; then oceanography within the basin; and finally use of coastal and marine habitats by plants, animals, and people. Interactions between the ecosystem's biological, physical and chemical components are discussed, as are factors that stress the ecosystem such as harvesting, development activities, contaminants, and climate change. The depth of coverage for a particular topic varies with the information available and its relevance.

Scientific and traditional knowledge have an equal place in the overview. They are complementary sources of information that are often in good agreement. Both sources of information have their strengths and weaknesses. Sometimes differences in experience and perspective lead scientists and hunters to reach different conclusions based on similar observations. Where this occurs these differences are highlighted and, wherever possible, explained.

Research coverage of the region has been limited by the difficulty and cost of sampling. Despite an impression to the contrary created by the many references to the region in the literature, in-depth information is only available for a few topics and areas at selected times of the year. Most research has been conducted during the open water period near large estuaries, often immediately downstream from existing or proposed developments, and seldom for more than a few sampling seasons. Taxonomic coverage has been uneven and few studies have examined either food-chain relationships or biological productivity. In consequence, there is little information on seasonal or inter-annual variation in the physical and biological systems. These gaps in research coverage make it difficult to identify and understand trends of change in the region, and to tell whether they result from variations in the natural environment or from human activities.

Three important tasks of the overview are: 1) to differentiate what we know from what we think we know, 2) to provide historical and geographical perspective, and 3) to make connections among people and disciplines. People often have to make important decisions based on limited information. They do this by extrapolating what they know—sometimes using mathematical models, and it is vitally important that they understand the limitations of their knowledge. Just because something has been repeated often or has

been predicted using a sophisticated mathematical model does not make it a fact. Historical information can be very useful for putting current conditions in perspective. The fact that commercial harvesters took over 8200 beluga whales from the estuaries in eastern Hudson Bay between 1852 and 1868, for example, illustrates the importance of these estuaries to belugas in a way that today's depleted populations cannot. From a geographical perspective, people must understand that events and actions in one area of Hudson Bay can have wide-ranging effects on the ecosystem as a whole or elsewhere. The seasonality of runoff, for example, affects the composition, productivity, and survival of biota under the ice and in the estuaries. Seasonal flows have already been altered by hydroelectric developments and may be affected by climate change. Because people have difficulty understanding what they cannot see, the overview must also communicate the importance of key aspects of the ecosystem, such as the social and economic importance of harvesting activities to the Inuit and Cree, the richness of faunal communities beneath the sea ice, and the constantly changing nature of the ecosystem.

The overview is still very much a work in progress. We hope that it will help people to better understand the Hudson Bay marine ecosystem and to ask better questions so they get better answers.

Wildlife Disease and Demographic Training in the Kivalliq

Presenter: Mitch Campbell
Date: March 30, 2004
Location: Rankin Inlet, NU

We are proposing a training program partnering the ArcticNet Program, Kivalliq hunters, and the Nunavut Department of Environment.

Project Objectives:

- To develop a hands on course aimed at teaching residents of the Kivalliq Region how to identify the common diseases found in wildlife.
- To take the newly developed wildlife disease course to each of the seven Kivalliq communities (Arviat, Whale Cove, Rankin Inlet, Baker Lake, Chesterfield Inlet, Repulse Bay and Coral Harbour) over a 2 to 3 year period beginning 2005/06.
- To teach individuals selected by Kivalliq HTOs the necessary skills to collect scientific data on caribou population demographics. Training will begin in Coral Harbour and move to other Kivalliq HTOs on request.
- To develop intuitive geographic software to communicate scientific findings to local hunters and HTO members aimed to empower these individuals/organizations will all available information on their wildlife.

Wildlife Disease Training Course:

- The initial course will be designed as a Powerpoint presentation with an accompanying course manual.
- Government biologist, one from the Nunavut Department of Environment and a second from the Federal Department of Fisheries and Oceans will teach the course in each of the communities over a two to three year period.

Integrating Local Hunters with Scientific Information:

- Development of a Nunavut-wide database containing all past and present research results from Nunavut based wildlife research.
- Integration of the database with GIS and image analysis software to graphically incorporate multiple layers of data
- Design the software as a virtual aircraft capable of over flying any geographic area in Nunavut
- Use Web-based application to visually inquire about the wildlife and/or its environment on the geographic area chosen.

Benefits of Doing this Work:

- Teaching local peoples to understand conditions that affect the health of their wildlife and potentially themselves is empowering, and will allow for a greater understanding of the changing environment around them.
- Giving communities the skills with which to take a more central role in the management of their wildlife will enhance co-management and help preserve traditional values and principles.
- Local peoples have a wealth of traditional knowledge. Integrating scientific knowledge with traditional knowledge already a part of the local culture is a more effective way of ensuring that the most complete knowledge base is used to manage wildlife in Nunavut.

Climate Change and Human Health

Presenter: Daniel Martin
Date: March 30, 2004
Location: Rankin Inlet, NU

Climate change and human health:

Our understanding of climate change processes and potential impacts on northern ecosystems has increased significantly in the last decade. In Nunavik, since 1989, a constant increase of 0,3 to 0,4 degrees per year has been observed (that means 3 to 4 degrees over a 10 years period : Fortier and Allard, 2003). In the Arctic regions, changes and impacts to ecosystems and human health are potentially the greatest. Potential human health impacts related to variability of weather, frequency of storm events, changing precipitation regimes, and impacts to wildlife habitat are similar in that they are related to climate variation, and unpredictability. All the potential changes put the economy, ecosystems and ultimately the health of northern communities and publics at significant risk. Potential impacts of climate change and variability on human health can be divided as follows :

Direct impacts of climate change on human health:

- *direct consequences from interactions with changes in local climate* (i.e. resulting from direct interactions with physical characteristics of the environment : air, water, ice, land) : e.g. exposure to thermal extremes;
- examples of direct impacts (adapted from Haynes *et al*., 2000) :

MEDIATING PROCESS	***Possible Direct Health Impacts***
Exposure to thermal extremes	Changed rates of illness and death related to heat and cold
Changes in frequency or intensity of other extreme weather events (floods, storms, etc.)	Death, injuries, infectious diseases, stress related disorders, psychosocial disruption
Changes in ice distribution and stability, and snow composition and amount	Death, injuries related to travel and hunting accidents
Increased UV exposure	Increased risks of skin cancers, infectious diseases, eye damages (cataracts) – immunosuppression

Indirect impacts on human health:

- *impacts of indirect consequences from interactions with local climate* – indirect interaction is mediated through a variety of means : e.g. effects on range and activity of vectors and infective parasites;
- estimating the consequences of indirect effects poses a greater challenge than direct effects;
- examples of indirect impacts (adapted from Haynes *and al*., 2000) :

MEDIATING PROCESS	***Possible Indirect Health Impacts***
Exposure to thermal extremes	Infectious disease, stress related disorders, other health related disorders (such as psychosocial disruption)
Change in ice distribution and stability, snow composition and amount	Dietary problems associated with availability of food sources and inability to fish and hunt

MEDIATING PROCESS	***Possible Indirect Health Impacts***
Effects on range and activity of vectors and infective parasites	Changes in geographical range and incidence of vector-borne diseases and their transmission to humans
Changes in local ecology of water-borne and food-borne infective agents	Changed incidence of diarrheal and other infectious diseases – emergence of new diseases
Changes in food and drinking water availability and productivity (Food and drinking water security)	Dietary problems : malnutrition and hunger, and consequent impairment of child growth and development, cultural and social implications due to diet 'shift', diabetes, nutritional deficiencies, changed contaminant exposure, etc.
Changes in distribution and composition of permafrost	Psychosocial disruption related to damages to infrastructures and population displacement – dietary problems associated with impacts through ecosystem changes
Sea level rise	Increased risks of infectious diseases – psychosocial disruption associated with infrastructures damages and population displacements
Changes in air pollution (contaminants, pollens and spores)	Increased incidence of respiratory (asthma, hay fever) and cardiovascular diseases - cancer and premature death - visual impairment - reduced work capacity

Arctic Net projects related to human health:
2.1 : Changing food diversity, wildlife, networking patterns and exploitation (Berteaux et al.)
2.2 Water quality, supply and indicators of change (Vincent et al.)
2.3 Emerging new infectious diseases in human and wildlife (Levesque et al.)
3.5 Persistent Organic Pollutants and Human Health (Ayotte et al.)
4.4 Climate change, key traditional food species and community health in the Arctic (traditional food): Furgal and Chan

4.5 Surveillance and management of climate change in the North : implications for northern public health policy and infrastructure : Gosselin and Wigle

Project 3.5: Persistent Organic Pollutants (POPs) and Human Health

Objective of the research :

The overall objective of this project is to investigate the potential health impacts of POPs, including both "old" contaminants of interest (organochlorines) and the recently identified groups of chemicals such as BDEs, PFAs and HPCs, in the Inuit communities of the Canadian Arctic, with a special focus on Nunavik and Kivalliq in Nunavut.

Overview of sub-projects within project 3.5 :

Project 3.5 is divided in 4 sub-projects :

- POPs in traditional food and dietary exposure (Chan, Stern, Egeland) : communities around Hudson Bay
- Body burdens of POPs (Ayotte, Dewailly, Weber) : Nunavik cohort (99 Inuit adults – Fall of 2004)
- Toxicity of POPs (Ayotte, Chan) : Nunavik cohort (2004)
- POPs exposure and health indicators (Young, Dewailly and Egeland) : this project will start later

Scientific excellence and Innovation:

- Both PFOA and PFOS have been implicated as possible carcinogens, while HPCs and PFOS can alter thyroid hormone status.
- The proposed study is the first comprehensive risk assessment of these chemicals in human populations.
- The research team has over 10 years of experience studying health effects of environmental contaminants and has an excellent working relationship with the Inuit communities.

Networking:

- People responsible for this project will coordinate sample and data sharing with other projects

Added Value:

- This is the first time that the team members of this project work on a collaborative project.
- This brings an impressive diversity of expertise to conduct this comprehensive study.

Training of HQP:

- Team leaders expect to train 7 Graduate students (6 M.Sc., 1 Ph.D.) and will adopt all possible means to involve and train local research assistants.

International Networking:

- Data collected from this study will be integrated into the Arctic Monitoring and Assessment Program Database.
- TLs are expecting that similar work will be conducted in other countries participating to the Circumpolar Inuit Cohort Study.

The Nunavik cohort starts August-September 2004 with scientific icebreaker Amundsen. Having access to Inuit communities with the proper laboratory equipment aboard the icebreaker is essential to this project as fresh biological samples have to be processed immediately. Two modules (laboratories) of the Atlantis mobile complex will be installed on the Amundsen deck during the Summer/Fall campaign : microbiology laboratory, for water and shellfish analyses and human toxicology laboratory for POPs investigations. The Atlantis complex is dedicated to environmental health research, environmental monitoring and educational outreach and technology transfer. It permits to integrate and standardize data acquisition and management.

Research finding in Nunavik will be useful for other parts of the Arctic region

Community Connections to the Land in Arviat

Presenter: Sherrie Blakney
Date: March 31, 2004
Location: Rankin Inlet, NU

For a people whose culture is based on the land, the health of the people is closely connected to their ability to hunt, fish, and obtain country food. The objectives of this project are 1) to understand how Inuit construct the concepts of health, wellness and the natural environment; 2) to identify how Inuit Qaujimajatuqangit can be used to increase health of Inuit in coastal communities; 3) to understand how natural resource policy development can support Inuit health and wellness.

The concept of health changes depending upon the cultural context from which it emerges. There is no objective definition for health, but all definitions reflect cultural norms, values and beliefs. For example, the Western concept of health is based on the bio-medical model and pertains to the physical body (Lupton 1995). But among the Cree (Adelson 2000) the concept of health has much to do with the quality of life—social relations, cultural identity, their relationship with the land as well as the condition of the body. It involves their ability to pursue traditional activities, to eat country foods, and to keep warm. The Inuit concept of health is also much broader than the western model. According to the Bathurst Mandate (GN) it is the goal of the Government of Nunavut to build healthy communities which are defined as the healthy interconnection of the body, mind, spirit and environment. It involves the physical, social, economic and cultural wellbeing of the people.

The research is taking place in Arviat, a community containing several dialect groups who are actively involved in the coastal and inland economy and have quite diverse oral traditions and resource harvesting strategies. Within the context of the Inuit family, resource harvesting strategies are examined, interviews and workshops with elders and resource specialists are being conducted, and life histories in relation to the family economy are collected, for the purpose of understanding Inuit concepts of health and the connection to the land. The first of four fieldwork phases in Arviat has been completed and initial thoughts arising from research with the Ahiarmiut (inland caribou people) dialect group are discussed below:

First, the importance of hunting in Arviat. Often the importance of hunting to Inuit is not understood by southern Canadians. Some southerners assume that there are not many Inuit hunters left in the north; that most have switched to a wage economy and consume a predominately southern diet. But how should a *hunter* be categorized? There are 1) the elders who raised their families on the land have a deep knowledge of the animals and their behavior; 2) those considered by the community to be 'a hunter' that are out on the land several times during the week and their catch is the primary source of food for the family; 3) those identified predominantly as artists or craftspersons, part-time wage earners but who hunt frequently and consistently home much food for the family; 4) the full-time wage earners that will take 3 or 4 caribou when herds are spotted within ½ km of the hamlet to feed the family.

A second consideration involves the concept of *the family*—what does it mean when Inuit bring home food for the family? Food sharing networks and responsibility often go far beyond the nuclear family often to include married children and grandchildren, in-laws, grandparents, aunts, uncles, cousins, nephews, nieces, and their adopted children. Not only does it involve the extended family within Arviat, but it also includes relatives within other hamlets. This winter, when there was a shortage of caribou and fish in Arviat, relatives from other areas brought country food in, and hunters from Arviat made long distance trips on skidoos hauling kamautiqs to Churchill, Rankin Inlet or Repulse Bay to hunt and bring back caribou and fish.

How important is country food? Country food and the ability to obtain it, is tied to Inuit identity. In Arviat, there is no charge for caribou meat. In 1968, members of the Arviat community council decided to enforce a decision that "Caribou meat should not be sold because everyone needs it". "We have a custom to take meat from another hunter. If meat were sold this would hinder our custom, also it would be really hard on somebody who isn't such a good hunter" (Messenger Newsletter, March 15, 1968). Caribou forms the basis of the Ahiarmiut diet and is prepared many different ways (frozen, fresh, dried, fried, boiled, baked and aged and as soup. Both symbolic traditional dishes (such as caribou heads and hooves, marrow and fat, caribou stomach) and contemporary dishes (such as caribou pizza, caribou lasagna, and shepherds pie) are prepared. Out of the 42 days spent with an Inuit family (mid Jan- late Feb), on 22 days caribou was consumed -- especially notable considering the caribou shortage during the month of Feb and the need to have it brought in. Arctic char was the second most frequent food consumed by the Ahiarmiut family. Although at times southern food was purchased, consumed, and enjoyed, heart burn and stomach upsets were not uncommon. In addition, southern foods are expensive. Food products purchased at the Northern Store served more as a supplement and were often supplied by family members with a regular wage income as part of the food exchange network.

The elders in Arviat, though often unable to contribute physically to the hunt and provide food, have an invaluable role as knowledge holders and advisors to the younger hunters. In an Ahiarmiut elder's workshop, Job Mukjunirq explained that the elders knew that there would be no caribou in Arviat this winter because in the summer the caribou were headed straight toward Arviat and then suddenly turned west bypassing the hamlet. The elder explained that caribou have scent glands in their hooves and as the males were leading the way south towards Arviat, enroute to Churchill, inexperienced hunters shot the leaders causing the survivors to back-track, frightening and scattering the main herd. Since the majority of frightened caribou turned west, successive groups followed the dominant scent trail bypassing the Arviat area. Ahiarmiut elders teach their hunters to allow the leaders of a migrating herd to pass undisturbed and not to start hunting until the 3rd or 4th day.

Phase two of the Arviat fieldwork will take place in April and May. Comments regarding the project are welcome. Email: umblakne@cc.umanitoba.ca

References

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Marine Mammals and Climate Change

Presenters: Steve Ferguson and Magaly Chambellant
Date: March 31, 2004
Location: Rankin Inlet, NU

An overview was provided on marine mammal studies being undertaken in Hudson Bay related to climate change and under the umbrella of ArcticNet (3.8 Marine Mammals and Climate Variability).

The main objectives linking these various projects are:

1. How do marine mammals move through the physical structure of the marine environment to migrate and locate food concentrations?
2. What are the physical and biological features marine mammals use to survive and reproduce?
3. How do marine mammals respond to the varying physical environment that includes climate change and human economic activities?
4. What are the conflicts and possible mitigation with climate change and human activities?

Different projects include studies of polar bears, beluga whales, ringed seals, bowhead whales, and walrus.
The two major themes are:

1. Maintain marine mammal biodiversity with climate change
2. Maintain social/cultural subsistence hunt of marine mammals by local Inuit

Two examples of major environmental changes predicted for Hudson Bay that will have ramifications to the marine mammals:
First, and foremost, is climate change with predictions that Hudson Bay could lose most of its annual sea ice within 50 years. Such dramatic changes will affect marine mammal distribution and abundance. An example was provided with prediction that ringed and bearded seals, currently the most numerous seal species in Hudson Bay, would become the least numerous with the loss of their sea-ice habitat. Also, predicted are increased numbers and distribution of harbour and possibly harp seals with the loss of sea ice.

Over the last 30 years different regions of Hudson Bay have experienced dramatic changes in the seasonal cycle of sea ice with northwestern Hudson Bay recording a 19 day earlier spring melt; southwestern Hudson Bay a 10 day earlier spring; northern Hudson Bay a 34 day earlier spring; and southeastern Hudson Bay recording a 43 day earlier mean spring sea ice break-up.

An argument is made that marine productivity may actually decrease with the loss of sea ice contrary to beliefs that warmer water temperatures mean greater primary productivity. Without the annual cycle of sea ice formation and ablation, productivity of the shallow Hudson Bay waters may actually decrease from current conditions with climate warming.

Another example of impeding major environmental changes was provided with the ecosystem-level response to increasing bowhead whale numbers. Since commercial whaling ended almost a century ago, bowhead numbers are rebounding. Also, incidental sightings of killer whales have increased and predictions are for more predation in the future with greater killer whale numbers. How the Hudson Bay ecosystem and its marine mammal community will respond to more bowhead whales and killer whales is speculative but likely changes will be considerable.

Potential problems with ringed seal recruitment, birth of pups and their survival to an age where they are hunted by local Inuit hunters, are described. Decreased snow depth over the past 10 years may have created reproductive problems for ringed seals in western Hudson Bay as indicated by hunter kill records.

A number of researchers' have been studying polar bears in Hudson Bay as this marine mammal garners considerable research attention. For example, possible breeding areas have been identified using genetic techniques.

Beluga whales have been tagged in recent years in both western (Nelson River estuary) and eastern (Nastapoka Islands) Hudson Bay. Movements indicate exchange between hunted populations and over-wintering areas in Hudson Strait and Davis Strait.

Other marine mammal research includes satellite-linked tagging of bowhead whales and hunter-assisted studies of walrus populations in Foxe Basin. Considerable research is on-going with marine birds in Hudson Bay that include evidence of food shifts of thick-billed murres which may indicate a changing marine ecosystem.

We are left with the need to continue research into marine mammals in Hudson Bay and use better methods to predict how these animals will respond to the changing climate and increased human economic activities. The goal is to maintain the social and cultural traditional association that local communities have with marine mammals in Hudson Bay.

Tapaminamahk Koyask Mantou Kaki Minokoyahk

Presenters: Stewart Hill and Jocelyn Cheechoo
Date: March 30, 2004
Location: Rankin Inlet, NU

The Fox Lake Cree Nation took the lead role in the development of a land and resource inventory model with the assistance of the Natural Resources Institute of the University of Manitoba.

The Cree Nation assigned a technical researcher to work on the model with a technical advisor from the university. The university advisor utilized three students at the Natural Resources Institute to conduct the necessary research for the technical processes and explanations section of the model.

For more information about the model please contact:
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How We do Things in Nunavut

Presenter: Laura Kowmuk
Date: March 31, 2004
Location: Rankin Inlet, NU

I will speak of three areas which demonstrate how we do things differently in Nunavut:

- People
- Environment
- Land

People:

People are our most important resource. When we are going to discuss solutions/ideas we to talk to the Elders.

It is very important to have various government agencies and Inuit Organizations and Elders keep each other informed about activities that will impact us.

The Hudson Bay Ocean Manager's Working Group is a good example of how we can work together for the future.

Environment:

Environment is closely connected to the people. We as Inuit take pride and show our respect of the land by only taking what we need. .

Elders Knowledge:

Our elders are a resource, we need to collect valuable information from them.

Real Life:

The Hudson Bay Ocean Manager Working Group is an example of how we can work together with our elders. Writing down the information they provide us is critical.

Harvesting of animals with caution is a new way of doing things in the world. This could set a world class example of cooperation with the people and the land.

What This Means:

We in Nunavut take our elders advice seriously. We see them as people with a PhD in environment. Their knowledge is huge and cannot be learned in any books. Many of the knowledge elders hold are not written.

Next Steps:

We need to recognize that elders are experts about the Environment.

We need to start writing down their knowledge.

Their expertise/knowledge needs to be patented.

We have to incorporate their ideas into the modern scientific way.

The question is, when will we start this process? The choice is yours, and that's how we can do things differently in Nunavut!

ArcticNet: Hudson Bay Marine Ecosystem

Presenter: David Barber
Date: March 31, 2004
Location: Rankin Inlet, NU

The Intergovernmental Panel on Climate Change (IPCC) has indicated the polar regions, and in particular Hudson Bay, are very sensitive to global scale climate variability and change (IPCC, 2001). In order to fully understand the complex interrelationships amongst the physical, ecological, social and medical characteristics of Hudson Bay and her People we require a multidisciplinary network focused around detailed experimentation and time series measurements of all aspects of the system. Unfortunately, baseline information of the type required simply do not exist. Over the first four years, **Theme 3** will document the present links between environmental change, health and economy within Hudson Bay. Linkages with heavily impacted southern watersheds and the role water regulation plays in the processes of Hudson Bay will illuminate the complex two-way connections between the subarctic and southern Canada. Key indicators of change and variability will provide the background necessary to make effective policy, management and governance decisions by all levels of government. Direct coupling between physical scientists and stakeholders in the communities, and elsewhere, will ensure integrated management decisions are based on policy relevant science.

The Hudson Bay watershed is an ideal laboratory to study the multidisciplinary interconnectedness of arctic, subarctic and southern Canada. Impacted watersheds in the south will affect biophysical aspects of Hudson Bay; airmasses modified over Hudson Bay will, in turn, affect southern latitudes. Because of hydroelectric regulation, freshwater fluxes are expected to increase by over 50%, with most of that net change occurring in the winter period (Prinsenberg, 1980; 1991). With increased regulation of the discharge from rivers, we also expect sea ice dynamic and thermodynamic processes to be altered (Barber et al. 2000, Senneville et al. 2002; Gough and Wolfe, 2001). Historically, ice break-up coincides with the peak in runoff, but is most likely driven by the ice-albedo feedback. Changes to the sea ice cover will have implications on the climatology of the area, by allowing greater heat exchange between the ocean and atmosphere.

The changes in freshwater fluxes are, of course, also associated with sedimentological and contaminant fluxes into Hudson Bay. Some of these are associated with intensification of agricultural practices in the south and some with climate change (e.g., permafrost melting). Several independent lines of evidence suggest that recent inputs of mercury to northern Canada are greater than that of pre-industrial times. For example, mercury levels in the teeth of modern Beaufort Sea beluga ranged from 4- to 17-fold higher, depending on the age of the animal, than levels measured in beluga teeth from archeological samples dated A.D. 1450-1650. Analysis of dated sediment cores also suggest that mercury fluxes are higher than pre-industrial times and that enrichment factors range from 1.2 to 2.7. Recent measurements of mercury in soft tissues of both western Arctic and Hudson Bay beluga have shown a dramatic increase in concentrations over a much shorter 20 year time period. These increases, however, are almost certainly not due to increased atmospheric loadings of mercury but rather to processes associated

with climate variation in the Mackenzie Basin and Northern Manitoba ecosystems. Rising temperatures in Northern Manitoba may result in higher Hg levels in biota for several reasons: (i) melting permafrost in Northern Manitoba may be associated with increased erosion and forest fires may release increasing amounts of Hg into the Nelson River system; (ii) the rate of Hg methylation processes may be enhanced with increasing water temperature and nutrient loadings (iii) an increase in the production of methyl mercury due to more frequent and severe flood events; (iv) possible changes in food web structure and (v) change in sea-ice dynamics and extent of coverage in relationship to mercury depletion events (MDEs; oxidation of Hg (0) to Hg (II)) and feeding patterns, movements and dive behaviour of marine mammals.

The interrelationships between the physical/biological processes and human health form a significant element in the ArcticNet proposal. A review of potential health impacts of climate change in the North conducted by Furgal et al. (2002a) in Nunavik and Labrador identified food security (traditional food availability, suitability, and access) as an important outcome of a changing environment in the North. Elder men and women, hunters, and youth reported observing changes in climate parameters in the two regions affecting the availability of, and their access to certain traditional foods at certain times of the year (Furgal et al., 2002b). Workshops conducted in the Inuvialuit Settlement Region in the western Arctic (Nickels et al., 2002) documented similar observations and concerns among three communities in that region, and problems among some individuals in accessing fresh wild meats during the year. Thus, the effects of climate changes in the North on Aboriginal peoples' ability to locate and procure these physically, social, culturally, mentally and economically important food sources are not simply predictions for the future, they are a reality in many communities today. However, the extent of these impacts and their implications for the nutritional well-being of individuals and communities is not yet well understood. By bringing together the required information on critical traditional foods species population trends, nutritional expertise on the value of these foods to individual's physical health, and chemical data on the risks they pose to certain aspects of health, along with scientific and traditional knowledge on changes in the environment and what these changes mean in relation to the availability of these wild food resources, the projects in ArcticNet will gain a better understanding of the specific health impacts of climate change in the North.

Social sciences also play an important role in the ArcticNet NCE proposal because of the simple fact that without people there are no environmental problems. Co-management responsibilities require that physical, biological, medical and social science investigations be integrated with and through local, national and international stakeholders. The role which industry plays in this mix is also important from economic development and social policy perspectives. Hydroelectric developments already carried out had both positive and negative impacts on the communities (Rosenberg et al., 1995). For instance, the Cree community along James Bay, received a new village with better facilities, better roads to allow for easier hunting and trapping and local self-government with the development of the LaGrande River (Berkes, 1981). However, in return, these communities relinquished their aboriginal rights and potential development of the land. Impacts of regulation of watersheds are currently unknown, development pressures for mining, mineral exploration and hydrocarbon development all complicate the association between people and the natural environment both of which are undergoing change.

ArcticNet Community-Based Monitoring

Presenter: Robert Hodgson
Date: March 31, 2004
Location: Rankin Inlet, NU

A community based monitoring (CBM) program focused on climate and sea ice was established in 2002 (trial phase) and 2003 (full program implementation) in the western Canadian Arctic. Four communities, Tuktuyakyuk, Holman, Paulatuk, and Sachs Harbour participated in the project. Initial interest that led to the creation of this CBM was the Canadian Arctic Self Exchange Study (CASES), which involved the Canadian Coast Guard Ship, Amundsen, over-wintering in the Amundsen Gulf (September 2003 to August 2004).

Scientific and Political will to establish a community lead long term monitoring program to compliment the CASES project began the process of engaging the communities in dialogue and planning surrounding the scientific objectives of the CBM. Community involvement helped shape the goals and protocols of the project to the point at which the program was fully implemented. Monitoring activities focus on the sea-ice environment and atmospheric-ice exchange of energy.

The Aurora Research Institute (ARI) maintains communications and data collection through the various HTC monitors in the communities. Thus far, data collected from the monitors is proving to be scientifically valuable as well as successful in engaging the community in the broader scientific goals of environmental monitoring of this region. Efforts are now focusing on the communication and reporting of these results. Hopefully the ability of the communities to see and compare data and experiences with their neighboring communities will lead to increased communication and dialogue between everyone involved.

ArcticNet provides the opportunity to seamlessly carry on and expand the current CBM program across the Canadian Arctic. As a particular focus for the near future the ArcticNet Theme 3 group, lead by Dr. David Barber at the University of Manitoba would like to expand the CBM network into Hudson Bay. The long term goal is to have a complete network of coastal communities involved in ArcticNet spanning the Canadian Arctic. ArcticNet will also continue the Schools On Board Program, which takes high school students from the North and across Canada onto the research icebreaker the *CCGS* Amundsen for a week of interactive learning with university researchers. It is our ultimate goal to link these two successful community outreach programs together such that all students can experience arctic scientific research weather it be from the ship of from monitoring programs in their own community. Future community monitoring stations will combine modern instrument technology, including real time telemetered data to the schools and internet, and traditional knowledge type observations of environmental processes and patterns. This scientific and traditional approach is intended to create the opportunity for students to learn both the scientific and traditional approaches to environmental stewardship.

The real strength of future CBM will come from community lead initiatives that expand upon the basic observations and protocols set out by the ArcticNet group. ArcticNet will continue to provide a common communication link, technical assistance, and guidance but it is hoped that the CBM network will also generate the growth of its own network of people and organizations, including new funding options.

Installation of a Hudson Bay trial CBM program is expected to occur for the 2004-2005 ice season. Western Arctic communities will continue their monitoring through this period, with further Hudson Bay and High Arctic communities being added in the 2005-2006 ice season.

People, Land and Freshwater in the changing Arctic

Presenter: Milla Rautio
Date: March 31, 2004
Location: Rankin Inlet, NU

Project Leader: Warwick F. Vincent, PhD, Prof.
Coordinator: Milla Rautio, PhD

Theme 2 is coordinated through the Canadian Network of Centres of Excellence (NCE) program **Arctic Net,** which is composed of three integrated regional study themes: on the coastal marine Canadian High Arctic (Theme 1); on the North-South gradient of terrestrial ecosystems in the Eastern Arctic (Theme 2; Northern RiSCC, linked to the international Antarctic program RiSCC), and on the land-ocean interaction zone in Hudson Bay (Theme 3). Each of these studies will contribute the knowledge needed to formulate policies and adaptation strategies to adjust to climate change in the Canadian coastal Arctic (Theme 4).

Using the research icebreaker CCGS Amundsen as a moving field station, Theme 2 will compare the response to climate change of coastal terrestrial ecosystems and impacts on communities along the North-South gradient of the eastern Arctic. This will be coupled to land-based observations and experiments throughout the duration of Arctic Net (2004-2010).

The geographic focus of Theme 2 is on the coastal lands and freshwaters within eastern Canada, over 30 degrees of latitude (53 to 83 ^{o}N). The study sector lies across the boreal, subarctic and arctic ecoclimatic provinces, with vegetation zones ranging from forest to shrub tundra to high arctic polar desert. It spans a broad range of temperature regimes, from a mean annual temperature of –2 ^{o}C at the southern end (James Bay) to –20 ^{o}C at Ward Hunt Island, in Quttinirpaaq National Park, northern Ellesmere. This program will largely focus on coastal land-based and freshwater systems with emphasis on human activities and environmental concerns in the region. The span of physical aspects considered will include the melting and erosion of coastal permafrost soils; changes in animal populations including freshwater birds and small mammals; shifts in tundra vegetation and wetlands; and climate impacts on lakes, rivers and other drinking water supplies. The consequences of future warming of the tundra will be addressed, including an analysis of the stores of soil carbon that may be released as greenhouse gases, and the resultant implications for Canada under international accords such as the Kyoto Protocol. The human health concerns to be examined include shifts in the diversity of food supplies from hunting, the nutritional quality of that food, changes in water supply and quality, and climate-related changes in infectious diseases such as brucellosis, Q fever, hepatitis A, cryptosporidiopsis and botulism. In addition to these health issues, key societal concerns will be addressed including cultural self-determination in the face of environmental change.

Adapting to change in the Canadian Arctic – Knowledge Transfer, Policies and Strategies

Presenter: Jaime Dawson
Date: March 31, 2004
Location: Rankin Inlet, NU

The focus of Theme 4 is human adaptation to climate change in the context of other stressors, such as economic or political, through the development of strategies, policies, and approaches. While the other three themes in ArcticNet are defined by a specific area – either the coastal Marine Canadian High Arctic in Theme 1, Eastern Arctic's terrestrial ecosystems in Theme 2, and Hudson Bay in Theme 3 – Theme 4 will work across all of these regions. Projects within Theme 4 will focus on changing vulnerability to natural and human-made hazards, impacts on human health, changes to marine transportation, and related socio-economic interrelationships. The approach common throughout all projects in Theme 4 is two-way knowledge transfer, between communities and individuals and scientists. It is hoped that this knowledge transfer can lead to a synthesis of directly relevant information for input to policies, strategies, and approaches, which will in turn assist communities and individuals dealing and living with climate change.

The following is a description of the seven Theme 4 projects.
Project 4.1 Projecting into the Future: the Canadian Arctic Environment, Tomorrow to 2100
Project Leader: David Barber, University of Manitoba
Recognizing that models are our only tools for projecting future climate and sea ice conditions, the goal of this project is to improve on the credibility and utility of Arctic climate models. A regional focus has been chosen for this work to build on existing partnerships and science. The four regions are Baffin Bay, Beaufort Sea, Canadian Archipelago, and Hudson Bay. The models for each region will examine marine and coastal processes, and the relationships with ocean, atmosphere and sea ice. Each model's performance will be evaluated. An important component of this project is integrating the arctic modeling community with scientists, northern residents and decision makers.

Project 4.2 Reducing Human Vulnerability to Environmental Changes in the Canadian Arctic
Project Leader: Barry Smit, University of Guelph
This project will collaborate with northerners to identify conditions to which they are vulnerable, and to assess capacity of communities to prepare for and adapt to changing environmental conditions. Climate science and community knowledge will be used to estimate future changes in environmental conditions and from this identify the types of risk to which communities may be exposed. Collaboration is essential to specify risks and document present adaptive capacity, similarly a partnership with northern decision-makers is needed to develop and evaluate adaptive strategies, risk management options and policy initiatives.

Project 4.3 Vulnerabilities and Adaptation to Meteorological and Related Hazards

Project Leader: Ronald Stewart, McGill University
This project will conduct an analysis of meteorological and related hazards to determine how they impact local communities and how these hazards will change with climate. Included in this project will be an identification of hazards that occur and have a significant impact, both directly on people and indirectly through effects on wildlife. These hazards will be ascertained from climatologies and through discussions with local communities and operational meteorologists. Key factors that lead to hazards will be identified and an analysis will be conducted to determine whether the frequency, magnitude and location of these factors and the events themselves will change in the future. Similar to all projects in Theme 4 and ArcticNet, community involvement is essential to identify hazards, and risk management, optimum adaptive strategies and methods for their implementation.

Project 4.4 Climate Change, Key Traditional Food Species, and Community Health in the Arctic
Project Leaders: Christopher Furgal, Université Laval and Laurie Chan, McGill University
Climate related changes in the North have been associated with alterations in animal, fish and plant population distribution, abundance, behaviour, and availability. Climate changes have also been associated with changes in ice, snow, and other environmental factors potentially influencing travel and transportation in the North. Given these impacts, climate related changes may influence components of Inuit traditional foods and food security. This research seeks to investigate to what extent and how climate change is affecting the traditional diet profile presently and potentially into the future and what implications this may have for individual's health. The project will specifically focus on nutrition, exposure to contaminants, and levels of food security (including availability and access to traditional foods) in five major regions in the Canadian Arctic – Yukon, NWT, Nunavut, Nunavik, and Labrador.

Project 4.5 Surveillance and Management of Climate Change Impacts in the North: Implications for Northern Public Health Policy and Infrastructure
Project Leaders: Pierre Gosselin, Université Laval and Don Wigle, University of Ottawa
Potential human health, socio-economic and environmental impacts are related to climate variation, unpredictability and change. These impacts have potentially very significant implications for regional and national health care systems. This research project proposes to assess several aspects of the ability of northern health and environmental organizations and departments to identify, monitor, manage and adapt to the various impacts of climate change. Through this review, the project will strive to identify policy options and make recommendations to strengthen adaptation strategies and their supporting infrastructure.

Project 4.6 Maritime Transport in an Ice-Free Canadian Arctic
Project Leader: Rob Huebert, University of Calgary
Historically, the extreme conditions of the Canadian Arctic have prevented shipping in this region. But as the ice recedes for increasingly longer periods of time, several factors will probably lead to an increase in ship traffic. This increase will lead to economic,

environmental, cultural, political, and security issues. It is these issues that will be assessed by this project. The first phase of this project will assess the current shipping regulations in the Northwest Passage, Hudson Bay, and other Arctic coastal waterways, and the impact of shipping on communities and the environment. The second phase will examine the aforementioned issues but in the context of future climate change. The direct involvement of those most affected by an increase in shipping is needed to examine the type and extent of impacts.

Project 4.7 Science to Policy-Makers and People
Project Leader: Gordon McBean, The University of Western Ontario
Adapting to climate and other changes in the Canadian Arctic requires knowledge transfer in ways that affect policies, decision-making and strategies of government and people. Through the facilitation of two-way knowledge transfer this project will provide an Arctic-wide synthesis of ArcticNet studies and bring this information to all levels of government. The central objective of this project is to ensure that the results of ArcticNet have the maximum positive impact for Canadians and their government.

Inuit Qaujimajatuqangit in the Management, Research and Monitoring of National Parks

Presenter: Vicki Sahanatien
Date: March 31, 2004
Location: Rankin Inlet, NU

Inuit knowledge is being incorporated into Nunavut National Parks through Ecosystem Monitoring, Research, and Protected Areas Management. The Parks Canada Ecological Integrity Fund is providing core funding (2004/05 to 2008/09), a project coordinator, community researchers, and training, translation, travel, databases, communication, and graduate students.

Goals:

- Structured approach to bringing Inuit knowledge into planning and decisions
- Create new knowledge and understanding by facilitating interaction of Inuit knowledge and scientific knowledge
- Enhanced public and PCA understanding of Inuit knowledge and TEK
- Enhanced public and PCA understanding of how Inuit knowledge and TEK contributes to ecological integrity
- Strengthened co-operative management
- Implementation of NLCA and IIBA
- Better communication between northern communities and scientists
- Increased capacity in communities to develop, undertake and direct research
- Increased capacity in communities to be involved in park management

Park focus:

- Ukkusiksalik: Integrated resources description
- Sirmilik: Understanding of terrestrial and marine arctic ecosystems from Inuit perspective
- Auyuittuq: Ecological indicators and monitoring program

Products:

- Working group for each park
- Annual work plans/research plans
- Compilation and review of existing Inuit knowledge for each park area
- Database structures and archiving protocols for future Inuit knowledge
- Protocols for Inuit knowledge collection
- Standardized training course for community, park staff and student researchers
- Inuit knowledge learning modules for high school, college and university
- Inuit knowledge databases
- Community work stations for accessing Inuit knowledge databases
- Annual youth/elder Inuit knowledge event
- Regular communication of activities and results – various media, reports etc.
- Circumpolar gathering on Inuit knowledge and protected areas management
- Community based long term Inuit knowledge research plans