



Dr. Joel Heath has an extensive background in interdisciplinary studies including a Ph.D. in sea ice ecology and postdoctoral expertise in mathematical biology. He was project leader for one of Canada's largest International Polar Year projects for Training, Education and Outreach. He is currently president and executive director of the Arctic Eider Society, and the upcoming 2014-2015 Fulbright Scholar and Visiting Chair in Arctic Studies at the University of Washington.

This talk includes results of over 12 years of collaboration with the Community of Sanikiluaq, Lucassie Arragutainiaq of the Sanikiluaq Hunters and Trappers Association, Grant Gilchrist at Environment Canada, and recent collaboration with Zou Zou Kouzyk and David Barber at the University of Manitoba.

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Overview of the communities involved in creating the Hudson Bay Network to date



History and Background on charitable activities of the Arctic Eider Society:  
Research, Education, Outreach, Capacity Building



Background of AES, which was formally registered as a Federal Charity during IPY



AES is best known for the film People of a Feather

**PEOPLE OF A FEATHER**  
Δ δ Δ ε Γ ρ Δ Γ Δ  
**EDUCATIONAL PACKAGE**  
LESSON PLANS AND CLASS ACTIVITIES TO ACCOMPANY THE FILM

**1 Polynya & Floe Edge Habitats**  
COMMUNITY-BASED MONITORING AND FIRST-GEN ICE KNOWLEDGE

**2 Hydroelectricity and Sea Ice**  
SOLUTIONS THAT GROW WITH THE SEASONS OF THE HYDROLOGICAL CYCLE

**3 Inuit Ingenuity**  
TECHNOLOGICAL AND SCIENTIFIC TOOLS

**4 Ecology of the Arctic Eider**  
SHARED AND SHIFTERING WINTER SEA ICE HABITATS

**5 Anthropological Filmmaking**  
FIELD OF THE FILMMAKERS AND COMMUNITY OF AN ARCTIC CULTURE

**OVERVIEW**

Students will learn about the characteristics of "polynya" (ice-free) and "floe edge" sea ice habitats within the winter environment of the Becharof Islands. They will compare their own habitat to those of the birds that depend on them, and the various methods and tools used to study and monitor the ecology and cartography of these unique environments. Community-based monitoring programs and the integration of scientific and local knowledge about sea ice are explored.

**OVERVIEW**

Students will have the opportunity to take part in small group and also demonstrate concerning the impacts of hydroelectricity production on sea ice habitats, the season migration, and final way of life. Students will discuss the concept of sustainable energy, consider connections between multiple forms and sites. Students will also discuss alternative methods of energy and distributing hydroelectric energy that can be used with seasonal timing of the hydrological cycle.

**OVERVIEW**

Students will reflect on how and why technologies change over time by comparing and contrasting various uses of the tools in their local community as well as for the Becharof Islands. Students will also reflect on the concept of ingenuity and why.

**OVERVIEW**

Students will have an opportunity to demonstrate their knowledge of the scientific process by conducting research on the Arctic sea ice, including the Common Tufted Puffin as an important component of the winter food web, and use provide a good indicator of the health of sea ice environments. Students will present the potential "status of the world's sea ice" for the changes happening in Becharof Bay. Students will have been trained for several on the sharing and learning ecology of water ice provide a better understanding of their winter research and the future of being the all events. Through the process students will understand how to collect and assess the impact of environmental change on wildlife population and sea ice ecosystems.

**OVERVIEW**

Students will consider the process of representing culture in anthropological filmmaking. They will compare and contrast Peter of a Feather with "Gandhi of the North," a film created 80 years earlier by Robert Flaherty. They considered the film documentary. Flaherty began filmmaking on the Becharof Islands, but has to change and work "around" the culture. The film was a huge success, though the effectiveness of his approach has been an important debate in anthropological filmmaking and cinema history. The debate is revisited by considering how "Peter of a Feather" was made on the Becharof Islands 80 years after Flaherty's initial run.

We also do educational programs bringing culturally relevant curriculum to northern schools



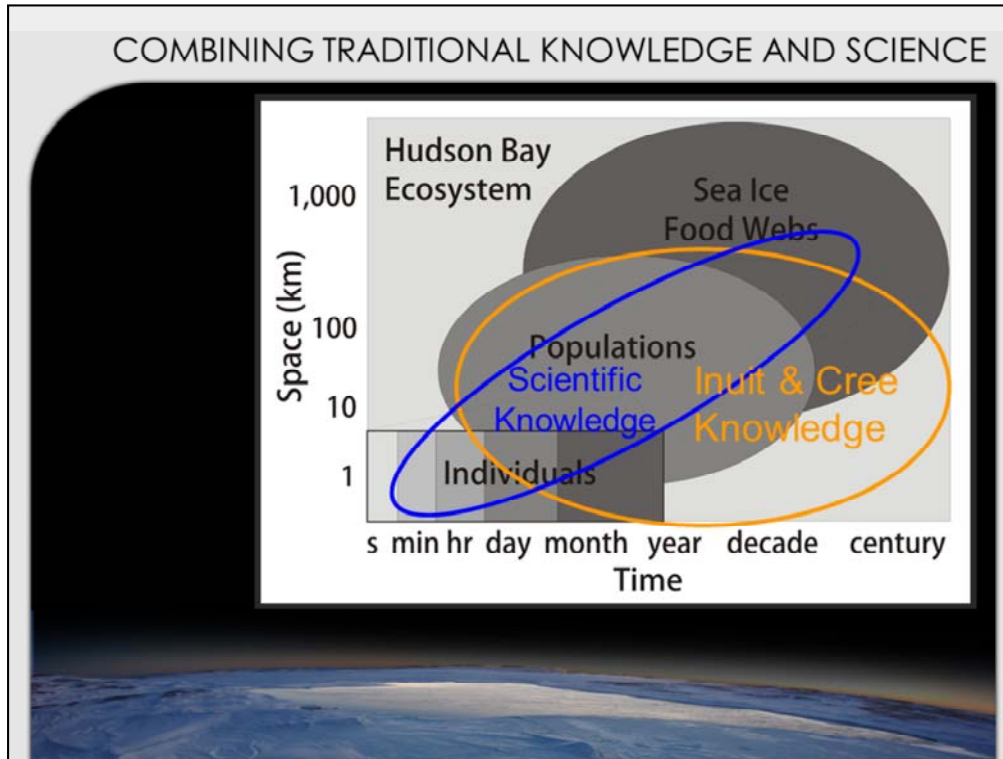
As well as community and youth engagement (Community Engagement Day, 2014)

Objective: Work with communities to study environmental change in sea ice ecosystems



Main focus of charitable programs and this talk, Community Based Research and Monitoring

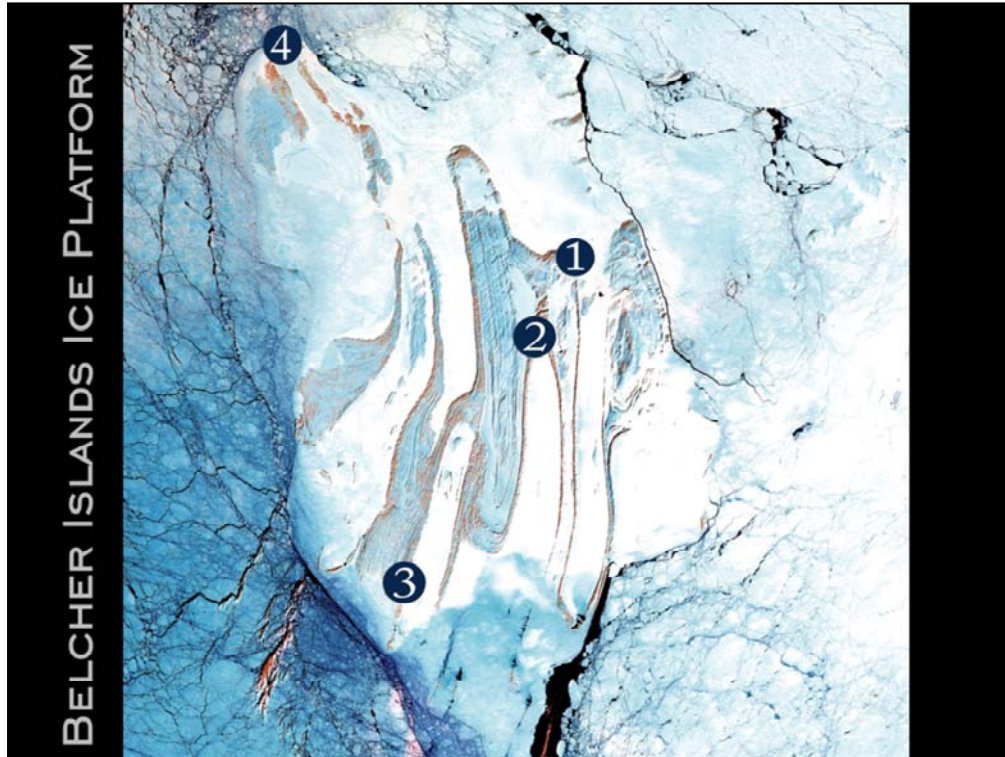




Integrating Local/Traditional Knowledge with Scientific Knowledge can be considered a “problem of scale” and combining these approaches provides a greater scope to understand the issues.



Working with hunters out on the sea ice on the Belcher Islands

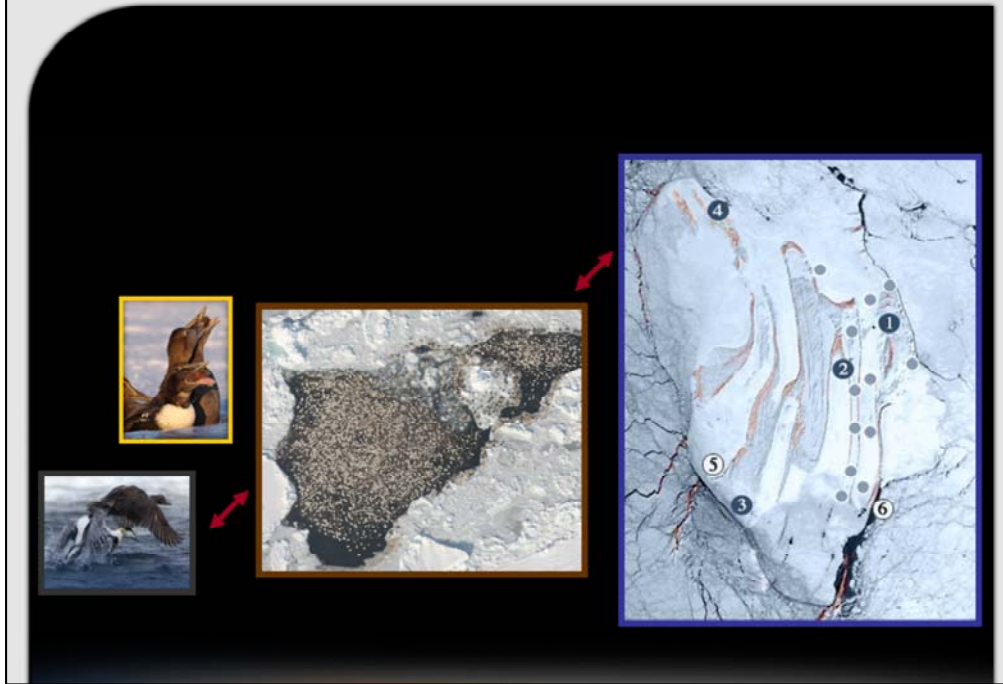


The Belcher Islands Land Fast Ice Platform provides an area >1000km<sup>2</sup> in the middle of Hudson Bay from which to study and monitor the various oceanographic regimes in east Hudson Bay



Working above, on and below the ice

## CONNECTING SCALES | FROM INDIVIDUALS TO POPULATIONS



Linking individual behaviour, energetics, physiology to understand winter survival requirements and how this affects population dynamics and ability to adapt to environmental change. Our work has developed Individual Based Models to understand how different scenarios of environmental change could affect population dynamics in sea ice ecosystems.

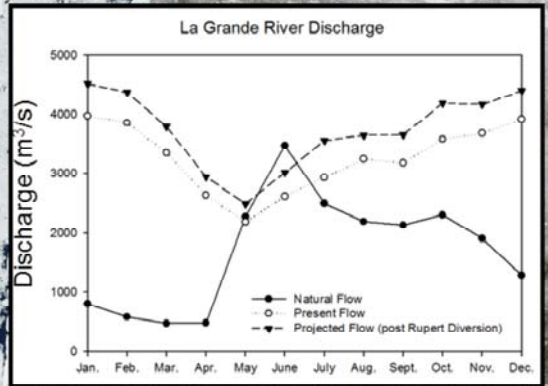


...and be used to understand the conditions that lead to mortality events of eiders

# Hudson Bay Sea Ice Food Web

While eiders are an important indicator species and where our programs originated, they are just the “Canary in the Coal Mine” and environmental change in sea ice ecosystems is affecting all the species in the marine food web. Our programs take a holistic approach considering oceanography, sea ice dynamics and other organisms like benthic invertebrates and marine mammals.

# Environmental Change in Hudson Bay & James Bay



Environmental change in Hudson Bay – Changing hydrological cycle following hydroelectric developments



# Changing Currents in Hudson Bay



Inuit and Cree knowledge from “Voices from the Bay” consistently indicate this has affected currents in east Hudson Bay.

## Freshwater Ice vs Saltwater Ice

- Structure
- Ice formation and Break-up (fall spring)
- Mid-winter freeze events
- Entrapments of eiders and beluga

Freshwater ice is very different from Saltwater ice

Freshwater ice is more brittle and less flexible than salt water ice

Salinity and temperature changes affect ice formation and breakup

And in midwinter can even cause more ice as freshwater freezes at warmer temperatures than saltwater.

This can cut off access to open water and cause entrapments, depletion and die-offs of animals like eiders and belugas



Strange freshwater layers have been observed recently on the surface of the sea ice

## Other impacts

- Seals
- Benthic invertebrates

Impacts have also been reported on seals, ability to hunt seals (sinking) and benthic invertebrates (turning white)

Objective: Work with communities to study environmental change in sea ice ecosystems

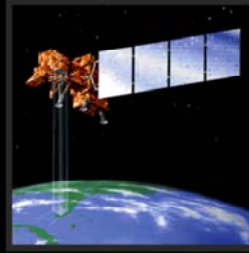


To begin addressing these issues, the Arctic Eider Society has been establishing community based monitoring programs to assess cumulative impacts of environmental change

TECHNOLOGY AND TECHNIQUES | RESEARCH & MONITORING



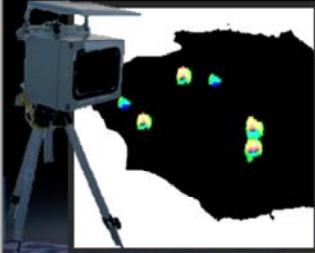
Local Knowledge



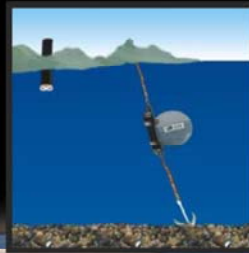
Satellite



Video Observations



Timelapse



Oceanography



Quantitative Models

A variety of techniques are used

## Summary of research to date

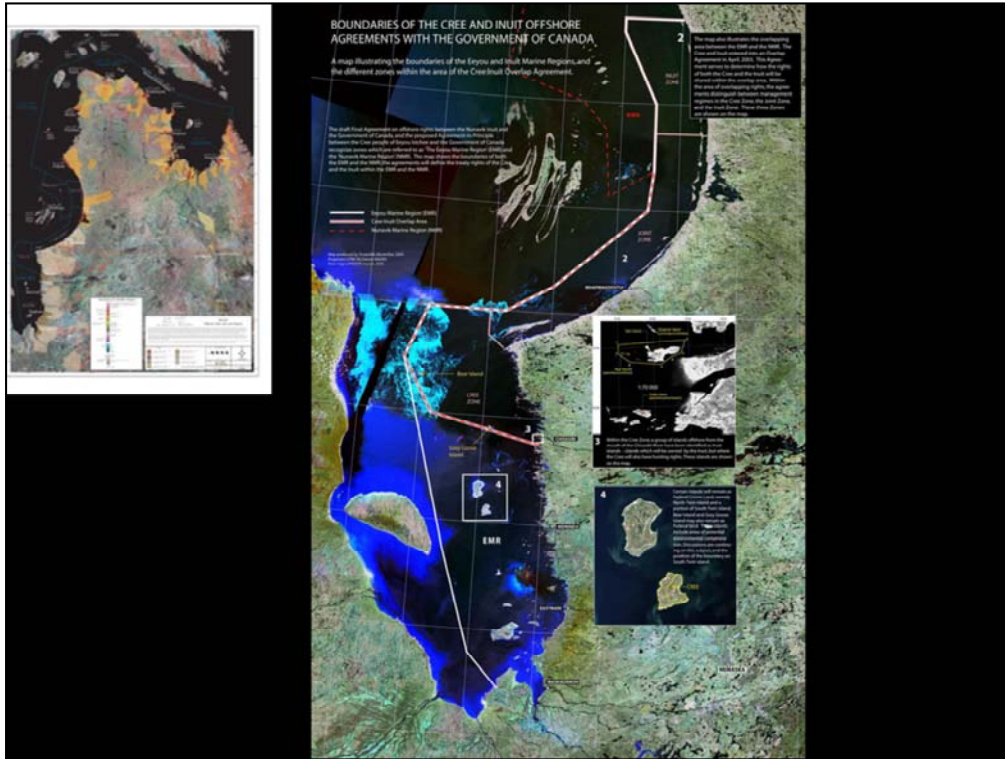
- Salinity profiling
- Ice core sampling
- Water sampling
- Oceanography deployments
  - Aquadopp, Aquadopp Profilers, CT sensors

A summary of community based research to date and from this past winter (2014) from the Belchers Land fast Ice platform was provided, including salinity profiling, ice core sampling, water sampling and oceanography deployments including Aquadopp Current meters, profilers and CT sensors. Some preliminary data was presented showing stratification of freshwater plumes under the sea ice in mid-winter.



Inukjuak, Umiujaq, Kuujjuaraapik were visited this winter for consultation and community engagement with strong support for training programs and Community Based Monitoring as part of the Hudson Bay Network beginning next winter (2015) . Funding has been approved by the Nunavik Marine Region Wildlife Board to support this. We have also been in touch with representatives from Chisasibi towards including programs there as a part of the Community Based Research Network





Inter-jurisdictional challenges have been a primary constraint to date towards establishing collaborations to assess cumulative impacts

## Network Collaborators/Funders

- Nunavut General Monitoring Plan
- Nunavik Marine Region Wildlife Board
- Eeyou Marine Region Wildlife Board?
- Environment Canada
- Department of Fisheries and Oceans
- University of Manitoba

The Arctic Eider Society has been working with many of the relevant organizations towards establishing the network, which we hope will include the Eeyou Marine Region Wildlife Board in the future.

## Network Collaborators/Funders

- NTK (Hudson Bay Inter-agency Working Group) / HB Inland Sea Initiative
- Inuit Tapiriit Kanatami (ITK)
- ArcticNet
- Sponsors: Air Inuit, RBR

... We are also working so that our programs contribute to the Hudson Bay IRIS 3 for Arctic Net and that our collaborative interdisciplinary programs will be a catalyst for establishing a more formal consortium or governing body for inter-jurisdictional research in James and Hudson Bay

**Government of Quebec, CERTIFICATE OF AUTHORIZATION,  
Ref. no.: 3214-10-17, p. 29 November 24th, 2006**

*Recommendation #34 (Federal); Condition 8.1 (Quebec)*

• **CUMULATIVE IMPACTS**

*Analysis of the cumulative impacts of James Bay and Hudson Bay will require setting up a research and monitoring program on a wide scale. This initiative should be spear-headed by a consortium consisting primarily of the government authorities concerned, as well as representatives from the academic community and those stakeholders responsible for the problem (including the proponent). Such a program will need to take into account traditional knowledge in determining its research approach. Communities could also take part, notably by contributing their valuable knowledge of these vast territories with which they are intimately familiar”.*

Such as governing body was recommended by the provincial and federal review panels for the Rupert River project towards assessing cumulative impacts of hydroelectric projects in Hudson Bay and James Bay, and we hope that our community based monitoring network can contribute to this effort and will help motivate formation of the consortium necessary to see this condition through and begin adequately assessing cumulative impacts in this understudied but important region.

