

# The 2016 Beluga Summit: Planning and Proceedings

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## **ABSTRACT**

Murray, L., MacPhee, S., Ostertag, S., Hoover, C., Hynes, K., Matari, K., Lam, J., Loseto, L. 2022. The 2016 Beluga Summit: Planning and Proceedings. Can. Manuscr. Rep. Fish. Aquat. Sci. 3257: xvi + 200 p.

The first Beluga Summit was held in Inuvik, Northwest Territories, on February 23 – 25, 2016. This significant engagement event brought together government scientists, co-management partners, academics, and Inuvialuit community members to share knowledge and discuss future research priorities for the Eastern Beaufort Sea beluga population. The summit was jointly organized by Fisheries and Oceans Canada, the Fisheries Joint Management Committee and the Inuvialuit Game Council, with full engagement in program planning from Inuvialuit Hunters and Trappers Committees. The summit was structured around three major themes: (1) community knowledge, (2) scientific research, and (3) beluga management. Multiple formats were used to share information during the event, including oral presentations, breakout groups, poster sessions, a cultural evening, and roundtable discussions. Knowledge was shared and connections were strengthened between the diverse groups working on beluga research, monitoring and management, and new research priorities and collaborations emerged. The value of the summit was recognized by participants and there was interest from co-management groups as well as other attendees in holding similar events on a five year cycle. The success of the summit was largely due to the collaborative approach adopted amongst co-management partners to design an event that incorporated a variety of perspectives, and to the active participation and high level of engagement from all attendees.

## RÉSUMÉ

Murray, L., MacPhee, S., Ostertag, S., Hoover, C., Hynes, K., Matari, K., Lam, J., Loseto, L. 2022. The 2016 Beluga Summit: Planning and Proceedings. Can. Manusc. Rep. Fish. Aquat. Sci. 3257: xvi + 200 p.

Du 23 au 25 février 2016, à Inuvik, dans les Territoires du Nord-Ouest, se déroulait le tout premier sommet sur les bélugas. Cet important événement de mobilisation rassemblait des scientifiques du gouvernement, des partenaires de cogestion, des représentants du milieu universitaire et des membres de la communauté inuvialuit dans le but de mettre en commun les connaissances et de discuter des priorités de recherche futures pour la population de bélugas de l'est de la mer de Beaufort. Le sommet a été organisé conjointement par Pêches et Océans Canada, le Comité mixte de gestion de la pêche et le Conseil Inuvialuit de gestion du gibier, avec la pleine participation des comités de chasseurs et de trappeurs des Inuvialuit. Le sommet était structuré autour de trois grands thèmes : 1) les connaissances des communautés, 2) la recherche en cours et 3) la gestion des bélugas. Plusieurs formats ont été utilisés pour communiquer l'information au cours de l'événement, notamment des présentations orales, des groupes de discussion, des séances d'affichage, une soirée culturelle et des tables rondes. Les connaissances ont été échangées et les liens ont été renforcés entre les divers groupes travaillant sur la recherche, la surveillance et la gestion des bélugas, et de nouvelles priorités de recherche et collaborations ont été dégagées. La valeur du sommet a été reconnue par les participants, et les groupes de cogestion ainsi que d'autres participants ont manifesté leur intérêt pour la tenue d'événements similaires tous les cinq ans. Le succès du sommet tient en grande partie à l'approche collaborative adoptée par les partenaires de cogestion pour concevoir un événement qui intègre une diversité de perspectives, ainsi qu'à la participation active et au haut degré de mobilisation de tous les participants.



## ABBREVIATIONS

ABWC – Alaska Beluga whale Committee

ANAOI – Anguniaqvia Niqiyuam Area of Interest

ARI – Aurora Research Institute

BREA – Beaufort Regional Environmental Assessment

BSP – Beaufort Sea Partnership

CEO – Chief Executive Officer

CG1 – Canada Gazette I

CHAP – Community Harvesters Assistance Program

CIRNAC – Crown-Indigenous Relations and Northern Affairs Canada (Formerly  
Aboriginal Affairs and Northern Development Canada)

CWHC – Canadian Wildlife Health Cooperative

DEW – Distant Early Warning

DFO – Fisheries and Oceans Canada (2016 department name: Fisheries, Oceans and  
the Canadian Coast Guard)

EBS – Eastern Beaufort Sea

FJMC – Fisheries Joint Management Committee

GIS – Geographic Information System

GNWT – Government of the Northwest Territories

GOC – Government of Canada

HIV – Human Immunodeficiency Virus

HTC – Hunters and Trappers Committee

ICC – Inuit Circumpolar Council

ICS – Inuvialuit Communications Society

ICRC – Inuvialuit Cultural Resource Centre (now the Inuvialuit Cultural Centre)

IFA – Inuvialuit Final Agreement

IGC – Inuvialuit Game Council

IHS – Inuit Health Survey  
IRC – Inuvialuit Regional Corporation  
IOMP – Integrated Oceans Management Plan  
IPY – International Polar Year  
IRC – Inuvialuit Regional Corporation  
ISR – Inuvialuit Settlement Region  
ITK – Inuit Tapiriit Kanatami  
JS – Joint Secretariat  
NGO – Non-governmental Organization  
MPA – Marine Protected Area  
MPAN – Marine Protected Area Network  
NCP – Northern Contaminants Program  
NGO – Non-Governmental Organization  
PCB – Polychlorinated Biphenyl  
PFD – Personal Flotation Device  
POP – Persistent Organic Pollutant  
TEK – Traditional Ecological Knowledge  
TK – Traditional Knowledge  
TNMPA – Tarnum Niryutait Marine Protected Area  
WAMPA – Western Arctic MPA Steering Committee  
WWF – World Wildlife Fund

## PREFACE

Six years have now passed since the first Beluga Summit brought together southern scientists and community members from across the Inuvialuit Settlement Region (ISR) to share knowledge about Eastern Beaufort Sea (EBS) beluga whales. This unique setting provided a space where all knowledge types were respected as equal, and a common goal was established to work collectively to set future directions for research, management and monitoring of this iconic and culturally valued species.

Broadly disseminating information shared during the summit was a key goal of the organizers. Rapid communication following the event included circulation of a Beluga Bulletin (newsletter) to communities and co-management partners, the release of a short video by the Inuvialuit Communications Society (available at: [Beluga Summit 2016 in Inuvik - YouTube](#)) and a feature article in the Spring 2016 issue of Tusaayaksat Magazine (Inuvialuit Communications Society, 2016; Arnold & Heiburg-Harrison, 2016). See [Appendix XV](#) for a comprehensive list of media from the meeting. In September 2018, a special issue on EBS beluga was released in the open-access journal *Arctic Science*, and included papers across a range of topics from trends to Traditional Knowledge (TK) indicators of beluga health, along with plain language summaries accessible online (Vol 4, Issue 3 [Canadian Science Publishing \(cdnsiencepub.com\)](#); [The Beluga Summit: Knowledge sharing of the Eastern Beaufort Sea beluga whale | by Canadian Science Publishing | Arctic Science | Medium](#)).

Many of the local-scale projects that were conceptualized at the summit are now completed, including a study examining environmental and socio-economic drivers of a changing beluga harvest in Aklavik (Worden et al., 2020), a study assessing the relationship between beluga habitat use and storm events in Kugmallit Bay (Scharffenberg et al., 2020), and publications to document the unusual harvest of beluga whales in Ulukhaktok (Collings et al., 2018; Loseto et al., 2018). In addition to completed research projects, several management plans have been updated, including the Husky Lakes Beluga Entrapment Action Plan, and adoption of beluga hunting by-laws in the community of Ulukhaktok (Olokhaktomiut Hunters and Trappers Committee, 2018). The Northern Contaminants Program also convened a national beluga communication team to exchange information and coordinate advisories for human health issues related to consuming beluga whales across the three Canadian beluga harvest regions: Inuvialuit Settlement Region, Nunavik, and Nunavut.

Since the summit, significant investments were made into major science programs including a new beluga tagging program (2018-2019), an aerial survey to update the EBS beluga population abundance estimate (2019), and continuation of the integrated offshore sampling program using the *F/V Frosti* as a research platform. These programs remain underway, and their outcomes continue to inform on beluga habitat use, population status, and increased understanding of ecosystem connections that together can inform key management documents such as the Beaufort Sea Beluga

Management Plan and the Beaufort Sea Integrated Fisheries Management Framework (Fisheries Joint Management Committee, 2013; Ayles et al., 2016).

Several research priorities identified at the summit are also now underway and include such initiatives as the newly funded ArcticNet project to co-produce knowledge on the health and movement ecology of key species (including beluga whales and arctic char), a comprehensive wildlife health assessment for EBS belugas, a new human health study, “Country Foods for Good Health”, and an announcement by the federal government for permanent funding toward a new Inuit Health Survey (Loseto, 2018; Ostertag et al., 2018; Laird & Ostertag, 2020). These projects will also incorporate TK interviews and youth engagement regarding the Inuvialuit food system. Work to address additional recommendations from the summit are in early development phases, including the design of a comprehensive TK study on EBS beluga whales, and exploring the feasibility of drones and other new technologies to enhance our understanding of beluga ecology and inform conservation management strategies.

Due to the success of the Beluga Summit and contributions to beluga whale co-management in the ISR, the Fisheries Joint Management Committee awarded the Beluga Summit Steering Committee with the “FJMC Award for Cooperative Management” and earmarked a line item to hold the Beluga Summit on a 5-year cycle in their renewal of the Inuvialuit Final Agreement Implementation Funds with the Government of Canada. In 2020, planning began for the second Beluga Summit. Due to the COVID-19 global pandemic, planning was paused and efforts shifted toward developing accessible platforms to archive and retrieve information related to EBS belugas (e.g., websites with repositories) until a future date can be set for an in-person gathering. The current Proceedings document aims to serve as a reference for the collaborative, multi-year planning effort undertaken for the first Beluga Summit. Further, summaries of presentations and discussions contained herein serve to document valuable information and ideas shared from both western science and TK perspectives that set the foundation for EBS beluga research and management since 2016.

The Authors, May 2022

SHARING KNOWLEDGE

# AIPAARNIHAT ILIHIMAŔAT AVKTURTINGIT



## OPENING WELCOME

*Vic Gillman, Chair, Fisheries Joint Management Committee, 2010 – 2018*

Welcome to the Beluga Summit!

This truly unique event is representative of the success that the beluga whaling communities and beluga hunters in the ISR have achieved in cooperatively managing this valuable resource. For over 30 years these studies have successfully blended Traditional Knowledge (TK) and western science, and increased our understanding of the numbers, life history and health of beluga whales in the Beaufort Sea. The program has yielded an Inuvialuit Beluga Management Plan, hundreds of scientific papers, worldwide respect, and successfully achieved the intent of the third key principle of the Inuvialuit Final Agreement “*To protect and preserve Arctic wildlife, environment, and biological productivity*”. This success has been found through the commitment, cooperation, and hard work of community leaders and members, fish and marine mammal scientists, managers, and others.

*The Honourable Hunter Tootoo, Minister of Fisheries and Oceans Canada, 2015 – 2016*

As Canada’s Minister of Fisheries, Oceans and the Canadian Coast Guard, it is my pleasure to welcome you to Inuvik. As the first Inuk to hold this office, I have great respect and support for your work. Like you, I am committed to protecting Canada’s three oceans, coastlines, waterways and fisheries so they remain healthy today and for future generations.

I am pleased to support these regional beluga consultations, which are the result of the successful partnership between the Department of Fisheries and Oceans, the Fisheries Joint Management Committee and the Inuvialuit Game Council.

This meeting is bringing together a wide variety of partners to share both Western science and local traditional knowledge. This holistic approach will help improve our collective understanding of these magnificent marine mammals. The work you undertake over the next few days will form the foundation of a sustainable, jointly managed regime in the Inuvialuit Settlement Region for many years to come.

As Minister and as an Inuk, I believe in the strength of partnerships. Meetings such as this one are an excellent example of how the whole is greater than the sum of its parts. I am confident that, by working together, we can achieve great things.

## INTRODUCTION

The first ever Beluga Summit was a significant forum for knowledge exchange held in Inuvik, Northwest Territories, from February 22–25, 2016. The concept of holding a large gathering to share knowledge about beluga whales was first identified by Inuvialuit community members following the success of a science communication event held in Tuktoyaktuk in 2012 and a desire for a more structured and holistic presentation of the current state of knowledge on Eastern Beaufort Sea (EBS) beluga whales, particularly given the numerous ongoing research and monitoring activities underway in the region. Scientists also wanted to improve ways to share research findings within the Inuvialuit Settlement Region (ISR), while continuing to learn and engage with Inuvialuit knowledge holders. In the years leading up to the Beluga Summit, research and monitoring of beluga whales in the ISR was rapidly expanding with respect diversity of topics and research methodologies used. Subsequently, the number of research participants was also growing, and local communities were taking on an increasingly lead role in research and monitoring activities, further underscoring the value of bringing together the community of knowledge holders of EBS beluga whales.

The Beluga Summit was jointly organized by Fisheries and Oceans Canada (DFO), the Canada/Inuvialuit Fisheries Joint Management Committee (FJMC) and the Inuvialuit Game Council (IGC) who together identified three overarching goals to:

1. Share knowledge about EBS beluga whales,
2. Summarize the current state of knowledge about the EBS beluga population, and
3. Develop directions for research, monitoring and management of EBS beluga in the ISR for the next 5-10 years.

The three-day summit brought together approximately 75 participants including researchers from federal, territorial and Inuvialuit governments, academia, and non-governmental organisations (NGOs), federal science and resource managers, Inuvialuit community members from the six ISR communities, staff supporting the co-management boards, and delegates from the Alaska Beluga Whale Committee (ABWC) and national Inuit organization Inuit Tapiriit Kanatami (ITK).

Central to the event was fostering in-person communication and collaboration amongst knowledge holders, including scientists, resource managers and Inuvialuit. Scientists shared knowledge on a range of topics including beluga ecology and physiology, human health, contaminants and disease. Community delegates shared knowledge on cultural practices (e.g., hunting/food preparations), connections between beluga whales and the ecosystem (e.g., observed changes), and perspectives on future research and monitoring (e.g., what collection methods could be improved or changed to increase knowledge on beluga whales). Together participants identified common concerns and knowledge gaps about EBS beluga to direct and prioritize future beluga whale research, monitoring and management in the ISR.



Figure 1. Some of the participants at the 2016 Beluga Summit, Inuvik NT, 2016.

## **PLANNING THE SUMMIT**

### **STEERING COMMITTEE**

Planning for the Beluga Summit began in the fall of 2014, and a Steering Committee was initiated in February 2015. Seed funding for the summit was obtained from a proposal to the communications envelope of the Northern Contaminants Program (NCP) administered through Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC). Once funded, the committee began to formalize and meet monthly.

The Steering Committee was led by three Chairs representing the three co-management organizations: DFO, FJMC and IGC. Together the Chairs worked with Steering Committee members, key support staff from the Joint Secretariat, and a representative from the Inuvialuit Regional Corporation (IRC), to integrate with the Government of the Northwest Territories (GNWT) regional health authorities national/regional health leads ([Appendix I](#)). Committee members planned and designed the summit including objectives, finances, logistics, participants, communications, priority topics for agenda development, and methods for effective engagement of scientists and Inuvialuit community members in the planning stages of the summit.



## COMMUNITY ENGAGEMENT

Several iterations of planning meetings, surveys, and calls were held among co-management boards and the Steering Committee to develop an agenda that appropriately addressed questions and interests raised by the ISR communities. Six months in advance of the summit, a letter was sent to all six HTC's requesting guidance on summit planning, including comments on priority topics and themes (by way of a ranking survey), to select the means by which information should be shared (oral presentations, breakout groups, etc.) ([Appendix II](#)), and finally to identify three delegates that included a) youth, b) beluga harvester and c) Elder from their community.

Preparatory questions were used to guide conversations with HTC's to identify what they wished to share at the summit and what they hoped to learn. Steering Committee members hosted these conversations opportunistically (e.g., when in communities for other meetings), and outcomes were used to inform the summit content, agenda and format. Feedback from these conversations included an interest in learning about other communities hunting and food preparation practices, discussing how the Beluga Monitoring Program could be improved, discussing the effects of climate change on beluga whales and the marine ecosystem, and enhancing communication from researchers to communities. Community members also indicated that they were comfortable delivering presentations to share information from their perspective. See [Appendix IV](#) for draft notes from these pre-planning meetings.

Leading up to the summit, members of the Steering Committee assisted community delegates in developing their knowledge-sharing platform (i.e. slideshow, video presentation or talk). Meetings with the IGC and FJMC also identified linkages between beluga health and human health as a key topic to be covered in the summit. Ultimately a half day was devoted to this topic and key experts were asked to provide guidance on items such as invited speakers and key messages through the health subcommittee. Finally, co-management boards and HTC's were provided with a draft program agenda and asked to provide input.

A preparatory day was held on February 22, 2016, where 28 community delegates ([Appendix VI](#)) convened and informally discussed topics including concerns about belugas, knowledge of their local hunting practices, and observations of environmental change. Members of the Steering Committee were assigned to work with community delegates to ensure their goals and outcomes were met. This included holding informal discussions to formulate a list of questions, observations, and/or concerns to raise during the summit.

Various communication channels were used to notify community members about the summit. Public announcements were made through posters for the feast and cultural night on Day 1, and feast and presentations on Day 2 ([Appendix V](#)). Letters were sent to all Inuvialuit Community Corporations ([Appendix III](#)) and postings were made in the local paper (*Inuvik Drum*). During the event, real-time information was shared using social media platforms (i.e., Twitter and Facebook) using the hashtag #Beluga2016. Interviews were conducted with *CBC News North* and the *Inuvik Drum*. The summit was filmed by the Inuvialuit Communications Society (ICS), and after the event the ICS created a 7 min and 3 min video highlighting the Beluga Summit ([Appendix XV](#)).

## SCIENTIST ENGAGEMENT

Twenty-five scientists (including veterinarians, research scientists, biologists, chemists, and graduate students ([Appendix VI](#))) were identified as conducting research on EBS beluga and were contacted to participate in the summit. Research topics were organized into five major themes:

1. Beluga Habitat (5 researchers),
2. Beluga Health (8 researchers),
3. Contaminants (3 researchers),
4. Human Health (3 researchers), and
5. Knowledge Co-production (6 researchers).

Scientists were asked to populate a research profile template to provide background on their research area, as well as identify key findings to be highlighted in the meeting program ([Appendix VIII](#)), and to prepare a poster about their research and key findings in advance of the meeting ([Appendix XIV](#)). All posters were reviewed by the Steering Committee for clarity and use of plain language, and scientists delivering oral presentations were also assisted with best practices for effective science communication. All posters and presentations that covered information related to human health were shared with the GNWT Public Health Authority in advance of the summit. Plenary speakers were invited to deliver talks based on feedback received from community partners and co-management boards.

## PROGRAM DEVELOPMENT

Significant preparation and thought went into developing the Beluga Summit to serve as a platform for knowledge exchange that respected both western science and Inuvialuit and Iñupiat knowledge (defined herein as TK). A range of knowledge holders were invited to attend the summit, including co-management groups, community delegates, beluga monitors, scientists, science advisors, and science managers.

Core themes of the summit were: culture, science, and co-management. The first day of the summit was the 'Cultural Day', led and designed by the communities, during which they shared knowledge and provided recommendations for research, monitoring and management. The second day was 'Science Day', which focused on plenary talks disseminating results of research and monitoring on key topics identified by communities and co-management partners, followed by focused breakout groups. The final day, 'Co-management Day', included presentations from co-management partners and wrap-up discussions to set recommendations on needs for beluga research and monitoring for the coming 5 years. The meeting space was organized to have people sitting at small round tables to facilitate intimate discussions. A key design element of the summit was the sharing of information in many ways, including: oral presentations, breakout groups, a poster session (with elevator pitches), a cultural evening (including a hunting video, traditional qayak presentation, camp display, photos of historic hunts, muktuk preparation video, and a traditional feast), and roundtable discussions. The evening programs on Day 1 and Day 2 were open to the public to encourage participation.

The Beluga Summit Program booklet ([Appendix VIII](#)) was developed as a resource for participants and contained information about the purpose of the summit, major agenda items, and a list of attendees and their affiliations. The booklet also contained a map of the ISR identifying communities and delegates, a flow chart showing the Steering Committee and resource managers, and short biographies of each

community delegate and researcher to highlight their area of expertise. These additions allowed participants to explore the range of background and experience represented at the summit, and to “put a face to a name” to help with introductions. Work toward the booklet was also useful at engaging participants in advance of the summit and became a final product to circulate following the event.

Other planning considerations included drafting cost estimates, developing funding proposals, and organizing funding sources at various partner agencies. Logistical work included making travel arrangements (flights, taxis, and hotels), handling participation costs (Inuvialuit honoraria and per diem payments), and booking and preparing the venue (room layout, catering, displays, audio-visual requirements). In addition to the ICS video recording of plenary presentations and panel discussions, audio recorders were placed at tables to capture breakout discussions, and were professionally transcribed (<https://transcriptheroes.ca/>). Two rapporteurs also manually recorded the proceedings.

## **PROGRAM PROCEEDINGS**

The following sections summarize proceedings of the Beluga Summit and are organized according to the program agenda and three themed days: Cultural Day, Science Day, and Co-management Day. They include a brief summary of presentations by invited speakers and key discussion points from breakout group sessions. Copies of PowerPoint presentations can be found in Appendix X (Cultural Day), Appendix XI (Science Day), and Appendix XII (Co-Management Day).

### **DAY 1: CULTURAL DAY**

#### **OPENING REMARKS**

The Beluga Summit was opened by welcoming words from IRC Chair Mr. Duane Smith, followed by the Chair of the IGC, Mr. Patrick Gruben, Chair of the FJMC, Mr. Vic Gillman, and finally by Regional Director of Science in the Central and Arctic Region of DFO, Dr. Michelle Wheatley ([Appendix IX](#)).

#### **PLENARY PRESENTATIONS**

##### **Long-term Monitoring and Management of Beluga whales in the ISR**

Mr. Frank Pokiak, outgoing IGC Chair and long-time FJMC beluga monitor, provided an overview of the Inuvialuit Final Agreement, the Tarium Niryutait Marine Protected Area (TNMPA), and long-term beluga harvest monitoring program at Hendrickson Island ([Appendix X - a](#)). He reviewed how the monitoring program operates at Hendrickson Island, discussed sampling in general, and the importance of sample collection to generate baselines and knowledge. He shared how Canada and the Beluga Monitoring Program have lead the way in harvest-based beluga monitoring and research, and how it is important to share this information, not only at Canadian conferences and meetings, but also around the world to teach others about co-management programs and leadership in science.

## FJMC Award for Cooperative Management: Awarded to Frank Pokiak

Following this presentation, Frank Pokiak was presented with the FJMC Award for Cooperative Management to recognize his many years of service to the long-term Beluga Monitoring Program. The FJMC Chair presented the award and spoke of Frank's long-term community service and work on beluga, co-management, monitoring, and research. He recognized Frank's leadership and mentorship for community members and beluga monitors, describing him as a skilled technician, an author on scientific publications, a communicator on international stages, and a proponent for partnerships and the IFA. He also recognized that Frank's work spanned over 2 decades and serves as an outstanding example of co-operative resource management between the government of Canada and the people of the ISR.



Figure 2. Vic Gillman presenting Frank Pokiak with the FJMC Co-operative Management Award. Photo: J. Lam.

## Overview of Beluga Research in the ISR

Dr. Lisa Loseto (DFO) provided an overview of beluga research in the ISR ([Appendix X – b](#)). She began with an introduction to beluga populations worldwide, then focused on the EBS beluga population and highlighted the many years of beluga research and monitoring programs in the ISR, and the general state of knowledge of the EBS beluga population. Some highlights include:

- Beluga are highly adapted to life in the Arctic; they are circumpolar in distribution, but can be found as far south as the St. Lawrence estuary; there are an estimated 29 subpopulations globally.
- The EBS population is thought to be stable or increasing; the last estimate of 40,000 whales is based on data from a 1992 aerial survey.
- The Mackenzie Estuary supports one of the world's largest summer aggregations of beluga whales; this was one of the reasons for the creation of the TNMPA and why the work taking place here is so important.

Dr. Loseto spoke to the long history of monitoring and research on EBS belugas in the ISR, which began as early as the 1970's. Through advances in technology and the use of satellite transmitters we now have a better understanding of the movement and migration patterns of EBS beluga, including that they have the largest known home range, summering in the Beaufort Sea and overwintering in the Bering Sea. She showed that over time the type and amount of research has been influenced by external pressures, such as oil and gas exploration, international concerns surrounding persistent contaminants/pollutants in the marine environment, and more recently, the need to understand climate change impacts.

The presentation concluded with information on more recent research, such as examining the effects of climate change on beluga diet, physiology, health and disease, and changes to their distribution. She recognized that much of this research is possible through partnerships with the FJMC Beluga Harvest Monitoring Program. She also recognized that the large amount of historical data is important in allowing us to examine temporal trends, the effects of climate change, and to guide management actions.

## YOUTH PRESENTATIONS

### Importance of Kendall Island Whale Camp

Kyle Conley, youth delegate from Inuvik shared a slideshow presentation and personal stories of how knowledge of whaling and food preparation has been passed down to him from his parents and grandparents ([Appendix X – c](#)). He shared how he was taught this way of life and that he will share this knowledge with future generations.

### Inuvialuit Youth Perspective

Kate Snow (now Matari) gave a presentation from her perspective as an Inuvialuit youth working with scientists at Fisheries and Oceans Canada ([Appendix X – d](#)). She began by acknowledging other youth who have been involved and contributed to the work on beluga whales in the region, including CJ Haogak (Sachs Harbour), Jocelyn Noksana (Tuktoyaktuk), Jon Arey (Aklavik), Kelly Nigiyok (Ulukhaktok), Kyle



Conley (Inuvik), Jody Illasiak (Paulatuk), Melanie Wolki (Paulatuk), Kendra Tingmiak (Inuvik), Andrew Gordon Jr. (Aklavik), and Jessi Pascal (Aklavik). She shared that much of her learning about Inuvialuit culture happened through school opportunities (such as working at the Aurora Research Institute as a summer student and learning how to shoot, set a net, gut fish, and cut up muktuk), as opposed to being passed down to her from her family. This created a passion for building a stronger bridge between science and Inuvialuit culture. She also spoke of her opportunities with DFO and how she has been mentored by many people in her work. She shared a definition of mentorship which resonated with her... “when someone takes you under their wing until you are ready to fly on your own”.. She also shared how valuable and rewarding it is to work with communities, including the work to plan the Beluga Summit. She spoke on the importance of the IFA to the region, and how it makes the region unique.

K. Snow also spoke of what she hopes to see from the summit, including getting productive work done (finding ways to work together and have better communication), getting some questions answered, and also asking more questions (“this is how science moves forward”), and passing on everyone’s unique set of knowledge to others. K. Snow ended with a reminder of how much knowledge people on the land have, and that they can be considered to have “PhDs” in their Inuvialuit Knowledge.

## **ROUNDTABLE INTRODUCTIONS**

A microphone was passed around the room and each participant introduced themselves and spoke to why they were participating in the Beluga Summit and what they wanted to gain from the event. Many of the scientists shared a common reason for attending the summit, which was to share information with the communities and to learn from them. Many participants were excited about the opportunity to bring science and TK together. Some participants described long time engagement in the region and were happy to see work continue and grow. Many community delegates noted they wanted to learn from members of other communities and from scientists, and to share their information. Specific topics of interest included learning about beluga health and linkages to human health, and hearing about how other communities hunt and prepare whales. Delegates from experienced communities wanted to share information about hunting with communities that harvest belugas less frequently. Some representatives from co-management groups highlighted having the information shared to guide the direction of monitoring programs and resource management. Some participants noted the importance defining a “healthy” whale based on comparative learning based on belugas harvested in Alaska, as well as comparisons with other Canadian populations such as the St. Lawrence Estuary beluga population.

## **THE ALASKA BELUGA WHALE COMMITTEE: A PARTNERSHIP IN BELUGA RESEARCH AND MANAGEMENT**

Mr. Willie Goodwin, Chair of the Alaska Beluga Whale Committee (ABWC) gave a presentation about the ABWC ([Appendix X – e](#)). The ABWC was established in 1988 and is comprised of hunters, managers, and scientists. W. Goodwin has been Chair for 10 years and was just re-elected for two more years. Prior to becoming Chair, he was a hunter representative to the ABWC for the village of Kotzebue for 10 years. He has worked with scientists for several years doing surveys for abundance in Northwest Alaska. He believes we need as much of western science to better understand beluga in addition to TK, and stated that “...we need to continue to teach our young hunters the proper way to hunt and preserve beluga”.

Mr. Goodwin shared that the goals of the ABWC are to:

- Maintain a healthy beluga whale resource for subsistence use and public enjoyment by future generations;
- Encourage the safe and efficient harvest, processing, and use of beluga, and to reduce the number of struck and lost whales through regional management plans;
- Ensure that belugas are used as fully as possible in a non-wasteful manner;
- Obtain accurate harvest information and biological samples from each region;
- Educate and promote understanding about beluga issues among users, resource managers, and other interested groups;
- Obtain biological information and TK necessary for sound management and conservation of beluga whales; and
- Oversee enforcement of regional management plans and hunting guidelines, and promote enforcement of habitat protection laws.

The ABWC is also a forum for communication. Every two years, they have a workshop with scientists to discuss ongoing research and for scientists to request permission to conduct work on belugas. Future concerns include climate change, increased shipping, and oil and gas development. He proposed a joint program of whale tagging between Canada and Alaska to learn more about how beluga stocks move around and share common habitat.

## **COMMUNITY PRESENTATIONS**

Delegates from each of the six ISR communities gave presentations to highlight the importance of belugas from their community perspective. Key messages from those presentations are summarized below.

### **Tuktoyaktuk**

Jocelyn Noksana gave a presentation on behalf of the community of Tuktoyaktuk titled: “Hendrickson Island Annual Beluga Project” ([Appendix X – f](#)). This presentation focused on the Hendrickson Island Beluga Monitoring Program and its many partnerships. She provided an overview of the sampling program and team, as well as the beluga harvesting and preparation that takes place at Hendrickson Island, and the involvement of the community and evolution of the program over recent years. She concluded with the importance of the program to her community and the ISR, and the important role of both science and TK.

### **Paulatuk**

Reuben Green, Jody Illasiak Sr. and Melanie Wolki gave a presentation on behalf of their community of Paulatuk. Mr. Green introduced the presentation title as acknowledging the “three C’s”: “Collaborative, Collective, and Community” ([Appendix X – g](#)). He followed this with a photo slideshow that illustrated the history of Paulatuk and spoke about observations of ocean change, such as changes in sea ice, warming temperatures, and animal movement. Reuben provided examples, including geese hunting occurring earlier (mid-May rather than mid-June) and mosquitoes arriving earlier (in May) than in the past. He stated that “these changes have us jumbled up”. Reuben’s presentation stressed the importance of continued beluga monitoring to capture such changes.

Mr. Illasiak presented about the changes observed over time near his community. He showed a map of beluga harvesting locations used by community members from Paulatuk, and how the location and numbers of beluga harvested have changed between 1960 and 1980. Beluga harvesting was sporadic until the 1980s, but it has become a regular occurrence with whale hunting more centralized near Paulatuk and Tippi. Previously they would have to travel long distances to harvest belugas and now the whales come much closer to town. Jody concluded by discussing his role as a Beluga Monitor, the importance of this position, what it means to his family and how it relates back to his cultural connection with belugas.

Ms. Wolki shared her experiences from working as a youth monitor of beluga at Tippi. She presented on her role at the camp, which included helping in camp with sampling as well as preparing belugas to eat.

***Discussion:***

Following the presentations there was further discussion about the timing of arrival of the belugas and accessibility to hunt them. It was highlighted that whales enter into the area earlier now than in the past. Reuben Green explained how the ocean has changed; it is lighter than it used to be because there is more fresh water. The dominant winds now come from every direction, but it takes less time for the ocean to calm down because of the fresh water.

**Aklavik**

Dean (Manny) Arey presented on behalf of his community of Aklavik in a presentation titled: “Beluga Whales at Shingle Point” ([Appendix X – h](#)). He spoke about how difficult and unpredictable whaling has become. Hunters go out when ice leaves the river to get to the whales hanging around the coastal shoreline but now it is “hit or miss” with hunting whales. Few young people are hunting because they do not have the information needed for harvesting, butchering, and storing for the winter. Granny Alice helped teach others how to butcher whales. Whales used to go right into the cove at Shingle Point, but now most swim by the area. He highlighted that the winds and weather are a challenge for going out to get the whales.

***Discussion:***

People must travel far to reach whales, and weather and ocean conditions may change unexpectedly and cause you to turn back. Erosion is a challenge around previous hunting areas like West Whitefish. Manny would be interested in monitoring when whales arrive, and monitoring from the west to know if they are migrating earlier now than in the past.

**Inuvik**

Clara Day, Lawrence (Fraser) Angasuk and Kyle Conley spoke as delegates from Inuvik in a presentation titled: “Beluga Whales and Whaling Camps” ([Appendix X – i](#)). Clara spoke of the process of whaling, beginning with preparation for camp, set up, tools, all the way to storing the food back home. Clara highlighted that it is a lot of work to get ready and have all the proper gear for whaling. Her main messages were on the importance of passing on knowledge through the generations.



### ***Discussion:***

Changes have been observed at the two main harvest locations (Kendall Island and East Whitefish) and include increased storms, erosion of the land and whales “fighting boats back”. Cold pits are used to keep whale longer, otherwise whale is brought to town within a few days.

### **Sachs Harbour**

The presentation from Sachs Harbour was jointly delivered by CJ Haogak, Norman Anikina and Ryan Lucas, and was titled: “Sachs Harbour Perspective, with Sampling, Safety, and Observations” ([Appendix X – j](#)). Ryan explained that Sachs Harbour does not have traditional whaling camps like other areas, as belugas only recently began to show up around the community. Five to six years ago there were no belugas in the area and now they are spotted right in town. CJ Haogak shared the different ways to harvest and butcher belugas. They do not have hanging racks for muktuk, and instead use pallets and cardboard. Hunting whales is an unusual event, and everyone comes to see and be a part of it. Norman stressed the importance of using a personal flotation device (PFD) when out on the water. He spoke about the need to be aware of all boats around you when shooting whales in the open water.

### ***Discussion:***

Historically, elders would see belugas from time to time and would harvest a few (~5). There was a discussion about changes in weather and loss of ice likely increasing sightings of belugas. They are seen about 3 to 4 weeks after the ice clears out, and recent stomach samples contained capelin.

### **Ulukhaktok**

Delegates from Ulukhaktok, John Alikamik, Corrie Joss and Kelly Nigiyok, presented a video titled: “The Summer of Beluga Whales” that highlighted the unusually high number of beluga observed and landed near their community in July 2014 ([Appendix X – k](#)). Following the video presentation, questions were raised and a discussion followed about boating safety and by-laws for beluga harvesting practices. Suggestions were made for other HTC’s that have more experience harvesting belugas to assist the Olokhaktomiut HTC with creating beluga hunting by-laws and to assist the community of Ulukhaktok with future beluga harvesting and food preparation.

## **EVENING CULTURAL EVENT**

The purpose of the cultural evening on Day 1 was to provide an informal space to share knowledge of beluga whales, and to celebrate the diversity of perspectives in this common interest. The key focus was on Inuvialuit sharing their cultural knowledge and practices with the scientific community through a range of media. A feast hosted by the IRC included traditional foods such as muktuk, goose and bannock, and was open to all summit attendees and Inuvialuit beneficiaries. All participants were invited to share stories, photos, videos, and demonstrations related to belugas. Below is a summary of the presentations shared.

## **PAULATUK HUNTING VIDEO PRESENTATION**

Lawrence Ruben showed a video of beluga hunting in Darnley Bay and discussed the behaviour of belugas that can be observed in the clear water near Paulatuk. The video showed a beluga turning its head to watch the hunter, and how the whales reacted and behaved in a cooperative manner swimming under boats. The clear water influences local hunting style and differs from the turbid waters of the Mackenzie Estuary. An open-floor discussion covered different Inuvialuit hunting techniques and how they are dependent on the hunting area.

## **DEMONSTRATION OF THE TRADITIONAL INUVIALUIT QAYAQ**

Kevin Floyd, who leads a local qayaq club based in Inuvik, gave a presentation about traditional Inuvialuit kayaks and how they are built using traditional methods and tools. He reviewed step-by-step how they are put together and the evolution of different materials used in their construction from the past to present. The presentation included a display qayaq and qayaq building demonstration.

## **DISPLAY OF TRADITIONAL BELUGA WHALE CAMP**

The Inuvialuit Cultural Resources Centre (ICRC) provided a life-sized display of a traditional Inuvialuit beluga whale camp. It included models of dry meat and muktuk hanging on a wooden drying rack, a table for cutting muktuk, and barrels to render and ferment uqsuq. The display was a great conversation starter and was especially informative for researchers who study beluga tissues but have never been to a whaling camp or learned about traditional food processing practices.



*Figure 3. Display of traditional Inuvialuit beluga whale camp provided by the ICRC. Photo credit: J. Lam.*

## HISTORIC PHOTOS OF BELUGA HUNTING IN THE WESTERN ARCTIC

A photographic display titled “Beluga Hunting Through Time” was developed by Charles Arnold, Prince of Wales Northern Heritage Centre (Yellowknife, Northwest Territories), with photo permissions made available through the Hudson’s Bay Company Archives (Winnipeg, Manitoba). Some of these photos later appeared in the Spring 2016 Issue of Tusaayaksat Magazine in an article titled “Mamaqtuq! Beluga Harvesting Through the Ages” (Arnold & Heiburg-Harrison, 2016). The display was introduced by Corinne Bullock (DFO, Inuvik) who acknowledged Mr. Arnold and explained that the photos demonstrated the evolution of Inuvialuit beluga hunting, from use of traditional qayaq’s to schooners, putt-putts and later, more powerful outboard motors. Photos were placed in series along a wall for participants to browse during the break. They generated a great deal of discussion, and several participants recognised their relatives in these images. The photos were also bound into a short book, and a copy was provided to each HTC, FJMC and the IGC. Copies were also gifted to several individuals involved in organising the event (members of the Steering Committee and other contributors) and given away as door prizes.

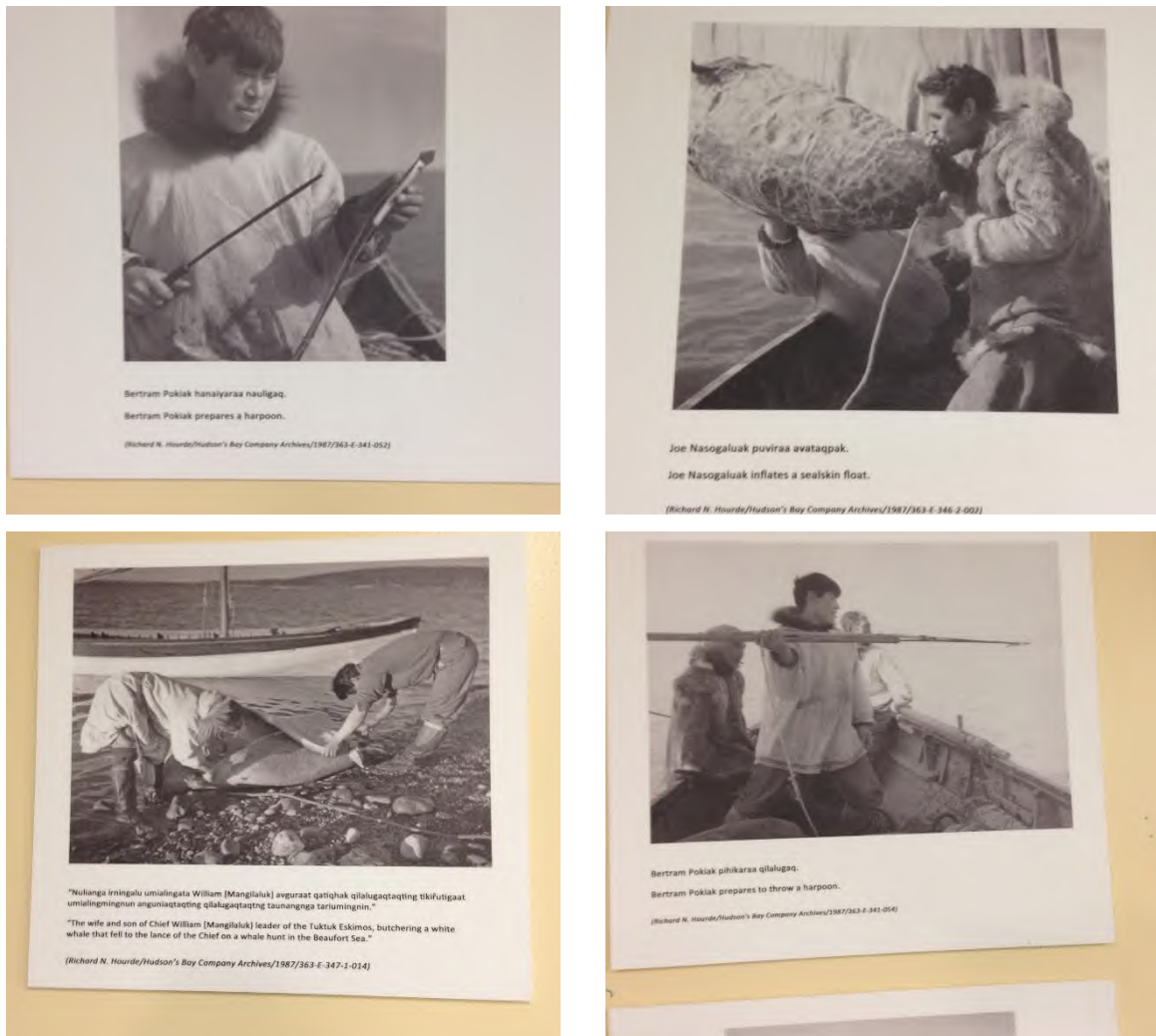


Figure 4. Photographs from the ‘Beluga Hunting Through Time’ display. Photo credit: J. Lam.

## **VIDEO PRESENTATION ON PREPARING MUKTUK**

A video showing Inuvialuit elder Maureen Rogers preparing muktuk on Baby Island was played during the feast. The video was provided by the Inuvialuit Communications Society (ICS) and was produced in 2007. It featured M. Rogers describing how muktuk preparation has changed over the years. In the past, people used logs as their stage and sat on the grass, whereas now they stand or sit at tables. They would also cut longer pieces of muktuk. She described how cutting the muktuk and processing the whale is usually women's work, while the men hunt and pull up the whale. She prefers to work by herself and have her own place on the stage. That way she does not have any conflict on how to go about her work. She learned from her older sister how to cut whale after she married. You must have a sharp knife to work at whale. Maureen also described that you must cut the whale, hang it for 2 – 3 days (unless it's hot, in that case it is hung for 2 days), and then cook it in barrels. She also described that uqruq (oil from the blubber) is good with roots in it, or you can cook and put in yellow berries. In times past, people would go out with a barge and come back with lots of dry meat and muktuk. They had dogs in this time, which would eat the whale bones. They would also clean the stomach and use it as a container for berry picking.

## **PHOTO SLIDESHOW OF BELUGA MONITORING IN THE ISR OVER THE YEARS**

All participants were invited to share photos and videos of beluga harvesting, research, and monitoring, and many wonderful submissions were provided. L. Harwood provided historical photos from the Beluga Monitoring Program. Other scientists and community members shared a variety of photos and videos.

## **DAY 2: SCIENCE DAY**

### **DAY 2 OPENING REMARKS**

#### **Welcome to Science Day**

Dr. Michelle Wheatley, Regional Director of Science, Central and Arctic Region, Fisheries and Oceans Canada, welcomed everyone to the Beluga Summit and thanked the IRC for hosting the evening feast. She thanked the youth and community speakers from the first day. She shared her enthusiasm for all the great presentations and knowledge shared by communities, and noted how different they all were. Lastly, she thanked the Steering Committee for organizing the Beluga Summit, and acknowledged the amount of work that went into planning a successful event.

#### **Introduction to Science Day Program**

Dr. Lisa Loseto, Research Scientists, Fisheries and Oceans Canada, explained that the Science Day had been structured following feedback from co-management boards and communities. The first half of the day would feature presentations focused on beluga health and human health, while the second half focused on beluga health and ecosystem topics. The afternoon also included breakout group sessions designed to encourage the bridging of western science and TK. Breakout groups were instructed to think about future planning around gaps and priorities for science and resource management. In the evening

there would be a poster session during which each researcher would give a short presentation on their research to the room and be available to answer questions.

## **Introduction to the Beluga and Human Health Session**

Dr. Loseto and Inuvik Elder Clara Day spoke from their unique perspectives on the relationship between beluga health and human health. As a scientist, Lisa was trained to be focused on approaches to defining and exploring beluga health and responses to external stressors. Early in her career, she noticed how conversations with community members about beluga health research were often redirected to discussions about human health. Through her work with S. Ostertag and developing a greater understanding of community perspectives, she realized that her original view on defining beluga health was too narrow. L. Loseto came to understand that beluga health *IS* human health. Clara explained why beluga health is important to Inuvialuit from a holistic perspective. Beluga are rich in vitamins and energy, and if a whale is sick it can make people sick. When she first heard about toxoplasmosis [an illness caused due to infection by the parasite *Toxoplasma gondii*] she was scared to eat raw muktuk, but it has since been explained that it is ok to eat beluga (CBC News, 2014). Having healthy beluga to eat allows Inuvialuit to support themselves on the land. Healthy whales will keep people healthy and allow them to live long lives and see their grandchildren and great grandchildren.

### ***Discussion:***

People were curious about how different food preparation methods may alter nutritional levels of beluga country foods (degree of aging, aged whale in comparison to fresh meat), long-term effects versus short-term effects, and how to avoid botulism. L. Loseto explained that she expected the following presentations to address these topics (see copies of invited presentations on human health in Appendix XI).

## **DAY 2 PLENARY PRESENTATIONS**

### **International Polar Year (IPY) Inuit Health Survey Findings in the ISR**

Scott Tomlinson of the Northern Contaminants Program presented an overview of the NCP, and David Xu, University of Ottawa, gave a presentation on the International Polar Year (IPY) Inuit Health Survey (2007-2008) ([Appendix XI – a](#)). The health survey involved 280 Inuit participants. Findings for the ISR were presented relative to other Canadian Arctic regions. Some findings from the study included that:

- Beluga products are one of the 10 most frequently consumed traditional foods.
- Over 90% of ISR adults consume beluga products (muktuk, meat, and oil).
- Beluga is an excellent source of protein, vitamins, selenium, and omega-3 fatty acids.

D. Xu's work generally addresses the balance of nutrients and contaminants in traditional foods. Key messages were that:

- Country foods, including beluga, are good to eat.
- The majority of people in the ISR have a low risk of mercury exposure.

- Studies from around the world (including one in Nunavik) show that mercury exposure may have subtle effects on fetal development.
- Health Canada recommends that pregnant women and women of child-bearing age limit exposure to mercury.

**Discussion:**

- Levels of mercury in Inuvialuit in the ISR are lower than Inuit in Nunavik but higher than other populations in Canada.
- The human fetus is more sensitive than adults to mercury exposure.
- There was clarification that the outermost part of beluga skin has higher mercury levels.
- The IRC Chair would like to see an updated Inuit Health Survey across the four Inuit regions and hoped that the Beluga Summit would provide momentum for this work.

**Beluga Health and Food-borne Parasites in the ISR: Emily Jenkins, University of Saskatchewan ([Appendix XI – b](#))**

E. Jenkins presented a study which addressed the health of the EBS beluga population, with a focus to help communities identify and address food safety issues related to parasites like toxoplasmosis. This information was provided in response to a media article on toxoplasmosis that went viral in February 2014, following a press release issued during the 2014 American Association of Science. This sensationalized story was then picked up by national and international media, resulting in great concern across the ISR and across Inuit Nunangat, and led to much unnecessary alarm about consumption of traditional foods.

Toxoplasmosis is not new to the Arctic. It exists across the North and has for some time. Toxoplasma exposure to people is only 8% in the ISR, much lower compared to the rest of the North, as well as nationally and globally. In addition, exposure does not guarantee infection, and in most cases people's bodies will fight off the parasite. Many cases of infections in Canada are associated with people who have compromised immune systems, for example, people with Human Immunodeficiency Virus (HIV). Only people with compromised immune systems and pregnant women are at higher risk of infection. Individuals from those groups need to talk with their medical doctors about changes to their diets, if relevant.

There is continuing research on belugas and parasites in the Canadian Arctic, and samples collected from Hendrickson Island are analyzed for the presence of the parasite *T. gondii* that causes toxoplasmosis. Next steps in this research include developing more accurate tests for toxoplasmosis using samples of belugas harvested at Hendrickson Island. From a food security perspective, traditional foods remain critical to the health and well-being of Inuit. Alarmist media and health advice from non-professionals undermines food security. Research continues to support informed decisions about food consumption, food preparation and disposal.

Note: the research team has since published a risk assessment of beluga and toxoplasma in the Beluga Summit special issue (Sharma et al., 2018).



## Recognition for Beluga Summit Logo Design

Dr. Sonja Ostertag spoke about the Beluga Summit hoodies and the art logo design by Gerald Inglangasuk. The Inuvialuktun phrase “Aiparaarnihat Ilihimarat Avkturtingit” was included in the design, which translates to “Sharing Knowledge” (translation by L. Elias). G. Inglangasuk was presented with a “Beluga Hunting Through Time” photo complication booklet for his contribution.



*Figure 5. Sonja Ostertag presenting Gerald Inglangasuk with the 'Beluga Hunting Through Time' booklet. She is holding a hoodie showing Gerald's design. Photo credit: Jen Lam*

## Traditional Knowledge and Food Preparation

John Noksana Jr. and Gerald Inglangasuk, Inuvialuit Members of the FJMC, gave a presentation on TK and food preparation ([Appendix XI – c](#)). They acknowledged upfront that personal preferences exist for muktuk preparation, and the general process to prepare muktuk was shared. Muktuk can be drained on pallets or logs for anywhere from 6 hours to 2 days (longer on cooler days). The top can be cut off for use as oil. It can then be cut into long strips (3/4" x 1 ft), put in the ocean to soak, then trimmed and drained. Muktuk should be cooked in water at a slow boil to avoid becoming rubbery. Meat can be washed with a bit of baking soda in the water to reduce the taste of blood, and should be cut across the grain to stay together better while hanging. It can be fried for a better taste. The flippers are often roasted on a fire while the whale is worked on at camp. Uqsuq (blubber rendered to oil) can be prepared under houses in pails. The pails are put on plywood to not absorb heat from the ground. They can be covered with a cotton t-shirt so they can breathe, and stirred once or twice a day. After 2 to 8 days the uqsuq is ready.

### ***Discussion:***

There were questions on the type of wood used for cooking; it was explained that usually driftwood is used. An oven can also be used to cook at 375° for 4 – 5 hours with a bit of water to cover the top. A participant from Ulukhaktok noted that they do not have much wood in their area.

A participant shared a story about a bad experience with botulism. He ate some muktuk and the next day developed symptoms of dry mouth, difficulty breathing, and an upset stomach. He went to the nursing station but the team could not at first determine what was wrong. When he went back to the nursing station a second time he was medevac'd to Edmonton. He was in a coma for 8 – 9 days, and it took him 2 years to get his full strength back. That year, it was hot when they made their muktuk. In those conditions care must be taken to ensure the muktuk and uqsuq is in a cool, dark place. It was noted that hot conditions are more common lately. In this case, he had eaten only two small pieces of aged muktuk, and there was no unusual taste. Contaminated muktuk from poor preparation cannot be visually identified. Other symptoms of botulism include blurred vision and slurred speech.

### **Cultural Importance of Beluga whales**

Jody Illasiak Sr. shared his perspectives on the cultural importance of beluga harvesting ([Appendix XI – d](#)). He had worked as a beluga monitor with FJMC and DFO for the last 3 years. He explained and showed how they hunt belugas from his area near Paulatuk, in Darnley Bay. He described details about local hunting methods that included watching whales from a hill for hours (they can see whales 20 to 30 km away), working together to herd them, and harpooning and then shooting a whale. Everyone works together to haul the whale up. He also shared the processing methods he was taught. These included soaking skin/blubber (muktuk) in saltwater, setting it on pallets to let the blood drain, cutting and hanging it for 1 to 5 days, then freezing it fresh or letting it age for 1 – 3 days. He stressed the importance of having community freezer space to store the whale, because personal freezers are often full from the geese and char harvest. Beluga is a big part of their diet. Their family harvested 3 whales and that fed up to 19 families.

### **Changes in Nutrient and POPs Levels in Beluga Traditional Foods from Food Preparation**

Matt Binnington, University of Toronto, presented his research on how different food preparation methods can alter nutrients and the concentration of persistent organic pollutants (POPs) in muktuk and uqsuq ([Appendix XI – e](#)). He presented initial results and focused on the fatty acids and selenium for nutrients, and POPs for contaminants (with pending results including other types of POPs and mercury). He sampled pieces of muktuk and uqsuq from the same animal and compared preparation methods such as fresh, air drying overnight, boiling in a large and small vessel, roasting, and aging over 2 and 5 days. Overall, there were no large differences by preparation method for either nutrients or contaminants observed, but some small differences could be detected. Roasting appeared to increase selenium content, and ageing appeared to increase fatty acids. Ageing also appeared to decrease some fluorinated POPs. In addition, fatty acids were found to be higher and selenium lower in uqsuq compared with muktuk.

Since this presentation, the team has published the full findings (Binnington et al., 2017).



### ***Discussion:***

There was much interest from the community members and they were eager to see further work on this topic. There was interest in the differences of contaminant levels between individual whales. Only 2 whales were sampled in this work, so while differences were seen between the two individuals, no conclusions could be drawn. There was some confusion between the results from this presentation and David Xu's presentation. Clarity among contaminant types and interpretation was requested.

### **Are the Eastern Beaufort Sea Beluga Healthy?**

Dr. Stéphane Lair is a wildlife veterinary pathologist with Université de Montréal and the Canadian Wildlife Health Cooperative (CWHC). He spoke about how science defines a “healthy” and “unhealthy” population, with the presence of disease, adequate energy reserves, and reproductive success being key criteria in defining wildlife health ([Appendix XI – f](#)). He spoke about other beluga stocks that are struggling and considered to be unhealthy, such as the St. Lawrence Estuary population. This population has had decreasing numbers, increased complications with calving, and increased numbers of dead calves. Some individuals in this population also have high levels of lungworms. S. Lair and his team are conducting a health assessment for EBS beluga whales. In 2015, they intensively sampled a small number of samples taken (16 whales) at Hendrickson Island and no significant diseases were found. The veterinarians found mild parasitic infections at low levels and some cysts. Most whales were in good condition, and a few were thin. However, this may be normal based on the season/migration routes and they need to do a larger study and look at season cycles to be able to interpret these findings. They will be working to better quantify beluga body condition. Reproductive success appears to be well as the population appears stable. Dr. Lair noted that while no diseases that could cause a risk to humans were found in the whales, to be safe it is best that if something does not look right, do not eat it.

### **Beluga Health and Traditional Ecological Knowledge Perspectives**

Mr. James Pokiak, Chair of the Traditional and Ecological Knowledge Working Group, provided his perspective on beluga health ([Appendix XI – g](#)). In general, he stated that the beluga population harvested by Inuvialuit is healthy. He feels the fatter the whale, the healthier it is. Blubber thickness seems to vary over the years, which impacts the amount of uqsuq you can make. Mr. Pokiak stated age might be another factor in health. He shared that the population is healthy and has been stable for generations. Based on TK, they believe that populations in the past were healthy. They have harvested this population for generations. He stressed the importance of belugas for Inuvialuit diet and culture, and the value of passing down TK to the next generation. He supports having science and TK work together more. “We have to support each other”.

### **THEMATIC BREAKOUT GROUP SESSIONS**

Breakout themes were developed based on feedback from the HTCs, FJMC, IGC, scientists, and the Steering Committee. Participants were asked to select a breakout group (six in total) relevant to their knowledge and/or interest. Breakout session (co-)chairs and rapporteurs were selected in advance of the meeting, and were prepared with questions for discussion. Breakout group themes and participants are detailed in [Appendix XIII](#); briefly:

- 1) Contaminants – Chair: B. Reinfort and 9 participants
- 2) Disease and Condition – Chair: C. Parker, K. Hynes and 15 participants
- 3) Population/abundance/Genetics – Chair: J. Lam and 7 participants
- 4) Diet and Condition – Chair: K. Snow and 6 participants
- 5) Habitat and Habitat use – Chair: D. Swainson and 8 participants
- 6) Future Impacts – Chair: V. Gillman and 11 participants

Breakout groups were directed to: a) review the state of knowledge on the topic, or ‘what we know’ (using both western science and TK), b) discuss gaps/questions, and c) provide recommendations for future research. The breakout groups were conducted as a round table, allowing everyone to have a chance to speak.

## **1. Contaminants Breakout Group Session**

### ***What We Know***

Mercury was the contaminant most discussed in this session. It is the biggest concern and makes people uncomfortable because “you cannot see it, so it is hard to know it is there”. There were a lot of questions about mercury related to where mercury is found in animals and the environment, and what this means for human health. Scientists addressed questions, but noted that mercury is a challenging contaminant to study and to fully understand all pathways.

There was concern regarding radioactive fallout from the Fukushima disaster and what this might mean for consumption of country foods. Scientists explained how nuclear fallout travels and will disperse via ocean water masses and in air. Levels are very low at present. Despite this information, community members were concerned about radioactive fallout.

There was also concern regarding migratory birds ingesting oil in feeding grounds and Distant Early Warning (DEW) line clean-up sites – worry about fuel leaks and entering the food web. The NCP mandate is for contaminants with long-range transport, not for things like DEW line site clean-up or research on oil spills. CIRNAC has a point-source contaminant site program, but it is focused on clean-up action rather than research, and there is no human health component.

There was concern regarding permafrost thaw and how that might impact the release of stored mercury. Another major issue is the increased release of methane into the environment.

### ***Recommendations for Future Research***

- Continuation of long-term marine mammal (especially beluga) contaminant monitoring is a priority. This was emphasized by both Inuvialuit and science representatives. There is also a need for contaminant monitoring in people. Specific recommendations were for:
  - Another Inuit Health Survey to measure contaminant levels in Inuvialuit.
  - More frequent human biomonitoring for contaminant trends. This can help increase capacity in community health centers.
  - A regional-scale human biomonitoring study might be more cost-effective

- Food frequency surveys should be expanded to know *when* certain foods (e.g., muktuk, dry meat) are eaten, not just average for food consumption. Would also need to understand and study how long it takes for mercury to leave a person's system.
- One major problem with contaminants is the issue of communication:
  - Contaminants are invisible, and the science is not always clearly understandable.
  - Use of infographics can help explain the science if pamphlets are sent to communities.
  - Plain language summaries are good but they do not always make it to the communities and the information they contain is not always accessible.
  - A communication plan needs to include contingencies for when things go wrong (e.g., media scare resulting in miscommunication).
- NCP should host a regional contaminant workshop with communities and scientists in an event like the Beluga Summit. This type of event is the best kind of plain language summaries because it:
  - Gets people together to talk and keeps working relationships close between scientists and TK holders.
  - Increases information sharing in the North: do not hold these meetings in the south so that more people who are directly affected by these issues can come to learn, teach, and share.

## 2. Disease and Condition Breakout Group Session

### *What We Know*

There are some parasites that are semi-regularly observed in harvested belugas, such as parasitic cysts in blubber and kidneys. Roundworms are found in stomachs (transferred to beluga by infected fish). These are found in the 1000's in St. Lawrence Estuary beluga (and can cause mortality there) but are quite low in EBS beluga. Round worms can be found around sinuses (an elder noted that he has observed these parasites in high numbers in every beluga skull he has opened). Dr. Lair said these do not appear to affect beluga. It is parasite larvae from the flesh of infected fish that transfers to beluga. These parasites are not known to infect humans – however it is always best to be cautious and not consume anything that does not look normal. The harvesters and beluga monitors said that they observe the cysts and other parasites and abnormalities every now and then. They have not observed a notable increase or decrease in the prevalence of these abnormalities over the years.

Brucella (a bacteria that can cause brucellosis) is present in some of the beluga harvested in ISR. It was noted that this has never been transferred from a whale to a human, but there is one incident of transfer from fish to human in Brazil. It can cause abscesses in blubber. In theory it can pass to humans through blood transfer or through orifices.

EBS beluga appear to be resilient to disease and parasites and in most cases still appear healthy in comparison with some other beluga populations that have higher levels of disease.

Any abnormal samples collected can be sent to DFO who will forward them to the Canadian Wildlife Health Cooperative for analyses. Dr. Lair's lab can return results for normal tests in 2-3 weeks, however,

some tests may take a few months. It is important to note that current sampling through harvest-based monitoring provides a small snapshot of the overall population.

Scientists asked harvesters if they are potentially selectively hunting slower whales. Harvesters indicated that they generally select the larger males and noted that they see larger males in late July. Whales in mid-July are a bit smaller. Hunters noted that the large males do spend time a bit further offshore sometimes. Somewhat shared that in Arviat, hunters report that the large males are further offshore. An Elder said she has observed a change in the fatness of whales through her life. In general, belugas were fatter in the past than they are now.

It is important to continue to monitor the prevalence of disease and parasites so that if there are changes over time, it improves the chances of understanding how ecosystem or climate changes may be affecting the population. New fish or other species entering the ecosystem have the potential to bring in novel disease or parasites.

### ***Recommendations for Future Research***

- Community members have sent in abnormal samples to DFO and have not received results (e.g., East Whitefish Monitor sent in 2 cysts from blubber 2 years ago and never heard back), and that it seems like it takes “years” to get back results.
- Developing a local tracking list (at FJMC or DFO Inuvik) would be useful to track all the samples of concern that are collected, including information on location, harvester, date collected, date sent, who it was sent to, and follow-up. This would assist with ensuring the information is sent back to the harvester, not just provided to FJMC or an HTC where the information may not make it back to the individual harvester who was most interested in hearing the results.
- Reports that are sent back on the results of these analyses need to be in plain language and include some clear notes on potential effects on humans, along with what tests came back positive or negative. CWHC forms (available online) accompany samples sent in for analysis. Harvesters should include their specific questions that they have so these answers will be provided in the pathology report. The CWHC have improved these types of reports in other areas based on feedback from hunters.
- Dedicated HTC freezers should be used for samples of concern to avoid contamination of food.
- Comparison of the data collected 10-20 years ago should be done with the current data – to see if there have been changes in prevalence of disease and parasites.
- Enhanced training to sample for abnormalities or whales that washed up dead should be provided to beluga monitors to increase their knowledge and ability to collect samples when science crews are not present.
- Information on parasites and diseases are available in the field (provided in beluga monitor binders), but information sheets to handout to harvesters would also be valuable.
- FJMC will work with team on a plain language summary document to be provided to HTCs, monitor binders and the main harvesters at whaling camps, and to share information on marine mammal diseases with HTCs.
- End of season debrief meetings at camps would allow a general assessment from beluga monitors and harvesters and the general observations on beluga and potential changes observed from year-to-year.

### **3. Population Abundance and Genetics Breakout Group Session**

#### ***What We Know***

Breakout group participants agreed that both TK and science indicate that the EBS beluga population is stable. The last aerial survey to develop a population abundance estimate was conducted in 1992, which resulted in a population estimate of 40,000 whales. However, the 1992 survey did not cover the entire summer distributional range for EBS belugas known from tagging studies. Based on current genetic tools available, all belugas harvested in the ISR are from the EBS beluga population.

Community members had questions and shared observation about beluga movement and distribution. Observations from Paulatuk included seeing larger pods earlier in the season than in the past. A mother and calf were observed near Herschel Island in summer 2015, and this is new. Delegates from Inuvik reported that whales are trying to stay in the shallow waters.

#### ***Recommendations for Future Research***

- A new population abundance estimate is not a priority and aerial surveys are not practical. There is preference for a program to access the population using tools such as: TK observations, harvest samples, satellite tagging, and passive acoustic monitoring.
- A comprehensive and holistic view of beluga health and relative abundance is needed.
- Harvest monitoring data needs to be analyzed up to the present day.
- Indicators for stock status other than a population abundance estimate should be developed.
- Genetic work, especially for belugas harvested near Paulatuk, should be updated.

### **4. Diet and Condition Breakout Group Session**

#### ***What We Know***

The sex and size of belugas influence their diet, as measured using scientific approaches such as fatty acid-inferred diet and habitat use derived from satellite tagging. Marine fish, rather than estuarine fish, appear to be dominant prey, and Arctic cod (*Boreogadus saida*) are a particularly important prey item for EBS belugas.

Stomachs of belugas landed in the estuary are typically empty. The vomiting explanation for empty stomachs in harvested whales does not seem to hold based on TK and hunter observations. For example, there are no oil slicks near whales during hunts to indicate vomiting, and perhaps that during a chase fish may be jumping out of the way that may be misinterpreted as vomit. To further this, recent observations of full stomachs in belugas harvested at Ulukhaktok in 2014 demonstrates that whales chased in a hunt can still hold down their food. One item that remains puzzling is that stomachs are empty, despite the many coastal and anadromous fishes in the delta where beluga aggregate and are harvested. Why are beluga not taking advantage of the opportunity to feed on these fish? Hunters agreed belugas appear to be in good body condition overall.

It would be beneficial to identify feeding areas as well as understand the “travelers vs the feeders”. Sometimes whales are busy travelling even if there is food nearby, whereas others are specifically focused on feeding.

### ***Recommendations for Future Research***

- Study on digestion and passage rates for food evacuation through a beluga.
- Determining key fish habitats, aggregations, and associated activities (e.g., spawning).
- Understanding use of different areas for beluga activities such as molting, fasting, and travelling.
- Defining characteristics of blubber layers (i.e., consistency, colour, type of fats).
- Important to continue monitoring programs and address observations such as changes of size (noted whales were as large as 19.5 ft in the past).
- Building better partnerships with Alaska to build a seasonal understanding of health (spring and fall); should involve more Iñupiat beluga hunters at the next Beluga Summit

## **5. Habitat and Habitat Use Breakout Group Session**

### ***What We Know***

The discussion focused on the delta communities as no members from Paulatuk or Ulukhaktok were present. There was discussion about the many changes observed at East Whitefish (e.g., Gull Island is gone, entrance at East Whitefish is different than in 1950s, very silty, nearshore is rough). Similarly, there are beaches beginning to appear near Tuktoyaktuk. Belugas in the East Whitefish area appear to be “cleaning themselves”.

On the west side of the delta, habitat appears to be changing as well with warmer, murkier and less salty water. The channels are changing, making it hard for people from Aklavik to reach the coast. This year (summer 2015) people were able to get to Shingle Point on June 13th, due to open water, whereas normally they cannot get there until July because it is inaccessible due to ice. There were whales passing by, but it was too cold to prepare muktuk. Whales used to go in the harbour at Shingle Point but do not anymore. More whales were seen at Shingle Point in 2015, but there was not very much hunting. Mothers and calves were seen at Shingle Point and bulls come in August (fall period).

### ***Recommendations for Future Research***

- Research into fish and other beluga prey items is of interest to gain a better understanding of ecosystem changes that may be affecting beluga.
- Research and monitoring of water temperature and salinity is necessary to better understand changes observed.
- Erosion is occurring on the coast and the delta. This is important to focus on as it affects access to beluga hunting and will also likely affect beluga habitat.
- Ice break-up is a big event in the area and should be studied to understand how it is changing.
- Storms and other big weather events are becoming more frequent. This is detrimental to hunting and how it is affecting beluga is also important to study.
- Tagging whales is of interest as it would provide information on how beluga are using their habitat and how that use is changing.

## 6. Future Impacts Breakout Group Session

### *What We Know*

The group discussed different stressors that are of concern in the region and that may have an impact on beluga whales. These were:

- Increased vessel traffic – with specific stressors including noise disturbance, vessel strikes (more of an issue for bowheads than beluga), transport vectors for invasive species and disease, and water quality issues.
- Contaminants – with effects on the health of beluga whales and their prey.
- Ice cover and seasonality – with potential effects of species range expansion/contraction, changes in the distribution of predators (e.g., orcas) and prey, productivity shifts, and ecosystem changes driven by wind and erosion.
- Tourism – both on sea and land, and potential effects of disturbances to beluga range and their preferred areas.
- Cumulative impacts – the effects of the combination of multiple stressors and how they might compound to have even more of an effect on beluga and their habitat.

### *Recommendations for Future Research*

Many of the topics identified by the breakout group are being investigated at various levels. Therefore, it may be more about strengthening or improving the research framework to address future concerns.

Specific recommendations included:

- Continued investment in understanding the food web and beluga habitat use, with emphasis on diet studies using biotracers (stable isotope, fatty acid).
- Gaining a longer-term understanding of deep-water areas of the Beaufort Sea and linkages between beluga and other components of the ecosystem.
- Improving knowledge across the entire beluga range with transboundary sharing of information and linking program designs with other communities and agencies.
- Research into the potential risks of invasive species and range extensions due to climate change and shifts in sea ice patterns.
- Consideration of a refresh on the population abundance estimate with addition of acoustic monitoring to better understand timing of beluga migrations.
- Consideration of improving the physical monitoring approach to achieve a better baseline, by continuing sampling at a set of stations (6-8) across Canadian Beaufort Sea with beluga habitat use and timing the driver for selecting sites.
- Research into noise disturbance from increased shipping and tourism activities, including an inventory of shipping activity with overlay of beluga travel, migration, and feeding areas
- Examination of potential mitigation measures for shipping activity (dynamic closures or regulations on timing, speed, etc.)
- Design a set of cumulative impact assessment tools.
- Research TK on belugas in the ISR and create a knowledge compendium to serve as a baseline.
- Consider a State of the Environment conference for the Beaufort Sea within the next 2 years and ensure there are species-specific TK summaries available for that event.

## **BREAKOUT SESSION PANEL DISCUSSION**

A breakout session panel discussion included a representative from each breakout group, typically the chair or rapporteur. Each representative shared key summary points from the breakout group discussions with a focus on priorities for future research. Key summary points are presented below.

### **Contaminants: Presented by B. Reinfort**

Key messages: people want to know where contaminants are coming from and where they are located throughout the whale. Specific needs identified included:

- Need for human contaminant data among Inuvialuit, with strong support for a follow-up Inuit Health Survey.
- Data for contaminants in beluga whale remains a priority.
- Need for increased communication about contaminants, this event is a good addition, but there needs to be more information sharing within the North.

### **Disease and Condition: Presented by K. Hynes**

The key message was that people want to know if their food is safe to eat.

- No major changes were observed in the presence of lesions or disease prevalence.
- There is a need for more intensive training for beluga monitors to sample harvested and stranded whales. Provide monitor binders with pictures of abnormalities, for more common things to assist with on-site interpretation of abnormalities.
- Recommendations to improve handling of abnormal samples included use of dedicated HTC freezers and implementing a shared FJMC/DFO tracking system for shipping, analysis and reporting. Unusual samples tend to get lost because they are not part of the regular beluga sampling regime.

### **Population Abundance and Genetics: Presented by J. Lam**

Key messages: Both science and TK concur that the population is stable, yet distributional changes are occurring over space and time. Highlights include:

- The importance of documenting changes in movement and timing in different locations, as well as unusual occurrences and links to habitat and ecosystem changes.
- Population assessments using aerial surveys are not practical due to costs and logistics. TK would be useful for monitoring presence/ absence, in addition to tagging programs, acoustic monitoring, and use of drones.
- Concern over killer whales (*Orcinus orca*) coming into the area and influencing pods of young belugas – this is new and unusual.
- Updating the FJMC Harvest Monitoring database from 2009 to present.
- Developing more holistic indicators for the status of the EBS beluga population other than stock status indicators.



## **Diet and Condition: Presented by K. Snow**

Key Messages: Despite much local observation and scientific research, many questions about beluga diet remain. Based on group participants, the discussion focused on the Tuktoyaktuk and Paulatuk areas. The group proposed focusing on the following topics to address knowledge gaps:

- Quantify digestion time to help understand why empty stomachs are seen in the majority of harvested belugas.
- Understand fish location so that fish can be sampled if needed (primarily for Paulatuk area).
- Identify activities that are affecting whale feeding - are they choosing to do other activities (i.e., traveling vs feeding)?
- Continue with harvest-based monitoring (size, stomach contents, condition, etc.).
- More partnered work with Alaskan communities is needed to put findings into context with other seasons and locations, and to facilitate more cross- exchange of information.

## **Habitat and Habitat Use: Presented by D. Swainson**

Key messages: Changes are being observed in belugas and habitat and new research is needed to address this issue. The discussion focused on Kugmallit Bay and Shallow Bay as no harvesters from Paulatuk, Ulukhaktok, or Sachs Harbour were represented in the discussion.

- Changes were observed at Shingle Point / Shallow Bay (Aklavik area) over the past summer (i.e., 2015) where ice broke early (13 June 2015) and lots of whales entered. It is difficult to hunt at that time of year as it is difficult to prepare muktuk when the weather is still cold. Later in the season there are not as many whales. Not as many whales are utilizing areas behind Shingle Point as they used to (reflecting changes in fish distribution or wave action?)
- Changes in the physical environment (e.g., temperature or salinity) might be impacting the fish and changing where whales are located.
- Recommendations for future research were to:
  - Study prey species distribution and how that is changing.
  - Monitor the salinity and temperature of the delta to see if that is impacting the whales.
  - Study changes in ice and timing of ice break-up, how that impacts where whales are located and the timing of beluga occurrence.
  - Study coastal erosion and how that changes the landscape and beluga distribution.
  - Study changes in beluga migration patterns – use tagging studies to find out where the whales are going and to learn their travel patterns.

## **Future Impacts: Presented by V. Gillman**

Key Message: The breakout group examined research needs and it appears that the research currently occurring is supporting needs to address future impacts and concerns.

Topics of concern included:

- Climate change and changing physical conditions altering beluga patterns.
- Pollution, including contaminants, invasive species, and airborne pollutants.
- Impacts from human activities such as shipping, tourism, oil and gas, and more people.
- Cumulative impacts and how all these stressors interact.

Recommendations for future research topics included:

- Continued investment in food web knowledge (deep water and components in food web).
- Gaining a better understanding of in beluga range, timing and distribution.
- Incorporating information across the entire geographic range of the EBS population.
- Cataloguing current vessel traffic routes to predict future areas of impact from stressors such as invasive species and novel diseases where ships are vectors.
- Continue research into noise impacts on beluga from shipping.
- Refresh population abundance estimates and information on migration (timing, routes).
- Run a new beluga tagging program.
- Continued investment into beluga diet studies.
- Focus on understanding cumulative impacts; the lack of a comprehensive marine monitoring program in the Beaufort Sea is a gap.
- Investment into TK for beluga in the ISR, as it will require a lot of energy to develop a comprehensive knowledge base.

Following the panel discussion, an open-floor discussion focused on shipping activity and funding sources. The FJMC was working towards a shipping risk assessment and a set of recommendations for a management framework. The importance of using funding efficiently was also mentioned, notably leveraging funds to bring together several smaller pots of money to make investments go further. It was noted that there was community-based funding available and coordination is needed with other funding envelopes. It was also recognized that the Beluga Summit helps to use funding well, by setting priorities and directing what work is done in the region.

## **DAY 2 CLOSING REMARKS: MICHELLE WHEATLEY**

Dr. Wheatley thanked everyone for their input and directed participation in the breakout groups and panel that helped achieve the goals set forward for the Science Day.

## **DAY 2: EVENING SCIENCE POSTER SESSION**

### **POSTER SESSION FORMAT**

An open house poster session was held during the evening of the Science Day and was open to the general public. The poster session was organized as an opportunity for scientists to share their research on beluga, and for community members, resources managers, members of the public, and other scientists to interact, ask questions, and share their knowledge and perspectives. Posters lined the walls of the

venue and were grouped into general themes: research on diet and habitat use, population abundance and genetics, contaminants and health, and youth and community involvement in programming. At the start of the session, each scientist gave a 3-minute elevator pitch about their poster, then the floor opened for participants to walk around and talk with the scientists. In total, 19 posters were presented; these are archived in [Appendix XIV](#).

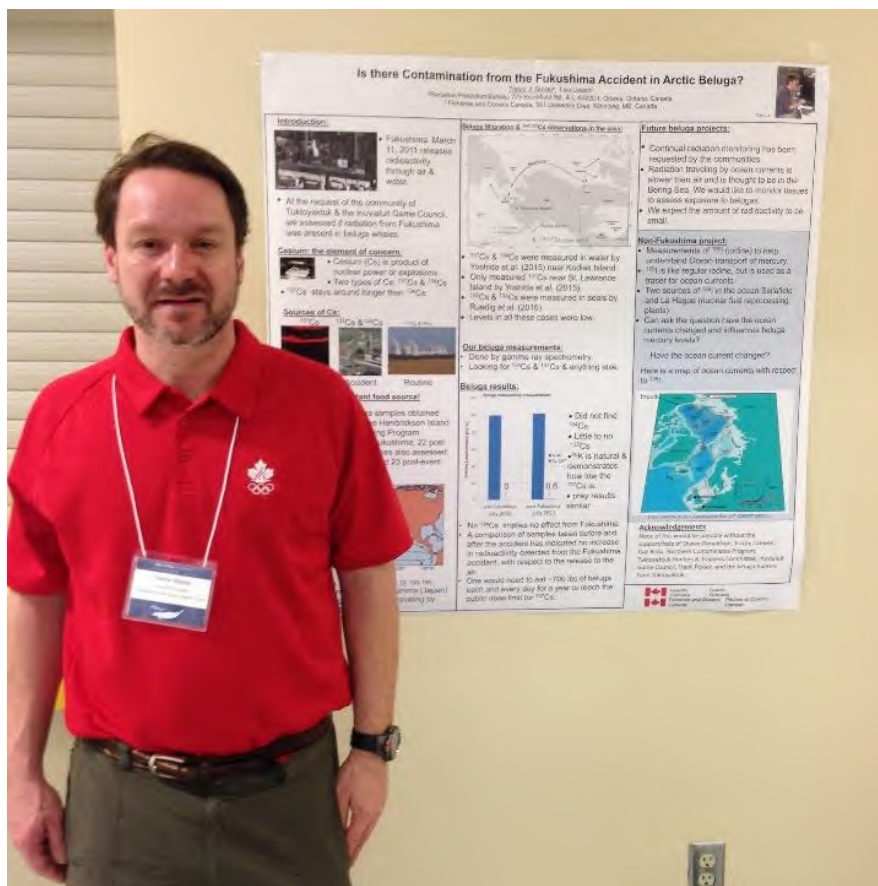


Figure 6. Trevor Stocki (Health Canada) participating in the poster session. Photo credit: Jen Lam

## DAY 3: CO-MANAGEMENT DAY

### DAY 3 OPENING REMARKS: Vic Gillman and Jen Lam

V. Gillman shared opening words on the joint partnerships at the Beluga Summit and commented on approaches to improve the summit in future years. The informal setting is ideal to enable sharing amongst all participants.

J. Lam explained that she had been posting information on Facebook for all community members to see and learn what information is being shared at the summit and to engage those not present. She encouraged everyone to share what they had been posting under the hashtag #Beluga2016 to create collective documentation.

## DAY 3 PLENARY PRESENTATIONS

The Co-management Day included three plenary presentations followed by two concurrent management sessions. Copies of presentations are archived in Appendix XII and are summarized below.

### Beluga Research to Inform Co-management in the ISR

Lois Harwood gave a presentation ([Appendix XII - a](#)) that covered four key areas of research highlights:

1. Stock size and abundance trend;
2. Harvest-based monitoring (harvest size, timing and trend, reproductive rate, growth rate);
3. Offshore distribution and abundance; and
4. Behavioural responses to industrial activity.

**Stock Size and Trend:** The last population estimate for EBS belugas was based on aerial surveys conducted over the Mackenzie Estuary and Amundsen Gulf in 1992. The count was ~20,000 whales, but with a correction factor the estimate is ~39,000 whales. Collection of genetic samples started from East Whitefish and Hendrickson Island in 1988 and are still going today to help understand how large the stock is, allowing estimations of harvest levels and if entrapment events impact the population size.

**Beluga Monitoring Program:** This program started in the 1980s, and now 800+ males and 200+ females have been sampled. It provides estimates of the number of belugas harvested, number lost, and mean landed. The decadal average of whales harvested has been decreasing from ~140/ per year to now ~90 per year. The Alaskan harvest of EBS belugas is low compared to ISR harvest. Also, the timing of subsistence harvest of beluga whales has changed. Analyses from harvested female beluga (from 2000-2005) revealed females are reproducing once every three years. The age of males harvested does not show any trends however younger adult whales are taken at Paulatuk. Growth rate has declined slightly over the last 20 years, and a similar pattern is seen in ringed seals over a longer timeframe and larger sample size. This may be indicating prey shifts for both beluga and ringed seals.

**Offshore Distribution and Abundance:** Aerial surveys conducted in July and late August (1982, 1984, 1985, 2007, 2008, 2009) showed similar patterns between the early and more recent years. However, many more belugas were observed in offshore areas during the more recent surveys. This may be due to changes in prey, increase in stock size, or beluga avoidance of oil and gas activities in the 1980s.

**Behavioural Responses to Industrial Activity:** When comparing sightings from offshore systematic aerial surveys and offshore 2D seismic surveys in 2007-2008, ship-based whale sightings show very few belugas (n=8 for large coverage area) suggesting that belugas avoid ships.

Looking Forward, the following research is needed to support resource management:

1. Monitor beluga growth rates, dietary shifts, and observations of distributional shifts using both western science and TK.
2. Use marine mammal health as an “ocean indicator” and part of a global/ regional observing network.
3. Identify biological hotspots and use this to set terms and conditions for shipping, industrial exclusion zones and protected areas for belugas.

Research funds must be used strategically to address the research questions of the day, to be adaptive and try new ways to monitor the stock, and to adopt new knowledge. Papers need to be published to evoke change.

## **ISR Beluga Monitoring: Past, Present and Future**

Danny Swainson, FJMC staff, presented on the history of beluga monitoring in the ISR, identified upcoming challenges, and provided an overview of the annual consultation cycle of the FJMC ([Appendix XII – b](#)).

Beluga monitoring in the ISR began at East Whitefish in 1950. In the 1960's, DFO provided beluga “fishing” permits to harvesters. By the 1970's, DFO began collecting harvest information. In 1980 the data collection was standardized for all delta whaling camps. In 1987, the beluga monitoring program was transferred from DFO to the FJMC, newly created under the IFA. Shortly after, members from environmental NGOs came to the whaling camps and tried to sabotage the hunt with orca recordings that were played to scare away belugas. Beluga hunting guidelines created in the 1990's by the HTC's and FJMC are attributed as the reason that fewer whales are being struck and lost. To date (2015) there has been an impressive 35 years of standardized measurements of harvested belugas.

Over time there have been modifications and changes made to the program to reflect needs and shifts in beluga harvest. In 2012, beluga monitors were no longer hired at Shingle Point as fewer whales were being harvested at that location. In 2014, at least 38 whales were harvested at Ulukhaktok. In 2015, a Harvester Reward Program was running in all six communities and beluga monitors were stationed at four community harvesting sites. In 2014 and 2015 all six ISR communities participated in the beluga monitoring program for the first time. Future considerations and challenges included the FJMC working towards annual reporting and database management. Funding constraints are also an issue, especially because FJMC is now running a much larger program with no increase in funding. In addition to the growth of participation in the program is the increase in community-driven questions and interests that include impacts from contaminants, increased shipping and tourism, changes in weather, large-scale ecosystem shifts, dietary changes, and changes in distribution. Addressing these expanding priorities requires additional resources. The FJMC was interested to hear from communities and participants at the Beluga Summit about their priorities for the future.

### ***Discussion:***

There was a question about potentially incorporating drones into the beluga monitoring program, which was recognized as a good idea for the future. The timeline for finalizing draft beluga tourism guidelines was asked about, and FJMC responded that they are hoping to release them next year. There was a desire for more communication between scientists and beluga monitors, with scientists showing the monitors how to identify abnormalities, parasites, etc. It was recognized that scientists do not necessarily know what they are looking at in the field, and often need to take samples back to the laboratory for analysis, but that there could be general descriptions shared either in person or in reference material.

## **Future Directions for Beluga Monitoring and Management in the ISR**

A panel was convened to discuss directions for future monitoring and management of beluga whales in the ISR. Panel participants included Lois Harwood (DFO), Frank Pokiak (IGC), Lawrence Ruben (Paulatuk HTC), Gerald Inglangasuk (FJMC) and Larry Dow (DFO). Key themes discussed were:

- The importance of having regular forums, such as the Beluga Summit, where knowledge can be shared to help direct research, monitoring and management.
- The inclusion of youth is crucial. Youth are the future and decisions should not be made without them.
- Funding is always a challenge, and there is a desire for guaranteed funding so that it is not a struggle to support programs every year. There were also suggestions to use non-governmental organizations as potential funding sources.
- The development of community-based monitoring is good to see as it represents increased community capacity. Expansion of these programs should be supported.
- It is important to consider appropriate sample size when conducting research to make sure the study can answer the question being asked. It is also important to have a plan to share the knowledge generated, for example through publications or online.
- Specific topics of interest included: contaminants, shipping, changes in weather, killer whale occurrence, and beluga movement. Continued research and monitoring of these issues is supported.

### ***Discussion:***

A participant highlighted the importance of translation being present for all communications to make sure Elders are meaningfully included in discussions. Ideas to increase involvement of students and youth was discussed, including getting people out on the land, getting people's children out with them, and directing funding to support youth participation on the land and at meetings. It was also noted that youth participation in science programs was very positive. The potential for collaboration with Alaska was recognized, as they have similar concerns in their area.

## **LUNCHTIME DRUM DANCE PERFORMANCE**

The Inuvik Drummers and Dancers put on a cultural presentation of various dances and explained the meaning behind each dance move. Participants were invited on stage and were led through a dance choreographed by the dancers.

## **DFOs Oceans Program**

Connie Blakeston of DFOs Oceans Program gave a presentation that covered multiple conservation management initiatives including the Tarium Niryutait MPA (TNMPA), the Anguniaqvia niqigyam Area of Interest (ANAOI), the Western Arctic Marine Protected Area (WAMPA) Steering Committee, Marine Protected Area Network (MPAN) planning, and the Beaufort Sea Integrated Oceans Management Plan (IOMP) ([Appendix XII – c](#)).

The TNMPA was formally designated as protected in 2010. It was based off the beluga management zones in the Beaufort Sea Beluga Management Plan. Benefits of this federal protection include a

regulatory regime and enforcement under the *Oceans Act*. The TNMPA protects harvesting and the sustainability of the EBS beluga population. Following designation, management and monitoring plans were developed in 2013. The monitoring plan is based on the use of indicators to determine if the TNMPA goals were being achieved. Indicators fall into ecological, social, economic, cultural, and governance categories. There will be a “State of the TNMPA” report to assess management and monitoring which will support, if needed, adaptation of the management and monitoring plans to continue to support the conservation objectives of the MPA.

The ANAOI was selected to be the second Marine Protected Area (MPA) in the Canadian Arctic. It is the first MPA with a conservation objective based on both TK and western science. The science objective focuses on the northern part of the AOI around the polynya, and the TK focuses on the southern part to protect char, belugas and seals. The regulatory package is going for Ministerial approval and will then be published in Canadian Gazette I (CG1). The hope is that the area will be officially designated in fall 2016. Development of a management and monitoring plan is in the works, and research has been funded to provide baseline information. This includes the beluga monitoring program, blue char research, as well as research into coastal fish communities.

The WAMPA Steering Committee was formed in 2014 and includes representation from FJMC, DFO, and the communities. It was formed to support co-management of MPAs in the ISR with a goal of having all partners participate in decision-making. The role of WAMPA includes:

- Developing management & monitoring plans for the MPAs.
- Taking a broad view when managing MPAs (i.e., regional and ecosystem-based approach).
- Ensuring that ISR communities are involved in MPA management and monitoring and building capacity in the communities.
- Combining efforts to use time, money, and people optimally.
- Developing a strategy to evaluate the MPAs and to assess if they are accomplishing set goals.

A Western Arctic MPA Network (MPAN) is another marine conservation initiative. An MPAN is a collection of individual sites (including but not restricted to MPAs) that work together at different scales to accomplish conservation goals more effectively. An MPAN Working Group has been formed in the Western Arctic (including the ISR and Kitikmeot region of Nunavut), and a community tour will occur next month to allow communities to provide input.

**Integrated Oceans Management:** Integrated Oceans Management is the basis for the DFO Oceans Program. The Beaufort Sea Integrated Oceans Management Plan (IOMP) was endorsed in 2009 and helps to guide and coordinate activities that affect the region. Several groups have been formed from this initiative. The Beaufort Sea Partnership (BSP) is a broad multi-stakeholder group with approximately 53 agencies represented, including federal and territorial levels of government, academia, communities, and industry. The BSP convenes to coordinate and provide guidance on activities relevant to the IOMP. Working groups formed from the BSP include a Traditional and Local Knowledge Working Group (which initiated the creation of the Traditional and Local Knowledge Catalogue), and the Governance Working Group (which initiated the creation of the Beaufort Sea Online Platform for mapping). The BSP is unique collaboration and there are very few examples of this in other areas of the country. This willingness to



work together is one of the reasons why the ISR has had so much success, and the future looks bright with the federal government's increasing interest in the Arctic.

## **OVERVIEW OF CONCURRENT SESSIONS**

### **Husky Lakes Beluga Entrapment Action Plan**

The FJMC coordinated a special closed session focused on reviewing the 2008 draft Husky Lakes Beluga Entrapment Action Plan with Inuvialuit delegates attending the Beluga Summit ([Appendix XII – d](#)). The FJMC Chair introduced the session and provided background information on beluga entrapments in Husky Lakes, the action plan that was developed after two consecutive entrapments in 2006-2007, and the current need to determine if Inuvialuit views had changed regarding how future entrapments should be managed. Three break-out groups were formed and tasked with discussing a series of questions related to beluga entrapments in Husky Lakes, followed by verbal summaries from each group.

Beluga entrapments in Husky Lakes are a natural occurrence that Inuvialuit have observed for generations. Whales enter Husky Lakes via Liverpool Bay, and can reach the southern portions of the system through Gudchiaq Channel. Beluga can become entrapped if they are unable to exit Husky Lakes before freeze-up. Beluga entrapments in Husky Lakes have been documented in 1966, 1969, 1974, 1989, 1996, 2006, and 2007. Following the consecutive entrapments of 2006-2007, representatives from DFO, FJMC, and the Inuvik and Tuktoyaktuk HTCs participated in a series of meetings focused on the entrapments, including the Husky Lakes Beluga Whale Entrapment Workshop, in Tuktoyaktuk, June 16-18, 2008, to determine what mitigation and response measures should be considered in the future. The workshop resulted in the development of a 3-year Husky Lakes Beluga Whale Intervention Program, which included the deployment of pingers (a device that transmits short high-pitched signals at brief intervals) in Gudchiaq Channel to deter whales from entering the southern part of the lakes system, as well as a draft action plan outlining how future entrapments in Husky Lakes should be managed.

At the Beluga Summit, the 3 break-out groups, each with representation from all six ISR communities, discussed the following questions related to the management of beluga entrapments in Husky Lakes:

- What has changed since 2008 that requires the plan to be reviewed, and how often should the plan be reviewed?
- Should deterrent devices (e.g., pingers) continue to be used to keep whales out of Husky Lakes?
- What number of entrapped whales should trigger a response from DFO, FJMC and the HTC?
- Should Inuvialuit hunt whales that become entrapped in Husky Lakes?
- What recommendations do you have regarding entrapments in the ISR?

The summary reports provided by each group highlighted the broad range of topics discussed related to entrapment events, as well as the lack of clear consensus regarding how future entrapments should be managed. The following feedback was shared:



- Many things are changing now (e.g., weather patterns; future improvements to the accessibility of Husky Lakes via the Inuvik to Tuktoyaktuk Highway); the plan should be reviewed every 3 years.
- There should be a continued focus on preventing whales from becoming entrapped using mitigation measures such as:
  - The continued use of pingers at Gudchiaq Channel, and consideration of another pinger array between basins 3 and 2 of Husky Lakes. The pingers should be checked throughout the season and should be anchored to shore to ensure they stay in place. Beluga whales were able to travel south of Gudchiaq Channel in 2015, perhaps because the pingers had shifted after they were deployed.
  - Having Inuvialuit monitors stationed at Gudchiaq Channel (this was a component of the 2008-2010 Husky Lakes Beluga Whale Intervention Program), so that they can herd whales out of Husky Lakes early in the season before freeze-up.
  - Herding belugas out of Husky Lakes before freeze-up:
    - Some harvesters from Tuktoyaktuk thought that herding whales out of the Husky Lakes would be quite difficult; in the past when they had tried driving them out, the whales turned around each time they moved toward shallow areas.
    - If there is a herding exercise, care should be taken not to push the whales too hard or fast, as it would be stressful for the beluga whales; experienced hunters from Paulatuk should be invited to assist with hunting beluga in clear, deep water.
    - Herding should not occur after August. This is to ensure that if herding efforts fail, harvests could occur in September before ice forms on the lakes. This would be safer for the harvest team, and the beluga would still be in good body condition.
- If a beluga entrapment event does occur:
  - Action should be triggered when more than 35 whales are entrapped. The current action plan developed in 2008 required over 100 beluga to trigger a response. It was recommended that a community meeting be held in Tuktoyaktuk to finalize this number.
  - Regardless of the number of entrapped whales, the GPS coordinates of the area should be recorded and advertised to all harvesters so that areas with thin ice can be marked and avoided for safety.
  - If a harvest occurs, a distribution plan for the muktuk should be developed in collaboration with the Gwich'in. HTC's can also consider using a portion of their Community Harvesters Assistance Program funding to support the costs of a beluga harvest effort in Husky Lakes.

## Plan for Communication and Dissemination of Research

Concurrent to the session on Husky Lakes entrapments, scientists met to discuss ways to effectively report back information shared during the Beluga Summit. Ideas included:

- A Special Issue in an academic journal to publish many of the recent scientific findings presented at the Beluga Summit. The issue of timelines was raised and when people would be ready to publish. It was noted that online or Open Access journals do not hold up publications for Special Issues, and papers are published online as soon as accepted. It was noted that a Special Issue might allow for topics that are usually difficult to capture in publications (e.g., capacity building, role of youth, field program development). Topics for a Special Issue were discussed and included a review article about the Beluga Summit.
- An FJMC Technical Report could be written about the Beluga Summit. It could be organized in sections from concept to implementation and include proceedings and key recommendations. It could include detailed outcomes and be available for future planning.
- A report similar to the Beaufort Sea 2000 conference report could be published and sent to the communities quickly. That conference also had a Special Issue in the journal *Arctic*.
- The ICS could create a short video about the summit based on all the footage taken.
- A Beluga Bulletin could summarize the meeting and be sent to communities relatively quickly.
- An article or full issue of *Tusaayaksat* Magazine could include lots of photographs and reach many Inuvialuit. It could be similar to the one produced for the Inuit Circumpolar Conference (ICC) 2014.
- A book of the Beluga Summit could be produced, or potentially about EBS beluga and beluga management in the ISR.

Other ways to share information with community members who did not participate in the summit was discussed. Ideas included use of social media (Facebook) and having youth participants create presentations for their schools and communities. The importance of having both scientific outputs and products accessible in communities was recognized, as was the importance of getting things out on a reasonable timeline to maintain momentum.

## DAY 3 CLOSING REMARKS AND WRAP-UP TO THE FIRST BELUGA SUMMIT

Closing remarks were shared by participants at the summit in an open mic session. Many people spoke of appreciating the event, noting how much they had learned. Many also mentioned the importance of bringing science and all ISR communities together. “Western science and TK working together is a good thing”. [Quote, James Pokiak, Chair of the Traditional and Local Knowledge Working Group]. Community members shared their appreciation of learning from other communities on different hunting methods and the preparation on muktuk. Outcomes from this event will help guide future work on monitoring, research, and management of EBS beluga whales. Participants reflected on the importance of including youth and the knowledge of Elders, and that increased involvement of youth and Elders should be a focus of future summits or knowledge sharing events.

## **Closing Remarks from Regional Director of Science, Central & Arctic Region, Fisheries and Oceans Canada: Michelle Wheatley**

Thank you everyone for the great engagement we have had over the last three days. It has been a wonderful experience. I am going to speak to the science and what we have heard over the last three days.

When we speak about science and beluga whales, the first thing we think about is: How many are there, and where are the whales? This is the very basics of science - to know what is where. The presentation Lois did was great at summarizing the data we have on this population, as well as the long history and great amount of data we have on this beluga population. What has become clear over these days as we heard from the communities and had the breakout groups yesterday is how many other questions we have about beluga. Not just where they are and how many, but why are they there? What is their health like? What are community concerns regarding harvesting and using the beluga? It became clear that to understand the beluga there are so many more questions to be answered.

Over the past three days regarding science, we have heard from a number of areas. Firstly, we have heard from the Beluga Monitors. The Beluga Monitors are so critical in all the ISR communities and whale camps. The data they collect feeds into so much of the other work that is done, so they are critical to all this other work. During the three days we also heard about beluga habitat. What became clear when we went through all these topics was all the different groups that are involved. It is not just DFO, we can't do it alone. We rely on the communities, the academics, students, universities, and other government departments that collect data that feeds into the collective discussions. For beluga habitat we had presentations and posters from DFO as well as University of Manitoba, and communities, all speaking on beluga habitat and relations to beluga health, and links to offshore. In terms of beluga health, we also heard presentations from DFO, University of Manitoba, University of British Columbia, Canadian Wildlife Health Cooperative talking about diet, climate change, aging, genetics, and disease; all things that affect how the beluga population is doing. We had posts and discussions on contaminants from the University of Manitoba, Vancouver Aquarium, Health Canada, talking about trends over time, and concerns about radiation. We had presentations regarding human health concerns relating to beluga by the University of Ottawa, the University of Saskatchewan, University of Toronto discussing nutrients, contaminants, food parasites, preparation of food, and about how this can all affect human health. There were also discussions on co-production of knowledge by the University of Manitoba, University of Guelph, and issues in our perceptions, monitoring, and how we use TK.

I think what was clear throughout all the input and discussions was that we cannot work in isolation. None of us can do our science in isolation – we depend on each other to get all the information we need. This highlights the importance of a gathering such as this to bring all of this information together. The academics, universities, and communities - building on each other's' knowledge and expertise. Also to identify the gaps and knowledge needed to go forward. Western science, whether it is DFO or government departments or universities, we need the cooperation and collaboration of the communities and hunters to do our work. This week was an amazing opportunity. We thank everyone for their participation, and I am glad I could be a part of this. It has been a wonderful opportunity. It was great to be back in the ISR after many years being away. I thank everyone for their engagement.

## **Closing Remarks Chair of the Fisheries Joint Management Committee: Vic Gillman**

It is hard to draw together your thoughts when running sessions. But first, I would like to thank you all for your energy that you brought to this exercise. I would like to commend the HTCs for their selection of representatives. I think the commentary and input has been exceptional. I think we are taking away some strong recommendations and guidance. I think we have a strong team here from the FJMC that are taking away some great recommendations for work in the ISR. Thank you for them.

It is not enough to say that – it's what we do with it. Here are a couple action items I will take back to the Committee to represent what I've heard here.

This Summit should be repeated. Action for FJMC – amend Beluga Management Plan to add a component of research priorities and directions and to ensure that this has a 5 year horizon to ensure we repeat this in some way.

These exercises are expensive. Think about how we can fund this to become an ongoing activity. Because the 2016 implementation funding will be coming in this year, I will put this in as part of our FJMC plan. I am hopeful that it will get the respect that it deserves. It certainly is attached to item #3 in the IFA. If we were successful in maintaining this summit, we can take the suggestions for format and action in involvement and incorporate that in the future.

I am particularly pleased with the focus on youth involvement. I thank the youth that participated. It has been very refreshing and energizing. Thank you. I will also take away that there are opportunities for youth involvement beyond this summit. I will take this to the Committee to try to reach an understanding as to what we can do in that area.

I have received what I think is good guidance on TK issues. One of the aspects that I will take to the Committee is the Norton Sound Salmon document. We will have a conversation within the Committee as to how we could have a similar guidance system for beluga in the ISR. I know there is lots of info out there and it would be good to have it all in one place.

I received many positive comments about the books. I think we will take this on as an initiative, to try to translate these and to make more copies available for all.

I think that pretty much concludes my summary. I am really pleased with the outcomes. I wish you all a safe trip home.

## **Closing Remarks from Chair of the Inuvialuit Game Council: Patrick Gruben**

Thanks Vic and Michelle. First of all I'd like to thank everyone here for coming to participate in the first Beluga Summit organized in the ISR. My observations over the last three days on the cultural side of things are each community has different ways of harvesting whales. Some communities need help in setting up by-laws. As the Game Council, we are available to assist you. The other thing is the differences in the way we prepare muktuk in each community. Vic and I were chatting that maybe we can put up a video of the steps of how to prepare muktuk so it can be safe to consume.

We all support the monitoring of beluga whales. In an earlier statement we were recognized as leaders in having data on beluga. As we saw this morning, we have over 40 years – going back to 1961, I think, was the first permit, in 1972 we started collecting information. I am a big supporter of youth participating in any conference. I will let the Game Council know.

I was quite surprised on Lois's information provided this morning on how industry affects where belugas were in the offshore, in the 80's compared to 2000. Showing number of ships. This leads to the question as to what sort of effect shipping could affect beluga in the future with the possibility of the opening of the Northwest Passage. I would also like to thank Frank for discussing his personal experiences. Frank with his experiences with botulism. I think everyone took the symptoms he explained to heart. A lot of you have spent time at your camps. I think many people have fears regarding botulism. I think many were scared with toxoplasma, but we were reassured during the conference.

And not to forget about Willie – and comparing our issues to Alaska. They have the same concerns as us. They want to know where beluga are traveling and we also want to know that. It is quite interesting about contaminants especially mercury – my big take away is that I won't take too much beluga meat anymore. I thank the Steering Committee, and DFO staff for hard work for organizing this summit – both before and during. They were staying right until 7 or 8 at night and I thank you guys. I hope we learned a lot from each other, and I hope the scientists are going to put a summary of what they'd like to see over the next 5 – 10 years and bring it to us so we can discuss at the respective levels – Co-Management Committees or Boards.

In closing I wish to thank everyone a safe trip home wherever you came from. All the community members, scientists, and other invited groups for attending. Thank you.

## **SUMMARY AND FUTURE CONSIDERATIONS**

The objectives of the Beluga Summit were to: (1) share knowledge about beluga whales, (2) summarize the current state of knowledge about Eastern Beaufort Sea beluga, and (3) develop directions for research and management of beluga for the next 5 – 10 years. Overall, the Steering Committee felt that these objectives were met, and feedback from participants has consistently been that the summit was a truly unique learning experience. The value of the summit can be also measured by the many outcomes since the event was held, including the development of community-level projects (e.g., Worden et al. 2020), scientific publications (see Loseto et al. 2018 for an introduction to the Special Issue on the Beluga Summit), updated management plans (i.e., Husky Lakes Action Plan, Ulukhaktok beluga hunting community by-laws), investments in major programs (e.g., aerial survey and telemetry), and work toward various research priorities such as human health biomonitoring (see Preface for further details). This success can be attributed to the careful planning over a nearly two year time frame to ensure relevance to communities and resource managers and high levels of participation from different knowledge holders. The summit brought a large and diverse group of people together in a forum that encouraged knowledge sharing across and within the different disciplines of western science and Indigenous knowledge, and strengthened connections and collaborations amongst participants.

## **RECURRING THEMES FOR FUTURE RESEARCH PRIORITIES**

### **Beluga Health and Contaminants**

The connection between beluga and human health was raised many times during the summit by community members. Belugas are important to Inuvialuit, both culturally and as a subsistence food source. People are concerned about the potential for disease transfer (e.g., toxoplasmosis), and contaminant transfer (e.g., mercury), and this concern affects how people are eating beluga. This makes continued research of whale health and condition a top priority. There was interest in more research into how different methods of food preparation affects the level of contaminants and nutrients in beluga food products. There was also a call to have more research conducted on human health, such as conducting another Inuit Health Survey (IHS) in the ISR, with potentially refined methods such as looking at when certain foods are eaten and not just average food consumption. Effective communication on these research findings is important, such as ensuring plain language summaries are accessible in the communities.

### **Habitat Use and Population Abundance**

The EBS beluga population was recognized as healthy (stable or increasing) using information from both TK and science. However, the last aerial survey for a population abundance estimate was conducted in 1992, and the current abundance estimate is outdated. Community members have recently reported many changes in the ecosystem and in beluga distribution and movement. To inform a population abundance estimate and to gain a better understanding of beluga distribution and movement patterns, tools other than aerial surveys were discussed, including use of TK observations, harvest samples, satellite tagging, passive acoustic monitoring and drones. There was interest in developing indicators other than population abundance estimates to inform on populations status. There was also interest to update the genetic work on the EBS stock given observed changes in distribution.

### **Communication**

Communication was recognized as integral to generating and mobilizing knowledge from research, and to ensure that resource users and managers benefit from research findings. The summit provided a space to enable cross-community sharing on topics such as hunting techniques, food preparation, beluga monitoring and observations of environmental change. In the past, youth exchanges have served as one means to enhance cross-community learning, and there was interest in reviving this practice. Communication from HTC's to the community and scientists is important, and it is essential that messaging is appropriate and coordinated, particularly on topics relevant to human health. Communication from the community to scientists is also important to guide future research priorities. The role of beluga monitors in facilitating communication between groups (harvesters, community members, HTCs, scientists) was recognized. Enhanced communication with Alaskan partners was also encouraged.

## **Youth Engagement**

Youth engagement was a priority for both researchers and Inuvialuit. Many participants spoke about the need to engage youth. Frank Pokiak spoke about how HTC's and others need to train youth in resource management, and Annie Goose spoke about the evolution of beluga management since the IFA and the need to keep this going as a living process. Bob Simpson spoke to the need for researchers to present in schools and foster growth in youth. It was recommended that the next Beluga Summit enhance youth engagement.

## **LESSONS LEARNED AND NEXT STEPS**

Valuable lessons were learned throughout the planning, implementation, and follow-up to the summit that will benefit future events. Key feedback included the need to create even more space and time for discussion. For example, the initial community pre-day was designed to support delegates in preparing presentations and to familiarize them with the agenda, but it evolved into a major opportunity for cross-community knowledge exchange in a smaller, informal, more focused setting. The poster session would have also benefited from more time (potentially a whole afternoon) for researchers to discuss their work with participants in a less formal setting. While the Beluga Summit provided space for knowledge exchange and communication between different knowledge holders, the documentation of knowledge co-production in-the-moment was extremely challenging. The objective of developing directions for research and management of beluga for the next 5 – 10 years was achievable with respect to setting recommendations, but challenging at a focused implementation scale. In the future, it would be beneficial to consider a follow-up activity or working group or to bring together recommendations arising from a summit to develop specific guidance for a 5-year research and monitoring plan.

In summary, the approach of the Beluga Summit was successful in building positive relationships between participants spanning community members, the research community and decision-makers, and was successful in providing direction for future research and monitoring in the ISR. The FJMC recognized this value by recommending that the Beluga Summit be repeated on a 5-year cycle to continue to share and update the state of knowledge and revisit research priorities and management needs. Future meetings with Inuvialuit and co-management partners for beluga and other key northern issues would benefit from using a similarly collaborative approach as much as possible.

## **AUTHOR CONTRIBUTIONS**

*Funding Acquisition:* LL, JL, SO; *Supervision:* LL, SM; *Project Administration:* SO, SM, LL; *Report Conceptualization:* SO, SM, LL; *Data Curation:* CH, SM, LM, KM; *Writing – Original Draft:* LM, SM, LL, KH, KM; *Visualisation:* LM; *Writing – Review and Editing:* All authors.

## ACKNOWLEDGEMENTS

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- The FJMC, IGC, and Inuvialuit HTC's for supporting the concept of the Beluga Summit, for providing guidance in the planning and implementation stages of the project, and to the Joint Secretariat (JS) for providing financial resources and staff support.
- Members of the Steering Committee and Beluga Summit Co-Chairs for their participation in countless teleconferences, and for providing guidance that set the direction of the Beluga Summit: Vic Gilman (FJMC Chair), Frank Pokiak (outgoing IGC Chair), Patrick Gruben (incoming IGC Chair) and one of us (Loseto, DFO).
- Members of the Health Subcommittee who oversaw program development and reviewed presentations on contaminants and human health issues for clear messaging and accessibility: Shannon O'Hara (IRC), Scott Tomlinson (CIRNAC), Eric Loring (Inuit Tapiriit Kanatami) and Laurie Chan (University of Ottawa).
- Special quyanaq to Willie Goodwin, Chair of the Alaska Beluga whale Committee, for making the trip all the way down south and back up again to Inuvik from Kotzebue Sound, and for demonstrating the importance of transboundary collaborations and cultural exchanges about belugas.
- JS staff who provided fundamental support for administrative items and program development: Danny Swainson, Steven Baryluk and two of us (K. Hynes, J. Lam), and JS support staff who took on the work load of arranging travel, honoraria and per diems for community participants: Shawna Kaglik and Eunice Thrasher.
- The HTC Resource Persons for their correspondence during the program planning stages, and for their work to arrange participation by community delegates: Betty Haogak (Sachs Harbour HTC), Bessie Inuktalik (Olokhaktomiut HTC), Diane Ruben (Paulatuk HTC), Jocelyn Noksana (Tuktoyaktuk HTC), Lisa Rogers (Inuvik HTC), and Michelle Gruben (Aklavik HTC).
- Connie Blakeston, Corinne Bullock and Ellen Lea (DFO Inuvik) for providing boots-on-the-ground administrative and logistical support.
- Simon Farla (simonfarla.com) for his patience and artful graphic design work in the production of the Beluga Summit Program booklet with one of us (S. MacPhee).
- David Stewart (Inuvialuit Communications Society) for filming the event and producing the 3 min and 9 min summary videos, and Natalie Heiberg-Harrison for the Beluga Summit article in the Spring 2016 issue of *Tusaayaksat* Magazine.
- Gerald Inlangasuk (FJMC) for his artwork that appeared on the Beluga Summit Program booklet and Beluga Summit hoodies.
- Lillian Elias (ICRC) for translations that appear in print and on the Beluga Summit hoodies.
- Charles Arnold (Prince of Wales Northern Heritage Center) for curating the historic beluga hunting photos and compiling the "*Beluga Hunting Through Time*" photo compilation book, and Corinne Bullock (DFO) for her work to have the books printed and translated.



- Kevin Floyd for the traditional qayak demonstration during the Cultural Evening.
- Cathy Cockney (ICRC) for providing the muktuk display.
- Shannon O'Hara (IRC) for arranging country foods for the traditional feast during the Cultural Evening.
- The Inuvik Drummers and Dancers for their performance and dance lesson.
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- Rod Harrington (Twisted Ladle) for catering and hospitality services.
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- Devin Waugh (University of Guelph) and Carie Hoover (University of Manitoba) for taking notes throughout the entire duration of the meeting. Together with audio recordings and Inuvialuit Communications Society (ICS) video footage, their notes formed the basis of this report.
- Claire Hornby (DFO) and Richard Gruben (IGC and Tuktoyaktuk HTC) for their helpful reviews.

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## APPENDIX I: STEERING COMMITTEE & KEY SUPPORT STAFF

Name	Affiliation	Role
Lisa Loseto	Fisheries, Oceans and the Canadian Coast Guard	Steering Committee Co-Chair
Vic Gillman	Fisheries Joint Management Committee	Steering Committee Co-Chair
Patrick Gruben	Inuvialuit Game Council	Steering Committee Co-Chair
Jen Lam	Inuvialuit Game Council	Program Development, Administrative Support
Shannon O'Hara	Inuvialuit Regional Corporation	Health Subcommittee
Frank Pokiak	Inuvialuit Game Council (Outgoing Chair)	Steering Committee Co-Chair (outgoing)
Scott Tomlinson	Northern Contaminants Program, Aboriginal Affairs and Northern Development Canada	Health Subcommittee
Eric Loring	Inuit Tapiriit Kanatami	Health Subcommittee
Laurie Chan	University of Ottawa	Health Subcommittee
Sonja Ostertag	Fisheries, Oceans and the Canadian Coast Guard	Program and Agenda Development, Scientist Engagement
Kate Matari (née Snow)	Fisheries, Oceans and the Canadian Coast Guard	Community Engagement, Logistics
Connie Blakeston	Fisheries, Oceans and the Canadian Coast Guard	Administrative Support
Gerald Inglangasuk	Fisheries Joint Management Committee	Program Development
Kristin Hynes	Fisheries Joint Management Committee	Program Development, Administrative Support
Danny Swainson	Fisheries Joint Management Committee	Program Development, Administrative Support
Steve Baryluk	Inuvialuit Game Council	Planning, Administrative Support
Shawna Kaglik	Joint Secretariat	Administrative Support
Eunice Thrasher	Joint Secretariat	Administrative Support
Shannon MacPhee	Fisheries, Oceans and the Canadian Coast Guard	Program, Audio/Visual, Logistic Support
Corinne Bullock	Fisheries, Oceans and the Canadian Coast Guard	Historic Photos, Logistics
Ellen Lea	Fisheries, Oceans and the Canadian Coast Guard	General support
Michael Niziol	Fisheries, Oceans and the Canadian Coast Guard	Communications, Media

## APPENDIX II: LETTERS TO HUNTERS AND TRAPPERS COMMITTEES

(September 2015 & January 2016)

### September 28 2015

To: Aklavik, Inuvik, Paulatuk, Sachs Harbour, Tuktoyaktuk, and Ulukhaktok Hunters and Trappers Committees

As many are aware the FJMC, IGC and DFO are preparing to hold a Beluga Communication Summit in Inuvik for the week of Feb 22-26 2016 (3 to 4 day event). The Beluga communication Summit is in response to requests made by both boards and community members to learn more about the beluga research taking place in the ISR as well as to share their knowledge. As such the Summit will be dedicated to bringing together researchers, community research assistants, harvesters, Elders, Youth and resource managers for the sharing of knowledge about beluga whales. Through a multi-day gathering participants will have the opportunity to present their knowledge about belugas, contribute to the interpretation of findings, and identify common concerns and knowledge gaps in beluga research and monitoring which will help direct future research in the Inuvialuit Settlement Region (ISR).

We want to ensure we are addressing the community and co-management needs and interests as we develop the meeting, as such, we are asking the HTC's to provide and comment on the following: Goals for the Summit, key themes for discussion and finally the identification of participants.

**Goals/Objectives:** Currently the proposed Goals and Objectives are presented below.

- Share knowledge on beluga whales (western science and traditional ecological knowledge);
- Summarize our current state of knowledge;
- Develop a plan for research and management of beluga whales for the next 5 to 10 years (e.g. update the beluga management plan); and,
- Support the preparation of a publication that will assist management of beluga in the ISR

Please add additional or more specific goals the HTC may have. Examples of specific goals/objectives can include local questions/concerns, for example Husky Lake beluga entrapment management, monitoring programs, hunter knowledge sharing on harvest techniques or food preparation, involvement of Youth in monitoring, etc.

**Selection of Participants:** We are requesting each HTC select 3 representatives to participate in the Summit, we will support all costs (travel, honorariums and per diems). Please select and

identify representatives for each group: one Youth (age 18-30), one beluga harvester and one Elder who have been involved with beluga harvesting and/or monitoring. We ask the HTC consider selecting individuals who have participated in beluga related projects or were involved in the beluga monitoring. It is also important to note that we will be expecting the representatives to be involved with Summit in advance of the meeting. They will be required to present/share both their perspectives and/or knowledge as well as their respective HTC concerns. As such they will need to work with the HTCs to ensure they can represent community concerns. Following the Summit they will also need to report back to the HTC and community.

**Evening Events and Representation:** In addition to the day workshops, we will be host two evenings events open to all beluga hunters who are able to participate. The first evening will focus on community-community knowledge sharing between hunters. It will allow for sharing of knowledge on hunting practices, food prep or other topics of interest for sharing. The second evening will again be open to all hunters and will focus on community-scientist sharing, with the intent to allow for more one on one interactions between knowledge holders.

**Topic Themes:** Recognizing there is a wealth of knowledge that has been acquired on beluga whales both by western science and TK, and that we have a limited time, we ask the HTCs to help in the selection of key topics of interest. Please find attached a scoring sheet of topics. Note we hope to cover and highlight all topics, however some topics may need to be summarized in a pamphlet while others will be covered in more detail at the meeting (e.g. presentations).

Please rank the topics in the attached sheet from 1 being of most interest and 4 being of least interest under each of the sub headings. You can also have many 1's if the topics are all of interest.

Please return the names of representatives, goals and ranked themes by October 23<sup>rd</sup>.

Best regards,

The Beluga Summit Steering Committee:

Lisa Loseto, (w) 204-983-5135, Sonja Ostertag, (w) Kate Snow, (w) 867-777-7504, Shannon O'Hara (w) 867 777 7026, Connie Blakeston (w) 867-777-7515, Kristin Hynes/Danny Swainson (w) 867-777-2828, Jen Lam/Steve Baryluk (w) 867 -777-2828.

Beluga Communication Summit Themes and key subtopics – February 2016

1) Beluga and Ecosystem health

Please prioritize the following topics from 1-5 (most to least important)

#\_\_\_\_\_ Characterizing baseline conditions of beluga health (Western science and TEK)

- Includes contaminants, disease, diet and food web linkages

#\_\_\_\_\_ Distribution/link to habitat (Western science and TEK)

- Includes movement/behaviour (tagging/surveys); vocalization and habitat use; climate change/sea ice change; habitat disturbance

#\_\_\_\_\_ Foodweb linkages (Western Science and TEK)

- Includes diet studies (biomarkers, local observations and stomach contents)

#\_\_\_\_\_ Genetics

- Relates to family groups and spatial variation

#\_\_\_\_\_ Defining physiology (western science)

- Includes diving parameters, lung capacity, ear bone

2) Beluga Monitoring and Management

Please prioritize the following topics from 1-4 (most to least important)

#\_\_\_\_\_ FJMC long term beluga monitoring

#\_\_\_\_\_ TNMPA/ANAOI – management and monitoring

#\_\_\_\_\_ Husky lakes – management plan

#\_\_\_\_\_ Shared stock with other countries (Alaska/Russia) and perhaps Nunavut

3) Human Health/Food safety

Please prioritize the following topics from 1-4 (most to least important)

#\_\_\_\_\_ Concerns of Health: diseases and contaminants, and food handling/safety

#\_\_\_\_\_ Benefits of Traditional food: nutritional food, and cultural wellness

#\_\_\_\_\_ Cultural practices: hunting (safety, bi-laws), and food prep

#\_\_\_\_\_ Climate change impacts on traditional practices

Please add any other topics that you'd like included:

How would you like to share information? Please prioritize from 1-4 (most to least desirable)

a. #\_\_\_\_\_ Presentations

b. #\_\_\_\_\_ Posters

c. #\_\_\_\_\_ Panel discussions

d. #\_\_\_\_\_ Break-out sessions

**Jan 29, 2016**

To: Aklavik, Inuvik, Paulatuk, Sachs Harbour, Tuktoyaktuk, and Ulukhaktok Hunters and Trappers Committees

Thank you all for the selection of delegates for the Beluga Communication Summit in Inuvik the week of February 22<sup>nd</sup> and for ranking the themes to help shape the draft agenda (attached). In preparation for the upcoming meeting we wanted to provide some updates.

**Dates and Times:** The official opening to the meeting will be on Tuesday Feb 23<sup>rd</sup>; however, we will be working with delegates in preparation for the meeting on Feb 22<sup>nd</sup>. Registration is required for the day events and will be open Monday afternoon and Tuesday morning. The meeting will close at the end of day Thursday Feb 25<sup>th</sup>.

There will be two evening events that are open to Inuvialuit beneficiaries. We have provided information about these evening events that we hope you can post on your HTC Facebook website or share as you feel appropriate.

**Logistics:** Our team and the JS office will be leading on logistics, flight books and hotel arrangements. All delegates will be receiving a per diem for meals and honouraria of \$200/day for their participation in the event (this includes travel days). Lastly we will be updating and following up with the HTCs details on charters, hotels and logistics. If you have any further questions please do not hesitate to ask.

**Participants:** Please let us know if there have been any changes to delegates and participation. In advance of the meeting, members of the team will be contacting delegates to ensure all are prepared and feel comfortable to share and participate at the meeting. Kate Snow is working with delegates and the HTC RPs to prepare content about the delegates for the event programme. Delegates are also being asked to answer a few questions about how they would like to participate in the Beluga Summit.

Beluga Summit participants will also include scientists, representatives of IGC and FJMC boards and additional Beluga Monitors invited by the FJMC. We are working closely with scientists to ensure they are prepared for the meeting.

All the best,

Lisa Loseto, DFO

Patrick Gruben, IGC Chair

Vic Gillman, FJMC Chair



## APPENDIX III: LETTER TO INUVIALUIT COMMUNITY CORPORATIONS

Jan 29, 2016

Dear Inuvialuit Community Corporations,

We would like to bring to your attention the upcoming Beluga Summit taking place at the Midnight Sun Recreation Complex from February 22-25, 2015.

As you may know Fisheries and Oceans Canada is collaborating with the Fisheries Joint Management Committee (FJMC) and the Inuvialuit Game Council (IGC) to host a Beluga Summit in Inuvik. This event is dedicated to bringing together researchers, community research assistants, harvesters, Elders, Youth and resource managers for the sharing of knowledge about beluga whales. The attendees of the Summit are by invite only; and community delegates were selected by the local Hunters and Trappers Committees.

The proposed Goals and Objectives for the Beluga Summit are to:

- Share knowledge on beluga whales (western science and traditional ecological knowledge);
- Summarize our current state of knowledge;
- Develop a plan for research and management of beluga whales for the next 5 to 10 years (e.g. update the beluga management plan); and,
- Support the preparation of a publication that will assist management of beluga in the ISR.

Your HTC's have selected three delegates to participate at the meeting (Elder, Youth, hunter). If you would like to also participate in the 3 day meeting please RSVP and registrar, note we do not have funds for additional delegates. It is important to note that evening events are open, please see information below and share as you see best fit.

There will be two evening events open to Inuvialuit Beneficiaries to participate in the Beluga Summit.

Inuvialuit Culture and Knowledge about Beluga Whales  
Feast and Cultural Night for all Inuvialuit Beneficiaries  
Tuesday, February 23, 2016, 5:30 – 7:30 PM  
Midnight Sun Recreation Complex, Inuvik, NT Sharing  
Knowledge about Beluga Whales Feast and Presentations  
open to the public  
Wednesday, February 24, 2016, 5:30 – 7:30 PM  
Midnight Sun Recreation Complex, Inuvik, NT

## APPENDIX IV: PREPARATORY MEETINGS WITH COMMUNITIES

In addition to letters sent to Hunters and Trappers Committees (HTCs) (Appendix II), both Department of Fisheries and Oceans (DFO) and Fisheries Joint Management Committee (FJMC) staff met with community members (and representatives of the communities' HTC if available) to identify topics they wanted discussed, as well as the format the Summit should have. They were also asked what they would like to share about at the event and in what way.

- **Inuvik:** community members wanted the Summit to cover beluga distribution, how to improve the Beluga Monitoring program, and how to ensure scientific information got back to the communities. They were comfortable presenting a PowerPoint sharing photos of preparing muktuk/mipku, as well as sharing on other whaling Traditional Knowledge (TK). They also wanted to talk about hunting, muktuk preparation and storage with other communities.
- **Paulatuk:** community members had interest in discussing climate change and how it had impacted the physical habitat and their hunting strategies over time at the Summit. They wanted an informal structure with some smaller groups, and to ensure that science wasn't guiding all conversations. They wanted to share photos and informally discuss them.
- **Aklavik:** community members were fine with any format at the Summit as long as it encouraged learning from each other. They were fine with speaking if there was an opportunity.
- **Tuktoyaktuk:** community members had interest in discussing how the Beluga Monitoring program could be improved, and how to better deal with beluga entering Husky Lakes at the Summit. Members were comfortable presenting a Powerpoint, and to speak about TK such as whale harvesting, preparation, and cooking, as well as sharing their tools.
- **Ulukhaktok:** community members were interested in learning from other communities about how to prepare, harvest, and hunt whales at the Summit. They were comfortable sharing photos and talking with a Powerpoint presentation to a smaller group, or potentially having a booth where they could talk to people.
- **Sachs Harbour:** there was less contact with Sachs Harbour community members than other communities before the Summit unfortunately. However community members were contacted and were comfortable presenting on the increase in beluga whale in the Banks Island area as well as on their way of hunting and preparing muktuk.

Every HTC was also asked to fill out the following questions for each Summit participant so that it was clear to the organizers what the participants wanted to contribute and also get out of the Summit. This was a vital step to facilitate knowledge sharing as well as to get the most information from people who hold vast knowledge on specific areas.

**1) Name:**

**2) Where are you from?**

**3) What is your role at the Beluga Summit?**

**4) What do you want to get out of the Summit?**

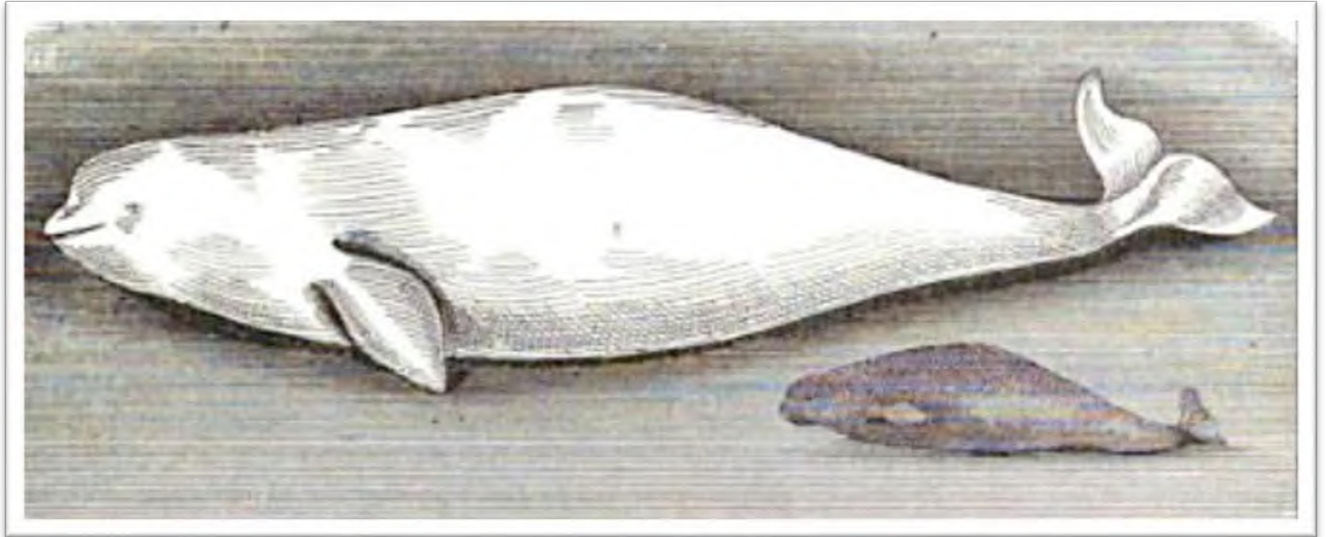
**5) On behalf of your community, what can you contribute to the Summit?**

**6) How is your life affected by hunting/harvesting beluga?**

**7) Why is keeping up the tradition of whaling important to the Inuvialuit?**

## **APPENDIX V: PUBLIC ANNOUNCEMENTS**

Beluga Summit Community Events



**Inuvialuit Culture and Knowledge about Beluga Whales  
Feast and Cultural Night for all Inuvialuit Beneficiaries**

**Tuesday, February 23, 2016**

**5:30 – 7:30 PM**

**Midnight Sun Recreation Complex Inuvik,**

**NT**

**Sharing Knowledge about Beluga Whales  
Feast and Presentations open to the public**

**Wednesday, February 24, 2016**

**5:30 – 7:30 PM**

**Midnight Sun Recreation Complex Inuvik,**

**NT**

## APPENDIX VI: BELUGA SUMMIT PARTICIPANTS

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## **APPENDIX VII: BELUGA MONITORS IN THE ISR**

An incomplete list of Beluga Monitors can be found below (taken from Danny Swainson's presentation 'ISR Beluga Monitoring; Past, Present and Future' (Appendix XI – 3b)). More information on the program as well as a list of Monitors that attended the Summit can be found in the Program Booklet (Appendix VIII).

### **SHINGLE POINT, WEST WHITEFISH & BIRD CAMP**

Foster Allen  
Daryn Archie  
Jacob Archie  
Jerry Arey  
Nellie Arey  
George Edwards  
Peter Elanik

Tom Elanik  
Danny A. Gordon  
Ricky Joe  
Wilson Malegana  
Jonas Meyook  
George Selamio  
Judy Selamio

### **HENDRICKSON ISLAND & TUKTOYAKTUK HARBOUR**

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Jimmy Avik  
Willie Carpenter  
Chris Felix  
Joe Felix Jr.  
Noah Felix  
Ron Felix  
Jon Kikoak

Jimmy Komeak  
Rex Noksana  
Johnny Pan  
Dale Panaktolok  
Frank Pokiak  
Verna Pokiak  
Tommy Thrasher

### **KENDALL ISLAND & EAST WHITEFISH**

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Larry Angasuk  
Steve Cockney Jr  
Kyle Conley  
  
Billy Day  
John Day  
Ernie Dillon  
Alex Elanik  
Wiliam Elias  
Roy Ipana  
Bertha Joe

Gilbert Kasook  
Ned Kayotuk  
Hugh Rogers  
James Rogers  
Kenny Rogers  
Noel Rogers  
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Jon Roland  
Dolly Sydney  
Abel Tingmiak

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John Max Kudlak  
Barb Ruben  
Ray Ruben

David Ruben  
Glen Ruben  
Bill Wolki  
Hank Wolki  
Joe Ruben Sr.  
Joe Ruben Jr.

## **ULUKHAKTOK**

Patrick Akhiatak  
Cora Joss  
Corie Joss



## APPENDIX VIII: PROGRAM BOOKLET





## FOREWORD FROM VIC GILLMAN

CHAIR, FISHERIES JOINT MANAGEMENT COMMITTEE

Welcome to the Beluga Summit! This truly unique event is representative of the success that the beluga whaling communities and beluga hunters in the Inuvialuit Settlement Area have achieved in cooperatively managing this valuable resource.

For over 30 years these studies have successfully blended traditional knowledge and western science and increased our understanding of the numbers, life history and health of beluga whales in the Beaufort Sea. The program has yielded an Inuvialuit Beluga Management Plan, hundreds of scientific papers, worldwide respect, and successfully achieved the intent of the third key principle of the Inuvialuit Final Agreement *“To protect and preserve Arctic wildlife, environment, and biological productivity”*. This success has been found through the commitment, cooperation, and hard work of community leaders and members, fish and marine mammal scientists, managers, and others.

I am confident that this spirit of cooperation, commitment, and communication will continue throughout our Beluga summit and create guidance for the coming years as we strive to improve our knowledge and understanding of beluga in the ISA. On behalf of the Steering Committee, we thank you for your attendance and look forward to this Summit as an opportunity to understand where we have been, what we have accomplished, and what remains to be done in the coming years. I urge you to be a participant in the sessions, make or renew friendships, have fun at the social events, and enjoy to the fullest!







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time	Monday Feb 22	Tuesday Feb 23
		CULTURAL FOCUS
8:00 – 8:30		coffee
8:30 – 9:00		Opening remarks & prayer
9:00 – 9:30		
9:30 – 9:45	Steering committee prep meeting	Overview presentations ❶
9:45 – 10:00		
10:00 – 10:30		
10:30 – 11:00		
11:00 – 11:20	Participant registration	Inuvialuit Youth perspectives
11:20 – 11:40		Introduction of all participants
11:40 – 12:00		
12:00 – 1:30	lunch on your own	lunch on your own
1:30 – 2:00	Meeting preparations with community delegates, scientists & managers	Inupiat knowledge & perspectives
2:00 – 3:00		Community presentations
3:00 – 3:30		coffee
3:30 – 4:30	Participant registration	Community presentations
5:30 – 7:30		Open house: Cultural night

**❶ Presentations**

- » Inuvialuit knowledge & perspectives
- » Management & history of monitoring
- » Science overview
- » Coffee

**❷ Overview**

- » The health of the Eastern Beaufort Sea beluga stock

**❸ Groups**

- » Condition, disease, contaminants
- » Beluga diet & condition
- » Habitat use & genetics
- » Future activities & impacts

RESEARCH FOCUS	MANAGEMENT FOCUS	time
Wednesday Feb 24	Thursday Feb 25	
		8:00 – 8:30
coffee	coffee	8:30 – 9:00
Opening remarks	Opening remarks	9:00 – 9:30
Contaminants & Inuit health	Monitoring & management	9:30 – 9:45
Food borne parasites in wildlife		9:45 – 10:00
coffee		10:00 – 10:30
TEK & food preparation	Panel 5	10:30 – 11:00
Cultural importance of beluga		11:00 – 11:20
Nutritional importance of beluga		11:20 – 11:40
lunch on your own	lunch on your own	11:40 – 12:00
Overview 2	Concurrent sessions 6	12:00 – 1:30
Breakout groups 3		1:30 – 2:00
coffee	coffee	2:00 – 3:00
Panel 4	Conclusions & closing remarks	3:00 – 3:30
Open house: Science night		3:30 – 4:30
		5:30 – 7:30

**4 Panel**

- » State of knowledge & future direction for beluga research

**5 Panel**

- » Future directions for beluga monitoring & management

**6 Sessions**

- » Review of Husky Lakes beluga entrapment action plan
- » State of scientific knowledge about beluga



## INTRODUCTORY REMARKS

The Beluga Summit is bringing together researchers, harvesters, Elders, youth and resource managers for the sharing of knowledge about beluga whales. During this three-day gathering, researchers and community members will have the chance to present their knowledge about belugas. Together, we will identify common concerns and knowledge gaps in beluga research and monitoring to help direct future beluga whale research in the ISR.

The Steering Committee developed the format and content of the Beluga Summit in collaboration with community delegates, HRCs and researchers to ensure that the meeting would meet the following goals:

- › Share knowledge on beluga whales
- › Summarize our current state of knowledge
- › Develop a plan for research and management of beluga whales for the next 5 to 10 years
- › Support the preparation of a publication that will assist management of beluga in the ISR

Community representatives will be full participants at the meeting and are there to learn from others as well as share their knowledge and perspectives. The three broad areas of sharing from a community perspective include cultural practices (*e.g. sharing, hunting, food preparations*), knowledge about beluga whales and the ecosystem (*e.g. noting changes in belugas and the ecosystem*) and

perspectives on future research and monitoring (*e.g. what is needed or what should be adjusted to increase our knowledge on beluga whales*).

Scientists and research advisors from the Department of Fisheries and Oceans (DFO), Health Canada, Northern Contaminants Program, Inuit Tapiriit Kanatami, Canadian universities and research institutes are travelling to Inuvik to share knowledge with community members and resource managers. Researchers studying beluga ecology and physiology, human health, contaminants, disease and Traditional Ecological Knowledge will present their research, learn about Inuvialuit knowledge and perspectives, and contribute to discussions about future research and monitoring.

Managers and staff from the co-management boards, DFO, Inuvialuit Regional Corporation and the Alaska Beluga Whale Committee will contribute a regional, national and international perspective to beluga management concerns.



They will also have the opportunity to hear directly from community delegates and scientists studying and living in the ISR.

The Summit provides an important opportunity for beluga knowledge-holders to come together, bring their knowledge together to bring us to our current understanding of beluga in the context of environmental change. We hope this event fosters communication and collaboration among the many knowledge holders engaged in beluga whale harvesting, monitoring and research on beluga whales.

We are excited for your participation in the development of a future plan for beluga in the ISR!

*The Beluga Summit Steering Committee*

***Beluga Summit Steering Committee***

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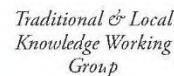
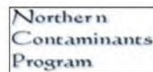
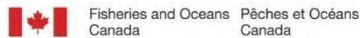
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WHALE  
COMMITTEE



Willie Goodwin is the Chair of the Alaska Beluga Whale Committee, which was formed in 1988 and is comprised of hunters, managers, and scientists.

Mr. Goodwin has been Chair for 10 years and just got re-elected for two more years and was a Hunter representative for Kotzebue for 10 years prior to that. He has worked with scientists for a number of years doing surveys for abundance in Northwest Alaska. He believes we need as much of western science to better understand beluga on top of our traditional knowledge.

The goals for ABWC are:

- › Maintain a healthy beluga whale resource for subsistence use and public enjoyment by future generations
- › Encourage the safe and efficient harvest, processing, and use of beluga whales; reduce the number of struck and lost whales through regional management plans.
- › Ensure that belugas are used as fully as possible in a non-wasteful manner.
- › Obtain accurate harvest information and biological samples from each region.
- › Educate and promote understanding about beluga issues among users, resource managers, and other interested groups.
- › Obtain biological information and traditional knowledge necessary for sound management and conservation of beluga whales.
- › Oversee enforcement of regional management plans and hunting guidelines, and promote enforcement of habitat protection laws.



“We need to continue to teach our young hunters the proper way to hunt and preserve beluga”

**Argagiq Willie Goodwin**

CHAIR, ABWC

The ISR-CBMP is a regionally coordinated, community-based approach to monitoring.

The overall goal of the ISR-CBMP is to support the Inuvialuit “to protect and preserve the Arctic wildlife, environment and biological productivity” to achieve the principles of the Inuvialuit Final Agreement (IFA) and enhance decision-making.

### *Steering committee members*

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CHAIR INUVIALUIT GAME COUNCIL

#### **Vic Gillman**

CHAIR FISHERIES JOINT MANAGEMENT COMMITTEE

#### **Larry Carpenter**

CHAIR WILDLIFE MANAGEMENT ADVISORY COUNCIL – NORTHWEST TERRITORIES

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#### **Bob Simpson**

DIRECTOR OF INTERGOVERNMENTAL RELATIONS, INUVIALUIT REGIONAL CORPORATION

## ISR COMMUNITY BASED MONITORING PROGRAM



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#### **Jon Pierce**

CHAIR ENVIRONMENTAL IMPACT REVIEW BOARD

### *Advisor*

#### **Norm Snow**

EXECUTIVE DIRECTOR  
JOINT SECRETARIAT

The ISR-CBMP Staff Acting Program Coordinator is Kendra Tingmiak, who joined the team in 2014. Kendra graduated from the ENRTP program at Aurora College. Following this she worked with various researchers at the Aurora Research Institute assisting with various field and lab projects. Kendra also participated in several beluga research and monitoring programs including two years as an observer on aerial surveys and assisting in the beluga monitoring program at Kendall Island.



#### **Kendra Tingmiak**

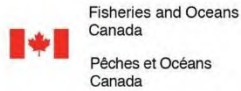
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.....  
The DFO Science Sector  
provides science advice  
to DFO management

Sectors, including:

- › Fisheries Management
  - › Oceans Management
- .....

### *Fisheries Management*

Fisheries and Oceans Canada's (DFO's) fisheries management program works to provide Canadians with a sustainable fishery resource that provides for an economically viable and diverse industry. Protection and conservation of fisheries resources are a key component of fisheries management. DFO manages fisheries according to credible, science-based, affordable and effective practices.

### *Oceans*

One of our goals at the Department of Fisheries and Oceans (DFO) is to ensure that current and future generations of Canadians can continue to enjoy all of the benefits of a most precious natural resource: our Canadian Oceans. DFO strives to safeguard Canada's healthy and productive aquatic ecosystems and thus helps to maintain sustainable resources for Canadians by adopting an integrative approach for improved management and conservation of our oceans.

The "Integrated Oceans Management Plan for the Beaufort Sea: 2009 and beyond" (the IOMP) is the result of several years of planning efforts undertaken by Aboriginal, Territorial and Federal government departments, management bodies, and northern coastal community residents with interests in the Beaufort Sea. Industry, non-governmental organizations, academia and other interested parties have agreed to collaborate in the decision-making processes that will influence the future of the Beaufort Sea region. It is also a demonstration of Canada's commitment to sound management of Arctic marine and coastal resources. The purpose of the Plan is to achieve the full vision of the IOMP while streamlining existing decision-making processes, and to guide and coordinate future activities during the implementation phase, especially as they pertain to development in the Beaufort Sea.

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**Larry Dow**  
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**Kathleen Snow**  
FISHERIES MANAGEMENT  
TECHNICIAN



“As a proud Inuvialuit, I am thrilled to learn about and be involved with the co-management process that takes place amongst all the different organizations in our region. I am also in awe of the collaborative efforts made to protect the beluga whales and their ecosystems while preserving the Inuvialuit culture and annual subsistence harvest.”

**Corinne Bullock**  
INTEGRATED MANAGEMENT PLANNER, OCEANS

FISHERIES  
JOINT  
MANAGEMENT  
COMMITTEE



left-to-right: Vic Gillman, John Noksana Jr., Gerald Inglangasuk, Brian Zytaruk, Joey Carpenter, Charles Pokiak, Burton Ayles



[www.fjmc.ca](http://www.fjmc.ca)  
[www.facebook.com/ISR.FJMC](https://www.facebook.com/ISR.FJMC)

The FJMC works jointly with DFO to co-manage all fish, fish habitat, and marine mammals within the ISR, and has the power to directly advise the Minister of Fisheries and Oceans on fisheries issues. The Committee is responsible for collecting harvest information and making recommendations on voluntary harvest levels for fish and for marine mammals, including beluga whale.

To ensure resource users have input in the co-management process, FJMC conducts community tours to visit all the communities in the Settlement Region. Community consultations are essential for identifying and prioritizing local user-based resource concerns and developing subsequent research projects.

Each year the FJMC contributes to research, assessment, and monitoring projects that address concerns raised at the community level, such as monitoring beluga whale harvests. These annual research projects are an example of how well Traditional Knowledge and Western Science can complement each other and help to solve difficult resource management issues in the ISR.

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INUVIALUIT MEMBER

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**Danny Swainson**

FISHERIES RESOURCE SPECIALIST



As an Inuvialuit Board, Inuvialuit Game Council (IGC) plays a vital role in the co-management system. Under the IFA, the IGC represents the collective Inuvialuit interest in all matters pertaining to the management of wildlife and wildlife habitat in the ISR. This responsibility gives the IGC authority for matters related to harvesting rights, renewable resource management, and conservation.

The specific duties of the IGC are set out in Section 14(74) of the IFA. These duties include appointing Inuvialuit members for all Inuvialuit co-management bodies under the IFA and assisting these bodies whenever requested, advising government agencies, through the co-management bodies or otherwise, on renewable resource policy, legislation, regulation, and on any proposed Canadian position for international purposes that affects wildlife in the ISR.

The IGC also allocates Inuvialuit quotas among the six ISR communities and appoints members for any co-management body dealing with Inuvialuit fish and wildlife harvesting and environment.

The IGC is comprised of a chair and two representatives appointed by Hunters and Trappers Committee (HTC) in each of the six ISR communities which are Aklavik, Inuvik, Ulukhaktok, Paulatuk, Sachs Harbour, and Tuktoyaktuk. The Chair can be from any of the six communities and is elected by all 42 HTC Directors.

## INUVALUIT GAME COUNCIL



### *Current members*

**Patrick 'Dang' Gruben**

CHAIR

**Chucky Gruben**

TUKTOYAKTUK HTC

**Doug Esagok**

INUVIK HTC

**John Alikamik**

ULUKHAKTOK HTC

**Jordan McLeod**

AKLAVIK HTC

**Joseph Carpenter**

SACHS HARBOUR HTC

**Lawrence Ruben**

PAULATUK HTC

### *Staff*

**Jennifer Lam**

RESOURCE MANAGEMENT  
COORDINATOR

**Steven Baryluk**

RESOURCE MANAGEMENT  
COORDINATOR

INUVIALUIT  
REGIONAL  
CORPORATION

[www.irc.inuvialuit.com](http://www.irc.inuvialuit.com)



**Mr. Duane  
Ningaqsiq Smith**

CHAIRPERSON AND CHIEF  
EXECUTIVE OFFICER, INUVI-  
ALUIT REGIONAL CORPO-  
RATION

Duane Smith is the Chairperson and Chief Executive Officer of Inuvialuit Regional Corporation (IRC). Born and raised in Inuvik, NWT, Mr. Smith has over 18 years of experience with the region's government in conservation and resource management. He has represented Inuit nationally and internationally for many years as President of Inuit Circumpolar Council – Canada (ICC Canada) and Vice-President of Inuit Tapiriit Kanatami (ITK). Locally, Mr. Smith was elected Chairperson of Inuvik Community Corporation for 6 terms beginning in 2004 and was previously the Chair of the Inuvialuit Game Council representing Inuvialuit on sustainable resource management & indigenous rights. Mr. Smith continues his close attachment to the land and is a steadfast advocate for indigenous rights, their relationship to the environment as well as the traditional knowledge and insights indigenous people can provide.



**Shannon O'Hara**

INUIT RESEARCH ADVISOR,  
INUVIALUIT REGIONAL  
CORPORATION

Shannon has been involved with beluga monitoring in the ISR for several years working with Regional Organizations and DFO on contaminants and health-related issues on behalf of the IRC. In her role, Shannon also works closely with regional health authorities and contaminants researchers to determine how to communicate about contaminants to northerners.



**Bob Simpson**

DIRECTOR OF INTERGOV-  
ERNMENTAL RELATIONS



**Nellie Cournoyea**

OUTGOING CHAIR,  
1996 – 2016

Inuit Tapiriit Kanatami (ITK), which means Inuit are united in Canada, is the national organization representing approximately 60,000 Inuit living in Inuit Nunangat and in other parts of Canada. Inuit Nunangat, which means Inuit homeland, makes up 40% of Canada's landmass and 50% of Canada's coastline and comprises of the four Inuit land claim regions (the Inuvialuit Regional Corporation in the Inuvialuit Settlement Region in Canada's western arctic, Nunavut Tunngavik Incorporated in Nunavut, Makivik Corporation in Nunavik, northern Quebec and the Nunatsiavut Government in Nunatsiavut, northern Labrador) that geographically and jurisdictionally create a continuous chain stretching across Canada's entire north.

Founded in 1971 ITK represents and promotes the interests of Inuit on a wide variety of environmental, social, cultural, and political, issues and challenges facing Inuit on the national level. ITK does not deliver or fund programs, rather it is a national advocacy organization.

Eric first began working in the ISR in 1994 on a project in Ulukhaktok with Rick Condon and Inuit youth. These days Eric works in the ITK environment and wildlife department, mostly on issues related to environmental contaminants entering the arctic and impacts on both the environment and Inuit of Canada.

His key work priorities that relate to beluga are to:

- › Provide information back to Inuit on the health of beluga from environmental contaminants
- › Communicate to Inuit and health workers the impact that contaminants have on the health of Inuit
- › Provide a means to communicate concerns on contaminants in belugas from the community to the International level

Beluga is an important and valuable food source, and Eric's work helps people in the ISR to make good food choices and to understand the impacts that contaminants may have on their environment and health. Eric hopes to let people know that there are places that people can go to address concerns related to contaminants and the health of Inuit and or beluga.

## INUIT TAPIIRIT KANATAMI



[www.itk.ca](http://www.itk.ca)

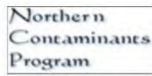


### **Eric Loring**

SENIOR RESEARCH, INUIT  
TAPIIRIT KANATAMI



## NORTHERN CONTAMINANTS PROGRAM



**Canada**

The Northern Contaminants Program (NCP) was established in 1991 in response to concerns about human exposure to elevated levels of contaminants in wildlife species that are important to the traditional diets of northern Aboriginal peoples. Early studies found a wide variety of substances, many of which had no Arctic or Canadian sources, but which were, nevertheless, reaching unexpectedly high levels in the Arctic ecosystem.

The NCP allocates funds for research and related activities in five main areas:

- › Human Health Research
- › Communication, Capacity and Outreach
- › National/Regional coordination and Aboriginal Partnerships
- › Community Based Monitoring Research
- › Environmental Monitoring and Research



**Scott Tomlinson**

ENVIRONMENTAL  
ADVISOR & MEMBER OF  
THE NCP SECRETARIAT

Scott is responsible for the Human Health and Community Based Monitoring sub-programs. He has worked on Arctic Science projects since 2006 when he was part of the International Polar Year Federal Program Office. He has been with the NCP Secretariat since 2011. Through his role in the NCP Secretariat, Scott is involved in the selection and monitoring of projects and is keenly aware of the projects in the ISR and in particular the work done with Beluga on Hendrickson Island and Paulatuk. The Beluga program in the ISR is very important for monitoring the health of Beluga and facilitating the exchange of knowledge among key knowledge holders in the region.



## COMMUNITY DELEGATES

All ISR communities were invited to participate in the Beluga Summit. The Hunters and Trappers Committees were asked to select three delegates, a youth, an elder and a hunter, who would participate at the meeting, as well as share back with their communities. In preparation for the meeting, community delegates provided valuable feedback that helped shape the structure of the meeting

### TUKTOYAKTUK

Jocelyn Noksana  
John Noksana Sr.  
Richard Gruben

### AKLAVIK

Dwayne Benoit  
Joe Arey Sr.  
Ally Gordon

### INUVIK

Clara Day  
Kyle Conley  
Lawrence "Fraser" Angasuk



**SACHS HARBOUR**

- Ryan Lucas
- Norman Anikina
- CJ Haogak

**ULUKHAKTOK**

- Corrie Joss
- John Alikamik
- Kelly Nigiyok

**PAULATUK**

- Ruben Green
- Joe Illasiak
- Melanie Wolki
- Diane Ruben



## INUVIK



**Martha Blake**

RESOURCE PERSON, INUVIK HTC

Martha Blake is the resource person for the Inuvik HTC. She provides logistics support to the beluga sampling programs at East Whitefish Station and Kendall Island.



**Clara Day**

ELDER, INUVIK

Clara is attending the Beluga Summit to learn of the different ways of preparing and storing of the beluga. She will also be contributing her knowledge about hunting, preparing and storing of beluga. Clara can remember as young as 6 years old helping her mother and step father with preparing the beluga whale. Clara wants to pass down knowledge of preparing and cooking the beluga whale because it is her tradition and she is passing down what she has learned from her ancestors.



**Lawrence 'Fraser' Angasuk**

HARVESTER, INUVIK

Lawrence is attending the Beluga Summit to learn from the other communities as well as represent Inuvik. He is hoping to contribute his knowledge, point of view and experiences with the other Summit participants. The whaling tradition is important to Lawrence because it is a part of his diet and is a main traditional food that is retrieved only once a year. The whaling tradition is a part of Lawrence's life and is a tradition that was passed down to him from Elders and it is important that the younger generations learn this knowledge too.



**Kyle Conley**

YOUTH, INUVIK

Kyle will be attending the Summit as a youth representative of Inuvik and wants to share the traditional knowledge that he holds. Kyle is willing to contribute his knowledge on how he works and prepares beluga whale. The whaling tradition is a way of living and is his main source of food that he works to get every year. It is good for the young kids to help with the hunting and harvesting to keep the tradition going from generation to generation.



## PAULATUK

Diane Ruben is attending the Summit to observe and assist the Delegates from her community. Diane will share her experience of coordinating the monitoring program in her community. Keeping up the tradition of whaling is important because if we don't continue the traditional values, which are passed onto us, it will get lost. It is important to us Inuvialuit to continue that tradition, by taking in Youth into our programs or hunting trips, we get to teach them what is passed onto us.



**Diane Ruben**  
RESOURCE PERSON,  
PAULATUK HTC

Ruben is attending the Summit to share information about how, when and why his community hunts and observations about changes in the weather, hunt, etc. Ruben's life is affected by hunting beluga whales because whales are now coming closer to his community. Keeping up the tradition of whaling is important to the Inuvialuit because it is a very important part of our lives.



**Ruben Green**  
ELDER, PAULATUK

Joe is attending the Summit as a TK Holder to share his experience and knowledge on harvesting beluga in Darnley Bay. Joe's life is affected by hunting beluga because it is easier today, since we don't have to go far to harvest belugas, they are coming into our community earlier. Keeping up the tradition of whaling is important to the Inuvialuit because belugas are food and it is important to learn the young hunters to the methods to harvest, prepare and preserve the muktuk.



**Joe Illasiak**  
HARVESTER, PAULATUK

Melanie is attending the Summit as the youth representative for her community and will contribute the knowledge that was taught to her. Melanie's life is affected by hunting beluga in a healthy way, because she gets to travel out on the land with her family, and she also gets to work on the whale when harvested. Keeping up the traditions of whales is important to the Inuvialuit because the traditional values our ancestors hold and which are passed onto us.



**Melanie Wolki**  
YOUTH REPRESENTATIVE, PAULATUK

## TUKTOYAKTUK



**John Noksana Sr.**

ELDER, TUKTOYAKTUK

John is attending the Beluga Summit to gain scientific knowledge and share cultural knowledge. John will share his knowledge of preparing and hunting beluga. John's life is affected by hunting beluga because you can't go without it, it is a part of our diet. We have to get it each year. How would you like it if someone took away your potatoes? Keeping up the tradition of whaling is important to the Inuvialuit because as you go on, younger people learn. Passing on the tradition is important. It is passed from generation to generation. You have to do it to learn it.



**Richard Gruben**

HARVESTER, TUKTOYAKTUK

Richard is attending the Summit to learn and gain more experience as a harvester and knowledge from other harvesters. Richard will share information and also gain new information at the Summit. Richard's life is affected by hunting beluga because if he does not harvest beluga then his family is missing part of their staple food for the year and also diet. Keeping up the tradition of whaling is important to the Inuvialuit because harvesting and hunting has always been the Inuvialuit way of life. It is important to the Inuvialuit because it is one of the main sources of their diet.



**Jocelyn Noksana**

YOUTH, TUKTOYAKTUK

Jocelyn will be attending the Summit as a Youth Rep from Tuktoyaktuk. Jocelyn would like to gain knowledge from other regions as they all do things differently. As a young person, it would be good for Jocelyn to know new and old information of belugas to pass on to the new upcoming generation. Harvesting beluga is an important part of the Inuvialuit culture. Jocelyn's family has been harvesting beluga for as long as she can remember. It brings her family closer together, sharing the knowledge of preparing beluga; how to do it safely. Keeping up the tradition of whaling is important to the Inuvialuit because it is a way of life that has been passed down for years. Beluga is also an important part of our diet and has been for many years.

## ULUKHAKTOK

Corrie was a whale monitor for the exceptional year of 2014 when Ulukhaktok got many beluga whales. She is hoping to gain helpful information at the Beluga Summit. She is willing to contribute her knowledge and experience of taking samples and working with the beluga harvest. The tradition of whaling is important to the Inuvialuit so that people can keep getting maktak every year.



**Corrie Joss**

MONITOR, ULUKHAKTOK

John is an Elder of Ulukhaktok who has been doing the seal program for many years. John wants to gain information and learn from others in the areas of hunting and from the workers about beluga whaling. He is willing to share information of his beluga whaling experience and wants to ask questions about belugas to the Summit participants. John states that it is important to keep up the tradition of whaling because it is our way of life as Inuvialuit.



**John Alikamik**

ELDER, ULUKHAKTOK

Kelly took part in several hunts during the exciting year of 2014 when Ulukhaktok got a lot of whales. He was eager to learn how to take samples properly and was a great assistant and learner. Kelly is hoping to gain information and learn from others at the Beluga Summit. Kelly is willing to contribute his knowledge and experience with beluga whaling and looks forward to asking questions to the other Summit participants on beluga whaling. Kelly states that it is important to keep up the tradition of whaling because it is his way of life.



**Kelly Nigiyok**

HARVESTER, ULUKHAKTOK



# RESEARCHER PROFILES

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## BELUGA MONITORS IN THE ISR

The Beluga Monitoring program has been running in the ISR for close to 30 years and is one of the longest running programs of its kind in the world. Selected annually by their respective Hunters and Trappers Committees (HTCs) and tasked with monitoring harvest and collecting all relevant biological information and samples at whaling camps throughout the region, the Beluga Monitors are the lifeblood of this program.

Beluga monitors take samples from almost every beluga harvested in the ISR on an annual basis. As a result of this exposure and many years spent at whaling camps, Beluga Monitors possess a vast amount of knowledge regarding traditional harvesting activities and beluga biology.

The following Beluga Monitors will be attending the 2016 Beluga Summit:

.....

**Lawrence Angasuk**

COMMUNITY

Inuvik

WHALE CAMP

East Whitefish

**Steve Cockney Jr.**

COMMUNITY

Inuvik

WHALE CAMP

East Whitefish

**Frank Pokiak**

COMMUNITY

Tuktoyaktuk

WHALE CAMP

Hendrickson Island

**Verna Pokiak**

COMMUNITY

Tuktoyaktuk

WHALE CAMP

Hendrickson Island

**Rex Noksana**

COMMUNITY

Tuktoyaktuk

WHALE CAMP

Hendrickson Island

**Jody Illisiak**

COMMUNITY

Paulatuk

**Cora Joss**

COMMUNITY

Ulukhaktok

**Kyle Conley**

COMMUNITY

Inuvik

WHALE CAMP

Kendall Island

**CJ Haogak**

COMMUNITY

Sach's Harbour

.....

RESEARCHER PROFILES

# BELUGA HABITAT



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## Claire Hornby

PROJECT COORDINATOR, CENTER  
FOR EARTH OBSERVATION SCIENCE,  
UNIVERSITY OF MANITOBA

# Spring Habitat Use and Entry in the Mackenzie Estuary

TIMING OF BELUGA ENTRY RELATIVE TO ICE  
BREAK-UP IN THE MACKENZIE ESTUARY DURING  
LATE SPRING

Claire Hornby first started working in the ISR in 2013 for her recently-completed Master's project under the supervision of Dr. Lisa Loseto. Claire's project focussed on beluga habitat use in the spring and fall. Her general research interests include arctic marine mammals, spatial habitat modeling and community based observations. In the spring, she examined the timing of beluga entry relative to ice break-up in the Mackenzie Estuary and in the fall she used data collected by Lois Harwood to examine beluga habitat preferences in the offshore.

Claire participated in aerial surveys along the edge and offshore of the Mackenzie Estuary and along the Tuktoyaktuk Peninsula. Habitat features (sea ice concentration, ice floe size, water depth and turbidity) and beluga locations were examined to identify important habitat features and compare "acoustic health" of the Mackenzie Delta beluga population with other beluga populations.

Arrival and timing of belugas into the estuary remains important for the people of the ISR, who depend on beluga as a food and cultural resource. In the Mackenzie Estuary, any changes to the date and location of sea ice break-up can have implications to beluga summer distribution in the estuary, which may in turn have major implications on the availability of beluga to subsistence hunters and food security.

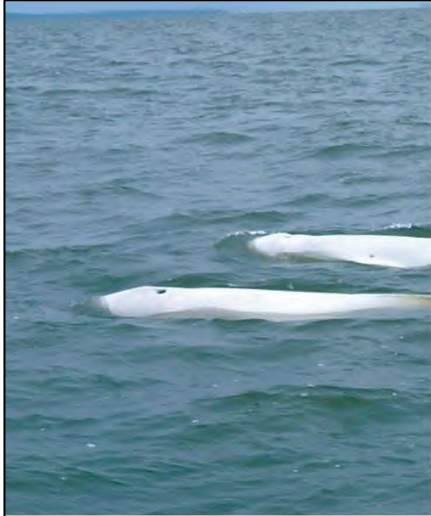


## *Key findings*

Contrasting spring ice conditions in 2012 & 2013 resulted in selection of different classes of each habitat variable, depending on year and location

Beluga preferred open water/light ice concentrations and shallow depths during both sampling years

Beluga displayed a significant association with turbid water (i.e., increased freshwater flow)



## Jennie Knopp

COMMUNITY SCIENCE ADVISOR,  
OCEANS NORTH CANADA

### Darnley Bay Passive Acoustic Monitoring Project

Jennie Knopp is a Community Science Advisor with Oceans North Canada who has been working in the ISR since 2008. Oceans North Canada promotes science-and community-based conservation of Canada's Arctic Ocean and the resulting well-being of indigenous Arctic residents who rely upon its natural wealth.

This past summer Jennie worked as part of a team in collaboration with the Paulatuk HTC and FJMC to conduct a beluga Passive Acoustic Monitoring program in southern Darnley Bay. The team used hydrophone recordings matched with local monitor observations at hydrophone sites for one month each summer over the past three years (2013-2015) to determine if passive monitoring methods can be used for monitoring beluga activity in the area.

This study provides additional information on beluga use of habitat in the Anguniaqvia Niqiyuam Area of Interest. In addition, data from this project can be used to evaluate the effectiveness of non-intrusive ways of monitoring beluga and ultimately to examine beluga response to human underwater noise (e.g. boat motors, etc.).

Work is currently underway to analyse data and report on findings from this study.





## Lisa Loseto

SECTION HEAD, ECOSYSTEM IMPACTS  
RESEARCH GROUP, FISHERIES AND  
OCEANS CANADA

# Beluga Health & Habitat Use

A COLLABORATIVE COMMUNITY BASED  
APPROACH TO UNDERSTANDING BELUGA  
IN THE WESTERN ARCTIC

Dr. Lisa Loseto works with management groups and her research team to develop conservation-related science advice for decision-making. She leads a diverse research program focussed on beluga and their supporting ecosystems, including projects on beluga health, diet, habitat use, and community knowledge. Lisa began research in Resolute Bay in 1999, and began her PhD in the ISR in 2004, where she tagged belugas at Hendrickson Island to address temporal trends of mercury based on diet and habitat use, later including community knowledge and considering other stressors like climate change.

Lisa's beluga health projects are partnered with the FJMC beluga harvest programs. Her habitat studies are conducted across multiple scales using aerial surveys, tagging, local boat/shore-based work and, more recently, beluga vocalizations matched with the physical habitat.

Research on health and habitat that includes TEK/LEK is important because (1) we need to characterize beluga health and set a baseline for 'normal' to manage human activities that may impact beluga, (2) we need to understand not only where beluga go, but why they go to certain places (for example knowing where feeding or birthing ground are located are critical for management), and, (3) Inuvialuit hold a lot of knowledge about belugas that goes back 1000's of years, whereas science is young in trying to understand belugas. Bridging this knowledge is critical for the successful long term viability of this population.



### *Key findings*

Beluga diet and habitat use relate to size, sex and age

Arctic Cod are the preferred prey of beluga

Belugas have an intricate connection with the physical environment that varies with time of year and time of day

Recent events at Ulukhaktok suggest the change in beluga distribution resulted from shifts in prey availability that may have impacts on beluga nutritional needs



## Lois Harwood

BIOLOGIST, FISHERIES  
AND OCEANS CANADA

### Condition, Distribution & Behaviour of Belugas

LONG TERM STUDIES ON CONDITION,  
DISTRIBUTION AND BEHAVIOUR OF  
BELUGAS, BOWHEADS AND RINGED SEALS

#### *Key findings*

The size of the Beaufort Sea beluga stock is estimated as at least 40,000 – the second largest stock in Canada

The distribution of belugas in the offshore is widespread, with belugas in small groups throughout the offshore Beaufort Sea (and well beyond) during July and August. They make trips in and out of the Estuary during July

There has been an emerging but subtle trend of declining beluga growth rates over the last decade, suggesting there has been a shift in their prey base. Similar trends are observed in other species (e.g., seals)

Lois Harwood began doing research in the ISR in 1980, joined the FJMC staff as a biologist in 1988 and joined DFO 1992. Lois' research spans across many species including charr, beluga, bowhead, and ringed seals, addressing many questions related to harvesting and management. Her breadth of research includes the use of aerial surveys and satellite telemetry, to study the distribution, behaviour and abundance of belugas, bowheads and seals, to inform us on patterns of habitat use, and the location of hotspots (required for seismic mitigation planning). Through collaborating with harvesters, Lois has led long term monitoring programs to document the size, sex, body condition and growth rates of harvested species that has revealed ecosystem change and stock trends.

Her results are significant for the Inuvialuit in particular to show the world that management of this beluga stock is done cooperatively and properly "At Home". The long-running FJMC beluga monitoring program and other 'add on' programs, are positioning the Inuvialuit and DFO with an understanding of the impacts of a changing environment on belugas. Lastly, knowledge of habitat use by belugas positions the Inuvialuit to set informed terms and conditions for industrial activities such as seismic work or dredging.





## Shannon MacPhee

AQUATIC BIOLOGIST, FISHERIES  
AND OCEANS CANADA

### Bottom-living Invertebrates in the Offshore Beaufort Sea

Shannon MacPhee first began northern research in 2009 while working with scientists and local guides to collect baseline biological data in the Hudson Bay lowlands. She began working in the ISR in 2012 as part of the Beaufort Regional Environmental Assessment (BREA) Marine Fishes Project, a study to collect baseline information about marine fishes and habitat associations in the offshore Beaufort Sea.

As part of the BREA, Shannon led the sampling of benthic (bottom-living) invertebrates such as seastars, shrimps, crabs and worms. Over the past three years, she has spent more than 15 weeks at sea collecting marine fishes and invertebrates at depths from 40m down to 1500m in the Beaufort Sea.

Shannon's work toward understanding the distribution and abundance of benthic invertebrates is relevant to beluga because many larger invertebrates, like octopi and shrimps, are eaten by beluga. In addition, many invertebrates in the offshore environment are an important part of the diet of marine fishes such as Arctic Cod, which are in turn a key prey item for beluga whales.

In 2015 Shannon started a new position with Dr. Lisa Loseto, and part of her new role will be to support research projects and ongoing monitoring activities needed to manage marine protected areas (TNMPA and ANAOI). This includes planning and participating in field sampling and reporting results from beluga whale research and monitoring projects. In addition, Shannon recently began coordinating science information for planning a network of Marine Protected Areas across the Canadian Arctic.



#### *Research interests*

Characterising the biodiversity of offshore marine fishes and bottom-living invertebrates

Describing the spatial distribution of offshore marine fish and invertebrate communities

Determining which environmental drivers (like depth and water temperature) are key factors in structuring the diversity and distribution of marine fishes and invertebrates

RESEARCHER PROFILES

# BELUGA HEALTH







## Bruno Rosenberg

AQUATIC BIOLOGIST, FISHERIES  
AND OCEANS CANADA

### Diet Biomarkers in Belugas & Fish

Bruno started working in the Arctic in 2001 and in the ISR specifically in 2003. He is currently working with Dr. Lisa Loseto's research team, where he measures the carbon and nitrogen stable isotope ratios and fatty acid profiles of beluga and fish samples obtained from ongoing community-based beluga and fish monitoring programs (in the ISR). The carbon stable isotope signature provides information on the source (freshwater, coastal or marine) of the food an animal is eating. Nitrogen signatures tell us whether an animal is feeding lower down or higher up in the food chain.

The results of Bruno's work can be used to:

- › Determine what an animal is eating
- › Determine an animals' health and nutritional status
- › Identify prey animals and habitats that are critical to animals such as belugas

In addition, changes in biomarker profiles (stable isotope and fatty acid) can be used to discover and monitor long-term changes in ecosystems. The work Bruno is involved in provides basic data that are required to understand beluga diet, health, and the environment they depend on, which is important for Inuvialuit who depend on beluga as a subsistence food source. This information can also be used by scientists researching the effects of climate change on beluga and monitoring contaminants such as mercury and pesticides and environmental stressor.



#### *Research interests*

Using stable isotopes and fatty acid analysis to study how food webs work

Studying effects of ecosystem change on marine mammal diet and health

Developing methods to analyze new biomarkers for monitoring ecosystem change and health



**Emily Choy**

PHD CANDIDATE, UNIVERSITY OF MANITOBA

## Beluga Diet & Energetic Consequences of Climate Change

IDENTIFYING THE OFFSHORE DIET OF THE EASTERN BEAUFORT SEA BELUGA POPULATION AND THE ENERGETIC CONSEQUENCES OF CLIMATE CHANGE

### *Research interests*

Ecological tracers of diet such as fatty acids and stable isotopes

Adaptive physiology

Energetics and climate change

Emily is working to identify the offshore diet of the eastern Beaufort Sea beluga population and the energetic consequences of climate change. Emily began working in the Arctic in 2007 and in the ISR in 2011.

Beluga whales may be an important indicator species for the effects of climate change because of their association with sea ice. Changes in sea ice are predicted to bring challenges to belugas and other sea-ice associated marine mammals, such as shifts in prey abundance, migration routes, feeding areas, and increases in human activity. The resilience of Beaufort Sea beluga whales to climate change may depend on their ability to adapt to shifts in prey regimes.

Emily's research focuses on the diet of beluga whales in the Beaufort Sea ecosystem. She has analysed fatty acids and stable isotopes as biomarkers that provide information on beluga prey items, such as Arctic Cod and octopi. Emily is also studying the relationship between diving physiology and prey selection by measuring blood cell percentage in the field.

Information on beluga diet and diving physiology is important to Inuvialuit because it relates to the health and body condition of belugas. Emily is also investigating how climate-induced prey shifts may affect beluga energetics and body condition.





## Kerri Pleskach

ANALYTICAL CHEMIST, FISHERIES  
AND OCEANS CANADA

### Marine Mammal Ageing & Hormone Analyses

Kerri started working on Arctic samples collected from the ISR in 2003. She recently began new research to support Dr. Lisa Loseto's and Dr. Steve Ferguson's studies on beluga and narwhal health.

The samples that Kerri analyses in the lab are collected from traditional harvests and shipped south to be processed in Winnipeg. Kerri has worked on a new laboratory method to age beluga whales using compounds in the beluga eyeball lenses. These compounds are called 'aspartic acid' and there are two forms of aspartic acid and the concentrations of them in eyeballs changes over time with age. In the lab Kerri tested out different methods of how to extract the aspartic acid from beluga eyeball lenses using acid hydrolysis. She compared her results to more traditional ageing techniques using beluga teeth (counting growth layer group-rings in beluga teeth) and found that beluga whales could be accurately aged using the aspartic acid racemization technique.

This work is important because accurate ageing methods are needed to develop reliable population models to ensure that beluga hunting is sustainable and that industrial activities are conducted so that beluga populations remain healthy for future generations. Beluga are near the top of the marine food web, therefore they are an indicator of the overall health of the marine environment. Kerri's work to establish baseline hormone levels including cortisol, thyroid hormones and reproductive hormones will help determine what a healthy beluga population looks like in order to assess any future changes.

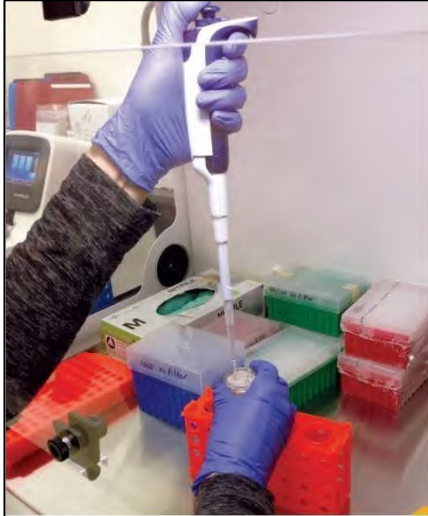


#### *Research focus*

Aging marine mammals using aspartic acid racemization in eye ball lenses

Extracting and analysing hormones in plasma and blubber tissues

Developing new methods to study marine mammal tissues in the laboratory



## Lianne Postma

MOLECULAR GENETICS BIOLOGIST,  
FISHERIES AND OCEANS CANADA

# Genetic Stock Structure of Beluga Whales

FINE SCALE GENETIC STOCK STRUCTURE & CONSERVATION OF BELUGA WHALES IN THE BEAUFORT SEA.

### *Key findings*

Based on mitochondrial DNA sequences, the Beaufort Sea belugas are very distinct from all other whale stocks in Canada but do not have any overall differences among any of the hunting locations sampled during the harvest monitoring programs

Clusters of related belugas, most strongly observed in females, use this large summering area but are not linked to particular aggregation 'hotspots' in the nearshore areas

Though some individual relationships were found, whales sampled from the Husky Lake entrapments were not from an overall related group and they were not distinct from any of the other sampling locations in the study

Lianne Postma studies the DNA of whales, walrus and seals to help learn about the genetic relationships among groups of animals to provide advice for marine mammals stocks assessments. Lianne began working on beluga whale genetics in 1987 as a summer student at the University of Manitoba. Since that time she has processed DNA from over 1000 beluga samples collected over the last 30 years from various harvest monitoring programs in the ISR. DNA extracted from beluga skin, muscle and jaws have been analyzed using both nuclear DNA (the kind inherited from each parent) and mitochondrial DNA (inherited almost only from the mother) to look at all ways that the ISR belugas might be clustered into genetic groups.

Lianne's work on genetics of the Eastern Beaufort Sea beluga stock adds to the knowledge about patterns of social structure revealed by studies using satellite tracking, habitat selection and foraging ecology. Understanding how and why belugas form groups can be useful for predicting what kind of impact human activities, natural mortality events like ice entrapments, and changes in the ecosystem might have on how the whales are using different areas.





## Maria Morell

POSTDOCTORAL RESEARCH FELLOW,  
UNIVERSITY OF BRITISH COLUMBIA

### Beluga Lung & Ear Health

Dr. Maria Morell analyzes the inner ears from stranded toothed whales using electron microscopy and immunofluorescence to investigate high-frequency hearing adaptations and possible structural alterations as a consequence of man-made overexposure. She started working in the Arctic in the summer of 2014, where she and a colleague extracted the ears from harvested beluga whales.

While Maria has not sampled in the ISR, she is analysing ears from Hendrickson Island. They were decalcified, dissected and processed for observation using scanning electron microscopy. Maria is currently working on characterising the normal ear ultrastructural anatomy of beluga and documenting any structural alterations of the cochlear cells (inner ear trauma), particularly related to man-made noise. If ultrastructural evidence of injury is detected, laboratory analysis can further determine the frequency range of the sound source that triggered the injury.

Results revealed that the cells of the sensory organ have morphological characteristics that allow belugas to hear at very high frequencies. These features are also shared by other toothed whales, and interestingly, by echolocating bats. Although lesions associated with gunshots made any assessment of acoustic trauma due to low frequency noise difficult, this analysis will allow Maria to detect permanent acoustic damage due to mid or high frequency man-made noise.



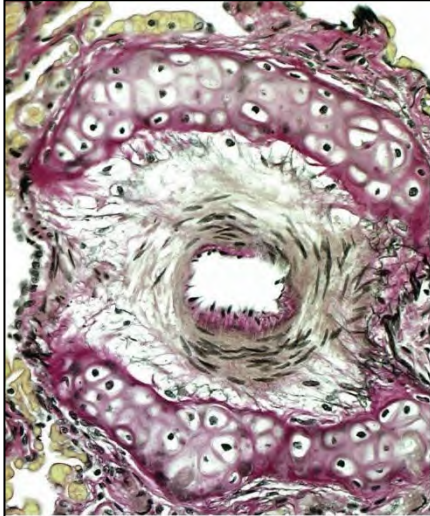
#### *Key findings*

Inner ear analysis provided information on the normal morphology of the organ of Corti (the hearing organ)

Electron microscopy analysis revealed that the cells of the sensory organ presented morphological characteristics that allow belugas to hear at very high frequencies

This analysis allows detection of lesions that can be compatible with acoustic trauma

Beluga ears from Hendrickson Island will allow researchers to predict the distribution of frequencies within the inner ear (i.e., cochlear frequency maps) in beluga whales



## Marina Piscitelli

PHD CANDIDATE, UNIVERSITY  
OF BRITISH COLUMBIA

### Beluga Lung Mechanics

Marina Piscitelli is interested in comparative anatomy and physiology of mammals including belugas. Marina has been working in the Arctic and the ISR since 2013. Compared to land mammals, dolphins and porpoises have enhanced lung volumes with faster breathing rates. However, these enhanced adaptations may increase the risk for respiratory diseases by inhaling more air per breath compared to terrestrial mammals. The samples that Marina collected at Hendrickson Island were used for biomechanical tests – inflating and deflating the lung while CT scanning and imaging with a scanning electron microscope.

Preliminary results suggest that beluga lungs are more elastic than pigs, a land mammal relative. The higher elasticity and lower opening pressure allow belugas to increase the amount of air breathed in and lowering the energy needed to breathe. The lungs would also compress more easily during diving. Microscopic images showed openings (pores) that directly connect different parts of the lung to each other (grey images). This allows for increased lung volume for deeper breaths. These openings could also be a pathway for diseases to spread more easily throughout the lung. A unique adaptation was also found in belugas – a series of valves in the lower lung (colored images) that can control air flow into and out of the lung, can trap air inside, and may be a critical mechanism to prevent diving illnesses in deep divers like belugas.

With changes in the western Arctic's climate and rate of development, both direct (e.g., an oil spill) and indirect (e.g., introduction of a new pathogen) impacts on respiratory health will be important to monitor.

#### *Key findings*

Beluga lungs are adapted to be more elastic with lower opening pressures than terrestrial mammals

Alveolar pores are present in beluga lung tissue, providing an alternative pathway for lung disease to spread throughout the tissue

A series of robust valves are present in the smaller airways and can function to control air flow in and out of the lung; as well as entrap and isolate pathogens or foreign debris that is inhaled





## Ole Nielsen

MARINE MAMMAL DISEASE SPECIALIST,  
FISHERIES AND OCEANS CANADA

### Disease Surveillance in Seals & Belugas

Ole Nielsen investigates infectious diseases in marine mammals and his research interests include virus discovery, investigating the role that emerging infectious diseases have on the health of marine mammals, and validating blood (serology) tests to determine exposure in belugas and seals as well as determining the role that brucellosis has on marine mammal reproduction and health.

Ole has been working in the Arctic since 1995 and in the ISR since 2001, and his current research project is disease surveillance in seals and belugas in the ISR. This project was originally developed in response to harvesters' concerns regarding abnormalities and disease that they were seeing in the animals they were consuming. Ole has been working with Lisa Loseto's group to investigate beluga health in a broader context, with the aim of relating beluga health to other parameters such as disease, body condition, contaminant burdens, and climate change.

Seal samples are collected in conjunction with Lois Harwood's seal monitoring project at Ulukhaktok and the beluga samples are collected by Lisa Loseto's and FJMC's beluga harvest monitoring teams. Beluga samples are tested for viruses confirmed with other laboratories for identification.

Climate change stress is likely making belugas more susceptible to new diseases and making diseases they are already exposed to, more serious. Infectious diseases can affect the number of belugas available for harvesting and some diseases can be transmissible to humans as well. Ole's work adds to our understanding of these diseases in belugas and other marine mammals.



#### *Key findings*

In collaboration with Alaskan beluga biologists, two new viruses have been isolated and identified (an alphaherpes virus and a mammalian orthoreovirus). These viruses are present in most if not all ISR harvested belugas

Both viruses are known to be associated with skin lesions but their role in contributing to the death of individual belugas is unknown at this time

Disease surveillance of harvested belugas serves as an "early warning system" of infectious disease threats to belugas and is best described in association with other qualitative/quantitative health parameter trends over time



## Stéphane Lair

REGIONAL DIRECTOR, CANADIAN  
WILDLIFE HEALTH COOPERATIVE

### Health Assessment of the Beaufort Sea Beluga

Dr. Stéphane Lair's research interests include marine mammal health (especially belugas), wildlife pathology and the impacts of climate change on the health of wild animals. Stéphane has been involved in half a dozen projects on wild animals in the Arctic since the 1990's. In the early 1990's he started performing autopsies on beluga whales found dead in the St. Lawrence Estuary, Quebec, Canada, and also had the opportunity to examine beluga whales from the Hudson Bay (Arviat) and the Chukchi Sea.

Stéphane began working in the ISR in 2015, and he is currently performing a baseline health assessment of belugas harvested and landed at Hendrickson Island. The team completed a full health examination on 16 belugas. Each animal was measured and all organs were examined for signs of disease. Samples of different organs were taken to be examined under the microscope. Samples were also taken to verify if two parasites (*Trichinella* and *Toxoplasma*) could be present in the meat. This work will be used to determine if these whales are healthy, and if not, do they carry diseases that could be an issue for the community.

Stéphane's work will help Inuvialuit determine how healthy the beluga whales they consume are. It will also determine if these animals carry disease agents such as *Trichinella* and *Toxoplasmosis*, which could potentially infect people that eat muktuk and mipku.

#### *Key findings*

Overall, the beluga whales examined seem to be in good health

Some belugas (21%) appear to be thin, which might be normal at the time of year they were killed

Low grade parasitic infections (lungworms, stomach worms, etc.) were present in some of the beluga whales examined (though these infections were mild with low health significance for the animal)

Some analyses, such as the evaluation for the presence of *Toxoplasma* and *Trichinella*, are still in progress





RESEARCHER PROFILES

# CONTAMINANTS

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## Gary Stern

ASSOCIATE DIRECTOR, CENTER  
FOR EARTH OBSERVATION SCIENCE,  
UNIVERSITY OF MANITOBA

### Temporal Trends of Contaminants in Belugas

Dr. Stern began working in the Arctic in 1992 and the ISR in 1996. He is currently investigating temporal trends of mercury and halogenated organic compounds in Hendrickson Island, Sanikiluaq and Pangnirtung beluga. His research will allow us to determine whether contaminant levels in the beluga are changing with time. This work together with the beluga diet and ecosystem work carried out with partners at DFO will help us understand contaminant transport in food webs. These results will also help to test the effectiveness of international controls and, in conjunction with projects such as ArcticNet and BREA, to understand the effects that climate variation may have on these contaminant levels.

In collaboration with Dr. Loseto recent analyses of beluga mercury levels revealed a decline in liver and muscle levels from 2002 to 2012. The temporal increases in mercury observed in the 1990s followed by these recent declines do not follow the trends in mercury emissions and were not easily explained by diet. These findings highlight the complexity of beluga feeding, food web dynamics and mercury transport in the ecosystem. Looking at regional-scale climate variables we found the Pacific Decadal Oscillation (PDO) had a significant relationship with beluga mercury with an eight year lag time. This distant signal points us to consider beluga winter feeding areas. Given that changes in climate will impact ecosystems; it is plausible that these climate variables are important in explaining beluga mercury trends.

#### *Research interests*

The study of environmental pathways of contaminants and the effects of climate change on their delivery, transport, and elimination from Arctic marine and freshwater aquatic ecosystems

Studying petroleum hydrocarbons in sediments and invertebrates at the base of marine food webs in the Arctic Ocean

Understanding the sources and fate of oil in ice and in the surrounding seawaters and biota



## Marie Noël

RESEARCH MANAGER, OCEANS POLLUTION PROGRAM, VANCOUVER AQUARIUM

# Effects of Contaminants & Climate Change on Belugas

INTERACTING EFFECTS OF CONTAMINANTS AND CLIMATE CHANGE ON THE HEALTH OF THE WESTERN ARCTIC BELUGA WHALES

### *Key findings*

PCB-associated effects on important genes indicate a response to contaminants

Potential health impacts related to difference in feeding ecology associated with a changing ice regime. However, additional temporal sampling is needed to extend these observations and assess potential impacts of a changing climate

The implications for beluga health at the population level are not clear but likely include increased risk of reproductive, immune function and developmental effects

Marie began her research in the ISR in 2008 for her PhD, when she first experienced the north while sampling beluga whales at Hendrickson Island. Her research at the time also included contaminant work on other marine mammal populations near the Vancouver area. Marie's PhD research used new methods to measure contaminant and other stressor impacts at the molecular level (gene expression) in beluga whales. She would like to continue this research and examine the interacting effects of contaminants and climate change in beluga whales.

Arctic wildlife are generally exposed to moderate levels of contaminants compared to their southern species. In addition, changes in Arctic sea ice cover, temperature, food web productivity, beluga distribution and feeding ecology may add a layer of stress on these animals. Measuring biological effects at the molecular level (gene expression) can provide us with an early warning signal of impacts.

It is important to better understand how contaminants and climate change may affect beluga health at the molecular, individual and population levels. This project helps to answer questions regarding the health of the whales with respect to environmental contaminants.



## Trevor Stocki

RESEARCH SCIENTIST, RADIATION PROTECTION BUREAU, HEALTH CANADA

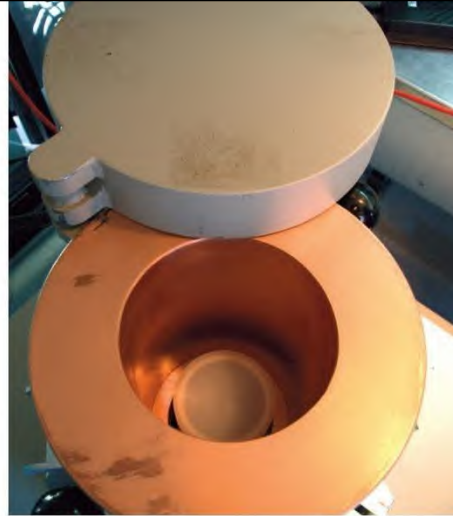
# Radioactivity in Beluga & Prey Following Fukushima

FOLLOW UP MONITORING OF RADIOACTIVITY IN BELUGA AND BELUGA PREY IN RESPONSE TO THE FUKUSHIMA ACCIDENT AND EXAMINING IODINE-129 IN BELUGA SAMPLES

Dr. Stocki is a physicist and research scientist currently investigating radiation in the environment and its effect on human health. Trevor began Arctic research in 2004 with Health Canada's Arctic atmospheric monitoring stations, and began working to measure beluga whale samples from the ISR for radioactivity in 2011. However, this meeting is his first trip to the Canadian Arctic.

His research group measured beluga samples to look for man-made radioactivity after the 2011 Fukushima accident and found that there was no effect of atmospheric release from Fukushima on beluga samples. However, the ocean plume from Fukushima has not yet reached the Arctic Ocean, and follow-up measurements are needed to see if there is an ocean-transported effect from Fukushima on beluga in the ISR. Trevor would like to use I-129 (iodine radioisotope) to help understand changing mercury levels in beluga. For both projects, he uses freeze dried and homogenized beluga samples which are then measured by gamma spectrometry (Fukushima work) and accelerator mass spectrometry (I-129 work).

This work is important for Inuvialuit because it can be used to determine if beluga are safe to eat with respect to radioactivity from Fukushima.



### *Research interests*

Using radiation measurement techniques to understand how radioactive materials travel through the environment and the food chain, specifically in caribou, lichens, beluga, and beluga prey (fish)





RESEARCHER PROFILES

# HUMAN HEALTH

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## David (Xuefeng) Hu

POSTDOCTORAL RESEARCHER, UNIVERSITY OF OTTAWA

### Balance of Nutrients & Contaminants in Traditional Food

Dr. David Hu is focusing his research on traditional diets and health. He started working on the Inuit Health Survey (2007-2008) and related projects since 2014. His research interests are on understanding the balance between nutrients and contaminants in Inuit traditional foods in human health. He studies specific types of fats in humans, specifically the omega-3 fatty acids (known as good fat) in humans as well as mercury and selenium and their interaction.

Previous research has shown Inuit in Canada have a low incidence of heart attacks and it is thought to be due to their traditional diet rich in good fats (omega-3). These good fats occur in food from the marine environment such as beluga whales. His research goal is to describe the Inuit diet and the source of food fats, selenium and mercury, to assess their contributions or reductions to the risk of heart attacks.

Beluga meat, muktuk, and oil/blubber are all important components of a traditional diet that provides invaluable nutrients, vitamins, good fats and selenium. Despite this mercury found in beluga may diminish some of these beneficial effects. Thus, David's research is quantifying the beneficial and adverse effects using human assessments of this data.

Local food availability, nutrients and contaminants in local traditional foods are important to make region specific estimates/suggestions. David's research group is trying to get more reliable ISR-specific estimates to better reflect the needs of Inuvialuit.

#### *Key findings*

Inuit diet contains levels of valuable fatty acids known as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), as well as mercury

It is thought that traditional food with high EPA and DHA can reduce the risk of heart attacks

Beluga oil, blubber, and muktuk (with fat) have high EPA and DHA relative to mercury compared with all other traditional food combined

Increased intake of selected traditional food, like beluga blubber (15 grams per day) or Arctic Char (40 grams per day) can reduce heart attack risks (RR 0.89 and 0.93 respectively)





## Emily Jenkins

VETERINARIAN, UNIVERSITY  
OF SASKATCHEWAN

### Beluga Health Assessment & Food Borne Parasites

Dr. Jenkins general research interests include parasites that transmit between animals and humans, public health and food safety, and the impact of climate change on diseases in the North. She started working in the Arctic in 1999, where she started her PhD in the Mackenzie Mountains. Since 1999, she has worked with the NT wildlife veterinarian and regional biologists (in the NT and ISR). She became involved in beluga research in 2015.

The food-borne parasite part of the overall beluga health assessment came about because of the recent detection of the parasite *Toxoplasma gondii* in ISR beluga by another researcher. This has raised questions about how this cat parasite gets to the Arctic, what effects it might have on the beluga, and if it poses a risk to people who consume beluga in the ISR. Dr. Jenkins is currently conducting a health assessment of beluga whales from the ISR, to see if they show evidence of exposure to *Toxoplasma* and *Trichinella*.

She is currently finalising analyses and will sharing the findings once completed. It is important to note that beluga in the ISR may have always had these parasites, and that beluga and other marine mammals across the Canadian North also have these parasites. Dr. Jenkins' work will help community members determine how healthy ISR beluga whales are. It will also determine if these animals carry disease agents such as *Trichinella* and *Toxoplasma* that could potentially infect people that eat muktuk and mipku.

#### *Key findings*

Preliminary blood testing shows that some beluga in the ISR are exposed to *Toxoplasma*

Tissue analyses are still in progress

Even if present in the beluga, food borne parasites may not pose a risk to beluga or human health – it depends on many factors. Country foods are still good to eat!



## Matthew Binnington

PHD STUDENT, UNIVERSITY OF  
TORONTO SCARBOROUGH

### Food Preparation Effects on Nutrient & Contaminant Levels

Matthew has been working in the ISR since 2014, studying how food preparation affects the nutrient and environmental contaminant levels in beluga whale traditional foods. Food preparation has been shown to affect concentrations of these compounds in other foods, mainly fish, but traditional foods have not been studied extensively. Matthew is examining how the different ways of preparing beluga whale blubber, such as boiling muktuk, ageing muktuk, ageing uqsuq, etc., can affect or change the polyunsaturated fatty acids (good fats) and selenium (nutrients) and environmental contaminants.

During the summer of 2014 Matthew worked with two members of the Tuktoyaktuk HTC to collect samples from harvested belugas throughout the process and preparation, from initial drying of blubber to completion of ageing muktuk and uqsuq. In the lab he extracted environmental contaminants and specific fats from these samples and will also measure the levels of nutrients (polyunsaturated fatty acids and selenium).

Beluga whales are a key component of Inuvialuit traditional food diets. Determining whether items prepared in specific ways affect the levels of nutrients and environmental contaminants is important for those individuals most sensitive to intakes of these compounds (e.g. pregnant/nursing mothers). This research will inform the consideration of diet recommendations or food preparations.



#### *Research interests*

Generally, the different ways of preparing beluga whale blubber affect nutrient and environmental contaminant levels less than the age and sex of the whale

Ageing muktuk most strongly influences nutrient and contaminant levels, as the surrounding uqsuq and uqsuq oil draw out fatty acids and lipid-based contaminants

Preliminary results suggest aged muktuk as the main food item for which dietary recommendations might be relevant



RESEARCHER PROFILES

# KNOWLEDGE CO-PRODUCTION





## Breanne Reinfort

PROPOSAL COORDINATOR, CENTRE  
FOR EARTH OBSERVATION SCIENCE,  
UNIVERSITY OF MANITOBA

# Perceptions of Contaminants & Communication

INUVIALUIT PERCEPTIONS OF CONTAMINANTS  
AND COMMUNICATION PROCESSES IN SACHS  
HARBOUR, NORTHWEST TERRITORIES

Breanne Reinfort first became interested in Arctic people, landscapes, and environmental contaminants when she attended “Summer Bush School” in Pangnirtung in 2007. Her research interests are contaminants in Arctic foodwebs and people, knowledge exchange and traditional knowledge, and how relationships between northerners and researchers affect research communication and northerners’ perceptions of research. Breanne’s Master’s work in Sachs Harbour 2009 investigated how Inuvialuit perceive contaminants (sources, sinks, pathways) and the communication (content/what, method/how, source/who) of contaminants research.

Inuvialuit have known their environment since time immemorial, yet the relatively new presence of contaminants in the Arctic is not part of Inuvialuit oral history. Also, the invisible nature of contaminants is at odds with traditional, observational ways of knowing. Over 20 years of contaminants research conducted in the Canadian Arctic (mostly by non-indigenous researchers) have been communicated to northerners in ways more befitting southern audiences. Community voices must be heard to best inform northerners about contaminants research. We should not assume to know the best way to communicate contaminants research without consulting community members themselves.



### *Key findings*

Communication methods (how) and sources (who) are important aspects of research dissemination strategies and are often overlooked

Lack of a basic foundational understanding of why researchers study contaminants in the Arctic and what these contaminants are challenge the capacity to understand new information

Contaminant perceptions expressed by Sachs Harbour Inuvialuit were consistent with those from other Inuit communities; information about contaminants – was not received nor retained by many participants, except for mercury in beluga maktak





## Carie Hoover

POSTDOCTORAL RESEARCHER,  
UNIVERSITY OF MANITOBA

### Indicators: Identification, Selection & Validation

IDENTIFICATION & SELECTION OF ECOLOGICAL, SOCIAL & ECONOMIC INDICATORS FOR THE BEAUFORT SEA

#### *Key findings*

Key priorities have been identified across co-management agencies for ecological, social, and economic indicators

Using these priorities we to hope to identify co-management agencies with similar goals to improve upon existing monitoring programs

By collecting data on existing indicators used in monitoring programs, the team will assess different datasets to find those that meet the needs of key priorities already identified within the region

Dr. Carie Hoover began working in the Arctic in 2008 and in the ISR in 2011. Carie studies how belugas and other species can be used as indicators to signal changes in the ecosystem within the ISR. Her research interests include identifying and summarizing long-term datasets related to belugas and other species in the ISR and identifying indicators that can be used for monitoring programs. Her recent three-year project aims to identify and select regional indicators to be used for the monitoring of marine resources in the ISR. To accomplish these goals, Carie's research team uses a combination of methods including consultations with co-management agencies, the Beaufort Sea Partnership, and communities, who each provide input into research directions, regional priorities, and help to identify strengths and weaknesses of current monitoring programs. The team will also collect and integrate existing indicator data into a central database in order to assess data currently being collected on indicators.

Carie aims to make this information accessible to increase awareness of data collection for these agencies and to identify high priority indicators and overlap in monitoring priorities and data collection.





## Devin Waugh

M.Sc. STUDENT, UNIVERSITY  
OF GUELPH

### Traditional Local Knowledge Under a Changing Climate

Devin started working in the ISR in 2016 and his work seeks to document local and traditional understanding of beluga in the ISR. The beluga whale (*Delphinapterus leucas*) is an important species to the coastal Inuvialuit communities of the Western Canadian Arctic. However, despite the local cultural and nutritional importance of beluga whale and ongoing scientific monitoring in the region, little research has examined local and traditional understandings of beluga. Documenting the local and traditional knowledge of beluga knowledge is needed given the rapid climatic changes that are occurring in the region, in addition to ongoing changes in culture, economy and governance.

Devin will use a systematic study of Inuvialuit and their culture (ethnographic) research methods such as semi-structured interviews with knowledge holders and participant observation. He hopes that his research will contribute to increased community knowledge and perspectives for the co-management of Beluga in the ISR, as well as a better understanding of the importance of local/traditional knowledge more broadly. Devin's work may contribute to ongoing improvements in the co-management of ISR beluga. Belugas are an important species to Inuvialuit and, to date, little research has examined local and traditional understanding of these cetaceans.

#### *Research interests*

Local/traditional ecological  
knowledge

Linked human-environment  
systems

Co-management of wildlife



**Sonja Ostertag**

POSTDOCTORAL FELLOW, FISHERIES  
AND OCEANS CANADA

## Traditional Local Knowledge for Beluga Monitoring Indicators

ENHANCING BELUGA MONITORING IN THE  
ISR THROUGH THE INCLUSION OF LOCAL AND  
TRADITIONAL ECOLOGICAL KNOWLEDGE

### *Key findings*

Local indicators are being developed with community members based on an Inuvialuit understanding of beluga health and habitat use. A plan is being developed on how Inuvialuit ways of knowing can be included in longterm beluga monitoring

The health of beluga whales was characterized by harvesters and their families based on the appearance and behaviour of the whales during harvesting activities, the condition of muscle, muktuk and blubber, and the appearance of internal organs

Beluga calving areas, potential nursery areas, feeding areas and travel routes/times in the areas surrounding the coastal communities and harvest sites were identified by research participants

Dr. Sonja Ostertag first studied beluga whales during her PhD in 2006 to learn about how mercury affects their brain chemistry. Her current research interests include Inuvialuit ways of understanding beluga health and habitat use, monitoring beluga health in a changing environment, and bridging scientific and traditional ecological knowledge about beluga whales.

She is currently working with the communities of Inuvik, Paulatuk and Tuktoyaktuk to develop 'local indicators' for belugas. These indicators are based on Inuvialuit knowledge and observations about beluga whales and her goal is to find ways for the Inuvialuit to share their knowledge to support monitoring of beluga health and habitat use in the ISR.

The ongoing beluga monitoring program in the ISR provides the longest record of beluga harvests in the world and is strongly supported by community members and organizations in the ISR. The Inuvialuit have a profound understanding of beluga whales and rely on them for their subsistence hunt; therefore, it is important to find ways to monitor beluga health and habitat use using both scientific and Inuvialuit ways of knowing.



**Colleen Parker**

WESTERN ARCTIC SPECIALIST,  
WWF CANADA

## Food Security & Adaption Options

ASSESSING INUIT FOOD SECURITY IN  
LIGHT OF CLIMATE CHANGE AND  
EXAMINING ADAPTATION OPTIONS

Colleen began working in the Arctic in 2010 and started her research in the ISR in Ulukhaktok in 2014. She collected information in Ulukhaktok about food security and adaption options to climate change over a period of three months between July and October 2014. Data were collected using semi-structured interviews with open-ended questions with a cross-section of community members and key informants; and participant observation, with a particular focus on attributes of the dual country/store food system including costs, preparation, access and storage

Findings indicate that the ability to store preferred country foods impacts household food security. This is demonstrated in households with active hunters where larger amounts of freezer space than the community average enable them to store their harvest (e.g. musk-ox, fish, ducks, muktuk), however their harvest may at times be limited by the absence of a functional community freezer or icehouse. These households in turn play a role in providing country foods for households with less freezer space by sharing what they are able to store.

This project will be useful to the community of Ulukhaktok and government policy makers responsible for the implementation of adaptation initiatives. By identifying and describing opportunities and barriers to enhancing food security, it is possible to highlight adaptation measures that are relevant and feasible.



### *Key findings*

Socio-economic factors impacting food security include access and use of income, high price of gas and equipment, transmission of traditional knowledge and knowledge of nutrition

Climatic factors impacting food security include changes in wildlife abundance and distribution, wildlife quality and changing environmental conditions

Storage is an important adaptation option for enhancing the use of country foods





## Andrew Doolittle

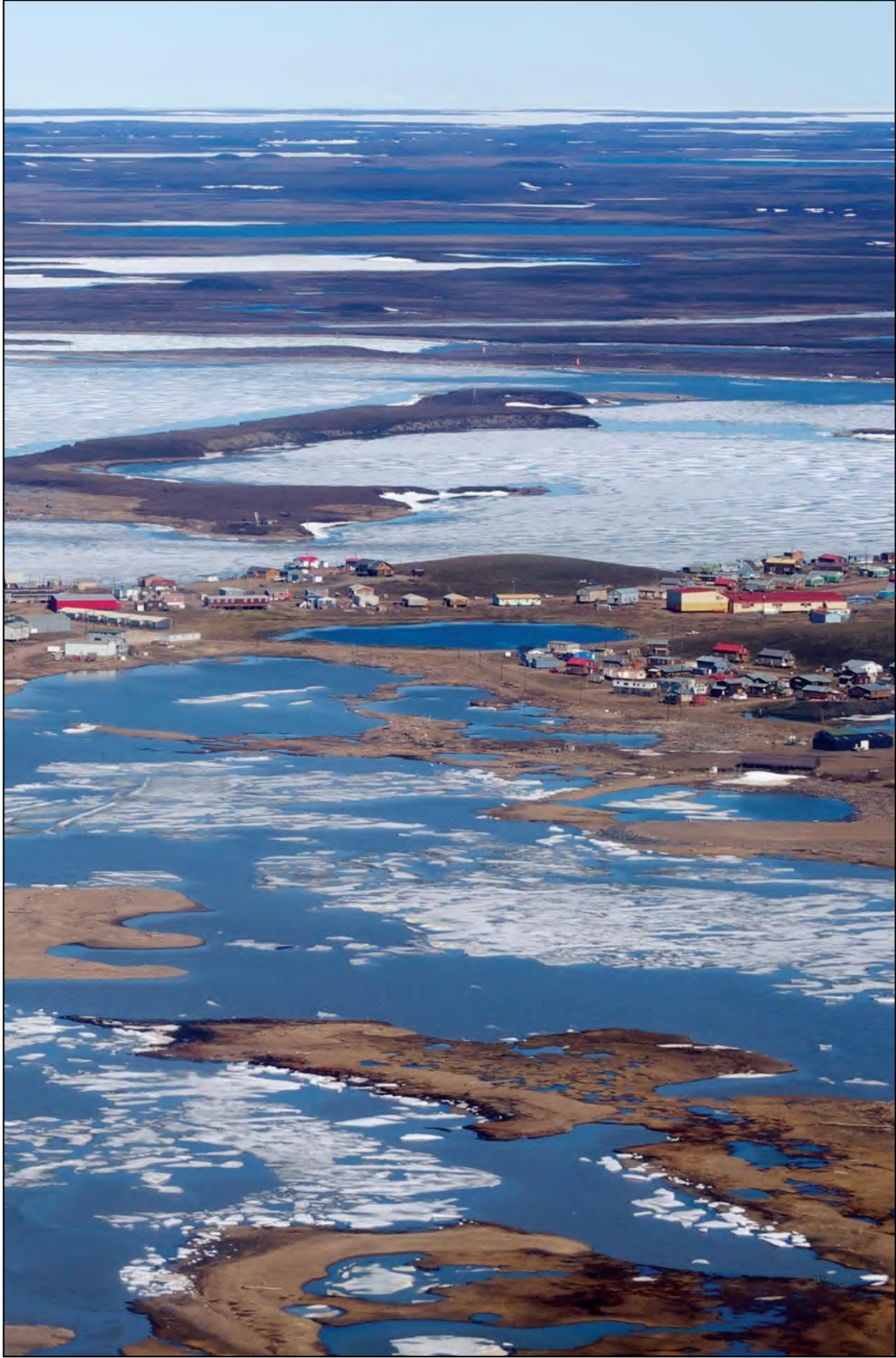
GEOGRAPHIC INFORMATION SYSTEMS  
(GIS) ANALYST, FISHERIES AND OCEANS  
CANADA

### Beluga whale observations: We've got an App for that!

Andrew Doolittle has been with Fisheries and Oceans since 2001. He has worked with DFO Science and Species at Risk, providing 15 years of experience with GIS database and application development, modeling, web mapping and cartographic (mapping) support. He is currently working with the Fisheries Protection Program and the Regional GIS Coordination office, supporting DFO Central and Arctic Region.

Andrew has been working with Sonja Ostertag and Lisa Loseto since 2014, developing an application to collect observations of belugas in support of the beluga monitoring program.







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SHARING KNOWLEDGE

AIPAARNIHAT  
ILIHIMAŖAT  
AVKTURTINGIT



## **APPENDIX IX: OPENING REMARKS**

### **a: Message from Chair & CEO of the Inuvialuit Regional Corporation: Mr. Duane Smith**

Arriga! Welcome to the Region.

I guess it is only fitting that I am now speaking at this forum focused on our health and wellbeing and the sustainability of our nutrition and ecosystem we see ourselves a part of. As some of you may be aware, I have been an advocate of such collaboration for this type of workshop but also for a broad Beaufort Sea Conference that includes our cousins from Alaska.

This is a unique opportunity with all the key parties here to develop a revised approach moving forward and as you formulate this over the next few days I would expect it to address the need for enhanced socio-cultural aspects reflecting the Inuvialuit relationship and dietary necessities. We have been sustainably harvesting beluga for thousands of years and expect that to continue. That is why, in recent years we have implemented methods to restrict activities in the key beluga habitat by establishing these MPA's long before they were entered into any federal legislation. That is why, we also developed the beluga bylaws of our own initiative to ensure our practices were set and reduced any potential struck loss ratio to practically nil.

As this is but one workshop focused on a key species, it may also be time to consider revitalizing the annual Nunatsiq Science Days that provides everyone with an opportunity to see all research being conducted, be it Inuvialuit knowledge or western science, or a combination of both. It would also be an opportunity for strengthening relationships and combined research while addressing gaps that do exist.

Now today with the respected Elders and leaders in this room we can forge a renewed effort, as our Youth become engaged. I wish you all the success in this workshop and a big applause to the organizers for this workshop.

QUYANAQ! QUAYANNINI! KOANA!

### **b: Message from Chair of the Inuvialuit Game Council: Mr. Patrick Gruben**

Good morning. I'd like to welcome Youth, community members, hunters, researchers, newly elected IRC Chair Duane Smith, and FJMC Chair Vic Gillman, to this Summit. I'd like to thank you all for taking the time and effort to travel from far distances to join us here. I'd like to recognize Willie Goodwin, Chair of the Alaska Beluga Whale Committee – thank you for joining us on this side of the border. This is an important and unique opportunity in the ISR for community members, researchers, and managers to discuss and share knowledge on beluga whales and direct future research and monitoring programs. Inuvialuit have been and continue to be leaders on beluga monitoring. The ongoing long-term work in the ISR on beluga has recently been nationally and internationally recognized and we want to continue being leaders in this work. The work of Monitors has provided us with a sample set that researchers have used

to gather information on beluga health and habitat. We want to thank the Monitors for this. Beluga are an important part of our culture, diet, identity and history. Archeological work at Kittigazuit shows us how important beluga harvest were to our ancestors. Over 1000 people gathered to hunt beluga in the summers of times past.

To the researchers - some of you we know on a first-name basis, some we hope to come to know you better in future and work with you more. Some we have long-standing important relationships with and we look forward to working with you more. As Inuvialuit we have observed changes over time such as the large harvest of whales in Ulukhaktok. In this time of changing climate these changes are impacting beluga and their habitat, and as Inuvialuit it is important to investigate and reduce these impacts if possible. To the community members - I would encourage and urge you to engage and share your knowledge. I look forward to an open conversation with you all. It is as much about sharing traditional knowledge as scientific knowledge. I think communities have much to learn from each other. I hope the conversation that is shared here develops into future collaborations between communities, researchers, and managers

Thank you very much.

### **c: Message from Chair of the Fisheries Joint Management Committee: Mr. Vic Gillman**

Welcome all participants,

I am pleased to be here and to be part of this continuing exercise of engaging communities and science in beluga research and management in the ISR. As stated earlier, this program is extremely successful, has created one of the best databases in the world, and has produced 100s of research papers.

What has made the Beluga Research and Monitoring Program successful? —COMMUNITY – COOPERATION—STRONG GUIDANCE—AND A GOOD TOOLKIT!

COMMUNITY –support for reporting and cataloging their own harvest and a willingness to learn as much as possible about one of their most important species—beluga!

CO-OPERATION—willingness of participants to work within the structures outlined in the Inuvialuit Final Agreement (IFA) that bring community members, scientists and managers into the same room on a continuing basis.

GUIDANCE STRUCTURES—documents that provide guidance for the exercise: The Inuvialuit Final Agreement, FJMC Beluga Management Plan, DFOs Integrated Oceans Management Plan, and now the Marine Protected Area Management Plans.

TOOLKIT—commitment, respect, trust, and flexibility

- Commitment of all who have worked in the programs
- Respect for the two ways of knowing
- Trust in people meaning and doing what they say
- Willingness to listen and to change to make it work

Results speak for themselves:

- Best documented beluga harvest in the world
- Publications covering abundance, distribution, migration, food webs, health, --and more all key to understanding how to ensure their sustainability
- An MPA that is unique to the Arctic and to the purpose of protecting the traditional hunting areas and interests of the Inuvialuit
- A spirit of cooperation between DFO, the communities, and FJMC that attracts and excites people who work in this program
- A model of management that has earned the respect and admiration of others

This Summit is a great opportunity to reflect on where we have been, what have been accomplished, and what yet remains to be done. I wish you a most enjoyable Summit and look forward to the outcomes.

Enjoy!

**d: Message from Regional Director of Science, Central & Arctic Region, Fisheries and Oceans Canada: Dr. Michelle Wheatley**

Good Morning,

I am very pleased to be here and to provide some opening remarks on behalf of the Department of Fisheries and Oceans Canada (known as DFO). Our Regional Director General, Mr. Dave Burden, would also have liked to be here as part of this Beluga Summit. Unfortunately he was not able to do so and asked me to pass on his regrets.

It is over 30 years since I had my first opportunity to visit the arctic as an undergraduate university student. For almost 20 years, I have had the honour and pleasure of working in the northern co-management system, both as an employee of co-management boards (in the Sahtu and in Nunavut) and as an employee of the DFO.

From my perspective, this Beluga Summit exemplifies the goals of co-management; bringing together researchers, harvesters, Elders, Youth and resource managers for the sharing of our collective knowledge about beluga whales. Together, we will identify common concerns and knowledge gaps in beluga research and monitoring to help direct future beluga whale research in the ISR. We are here, all of us, to learn from and to share our knowledge with each other.

Our DFO staff have a long history of working with our co-management partners, on many issues in the Inuvialuit Settlement Region. This includes many years of close, collaborative work with communities on beluga in the ISR. This Summit builds upon that collaboration and partnership. The outcomes of this meeting will form the basis for developing a research and management plan for beluga for the next 5 to 10 years, ensuring a knowledge-based approach to co-management for the future.

As you are likely aware, the Prime Minister's mandate letters to his Ministers were made public. I hope that many of you have already looked at the DFO Minister's letter, and if not, I encourage



you to do so. The Minister's mandate letter makes clear the importance for him and the Government as a whole to work closely and engage with indigenous peoples. The letter also emphasizes the importance of the Arctic, especially in relation to climate change and working with indigenous peoples to manage our oceans.

I look forward to the presentations and discussions over the next three days, and thank everyone, in advance for their engagement and participation.

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## APPENDIX X: COMMUNITY AND YOUTH PRESENTATIONS (DAY 1)

### A: LONG-TERM MONITORING AND MANAGEMENT OF BELUGA WHALES IN THE ISR: MR. FRANK POKIAK, OUTGOING CHAIR INUVIALUIT GAME COUNCIL AND LONG-TIME BELUGA MONITOR


Monitoring and Management of Beluga Whales in the ISR

Frank Pokiak  
Tukttoyaktuk

A group of people in outdoor gear are gathered around a large white whale carcass on a flat surface, possibly a boat deck or a pier. They appear to be conducting a post-mortem examination or a health check. One person is wearing a red jacket, another a brown jacket, and another a dark jacket. They are all looking intently at the whale.

Beluga Management and the IFA

The third key principle of the Inuvialuit Final Agreement is *"To protect and preserve Arctic wildlife, environment, and biological productivity"*.

A photograph showing two people on a small boat in a body of water. A large white whale is partially visible in the foreground, extending from the boat towards the water. The background shows a calm sea and a light sky.

Beluga Management Zones

A map of the Inuvialuit Settlement Region (ISR) showing various management zones for beluga whales. The map is color-coded with different shades of blue and green, indicating different zones. Labels include "Setha Harbour", "Uluksalik Harbour", and "Povunguaq". A scale bar is visible in the bottom right corner.

Hendrickson Island

A photograph of a person standing on a tall, triangular wooden structure built on a rocky shore. The structure is made of several wooden poles leaning against each other. The person is silhouetted against a bright sky. The sea is visible in the background.





# B: OVERVIEW OF BELUGA RESEARCH IN THE INUVIALUIT SETTLEMENT REGION – DR. LISA LOSETO, RESEARCH SCIENTIST, FISHERIES, OCEANS AND THE CANADIAN COAST GUARD

### Beluga Science Overview

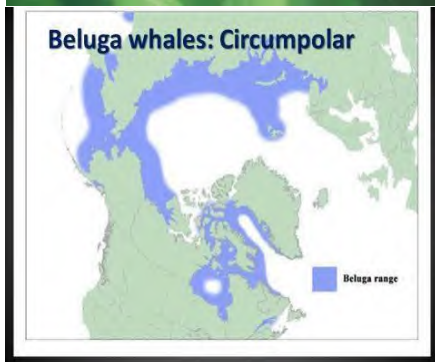


Lisa Loseto  
Freshwater Institute, Fisheries and Oceans Canada, Winnipeg, MB

### Beluga Whales: Adaptations to Arctic


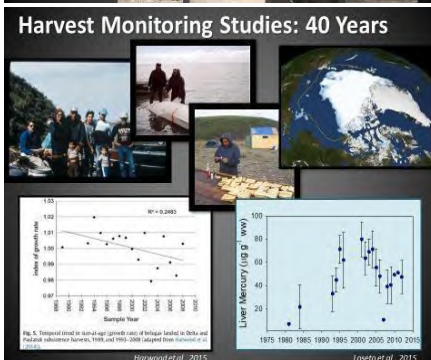
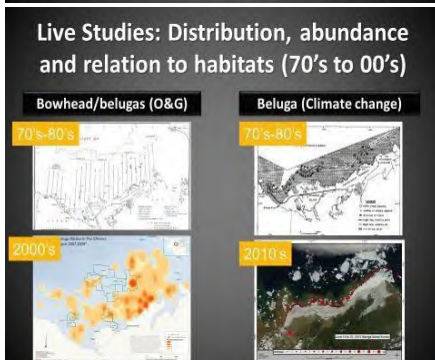


- Toothed Whales
- Long lived
- Adapted to life in ice
- migratory
- Very Social
- Diverse Diets
- Adapted to life in ice
- Canaries of the sea

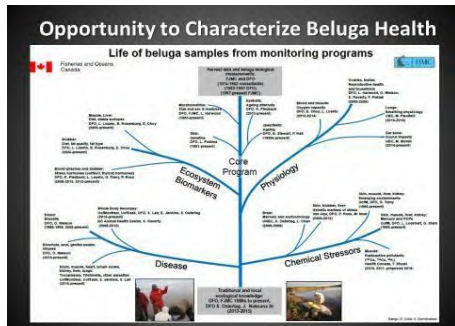


### External Drivers- Research Directions

- 1970 Oil and Gas (estuary 1970's)
- External Interference (1970's and earlier)
- 1980 Oil and Gas (offshore 1980-86)
- 1990 Contaminants
- Climate Change
- 2000 Renewed Oil & Gas (2000's)
- 2010 Climate Change & Cumulative Impacts of multiple stressors





### Projected Impacts of Climate Change

Are we seeing impacts of climate change on beluga habitat and distribution? Is this reflected in the prey base: quality and quantity

*Harwood et al., 2015; Loseto et al., 2015 suggest so...*

### Beluga whales: Indicator species for Climate Change

- Currently stable and healthy population
- We are seeing changes in the ecosystem and in belugas
- How can we be ready?
- Beluga is a window to understanding ecosystem and ocean changes

### Thank you

Logos for:
 

- FJMC
- Indian and Northern Affairs Canada
- ArcticNet
- NSERC CRSWG
- ArcticNet

## YOUTH PRESENTATIONS

### C: IMPORTANCE OF KENDALL ISLAND WHALE CAMP: PRESENTED BY KYLE CONLEY, INUVIK YOUTH



### Traveling to the Whaling camp

- Most of the years my grandparents Walter and Maureen Elias would travel out to their whaling camp (Baby Island) on July 1<sup>st</sup> which is located in the Beaufort Sea North of Inuvik.

## Whaling Time

- Whaling is a sensitive time of year for some people. The weather can change instantly. It either stays cool for days which is perfect to work on the muktuk.
- It is always weather permitting to hunt Beluga Whale.
- If it's too hot outside it can spoil the muktuk to an extent.



## Preparing the Whale



- Once the whale is cut up it is put on pallets for the blood to drain and the blubber to cool off. Once cooled off it is later cut into smaller pieces, washed and then hung to drain out water.



## Sharing for generations to come



Baby Island



## My Home Away From Home

- My home for the summer months was awesome I did not know it was part of survival I thought of it as it just has to be this way life. There are times we stayed at the whaling camp until August to prepare other traditional foods for instance picking berries such as blue berries and akpiqs. My grandmother would show her children where to find berries, I am hoping to share the culture I live in with others who have different opinions. It is difficult to share my knowledge at this age but I am learning to live it to pass it down to my future children.

## Harvest for winter months coming

- When a whale is harvested my family is happy and instantly start working together. Pulling the whale up on the beach for everyone to start cutting it up into sections.



The meat of the whale is cut up into dry meat, that is hung dried and smoked for mipku.



Whale Dry Meat is also canned and mixed with blubber oil which can last for months, if stored properly and ready to eat at anytime.

## WHALING SEASON

- Every year in July my grandparents Walter & Maureen Elias would travel to their whaling camp with my family. My aunts, uncles and many cousins are ready to enjoy the life of living. They would stay at their whaling camp until they are done preparing their muktuk mipku, raw muktuk for the months to come. It is part of survival in our culture.
- Whaling is passed down from generation to generation in my family. My Great grandparents Big Jim and Ida Rogers would travel to the same place where my childhood is being a part of now. Back then my great grandparents would travel in skiffs and scows which took them days to go Sunmiciq known as Kendall Island, but today it just takes us hours maybe four or five hours to go the same distance they did.
- My grandparents Walter and Maureen has raised my mom to share the same life style they knew best. Now I am sharing that with you.
- My mom recalls travelling to Kendall it did take them days too. They would have different camping places along the way to their whaling camp but today it is just hours away why because the different outboard motors and boats have more speed back in her days as a childhood.




## D: INUVIALUIT YOUTH PERSPECTIVE: KATE SNOW, FISHERIES, OCEANS AND THE CANADIAN COAST GUARD, AND LOCAL INUVIK YOUTH

No powerpoint presentation – see text.

## E: THE ALASKA BELUGA WHALE COMMITTEE: A PARTNERSHIP IN BELUGA RESEARCH AND MANAGEMENT: MR. WILLIE GOODWIN, ALASKA BELUGA WHALE COMMITTEE CHAIR, KOTZEBUE, ALASKA, USA.

**The Alaska Beluga Whale Committee - a partnership in beluga research and management**



Willie Goodwin, Jr.  
Alaska Beluga Whale Committee


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**Purpose of ABWC**

- Promote conservation & wise use of belugas
- Involve hunters in management decisions
- Hunters able to exchange information
- Research to provide information needed to conserve belugas and have a safe harvest
- Collect harvest data
- Provide a forum for communication (users, agencies, other nations)

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**ABWC Formation**

- ABWC formed in 1988 – before co-management existed in Alaska
- ABWC formed to develop beluga management program before there was a crisis
- If problem arises, co-management will be in place.
- People who hunt belugas as well as scientists & agencies will be involved in solutions

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**ABWC Membership**

Consists of:

- ➔ Hunter delegates
- ➔ Local & tribal government reps
- ➔ Federal & State scientists
- Everyone votes except on hunting matters (only hunters vote then)
- Inuvialuit original members, withdrew due to different relationship with IWC

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## What is "Co-Management"

- Decisions about resource management shared by Agencies & Users
- MMPA allows cooperative agreements with Alaska Native organizations for co-management of marine mammal subsistence harvests in Alaska



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## ABWC Management Plans

- Management Plan in 1990
- Co-management Agreement 1999
  - ➔ Signed by ABWC delegates
  - ➔ Resolutions of village support



\* Working on regional plans & hunter guidelines for Eastern Chukchi, Kotzebue, Norton Sound, Bristol Bay.

\* Inuvialuit-Inupiat Agreement in place since early 2000s

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## What the ABWC does now

- Harvest monitoring
- Stock identification using genetics
- Satellite tagging
- Aerial surveys
- Acoustics

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## ABWC at work



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### Consistent funding a key to success

We don't have big funding, but we are very cost effective because of all the cooperation

Our entire budget is \$100,000 - \$200,000 a year

Members review study plans & budgets at meetings, suggest & prioritize projects

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### Research - Before the ABWC

When ABWC formed in 1988:

- ➔ No survey-based population estimates
- ➔ No systematic harvest info
- ➔ Not sure summer concentrations were discrete stocks
- ➔ Little known about movements or wintering areas

**ABWC conducts research to answer these questions.**

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### Harvest monitoring

- On-site monitors, sampling - NSB Wildlife
- ABWC members, hunter representatives
- Local groups with Regional support



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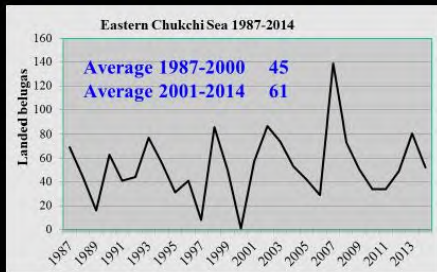
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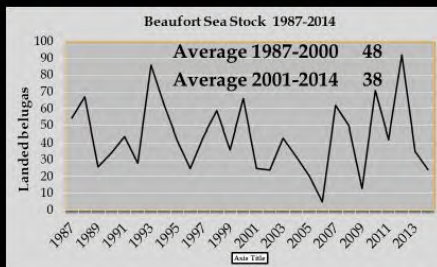


## E. Chukchi Sea Stock Harvest



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## Harvest trend - Beaufort stock



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## Genetic Stock ID after ABWC

- 1992 - ABWC funded O'Corry-Crowe, clear communication developed
- 2006 - ABWC hunters have provided ~2000 samples, picture quite clear
- Stock structure accepted by ABWC and NMFS

The genetics project had a significant effect on success of other ABWC activities because it got everyone working together.

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## Collecting samples to learn about diet, genetics and other things



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## Beaufort Sea Stock Harvest

	Landed				
	2010	2011	2012	2013	2014
Barrow	2	7	5	0	0
Diomede	1	0	0	1	0
Kaktovik	5	0	0	1	0
Kivalina	0	3	3	1	0
Nuiqsut	0	0	0	0	0
Pt. Hope	<u>62</u>	<u>32</u>	<u>84</u>	<u>31</u>	<u>24</u>
TOTAL	70	42	92	34	24

5-yr average = 52

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## Stock ID Before the ABWC



- Summer concentration areas were proposed as management stocks
- 1988 when ABWC formed - molecular genetics was a new science, no samples available

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## Collecting genetics samples with kids



## Genetics samples in the lab



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## Genetics studies (From O'Corry-Crowe)

sampling sites ~80  
samples ~2000

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### Satellite Tagging

- Open discussion about tagging projects
- Cooperative – scientists + hunters
- Point Lay – 23 belugas tagged
  - ➔ Tagging just after annual hunt
  - ➔ Hunters participate
- Bristol Bay – 31 tagged
  - ➔ Hunters + scientists
- Norton Sound/Yukon – 5 tagged by hunters

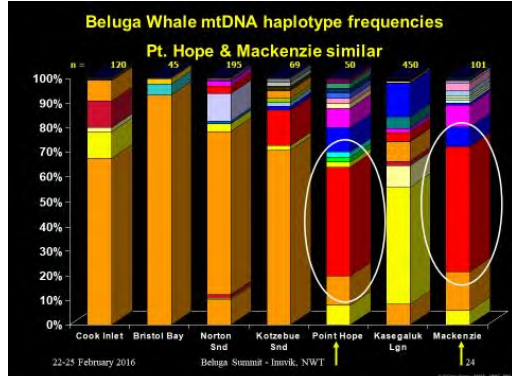
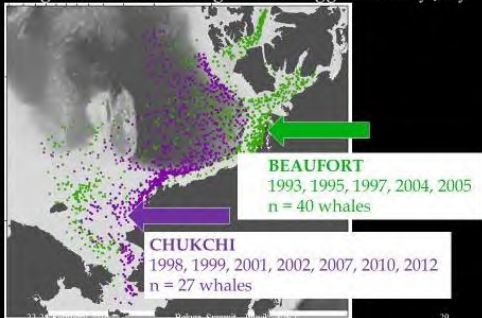
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### Norton Sound Tagging

AWBC Vice Chairman Tom Gray tagged the 1<sup>st</sup> belugas from Norton Sound.



Beluga locations from tags - Most tagged in early July



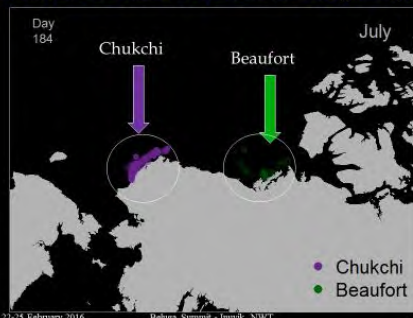
### Satellite tagging Point Lay, 1998-2002

Not only "science"

- Excitement (new info)
- Idea generator
- Communication



### Locations of Beaufort & Chukchi belugas in July





## Aerial Survey Program

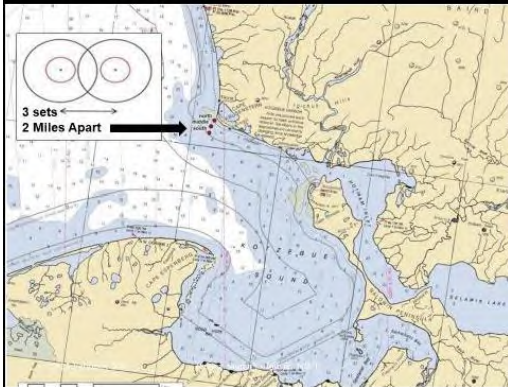
- Used for abundance estimates
- Early years - local participation
- Long and often boring
- Now, leave surveys mostly to the biologists!



22-25 February 2016

Beluga Summit - Inuvik, NWT

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## Communication is the key to success!

- ➔ Meetings - plain English, talk about controversial things
- ➔ Newsletters with information about research, management
- ➔ Science Workshops

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## So What?

### Working together leads to new ideas

- If we just stick to ourselves, we are more likely to do what we've always done
- People with different experiences come up with new ideas, think outside the box

ABWC has always tried new ideas - genetics, satellite tags, mark recapture and now acoustics

The More we bring our different ways of thinking together, the more likely we are to make progress in understanding belugas and conserving them for future generations.

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## New studies - Acoustics

Hydrophones listen for belugas and other marine mammals



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Beluga:  
7/9 - 10:30-10:45am  
7/25 - 10:26-10:35am  
Orca: 7/17 - 8/22  
Harbour Porpoise:  
7/6 - 9/10

22-25 February 2016

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## Why ABWC Succeeds

- Mutual respect - committee culture transmitted to new members
- Results get back to users
- Joint decision making about science, budgets, etc.
- Collaborative research

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## The Future - ABWC concerns

- Climate change and how it will affect us as hunters and our way of life
- Climate change and how it affects the belugas and other marine mammals
- Increased shipping as the ice decreases
- Oil & gas development in the Chukchi & Beaufort

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## Cooperative research we'd like to do with Canada

Satellite tagging studies at the same time in the Beaufort (Canada) and Chukchi (ABWC) to learn more about how our stocks move, migrate and mix.

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## Quyanaq!



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# COMMUNITY PRESENTATIONS

## F: TUKTOYAKTUK: HENDRICKSON ISLAND ANNUAL BELUGA PROJECT, PRESENTED BY JOCELYN NOKSANA

### HENDRICKSON ISLAND



ANNUAL BELUGA PROJECT  
Tuktoyaktuk NT

#### COMMUNITY INVOLVEMENT



- Local hires  
-IKR holder, summer students, Beluga monitor, camp cook, boat & boat drivers
- In 2012, the Science team came and did a workshop to go over results with the community
- 90% of harvested whales are sampled, harvested in partnership and supportive
- Thanks to FJMC, the THTC owns a dome, which will help membership when stranded anytime of the year.
- The THTC also built a 16x20 insulated cabin in 2013 for the membership
- Traditional knowledge is now being recognized by DFO & FJMC, which is really important to the community (included in studies)






### SUMMARY

- Community based monitoring of beluga in the ISR in a collaborative effort between FJMC, DFO, THTC & University Partners
- The main goals of the team is to conduct a health assessment of the harvested whales, collect samples to study stress and diet indicators in the whales, and record traditional ecological knowledge and local observations about harvested and migrating whales.
- Longest running project description, since the late 80s
- Billy Day, many years ago was instrumental in getting the beluga management zones set up in the ISR.




Belugas are culturally important to us; as a food source, we are thankful to have this scientific knowledge. We are even more thankful that Science is working with Traditional Knowledge.

**G: PAULATUK: A SHARED PRESENTATION BY RUBEN GREEN, JODY ILLASIAK JR. AND MELANIE WOLKI**





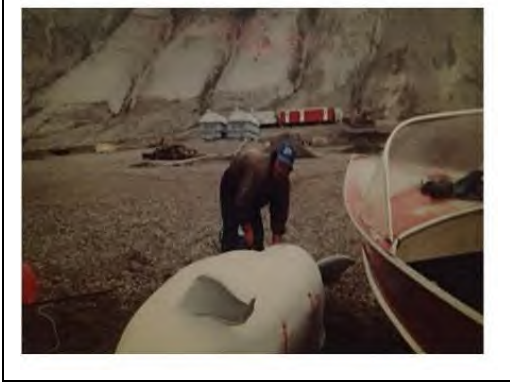




### Harvest History









Harvesters; Brandon Green (Monitor), Brent Wolki and Dennis Illasiak – Tippi 2013



H: AKLAVIK: BELUGA WHALES AT SHINGLE POINT, PRESENTED BY DEAN AREY





**I: INUVIK: BELUGA WHALES AND WHALING CAMPS, PRESENTED BY CLARA DAY, LAWRENCE ANGASUK AND KYLE CONLEY**

## BELUGA WHALES

Lawrence Angasuk  
Clara Day  
Kyle Conley



### PREPARING BEFORE WHALE CAMPS

- Food
- Gas
- Tools – Shells, Harpoon, Drag Hook, Rope, Knives, Ulu, Balloon, Binoculars, Camera, Hunting Bag, Grub Box, etc.
- Service Boat and Motor
- Weather

### WHALING TOOLS

- Harpoon & Balloon
- Rope
- Drag Hook
- Knives & Ulu / Sharpening Stone
- Gun & Shells
- Extra Harpoon and Shells




### WORKING WITH THE WHALE




### MAMMAQTUQ!




## INTRODUCTION

- Preparation Before Whaling Camps
- Camp Set Up
- Tools & Preparation for Hunt
- The Hunt
- Working on The Whale
- Preparing the Whale
- Storing The Whale
- Home Time




### CAMP SET UP


- Get Wood
- Haul Water
- Repair Camp if needed
- Repair Maktak Work Area




### THE HUNT – HARPOON, SHOOT & TOW



### PREPARING THE WHALE



### STORING THE WHALE



- Once done working with the whale and preparing it you let it cool off before pailing the maktak and make sure it has an air hole for it to breathe.



HOME TIME  
NEAR THE END OF JULY TO AUGUST WE  
START HEADING HOME WITH OUR HARVEST.



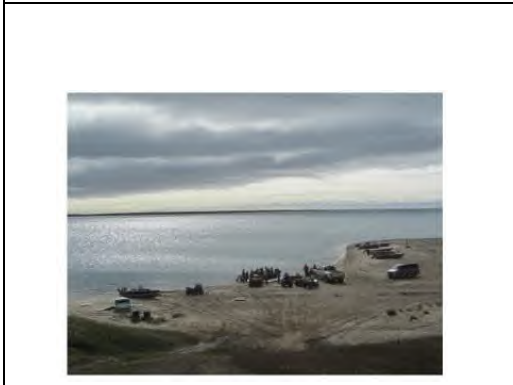
SHARING FOR GENERATIONS TO COME.



**J: SACHS HARBOR: SACHS HARBOUR PERSPECTIVE, PRESENTED BY CJ HAOGAK (SAMPLING), NORMAN ANIKINA (SAFETY AND CONCERNS) AND RYAN LUCAS (OBSERVATIONS)**

Sachs Harbour's Perspective  
on Beluga Whaling  
*Beluga Summit  
Inuvik, NT  
February 2016*

Safety and Concerns- Norman Anikina  
Observations- Ryan Lucas  
Sampling- C.J. Haogak





Occasional Use of Machinery Assistance



**K: ULUKHAKTOK: VIDEO: “THE SUMMER OF BELUGA WHALES”, PRESENTED BY JOHN ALIKAMIK, CORRIE JOSS, AND KELLY NIGIYOK**

Ulukhaktok Youtube Video of Whale Hunt from Denise

<https://www.youtube.com/watch?v=nVDhQVpMZjo>

Select photos from presentation below:







# APPENDIX XI: HUMAN HEALTH PRESENTATIONS (DAY 2)

## A: INTERNATIONAL POLAR YEAR (IPY) INUIT HEALTH SURVEY FINDINGS IN THE ISR: DAVID XU, UNIVERSITY OF OTTAWA, AND SCOTT TOMLINSON, NORTHERN CONTAMINANTS PROGRAM

uOttawa

### International Polar Year Inuit Health Survey findings in the ISR

-- updates with focus on beluga whale

David Xuefeng Hu and Laurie Chan  
University of Ottawa

uOttawa

### IPY Inuit Health Survey

- A comprehensive health and nutrition survey conducted in 2007-08.
- Nunavut, Nunatsiavut and Inuvialuit Settlement Region (ISR).
- Diet and nutrition, food security, chronic diseases, anthropometric and lab measurements of health indicators.
- Food frequency questionnaire (traditional food) and 24-hour recall.

uOttawa

### IHS participants in ISR

- Total 280 adults (≥ 18 years of age) participated the survey, of which 187 are women, 103 are of child-bearing age, 178 participants aged 40 and above.
- Men ate more country food than women.
- Older adults (≥ 40 years of age) ate more country food than younger adults (< 40 years of age).
- Beluga oil, beluga muktuk, and dried beluga meat were among the most frequently consumed (top 10) country food.

uOttawa

### Beluga is an important food in the ISR

- Over 90% of ISR adults consumed some beluga parts.
- Dried beluga meat, beluga muktuk (with/without blubber), and beluga oil were the most commonly consumed.
- Beluga consumption frequencies and consumption amount varied.
- Women at child bearing age ate beluga as often as the general Inuit population, but lower amounts.

From International Polar Year Inuit Health Survey 2007-2008

uOttawa

### Beluga intake in ISR

Beluga Part	Percentage (%)
BELUGA OIL	99.0
BELUGA BLUBBER (RAW OR COOKED)	90.2
BELUGA MUKTUK WITHOUT BLUBBER (RAW OR COOKED)	88.2
BELUGA MUKTUK WITH BLUBBER (RAW OR COOKED)	88.0
BELUGA MEAT (DRIED)	86.8
BELUGA MEAT (FRESH, COOKED OR FROZEN)	71.8

From International Polar Year Inuit Health Survey 2007-2008

uOttawa

### Beluga is good for health

- Most parts of the beluga are excellent sources of protein.  
Build and repair all parts of the body
- The liver, skin and blubber are excellent sources of vitamins.  
Keep the skin, bones, eyes, and teeth healthy
- Beluga blubber is a source of healthy fats, called omega-3 fatty acids (e.g. EPA,DHA).  
Keep the heart healthy and are good for brain development
- Beluga meat and muktuks are rich in selenium.  
Anti-oxidant, offset adverse effect of mercury
- Beluga contribute to overall wellbeing of Inuit.

uOttawa

### Omega-3 fatty acids -- concentrations in Beluga parts

Food Item	DHA+EPA Concentration (g/100g)
TUNA (CANNED)	2.00
ALL TRADITIONAL FISH (CANNED)	1.75
ARCTIC CHAR MEAT	1.50
BELUGA OIL	9.00
BELUGA BLUBBER (RAW OR COOKED)	5.25
BELUGA MUKTUK WITHOUT BLUBBER (RAW OR COOKED)	1.00
BELUGA MUKTUK WITH BLUBBER (RAW OR COOKED)	1.12
BELUGA MEAT (DRIED)	1.12
BELUGA MEAT (FRESH, COOKED OR FROZEN)	1.12

Lahiri et al. The Journal of Nutrition 2013; 143: 923-30  
Health Canada. Canadian Nutrient File. Fish, tuna, light, canned in oil

uOttawa

### Omega-3 fatty acids -- How much to eat

- Daily DHA+EPA 500 mg was recommended to maintain good health.  
A pill; approximately 50 grams Arctic char, or Cod (Pacific); 25 grams Herring
- To meet that requirement, the following amount of beluga parts is needed:

Beluga muktuk with blubber (raw or cooked)	22g/day	2 servings per week
Beluga muktuk without blubber (raw or cooked)	71g/day	1 serving per day
Beluga blubber (raw or cooked)	15g/day	1 table spoon per day
Beluga oil	5 g/day	2 table spoons per week

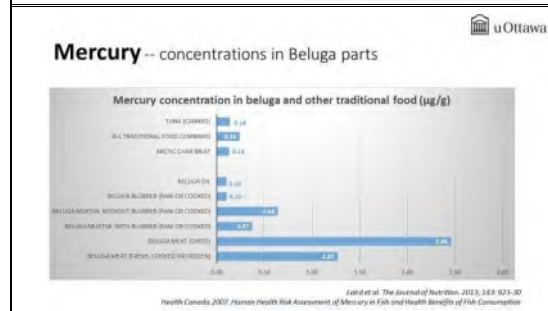
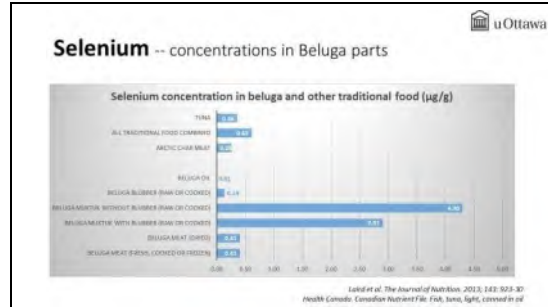
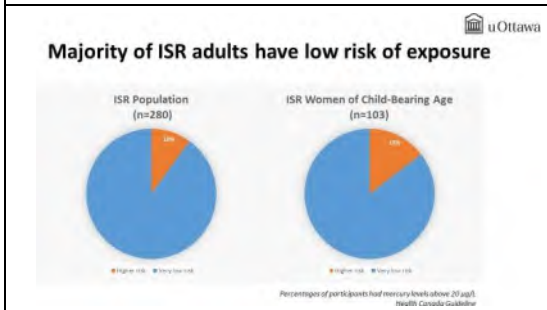
Canadian Nutrient File 2010  
Dietitians of Canada 2007



**Selenium** -- How much to eat

- Daily selenium 55 µg was recommended to maintain good health.
- To meet that requirement, the following amount of beluga parts is needed:

Beluga muktuk with blubber (raw or cooked)	20 g/day	2 servings per week
Beluga muktuk without blubber (raw or cooked)	15 g/day	1-2 servings per week



- Country food, including beluga is good for you.
- Majority of people in ISR have low risk of exposure to mercury.
- Studies from around the world including one in Nunavik show that exposure to mercury may have subtle effects on fetal development.
- Health Canada recommends pregnant women and women at child bearing age should limit exposure to mercury.

**B: BELUGA HEALTH AND FOOD-BORNE PARASITES IN THE ISR: DR. EMILY JENKINS, UNIVERSITY OF SASKATCHEWAN**

**Beluga health and food-borne parasites in ISR**

Emily Jenkins and Rajnish Sharma (U of SK)  
Sonja Ostertag and Lisa Loseto (DFO)  
Stéphane Lair (CWHC)  
Craig Stephen (CWHC)  
Brett Elkin (Govt NT)  
Alvin Gajadhar (CFIA)  
Brent Dixon (HC)

**Overall Objectives**

- Determine the health of the ISR beluga population
- Compare to other beluga populations
- Help communities to identify and address food safety issues related to the consumption of beluga
  - Toxoplasma
  - Trichinella?
- Compare to other communities in the North
- Determine a baseline against future change



## Background – Why *Toxoplasma*?

- Detection of the food borne parasite *Toxoplasma gondii* in beluga in the ISR
- Presence of *Toxoplasma* in wildlife in the Canadian Arctic (and beluga in St Lawrence)
- Inuit Health Survey – exposure of people across the Canadian Arctic to *Toxoplasma*



<http://www.aaas.org/news/arctics-big-thaw-may-affect-health-whales-seals>

### Arctic's Big Thaw May Affect the Health of Whales, Seals

The direct impact of climate change on Arctic marine mammal health is still unclear, but there are signs that warmer temperatures are producing a "new normal" in the region.

14 February 2014 By/for: Cary Schaller

"Beluga whales now carry a cat parasite that wasn't seen in the Arctic before 2006...an increase in the cat and dog population in the Arctic may have brought the parasite north"



## NATIONAL GEOGRAPHIC Daily News

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### Is Climate Change Increasing the Disease Risk for Arctic Marine Mammals?

Climate change may be increasing the risk of disease for marine mammals in the Arctic, experts say.



- Trending Now**
- 1 More Big Waves in Oceans Coast Guard Warns
  - 2 Q&A: Inside the Fight Against Ebola—Working in Brazil
  - 3 USAD Comes on an Open Leap to Help Save Wildlife
  - 4 These Murders Show the Planet's Death And Ocean's Pulse

**4 Ways to Avoid Running Out of Money During Retirement**  
If you have a \$500,000 portfolio, download the guide by *Forbes* columnist Ken Fisher's firm. Even if you have something else in place, this must-read guide includes research and insights from leading market experts. (Free)

<http://news.nationalgeographic.com/news/2014/02/140214-seals-beluga-whale-arctic-disease-health-science>

### Beluga and Toxoplasmosis Fact Sheet

There have been recent media stories regarding the finding of *Toxoplasma* parasite in beluga whales in the Western Arctic. To date, no case of toxoplasmosis in humans has been linked to beluga that was part of this study. In general, *beluga* and other *country* food are still safe to eat.

**What is toxoplasmosis?**  
Toxoplasmosis is caused by the parasite *Toxoplasma*. The parasite infects domesticated animals and wild animals. *Toxoplasma* is not new to the Arctic.

**Who is at risk?**  
Healthy people are generally not at risk, but the parasite can seriously harm an unborn child. Pregnant women, and those with compromised immune systems, are advised to not eat raw whale meat and thoroughly wash their hands after handling raw meat.

**What are the symptoms?**  
Most people with a healthy immune system won't have any signs of the disease. Short-term effect may include fever, muscle pain, sore throat, headache, swollen lymph nodes, eye problems and an enlarged spleen. Individuals who think they have toxoplasmosis should talk to their healthcare provider.

**How to prevent getting toxoplasmosis?**

- At risk individuals, particularly pregnant women and immune-compromised persons should only eat meat that has been thoroughly cooked, frozen or dried.
- Wash hands, cutting boards and utensils after handling raw meat.
- Pregnant women should avoid cleaning litter pans and contact with cats of unknown breeding history.

For questions related to human health concerns around toxoplasmosis, contact the Office of the Chief Public Health Officer at either of the following phone numbers: (867) 929-6294 or (867) 873-2183.

### COUNTRY FOODS ARE SAFE TO EAT



## Emergence of protozoal disease impacting arctic communities and causing outbreaks among susceptible marine mammal populations

AAAS Press brief  
Feb 2014

### Emergence of *Toxoplasma gondii* parasites infecting beluga whales in the Arctic

There is no need for these change but a great lesson for the Arctic. Recent comprehensive change have evidence from "new" studies showing the presence, both of evidence of marine mammals, wildlife populations, and indigenous people to pathogens. This presence may be evidence of a shift in the Arctic, suggesting that environmental changes are occurring. An example of this is the recent finding of the parasite *Toxoplasma gondii* in beluga whales in the Arctic. This parasite is a common foodborne parasite that can be contracted from cats, dogs, and other animals. It is also found in the environment, particularly in soil and water. The presence of this parasite in beluga whales in the Arctic is a new finding, and it is likely that this parasite has been introduced to the Arctic from the south.



### Cat parasite found in Western Arctic belugas

*Toxoplasma* poses danger for pregnant women, people with weak immune systems

CBC News Posted: Feb 17, 2014 12:28 PM EST Last Updated: Feb 17, 2014 12:28 PM EST

Facebook 247  
Twitter 9  
LinkedIn 12  
StumbleUpon 247  
Email

For the first time, a parasite that can affect humans has been found infecting Arctic beluga whales killed for food, suggesting one way climate change could pose a threat to human health.



#### Related Stories

- 400 dead seals found on May Island, N.D.
- Toxic chemicals released by melting Arctic ice

#### External Links

- CBC media release (Note: CBC does not endorse any link.)

The spread of parasites, which some believe is related to climate change, is also now believed to be responsible for the death of 400 grey seals of Cape Breton island in 2012, University of British Columbia researchers say.

The researchers announced at the 2014 annual meeting of the American Association for the Advancement of Science late last week that they had detected an infectious form of *Toxoplasma gondii* in a beluga whale in the Beaufort Sea. The whale was killed by Inuit hunters. The meat of whales such as belugas is valued as a traditional Inuit food.

"Previously, *Toxoplasmosis* was not found in the Arctic"

In humans, the *Toxoplasma* parasite causes toxoplasmosis or other illness, which is often fatal in immunocompromised people.

"With the big thaw, there's a breakdown of these ecological barriers, so you've got liberation of parasites."

<http://www.cbc.ca/news/technology/cat-parasite-found-in-western-arctic-belugas-1.2536234>

## up here

LIFE IN CANADA'S FAR NORTH

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### Due North: 10 Things To Know About Toxo

The Arctic's up-and-coming parasite is tiny, sneaky and treacherous. Here's what makes it tick... and how people can make it unick.

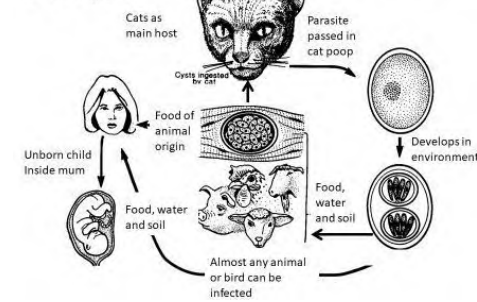
By Samia Medhat

*Toxoplasma gondii* has been in the news lately—it was recently discovered in beluga pods in the western Arctic, and touted as yet another alarming sign of climate change.

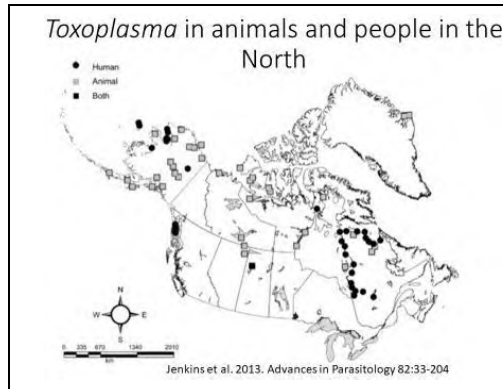
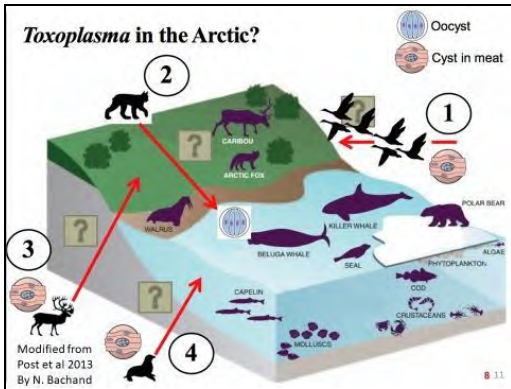
There's actually no need to panic. Yes, it's a water-borne parasite that can get into your food—if you like your raw meat, there's a chance you might swallow some *Toxo* too—but luckily in the Arctic, it's never been detected in animal fat or skin, or your morning's line. The best way to deal with this pest, get to know it better:

1. Headquarters: in the Arctic and subarctic, it's been found in most mammals, as well as geese. They likely pick it up from infected water down south, where *Toxo* can float around on its own for up to two years.

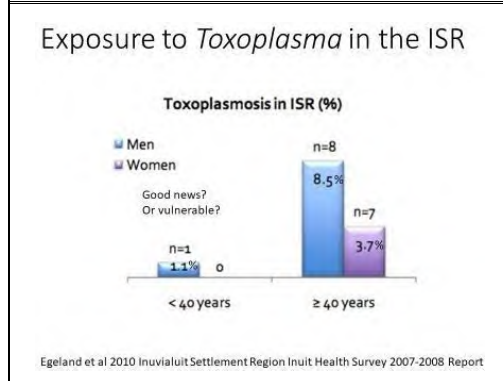
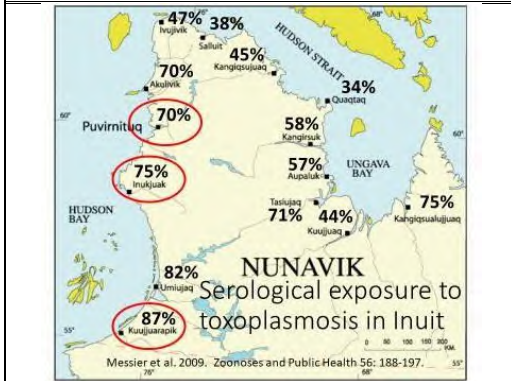
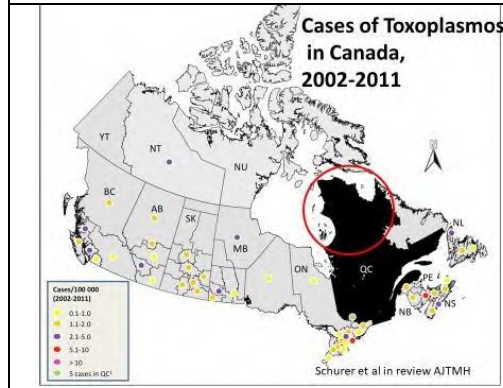
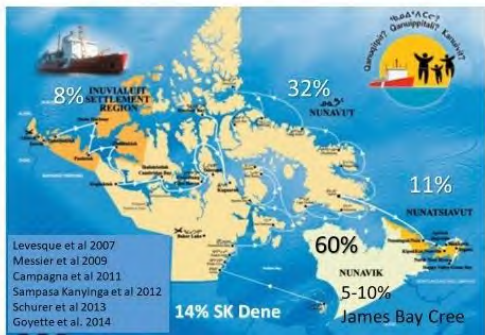
## *Toxoplasma* Life Cycle







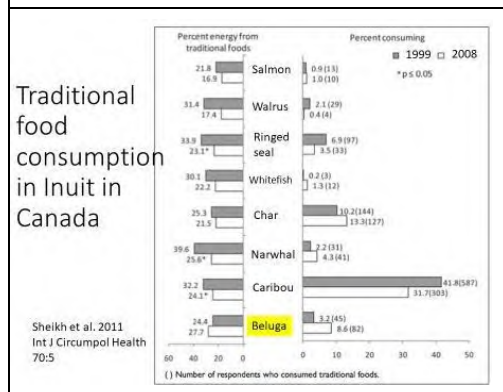
### Toxoplasma exposure in people 2004-2011



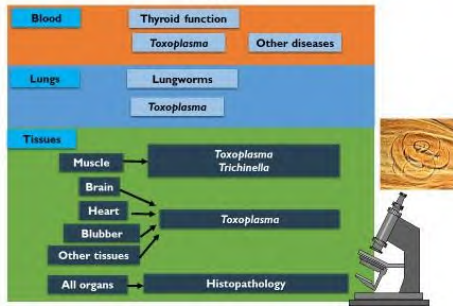
### ISR Inuit Health Survey 2007-2008

- Participants preferred country food (but also costly)
- Older participants (≥ 40 years of age) ate more country food; 55% ate beluga

Egeland et al 2010 Inuvialuit Settlement Region Inuit Health Survey 2007-2008 Report



## Sampling beluga



## Results – blood test for *Toxoplasma*

- 2014 Beluga (10 from Hendrickson Island and 10 from East Whitefish)
  - MAT: **all positive except one**
  - ELISA: To Be Done
- 2015 Beluga (13 from Hendrickson Island and 5 from East Whitefish)
  - MAT: **all positive**
  - ELISA: To Be Done
- Concerns about the accuracy of the MAT in beluga mean that some of these **may be FALSE positives**.

## Results – tissue test for *Toxoplasma*

- 2014 Beluga (26 animals, 13 from Hendrickson Island and 13 from East Whitefish)
  - Tissues: Heart, tongue, diaphragm
  - To Be Done
- 2015 Beluga (16 animals from Hendrickson Island)
  - Magnetic capture DNA extraction and conventional PCR – **all negative on heart, brain, muscle**
  - Real-time PCR: To Be Done
- Concerns about the sensitivity of conventional PCR mean some of these **may be FALSE negatives**.



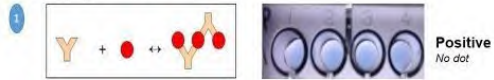
## Risk Factors for Toxoplasmosis

- Demographics (older age, female sex, education, income, living conditions, race/ethnicity)
- Soil-related occupations
- Having 3 or more kittens
- Consuming or working with raw ground beef, raw shellfish, rare lamb, locally produced cured, dried, or smoked meat, unpasteurized goat's milk
- Unfiltered surface water & natural water sources
- Preparing and consuming (raw) country foods (caribou, birds, marine mammals, shellfish)



## Modified Agglutination Test (MAT): serological test for *Toxoplasma*

1. Commercially available antigen binds with antibodies (if present) to give mat formation

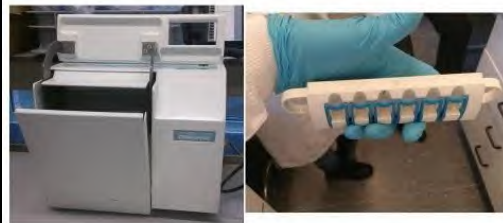


2. If antibodies absent, antigen settles and forms a dot



Credit: R. Sharma

## Magnetic capture test for *Toxoplasma*



## Next steps

- Develop and run better tests on beluga samples!
- Better understand how *Toxoplasma* gets into the Arctic and moves between land and sea
- Provide evidence for country food safety risk assessments
- Help community members make informed decisions about food consumption (wildlife species, individuals, and organs), method of food preparation, and disposal of carcasses

## Control measures

- Hand and food hygiene (soap and water)
- Cook meat to 67C
  - Smoking? Drying? Sausage?
- Freezing (several days at -20C)
- Special precautions for pregnant women and immunocompromised people
- Responsible cat ownership
  - Diet
  - Population control
  - Litter box hygiene

Outstanding questions for toxoplasmosis in the North

- What are the relative contributions of food, water, and direct exposure to cats?
- In northern wildlife, what organs are most likely to be infected and most likely to be consumed?
- What methods of food preparation allow survival of viable tissue cysts? (drying? smoking?)
- How are wildlife infected (south to north?)
- How are wildlife important for human harvest and ecosystem function affected?
- How are things changing?



**Funding**

- ArcticNet Network of Centres for Excellence
- Canadian Foundation for Innovation Leaders Opp. Fund
- Northern Scientific Training Program
- NSERC Discovery and Northern Research Supplement
- NSERC CREATE Training program
- Polar Continental Shelf Project
- Public Health Agency of Canada
- Saskatchewan Health Research Foundation
- WCVN Enhancement, Interprovincial, & Wildlife Health Funds





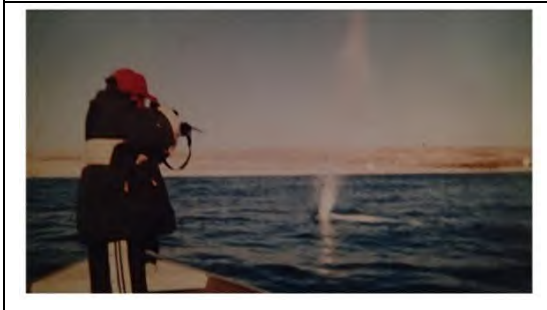
**C: TRADITIONAL KNOWLEDGE AND FOOD PREPARATION: JOHN NOKSANA JR. AND GERALD INGLANGASUK, FISHERIES JOINT MANAGEMENT COMMITTEE**

No powerpoint presentation – see text.

**D: CULTURAL IMPORTANCE OF BELUGA WHALES: JODY ILLASIAK SR., PAULATUK**













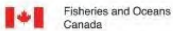



## E: CHANGES IN NUTRIENT AND PERSISTENT ORGANIC POLLUTANT LEVELS IN BELUGA TRADITIONAL FOODS FROM FOOD PREPARATION: MATT BINNINGTON, UNIVERSITY OF TORONTO

### Measuring Changes to Nutrient and Persistent Organic Pollutant Levels in Beluga Traditional Foods from Food Preparation

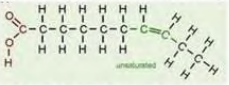

MJ Binnington, L Pokiak, J Pokiak,  
SK Ostertag, LL Loseto, HM Chan,  
LWY Yeung, YD Lei, F Wania

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### Nutrients




- Polyunsaturated Fatty Acids**
  - Found at high levels in fatty beluga blubber
  - Benefit pregnant and nursing mothers: healthy child development
- Selenium**
  - Mineral found naturally in beluga meat and blubber, as well as fish
  - Benefits: antioxidant, reduces effects Hg toxicity

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Do food preparation techniques affect the levels of **nutrients** and **POPs** in TFs?

- Beluga blubber - muktuk, uqsuq - as example


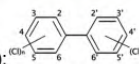




Muktuk advice to maximize nutrient minimizing POP exposure?

Uqsuq Oil

### Persistent Organic Pollutants

- Belugas may have high levels of **persistent organic pollutant (POPs)**:
  - Transported long distances to Arctic
  - Belugas consume POPs through diet (**bioaccumulation**):
- Concern for **sensitive populations**: expectant, pregnant, or nursing mothers

Donaldson et al. 2010, Jacobson and Jacobson 1996

---

### Food Preparation Impacts on Nutrients and POPs


- Different food preparation methods can alter **nutrient** and **POP** intakes from fish
  - ex. Enhanced FA, Se levels in cooked fish
- The influence of **food preparation** on **nutrient** and **POP** intakes in humans has not been looked at in belugas
- Focus on **blubber** products:
  - Nutrient yields
  - Consumption rates

Rawn et al. 2013, Wieber et al. 2008

---

### Field Campaign Details

- Samples from 2 belugas collected during 2014 summer in Tuktoyaktuk, NT





### Preparation Process

- One blubber chunk from each beluga resampled throughout preparation steps

● MUKTUK Baseline

● UQSUQ Baseline

### Fluorinated POPs

Compared influence of each preparation step to one another – Each whale individually

Because aged uqsuq oil contains almost **pure fat**.

**FOSA – LOVES FAT**

**PFOS – AVOIDS FAT**

### Acknowledgements

Fisheries and Oceans Canada  
Tuktoyaktuk HTC  
Aurora Research Institute  
Wania Lab at University of Toronto

**Funding Sources:**  
Northern Contaminants Program  
Northern Scientific Training Program  
Arctic Institutes of North America

### Nutrients

Compared influence of each preparation step to one another – Both whales together

Roasting muktuk **may enhance Se** content

Ageing uqsuq **may enhance FA** content

**Polyunsaturated Fatty Acids**

**Selenium**

- Initial results suggest that beluga blubber preparation can affect **nutrients** and levels of some **POPs**
  - Other **POPs** and **Hg**: results expected next month
- Ageing **uqsuq** likely increases levels of important **FA** levels compared to **muktuk**
  - Less **Se**
  - Opposit
- Potentia **nutrients** maximize s?

## F: BELUGA HEALTH AND TRADITIONAL ECOLOGICAL KNOWLEDGE PERSPECTIVES: JAMES POKIAK, CHAIR OF THE TRADITIONAL ECOLOGICAL KNOWLEDGE WORKING GROUP

No powerpoint – see text.

# G: ARE THE EASTERN BEAUFORT SEA BELUGA HEALTHY: DR. STEPHANE LAIR AND ÉMILIE L.COUTURE, UNIVERSITE DE MONTREAL



## What is a healthy animal / population

The most important defining characteristics of health are whether a population can **respond** appropriately to stresses and **sustain** itself.

Wildlife health is concerned with multiple **stressors**.

↓

Diseases  
Predation  
Contaminants  
Availability of food resources  
Competition with other species  
Adverse climatic conditions

Wildlife health can be applied to **individuals** and **populations**.

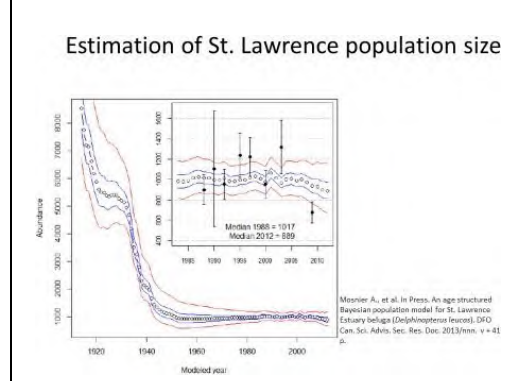
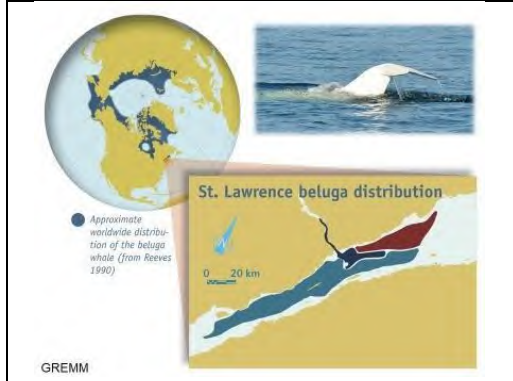
Wildlife Society Bulletin 36(3):477-482, 2012, DOI: 10.1002/wsb.163  
Promoting Wildlife Health or Fighting Wildlife Diseases: Insights From History, Philosophy, and Science. SHAMUNA L. HANSSCHL

## Signs of unhealthy animal / population

- Insufficient reproduction and/or survival
- **Presence of disease** with significant impact on the fitness of the animals
- **Energy reserves (caloric intake)** insufficient for its normal physiologic needs

↓

Resistance to fasting period  
Successful migration  
Immune system  
Reproductive success







### Are Eastern Beaufort Sea Beluga healthy?

Presence of disease

Energy reserves

Reproductive success

CANADIAN WILDLIFE HEALTH COOPERATIVE

### Histological examination

CANADIAN WILDLIFE HEALTH COOPERATIVE

### Energy reserves – body condition

- 11 beluga were subjectively assessed to be in good body condition, and 3 were assessed as “thin” (21%)
- Significance?
  - Need comparison with other populations (Arctic beluga)
  - Normal for the season?
  - Trend over the years?
  - \*Very subjective

CANADIAN WILDLIFE HEALTH COOPERATIVE



### Are Eastern Beaufort Sea Beluga healthy?

### Presence of disease

- July 2015: 16 whales (13 males and 3 females) examined and sampled
- Mild parasitic infections observed in the lungs, kidneys, stomachs and lymph nodes in most animals
- Intensity of infections low compared to unhealthy beluga
- These parasitic infections were not believed to have a significant impact on the health of the whales

CANADIAN WILDLIFE HEALTH COOPERATIVE

### Histological examination

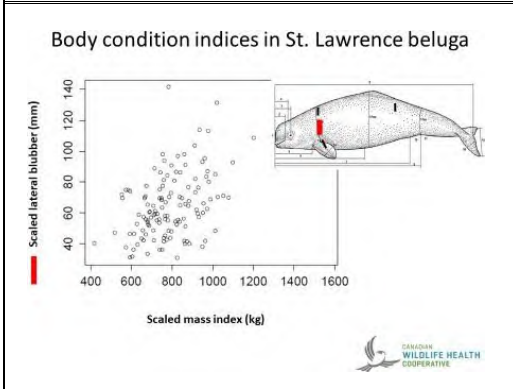
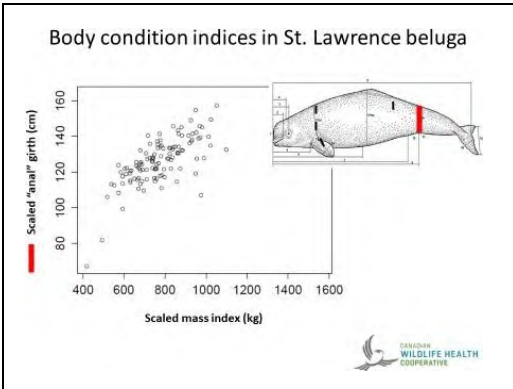
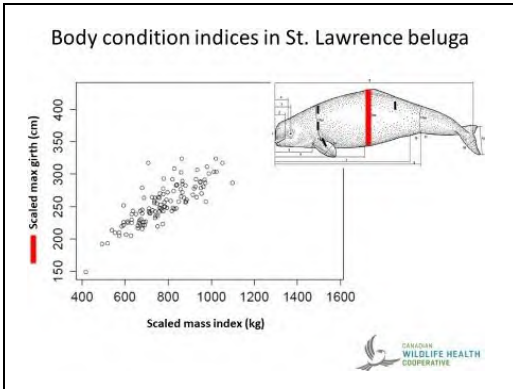
CANADIAN WILDLIFE HEALTH COOPERATIVE

### Energy reserves – body condition

- What would be a valid, easily measured, quantitative indicator for body condition?
- Morphologic measurements
- Weight: 9/16 animals

4. Maximum width (girth measurement)  
 5. Fathead (head width)  
 6. Total length  
 7. Head length  
 8. Snout length  
 9. Body girth  
 10. Body depth  
 11. Maximum depth (at the widest part of the body)  
 12. Maximum depth (at the narrowest part of the body)  
 13. Maximum depth (at the widest part of the head)  
 14. Maximum depth (at the narrowest part of the head)

CANADIAN WILDLIFE HEALTH COOPERATIVE



### Are Eastern Beaufort Sea Beluga healthy?

**Presence of disease**

- No significant disease process detected in 2015

**Energy reserves**

- Some animals were in suboptimal body condition: signification for the population unclear

Canada Wildlife Health Cooperative logo

### Are Eastern Beaufort Sea Beluga healthy?

**Reproductive success**

Canada Wildlife Health Cooperative logo

### Do Eastern Beaufort Sea Beluga carry diseases that could represent a risk for the health of communities?

**Not to my knowledge\*, but: *If it doesn't look normal, don't eat it***

\*Based on a very small sample size

Canada Wildlife Health Cooperative logo

### Acknowledgment

- FJMC, DFO, CWHC for funding
- Hendrickson crew: Hunters, whales monitors, youths and elders
- Lisa and Sonja

Canada Wildlife Health Cooperative logo

See you on Hendrickson next July!

## APPENDIX XII: CO-MANAGEMENT PRESENTATIONS (DAY 3)

### A: BELUGA RESEARCH TO INFORM CO-MANAGEMENT IN THE ISR: LOIS HARWOOD, FISHERIES, OCEANS AND THE CANADIAN COAST GUARD

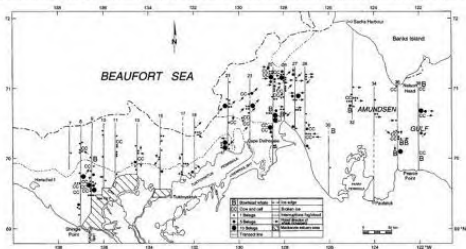


#### Research Highlights: Beluga

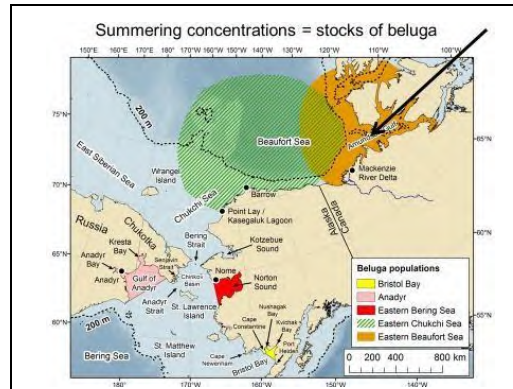
1. Stock size and trend
    - 40,000 indications stable (Oct 2016 review)
  2. Monitoring (biological data 1980-present)
    - Harvest size, timing and trend
    - Reproductive Rate
    - Growth rate
  3. Offshore
    - Distribution/relative abundance
  4. Behaviour responses/industry
- closing comments and photos

#### STOCK SIZE and TREND Aerial survey July 1992- offshore

Fig. 4. Distribution of beluga whales observed in the offshore Beaufort Sea and west Amundsen Gulf during an aerial survey, 24-25 July 1992.



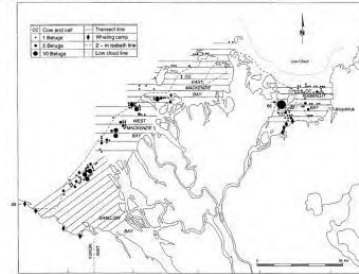
Harwood, Innes, Norton, Kingsley, Carr. J. Fish Aquat. Sci 1996.



#### STOCK SIZE and TREND

##### Aerial survey July 1992 estuary

Fig. 3. Distribution of beluga whales observed in the Mackenzie estuary during an aerial survey on 23 July 1992.



#### STOCK SIZE and TREND

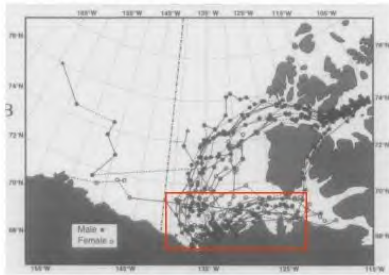
- stock size for Beaufort Sea belugas to be 39 258, with a coefficient of variation (CV) of 0.229 (Hill and DeMaster 1999)
- the second largest in Canada and was last assessed as stable or increasing (2000)
- shares Bering Sea wintering grounds with three other stocks of beluga in Alaska
- stock assessment will be done October 2016 (National Process, Winnipeg)



Billy Day, collecting genetic samples, EWF 1988



**Tracks of Satellite-tagged beluga whales: 1995- context for sightings in 1992 survey**



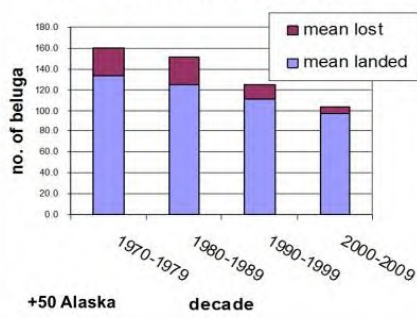
Richard, P. R., Martin, A. R., and Orr, J. R. 1997. Study of summer and fall movements and dive behaviour of Beaufort Sea belugas, using satellite telemetry: 1992-1995. ESRF Report 134.

7

**Research Highlights: Beluga**

1. Stock size and trend
  - 40,000+ indications stable (Oct 2016 review)
2. Monitoring (biological data 1980-present)
  - Harvest size, timing and trend
  - Reproductive Rate
  - Growth rate
3. Offshore
  - Distribution/relative abundance
4. Behaviour responses/industry

**Decadal trends in beluga landed 1970-2009**



+50 Alaska

2000-2005  
Hendrickson and Kendall  
N=50 adult females  
3 year calving interval  
Most repro activity 20-40 yr of age



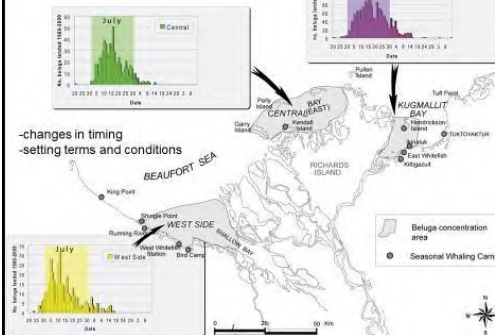
**1989- Husky Lakes Entrapment**



Beluga harvest-based monitoring -1980-2009 (n=>800 males, >200 females)

Sponsors: industry (1974-1980), DFO (1981-1986), FJMC (1987-present)

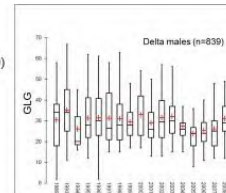
**Timing Of Subsistence Harvests Of Beluga Whales, Mackenzie Estuary, 1980-2009**



-changes in timing  
-setting terms and conditions

**Age and Growth**

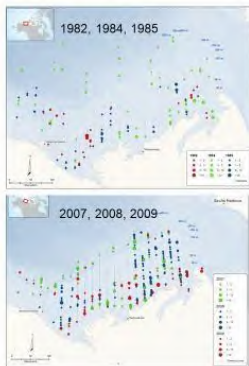
- No change in distribution of ages over 1989-2008— 20-40 GLG (15-50)
- Same pattern both sexes





## Research Highlights: Beluga

1. Stock size and trend
  - 40,000+ indications stable (Oct 2016 review)
2. Monitoring (biological data 1980-present)
  - Harvest size, timing and trend
  - Reproductive Rate
  - Growth rate
3. Offshore
  - Distribution/relative abundance
4. Behaviour responses/industry



- 4 x increased use of offshore in 2000s – why?
  - climate-related enrichment/increase in prey leading to change in distribution?
  - Temporary avoidance in the 1980s due to higher levels of industry activity?

Table 3. Summary of industry activities<sup>1</sup> in the SE Beaufort Sea during 1982, 1984-1985<sup>2</sup> and 2007-2009

	1982	1984	1985	2007	2008	2009
No. active seismic vessels	3	4	4	1	2	1
active offshore sites	15	18	19	0	0	0
Operating Dredges	6	7	8	0	0	0
Operating Drill ships	4	5	5	0	0	0
Wells Spudded	8	6	19	0	0	0

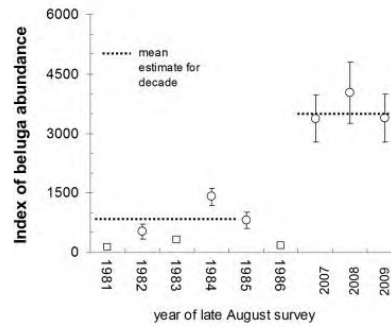
1. does not include support vessels or helicopters  
 2. data for 1982, 1984, 1985 adapted from Brouwer et al., 1988



### Behaviour: Comparing sightings from offshore systematic aerial surveys & offshore 2D Seismic 2007-2008



Aerial Surveys:  
 Offshore  
 Late August  
 1982, 1984, 1985  
 2007, 2008, 2009



## Research Highlights: Beluga

1. Stock size and trend
  - 40,000+ indications stable (Oct 2016 review)
2. Monitoring (biological data 1980-present)
  - Harvest size, timing and trend
  - Reproductive Rate
  - Growth rate
3. Offshore
  - Distribution/relative abundance
4. Behaviour responses/industry

AERIAL SURVEY  
 August 2008  
 (N=425 beluga)

SHIPBOARD  
 SIGHTINGS  
 August 2008  
 N=8 beluga

Ship data from Harris et al. 2008 and Harris et al. 2009 for whales sighted during 'on watch' hours, GMT seismic



## Looking forward

- ✓ Monitor beluga growth rates/diet shifts/observations/distribution shifts (FJMC program, TK observations)
- ✓ Marine mammal health as an 'ocean indicator' global/regional observing network (Moore and Gulland, 2014)
- ✓ Biological hotspots: exclusion zones/MPAs, industry, terms/conditions (Blackwell et al., 2015)
  - Acoustic recordings – presence/absence (e.g., Clark et al., 2015)

## In closing

- "wise use" of research resources



- Adapting "moving to higher ground"
- Invoking political/national/global responses

Many thanks to workshop organizers and all contributors to the research presented.

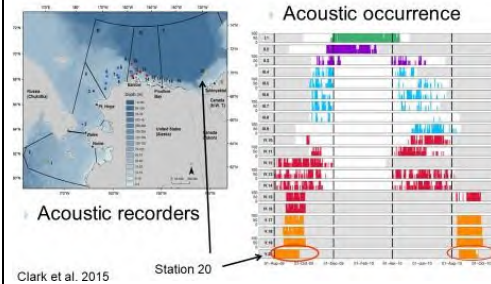
Program funding and support: FJMC, DFO (industry, ESRF, PERD)

Field help, wisdom and warm hospitality in whaling camps: Harvesters & Monitors Inuvik, Tuk, Aklavik, Paulatuk, DFO crews and labs

Analysts & GIS



## Bowhead Whale 'Acoustic Year'



Clark et al. 2015





## B: ISR BELUGA MONITORING; PAST, PRESENT AND FUTURE: DANNY SWAINSON, FISHERIES JOINT MANAGEMENT COMMITTEE



### Fisheries Joint Management Committee

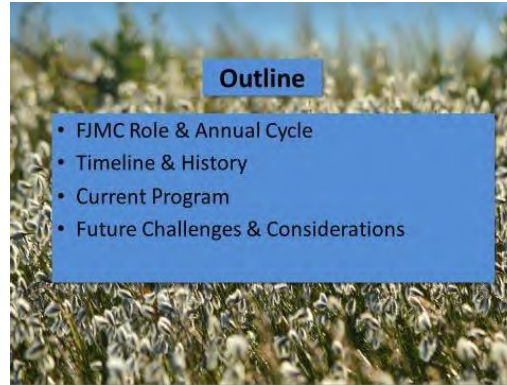
**What do we do?**

- Ensure that the renewable marine, anadromous and freshwater resources of the Inuvialuit Settlement Region are managed and conserved for the wise use and benefit of present and future generations – for all

**How is this completed?**

- A partnership between Inuvialuit and responsible federal government department – DFO
- Comprised of 2 appointed Inuvialuit members and 2 Canada members-
- chair selected by members

Inuvialuit Hunter's and Trapper's Committees



### FJMC Annual Business Cycle

1. Community Tour (June)
2. HTC President's Meeting (September)
3. DFO Science & Research Meeting (January)
4. Budget Allocation Meeting (April)

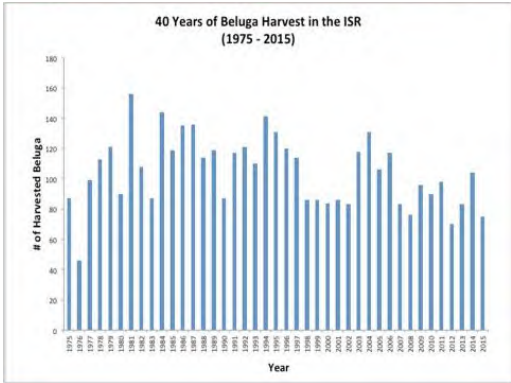
Rinse & Repeat!

### ISR Beluga Monitoring Timeline

- 1961/62 – Beluga "Fishing" Permits issued by DFO to Inuvialuit
- 1972 – First Hunter-collected harvest information
- 1980 – Data collection standardized for all of Delta whaling camps
- 1984 – Inuvialuit Final Agreement signed
- 1987 – Beluga monitoring program transferred from DFO to FJMC
- 1988 – Greenpeace orca sound sabotage attempt
- 1989 - Paulatuk joins Beluga monitoring program
- 1990's – HTC Beluga Hunting Guidelines established along with the creation of the Beluga Management Plan
- 2012 - Beluga Monitor no longer hired at shingle point due to minimal harvest
- 2014 – 35 Beluga Harvested in Ulukhaktok



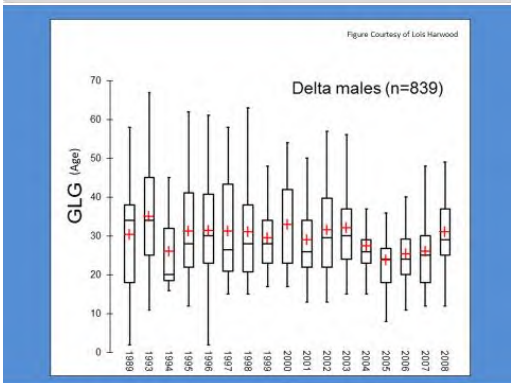
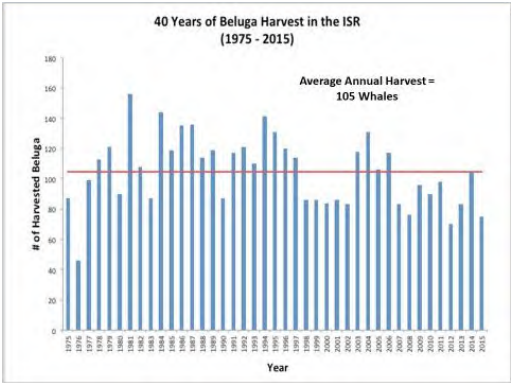
**40 Years of harvest information  
with over 30 years of standardized  
measurements !!**



### What is collected?

- Harvest Numbers (including Struck & Loss)
- Length and other basic measurements
- Sex
- Lower Jaw (Age)
- Tissue Samples
- Unusual Observations
- Flight Traffic Logs
- Daily Journal

Maggs & Drily Day at East Whitefish 1980s. Photo by Lois Harwood





## ISR Beluga Monitoring – Present

- Beluga Monitors in 4 of 6 ISR Communities
- Harvester Reward Program running in all 6 communities
- All 6 communities participated in monitoring efforts in 2014 & 2015



## Future

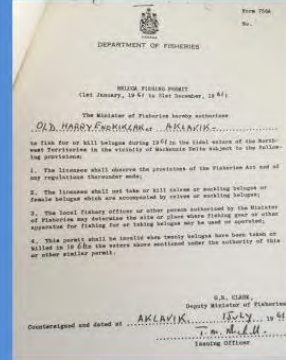


East Whitefish 2014

## Thank You

- ISR Hunter's & Trapper's Committees
- Past FIMC Staff & Committee Members
- Department of Fisheries Oceans
- National Contaminants Program
- All cooperating beluga harvesters in the ISR!

And...



## Future Considerations & Challenges

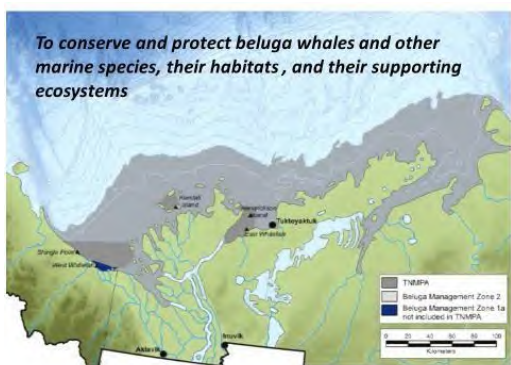
- Annual reporting & data base management
- Contaminants
- Increased shipping traffic
- Increased tourism
- Can we detect change?
- More frequent big wind events and unpredictable weather patterns
- Large scale ecosystem shifts & dietary changes (Arctic cod -> Capelin & Sandlance)
- Distribution changes
- Funding constraints



## The Beluga Monitors

SHINGLE POINT, WEST WHITESH & BIRD CAMP	HENDRICKSON ISLAND & TUKTOYAKTUK HARBOUR	KENDAL ISLAND & EAST WHITESH	PAULATUK	ULUKHARTOK
Foster Allen	Gordon Anonik	Laurence Anguak	Brandon Gralen	Cora Issa
Darryl Archib	Jimmy Auk	Larry Angook	Noel Green	Tasha Jones
Jacob Archie	Willie Carpenter	Steve Cockney Jr.	Judy Masluk Sr.	Patrick Ashlatak
Jerry Arvy	Chris Felle	Kyle Conley	Joe Blaylock	
Nellie Arvy	Joe Felle Jr.	Billy Day	John Max Kudlak	
George Edwards	Maah Felle	John Day	Ralph Roben	
Peter Ekanik	Ron Felle	Erica Dillon	David Roben	
Tom Ekanik	Jan Klauak	Alex Ekanik	Glen Roben	
Danny A. Gordon	Jimmy Komeak	W. Elak	Bill Waki	
Willy Joe	Rex Melopna	Ray Jones	Thom Wolfe	
Wilson Maligana	Johnny Pail	Baltha Ika	Joe Ruben Sr.	
James Meyook	Dale Penaitelich	Gilbert Kamek	Joe Ruben Jr.	
George Salamo	Frank Pokiak	Ned Kijerok	Rae Ruben	
Judy Setemo	Yetta Pokiak	Hugh Rogers		
	Timmy Trisklar	James Rogers		
		Kenny Rogers		
		Noel Rogers		
		David Rikland		
		Joe Roland		
		Dolly Sedyay		
		Abel Trigemik		

# C: DFO'S OCEANS PROGRAM: CONNIE BLAKESTON, FISHERIES, OCEANS AND THE CANADIAN COAST GUARD




**Western Arctic Marine Protected Areas (WAMPA) Steering Committee**

- Oversees both TNMPA and ANAOI
- Members from FJMC, DFO and community representatives from both areas

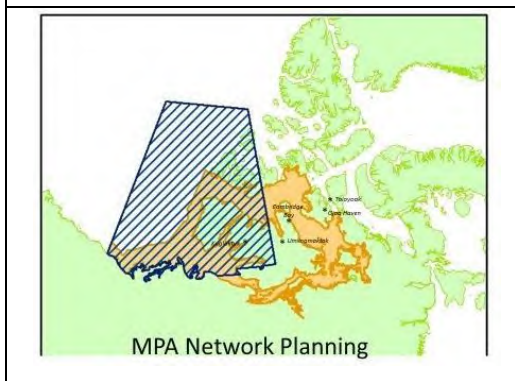


- Marine Protected Area Initiatives
  - Tarium Niryutait
  - Anguniaqvia niqiqyuam Area of Interest
  - Western Arctic Marine Protected Area (WAMPA) Steering Committee
  - MPA Network Planning
- Integrated Oceans Management
  - Beaufort Sea Partnership
- Future Planning

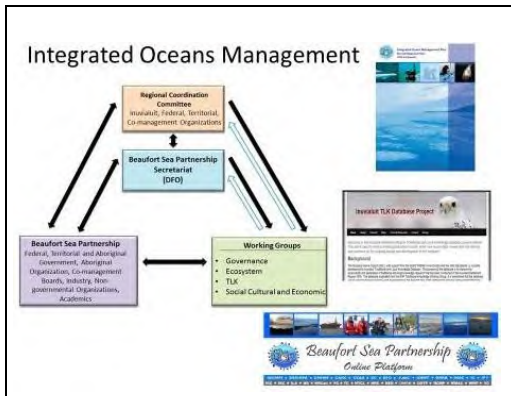
- Management & Monitoring Plans (2013)
- Monitoring Plan based on Indicators:
  - Ecological
  - Social, Economic, Cultural
  - Governance

- Conservation objectives based on both Science and Traditional Knowledge
- Designation
- Management & Monitoring plans
- Ongoing support for research







## D: HUSKY LAKES BELUGA ENTRAPMENT ACTION PLAN

(presentation given by FJMC during Beluga Management Sessions)

### BELUGA WHALE SUMMIT BELUGA ENTRAPMENT ACTION PLAN REVIEW

FISHERIES JOINT MANAGEMENT COMMITTEE  
FISHERIES AND OCEANS CANADA  
ISR COMMUNITIES

### HISTORY OF ENTRAPMENTS IN ISR

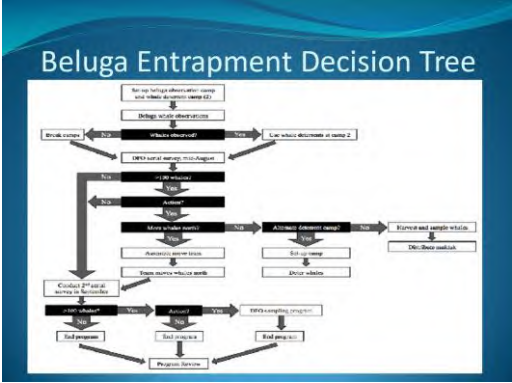
- Entrapments recorded many times in last century
- Modern records show entrapments in 1950, 1960s and 1970s
- Entrapments of 1989, 1996 spurred community and agency responses
- First back to back entrapments in 2006 and 2007

### History of entrapments(cont)

- DFO sponsored workshop in 2008
- Elders, hunters, and youth from 6 communities
- Provided recommendations for future entrapments
- Monitoring Program on Husky lakes–DFO
- Husky Lakes Intervention Program Report
- Action Plan for future entrapments

### Beluga Entrapment Action Plan

- Whales observed in Husky lakes-DFO conducts surveys to track presence and numbers
- If over 100 whales observed triggers a decision by communities, FJMC, and DFO to conduct sampling program and a humane harvest
- Coordinated effort to bring community members and sampling team to Husky Lakes once deemed safe to travel and work on ice
- Hunters conduct the harvest, FJMC, and DFO monitor and direct sampling
- Product may be distributed to communities



### Key messages from 2008 workshop and entrapment action plan

- Beluga whales are culturally important species
- Entrapments are a natural events
- Communities do not wish to see animals suffer nor lose an important food source
- Loss of beluga from ice entrapments will not negatively affect this population of whales (40K)
- The communities, FJMC, and DFO work together under the direction of joint management and Action plan in regard to entrapments

### Community – C. Gruben HTC President and hunt captain

- Husky lakes – important area for Inuvialuit
- History indicated area was used for whale hunting entrapping the whales a hunt strategy
- Entrapments attract media attention – often negative
- Action plan keeps the community, DFO, and FJMC together – same key media messages
- Product from ice edge hunts of lower quality
- Safety of hunters a key concern
- Hunting entrapped whales in summer may be an option

### DFO Management Plan L. Dow, E. Lee

- DFO workshop in 2008 gave directions
- 3 year monitoring program conducted 2009-2011
- Agreement reached to conduct a deterrent program at Guchiak – prevent whales from entering South Basin
- Pingers emit noise and keep whales out
- Entrapments may still occur if whales bypass the narrows
- DFO supports collection of samples
- DFO cannot pay for hunting activity

### Questions for break out groups

1. Is the current Entrapment Action Plan still an effective plan?
2. If changes are needed what should they be?
3. Should Whales be deterred from entering Husky Lakes?
4. What other issues need to be considered in our Husky lakes Intervention program? Now and for the future?





Figure AXII-1. Map of the Husky Lakes, including basins ('B') 1-5, Gudchiaq channel and Whale Point.

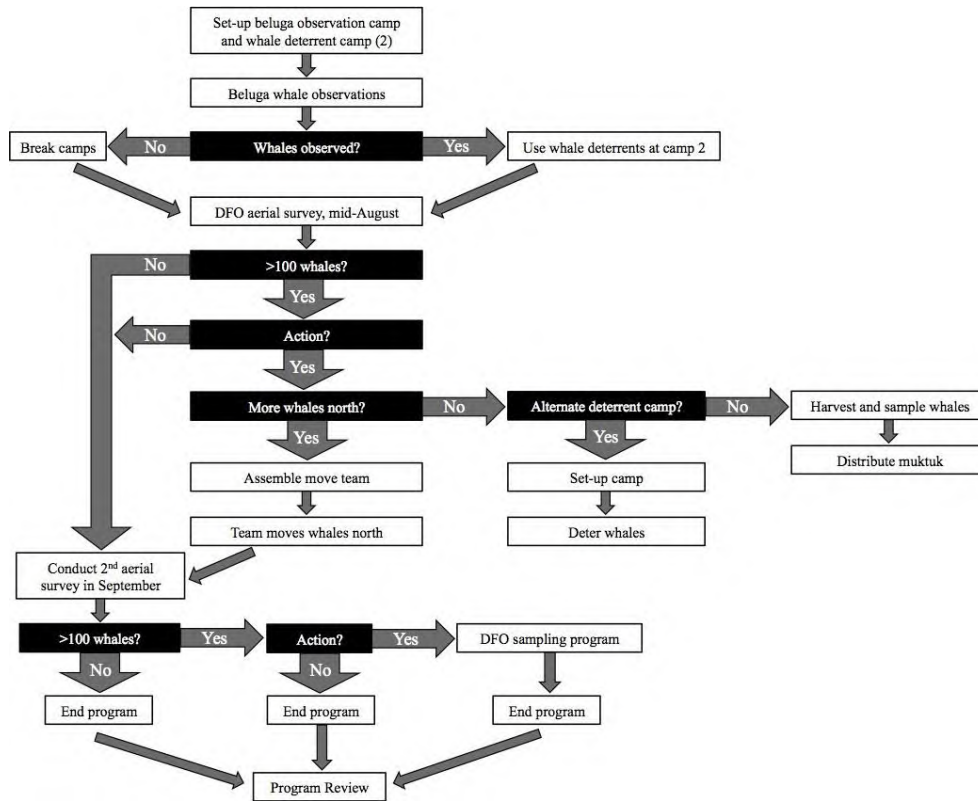


Figure AXII-2. The draft action plan developed in the *Husky Lakes Beluga Whale Entrapment Workshop*, Tuktoyaktuk, June 16-18, 2008.

## **APPENDIX XIII: BREAKOUT GROUP PARTICIPANTS**

### **Contaminants**

Breanne Reinfort (lead), Andrew Gordon Jr., CJ Hoagak, David (Xuefeng) Hu, John Noksana Jr., Marie Noel, Matt Binnington, Scott Tomlinson, Shannon O'Hara, Trevor Stocki

### **Disease and Condition**

Kristin Hynes (co-lead), Colleen Parker (co-lead), Emily Jenkins, Ole Nielsen, Sonja Ostertag, Stephane Lair, Clara Day, Corrie Joss, Lawrence 'Fraser' Angasuk, Jocelyn Noksana, Joe Illasiak, John Alikamik, John Noksana Sr., Kelly Nigiyok, Kyle Conley, Danny C. Gordon, Willie Goodwin

### **Population Abundance and Genetics**

Jennifer Lam (lead), Dean Arey, Hank Rogers Sr., Melanie Wolki, Ellen Lea, Kendra Tingmiak, Lianne Postma, Lois Harwood

### **Diet and Condition**

Kate Snow (lead), Emily Choy, Kerri Pleskach, Lisa Loseto, Ruben Green, Corrine Bullock, Frank Pokiak

### **Habitat and Habitat Use**

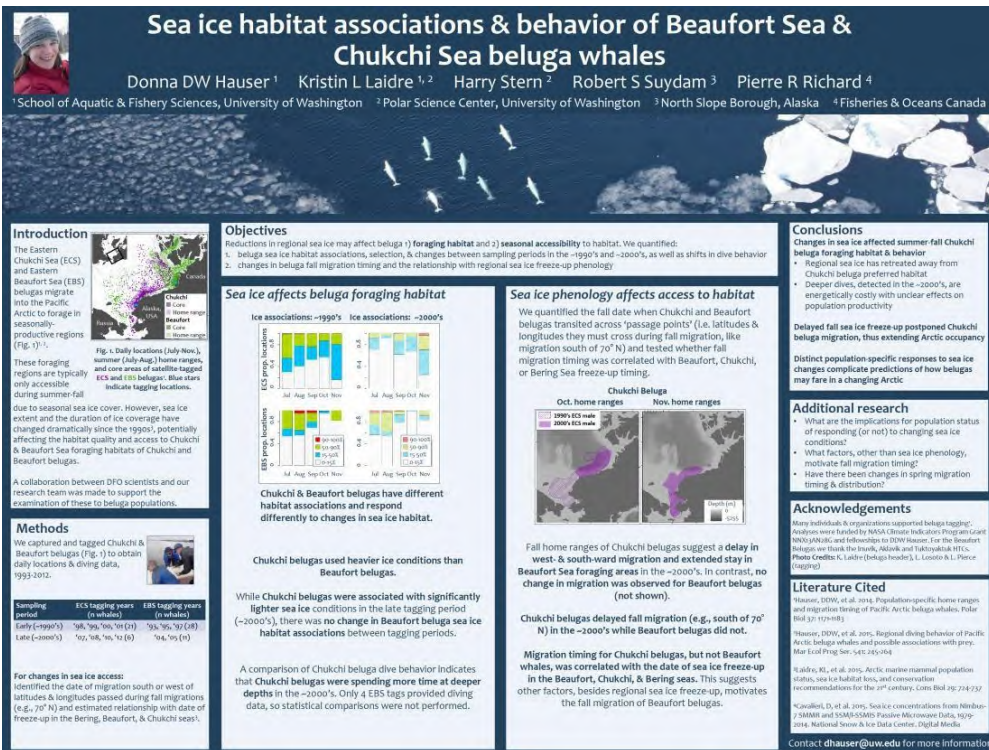
Danny Swainson (lead), Claire Hornby, Gerry Inglangasuk, Louie Porta, Ryan McLeod, Norman Anikina, Verna Pokiak, Jordan McLeod, Connie Blakeston

### **Future Impacts**

Vic Gillman (lead), Carie Hoover, Chucky Gruben, Dwayne Benoit, Jody Illasiak, Joe Arey Sr., Larry Dow, Michelle Wheatley, Richard Gruben, Ryan Lucas, Shannon MacPhee, Eric Loring



# APPENDIX XIV: POSTER PRESENTATIONS





# Understanding the Beaufort Sea Food Web and Changes Over Time

Carie Hoover<sup>1,2</sup>, Shannon MacPhee<sup>1</sup>, Wojciech Walkusz<sup>1</sup>, and Lisa Loseto<sup>1</sup>  
<sup>1</sup>Freshwater Institute, Fisheries and Oceans Canada, Central and Arctic  
<sup>2</sup>University of Manitoba, Centre for Earth Observation Science

## Ecosystem Overview

### Introduction

In order to gain a better understanding of the species within the Beaufort Sea Shelf and how they interact with each other, we pulled together information from multiple projects over the last 40 years to build a better understanding of the food web. By re-creating the ecosystem into a simplified version, we can understand key species, key interactions among species, and why things have changed over time.

### Methods

Providing an account of species within the ecosystem requires data from multiple sources and many projects. Here we present a simplified version of the ecosystem for the Beaufort Sea Shelf area (Figure 1). Using data such as the amount of each species (biomass), diet information, and other life history traits (growth, lifespan, etc.) we can piece together how all species are connected. To fill in knowledge gaps, we can use information about well known species (beluga) to help us understand species we know less about (fish). For example, by studying the diets of belugas through stomach contents, Fatty Acids, and Stable Isotopes, we can learn what fish are present in the ecosystem.



Figure 1: Beaufort Sea Region highlighting the study area (<200m)

Many projects (highlighted below) have contributed to our understanding of the ecosystem. In addition to these programs, scientific literature and expert knowledge contribute to our knowledge on the Beaufort Sea food web and how different species interact. Ultimately we are able to create a completed food web (Figure 2) linking all major species (or groups of species) together through predator-prey interactions.



Beluga Harvest Program (Kendall Island) 1980-present. Including diet information and harvest trends. This is the most complete dataset in the ISR. By studying belugas, we also get information on fish and other species through stable isotope and fatty acid data (diets of belugas)

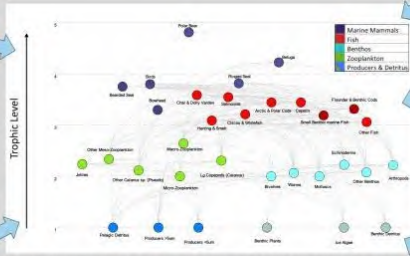
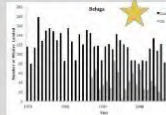


Figure 2: Representation of the Beaufort Sea Food Web. Each node (colored circles) represents an individual species or group of similar species. Each species or species group is connected by predator-prey interactions (grey lines) determined from diet studies.



Nahidik 2009-2006: Zooplankton species, relative abundance, diet information, and production values.



BREA Marine Fishes 2013-2014: Fish species, relative abundance, diet information, zooplankton species and abundance, production values.



ACES 2010-present: Fish abundance, Fish health, fish diet, Benthic invertebrate species and abundance

### Changes Over Time

Incorporating environmental changes over time, we can see how declines in sea ice and increases in temperature (Figure 3a) have led to changes in the structure of the food web. Model simulations recreating past changes show changes to the ecosystem and individual species or species groups:

- The structure of the ecosystem remains stable: Stable trophic level over time (Figure 3b)
- Large fluctuations in ecosystem biomass (abundance of all species; Figure 3b)
- Lower trophic level species such as producers and zooplankton are more sensitive to environmental changes, than higher trophic level species (Figure 3c)

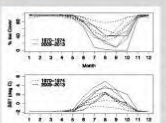


Figure 3a: Changes in sea ice and SST (sea surface temperature)

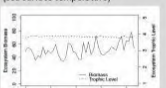


Figure 3b: Changes in ecosystem trophic level and biomass 1970-2012



Figure 3c: Changes in individual species or species groups 1970-2012. Grey bars (to the right) show increases, black bars (to the left) show decreases.

### Acknowledgements

Thank you to Andrea Niemi, Andy Majewski, Jim Reist, Jim Johnson for ecosystem information. Thank you to funders and project partners: NSERC, DFO, ERI (Ecosystem Research Initiative), ACCASP (Aquatic Climate Change Adaptation Services Program), CIMP (Cumulative Impacts Monitoring Program), and FIMC.

# Regional Indicators for Marine Monitoring in the ISR

Carie Hoover<sup>1,2</sup>, Vanessa Grandmaison, Joclyn Paulic<sup>1</sup>, Shannon McPhee<sup>1</sup>, Lisa Loseto<sup>1</sup>  
<sup>1</sup> Freshwater Institute, Fisheries and Oceans Canada Central and Arctic  
<sup>2</sup> University of Manitoba, Centre for Earth Observation Science

## Project Overview

Indicators are an important tool for managing resources. To ensure desired outcomes from monitoring programs, coordination among managing agencies is ideal to reduce cost and increase efficiency, especially in the Arctic. Here, we present the regional indicators project which aims to identify meaningful indicators in the ISR. We outline the process of including knowledge from multiple sources to include multi-agency stakeholders and the local communities.

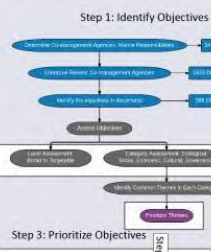
## Objectives

The overarching objective of this project is to bring together indicators from multiple sources, along with multi-stakeholder perspectives, to provide a comprehensive evaluation of indicators to meet the goals of managing agencies. In order to accomplish this we aim to:

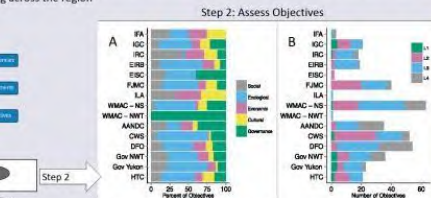
1. Identify the stakeholder objectives to be used for monitoring marine resources
2. Creating a comprehensive data on indicators (ecological, social, economic) used in monitoring across the ISR, and
3. Develop methods to select indicators for monitoring at the regional scale that suit the needs of multiple co-management agencies.

## Year 1: Identifying and Prioritizing Overarching Objectives for Regional Monitoring

By pulling together documents from co-management agencies through consultations and literature reviews, we were able to identify and assess objectives for monitoring across the region



Ranking of core objectives by BSP members October 2015



Assessment of Objectives: The first assessment (A) identifies the type of objective by category. The second assessment (B) identified how broad or measurable an objective is ranging from broad overarching objective (L4) to measurable objectives with targets (L1).

- Step 1: Starting with over 1800 documents related to co-management of marine resources, they were narrowed down to 398 objectives across 14 agencies.
- Step 2: Assessment of objectives revealed:
  - Co-management agencies represent interests across ecological, social, economic, cultural and governance, providing a balanced outlook to management.
  - Most objectives are broad and potentially hard to measure (67% of objectives at L3 and L4) meaning future indicator selection difficult.
  - A relatively low percent (5%) of all objectives are focused and measurable (L1). These are ideal for monitoring.
- Step 3: Core objectives were developed from the full list (step 1) and ranked by BSP members to identify high priority objectives for indicators.

## Year 2: Identify Potential Indicators

- Create a database of indicators currently being used in the ISR
  - Consult with co-management agencies to identify current indicators
- Identify potential gaps in current indicators
  - Consultations with communities and co-management agencies

## Year 3: Identify Indicators To Meet Management Objectives

- Year 3 aims to select indicators to be used for monitoring to meet the goals of multiple co-management agencies.
  - Develop ranking criteria for current indicators
  - Highlight common indicators for cost sharing across agencies.

**Acknowledgements:** Thank you to the BSP and BSP participants. In addition, thank you to Vic Gillman, Burton Ayles, Norm Snow, Jen Lam, Kristin Hynes, Marsha Branigan, Steve Newton, Rashid Sumaila, Michael Fabjan, and Don Cobb for guidance on the project. And thanks to ArcticNet, DFO, and CIMP for funding.



# Health Assessment of Beluga Whale in the Inuvialuit Settlement Region (Hendrickson Island) – 2015

Stéphane Lair, Émilie L. Couture and Emily Jenkins

Canadian Wildlife Health Cooperative, Faculté de médecine vétérinaire, Université de Montréal / Western College of Veterinary Medicine, University of Saskatchewan



The Beaufort Sea beluga whales are an important sentinel species for the health of the Arctic ecosystem. Changes in this ecosystem could impact the health of these valuable animals for ISR communities. This potential issue brought together DFO, HTC, FIMC and CWHC to perform a baseline health assessment of the ISR beluga population.

In July 2015, 16 whales (13 males and 3 females) that were landed on Hendrickson Island were completely sampled with consent from the hunters. CWHC and DFO staff performed the sampling in collaboration with whale monitors, as well as with community youths and hunters.



Beluga sampling on Hendrickson Island. From left to right: Sonja Ostertag, Tamika Pokiak, Kathleen Snow, John Noksana, Verna Pokiak, Stéphane Lair, Lionel Keevik, Jimmy and Vernon Carpenter.

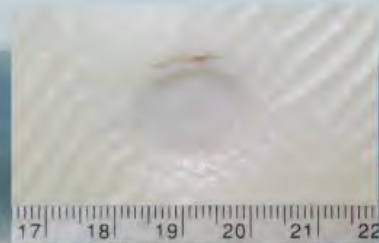


Whale monitor Verna Pokiak measuring the beluga with Kathleen Snow from DFO.

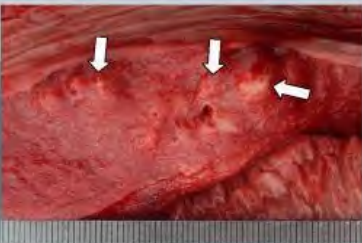


We were able to obtain the full weight of nine beluga.

Overall, the beluga whales appeared to be in very good health. A few parasites were noted in the lung, kidneys, stomachs and lymph nodes of some whales. These parasitic infections were not believed to have a significant impact on the health of the whales and do not represent health risk for people.



Circular crater-like depressions of unknown cause were observed on the skin of 12 of the 16 beluga.



Nodules in the lung (arrows) associated with infection by nematodes (lungworms). Mild lesions of pneumonia, caused by these parasites, were present in all beluga.



Mesenteric (intestinal) lymph nodes showing irregular calcified nodules (arrows). This lesion, which is caused by trematodes (flatworms), was observed in seven beluga.



Three out of the 11 beluga assessed for body condition were thin (decrease in back muscles and back fat).



Cyst in the kidney (arrow) cause by the nematode *Crossicoeludo gilkskiano*, the kidney roundworms (arrowheads), observed in three beluga.

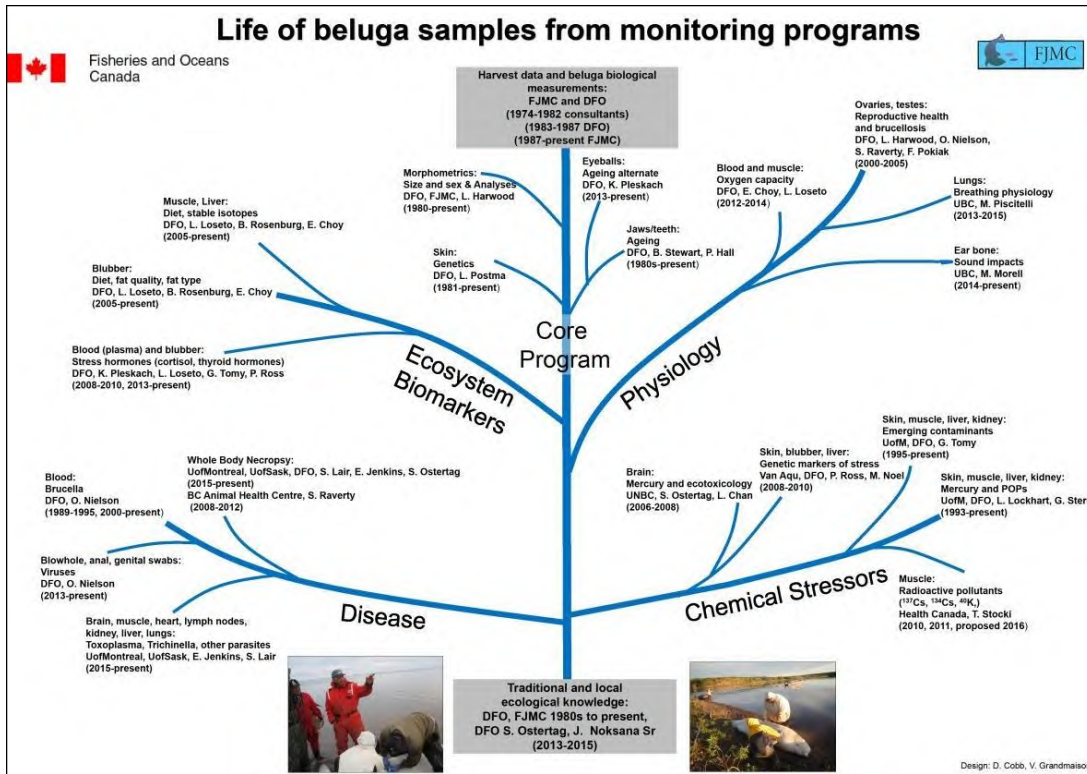
The veterinary team was impressed by the involvement of the community in this project. We will continue this survey during the summer of 2016 in order to increase the number of whales examined.



**Conclusions:**

- No significant disease process detected so far.
- Some animals were thin: Not unusual for a population of wild animals, so not necessarily a sign of bad health.
- Need to examine more animals.





## What Drives Beluga Habitat Use in Kugmallit Bay?

Fisheries and Oceans Canada      Natural Resources Canada

<sup>1</sup>Lisa Loseto, <sup>2</sup>Dustin Whalen, <sup>1</sup>Kayla Hansen Craik, <sup>3</sup>David Atkinson, <sup>4</sup>Danny Swainson, <sup>1</sup>Sonja Ostertag, <sup>1</sup>Lois Harwood, <sup>1</sup>Carie Hoover, <sup>1</sup>Shannon MacPhee, <sup>1</sup>Yvan Simard  
<sup>1</sup>Fisheries and Oceans Canada, <sup>2</sup>Natural Resources Canada, <sup>3</sup>University of Victoria, <sup>4</sup>Fisheries Joint Management Committee

### Beluga Habitat Use differs over space and time...

#### Spatially on the seabed

From the gravel bars along the shores near East Whitefish and the deep (4.9 m) channel at mouth of the river, to the expansive sandy shoal located just SW of Hendrickson Island this area is home to 5 distinct seabed types that could be favorable beluga habitat.

Previously defined hotspot (red) appears to be centered on the shallow shoal but covers a broad range of seabed types.

Sidescan sonar (left image) is used to identify the changes in seabed texture and characteristics. Strong reflectivity (dark patches) indicate gravel which has been traditionally used by beluga for rubbing and molting.

The majority of the seabed is flat and featureless, except for a channel extending out from East Channel that is up to 9 m deep.

#### Temporally in the water column

A number of instruments were placed on the seabed (black dots on adjacent map) from mid June to late August during the summers of 2014 and 2015. The instruments were capable of measuring water column salinity, temperature, turbidity, wave period and frequency and beluga vocalization.

The graph above of salinity and temperature in Kugmallit Bay between July 10-Aug 4 2015 shows a strong relationship between beluga vocalization, salinity and temperature. Low beluga presence during increased salinity events from Northwesterly storms, and high beluga presence during fresh water conditions dominated by the river discharge.

Short term beluga use can be related to oceanographic tidal fluctuations. Beluga vocalization data show little to no beluga use during high tide and salinity events (on west side of Hendrickson).

This is different than what was observed in 2011 and 2012, where vocalization was highest at high tide. However the hydrophone was located in the channel. This may suggest localized habitat use.

#### Next Steps

- Continue to determine how beluga presence and movement can be influenced by environmental conditions (wind, waves, salinity).
- Install a cable connecting the instruments to shore which will provide access to this scientific data (wind conditions, wave conditions, and temperature) to the community and stake holders on a real-time basis via a web-based portal.
- Provide and add to the baseline data of changing environmental conditions for the TN MPA.

This work would not have been possible without the continued support from HTCS, DFO, NRCAN and local community participants.

An extra thank you to our field crews: Paden Lennie, Jeremy Bentley, Kyle Kasoon, Andrew Gordon, Angus Robertson, Bertha Joe, Fraser Angasuk, Scott and Moses Kasoon, Jasmine Brewster, Erica Wall, Valerie Toronto, Clara Day, Sam Pingo and James Pokiak.

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## "You Are What You Eat": Linking Coastal and Offshore Ecosystems in the Beaufort Sea


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- The movement of animals can transfer energy between different habitats, such as nearshore versus offshore or bottom versus open-water.
- Animals move for many reasons at different life stages. Some of these reasons include: **1. Feeding & 2. reproduction (examples below).**

**Community-based beluga monitoring**



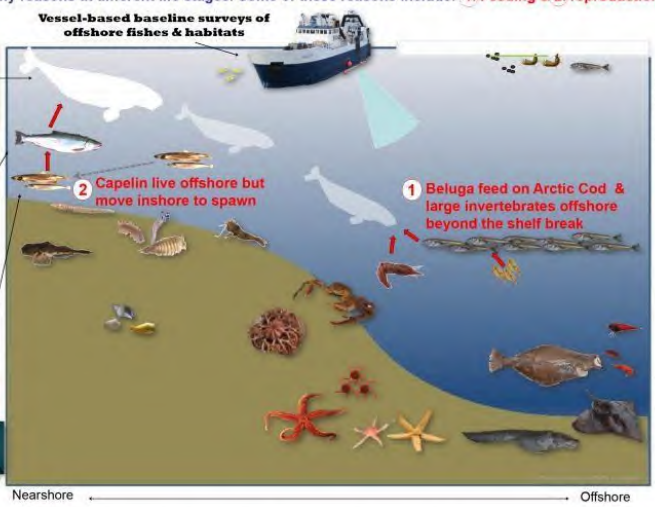
**Monitoring Estuarine Fish Communities**



**Baseline Coastal Ecological Surveys**



**Vessel-based baseline surveys of offshore fishes & habitats**




**1 Beluga feed on Arctic Cod & large invertebrates offshore beyond the shelf break**

**2 Capelin live offshore but move inshore to spawn**

Nearshore ← → Offshore

**Open-Water Feeding**

**Stable isotope signatures**  
...indicate the position of an animal in the foodweb and tell us how the foodweb is organised



**Bottom Feeding**

**Fatty acid signatures**  
...can be used to trace prey items through a foodweb



- Ecological Indicators:** We cannot monitor everything in an ecosystem. *Indicators* are relatively easy to measure and tell us something meaningful about what is happening in the environment.
- Dietary biomarkers, such as stable isotopes and fatty acids** are ecological indicators of diet, foodweb linkages and habitat use. They are like biochemical 'signatures' stored in animal tissue that indicate where an animal has been living and what it has been eating.
- We are sampling marine mammals, fish and invertebrates from **different areas of the Beaufort Sea (see photos)** to identify and use dietary biomarkers as indicators of ecosystem health.
- A key goal of this research is to identify indicators of foodweb linkages between nearshore and offshore habitats.

## Research to Prepare for Future Environmental Change

Shannon MacPhee, Aquatic Biologist, Arctic Aquatic Research Division, Fisheries and Oceans Canada, Winnipeg, MB ( [Shannon.MacPhee@dfo-mpo.gc.ca](mailto:Shannon.MacPhee@dfo-mpo.gc.ca) )

**Environmental Drivers**



**Establishing Ecological Baselines**

Ecological baselines give us a starting point from which to measure future responses to environmental change. We are collecting baseline data from coastal and offshore habitats.

**Knowledge and Data**

Ecosystem Connectivity    Variability (physical & biological)    Local Knowledge & Perspectives



**Environmental Stressors**



**Monitoring for Ecological Indicators**

Ecological indicators tell us something about what is happening in the ecosystem and can be used to track long-term (trends) change



**"You are what you eat". Signatures in predator tissue (beluga) and prey (fish, invertebrates) indicate foodweb linkages.**

**Opportunistic sampling for fish and beluga**



**Vessel-based baseline surveys of offshore fishes & habitats**



**Monitoring estuarine fish communities**



**Community-based beluga health monitoring**



**New surveys for coastal fishes and habitats**





## BRUCELLOSIS IN BELUGA IN THE INUVIALUIT SETTLEMENT REGION



Ole Nielsen<sup>1</sup>, Lisa Loseto<sup>1</sup>, Sonja Ostertag<sup>1</sup> and Om Surujballi<sup>2</sup>

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### PROJECT DESCRIPTION

- Whole blood (n= 685) from hunter harvested and ice entrapped beluga harvested between 1989 and 2014 was tested for the presence antibodies to *Brucella* bacteria.
- The overall prevalence was 8.0% with positive belugas being identified in all years from all locations.
- Prevalence ranged from a low of 1.9% in the years 1989-1995 to a high of 15.8% in 2006. This compares with a prevalence of 16% in beach cast beluga from the St Lawrence Estuary (1993-1996) and 3.9% for hunter harvested belugas from communities on Baffin Island (1990-1996).
- Neither blubber nor reproductive *Brucella* related abscesses have been reported from ISR harvested belugas.



Narwhal from Pond Inlet with a *Brucella* Abscess in the Blubber

Beluga Testicle With a Large *Brucella* Abscess (arrow) From Coral Harbour



### FACTS ABOUT BRUCELLOSIS

**WHAT IS BRUCELLA?** *Brucella* is a bacteria that causes the disease brucellosis. There different species of *Brucella* each having a preferred animal host.

**WHY ARE WE TESTING BELUGAS FOR BRUCELLA?**

Climate change effects are placing belugas under increasing stress. Changes in the prevalence and severity of diseases is an expected outcome of this added stress. Monitoring *Brucella* is one of many ways measuring their resiliency to stress.

**IS BRUCELLOSIS SERIOUS?** Yes, it can be very serious and can negatively affect the health and survival of infected animals? It can cause reproduction problems (spontaneous abortion) . It can also cause abscesses in joints and various organs of the body.

**WHAT ANIMALS SPECIES CAN GET BRUCELLOSIS?** It is usually associated with animals such as goats, sheep, cattle, pigs and caribou. The species of *Brucellae* that infects these animals is different from the *Brucella* that infects belugas. All species of seals world-wide can also become infected.

**HOW IS IT SPREAD?** It can be spread from infected mothers to their off-spring. It can also be spread by contact or consumption of infected tissues.

**CAN PEOPLE BECOME SICK?** To our knowledge no one has ever become sick from butchering or eating meat/muktuk from a marine mammal in Canada.

**WHAT ARE THE SYMPTOMS?** They can include, high fever, night sweats, fatigue, and head aches. These symptoms can get better on their own only to reappear weeks or months later. Brucellosis is also known as "relapsing fever".

**HOW IS BRUCELLA DETECTED?** Brucellosis is considered a life long disease in both animals and man unless treated. Testing the blood for the presence of antibodies to *Brucella* is the most common method. Isolation of the bacteria in the laboratory from submitted blood or tissue can also be done to confirm the diagnosis.

**HOW IS IT TREATED?** An extended regime of a combination of antibiotics can be prescribed by a doctor.

### SEROLOGICAL RESULTS OF ISR BELUGAS

YEAR	Number Tested	Positive (%)
1989-1995	111	2 (1.9)
2000	36	2 (5.5)
2001	41	3 (7.3)
2002	41	4 (9.7)
2003	41	5 (12.2)
2004	42	6 (14.3)
2005	33	2 (6.0)
2006	70	11 (15.8)
2007	18	1 (5.5)
2008	23	2 (8.7)
2009	25	2 (8.0)
2010	0	0
2011	40	4 (10.0)
2012	44	4 (9.0)
2013	59	4 (6.8)
2014	61	3 (4.9)
<b>TOTAL</b>	<b>685</b>	<b>55 (8.0)</b>

### CONCLUSIONS

- Prevalence of brucellosis in ISR belugas remains low. None of the *Brucella* related abscess problems seen in Nunavut are seen in the ISR.
- Continued monitoring is a cheap and effective tool for assessing beluga health.

### ACKNOWLEDGEMENTS:

- We would like to thank hunters for allowing us access to their harvested animals and permitting us to take the samples and information needed for doing this work.

## DISCOVERY OF TWO NEW VIRUSES IN BELUGA FROM ALASKA AND THE INUVIALUIT SETTLEMENT REGION

Ole Nielsen<sup>1</sup>, Kathy Burek-Huntington<sup>2</sup>, Carlos Romero<sup>3</sup>, Lisa Loseto<sup>1</sup>, and Sonja Ostertag<sup>1</sup>

<sup>1</sup>Department of Fisheries and Oceans Canada, Winnipeg, Manitoba, Canada <sup>2</sup>Alaska Veterinary Pathology Services, Anchorage Alaska, USA <sup>3</sup>University of Florida, Gainesville, Florida, USA  
Ole.Nielsen@DFO-MPO.GC.CA

### PROJECT DESCRIPTION

- In an effort to determine the cause of skin lesions as well as the cause of death of stranded belugas in Alaska, tissue and swab samples from belugas from Bristol Bay and Cook Inlet were submitted for virus isolation.
- Two cell lines were used in the study, Beluga Whale Kidney (BWK), a primary cell line derived from kidneys harvested from healthy belugas from Hendrickson Island, NWT and a standard continuous cell line used for routine virus isolation (VERO.DogSLAMtag).
- Two new and different viruses were commonly isolated.
- An Alphaherpesvirus was routinely recovered from skin lesions, anal, oral, genital and blow hole swabs using the BWK cell line.
- A Mammalian Orthoreovirus was also co-isolated using the SLAM cell line, but only when trypsin was added to the medium.
- Swab samples collected from the beluga hunts in the ISR confirmed that both viruses were present in presumably healthy hunter harvested Canadian belugas in multiple years suggesting that both viruses are causing persistent active infections.
- An Alphaherpesvirus has been implicated in causing reproductive lesions in St Lawrence Estuary belugas.



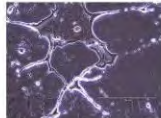
Skin Lesion from Live Captured Alaskan Beluga (Note: scarring)



Blowhole lesion from an Alaskan Beluga (arrow - Note the raised bumps)



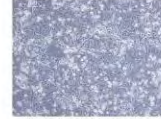
**Normal BWK Cells**  
Beluga whale kidney (BWK) cells are derived from hunter harvested beluga. They are living cells - therefore the need to get them to the lab in Winnipeg quickly. Thanks to the hunters for their effort on our behalf!



**BWK Cells Infected with Beluga Alphaherpesvirus**  
Alphaherpesvirus causing damage to infected cells



**Normal VERO.DogSLAM tag-cells**  
SLAM cells are also kidney cells but from an African Green Monkey. They are commercially available and are a common cell line used for virus isolation.



**SLAM Cells Infected With Beluga Orthoreovirus**  
Infected cells are rounding up and detaching from the plastic as they are dying. Orthoreoviruses are a common virus that can be found in mammals, some are capable of causing severe disease in the animals they infect. There is no evidence that the novel beluga Orthoreovirus may infect people



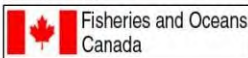
St Lawrence Estuary Beluga Penis With Herpes Lesion (arrows)

### CONCLUSIONS

- Collaboration between Alaskan, Floridian and Canadian scientists and stakeholders from both countries continues to provide new knowledge concerning our understanding of beluga health.
- The finding of two new beluga viruses in both Alaskan and Canadian beluga stocks is a significant finding.
- Alphaherpesviruses have been isolated from lesions and swabs from both healthy and unhealthy belugas while an Orthoreovirus was co-isolated with an Alphaherpesvirus from a skin lesion; however, their role in significant health impact though suspicious, is still unknown.
- Virus isolation methodologies remain an important tool in discovering new viruses infecting wildlife as long as good quality samples are taken, stored and shipped at the coldest possible temperatures to ensure virus survival.

### ACKNOWLEDGEMENTS

- We would like to thank hunters for allowing us access to their harvested animals and permitting us to take the samples and information needed for doing this work.





# Using eyeball lenses to determine beluga age



Kern Breukach<sup>1</sup>, William Hoang<sup>1</sup>, Mitchell Chiu<sup>1</sup>, Thor Haldrup<sup>2</sup>, Luca Lorenzi<sup>3</sup>, Steven H. Ferguson<sup>4</sup> and Gregg Tomy<sup>1</sup>  
<sup>1</sup>Fisheries and Oceans Canada, Winnipeg, Manitoba, R3T 3B6 Canada; <sup>2</sup>University of Manitoba, Department of Chemistry, Winnipeg, Manitoba, R3T 2N2 Canada

## Introduction

- Determining age is an important component to studying contaminants, population dynamics, and life-history traits and ultimately is needed for fisheries management.
- Estimating age use to be done by counting tooth Growth Layer Groups (GLGs) (see pictures in the middle column)
- Precision and accuracy of counting GLGs varies due to the high variability in the visibility of layered structures between species, tooth tissues, nodes, accessory layers, inclusions and tooth types and experience of the reader
- Aspartic acid (AA) is a non-essential α-amino acid that is used as a building block for proteins.
- Everyone is born with L-AA and over time, L changes to D-AA in the eye lens.
- The nucleus of the eye lens is a metabolically inactive tissue, a change in the D/L ratio is mostly controlled by temperature, therefore this change occurs at a constant rate over time.
- Once the rate of change and the D/L ratio at birth are known, age can be measured simply by measuring the D/L at death in the eye lens of an animal.



## Traditional beluga ageing method

Beluga jaw, Tooth, Tooth section

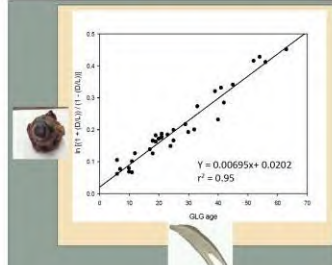
- Tooth is removed from jaw, glued on a block, sectioned via diamond blade, and GLG counted under a microscope
- One GLG is one dentine and one cementum layer

## New ageing method using eyeball lenses

Beluga eyeball, Eyeball lens, Heating lens

- Eye lens is removed from the eyeball, cut in half, heated in acid for 5 hours at 80°C, then run on an instrument

## Results



We now can age beluga whales using the eyeball lens



## Acknowledgments

This project was supported by Fisheries and Oceans Canada (Nunavut Implementation Fund), Fisheries Joint Management Committee, Northern Contaminants Program and the University of Manitoba. We thank the community members, whale monitors and Hunters and Trappers Committees of Tuktoyaktuk, Ulukhaktok, Sachs Harbour and Hunters.

# It's Not Just *What* You Say, It's *How* You Say It!

## How Relationships and Trust Influence Perceptions and Communication About Arctic Contaminants

Breanne Reinfort<sup>1,2</sup> (b.reinfort@gmail.com), G.Stern<sup>1,2</sup>, F. Wang<sup>1</sup>, & C. Furgal<sup>3</sup>

### Introduction

Past efforts to communicate contaminants information to Northerners = general awareness & confusion

Traditional knowledge about contaminants does not exist = affects how scientific messages are trusted

**Objective:** Consult Northerners about how to approach communication

Focus moves beyond *what* (knowledge as topic) → *how* (knowledge as process)

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### Past Communication Work

**Focused Only On:** Message content (*what*)  
 Audience perceptions of the hazard

- e.g. "What are contaminants?"
- poison
  - something unnatural
  - garbage
  - permafrost melting
  - hurtful to our health and our environment
  - pollution
  - oil & fuel spills
  - pesticides
  - things that don't belong
  - mercury
- Responses from people in Sachs Harbour

### Disregarded primary resources of information about a hazard:

- How Northerners perceive communication methods (*how*)
- Communicators/sources of information (*who*)

### Knowledge Gap

Ways that risk communication is approached and carried out

↓

Significant importance to how an environmental hazard is perceived!

### Learning About Mercury – an Inuvialuit Way

**Sources (who):** Spending time in the community fosters relationships

**Lesson #1:** Discussion, questions & clarification with a familiar face enables trust in the message



**Content (what):** Talk with people to find out how they feel, what they know, and what they want to know about mercury

**Lesson #2:** Lack of background information about mercury contributed to confusion/fear & prevented understanding new information



**Methods (how):** Iterative discussions increased mercury knowledge and understanding, enabling confidence to pass on what was learned

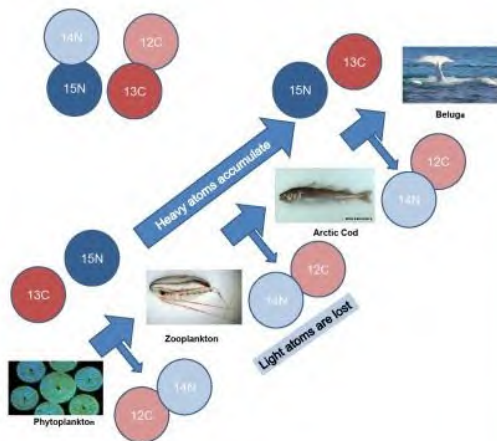
**Lesson #3:** Identified need for community-based information pamphlet with community-identified content gaps

# Stable Isotopes and Fatty Acid Analysis

Bruno Rosenberg  
Biomarkers Laboratory-Freshwater Institute

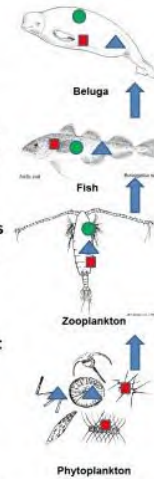
## Stable Isotopes

Carbon and Nitrogen have light and heavy atoms



## Fatty Acids

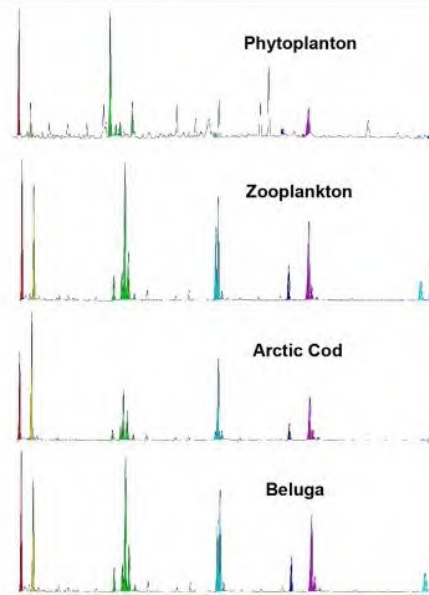
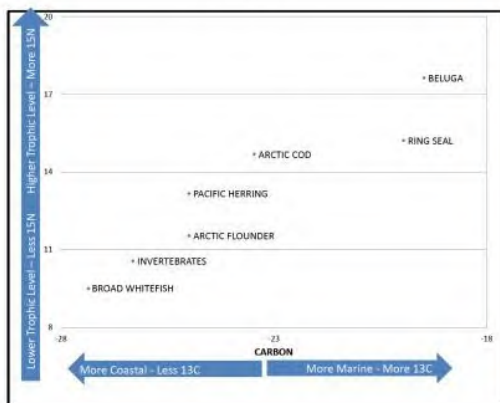
- Fatty acids are the main components of fats and oils
- Most fatty acids are made by plants and animals near the bottom of the food chain
- Most fatty acids move up the food chain unchanged
- Because they are largely unchanged as they move up the food chain fatty acids accumulate in predictable patterns
- Since an animal's fatty acid pattern is made up of the fatty acids of the plants and animals in its food chain we can learn who eats who by analyzing fatty acids
- Fatty acid analysis helps us to study:
  - what part of the food chain beluga depend on
  - which habitats are more important to beluga and
  - if the changing environment is affecting the beluga's diet



We can use the accumulation of heavier Carbon and Nitrogen atoms to study each animal's position in the food chain.

Fatty acid patterns of phytoplankton, zooplankton, arctic cod and beluga

Position in Beaufort Sea food web as determined by Stable Isotopes





# Where do mercury trends in western Arctic belugas originate?

Fisheries and Oceans Canada

1Gary Stern, 2Lisa Loseto, 3Robie Macdonald, 4Frank Pokiak, 5Branne Reinfort  
 1University of Manitoba, 2Fisheries and Oceans Canada, Winnipeg, 3Fisheries and Oceans Canada, Sidney, 4Community of Tuktoyaktuk



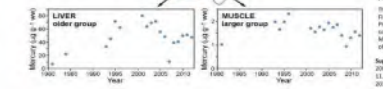
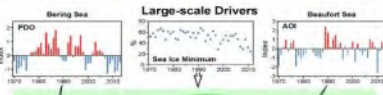
**Mercury in Beluga**  
 • Mercury (Hg) is a contaminant that travels to Arctic ecosystems through air and water and enter the foodweb  
 • Beluga are exposed to mercury through their diet  
 • Because beluga feed in relation to their size, age, and gender, understanding diet and habitat use is important to understanding beluga mercury levels  
 • Different parts of beluga have different types of mercury  
 • Here we investigate the trends and try to explain what is driving them by considering beluga age and size

Climate change has cascading impacts on the ecosystem  
 Changes in atmosphere  
 ↓  
 Changes in ocean process  
 ↓  
 Changes to nutrient/food supply, temperature  
 ↓  
 Changes in beluga foraging AND changes in where mercury travels...

**HIGHLIGHTS**  
 • 31 years of mercury data in Beaufort Sea beluga  
 • Mercury levels in beluga peaked in late 1990s  
 • Mercury trends in beluga can't be explained by diet or mercury emissions at a local scale  
 • What's going on? = **Changing climate at the regional level may have altered mercury levels in beluga prey**

**GOOD NEWS**  
 Mercury has decreased in Beaufort Sea beluga since 2002, but we don't know why

**Complex interactions** between food web dynamics, feeding behaviour, and mercury uptake



Beaufort Sea beluga migrate across habitat that is affected by large-scale climate variability, represented by the Pacific Decadal Oscillation (PDO), Arctic Oscillation (AO) and Sea Ice Minimum (SIM).

Important to study large-scale regional food webs, not just Beaufort Sea = Look at mercury in beluga prey in wintering grounds (Bering Sea)

Change to sea ice directly impacts beluga access to habitat and affects the food webs supporting beluga prey. Both AO and PDO can influence SIM as well as the ecosystems in summer (Beaufort) and wintering (Bering) regions.

**Acknowledgements**  
 This project was supported by multiple funding agencies including the Northern Contaminants Program, Fisheries and Oceans Canada, Northern Students Training Program, Cumulative Impacts Monitoring Program and ArcticNet. We thank Frank Pokiak for their years of dedication to the monitoring program, following samples in a consistent and reliable manner at Kodiak Island. We thank J. DeLuca, B. Macdonald, G. Bolla, and R. Stewart for laboratory support. We are grateful for the partnership and support of Hunters and Trappers Committees of Inuvik and Tuktoyaktuk for beluga tissue collections.

**Supporting references:** 1. ARAAP 2011, 2. Finn et al., 2011, 3. Frank et al., 2014, 4. Sjö et al., 2012, 5. Steffen et al., 2006, 6. Wong et al., 2012, 7. Loseto et al., 2007, 8. Braaten et al., 2014, 9. Morin et al., 2014, 10. Moore et al., 2011, 11. Gendron et al., 2008, 12. Gendron et al., 2006, 13. Gendron 2012, 14. Moore et al., 2014, 15. Lee et al., 2010, 16. Gendron et al., 2008, 17. Hare et al., 2010, 18. Steffen et al., 2006, 19. Steffen and Lapierre 2010.

## Is there Contamination from the Fukushima Accident in Arctic Beluga?

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 1Radiation Protection Bureau, 775 Brookfield Rd., A.L. (3302D1), Ottawa, Ontario, Canada, K1A 1C1  
 2Department of Fisheries and Oceans, Winnipeg, MB, Canada



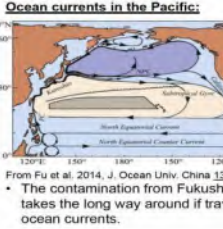
**Introduction:**  

 • Fukushima March 11, 2011 releases radioactivity through air & water.  
 photo: wikipedia  
 • The community of Tuktoyaktuk & the Inuvialuit Game Council requested this work.

**Cesium: the element of concern.**  
 • Cesium (Cs) is product of nuclear power or explosions.  
 • Two types of Cs: <sup>137</sup>Cs & <sup>134</sup>Cs  
 • <sup>137</sup>Cs stays around longer than <sup>134</sup>Cs.

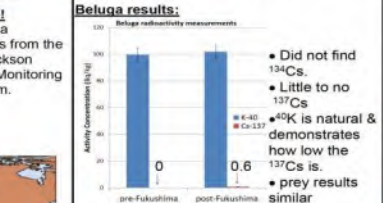


**Beluga are an important food source!**  
 • Beluga samples from the Hendrickson Island Monitoring Program.  
 • 19 pre, 22 post samples  
 • fish too (15 pre, 23 post).



**Beluga Migration & <sup>134,137</sup>Cs observations in the area:**  
 • <sup>137</sup>Cs & <sup>134</sup>Cs were measured in water by Yoshida et al. (2015) near Kodiak Island.  
 • Only measured <sup>137</sup>Cs near St. Lawrence Island by Yoshida et al. (2015).  
 • <sup>137</sup>Cs & <sup>134</sup>Cs were measured in seals by Ruedig et al. (2016).  
 • Levels in all these cases were low.

**Our beluga measurements:**  
 • Done by gamma ray spectrometry.  
 • Looking for <sup>134</sup>Cs & <sup>137</sup>Cs & anything else.



**Beluga results:**  
 • No <sup>134</sup>Cs implies no effect from Fukushima.  
 • A comparison of samples taken before & after the accident, has indicated no increase in radioactivity detected from the Fukushima accident, with respect to the release to the air.  
 • One would need to eat ~700 lbs of beluga each and every day to reach the public dose limit.

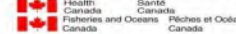
**Future beluga projects:**  
 • Measurements in beluga after radioactivity (traveling by ocean) from Fukushima has arrived (or best guess).  
 • We expect the amount of radioactivity to be small.  
 • This has been requested by the communities. (LISA should I put this? Or better phrase).

**Non-Fukushima project:**  
 • Measurements of <sup>129</sup>I (iodine) to help understand Hg (mercury).  
 • <sup>129</sup>I is like regular iodine, but is used as a tracer.  
 • Two sources in the ocean Sellafield and Lahague.  
 • Can answer the question with the beluga: Have the ocean current changed?

Here is a map of ocean currents with respect to <sup>129</sup>I:  
 Inuvik



**Acknowledgements**  
 None of this would be possible without the support/help of Shawn Donaldson, Tracey Loewen, Gail Bolla, Northern Contaminates Program, Tuktoyaktuk Hunters & Trappers Committee, Inuvialuit Game Council, Frank Pokiak, and the beluga hunters from Tuktoyaktuk.





## Traditional and Local Knowledge of Beluga Whale Under Changing Climatic and Non-Climatic Conditions in the Inuvialuit Settlement Region, NT Canada

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<sup>3</sup> Fisheries and Aquaculture Sciences, Memorial University, St. John's, NL, Canada



The beluga whale (*Delphinapterus leucas*) is an important species to the coastal Inuvialuit communities of the Western Canadian Arctic. Despite the ongoing local cultural and nutritional importance of beluga whale, little research has examined local and traditional understandings of beluga. The dearth of research is made more poignant by the rapid climatic changes that are occurring in the region, alongside ongoing changes in culture, economy and governance. The proposed research seeks to document local and traditional knowledge of the ecology and behaviour of the beluga whale under changing climatic and non-climatic conditions to complement current research and monitoring efforts in the Inuvialuit Settlement Region (ISR).

Inuvialuit community shares their beluga whale. (Photo credit: Colleen Fisher)

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### Rationale

The role of beluga as an important food source in the ISR faces threats from the unpredictable impacts of climate change on animal populations and the bioaccumulation of pollutants in whale tissues (Kry, Osterg & Chin, 2013; Loseto et al., 2008; Osterg et al., 2009; Harwood & Kingsley, 2013). However, the unique co-management structures in the region have created a robust, collaborative beluga whale monitoring program between the Department of Fisheries and Oceans and the Fisheries Joint Management Committee. Instituted in the Mackenzie Delta in 1973, these collaborative monitoring programs between beluga hunters and government scientists examine numerous parameters including information on size, age, sex, feeding, genetics, contaminants, disease and body condition of harvested whales (Harwood & Smith, 2002). The collected data has allowed for a clear and ongoing picture of the eastern Beaufort Sea beluga stock, indicating that harvests sizes are well within sustainable limits, but monitoring and co-management needs to continue to ensure the health of the populations and communities that rely on them for subsistence (Harwood & Smith, 2002). Addressing the gap in the literature regarding traditional knowledge of beluga could contribute to better co-management activity of the species.

### Research Methods

The research consultation will take place at the annual Beluga Summit in February 2016 in Inuvik. Engagement with stakeholders from various communities will allow for ongoing communication and eventual dissemination of results. Participants will be identified initially through the summit and through existing co-management relationships between Fisheries and Oceans Canada (DFO) scientists and Fisheries Joint Management Committee (FJMC) community hunters.

This project will be undertaken with Inuvialuit beluga hunters in the ISR, pending support from the community Hunters and Trappers Committees (HTCs) and Community Corporations, during a summer field season in 2016. Ethnographic research methods will be employed including semi-structured interviews, participant observation, and analysis of secondary sources (Pearce et al., 2009). Interview questions will be open ended and conversational to allow participants to share their knowledge and experiences in their own words and in terms that make sense to them (Table 1). Participants will indicate if other community members hold knowledge of beluga that can contribute to the study.



### References

Harwood, J., & Smith, J. (2002). *Beluga Whale: A Species at Risk in the Arctic*. Fisheries and Aquaculture Sciences, Memorial University, St. John's, NL, Canada.

Kry, J., Osterg, G., & Chin, J. (2013). *Beluga Whale: A Species at Risk in the Arctic*. Fisheries and Aquaculture Sciences, Memorial University, St. John's, NL, Canada.

Loseto, J., & Kingsley, M. (2013). *Beluga Whale: A Species at Risk in the Arctic*. Fisheries and Aquaculture Sciences, Memorial University, St. John's, NL, Canada.

Osterg, G., & Chin, J. (2009). *Beluga Whale: A Species at Risk in the Arctic*. Fisheries and Aquaculture Sciences, Memorial University, St. John's, NL, Canada.

Pearce, T., Welch, D., & Bradshaw, B. (2009). *Beluga Whale: A Species at Risk in the Arctic*. Fisheries and Aquaculture Sciences, Memorial University, St. John's, NL, Canada.

### Aim

The proposed research will document traditional and local knowledge of beluga whale under changing climatic and non-climatic conditions in the Inuvialuit Settlement Region.

### Objectives

1. Document Inuvialuit traditional and local knowledge of beluga whale ecology and behaviour, hunting technique and food preparation
2. Identify stresses affecting Inuvialuit-beluga interactions
3. Develop an understanding of how the linked Inuvialuit-beluga system is responding to change

### Expected Contributions

The research is expected to contribute to an understanding of Inuvialuit knowledge of beluga, and beluga-Inuvialuit interactions are affected by changing conditions. This will identify contribute to better conservation, development and subsistence management of the species while allowing for better collaboration among stakeholders.

### Acknowledgements

This research is part of the ArcticNet Project "Knowledge Co-Production for the Identification and Selection of Ecological, Social, and Economic Indicators for the Beaufort Sea" and is supported by the National Sciences and Research Council of Canada.



## Building Youth Capacity in Beluga Programs

Fisheries and Oceans Canada

FJMC

DFO and FJMC prioritize youth and beneficiary training with the beluga research and monitoring programs. A central focus has been to build capacity in beluga sampling and research among youth interested in science and monitoring. Additionally outside of the field setting many youth had the opportunity to visit research labs and attend various meetings and conferences. Researchers also provided class presentations and seminars at Aurora college and public schools in both the north and south. Youth and monitors have been encouraged to share their knowledge at local, national and international presentations.



**Participants and Years:**

- K. Nuyaviak & S. Osterg 2008
- K. Snow 2014
- B. Voudrach, K. Snow & R. Walker 2010
- Mangialuk, School 2014
- B. Green, L. Postma & B. Green 2014
- C. Cockney & K. Hansen-Craik 2004
- K. Snow & K. Hansen-Craik 2014
- J. Noksana & F. Pokiak 2009
- A. Gordon Jr. & D. Swainson 2015
- K. Tingmiak & L. Loseto 2012
- J. Noksana Sr., E. Gouture, J. Carpenter, V. Pokiak, K. Snow & T. Pokiak 2015
- P. Lennie, K. Hansen-Craik, L. Loseto 2013
- B. Lucas, L. Loseto & B. Voudrach 2010
- M. Rogers 2013
- K. Taylor & L. Loseto 2004
- B. Green, F. Pokiak & P. Lennie 2013
- E. Sudlovenick & K. Hansen-Craik 2013
- S. Pokiak 2014
- D. Whalen, K. Hansen-Craik, C. Hoover & P. Lennie 2013
- C. Kikoaks, E. Gouture, L. Kikoak, T. Pokiak, K. Snow 2015

## APPENDIX XV: LIST OF MEDIA

Below is a list of media that covered the Beluga Summit. These represent part of the efforts to broadly communicate information from the event.

Thurton, David. Mackenzie Delta beluga research shows preference for less ice. (22 Feb, 2016). *CBC News*. <https://www.cbc.ca/news/canada/north/inuvik-beluga-summit-1.3457713>

Toth, Katie. 'Full circle': DFO works with hunters, publisher to make beluga findings accessible to the public (22 Sept, 2018). *CBC News*. <https://www.cbc.ca/news/canada/north/beluga-whale-fisheries-oceans-canada-1.4833331>

Inuvik hosting Beluga Whale summit (23 Feb, 2016). *CKRW 96.1 FM The Rush*. <http://www.ckrw.com/news/local-news/inuvik-hosting-beluga-whale-summit/>

Beluga Summit 2016 in Inuvik (15 March, 2016). *Inuvialuit Communications Society*. <https://www.youtube.com/watch?v=i9EvM4Fz7Qo>

2016 Beluga Summit. *Tusaayaksat Magazine*. Spring 2016 issue. p. 26 - 30. [https://issuu.com/tusaayaksatmagazine/docs/tusaayaksat\\_spring\\_2016](https://issuu.com/tusaayaksatmagazine/docs/tusaayaksat_spring_2016)

The Beluga Summit: Knowledge sharing of the Eastern Beaufort Sea beluga whale (10 Sept, 2018). *Canadian Science Publishing*. <https://medium.com/arctic-science/the-beluga-summit-knowledge-sharing-of-the-eastern-beaufort-sea-beluga-whale-27f860c58fd6>

The Beluga Summit (29 April, 2019), *Above & Beyond*. <http://arcticjournal.ca/health-science/science/the-beluga-summit/>