Fisheries and Oceans Canada

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BELUGA BULLETIN

Prepared by Sonja Ostertag

Winter Update: Beluga Monitoring and Research in the ISR

Lisa Loseto, Section Head, Ecosystems Impacts, Fisheries and Oceans Canada

Inside this issue:

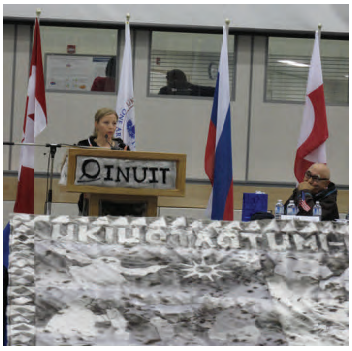
Small fish taken from the stomach of a beluga whale harvested in August in Ulukhaktok.

Please enjoy the winter-spring issue of the DFO-FJMC beluga bulletin. This issue focuses on **sharing updates** and early findings on beluga research, monitoring and other related activities. The purpose of the beluga bulletin is to share more information about the beluga-based research and monitoring, with all the communities in the ISR.

The studies taking place in the ISR on beluga whales are like none other in the world. The ISR has the **longest known beluga monitoring program** that will reach **35 years** this summer. This is an **astounding accomplishment** that has been made possible by the partnerships and perseverance by many.

We would like to **acknowledge** the willingness of the **hunters** who continue to share their samples and the **whale monitors** who lead on collecting samples and measurements.

Mentoring youth and inspiring students to become involved in science has consistently been a priority for the beluga research team. Eight community members were engaged as **community research assistants** and **summer students** for the 2014 Field Program. Presentations about the ISR beluga research program were given to nine school classes in Paulatuk, Inuvik, Tuktoyaktuk and Ulukhaktok and the ENRTP class at Aurora College.



Lisa Loseto presented her program to the Inuit Circumpolar Council's General Assembly.

The summer of 2014 remains an interesting one for beluga sampling that we are currently investigating.

The DFO is leading a number of studies that are not presented in this issue:

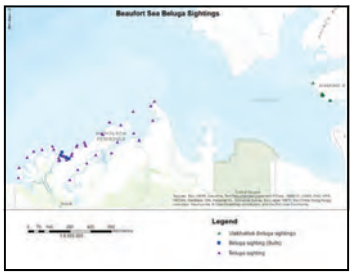
- The **age** of harvested whales is being approximated by analyzing the number of growth layer groups in the dentine of their teeth.
- The **stomach contents** from belugas harvested in Ulukhaktok this summer.
- The types of **fat, stress levels, contaminants, and viruses and parasites** in tissue.
- **Passive acoustic monitoring** of beluga **vocalizations** and baseline **natural and human noise** in Kugmallit Bay.

We look forward to sharing more updates and findings in our June issue!

Enhancing beluga monitoring in the ISR through the inclusion of local and traditional ecological knowledge

Sonja Ostertag, Visiting Fellow, Fisheries and Oceans Canada

The goal of this project is for the Inuvialuit to have their knowledge and observations recorded to support the monitoring of the health and habitat use of beluga whales.



In 2013 and 2014, harvesters' recorded their observations of beluga whales alongside regular monitoring at harvest camps. Interviews with beluga harvesters and their families have nearly been completed. Digital maps have been prepared to record where belugas have been observed in the ISR.

We are also linking shore-based observations made at Hendrickson Island with underwater recordings of beluga vocalizations to learn more about how belugas use the Estuary.

An online component to this project is being developed with the Beaufort Sea Online Platform. We are developing an online tool to record, store and share beluga observations in the ISR.

Involvement of Inuvialuit in ArcticNet and the Arctic Change International Conference

Kathleen Snow, Fisheries and Oceans Canada

Arctic Change brought together international partners from all sectors to discuss Arctic research, health, climate change and policy issues in Ottawa, in December 2014. Participants from the ISR beluga research and monitoring programs took part in the conference.

Bernadette Green (Paulatuk), Sonja Ostertag (DFO), Shaeli Pokiak (Tuktoyaktuk), Verna Pokiak (Tuktoyaktuk), Lisa Loseto (DFO) and Brandon Green (Paulatuk) at the Arctic Change conference in Ottawa.

Kate became the Inuit Communications Officer for ArcticNet in 2013 and had the privilege to facilitate workshops that discuss Inuit culture and relate this to scientific principles such as engaging communities and presenting scientific information back to research participants in a meaningful way. Kate's priority is to adequately bring relevant ideas and suggestions to the table that speak to Inuit values and way of life.

Kate helped co-ordinate a Collaborative Research panel discussion that displayed a dialogue between researchers and community participants. In addition, Kate spoke to the international audience about her involvement in the beluga monitoring program with Dr. Lisa Loseto, Dr. Sonja Ostertag, and the whale monitors and junior monitors Verna Pokiak, Brandon Green, Shaeli Pokiak and Bernadette Green.

Beluga Habitat Characterization in Kugmallit Bay

Kayla Hansen-Craik, Fisheries and Oceans Canada

Habitat characterization of Kugmallit Bay.

The beluga habitat characterization project collected samples during the summer of 2013 and 2014 prior to the arrival of beluga, to understand why beluga whales may prefer certain areas of the Mackenzie Delta (**hot spots**).

The seabed within Kugmallit Bay was characterized by five distinct zones (See Map). Most of the bay was characterized as featureless and flat (~60%). The presence of a sandy shoal just beyond the mouth of the Richardson Island channel was confirmed.

Turbidity varied throughout the bay, both over time and spatially. High sediment loads came into the Estuary with the spring freshet. Suspended particles slowly dispersed throughout the summer. The effect of environmental factors on belugas will be explored by linking local beluga observations with habitat characterization.

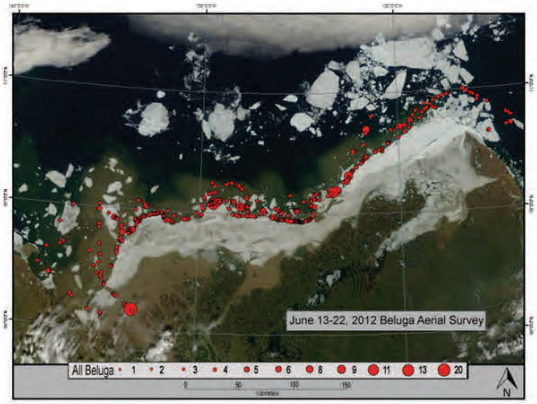
Beluga spring and late-summer habitat use in the southeast Beaufort Sea

Claire Hornby, MSc Student, University of Manitoba (DFO Project)

We investigated beluga habitat use of: sea ice, water depth and freshwater flow from the Mackenzie River using data collected from the 2012 and 2013 aerial surveys flown over the Mackenzie Shelf before breakup of the landfast ice in late June. We are interested in learning about the spring arrival and distribution patterns of beluga whales.

In general, beluga preferred open water to light ice concentrations, shallow depths of 0-50 m, and areas of medium to high freshwater. Breakup occurred first in Shallow Bay on June 22, 2012, and belugas were increasingly found in freshwater areas closer to this date. Belugas also observed to cluster along the ice edge more than the offshore regions along the Tuktoyaktuk Peninsula (>200 m).

Future work will look at the late-summer habitat use in the offshore Beau-



All beluga (red circle) sightings from June 13-22, 2012 aerial surveys.

New techniques for ageing beluga whales and measuring stress hormones

Kerri Pleskach, Chemist, Fisheries and Oceans Canada

A new technique was recently developed to estimate the age of beluga. This method is faster, simpler and comparable to the current method of ageing beluga based on counting dentine layers in their teeth. The chemistry of the eyeball lens changes over the lifetime of the animal. Hopefully this method can be used to estimate the relative age of harvested beluga.

Cortisol is a stress hormone that can be measured in beluga blubber and blood to indicate overall animal health. We measured cortisol levels in Hendrickson Island beluga from 2007-2010.

We now have a baseline to begin examining possible changes in stress levels over time, in this population of belugas.

An extracted lens from a beluga eyeball.

"This new method for ageing belugas is faster, simpler and comparable to the current method being used".

Identifying the offshore diet of Beaufort Sea belugas

Emily Choy, PhD student, University of Manitoba (DFO Project)

Emily is studying the potential consequences of climate change-induced prey shifts on the diet of Beaufort Sea belugas. She has spent three summers on Kendall Island, where she examined health and body condition by measuring blubber thickness of harvested belugas.

Emily is using fish and invertebrate species (e.g. squid) collected from the BREA Frosti fish program to determine diet linkages and energy transfer from prey (diet) to belugas.

Based on the preliminary results, Arctic cod, capelin, and Greenland halibut may be important offshore prey to the beluga whales.

Emily assisting John Day at Kendall Island to take measurements of a harvested whale.

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The DFO takes an ecosystem based approach toward research and management. DFO and FJMC partner to address the FJMC core mandate of measuring and monitoring the ecosystem status of both the TN MPA and the Large Ocean Management Area

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Highlights from 2014

The DFO and FJMC Team following a community presentation in Ulukhaktok.

Kate Snow from Inuvik, and Corrie and Cora Joss from Ulukhaktok received FJMC Instantaneous awards for their efforts in sampling beluga whales.

Deva Lynn Pokiak and Sonja Ostertag present to science students at Mangilaluk School, Tuktoyaktuk.

Diane Ruben from Paulatuk received an FJMC Instantaneous Award for her excellent reporting and coordination of projects.

Kayla Hansen-Craik and Kate Snow presented to the Inuit Circumpolar Council's General Assembly in Inuvik.

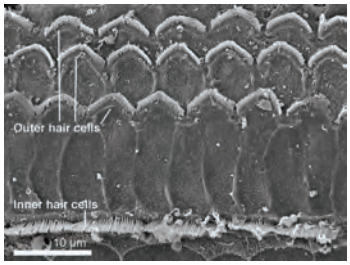
Collaborative research panel at the Arctic Change conference in Ottawa, ON.

Inner ear analysis of beluga whale

Maria Morell, Post Doctoral Fellow, University of British Columbia

During the summer of 2014, Marina Piscitelli and Sonja Ostertag collected the inner of beluga whales harvested in Hendrickson island.

Electron microscopy analysis revealed that the cells of the sensory organ presented structural characteristics that allow belugas to hear at the very high frequencies. These features are also shared by other toothed whales, and interestingly, by echolocating bats. Assessment of acoustic trauma from exposure to low frequency noise will be difficult due to lesions from gunshot fire. However, these analyses will still allow us to detect permanent acoustic damage due to mid or high frequency man-made noise overexposure.



Scanning electron microscopy image of a healthy organ of Corti of beluga whale, formed by one row of inner hair cells and three rows of outer hair cells.

Beluga lung mechanics

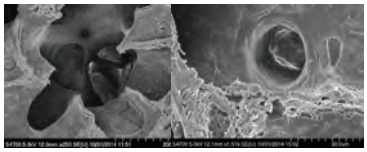
Marina Piscitelli, PhD student, University of British Columbia

During the beluga harvest of July 2014, lung samples were collected to examine the mechanics of beluga lungs.

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.

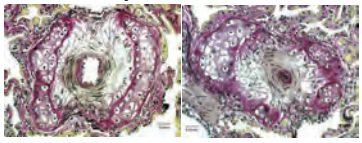
Viewing the lung tissue under the microscope showed openings (pores) that directly connect different parts of the lung (i.e. alveolar bundles) to each other (grey images). This allows for increased lung volume for deeper breaths. These openings could also be a pathway for diseases to spread more easily 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.



Openings that directly connect one alveolar bundle with another

Airway muscular valve



Open airway Closed airway

Food preparation impacts on nutrients and environmental chemicals in muktuk

Matthew Binnington, PhD Student, University of Toronto

We are interested in the impact of traditional food preparation methods on the levels of important nutrients (minerals, fatty acids) and environmental chemicals in traditional food items. We have chosen to examine beluga traditional foods. We think that the different ways of preparing blubber (raw, cooked, uqsuq,) may affect intakes of these nutrients and chemicals.

Following traditional food preparation methods in Tuktoyaktuk

I sampled beluga whale muktuk in Tuktoyaktuk with Lucky and James Pokiak in July 2014. Now I have begun to analyze the blubber, muktuk, and uqsuq samples with my research team to measure different groups of industrial chemicals and pesticides, as well as fatty acid nutrients. We have completed the analysis on 1 of the 3 major environmental chemical groups (perfluorinated compounds), and are in the middle of experiments to test the other classes. We will be able to communicate the full set of results this summer!