Community based monitoring of sea ice and Eider Duck Populations around the Belcher Islands, Nunavut 2015

The Hudson Bay eider (Somateria mollissima sedentaria) breeds on the east and west coasts of Hudson and James Bay, and on the Belcher, Sleeper, and Ottawa Islands. The harvest of adult Hudson Bay eiders occurs in all months by residents of the Belcher Islands, with an annual harvest of approximately 2000-5000 birds. Eiders are most important to residents during freeze-up in the fall when other bird and mammal species are often inaccessible to hunters. The Municipality of Sanikiluaq is also establishing a commercial eider down harvest. These factors make the eider one of the most economically important species to the community of Sanikiluaq.

Eiders breeding within Hudson Bay spend the winter in open water leads and polynyas near the Belcher Islands and off the west coast of Quebec. In doing so, the Hudson Bay eider is vulnerable to mass die-offs in winter when eiders are concentrated in open-water leads that freeze. In the 1990's the eider population was 70% lower than surveys from the 1980's, due to extreme sea ice conditions that caused a large starvation event. Our research to date has studied the detailed foraging behaviour of eiders as they dive under the sea ice at polynyas to feed on mussels and urchins. Through Local Knowledge studies, energetic models, and by radio tracking individual eiders, we have also identified the specific sea ice and winter conditions under which eiders can no longer balance their energy budgets. In addition to climate, tidal current regimes in Hudson Bay are apparently changing (perhaps as a result of the cumulative effects of extensive hydrological development in southeastern Hudson Bay). In recent years Inuit have reported slower tidal currents and unprecedented freeze-ups at polynyas that are important habitat for eider ducks. These factors emphasize the need for sound information on the possible changes occurring in the sea ice habitats and how they influence populations of eider ducks. The focus here has been to apply our existing knowledge of individual behaviour to a larger scale, and to understand how changing sea ice conditions influence the movements and population dynamics of eider ducks. Our ongoing use of time lapse photography and Inuit field surveys have led to the implementation of a multi-scale community-based research and monitoring program that allows us to simultaneously monitor the dynamics of sea ice formation and habitat use by eiders around southeastern Hudson Bay.
Additional information is provided at www.arcticeider.com/research

OBJECTIVES: (Key expected results & Management implications)

1. Quantify polynya formation at multiple sites around the Belcher Islands using high resolution satellite imagery, time lapse photographic monitoring, information from local residents, and snowmobile surveys.
2. Quantify the distribution and movements of sea ducks and marine mammals in relation to changing ice and current conditions within a winter and over several years.
3. Identify the magnitude and seasonal timing of eider die-offs during winter, and identify the causes of this mortality if they occur.
4. Provide local hunters with oceanographic equipment to deploy through the sea ice at various locations around the Belcher Islands during winter.

5. Use our existing information, behavioral models, and movement data from GPS units to examine the behavior of large groups of individuals as they respond to changing currents and sea ice regimes. This will help assess their vulnerability to starvation.
6. Use high definition underwater video to quantify the distribution and abundance of benthic food resources and their rate of exploitation by eider ducks.
7. Consult hunters and residents of Sanikiluaq to identify long term trends in wildlife and sea ice and the areas they feel require priority for monitoring (ongoing).
8. Train Inuit hunters in biological techniques, population surveys, and time lapse monitoring so that local residents can be employed and engaged in long-term environmental monitoring of the marine environment in the Belcher Islands.

The results of this study have direct management implications. We will integrate data from time lapse monitoring, local knowledge, and foraging behavior into a computer model to assess the influence of different environmental regimes and harvest rates on eider populations.

METHODS: (i.e. Details of capture, handling, and disposition – *be SPECIFIC*)

Multi-scale community based monitoring using time lapse photography - Experienced Inuit hunters provide access and knowledge on local sea ice habitats for long term monitoring. These individuals, and Inuit youth that occasionally accompanied them, are trained in the setup and deployment techniques of time lapse monitoring stations. These stations can record images of sea ice extent and wildlife at a variety of intervals: from every 10 seconds for about a week, to 12 times per day for several months. This will allow both within and between year comparisons to detect important environmental changes. Resulting images will be analyzed and turned into time series data, through processing at southern laboratories. Furthermore, images will be shown to the Hunters and Trappers Association and disseminated to the community. This approach has inspired many local collaborators, directly allowed elders and hunters to view what we are monitoring and will provide a long term data set that can be used to document environmental changes in sea ice habitats and their influence on wildlife populations.

As in past years, long term timelapse deployments will be established at several major important sites, Agiararaluit, Lucassie Island polynya, and Quipaluq polynya. The Agiararaluit, Lucassie Island polynya deployments will obtain images of sea ice extent from January until March, and the Quipaluq site will obtain images from January through till June. Through the winter detailed sea ice dynamics will be quantified at an even higher resolution, up to an interval of every 20 seconds. This will allow further quantifying of wildlife abundance and behaviour at these habitats in relation to the ice data. Additional monitoring stations will be deployed at floe edge habitats used by eiders, providing unique insight into these habitats which are difficult to monitor due to their dynamic nature. We will compliment time lapse photography with high resolution satellite imagery. This comprehensive coverage of the different oceanographic regimes will be important in understanding how changing sea ice conditions are influencing the large scale distribution and abundance of eider populations.

Local Ecological Knowledge - Information regarding habitat and wildlife relationships (both past and present) are being documented through ongoing interviews with local residents by project members. This provides important information on historical sea ice extent and wildlife use, guides our community based monitoring efforts, and directs the selection of sea ice habitats for monitoring.

Oceanographic Monitoring
To monitor potential changes in freshwater flow regimes associated with discharge from Hydroelectric projects in James and Hudson Bay, we will be conducting a series of oceanographic surveys deploying CTD (salinity, temperature, depth) profilers to assess the extent of freshwater under winter sea ice. Ice core samples and water samples will also be taken. This will be conducted with local hunters by deploying a profiler through a small hole in the ice, letting it sink to the bottom, them immediately pulling it up. This work will occur in the Belcher Islands primarily, but also along the coastline in between Chisasibi, Kuujjuaraapik, Umiujaq and Inukjuak.

Deployment of GPS tags on eiders
We will trap eiders using a large salmon gill-net suspended in the air. We have used this method successfully in the past at the Belcher Islands and it allows us to capture eiders without harming them. Captured birds will be banded with a metal USFWS band. After banding a GPS tags will be mounted to the feathers on the birds' back. The waterproof, remote data-download units weigh 18 g (<1% of the body mass of a Common Eider), and will be attached to female eiders by taping the unit to their dorsal feathers, approximately 5 cm above the uropygeal gland, using waterproof, cloth-backed Tesa tape. This attachement method is designed so that the unit will fall off of the bird after 2-3 weeks. Data will be received via remote downloadable GPS receiver stations so there is no need to capture the same bird again to retrieve the GPS data. We hope to deploy 35 of these GPS units in 2014.

Monitoring disease and contaminants in eiders
We will be accompanying Inuit to their hunting grounds using snowmobiles, and collecting Common Eiders using 12 ga shotguns and bird shot. After a bird has been shot and retrieved by a hunter, whole eider carcasses will be frozen at -20°C and then shipped to the National Wildlife Research Centre in Ottawa for dissection and sample preparation. From each carcass, blood, feather, and tissue samples will be collected. All tissue samples will be analysed at the National Wildlife Research Centre in Ottawa for parasite and contaminant loads. We will collect up to 60 eiders (males or females) for a total of 60 samples of each type outlined in the table below for contaminant and parasite analysis. We will also opportunistically collect any dead eiders found at the site to be sent to the lab for contaminant and disease analysis.

Camp
While trapping eiders and during the oceanographic monitoring period we will be based at an Environment Canada research camp (55° 49.361 N, 79° 53.925 W) and travel to the polynyas and floe edge by snowmobile.