

East Bay Island Migratory Bird Research

2013 Field Season Trip Report and Update to Collaborators

King and Common Eiders

Project Overview

East Bay Island is the largest known colony of common eiders in the Eastern Arctic. Our studies at East Bay were initiated in 1996 in response to concerns that northern common eider ducks were being overharvested on their wintering grounds in west Greenland. We collaborated with Danish researchers, and the recommendations of our study resulted in new regulations in 2002 limiting the harvest quotas in Greenland. Following the implementation of the new regulations, the population at East Bay started to rebound



with increased female survival rates and an increase in the overall colony size. In 2005 avian cholera was detected at the colony, and has been present every year since then. This virulent disease is often fatal, and resulted in a 44% decline in the number of nesting females over a 3-year period (2006-2008). Since 2009 the number of females dying from avian cholera has steadily declined. In response to recent dramatic increases in resource development in the Hudson Strait-Foxe Basin region, we have partnered with Baffinland Iron Mines and expanded our research program over the past two years to assess the interactions of bird populations with proposed development activities; particularly year-round shipping. At East Bay, we collaborated with Danish veterinary surgeons and successfully tracked 46 eiders using satellite transmitters to determine key marine habitat areas throughout the annual cycle. Polar bear predation of nests on eider colonies is an

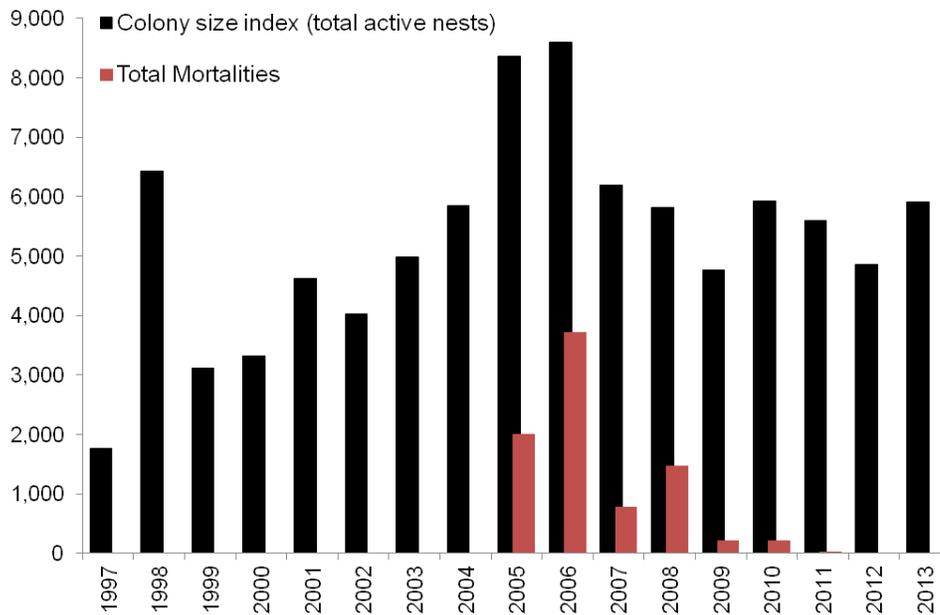


emerging concern throughout Hudson Strait and we have documented rapid increases in bear activity on multiple colonies and subsequent complete reproductive failure of eiders in some years. Our work suggests that bear prevalence on seabird colonies may be related to ice conditions over the previous winter. In future years the work at East Bay Island will continue to investigate the impacts of increasing polar bear predation, industrial development, emerging disease and harvest on northern common eiders.

2013 Research Highlights

In 2013, we continued with our long term research objectives including investigations into avian cholera and polar bear predation on East Bay Island. We also expanded our usual program to include satellite telemetry of a subset of adult eiders in order to investigate marine habitat use.

Avian Cholera at East Bay Island



Black bars are an estimate of the total number of active nests at East Bay Island, and red bars indicate the number of birds that died from avian cholera.

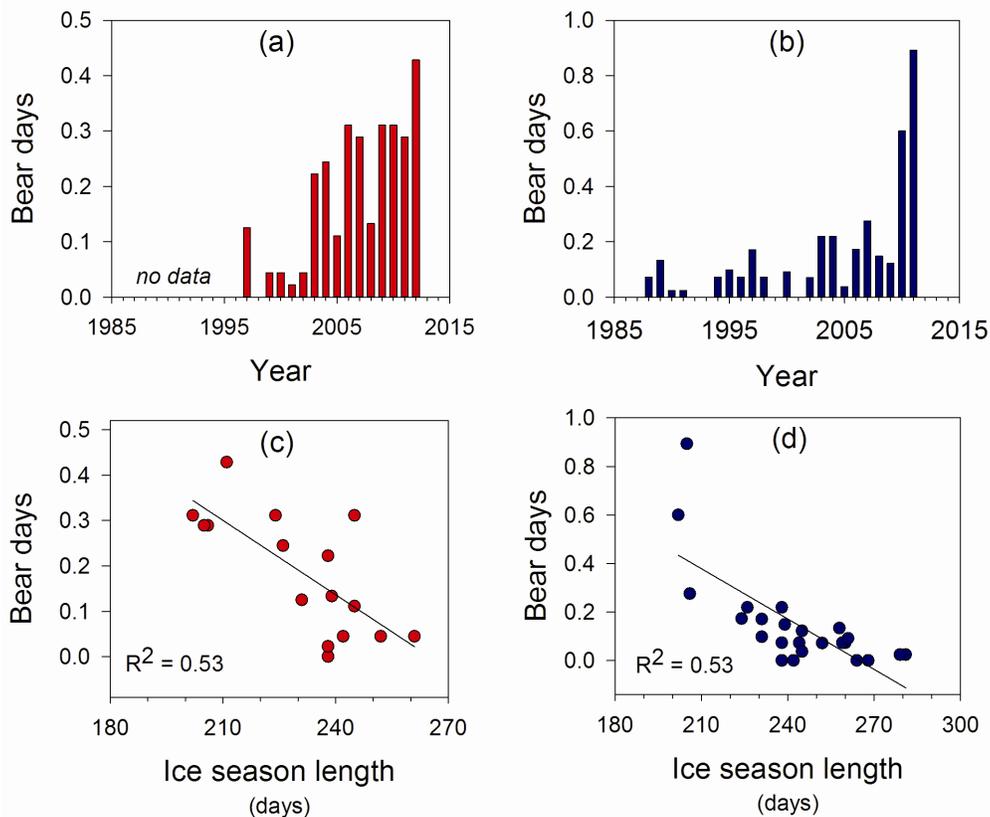
- Deaths from Avian Cholera are reduced from previous years, but the colony has not yet rebounded to pre-cholera levels. We recovered 6 dead eiders in 2013, compared to 34 in 2011, 222 in 2010 and 3,722 at the peak of the cholera epidemic in 2006.

With help from local HTO's, we are conducting surveys to evaluate the spread of avian cholera in eider colonies throughout Hudson Strait.

- The presence of avian cholera in the Canadian Arctic appears to be new. We have not confirmed any outbreaks of avian cholera in Nunavut, other than at East Bay Island. However, several outbreaks have been documented throughout the coastal regions of Nunavik.

Polar Bears at seabird colonies

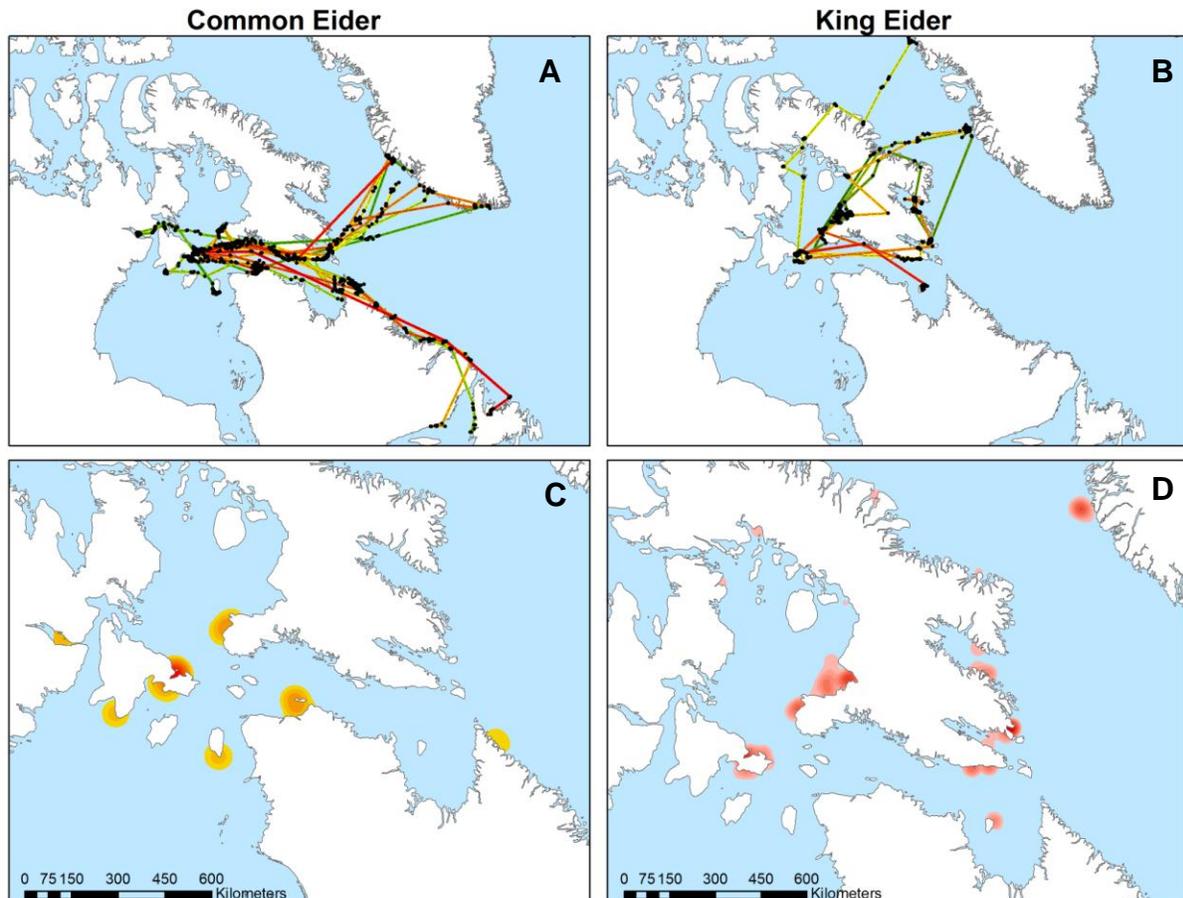
Surveys of eider breeding colonies indicate that polar bear predation of eider eggs occurs at multiple colonies throughout Hudson Strait, and can have important consequences for reproductive success of Common Eiders. At East Bay Island polar bears are present on the island more frequently in recent years and this appears to be related to ice conditions (b). The same pattern has been observed for the Thick-billed Murre colony on Coats Island (c and d). Taken together, these results suggest that ice conditions are having important indirect effects for eider reproduction in the eastern Arctic due to the relationship between ice conditions and bear prevalence at breeding colonies.



Number of days in which at least one bear was seen on East Bay Island (a) and Coats Island (b) seabird breeding colonies by year and in relation to ice conditions (c,d).

Eider Satellite Tracking

Resource development within the Hudson Strait-Foxe Basin region is expected to increase dramatically in future years. To assess the possible interactions of bird populations with proposed development activities; particularly year-round shipping, our goal is to determine important marine areas for birds in the region. To build on tracking data collected in 2012, we again collaborated with Baffinland Iron Mines and Danish veterinarians from Aarhus University to deploy satellite transmitters in Common and King Eiders in an effort to document their marine habitat use throughout the annual cycle.

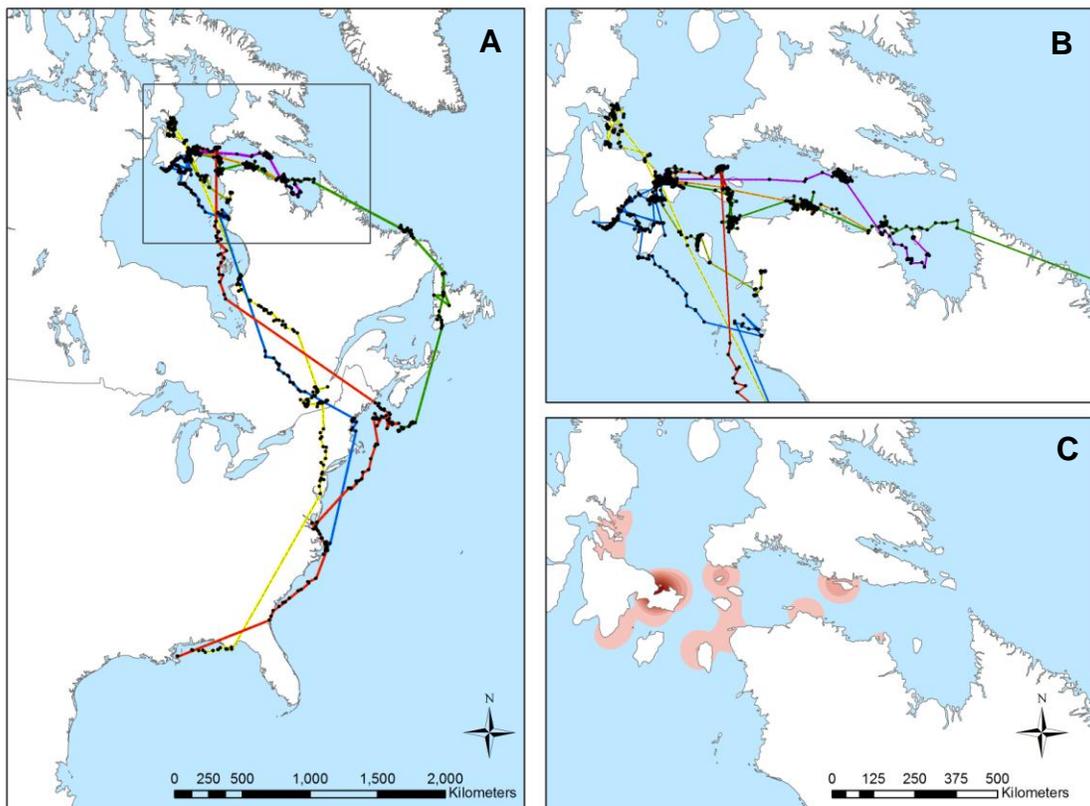


Common and King Eider satellite tracking: June 25-Nov. 5, 2013. Tracks (A,B) and important marine habitat areas (C,D) of individuals captured at East Bay Island.

All Common eiders that we tracked spent much of the summer and fall in Hudson Strait, indicating this is an important moulting area and migration corridor. Many of the King Eiders also used Hudson Strait, but Foxe Basin was used more by King Eiders than by Common Eiders from East Bay. Common Eiders wintered either in the Gulf of St. Lawrence and Newfoundland, or on the eastern coast of Greenland. All King Eiders wintered in Greenland, but multiple migration routes were evident, including direct trips over the mountain ranges of Baffin Island.

Herring Gulls

We have been tracking the reproductive ecology and demography of Herring Gulls at East Bay since 1998. We have also been using geolocators to track the migration of individuals over this period, and ramped up our tracking efforts in 2010 due to concern over potential negative effects of the Deepwater Horizon oil spill in the gulf of Mexico. Unfortunately, manufacturing defects meant that most of our recovered geolocators provided no useful tracking information. As a result, we switched to solar powered satellite tags, which were deployed for the first time in 2013.



Satellite tracking data of Herring Gulls from July – November 2013. Individuals are indicated by different colors (a,b) and important marine habitat areas are in red (c).

As part of a larger collaborative study with Environment Canada's Ecotoxicology and Wildlife Health Division we are also comparing levels of contaminants in eggs of gulls breeding at East Bay to eggs of gulls breeding at the Great Lakes. In addition, we are comparing tracking data to contaminant information in collaboration with Dr. Craig Hebert (Environment Canada) to investigate whether contaminant levels are influenced by overwintering locations. To separate the influence of location versus diet on contaminant loads, we will be using stable isotopes from blood samples to infer local diet composition, and feathers to infer overwintering diet composition.

Research Partnerships

Our research at East Bay Island was a combined effort of many people and organisations. Dr. Grant Gilchrist (Environment Canada) leads the project together with Dr. Oliver Love (University of Windsor) and Dr. Joël Bêty (Université du Québec à Rimouski). The project coordinators in 2013 were Mike Janssen and Christie Macdonald (Environment Canada). Wildlife veterinarians Dr. Christian Sonne and Steen Anderson joined us from Aarhus University and the Danish Center for Environment and Energy.

Student Projects at East Bay Island

Holly Hennin, PhD Candidate, University of Windsor

Holly is investigating how conditions during the winter influence energetic management of individual common eiders upon arrival at the breeding grounds, and whether this has important consequences for reproduction. She measures physiological traits from blood samples that are collected from common eider females as they arrive off of the sea ice. She then relates the physiological data to reproductive data that is obtained by following individual females throughout the breeding season.



Jennifer Provencher, PhD Candidate, Carleton University

Jenn's work examines how parasites and mercury may independently and/or jointly affect avian species during times of energetic stress in their annual cycle (e.g. migration and breeding). Through her work with hunters in northern communities and at the East Bay Island eider colony, Jenn is examining how parasite burdens and contaminants may influence reproduction and survival of eider ducks. Jenn also led the annual Marine Bird Dissection Workshop held in collaboration with the Nunavut Arctic College in Iqaluit, Nunavut again this year (funded by the Nasivvik Centre). Here, birds collected for research are used to provide educational opportunities for local students.



Jane Harms, PhD. Candidate, University of Saskatoon

Jane's work seeks to investigate the ecology of Avian Cholera in northern Common Eider populations. Additionally, because avian cholera is a disease of migratory birds, she is interested in determining the geographic and temporal distribution of avian cholera in the North to map potential movements of the pathogen between eider breeding and wintering locations as well as in other potential carrier species. Jane has collected samples from more than 6000 birds since 2005 and preliminary results indicate between 3% and 6% of apparently healthy common eiders on East Bay Island carry some strain of *P. multocida*, suggesting that birds are potential carriers of the bacteria that causes Avian Cholera outbreaks. However, further bacterial characterization is required to determine whether the strains from carrier birds are similar to those initiating outbreaks.



Frankie Jean-Gagnon, MSc. Candidate, Université du Québec à Rimouski

Frankie is investigating the impact of sea ice conditions on the reproduction of common eiders breeding in the Canadian Arctic. To breed successfully in the Arctic, female common eiders need to time egg laying such that ducklings hatch when the bay is ice free. Sea ice break up patterns vary between years, and breeding success depends on the capacity of the female to correctly assess when to initiate breeding by accurately interpreting environmental cues during the pre-laying and laying stages. Frankie is quantifying sea ice conditions using radar and optical satellite imagery, and relating the sea ice data to breeding parameters of Common Eiders from East Bay Island to assess the effect of ice cover during the laying and pre-laying stages on the reproduction of Common Eiders from 2002-2012.



Lorelei Guéry, PhD. Candidate, Université du Québec à Rimouski

Lorelei is investigating relationships between climate and population dynamics of common eiders in the circumpolar arctic. Using three long-term data sets of populations of eiders nesting in the Arctic (Kongsfjorden, Norway and Southampton Island, Canada) and subarctic (Grindøya Island, Norway), Lorelei is investigating potential relationships of population demographics such as survival and reproduction with global and local climate variations and outbreaks of avian cholera. She is also examining variation in reproductive effort of individual females in response to changes in local climate and microclimate around the nest. Ultimately, she will be able to incorporate this information into models that will help predict the influence of global and local climate variation on Common Eider population dynamics.



Pierre Legagneux, Post Doctoral Fellow, Université du Québec à Rimouski
Pierre is investigating relationships between climate, disease, stress and reproductive success of common eiders breeding at East Bay Island. He has found that individuals with higher investment in reproduction (clutch size) had lower immune response to cholera infections.

Together with Jane Harms, Pierre has also found that females that experienced warmer temperatures in fall had higher levels of stress hormones in their feathers, and this was correlated with arriving later on the breeding colony the following spring, with negative consequences for reproductive success.



Recent East Bay Island Publications

Provencher, J. F., M. McEwan, M. L. Mallory, B. M. Braune, J. Carpenter, N. J. Harms, G. Savard, and H. G. Gilchrist. 2013. How wildlife research can be used to promote wider community participation in the North. *Arctic*, 66: 237-243.

Iverson, S. A., H. G. Gilchrist, and P. A. Smith. Cascading ecological impacts of climate change: are Polar Bears feeding down the food chain? In revision with *Proceedings of the Royal Society B*.

Legagneux, N. J. Harms, G. Gauthier, O. Chastel, H. G. Gilchrist, G. R. Bortolotti, J. Bety, and C. Soos. Does feather corticosterone reflect individual quality or external stress in arctic-nesting migratory birds? *PloS One*. In Press.

Harms, N.J., Legagneux, P., Forbes, M., Gilchrist, H.G., Bêty, J., Love, O.P., Bortolotti, G. & Soos, C. Carry-over effects associated with moulting period affect reproductive success and survival in an Arctic migratory bird species. *Proceedings of the Royal Society of London B*. MS submitted in Dec. 2013

Legagneux, P., Berzins, L.L., Forbes, M., Harms, N.J., Hennin, H., Bourgeon, S., Foster, J., Gilchrist, H.G., Bêty, J., Soos, C., Love, O.P., Descamps, S. & Burness, G. No selection on avian immune traits in response to a highly virulent pathogen. *Evolutionary Applications*, MS submitted in Nov. 2013.

Descamps, S., S. Jenouvrier, H. G. Gilchrist, and M. Forbes. 2012. Avian cholera, a threat to the viability of an Arctic seabird population? *PLoS ONE* 7(2): e29659. doi:10.1371/journal.pone.0029659

Field Support and Financial Partners

The research at East Bay Island is logistically complicated and labour intensive, requiring a relatively large, dedicated crew of students and bird biologists. Field contractors in 2013 included Rian Dickson, Maxime Rivest, Nik Clyde and Chris Baird. Local expertise was provided by Josiah Nakoolak and Juipi Angootealuk of Coral Harbour.

Research in Canada's north is expensive and funding for this work is necessarily provided by a network of partnerships that includes but is not limited to: Baffinland Iron Mines, Nunavut Wildlife Management Board, ArcticNet, Nunavut General Monitoring Plan, CWS, EC Wildlife Research Division and EC Ecotoxicology and Wildlife Health Division, Université du Québec à Rimouski, University of Windsor, University of Saskatoon, Carleton University, Polar Continental Shelf Program (PCSP), Northern Scientific Training Program, the Kenneth M. Molson Foundation, NSERC, and the Nasivvik Centre for Inuit Health and Changing Environments.

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