EAST BAY ISLAND

2022 FIELD SEASON REPORT

ENVIRONMENT AND CLIMATE CHANGE CANADA

PROJECT OVERVIEW

Our studies at East Bay Island/Mitivik were initiated in 1996 in response to concerns that northern common eider ducks were being overharvested on their wintering grounds in west Greenland. Since then, many new issues have emerged and our long-term dataset has allowed us to expand our research to respond to concerns raised by northern communities and environmental assessment initiatives. Many of the emerging issues that we are currently researching include the influence of climate change and resource development on arctic marine birds. Increasingly, our findings related to bird movements and their habitat use are contributing to the planning of marine protected areas in Northern Hudson Bay.

Our research objectives include:

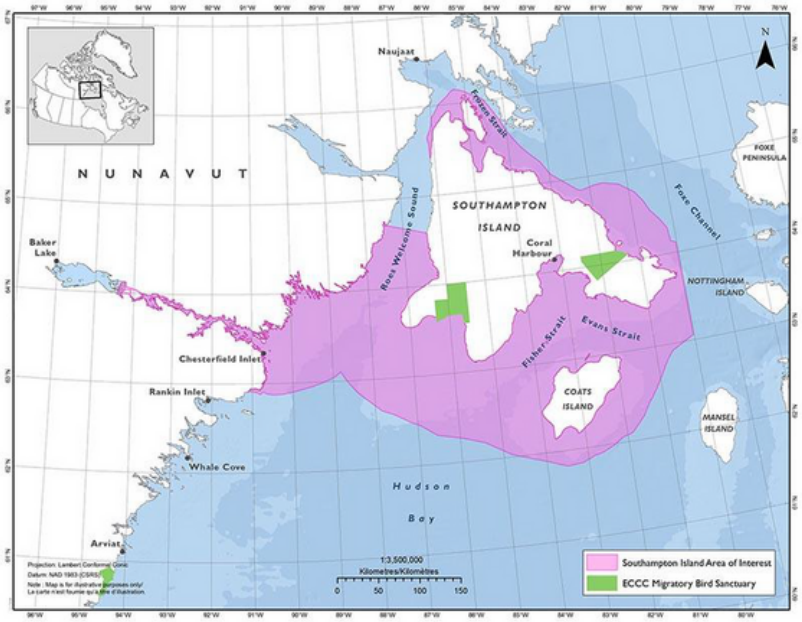
1. Investigating direct effects of variable annual weather conditions and changing sea-ice conditions on eider reproduction and population dynamics.
2. Investigating and forecasting relationships between polar bears and eiders as diminishing sea ice influences bear predation of eider nests.
3. Identifying key seabird marine habitats in an effort to identify potential issues related to northern industrial development, particularly year-round shipping.
4. Understanding the physiological mechanisms linking climate variability, reproduction, and survival of arctic breeding migratory birds.
5. Tracking birds using GPS technologies to quantify their use of coastal and off-shore marine habitats. These findings are contributing to the design of marine protected areas currently proposed in Northern Hudson Bay.

CONTRIBUTING TO MARINE PROTECTED AREAS

The formal protection of the Marine Environment is a national priority. In the Arctic, Government Departments and local communities are working together to identify areas worthy of protection. The spatial use of the ocean by wildlife is one element that considered when designing marine protected areas.

Our team is contributing seabird spatial tracking information which will be useful in the design of 'The Southampton Island Area of Interest'. This area encompasses the nearshore waters around Southampton and Coats Island in the Kivalliq Region of Nunavut. This site comprises 93000 km2 within the Hudson Bay Complex Marine Bioregion, and is approximately 1.6% of Canada's ocean territory.

Southampton Island is the largest island in Hudson Bay, near the confluence of Hudson Bay and Foxe Basin waters; making it an area of high marine productivity. The area is important for key marine species including narwhal, beluga whales, and bowhead whales. It also contains walrus haul-out sites, polar bear dens, and foraging habitats of seabirds. This new protected area will encompass two Environment and Climate Change Canada (ECCC) Migratory Bird Sanctuaries: The Harry Gibbons (Ikkattuaq) Migratory Bird Sanctuary, and the East Bay (Qaqsauqtuuq) Migratory Bird Sanctuary.



Proposed marine protected area.

BACK IN ACTION

It became clear early in 2020 that the impact of the COVID-19 pandemic would have profound and widespread impacts for everyone across Canada, and particularly those living in remote Northern communities. An important priority for our team was to the limit the impact of our field related activities on Northerners. In consultation with the community of Coral Harbour, Nunavut, our team decided to cancel the 2020 and 2021 field seasons.

In 2022, our team of Government researchers, northerners, academic professors and students were absolutely thrilled to be back working together on so many projects focused around the factors affecting Arctic biodiversity. We worked closely with our supporting partners and core team members from Salliq (Coral Harbour) to carefully and cautiously plan this year's field season to make sure everyone would be safe. In late May all the crew members waiting for news were overjoyed to hear from Grant, Josiah (Nakoolak), Mark (Eetuk), Zach and James who snowmobiled from Salliq to East Bay that the island camp looked great. It had weathered the past two years without all our support, and was ready for all the rest of the team to join and get our research up and running again.

The joy I felt at being fortunate enough to be returning for my own 17th field season at Mitivik/East Bay Island was truly hard to explain. The sense of working closely together with so many diverse team members, who come with such a range of experiences and backgrounds, is truly what makes Mitivik/East Bay Island magical for me. When that team is solid, the research naturally follows. After just a few days of getting back up to speed, we settled into our work studying common eider responses to climate change, examining how snow buntings are dealing with earlier and often highly changeable springs, and when and why Polar bears are visiting the island due to shorter winter hunting opportunities on the ice. The 2022 field season was a huge success, and it is truly great to be working with everyone again to play our part of understanding the impacts of a rapidly changing world on Arctic wildlife and the biodiversity they help to support.

- Dr. Oliver Love

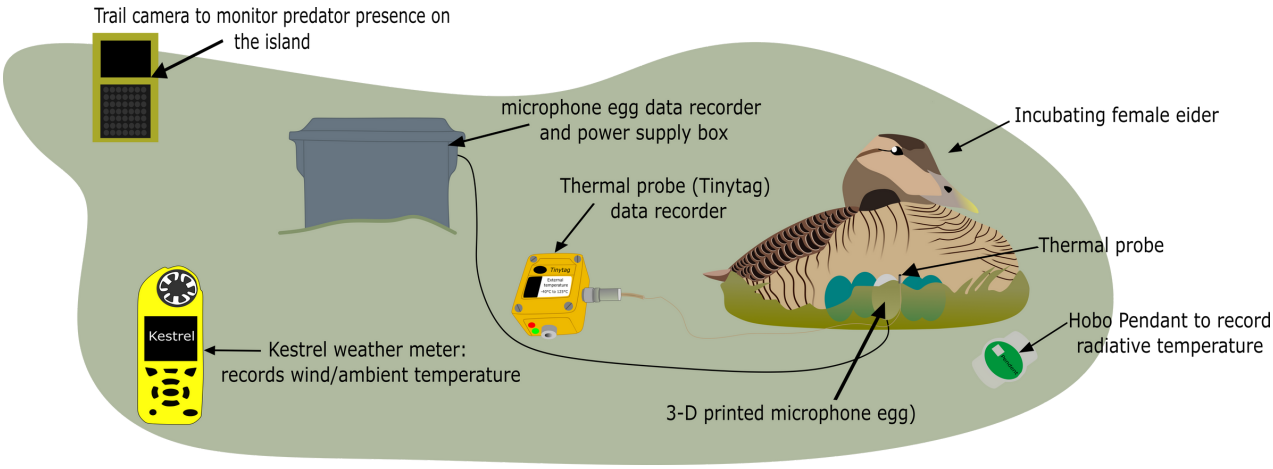
Impacts of thermal stress on nesting common eider physiology and behaviour

Emily MacDonald (M.Sc. Student, University of Windsor with Drs. Christina Semeniuk and Oliver Love)

Arctic temperatures rise at an alarming rate, yet its direct impact on arctic species remains understudied. As such we are examining the physiological and behavioural response of incubating female eiders to thermal stress at East Bay/Qaqsauqtuuq Migratory Bird Sanctuary in Nunavut. Female eiders here may be particularly at risk of over-heating during incubation because their nests tend to be thermally exposed, and they perform a 24-26 day fast during their incubation (i.e., no energy input to combat increased thermoregulatory costs).

We measured the physiological and behavioural response of female eiders to varying ambient temperatures by installing a heart rate recording microphone (previously validated by E. Geldart's research) and a thermal probe (previously validated by R. Smith's research) in 13 female eider nests this past summer. Further, we recorded ambient and radiative temperature as well as wind speed around the nests and breeding colony. This data set is further supplemented by similar data from 2019 (11 females), and an anticipated sample size of 20 females in the summer of 2023.

Characterizing climate warming effects on the energetic and behavioural costs of breeding in female eiders will provide insight on their vulnerability to rapid arctic temperature changes. Further, predicting temperatures at which eiders experience thermal stress can be used to predict future projected climate impacts, and inform timely management strategies of this culturally important seabird.



Example set up of heart rate and temperature recorders in eider nest with surrounding environmental temperature recording devices.

Mismatch as a consequence of a warming arctic in a cold-adapted passerine

Alysha Riquier (M.Sc. Student, University of Windsor with Dr. Oliver Love and Dr. François Vézina)

Snow Buntings (*Plectrophenax nivalis*) are a circumpolar Arctic-breeding passerine that are currently suffering from a large population decline. They are the earliest-arriving spring avian migrant to the Arctic. Snow buntings are income breeders, meaning that the resources used for egg formation is dependent solely on biomass accumulated on the breeding grounds. Because Snow buntings feed on arthropods (e.g., insects, spiders), the timing of breeding is especially important for this passerine. With climate change affecting the timing of snowmelt and the emergence of arthropods, it is critical that the bunting chick-rearing period matches with the peak of arthropods.

Our goal is to examine the link between food availability (arthropods) and laying phenology, and then forecast whether the synchronicity of timing between arthropods and buntings will diverge as climate change accelerates. To determine if there is mismatch between insect peak and nestling peak energy requirements, we work with a breeding bunting population located on Mitivik Island, NU, a small island with a high concentration of Snow Bunting pairs. We took breeding measures such as lay date and clutch size, as well as eventual success outcomes (e.g., hatching and fledging success). Pitfall traps were used to collect arthropod samples to quantify biomass present throughout the Snow Bunting nesting season and by using historical data (2007-present).

As a result of this research, we hope to find important mechanistic information on how climate change might be affecting the resource base for a declining arctic passerine. As such, our findings will help to determine whether Snow Buntings have the flexibility in their laying decisions to keep pace with the effects of expected increases in the effects of climate change in the north.

A female Snow Bunting feeding her hungry chicks.

A male Snow Bunting carrying a mouthful of arthropods.

RESEARCH PARTNERS AND FINANCIAL SUPPORT

Our research at East Bay Island is a combined effort of many people and organizations. Dr. Grant Gilchrist (Environment and Climate Change Canada; ECCC) co-leads the project together with Drs. Oliver Love (University of Windsor), Christina Semeniuk (University of Windsor), Mark Forbes (Carleton University), Paul Smith (ECCC), Evan Richardson (ECCC) and Holly Hennin (ECCC). Support in Coral Harbour is provided through the Aiviit Hunters and Trappers Organization, and especially by Natasha Ottokie and Jupie Angootealuk. We thank Isabel Buttler and Rob Kelly for their ongoing contributions to data management.

The research at East Bay Island is logistically complicated and labour intensive, requiring a dedicated crew of students, biologists and Northerners. Our eider field crew in 2022 included Jupie Angootealuk, Mark Eetuk, Grant Gilchrist, Oliver Love, Josiah Nakoolak, Alysha Riquier, Rebecca Jardine, Duncan Wright, Erika Nissen, James Alexander and Zachary Earle. Photos in this report provided by Alysha Riquier, Rebecca Jardine and Erika Nissen.

Research in Canada's north is expensive and funding for this work is provided by a network of partnerships that includes but is not limited to: Environment and Climate Change Canada (ECCC) Wildlife Research Division, ECCC Ecotoxicology and Wildlife Health Division, ECCC Canadian Wildlife Service, the PEW Charitable Trusts, Oceans North, Baffinland Iron Mines Corporation, Mitacs, Polar Knowledge Canada, ArcticNet, Nunavut General Monitoring Plan (NGMP), Carleton University, University of Windsor, Polar Continental Shelf Program (PCSP), Northern Scientific Training Program (NSTP), Northern Contaminants Program (NCP), Natural Sciences and Engineering Research Council of Canada (NSERC), the Garfield Weston Foundation, the Liber Ero Fellowship Program, and the Canada Research Chairs program.

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