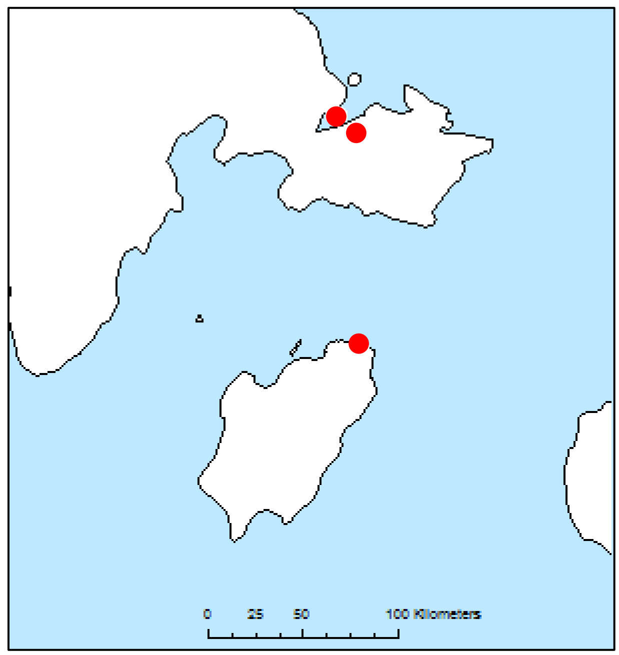
Migratory Bird Research 2017

East Bay, Southampton Island and Coats Island

Project Overview

Environment and Climate Change Canada has been doing research on seabirds and shorebirds at East Bay since 1996, in order to understand how Nunavut's bird populations are changing and why. Through our long-term studies in the Kivalliq, we are monitoring the wildlife and investigating the impacts of emerging issues like disease and shipping, in an effort to inform wildlife management decisions and conservation planning. There are two Environment and Climate Change Canada research stations at East Bay. The East Bay Island camp (Mitivik Island) focuses primarily on common eiders, and the East Bay Mainland camp focuses mostly on shorebirds. On Coats Island, we conduct seabird research mostly focused on thick-billed murres. The shorebird camp on Coats Island was not used in 2017.

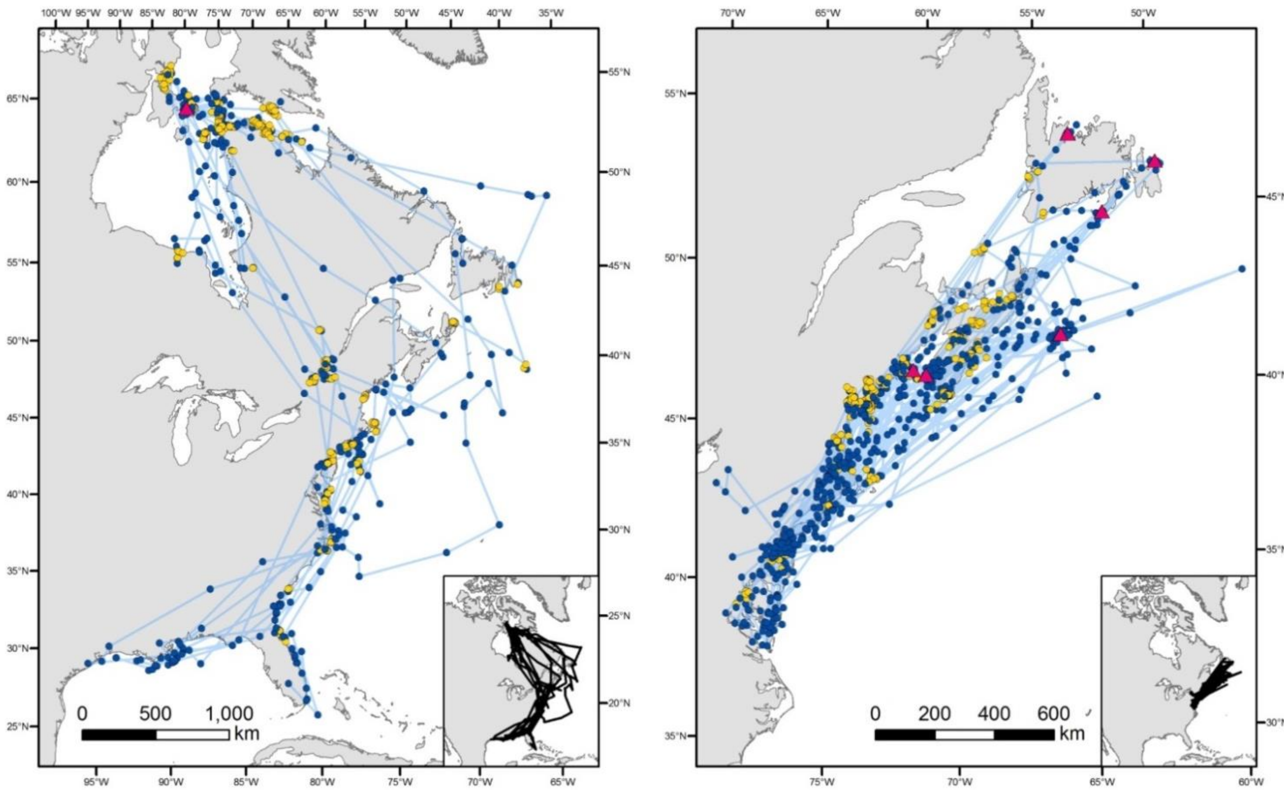


Many of the issues we are currently researching are in response to concerns raised by northern communities and environmental assessment initiatives, including:

1. Investigating polar bear predation on common eider nests as sea-ice diminishes.
2. Investigating how changing sea-ice affects eider movement and habitat use.
3. Identifying key marine areas for seabirds to understand potential issues related to northern industrial development, particularly year-round shipping.
4. Determining the effects of overabundant snow-geese on shorebirds and wetland habitats.

Migration of Herring Gulls across Eastern North America

Migratory birds are affected by events that occur throughout the year. Studying the full annual cycle of an organism is therefore critical to understand the effects of behaviour and environmental conditions over the seasons, especially in a context of changing ice conditions and increasing human activities. To study movements outside the breeding season, we paired our data with data provided by collaborators and used movement tracks of 43 individuals from 3 different populations of Herring Gulls.

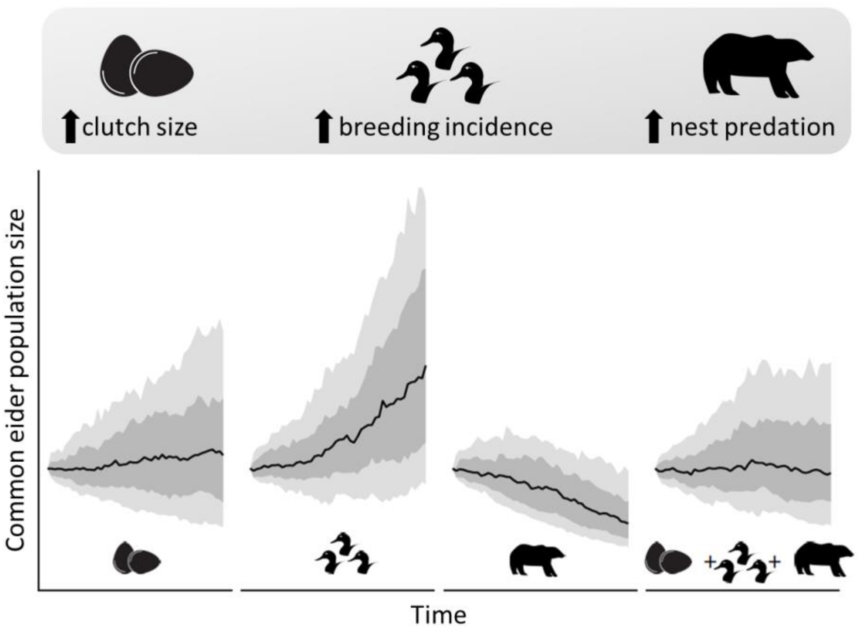


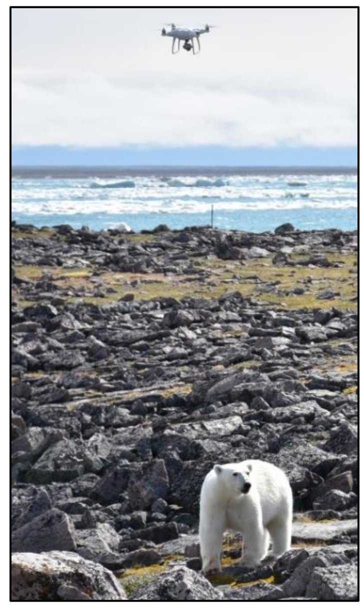
Maps of migration routes for Herring Gulls breeding In Nunavut (left) and in Atlantic Canada (right). Travel days are represented in blue, stopover days in yellow and breeding sites in pink.

We found that Herring Gulls breeding in the Arctic migrate long distances to spend the winter in the Gulf of Mexico, more than four times further than individuals from the Atlantic and Great Lakes regions. Herring Gulls from the Arctic spent the majority of the winter in marine habitats, while those from the Great Lakes and Atlantic Canada used a wider variety of terrestrial habitats. However, in the Atlantic populations, known for their lower survival, a large proportion of individuals spent most of their time in habitats modified by humans. These results suggest that the observed lower survival of Atlantic Herring Gulls could be linked to stress and mortality caused by human activities during the winter. This information provides an important baseline from which to examine potential effects of large scale environmental changes and human influences on both breeding and wintering grounds.

The Impact of Nest Predation by Polar Bears on Common Eider Populations

Because of sea-ice loss, we have shown that polar bear predation on common eider eggs has been increasing at Mitivik Island and in other locations across the Arctic. Yet the number of eiders nesting at Mitivik Island has remained relatively stable over the last 5 years. We have been using computer simulation models to understand how polar bears might be affecting common eider populations and why the population at Mitivik Island is not declining as expected. Our models suggest that climate warming may slightly increase the number of eggs laid by eiders, as well as the number of eiders that initiate nesting, which could offset the effect of polar bear predation. However, our models also suggest that eiders might disperse to different islands to avoid polar bears. This in turn could make it harder to collect down or eggs from the colonies by Inuit harvesters, as eiders become more dispersed.





Left: Effects of clutch size, number of nestlings produced and nest predation by polar bear on common eider population sizes. The combination of all the effects leads to no long-term changes in the number of eiders in the population. Right: a drone filming a polar bear at Mitivik Island.

Studying the Feeding Behavior of Polar Bears in Common Eider Colonies

To improve our knowledge about polar bear feeding behaviour, we have been doing videography studies of feeding polar bears using aerial drones. These have been occurring for the past two summers at Mitivik Island. Using the videos that have been recorded, we will estimate how much energy polar bears gain from eating eider eggs in relation to time as well as how bears interfere with each other. These data will lead to better predictions of how sea ice loss will affect both polar bears and eider ducks.

East Bay Mainland

2017 was a very productive year at our long-term study site at the East Bay Mainland camp. We found 131 shorebird nests (compared to 77 nests in 2016 and 68 in 2015), making 2017 one of the highest nest counts in the 20 year history of the study. The season was marked by warm temperatures and early snow melt, which may have contributed to the high breeding numbers at the site. Almost 9 times more Red Phalaropes bred at the site in 2017 compared to 2016 (61 nests vs 7 nests); after several years of poor breeding numbers for Phalaropes at East Bay, this was an encouraging finding.

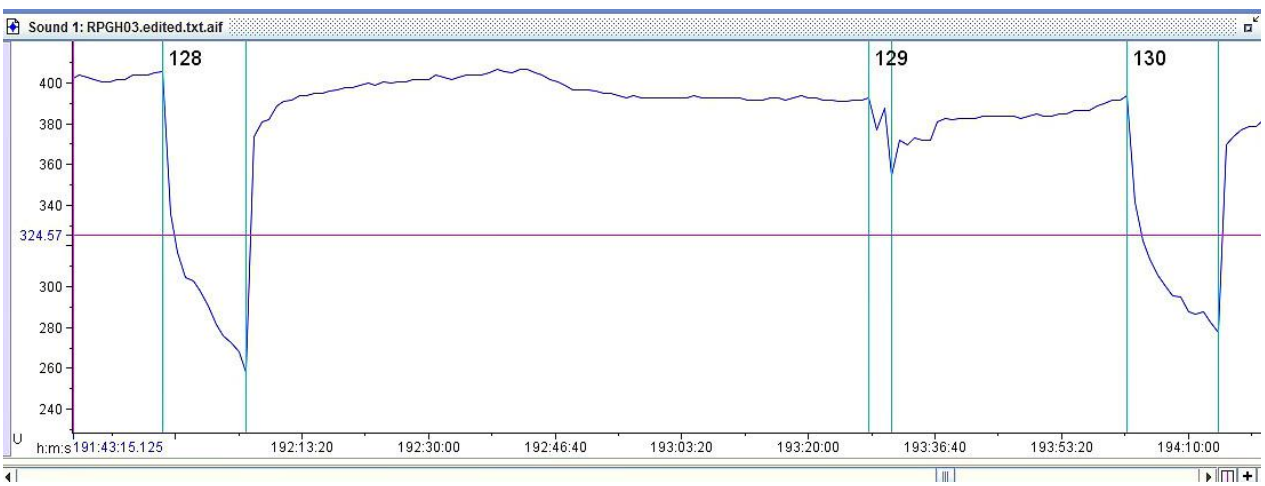
The hatching success of shorebird nests was also higher in 2017 than in recent years, with 21% of nests hatching chicks (compared to only 3.6% in 2016 and 0% in 2015). Lemming abundance was high and we observed few foxes on the plots, likely contributing to the above average hatching success. Another notable occurrence this year was the first Lesser Snow Goose nests within the permanent study plots, further evidence of the spread of the nearby colony at the head of the bay.

This year, in addition to our normal science program, we deployed geolocators, devices that allow us to track the movements of birds, on Artic Terns as part of a multi-site collaboration with other researchers throughout North America. We successfully deployed all 20 geolocators allocated to us, and hope to recapture as many as possible in 2018.

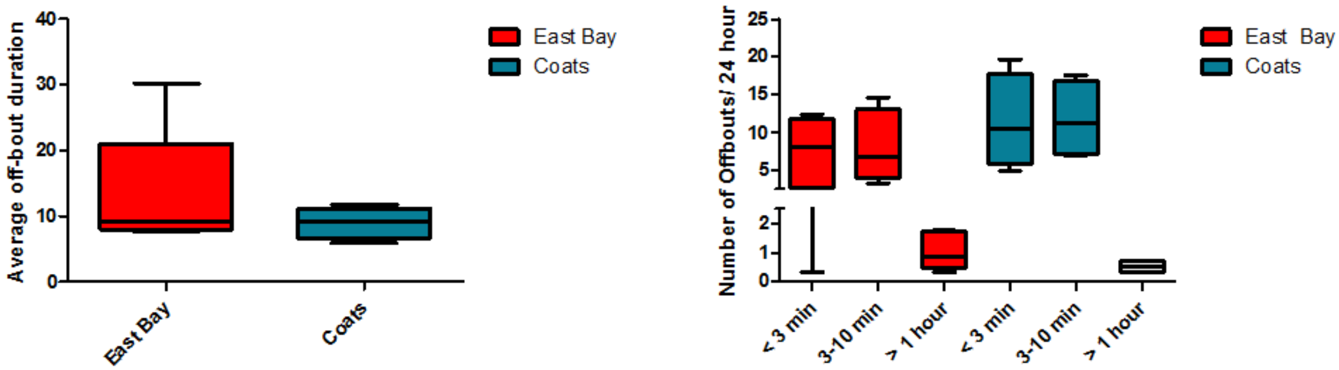
Clockwise from left: Black-bellied Plover, Arctic Tern preparing to have geolocator attached, White-rumped Sandpiper chicks in a nest.

Impacts of Geese on Shorebird Behavior and Reproduction

At times and locations where snow goose numbers are high, we see a higher disturbance of incubating shorebirds. At our Southampton Island sites, these goose-related disturbances are generally more common than other sources of disturbance, such as predators. Although 2017 was a comparatively good breeding year at East Bay, many recent years have seen poor nest success rates for shorebirds (<12%). Determining the causes of this poor hatching success is one of our primary objectives. Previous studies have shown that the risk of nest predation is increased when birds come and go from the nest more frequently. This is particularly important for birds nesting in tall vegetation that do not actively defend their nest but instead rely on avoiding detection. While geese are not eating shorebird nests, goose-related disturbance of nesting shorebirds could alert predators to the location of the nests, thereby increasing the risk of predators detecting nest locations. We placed temperature sensors in the nests of shorebirds to determine the number and duration of their breaks in incubation in areas with geese compared to areas without. The duration of breaks can also demonstrate the amount of time that birds need to gather the food required in order to sustain themselves during incubation.



Temperature profile of an incubating Red Phalarope at East Bay, Southampton Island 2016. Large drops in temperature occur when the bird leaves the nest for an extended period of time, for example to feed (#128, #130). Smaller drops in temperature occur when birds are disturbed but quickly return to the nest (#129).



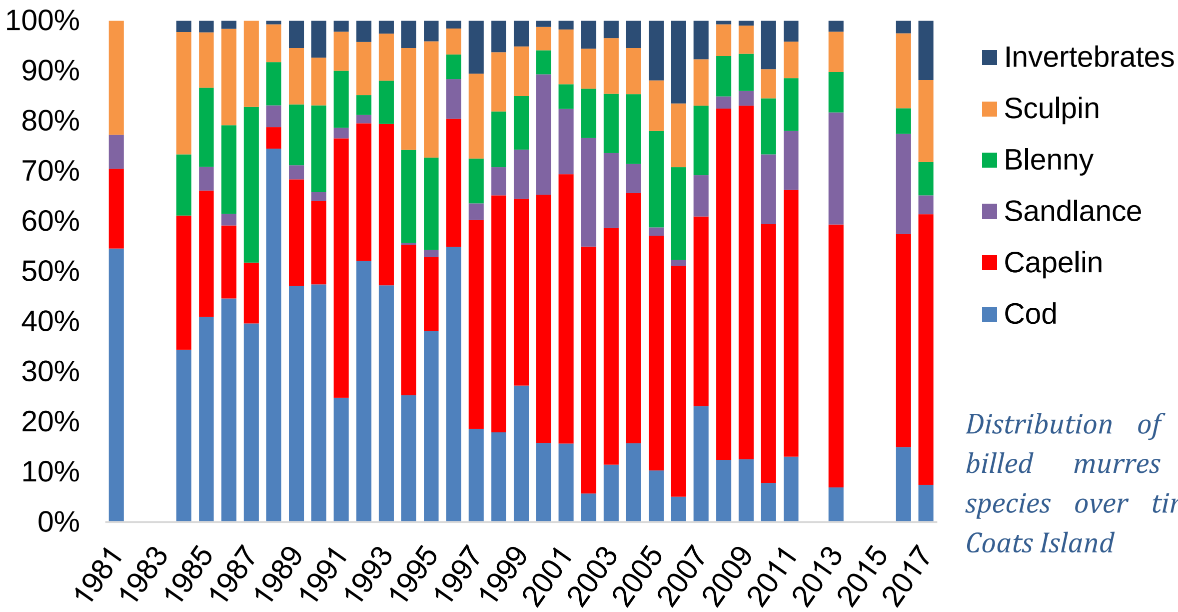
Incubation behaviour for Red Phalarope at East Bay compared to Coats Island, 2016.

Red Phalaropes are only one of the 7 species for which we monitor incubation behaviour. 2016 results suggest that Phalaropes have a similar number of incubation breaks at East Bay, where there are geese, and at Coats Island, where there are almost none (Fig. 4). At East Bay however, Red Phalaropes are off their nest for a longer period of time per break, potentially suggesting that they require a greater amount of time to gather sufficient food to maintain their energy balance. In 2017, we found a large number of Red Phalarope nests and deployed temperature sensors in most. Nest success was above average in 2017, and analyses of incubation data from this year will provide useful insights into the variability of incubation behaviour and how it relates to nest success in areas with and without geese.

Long Term Monitoring at Coats Island

Since 1981, we have been collecting data on the timing of breeding, nestling diet and growth, and population size. Although the population had been growing since the start of annual censuses, since 2010 the counts have been lower than the long term average suggesting a decline that is also being observed at the Digges Island colony. We therefore suspect that similar but as yet unknown factors may be influencing both of these thick-billed murre colonies in Hudson Strait.

Documenting the type of prey that adults select to feed their chicks provides an indication of fish species that may be available to seabirds. We have seen a shift in the main prey species brought to chicks at Coats Island, with Capelin replacing Arctic Cod as the primary prey species. We suspect this is due to a shift towards reduced summer ice cover that occurred in the mid 90's.



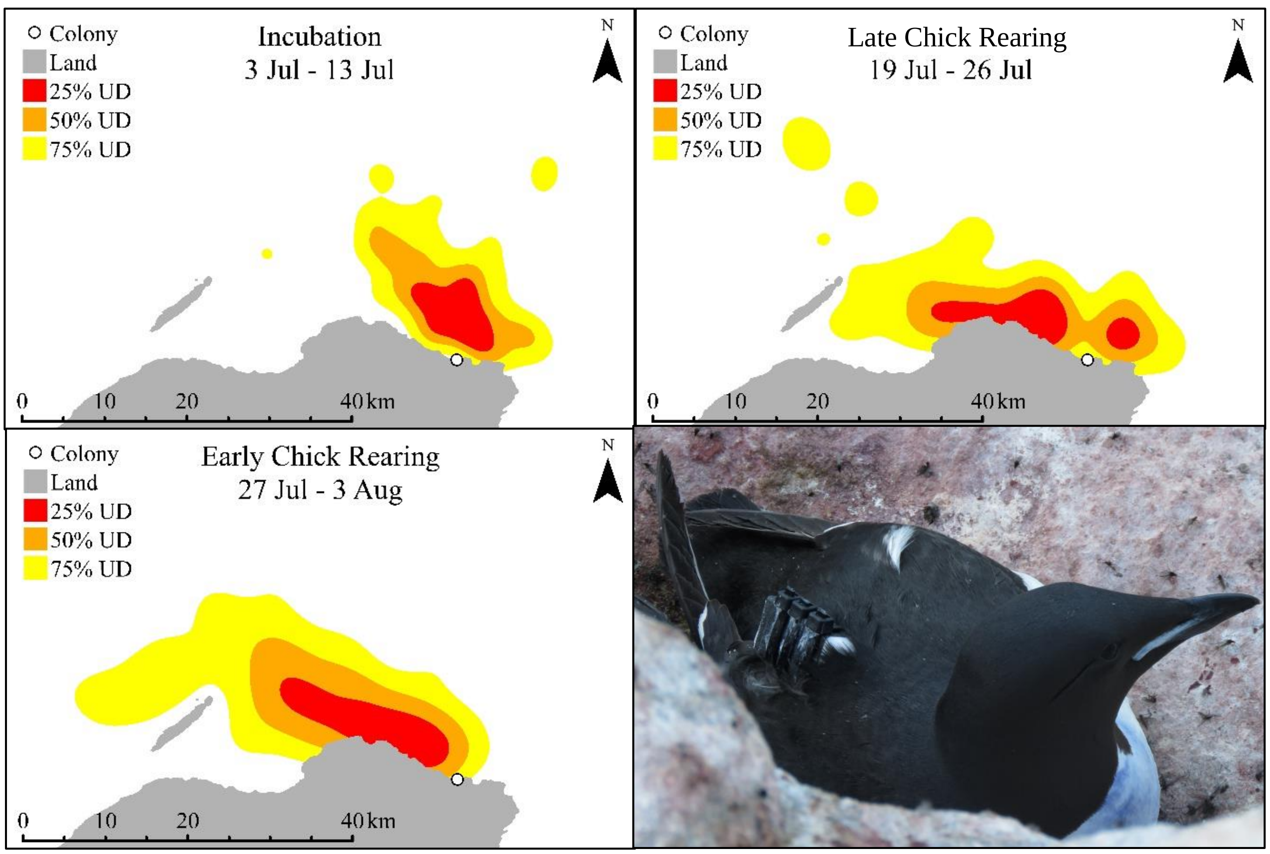
Distribution of thick-billed murres prey species over time at Coats Island

We found that reductions in summer sea ice were associated with fewer Arctic cod in chick diet. Yet this does not seem to affect the nestling growth, suggesting that adults are able to adjust their provisioning behaviour according to what is available in their environment.

So far, reductions in summer sea ice have mostly been detected in the low-Arctic. However, if the phenomenon keeps progressing northward, the patterns observed at Coats Island could also occur in the colonies found in mid and high-Arctic. With the shift of available resources these novel conditions could potentially lead to more competition between species. For example, Razorbills typically out-compete murres and they have been observed at the Coats Island colony in years when sand lance was more abundant than usual.

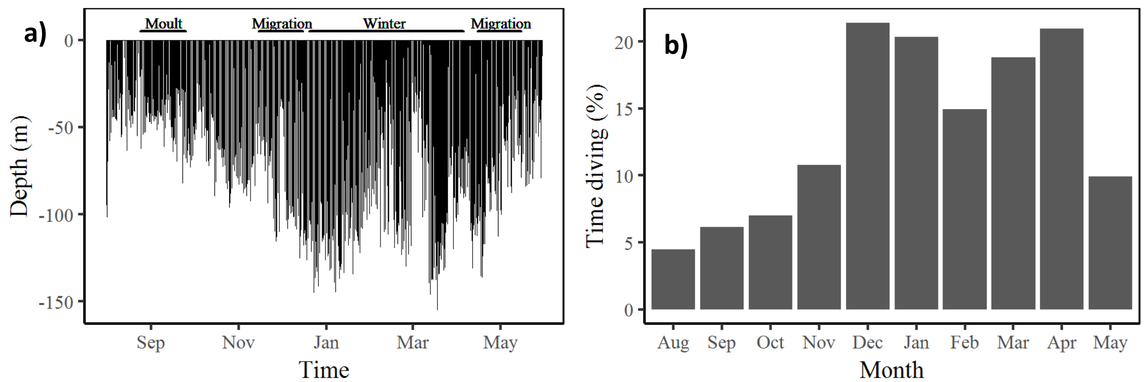
Distribution, Habitat Use and Feeding Behaviour of Thick-billed Murre

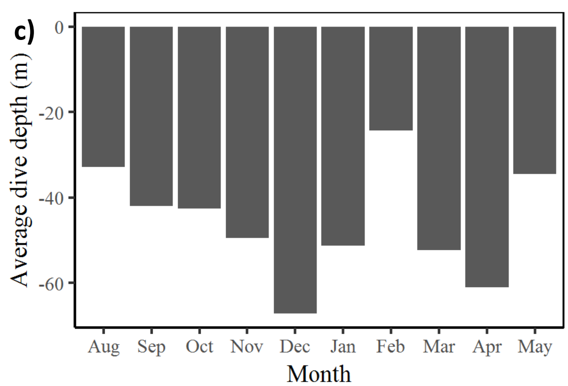
To examine variation in feeding behaviour and distribution of thick-billed murres, we collected GPS data from more than 70 breeding murres at Coats Island during incubation and chick rearing. This information will be analyzed in combination with GPS data collected by us in previous years from three colonies in the Canadian Arctic. We found that during incubation, the core feeding area covered 144 km^2 and was distributed immediately north of the colony. In early chick rearing, the size of the core feeding area increased to 198 km^2 and feeding was distributed more to the west of the colony and closer to the coast of Coats Island. The size of the core feeding area increased again during late chick rearing, to 255 km^2, and moved farther northwest, between the colony and Bencas Island. Mapping where birds feed around the colony and how this distribution changes within and between breeding seasons is essential to protect critical habitat around murre colonies.



Maps showing the feeding ranges (utilization distributions, UD) of thick-billed murres from the Coats Island colony during three stages of the breeding season in 2017. Bottom right: GPS attached on the back of a thick-billed murre

We also deployed 47 geolocators with temperature-depth-light recorders on adult murres at Coats Island to look at year-round distributions, habitat use, and feeding behaviour. These small data loggers are attached to the leg bands of murres and record light levels, pressure, and temperature for up to 1 year. Light-level data will be used to determine where murres go during the non-breeding season (Aug – May). The depth and temperature data will be used to estimate daily activity rates and diving behaviour throughout winter.





An example of year-round dive data for a thick-billed murre from Coats Island. a) all diving data for the non-breeding season (Aug – May), b) average time spent diving each month, c) average dive depth each month. These data were collected as a pilot project in 2015/16 for the research initiated in 2017.

Data loggers deployed in July 2017 will be retrieved in June 2018, when murres return to breed. These data will also be used to examine how behaviour during the non-breeding season influences breeding success the next year. This will improve our understanding of how winter habitat use influences murre populations and will also help to identify key areas used by murres over winter.

Research Partners

The research at East Bay is logistically complicated and labour intensive, requiring a strong, dedicated crew. We are particularly grateful for the guidance and assistance provided by our new crew member, Richard Nakoolak, and our returning crew members Jupie Angootealuk and Josiah Nakoolak and Clifford Natakok. We also appreciate very much the continued support provided by the Aiviit Hunters and Trappers Organization, and the Irniurviit Area Co-management Committee.

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: Environment Canada Wildlife Research Division, Environment Canada Ecotoxicology and Wildlife Health Division, Baffinland Iron Mines Corporation, the Canadian Wildlife Service, the PEW Charitable Trusts, Mitacs, Oceans North, Polar Knowledge Canada, ArcticNet, Nunavut General Monitoring Plan, Arctic PRISM, The Bureau of Ocean Energy Management, The United States Fish and Wildlife Service, Trent University, Université du Québec à Rimouski, University of Windsor, Carleton University, Acadia University, Polar Continental Shelf Program (PCSP), Northern Scientific Training Program, Northern Contaminants Program, NSERC, and the Canada Research Chairs program.

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