



CAPE GRAHAM MOORE

2022 FIELD SEASON REPORT

ENVIRONMENT AND CLIMATE CHANGE CANADA

PROJECT OVERVIEW

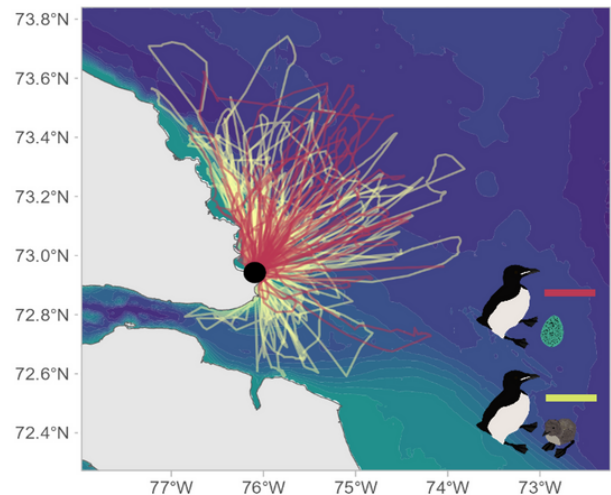
Recent increases in resource development activities are increasing shipping traffic in Canada's eastern Arctic marine regions. However, there is not enough information to properly assess potential ecological impacts of year-round shipping lanes on marine wildlife. Our goal is to work in partnership with industry to determine the distribution and abundance patterns of thick-billed murres, in an effort to identify key marine habitats and provide data for the existing National Marine Conservation Area, Tallurutiup Imanga, that surrounds the waters of Bylot Island and Lancaster Sound.

At the Cape Graham Moore (Niaqunnguut) thick-billed murre colony on Bylot Island, in the high Arctic, we are collecting data on the foraging movement, physiology, and diet of murres. This data will be compared to previous work at the Digges Island murre colony and concurrent work at the Coats Island murre colony in north eastern Hudson Bay to understand the impacts of climate change at high and low Arctic sites. Our work will establish a baseline of marine habitat use which may be used for assessing the potential future impact of planned shipping lanes and marine protected areas in the region. This project will also help to provide the information necessary to develop efficient monitoring protocols for Canada's northern thick-billed murre colonies.



COLLECTING ECOLOGICAL BASELINE DATA

This was our fourth season collecting data at Cape Graham Moore. We deployed GPS units times to track the foraging movements of thick-billed murres in Eclipse Sound and Baffin Bay. This data will be useful as an ecological baseline against which environmental changes in the region can be assessed. We are providing reference data for informing both the Tallurutiup Imanga National Marine Conservation Area and shipping routes from the Baffinland Mary River Mine.



Foraging movements of thick-billed murres tracked during incubation (red) and chick-rearing (yellow) at Cape Graham Moore (black circle) in 2022.

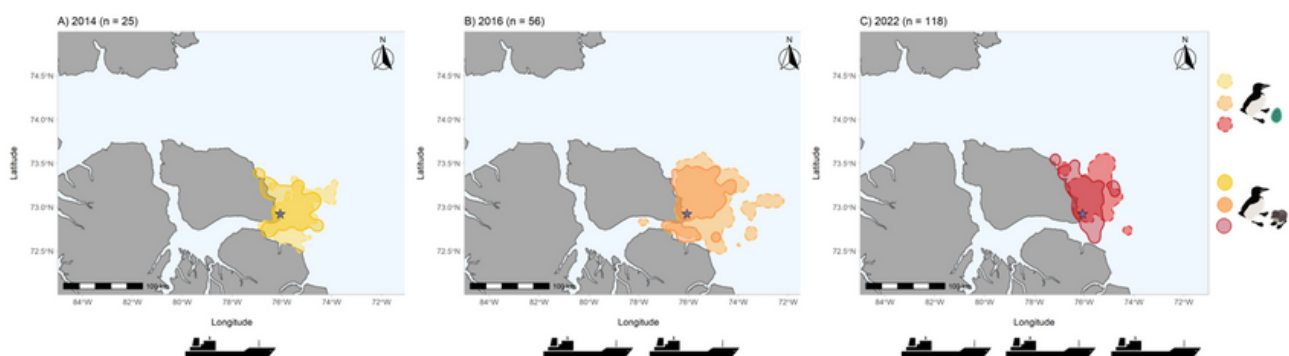
By tracking thick-billed murres at Cape Graham Moore, we are working to identify key habitat sites in the region, which will help us to monitor shifts in habitat use if they occur. By collecting physiological and diet data at the same time, we will also be able to evaluate how environmental changes affect diet, fattening rates and stress levels in seabirds, and in turn how diet will affect seabird nutritional state and demographic rates of these wild bird populations.

Modelling the response of an Arctic seabird to shipping

Alyssa Eby (PhD Candidate, McGill University with Dr. Kyle Elliott and Dr. Grant Gilchrist)

Shipping in the Canadian Arctic has nearly tripled over the past decade, including the shipping of goods into Arctic communities, the shipping of resources out of the Arctic, and shipping associated with tourism. Although increased shipping of goods and tourism provide socioeconomic benefits to northern communities, an increase in shipping may negatively impact culturally significant Arctic wildlife that northern communities rely upon. Recent development of the Mary River iron ore mine by Baffinland Iron Mine Corporation has resulted in more shipping surrounding the community of Pond Inlet, Nunavut and the neighbouring thick-billed murre colony of Cape Graham Moore, Nunavut. This study aims to quantify the impact of shipping intensity on the foraging behaviour of murres during the breeding season at Cape Graham Moore.

To examine murre movement during the breeding season I will use previously collected GPS deployments from Cape Graham Moore, Nunavut collected in 2014, 2016, and 2022, and I will conduct an additional 150 GPS deployments during the 2023 breeding season. Satellite Automatic Identification System data will be used to estimate shipping intensity across study years. To quantify the foraging behaviour of murres during the breeding season I will conduct kernel density analysis from foraging locations for each breeding stage. To assess the impact of shipping intensity on murre foraging behaviour, I will measure the spatial similarity between the 95% utilization distributions (overall foraging area) and 50% utilization distribution (core foraging area) of each year, corresponding to different levels of shipping intensity.



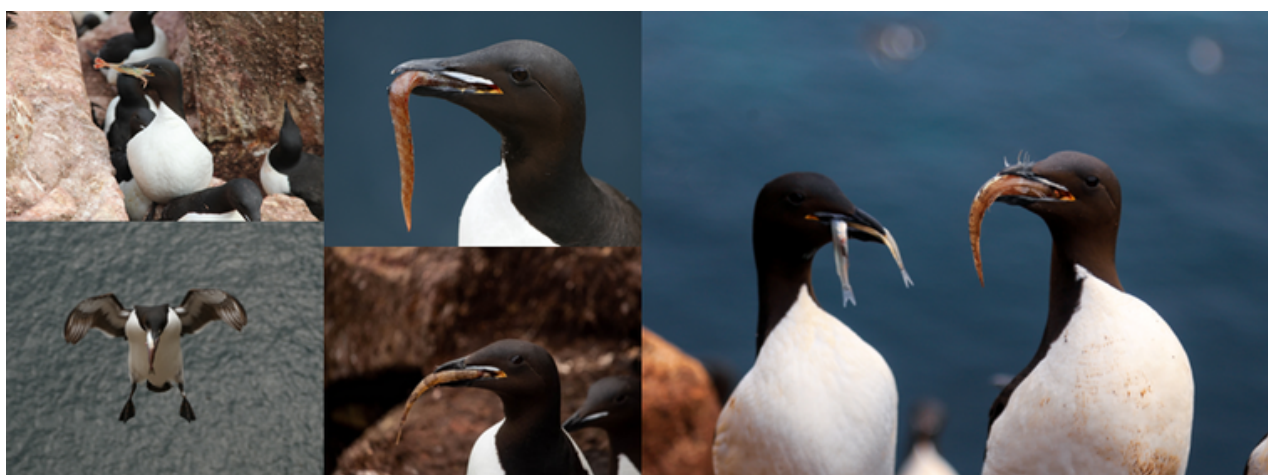
Preliminary data showing the overall foraging area (95% utilization distributions) of thick-billed murres during the incubation (dashed lines) and chick-rearing (solid lines) breeding stages at Cape Graham Moore, Nunavut in 2014 (A; low shipping intensity; yellow), 2016 (B; medium shipping intensity; orange), and 2022 (C; high shipping intensity; red).

Examining trophic interactions in changing Arctic marine ecosystems

Dr. Allison Patterson (Post-doctoral Fellow, University of Windsor with Dr. Oliver Love)

Climate change is warming ocean temperatures in the Arctic faster than anywhere in the world. The distribution and abundance of critical forage fish species like Arctic cod are strongly tied to ocean temperatures and sea ice. Many marine predators – fish, marine mammals, and seabirds – rely on Arctic cod as prey. Shipping, commercial fishing, and other industrial activity in the Arctic is expected to increase as sea-ice cover declines, which could aggravate effects of climate change on marine predators.

My project is using the feeding activity of seabirds to monitor changes in fish populations at remote sites in the Canadian Arctic. Vast distances and challenging ocean conditions in the Canadian Arctic make it difficult to monitor fish populations using traditional sampling methods. However, Arctic seabirds breed in huge colonies and these birds are ‘sampling’ fish every day when they fly to sea to feed themselves and their chicks. I am using tiny activity loggers to measure how much effort birds are expending to catch fish and DNA metabarcoding of fecal samples to identify prey species. With this information, we can determine if there are changes in the fish species available around murre colonies and if the relative abundance of forage fish species is changing in response to changing environmental conditions. This information can be used in planning for sustainable harvest of fisheries in the face of climate change and increased commercial activity in Canada's North.



Thick-billed murre bringing fish to feed their chicks. Clockwise from top-left: shrimp, fish doctor, capelin and sculpin, daubed shanny, and Arctic cod.



RESEARCH PARTNERS AND FINANCIAL SUPPORT

Our research at Cape Graham Moore was a combined effort of many people and organizations. Dr. Grant Gilchrist (Environment and Climate Change Canada) leads the project together with Dr. Oliver Love (University of Windsor) and Dr. Kyle Elliot (McGill University). The project coordinator in 2022 was Holly Hennin (Environment and Climate Change Canada).

Remote research is logistically complicated and labour intensive. Our work would not be possible without our extensive crew of climbers, students, biologists and local guides. The Cape Graham Moore field crew included Allison Patterson, Alyssa Eby, Brian Malloure, and Douglas Noblet. Environment and Climate Change Canada staff, Jamie Enook and Evan Richardson, and Parks Canada staff Terry Kalluk, Randy Quaraq, and Carey Elverum provided support and local expertise in Pond Inlet.

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 and Climate Change Canada Wildlife Research Division, Baffinland Iron Mines Corporation, the Canadian Wildlife Service, the PEW Charitable Trusts, Mitacs, Polar Knowledge Canada, ArcticNet, Oceans North, the Weston Family Foundation, University of Windsor, McGill University, and NSERC.

CONTACT FOR MORE INFORMATION

Grant Gilchrist
National Wildlife Research Centre
Environment and Climate Change Canada
Tel: (613) 998-7364
Email: grant.gilchrist@ec.gc.ca

Holly Hennin
National Wildlife Research Centre
Environment and Climate Change Canada
Tel: (613) 991-9973
Email: holly.hennin@ec.gc.ca