ENVIRONMENT AND CLIMATE CHANGE CANADA

ARCTIC COASTAL BIRDS & ECOSYSTEMS

2019 FIELD SEASON AND RESEARCH REPORT

King Eiders resting at East Bay.

FIELD SEASON OVERVIEW

The goal of our research is to better understand the ecology of coastal tundra ecosystems, so that these important habitats can be better managed and conserved. Shorebirds are the most abundant and diverse group of birds in coastal tundra, and are an important focus of our work. Canada's Arctic-breeding shorebird populations have declined dramatically since the 1970s, making them stand out as a group of conservation concern. We carry out research to 1) evaluate the influence of changing conditions in the Arctic on the breeding ecology of shorebirds and other tundra birds, 2) develop innovative approaches to improve knowledge of population status, and 3) use technology to track Arctic birds throughout the year and understand the ways in which populations are limited throughout the annual cycle.

A recent focus of our work now nearing completion has been a series of studies to understand the effects of overabundant Arctic geese on species such as shorebirds and gulls that nest in the same areas. Few studies have evaluated the impact of overabundant geese on other birds but the possibility exists for strong effects, operating through habitat change or altered predator/prey dynamics. Another key current project involves the use of tracking technology (primarily the MOTUS network) to enhance the monitoring of bird populations. We're combining modern technology with modern statistical methods to integrate behavioral data into monitoring programs, in order to improve our understanding of birds' population status. At the core, our research seeks innovative solutions to conservation challenges.

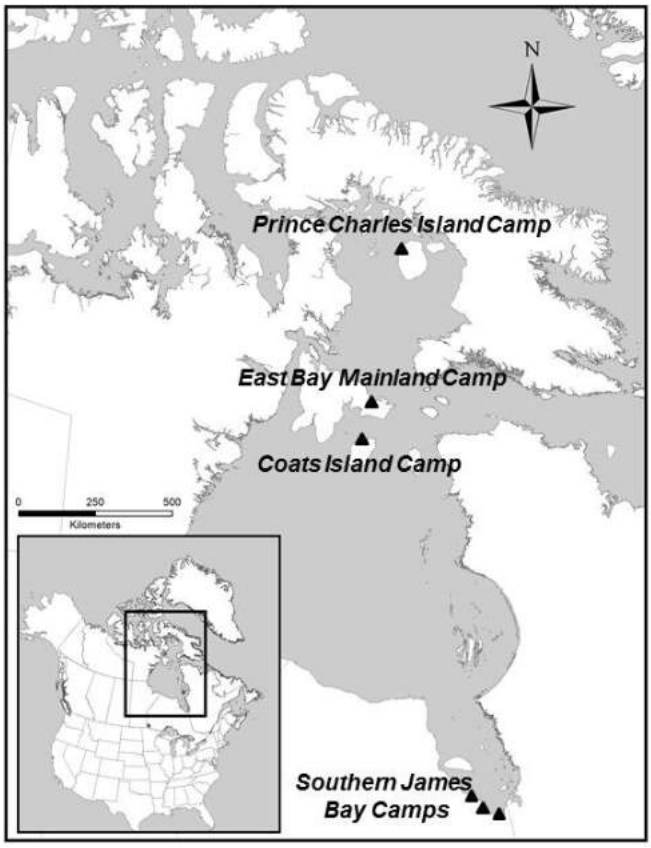

Figure 1. Map of ECCC shorebird research sites in the eastern Canadian Arctic and Subarctic James Bay.

In 2019, we operated out of two low-Arctic field sites: Our primary camp at Qaqsauqtuuq (East Bay Mainland) on Southampton Island, NU, and at our field site on Prince Charles Island in the Foxe Basin, NU (Figure 1). At East Bay Mainland, this year marks 21 years of continual monitoring of Arctic-breeding birds, vegetation and climate by Environment and Climate Change Canada (ECCC) and partners. This site continues to be one of the most valuable long-term northern monitoring and research stations in Arctic North America. 2019 was our second field season operating the Prince Charles Island camp, and we plan to continue operating at this site over the next several years to provide a mid-Arctic reference point for collaborative studies of shorebird breeding ecology across a latitudinal gradient. We also carried out field studies in southern James Bay, in collaboration with the Canadian Wildlife Service. These James Bay sites are used by hundreds of thousands of shorebirds during their southward migrations in July - September. We did not work at the Coats Island shorebird site in 2019, although we continue to use the data collected there in previous years in our research.

Black-bellied Plover nest on Prince Charles Island

EAST BAY MAINLAND

2019 was the best of the last several years for nest survival at East Bay, with 34% of shorebird nests surviving to hatch. However, despite a better nest survival rate than in the past several years, the numbers of breeding shorebirds remain comparatively low. In 2019, we found a total of 74 shorebird nests, in comparison to an average of 100 nests per year in the early 2000s. Several species, such as the Ruddy Turnstone, have declined dramatically in abundance at this site since the late 1990's when monitoring began. Similar to previous years, White-rumped Sandpiper was the most abundant species of nesting shorebird in 2019, followed by Red Phalarope (Figure 2A). This year there were also greater numbers of Ruddy Turnstones than in 2017 and 2018, which was encouraging after several years with very few nesting pairs.

The field camp at East Bay Mainland in early June, 2019

The moderate hatching success of shorebird nests at East Bay this year was encouraging following several years of extremely poor nest survival - 12% survival in 2018, 21% in 2017, and only 4% in 2016 and 0% in 2015 (Figure 2B). We hypothesize that higher hatch success in 2019 may be attributed to several factors; for instance, the predator guild appeared different this year, with relatively more Parasitic Jaegers but fewer foxes. Foxes pose a greater threat to shorebird nests, because some species can effectively defend against Jaegers but not foxes. Another possibility is that predators were concentrated nearer to the snow goose colony at the head of East Bay, which was very active this year as opposed to last year when many geese did not nest due to poor spring weather.

This year, in addition to our normal science program, we received funding from Polar Knowledge Canada for a pilot project to develop a protocol for use by local community members to monitor goose nesting density, and we made two visits to the goose colony at the head of East Bay to test the sample design and data collection methods. Field personnel counted goose nests and measured eggs along transects within the colony. This project stems from a recommendation from the 2018 Light Goose Management Workshop (reports available at www.kangut.ca) to develop ways for communities to be involved in tracking nesting densities of geese on Southampton Island and monitoring the impacts of overabundant geese on the ecosystem. If taken up by the community, local monitoring initiatives such as this could result in employment opportunities for community members.

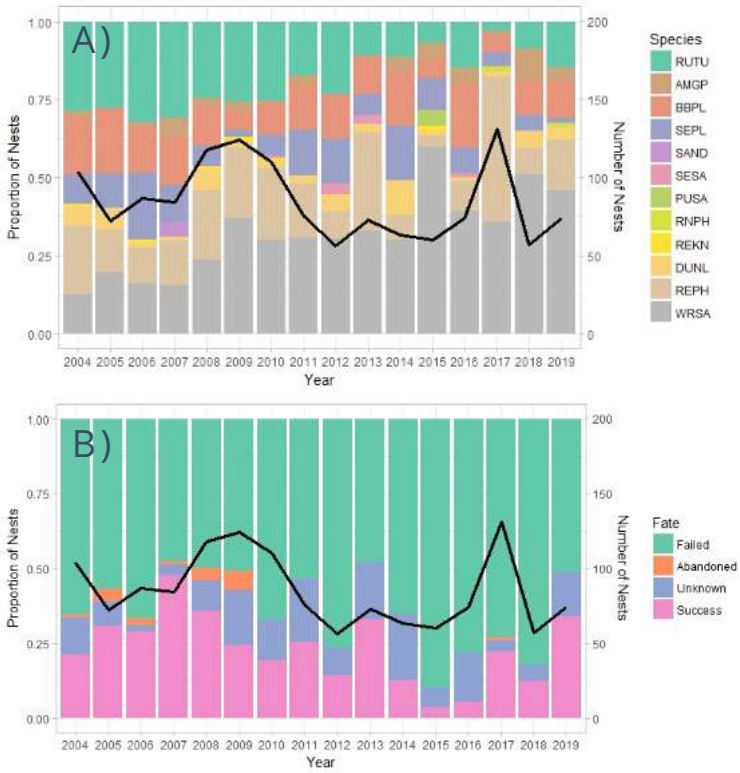

Figure 2. The number of shorebird nests monitored at East Bay (black line, both panels) in a 3 km by 4 km survey area between 2004 and 2019. Underlaid bars show species composition in panel A, and nest fate in panel B.

Snow Goose nest measured during goose density monitoring

We also continued our recapture efforts to collect geolocators that had been deployed on Arctic Terns in 2017 as part of a multi-site collaboration with other researchers throughout North America. We had deployed 20 geolocators in 2017, but only recaptured three in 2018 because of many terns' failure to nest in that year. This year we were able to recapture another six geolocators, and resighted several others that we hope to be able to recapture in future years. Data collected from geolocators deployed and recaptured at East Bay has contributed to a greater understanding of Arctic Tern migration patterns, including the use of a North Atlantic stopover site during the fall migration, and a spring migration pathway that follows the Atlantic coast of Africa northward before crossing the Atlantic towards the east coast of the United States and Canada to continue migrating back to nesting grounds at East Bay. Figure 3 shows the movement maps for two Arctic Terns that nested at East Bay in 2017 and subsequently migrated all the way to the Antarctic Ocean and back.

Right: An Arctic Tern that we recaptured at East Bay in 2019 to retrieve a geolocator that we deployed in 2017.

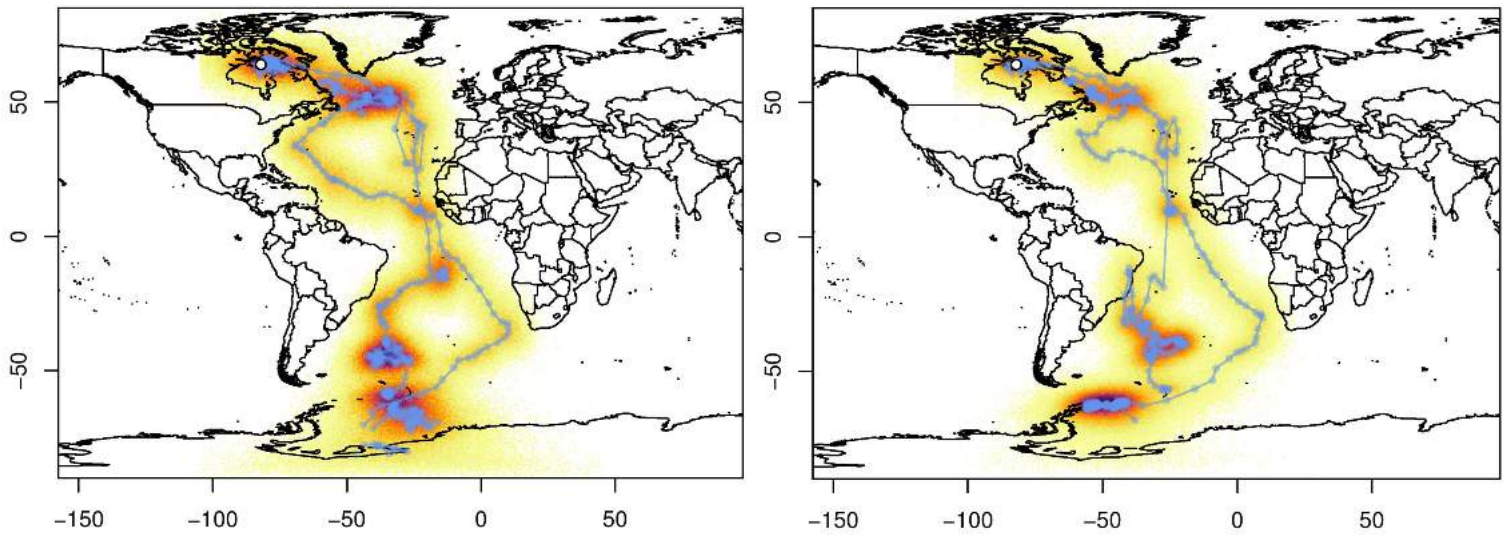

Figure 3. Migration tracks for two Arctic Terns tagged with geolocators at East Bay in 2017. Maps courtesy of Joanna Wong and Mark Mallory (unpublished data).

Above: Caribou, Snow Geese and their young share the landscape on Prince Charles Island

PRINCE CHARLES ISLAND

We developed a camp at Prince Charles Island in 2016 and carried out our first year of field work at this site in 2017. In 2019, we returned to this site and were excited to collaborate with researchers from the Centre National de la Recherche Scientifique, (CNRS, France) who had visited Prince Charles Island in 1996-1997. Together we are undertaking a comparative study of breeding bird density and habitat use by re-surveying plots that were visited more than 20 years prior. Our field crews collected data on nest abundance for several species of shorebird, including White-rumped Sandpiper, Red Phalarope, Dunlin, Black-bellied Plover, and Ruddy Turnstone, and re-visited old nest sites that had been photographed in the late 1990s to document changes to the habitat that had occurred over two decades. Notably, there was a greater density of Snow and Ross' Goose nests than 20 years ago, and the effects of increased goose abundance on the habitat was apparent in many areas that had previously been sedge communities but are now dominated by mosses. In keeping with these changes to habitat, there appeared to be lower densities of grass-nesting species such as White-rumped Sandpiper and Red Phalarope than in the late 1990s, but the abundance of upland nesting species such as Black-bellied Plover and Ruddy Turnstone seemed similar to before. We plan to return to Prince Charles Island for another season of data collection next year, which will serve to verify these observations using multi-year data.

Our crew on Prince Charles Island also assisted the Canadian Wildlife Service in conducting 10 days of helicopter surveys for shorebirds following the Arctic Program for Regional and International Shorebird Monitoring (PRISM) protocol. Plots on Prince Charles Island were among the first to be surveyed under this protocol in 1996 and 1997, and this year marked the first opportunity to re-visit some of the original plots to evaluate how shorebird density has changed. A regional-scale comparison such as this, over a period of more than 20 years, is an extremely rare opportunity to examine changes in the densities of bird populations in the Arctic.

The research camp at Prince Charles Island

During the PRISM surveys, we documented Dunlin nests on Foley Island and western Baffin Island, which are areas further north than they were expected to breed previously; potentially a northward range shift is occurring as a consequence of climate change. We also documented several large nesting colonies of Ross' Geese, previously not known to nest on the islands of the Foxe Basin, but expanding rapidly to the east and north across Nunavut.

INUIT FIELD TRAINING PROGRAM

2019 was the second consecutive year that we offered the Inuit Field Training Program at the East Bay Mainland camp. The program was initiated by Environment and Climate Change Canada in 2018 and is led in collaboration with a community based steering committee. The program was developed in response to a need expressed by Inuit communities for local opportunities for Inuit youth to engage and get exposure to training and employment opportunities in environmental fields.

At East Bay, the Inuit Field Training Program offers young Inuit an opportunity to experience living and working in a northern research camp, led by a team of Inuit mentors and scientists. In 2019, the local steering group from Coral Harbour selected eight participants who traveled to East Bay for 10 days in late July to learn about environmental monitoring techniques, skills required for living and working safely in remote research camps, educational and employment opportunities available to them in environmental fields, and Inuit traditional knowledge taught by a local elder. Following two successful deliveries of the program, we are exploring partnerships with other federal departments to expand the program in 2020.

The Inuit Field Training Program is an innovative and focused approach to address a real need – helping Inuit youth succeed in making the transition from secondary school to further opportunities. In the long-term, this initiative could make a meaningful contribution to science-based departments' achievement of their Inuit employment goals, and more generally, to the Government of Canada's objective of meaningful inclusion of Inuit in environmental research and monitoring in the North.

2019 Inuit Field Training Program participants and leaders.

Above: A White-rumped Sandpiper hovering at East Bay

RESEARCH PARTNERS AND FINANCIAL SUPPORT

The research projects described in this report are a combined effort of many people and organizations. Dr. Paul Smith (Environment and Climate Change Canada, ECCC) leads the program together with key collaborators Dr. Erica Nol (Trent University), Jennie Rausch (CWS), Christian Friis (CWS), Dr. Grant Gilchrist (ECCC), Dr. Jean-Louis Martin (CNRS), Dr. Tanguy Daufresne (CNRS), and Dr. Pam Loring (USFWS). Technical leadership and coordination is provided by Doug MacNearney (ECCC), with assistance and support in 2019 from Holly Hennin, Bronwyn Harkness, and Bonnie Taparti (ECCC).

These projects are logistically complicated and labour intensive, requiring a large, dedicated crew of students and biologists. Our East Bay Mainland and Prince Charles Island field crews in 2019 included Christine Anderson, Jupie Angootealuk, Dr. Tanguy Daufresne, Lenny Emiktaut, Willow English, Natalie Grishaber, Ariel Lenske, Doug MacNearney, Dr. Jean-Louis Martin, Josiah Nakoolak, Sarah Neima, Paolassie Ottokie, Julia Prokopick, Adamie Samayualie, Brian Smith, and Dr. Paul Smith.

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, the Canadian Wildlife Service – Northern Division, The Bureau of Ocean Energy Management, The United States Fish and Wildlife Service, Trent University, Carleton University, Polar Continental Shelf Program, ArcticNet, the Nunavut Wildlife Management Board via the Nunavut Wildlife Research Trust, Agnico Eagle Mines Ltd., Baffinland Iron Mines, Northern Scientific Training Program, Polar Knowledge Canada, CanNor, Institut Polaire Français Paul-Émile-Victor (IPEV), the Natural Sciences and Engineering Research Council, and the W. Garfield Weston Foundation.

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