Environment and Climate Change Canada

Regional and Range-wide Causes of Decline for shorebirds of the Kivalliq

Final Project Report, Project 23-003-09
Prepared for Nunavut Wildlife Research Trust,
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Project Title:
Regional and range-wide causes of decline for shorebirds of the Kivalliq

Project Leader

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Summary:

This report presents the findings from a multi-year study funded in part through the Nunavut Wildlife Research Trust. Nunavummiut throughout the Kivalliq have long expressed concerns about shorebird declines, and the objectives of this project were formed following a Nunavut Wildlife Studies Fund collaboration in 2016-2017 between residents of Salliq (Coral Harbour) and scientists at Environment and Climate Change Canada that summarized IQ about shorebird declines. With funding from the NWRT (Project #5-18-01), we worked with the Aiviit HTO and the Irniurviit Area Comanagement Committee (ACMC) in 2018 to further refine research topics stemming from the IQ summary, and in 2019 we initiated a research program to study these issues of shared priority with support from the NWRT (Project #5-19-02). The project was intended to take place over 3 years; however, the arrival of the COVID-19 pandemic in 2020 disrupted the project schedule and while we were able to continue to advance some of the objectives in 2020 and 2021 using existing data, we decided to pause the receipt of funds from NWRT until we could complete the final two years of field activities in 2022 and 2023 (Project #23-003-01 and 23-003-09). The project objectives were structured around three pillars:

i) Applied research of shorebird movement and breeding ecology to investigate the causes of declines in shorebirds in the Kivalliq through various lenses including tracking technology, interactions with other species (e.g., overabundant geese), and carry-over effects from the non-breeding period;
ii) Local survey efforts to evaluate the breeding bird community in Ikkattuaq Migratory Bird Sanctuary, an area identified by IQ and previous studies of geese to be a productive area for breeding shorebirds but where comprehensive surveys for shorebirds have not been conducted; and
iii) Engaging and training youth from Salliq in all parts of the project to increase their involvement in our research and to develop their employment prospects for the future.

Presently, we have completed all of the project objectives, and provide this final report to detail the accomplishments and advances to research and Inuit self-determination in research made possible in part by funding from the NWRT. Many of the initiatives undertaken during this project are part of long-term monitoring strategies to understand trends in shorebird demography at Arctic breeding sites and provide training and employment opportunities for Inuit, and we intend to continue several of these activities in years to come to refine our understanding of shorebird declines in the region as well as respond to local priorities for research as they arise.

The scientific outputs of our project are also described in detail in the accompanying field reports for the project years from 2018-2023.

Project Objectives:

Shorebirds are declining to such an extent that many could become Species at Risk. People in Salliq recently reiterated concerns about these large declines and requested that further scientific studies be undertaken, to complement our recent IQ research. We refined these priority research questions with NWRT funding in 2018 (Project 5-18-01), and initiated a research project in 2019 (Project 5-19-02) to address the following objectives that were identified as high priorities for wildlife managers in Salliq:

1. Track shorebirds with modern tracking devices to understand their movements throughout the year and how these movements expose them to threats
2. Explore “carry-over” effects, for example, how feeding conditions at stopover sites influence the physiological status of birds upon arrival to Nunavut, and how this influences subsequent survival and reproduction
3. Carry out comprehensive shorebird surveys in Ikkattuaq Migratory Bird Sanctuary, as per ACMC Management Plan objectives, and determine the feasibility of more frequent monitoring and research there.
4. Engage and train local youth to increase their involvement in our research and to develop their employment prospects for the future.

We conducted a summer of field work in 2019 (Project 5-19-02), and then following a COVID-related hiatus in field work for 2020 and 2021, we resumed this project in 2022 and 2023 (Project 23-003-01 and 23-003-09) and have now completed all objectives. In addition to these wildlife-monitoring and capacity building objectives, based on a request from the community, we also used our logistical arrangements and aircraft to facilitate archaeological surveys of cultural sites within the Ikkattuaq MBS. These sites have been known to the community for some time, and during community visits to the MBS in 2017, community members expressed interest in learning more about their history. Working with the community, and the Inuit Heritage Trust and the Government of Nunavut, we conducted site visits and interviews with knowledge holders in 2022. Adding this component to our wildlife surveys was a cost-effective means of helping the community to address their research questions about these sites. This partnership also provided an opportunity to train local youth in the archaeological survey techniques, building further capacity for community-based monitoring.

Materials and Methods:

Through annual visits to Salliq, teleconferences, and email correspondence with community and organizations in Salliq, we co-developed a list of research objectives that centers around studies of breeding and migration ecology of shorebirds, especially Red Phalaropes (*Saurraq*) and Ruddy Turnstones (*Tuvvititiiq*), as well as Arctic Terns (*Imiqqutailak*). Specifically, people and organizations in Coral Harbour are interested in better understanding the routes taken by these birds during migration, how these distributions outside of Nunavut expose species to threats, and how changing environmental conditions within and outside Nunavut are contributing to shorebird declines. Over the course of the project, our study objectives focused on work at two sites – Qaqsauqtuuq and Ikkattuaq Migratory Bird Sanctuaries.

At Qaqsauqtuuq, during the project period we monitored 261 nests from 7 different shorebird species during the 2018, 2019, 2022, and 2023 breeding seasons. This monitoring effort contributes to a larger dataset, with over 1700 nests monitored since 2004 (Figure 1). Using advanced analytic techniques for analysis of nest and adult survival, and through deployment of the latest satellite-based tracking technologies, our research team is at the cutting-edge of avian breeding ecology research. Using data collected at Qaqsauqtuuq, we are also carrying out innovative studies of the survival shorebirds throughout the year, to understand how breeding conditions in Nunavut contribute to the population trends of shorebirds. Conversely, we are also studying how conditions outside of Nunavut influence breeding success through "carry-over effects" (Objective 2). These studies rely on feather samples obtained from Qaqsauqtuuq, measured for levels of stress hormones. Our scientific methods for studying breeding shorebirds in the Arctic are well established and are being applied at several sites throughout the Canadian Arctic and Alaska.

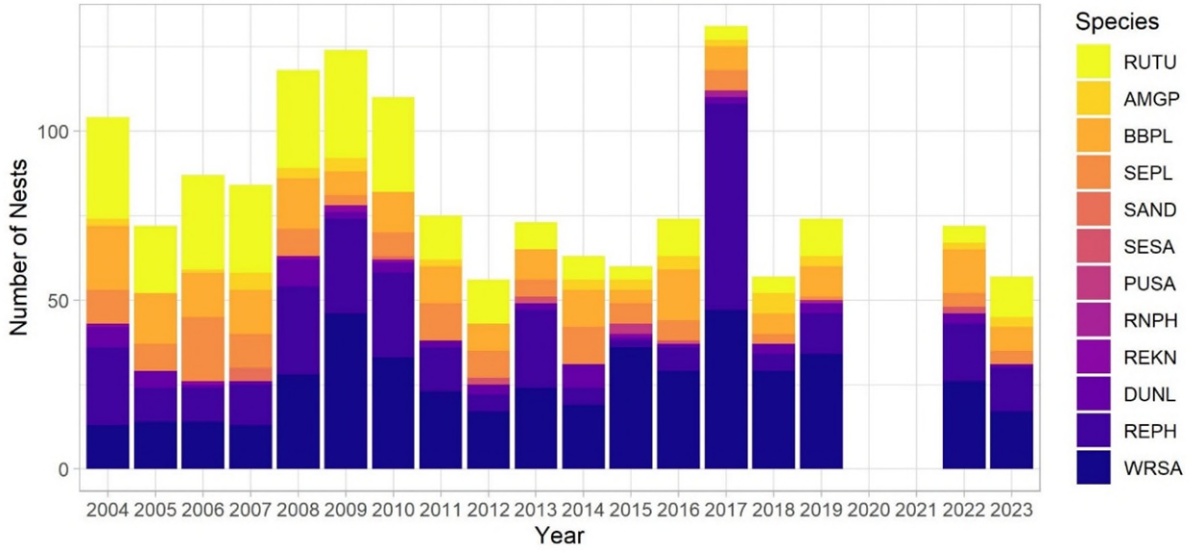

Figure 1. The number of shorebird nests monitored at Qaqsauqtuuq in a 3 km by 4 km survey area between 2004 and 2023. Bar colouring indicates species composition of nests. 2020 and 2021 are omitted as no data were collected during these years.

In the Ikkattuaq Migratory Bird Sanctuary, in 2022 and 2023, we conducted baseline surveys of shorebirds' use of the protected area (Objective 3), using the well-established Program for Regional and International Shorebird Monitoring (PRISM) survey methods, developed by Dr. Smith and others. These surveys were carried out by a team of Inuit research assistants and ECCC scientists. Research assistants (4 in 2022 and 3 in 2023) were successful participants in previous Inuit Field Training Program sessions. Through this approach, we were able to address the research objectives while also offering a higher-level training and employment opportunity for local youth (Objective 4). Statistical analyses followed the established methods for PRISM surveys, so that estimates of distribution and density of breeding birds in Ikkattuaq can be directly compared to PRISM surveys elsewhere in the Arctic. Full details of the sampling design and statistical methodology for these surveys will be documented in a report being prepared for the Irniurviit ACMC, that will be delivered and discussed in December, 2024.

Throughout the project, we delivered an annual edition of the Inuit Field Training Program, in late July of 2018, 2019, 2022, 2023. This exciting training effort has brought a total of 29 young Inuit from Salliq and Naujaat to our camp over the years, mentored by a balanced team of Inuit and southern scientist leaders, to learn about techniques and employment opportunities in environmental science. Logistics and administration of the training program are led by a steering committee based in Coral Harbour, and have also been led (2019-2024) by a full-time Nunavut beneficiary working in our office in Ottawa and traveling to the field site to help deliver the program. Additional details of this program are included in an attached field reports. This component of our work continues to gain momentum, and in 2023 we were successful in expanding the Inuit Field Training Program to include participants from 3 communities (Coral Harbour, Naujaat, and Sanirajak) at 2 field stations (Qaqsauqtuuq and Prince Charles Island).

Results:

The purpose of this study is to investigate research questions relating to the declines of shorebirds that interest the community of Coral Harbour, as identified in a preliminary study that was funded by the NWRT (Project 5-18-01). We began addressing these objectives with fieldwork conducted in 2019, with the intention of carrying out a 3-year research program. We paused field activities between 2020-2021 and declined an NWRT award at this time because we felt that it was not appropriate to accept NWRT funding when we would not have the opportunity to spend the funds in Nunavut due to the pandemic. However, during this period we continued to make progress on our objectives through analyses of data collected in 2019, and other datasets received from collaborators. When it became possible to return to the field for the 2022 season and continue advancement of the community engagement aspects of the project, we re-applied for NWRT funding in 2022 (Project 23-003-01) and 2023 (Project 23-003-09). Here, we present results here spanning the entire period that was funded by NWRT, from 2019-2023.

Objective 1: Shorebird Tracking

Through our own efforts, and those of collaborators, 248 geolocator tracking tags were deployed on 8 shorebird species. During the NWRT project, we summarised results from these tracking efforts which contributes to our understanding of the areas used by shorebirds of the Kivalliq throughout the breeding and non-breeding periods (Figure 2). Additionally, these datasets have also been used in the series of scientific papers described under objective 2, below. However, to ensure that Inuit can connect with the

knowledge generated by these studies, we are working on additional communications products to share stories of shorebird migrations with Inuit. For example, we are currently developing an ArcGIS "storymap" to present the migration routes in an accessible and visually appealing format. This product will be available online, in English and Inuktitut. Although this work is being completed with funds from other sources, the product is specifically intended to communicate information about shorebird migration to Inuit, so is highly complementary to the NWRT project objectives.

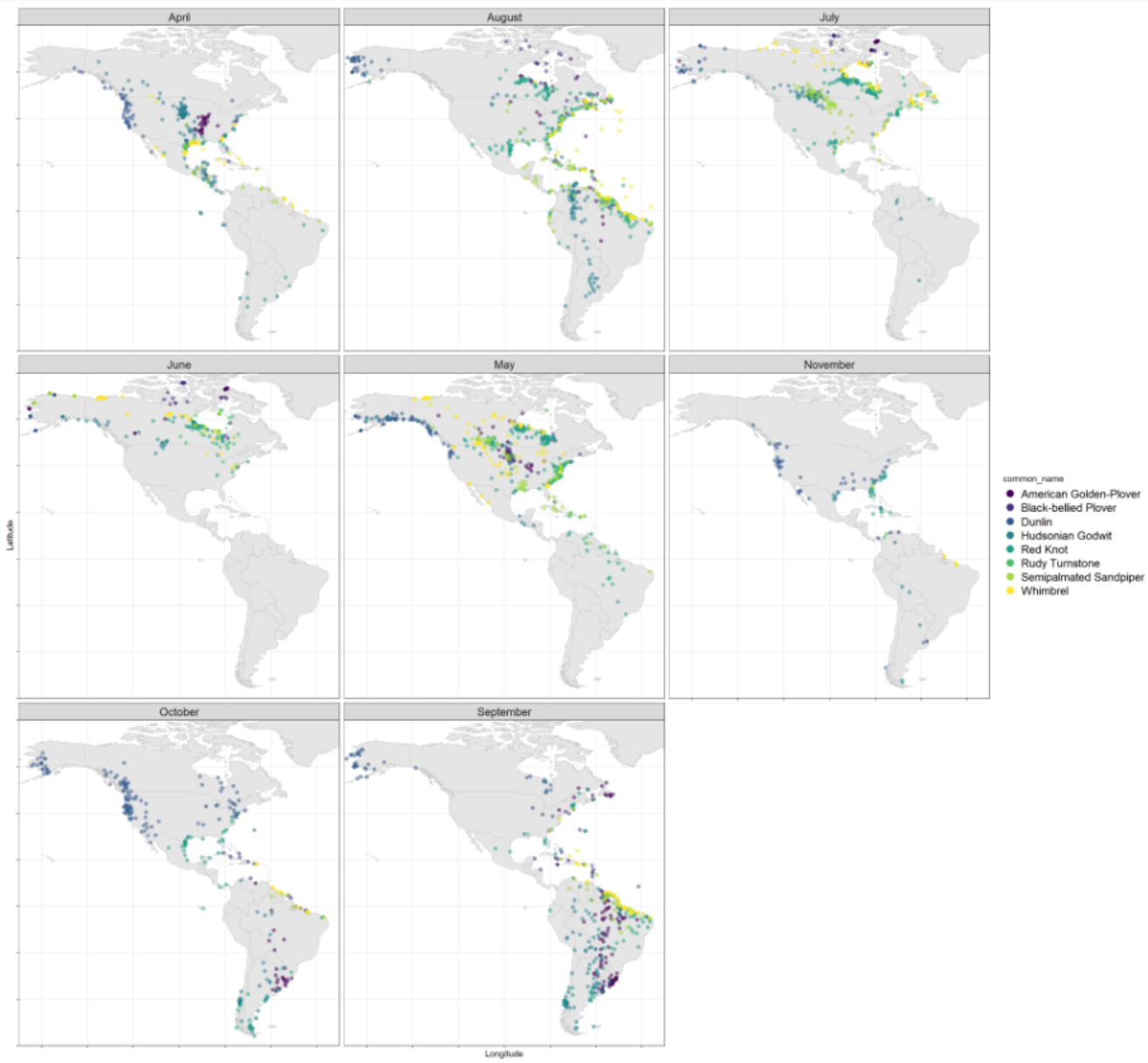

Figure 2. Distribution of geolocator locations per month of arrival for eight Arctic bird species (2008-2020). Species include Black-bellied Plover, Hudsonian Godwit, Whimbrel, American Golden-Plover, Dunlin, Red Knot, Ruddy Turnstone, and Semipalmated Sandpiper.

While many shorebirds have shown population declines, *rufa* Red Knots are a Federally listed Species at Risk. During the NWRT project, we summarized a large dataset of geolocator tracks deployed on Red Knots, with the goal of furthering our understanding of their migration habits, wintering subpopulations, and possible range overlaps between the subpopulations. Red Knots migrate up to 15,000 km between wintering areas in South America and breeding grounds in the Arctic and were once commonly sighted by Inuit on Southampton Island, but have declined dramatically in recent decades. We compiled definitive tracks and associated metadata for over 100 geolocators deployed on Red Knots between 2009-2021 and were able to show clear distinctions of wintering ranges in northern South America, Southeast United States and Caribbean, Western Gulf of Mexico, and Tierra del Fuego with large range overlaps during breeding and en route to and from breeding grounds (Figure 3). This nuanced understanding of distribution is important, because the present COSEWIC listing for *rufa* Red Knots recognizes the different wintering populations as different "designatable units", with different legal status for the different units.

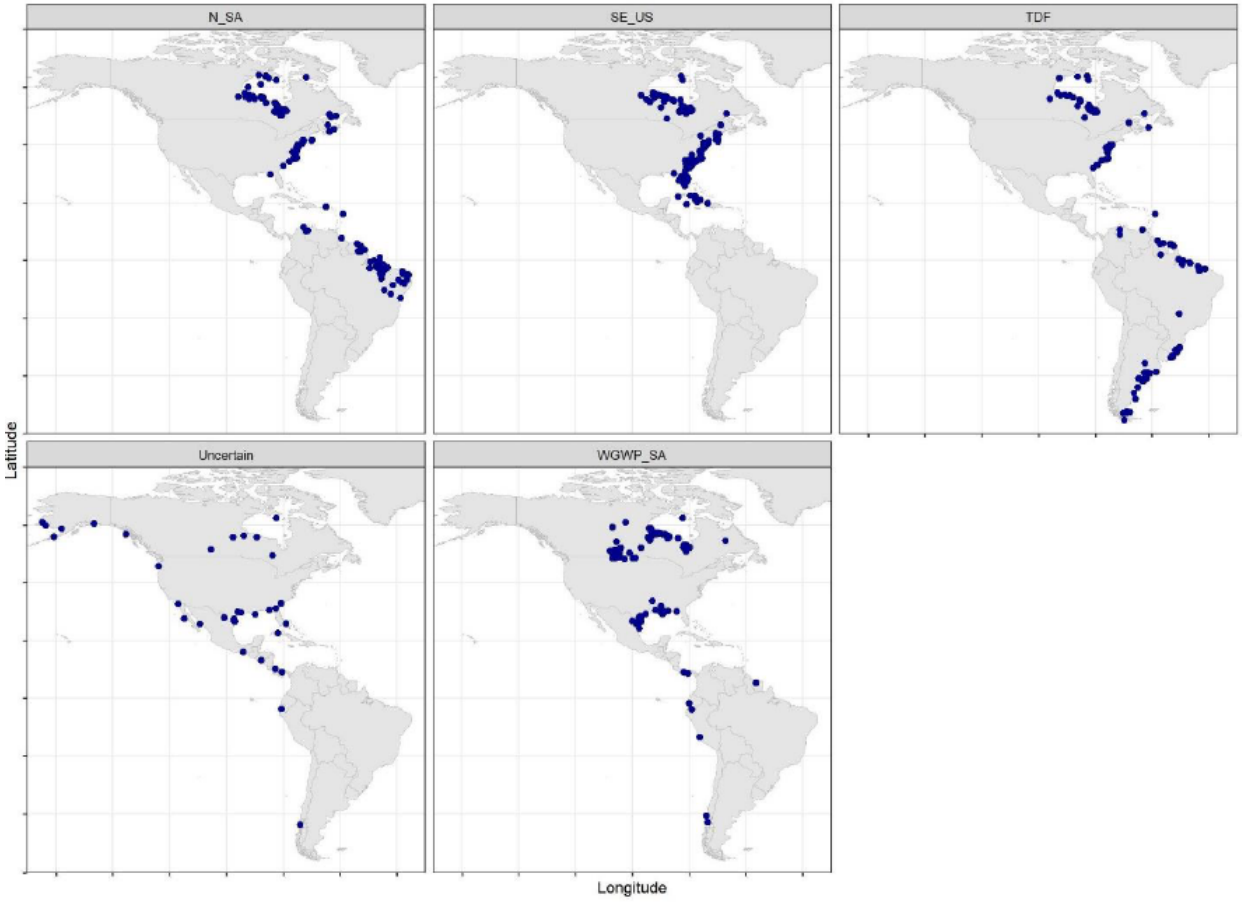

Figure 3: Distribution of rufa *Red Knot subpopulation stopover locations based on light-level geolocator data. Subpopulations include N_SA (Northern South America), SE_US (Southeast US/Caribbean), TDF (Tierra del Fuego) and WGWP_SA (Western Gulf).*

In addition to compiling definitive migration tracks from previously deployed geolocators, we collaborated in 2022 and 2023 to deploy satellite tracking tags on Red Knots during their northward migration, to determine the current breeding range of Red Knots in the Canadian Arctic. Uncertainties in the breeding range for the various designatable units of *rufa* was listed as a key knowledge gap in the SARA recovery plan for Red Knots in Canada. New satellite tracking tags that are light enough to be carried by a Red Knot have allowed investigation of this question by tagging northbound Knots in the spring and tracking them in real time to the breeding grounds. Several of the tagged birds appear to have nested on Southampton Island, indicating that this area continues to be important for declining Red Knots (Figure 4). However, GPS locations for tracked birds have helped identify additional areas that appear to be more important for breeding than previously thought, including parts of Victoria Island and Baffin Island (Figure 5). Moreover, examination of the datasets across years suggests that use of parts of the breeding range is variable among years. These analyses represent and important advance in our understanding of Red Knot migration habits at the subspecies and subpopulation level, which can guide geographically specific conservation measures and assist in determining priorities.

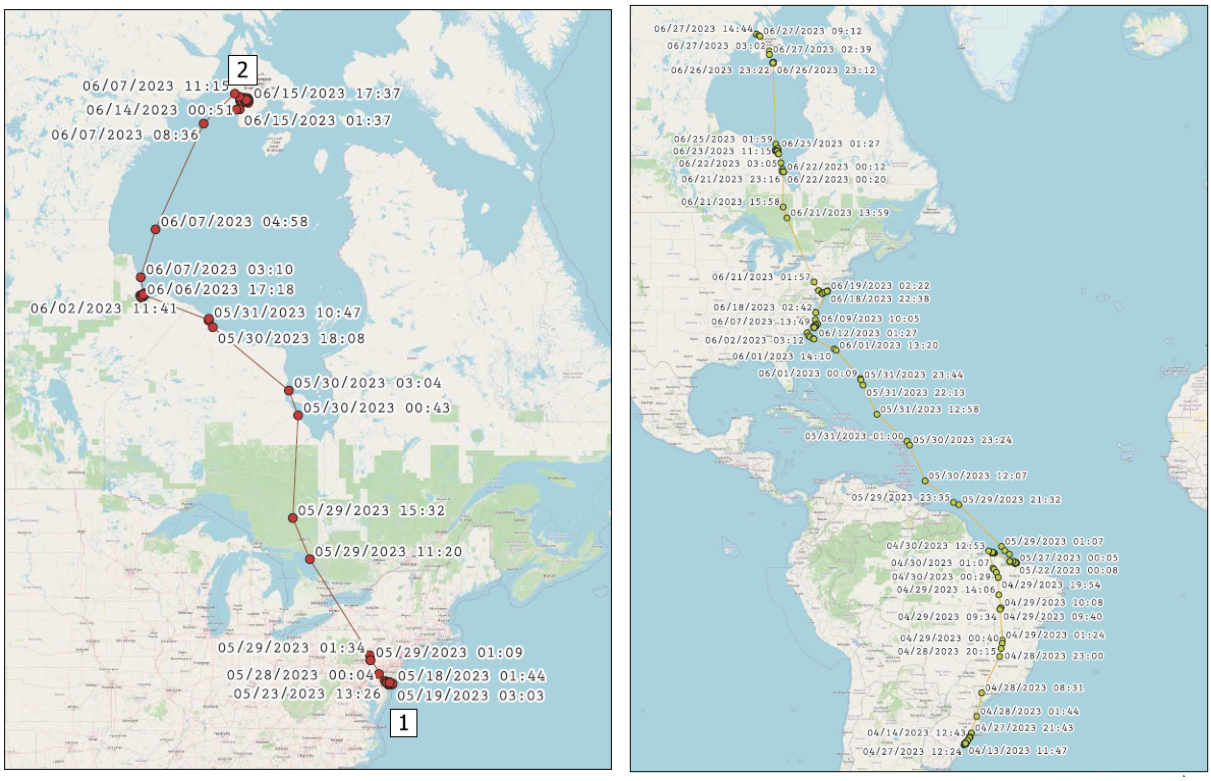

Figure 4: Two sets of satellite tracks from Red Knots that migrated to breed on Southampton Island in 2023. Maps courtesy of Stephanie Feign, unpublished data.

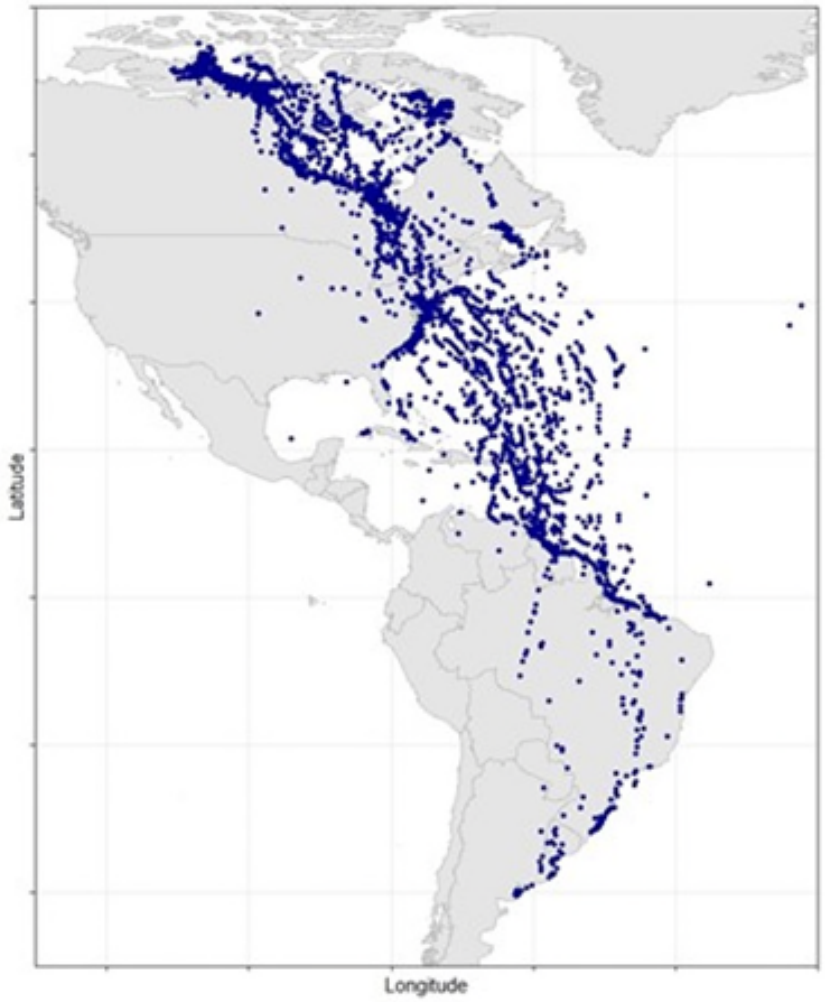

Figure 5. Distribution of Red Knot locations from compiled GPS datasets (2020-2023). These data have helped identify areas of importance for Red Knots breeding in Nunavut to address knowledge gaps for the species and help its recovery.

Tracking technology continues to evolve to permit investigation of new aspects of migration ecology for shorebirds, adding greater precision to our understanding of migration habits, and for a greater number of smaller shorebird species. In addition to the recent studies highlighted here, we have contributed to a multitude of collaborative tracking studies and will continue to pursue future studies to address knowledge gaps in migration ecology.

Objective 2: Carry over effects

PhD student Willow English investigated carry over effects in ten species of shorebirds, using data collected at East Bay and by collaborators at other Arctic breeding sites. Willow completed her thesis in January 2023, and publications from this work are in the peer-review process. One of Willow's PhD thesis chapters tested whether corticosterone levels in feathers ($CORT_f$; a measure of stress incurred on

the winter grounds during moult and feather growth) were related to breeding metrics such as nest initiation date, nest success, and egg size. Willow additionally tested whether $CORT_f$ varies among species, sexes, or with morphometric measurements. $CORT_f$ levels varied substantially among species and were below detection limits in White-rumped Sandpipers, suggesting that $CORT_f$ may not be a useful measure of stress for all species. For species with detectable $CORT_f$ levels, birds with higher $CORT_f$ had higher nesting success in the natural ecosystem (Figure 6), but lower success in the area with artificially low predation pressure (Figure 7), suggesting that the effects of winter stress levels on breeding may be context-dependent.

Impacts of carry-over effects on shorebird breeding success can also be inferred by examining migration timing to breeding grounds. To investigate the influence of carry over effects related to migration timing, Willow used tracking and breeding data from 248 individuals of 8 species and subspecies of Arctic-breeding shorebirds at multiple sites across the Canadian Arctic and Alaska to estimate how the timing of nesting is related to local conditions like when snow melts, and prior conditions, measured by migration timing. Path analysis (a statistical method the examines direct and indirect relationships among variables) showed that the timing of breeding was dependent on both local and prior conditions, suggesting that both potentially affect reproductive success. Individual birds that arrived later to the breeding grounds did not leave the wintering grounds later, but instead took longer to migrate (Figure 8). Individuals that migrated longer distances arrived and nested later. This may be due to reduced habitat quality at key stopover sites or an inability to adjust their migration timing to spring coming earlier in the Arctic with advancing climate change.

Overall, these results using data from corticosterone levels and tracking technology show that winter conditions continue to affect birds during the breeding season, highlighting the importance of including carry-over effects when explaining variation in reproductive success, and the importance of considering the whole annual cycle when planning conservation measures for migratory species. For birds in the Kivalliq, this implies that conditions outside of the region are likely affecting birds' reproductive success upon arrival at their breeding grounds.

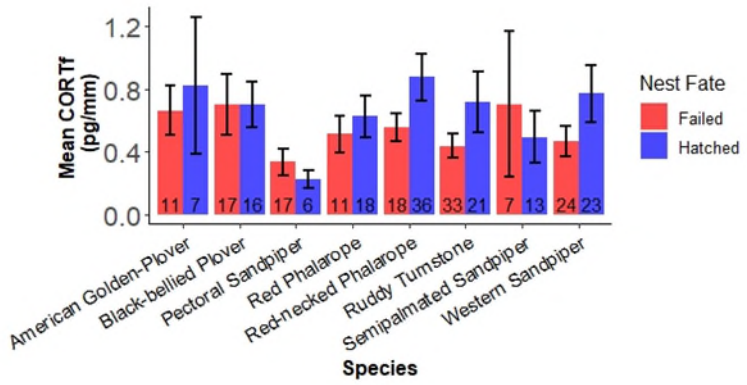

Figure 6. Mean $CORT_f$ levels and standard errors of birds with successfully hatched nests (blue) and depredated nests (pink), by species, from site-years with normal predator regimes (no fox control). Numbers at base of bars are sample sizes.

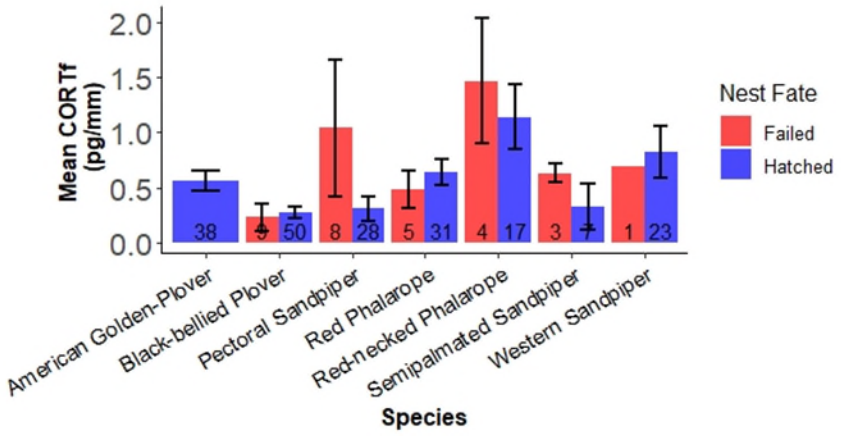

Figure 7. Mean $CORT_f$ levels and standard errors of birds with successfully hatched nests (blue) and depredated nests (pink), by species, from years with Arctic fox control in Utqiagvik, Alaska. Numbers at base of bars are sample sizes.

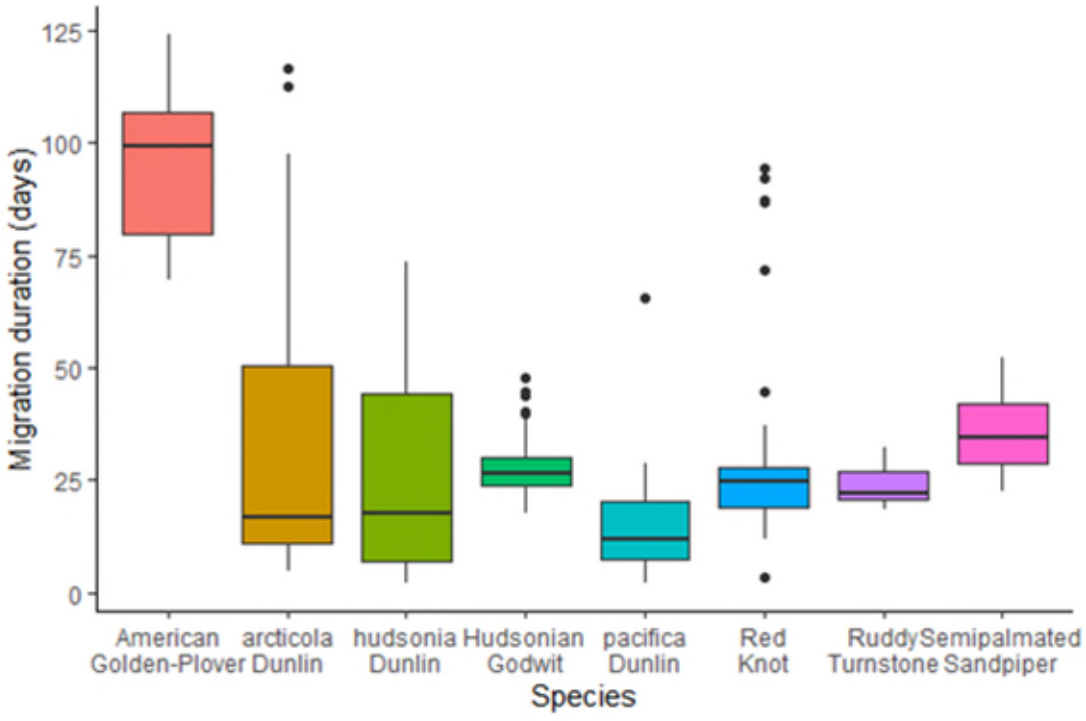

Figure 8. Length and variability of migration duration in Arctic-breeding shorebird species and subspecies. Greater migration durations were related to later arrival on breeding grounds and later nest initiation dates.

Objective 3: Shorebird Surveys in Ikkattuaq Migratory Bird Sanctuary

In 2022 and 2023 we surveyed 28, 0.12-km^2 plots in the Ikkattuaq Migratory Bird Sanctuary, to provide the first rigorous estimate of shorebird populations for this area (Figure 9). This survey effort is an important piece of monitoring data for the sanctuary, and it directly addresses a priority identified in the Management Plan developed by the ACMC for the sanctuary. On the surveys, following the PRISM rapid survey protocol, we recorded 664 shorebirds of 8 species and 984 birds of 16 other species. The most common shorebirds, in order of abundance, were Red Phalarope, Semipalmated Sandpiper, and Dunlin. The most common other birds were Snow Goose, Lapland Longspur, and Cackling Goose. Estimated densities per km^2 were roughly 200 shorebirds and 300 other birds. Estimated population totals on the Sanctuary were approximately 250,000 shorebirds and 440,000 other birds. These densities within the sanctuary are considerably higher than densities from the broader PRISM region that includes most of Southampton and Coats Island, indicating the high value off the sanctuary for breeding birds. The elevated shorebird densities in Ikkattuaq are driven in part by large numbers of Red Phalarope observed in wet plots, and Semipalmated Sandpipers in moist plots (Table 1)

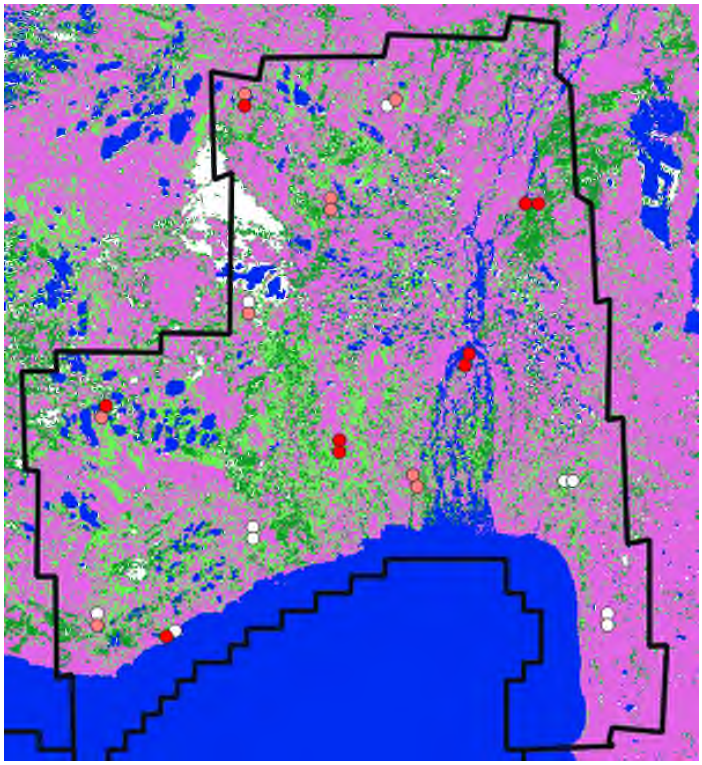

Figure 9. Survey locations for 28 0.12-km2 plots visited in 2022 and 2023 in the Ikkattuaq Migratory Bird Sanctuary. Numbers of shorebirds recorded on each plot are indicated by circle coloration (white=0-14, orange=15-30, red=31-62). Habitat types are underlaid (pink = dry, light green = moist, dark green = wet, blue = water) and the PRISM region boundary for the Ikkattuaq Migratory Bird Sanctuary is indicated by the black line.

Table 1. Mean counts of shorebirds per plot at Ikkattuaq and in PRISM Region 4.1 (Southampton Island and Coats Island). The differences are especially large in highlighted cells.

Hab-itat	Area	Black-bellied	American Golden-	Ruddy Turn-	Red Knot	Sander-ling	Dunlin	White-rumped	Pectoral Sandpiper	Semi-palmated	Red Phalarope
Wet	Ikkattuaq	0.5	0.1	0.1	0.0	0.0	3.8	0.9	0.4	4.0	13.6
	Region 4.1	0.0	0.6	0.0	0.0	0.2	1.8	1.2	0.0	1.2	2.4
Moist	Ikkattuaq	0.6	1.4	1.4	0.0	0.0	2.6	4.3	1.7	16.6	5.7
	Region 4.1	0.3	0.4	0.3	0.1	0.0	2.3	1.8	0.1	1.9	4.1
Dry	Ikkattuaq	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0
	Region 4.1	0.0	0.9	0.0	0.0	0.0	1.7	0.4	0.3	2.2	3.2
All	Ikkattuaq	0.4	0.9	0.6	0.0	0.0	2.2	2.1	0.8	9.8	6.4
	Region 4.1	0.2	0.6	0.2	0.1	0.1	2.0	1.3	0.1	1.8	3.4

A key component of the ACMC management objectives for the Ikkattuaq Migratory Bird Sanctuary is that Inuit self-determination be supported by all monitoring and research activities. This project advanced this objective by providing employment and training for 4 local research assistants in 2022 and 3 local research assistants in 2023. One individual, Joseph Pingwartuk, was further employed to conduct shorebird research at Qaqsauqtuuq and assist with Southampton Island goose banding led by the Canadian Wildlife Service in 2023 and 2024. We hope to be able to continue employing Joseph to participate in future projects.

Surveys in Ikkattuaq for this project positioned us to support additional community priorities by alleviating the logistical hurdles associated with contracting a helicopter to access the bird sanctuary. During the 2022 season we provided logistical support for an archaeologist from Inuit Heritage Trust, Dr. Lesley Howse, to visit Ikkattuaq and conduct preliminary site investigations of archaeological sites in the area, at the request of the community. The community was very interested in the findings of this work, and we were happy to be able to facilitate the field visits during the time at which we had access to a helicopter for the shorebird surveys. For additional information related to the archaeological study, please see the attached report prepared by Inuit Heritage Trust following this project.

Left: A group photo of the 2022 project team that conducted bird surveys and archaeological surveys in Ikkattuaq Migratory Bird Sanctuary. From left are Solomon Nakoolak, Laa Saviajuk, Jenny Kolit, Alannah Kataluk, Joseph Pingwartuk, Doug MacNearney, Lesley Howse.

Objective 4: Increase involvement of local youth in environmental monitoring

The Inuit Field Training Program remains an important annual program for us, as a means of building capacity and interest for environmental monitoring in the communities we work with. This program, first delivered in 2018, brings Inuit mentors and scientists together to encourage youth to consider careers in environmental fields. We have delivered the program annually since 2018, with the exception of 2020 and 2021 due to the COVID-19 pandemic. Each year, the IFTP takes place over 8-10 days in late July at Qaqsauqtuuq Migratory Bird Sanctuary, based out of the East Bay Mainland research station operated by Environment and Climate Change Canada, and providing a training opportunity for up to 8 youth per year. To date, we have primarily had participants from Salliq, however in 2023, we expanded the program to invite participants from Salliq and Naujaat to Qaqsauqtuuq, and we ran a second program at our field site on Prince Charles Island that drew participants from Sanirajak, for a total of 11 participants in 2023. The model for the IFTP is for participants to learn a mix of technical skills and land skills, under the leadership of mentors from the community and ECCC. We look forward to continuing this program in future years, and community members remain interested in this opportunity as way to offer training to youth and involve them in the research taking place around their communities.

Past participants in the IFTP have gone on to secure jobs with us and other departments for longer periods, and the program has been a valuable way to provide training in environmental monitoring to youth that might not otherwise have the opportunity to gain these skills.

Additional details on the development of the Inuit Field Training Program are described in the attached reports.

Above: Group photo of Inuit Field Training Program participants at Qaqsauqtuuq, July 2022.

Discussion/Management Implications:

Communities in Nunavut are concerned about the state of shorebird populations, and scientific evidence also shows strong shorebird population declines[1]. Our shorebird research activities are designed with direct input from community organizations (Aiviit HTO and Irniurviit ACMC), and include participation by local people, so that we can ensure that we are addressing local concerns and priorities about shorebirds. These NWRT-funded projects are an excellent complement to the broader suite of monitoring projects that we carry out, funded by Environment and Climate Change Canada. The preexisting infrastructure and our ongoing research and monitoring projects means that, with the additional funding from NWRT, we can efficiently leverage the resources already in place to focus on additional topics of particular interest to Nunavummiut. We are also able connect these local research projects to a broader network of researchers working at other sites across the Arctic. Therefore, research topics that are a community priority can be addressed at a larger spatial scale, allowing insights from across the Canadian Arctic.

We have completed all objectives related to this project, and with the support of NWRT funding have made important contributions to local research priorities and to the broader community of conservation scientists working to understand shorebird declines. Our shorebird tracking studies are yielding insights into migration routes and wintering areas that were previously not described for these species. Our work on Red Knots has allowed us to better understand their incredible migration and identify likely breeding areas throughout the Canadian Arctic. Our studies of feather corticosterone in shorebirds demonstrated an application for this innovative new technique to measure stress in the previous winter with a feather collected during the summer.

At a national scale, some of the results of these studies are contributing to status reports for shorebirds being considered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). We are currently leading a project to summarize the status of 14 species of Arctic-breeding shorebirds, for review by COSEWIC. Information from the shorebird breeding grounds in Inuit Nunangat is essential for the development of these status reports, and results from Qaqsauqtuuq are the most rigorous source of shorebird breeding data available in Canada. Additionally, the tracking dataset that we have amassed is the largest ever assembled and will provide new insights into the movements of these wide-ranging shorebird species.

The research topics identified in this project relate directly to the NWMB mandate of ensuring the conservation and management of wildlife in Nunavut for the long-term benefit of Nunavut residents. By working directly with community members and HTOs, we strive to provide relevant research results that can inform the management and conservation of terrestrial ecosystems such that they can be enjoyed by current and future generations.

[1] Smith et al., 2023. Accelerating declines of North America's shorebirds signal the need for urgent conservation action | Ornithological Applications | Oxford Academic (oup.com)

Report by Inuit Participants:

Throughout the project, we conducted mock interviews with Inuit who participated as research assistants conducting shorebird surveys and archaeological surveys in Ikkattuaq Migratory Bird Sanctuary. The following are some excerpts from those interview transcripts describing the thoughts of some of the community members after being a part of the project.

- "I liked it, I liked the experience, and I saw some stuff that I had never known, and I learned a bit. [Ikkattuaq was] different from when I first went to East Bay. It was so neat and interesting. I've never ever seen that before and it was pretty neat. I'd be interested [in doing this job again] and I'd also like others to experience it. [It was] way too short, I didn't want to go back home!" - *Jennie Kolit, Coral Harbour, June 2022*

- "I'm a local from Coral Harbour, born and raised here. My name is Solomon Nakoolak. […] I learned some things [this summer] that I wasn't even aware of that we were going use, like high-tech equipment. Very interesting for me to use high tech equipment. […] I believe this is good information that we have picked up for future generations to understand, and have an occupation, for our local community, on our island. […] I've seen more than usual polar bears with cubs [during surveys], and it was unusual for me to see them inland, not along the shoreline. That was unusual to see polar bears inland, where there's no snow, in the heat, in the summer. So that was interesting to see that many bears, inland. […] I know for a fact that we can move forward even further, once we get the idea or the understanding of the land. I'm sure this is the type of job that we could create for the future. This is for future generations that we are doing the project here, at the site and at the bird sanctuary. I try and visualize for our younger generations to have occupations, knowing in our community Coral Harbour is lacking occupations. So this is the type of job creation that can be given here, to give occupations for the future, for the long term. […] I'm happy to be included in [the] team, and I liked learning lots." *-Solomon Nakoolak, Coral Harbour, June 2022*

- "I heard about this through HTO. I got this job through the HTO and also I went to the Inuit Training Program at East Bay. This week we did bird surveys and historical surveys. [My highlight was] going on the helicopter, seeing lots of land, and visiting all those fox traps [archaeological sites]. I liked learning how to mark the nests and doing the surveys. […] There should be more Inuit people to learn this stuff." *-Joseph Pingwartuk, Coral Harbour, 2022*

Reporting to communities/resource users:

Originally, we had planned for a 3 year project beginning in 2019. Due to the COVID-19 pandemic and our inability to conduct fieldwork during the summers of 2020 and 2021, we were forced to adjust the project timeline accordingly. We were able to proceed with the second year of field work and data collection in 2022 (Project 23-003-01), and the final year of field work taking place in 2023 (Project 23-003-09). Since the resumption of activities as pandemic restrictions lifted, we have been able to meet several times with community members in Coral Harbour to share reports, discuss results, and make plans for future collaborative projects. We continue to work closely with the community to ensure that this project serves to further community priorities to the greatest extent possible.

Table 2: Summary of project milestones and community consultations.

Output or step	**Start date**	**End date**	**Status**
Initial meetings with HTO/ACMC	15/04/2018	01/09/2018	Completed through in-person meetings in April 2018, and subsequent communications by phone/email.
Project design and consultation	01/09/2018	31/03/2019	Complete
Year 1 of field work	01/05/2019	31/08/2019	Complete
Results sharing/consultation	01/09/2019	31/03/2020	Modified due to COVID – Reports of 2019 research progress were written, translated and distributed to HTO and ACMC by email. We made arrangements for an in-person meeting in March 2020 to discuss the results, but this was cancelled at the last minute due to COVID-related travel restrictions.
Year 2 of field work	01/05/2020	31/08/2020	Modified due to COVID - All 2020 fieldwork was cancelled.
Results sharing/consultation	01/09/2020	31/03/2021	Modified due to COVID - We had planned to visit Coral Harbour to discuss the project during winter 2021, however pandemic lockdowns prevented us from doing so.
Year *2 of field work	01/05/2021	31/08/2021	Modified due to COVID – All 2021 fieldwork was cancelled.

Output or step	Start date	End date	Status
Results sharing/consultation	01/09/2021	31/03/2022	Modified due to COVID – we had planned an in-person visit to Coral Harbour in winter 2022 to prepare for a return to field activities; however a COVID-19 outbreak in Coral Harbour and subsequent community lockdowns forced the cancellation of this trip. Instead, a teleconference was held in April 2022 when the caseload had improved.
Year *2 of field work	01/05/2022	31/08/2022	Complete
Results sharing/consultation	01/09/2022	31/03/2023	Complete – We visited Coral Harbour in February 2023 and met with the ACMC and HTO to discuss project progress. We used this opportunity to distribute research reports and discuss opportunities for further collaboration to meet community research priorities, and also to make a presentation to local high school students about career opportunities in environmental monitoring. Project Lead Paul Smith also gave a presentation to NWMB in Iqaluit in March, 2023 regarding the project results to date.
Year *3 of field work	01/05/2023	31/08/2023	Complete
Results sharing/consultation	01/09/2023	31/03/2024	Complete – We presented field reports for Year 3 activities to the HTO and ACMC in March 2024.
Results sharing/Final Reporting	05/01/2024	30/09/2024	Complete – we present this final report to the NWRT, and will provide printed copies to the ACMC and HTO during our next visit to the community in winter 2025.

Above: Photo taken during a meeting in Salliq with members of the Aiviq HTO.

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Above: A Sandhill Crane flies comes in for landing at a survey plot in Ikkattuaq Migratory Bird Sanctuary.