

Full project Description

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ORGANIZATION(S): Canadian Wildlife Service and Science and Technology Branches of Environment Canada

FUNDING SOURCES:

Environment Canada- Wildlife Research, Natural Resources Canada (Polar Continental Shelf Project), Environment Canada- Avian Disease Research, Canadian Wildlife Service, ArcticNet, National Science and Engineering Research Council, Nunavut General Monitoring Plan, Nasivvik Centre for Inuit Health and Changing Environments

ADDITIONAL LICENCES REQUIRED:

Bird Banding Permit (previously acquired, renewal pending), Government of Nunavut Wildlife Research Permit, EC Animal Care permit (previously acquired, renewal pending), INAC Land Use Exemption (Reserve # 46 A/4-1-2), Kivalliq Inuit Association Land Use Clearance (previously acquired, renewal pending), Nunavut Water Board Licence (3BC-EAS1214).

PROJECT TITLE AND RATIONALE:

Population Studies of Common and King Eider ducks and other birds at East Bay, Southampton Island, Nunavut

Common Eiders are an important source of food (adults and eggs) and down for subsistence hunters in Canada and western Greenland. During the breeding season eiders are concentrated in colonies, making them vulnerable to environmental disasters (ex. oil spills), contagious diseases, and disturbance. The Canadian Wildlife Service began monitoring eiders at East Bay in 1996 in response to population declines, heavy foreign hunting pressure, and a lack of knowledge of eider population dynamics. In 2004 avian cholera was first detected in the colony, and has killed birds every summer since then. The focus of the East Bay research now includes

the impact of avian cholera on population dynamics. We have also expanded our disease surveillance by surveying eider colonies near Cape Dorset in 2010 and 2011, Cape Dorset and Iqaluit in 2012 and Kimmirut and Iqaluit in 2013. During these surveys we are also quantifying polar bear presence on eider colonies and predation of eider nests, a phenomenon reported to be increasing by local citizens.

TIME PERIOD: May 20-August 20, 2014

LOCATION: East Bay, Southampton Island, Nunavut: Long-term eider demographic studies, parasite and contaminants study, as well as eider, gull and Snow bunting tracking studies. The boat based eider colony surveys will be based out of Cape Dorset and occur on Mill Island, Salisbury Island and Nottingham Island, Nunavut.

SPECIES: Common Eider, King Eider, Herring Gull, Snow Bunting

PROJECT LEADERS: Grant Gilchrist

PROJECT PERSONNEL: Dr. Oliver Love, Dr. Joel Bety, Dr. Catherine Soos (veterinarian), Jason Akearok (biologist), Michael Janssen (technician), Christie Macdonald (technician), 6 graduate students, 5 contractors/volunteers, 7 Inuit Guides and Research Assistants (Coral Harbour, Iqaluit and Cape Dorset).

OBJECTIVES: (Key expected results & Management implications)

Breeding Ecology of Common Eiders and King Eiders

By banding eiders we are able to follow individuals in order to investigate and monitor key demographic rates such as survival rates and breeding ecology in relation to a suite of variables including environmental conditions and disease prevalence. From bands returned by hunters we are able to determine where the eiders that breed at East Bay over-winter and whether hunting activity on the wintering grounds in Greenland and Newfoundland has a significant effect on populations breeding in Nunavut. We band ducklings to measure duckling survival rates, which contributes to assessing the population dynamics over time.

The allocation of resources to egg production can influence the breeding success and survival of adult eiders. Female eiders rely on energy reserves to meet their energetic requirements during incubation. To determine incubation patterns of individual birds, we fit females with nasal markers before nest initiation because bands will not be visible during that time. Parasites and contaminants are also known to influence wildlife health. Through the observation of nasal-tagged females we aim to study how internal parasites and mercury may affect breeding eiders. Additionally, we hope to track a subset of individual breeding females using small temporary GPS tags to better understand relationships between physiological condition at arrival on the breeding grounds, pre-breeding foraging activity, and breeding success.

Avian Cholera

Thousands of eiders and small numbers of gulls and geese have died at East Bay since 2004 when cholera was first detected. The disease is highly contagious, and kills sick birds within 24 to 48 hours. In addition to salvaging eider (and other species) carcasses, we also collect blood samples from captured eiders. DNA analysis of tissues from carcasses will verify the type of cholera present in the East Bay population in 2014 (serotypes 1, 3, 4, and 3x4 have been detected to date), DNA fingerprinting of the bacteria that causes the disease (*P. multocida*) will show whether the bacterium found in birds at East Bay is related to the bacterium that has caused outbreaks elsewhere, and serum antibody analyses will indicate whether the tested birds have recently been, or are currently, infected with the bacterium. Ultimately this information will help us to understand how this disease is being transmitted, and whether some eiders are capable of developing immunity.

Parasites in Eiders

We will examine internal parasites in Common Eiders to study bird parasite communities present in Canadian Arctic marine birds. We will sample eiders to explore what parasites are present in Arctic marine birds, the degree of infestation and individual parasite loads. The birds collected will also be used to compare historical contaminant and parasite loads to current loads, and assess the relationship between these two stressors on marine birds.

Herring Gulls as Disease Vectors, and Contaminant Study

Herring Gulls take advantage of the mass cholera mortality, and can be seen scavenging eider carcasses throughout the island. Herring Gulls fitted with small satellite tags will relay information about their migration routes, and give us an indication of areas where avian cholera may be transmitted from. We will also be collecting small blood samples to test the Herring Gulls for contaminants, avian cholera and avian influenza. As part of a larger collaborative study we are also interested in comparing levels of contaminants in eggs of gulls breeding at East Bay to gulls breeding at the Great Lakes. We are also interested in how contaminant levels are influenced by overwintering locations. To separate the influence of location versus diet on contaminant loads, we will be using stable isotopes, from blood samples to infer local diet composition, and feathers to infer overwintering diet composition. Our aim is to collect 3 breast feathers, a 3ml blood sample, as well as one egg from each nest of birds tracked with satellite tags to compare contaminant loads, local diet composition, and wintering areas.

Snow Bunting Ecology

We hope to continue the investigation of Snow Bunting demography. We have been collecting basic breeding biology information on this population for a few years, and have also examined migration routes and wintering ranges through the use of geolocators (see Macdonald et al. 2012). In 2014, we will track individuals breeding in Iqaluit to compare the migration routes with

those tracked from East Bay. Specifically, information from these devices will allow us to 1) monitor variation in migratory behaviour of two distinct breeding populations (East Bay and Iqaluit), 2) to identify important wintering and migratory stopover sites, and 3) determine the geographic linkages of multiple breeding and wintering populations to direct future conservation efforts.

Contaminants in Thick-billed Murre Eggs

Monitoring of environmental contaminants in arctic seabird eggs has been ongoing since 1975. Seabirds breeding in the high Arctic were shown to be contaminated with a similar suite of contaminants as those breeding in temperate regions and, in fact, some contaminants, such as mercury and certain perfluorinated chemicals, are increasing. Starting in 1993, eggs of thick-billed murre have been collected from Coats Island in northern Hudson Bay in parallel with the high Arctic collections for comparative purposes. In order to continue these historical contaminant trends, collection of 15 thick-billed murre eggs is proposed from Coats Island in 2012.

METHODS: (i.e. Details of capture, handling, and disposition – *be SPECIFIC*)

1. TRAPPING AND BANDING

Adult Eider Capture

At East Bay we capture up to 700 Common Eiders and 50 King Eiders using a large mist net, which traps them during flight. We use this method in June, before the breeding season begins, when prospecting and courting flights occur. This method is based on a system described by Goudie (1997), in which capture success rate was 90%, and the mortality rate was 3.2%. In that study, most of the mortality (6 of 7 birds) occurred during one banding event, when temperatures were very high (32°C), and birds died of heat prostration. Considering our arctic study site, this will not be a problem in our case.

The net used to trap eiders is a 100mx8m monofilament gill net that is suspended from 6m steel conduit poles at each end. The top of the net is attached to a steel cable with metal shower curtain rings, allowing the net to be closed between banding sessions. Polypropylene ropes run horizontally through the net, which creates bag-like pockets that hold the bird after it flies into the net. These pockets prevent the birds from dropping or rolling to the ground and escaping. The net is situated on a small isthmus of land separating a freshwater pond from the ocean. Field assistants situate themselves out of sight on either side of the net to encourage individuals to fly directly into the net should they try to fly around it. Once an eider is captured in the net it is retrieved, carried 10-50 metres to the banding station, banded, and released. Birds captured as pairs are released as pairs. If birds are held during a busy banding period, they are put individually in a wooden holding box whose floor is lined with crushed sea ice to keep temperatures in the box cool. Trapping activities are discontinued if winds are greater than 20km/h.

We place metal US Fish and Wildlife Service (USFWS) bands on the right tarsus, as well as individually coded plastic coloured bands on both legs. The plastic band above the metal band is half the size of the metal band and the plastic band on the left tarsus is the same size as the metal band. Ducklings are banded with plasticine-filled metal leg bands, as well as a half-sized colour band. Females are fitted with nasal disks so that individuals can be identified during incubation. The disks are attached to the nares using UV-degradable surgical monofilament that will allow the disks to fall off shortly after the breeding season. Temporary nasal tags have been successfully used on eiders at East Bay and other locations since 2001 (ex. Queen Maud Gulf by Ray Alisauskas and students), and no differences in survival rates of eiders or their nests have been detected.

During July, behavioural observations will be conducted from 4x4m blinds, which are accessed using long canvas tunnels leading to the blind from shore. This is to minimize any disturbance to the colony. Some hens will successfully nest within 2-3m of the tunnels and blinds, which are erected before eiders arrive back at the colony.

A small sample of eiders (10-15) will be captured on the nest using bow nets. This is done to collect blood samples from hens during incubation, which will allow us to evaluate the health status of incubating hens, as well as hormone changes over the nesting period. The bow net base surrounds the nest, but the net part is folded down to one side and spring loaded with a string attached to a release lever. The string pull cord is then run to a hiding spot where we wait for the female to return to her nest. Once the female is settled down on her nest the pull cord is pulled and the net springs over the entire nest trapping the bird on her nest. The traps are set for no longer than 1 hour. If the female does not return to her nest in that time, the trap is removed.

Duckling Capture

Up to 200 ducklings will be caught using a funnel walk-in trap in late-July when they leave the nest and go out to sea. Broods leaving the colony are directed into a wire mesh (not chicken wire) cage by low wire fences. The trap is passive, so that no human intervention is required to move the broods into the traps. Hens and ducklings are merely following their natural pathway to the ocean. Traps are generally checked every 2 hours, but more often during periods of high brood departure from the colony. Plasticine-filled leg bands and colour-coded leg bands will be applied to the tarsus of the ducklings, as described in Blums et. al. (1994). Ducklings and adults caught together are released together in a nearby bay so that ducklings are not separated from their mother. Duckling trapping is only done during ideal weather conditions (calm days, moderate temperatures, no precipitation).

Herring Gull Capture

Herring Gulls will be trapped using box traps set over their nest. Noose and bow nets are used rarely, and only if an individual is trap shy, or if the position of the nest (eg. in a rock pile) excludes the possibility of setting a box trap. The traps are constructed from wire and are propped up on wooden sticks that fall away when the gull enters the trap and sits on the nest, causing the trap to fall over the bird. Traps are left on the nest for a maximum of 1 hour, and

eggs are covered with nesting material to avoid chilling. Each bird is fitted with a metal USGS leg band and 2 colour bands to allow for individual identification using binoculars and scopes.

Snow Bunting Capture

Up to 400 Snow Buntings will be captured using potter traps (walk in type, baited with seed, at maximum checked every 30 minutes). All newly captured birds will be banded with a metal band, up to 3 plastic coloured bands to allow for individual identification.

2. SAMPLING

Eider Blood Sampling (700 birds)

Blood will be collected from all Common Eiders and King Eiders for corticosterone and contaminant testing. Blood will be collected from the tarsus or jugular with a needle and syringe (23 gauge), as recommended by Gaunt and Oring (1999, Guidelines on the use of birds in Research). Approximately 3ml of blood will be collected and will be centrifuged and the plasma removed and stored in a -20C freezer.

Snow Bunting Blood Sampling (200 birds)

A blood sample ($\leq 150 \mu\text{L}$) will be collected from up to 200 birds through puncture of the brachial vein using a 26 gauge needle and heparanized capillary tubes. These samples will be collected and will be centrifuged and the plasma removed and stored in a -20C freezer. They will be used to test for physiological traits as well as avian cholera.

Herring Gull Blood Sampling (30 birds)

A blood sample will be collected from each Herring Gull caught. This includes gulls newly caught and deployed with a 2014 satellite tag ($n=10$), and any other gulls caught who were captured and released in in 2012 or 2013 with other tracking devices (up to 20 birds). Blood will be collected through the tarsus or brachial vein with a needle and syringe (23 gauge). Approximately 3ml of blood will be collected and stored in a -20C freezer.

Feathers (200 SNBU, 700 COEI, 30 HERG)

1-3 body feathers will be collected from each newly banded Snow Bunting.

One tail feather and two secondary covert feathers from all captured or collected eiders will be collected and stored in paper envelopes for disease and stress hormone testing. We will collect 3 feathers from the back of the head of each captured Herring Gull, which will be stored in small paper envelopes and transported at room temperature for lab analysis of contaminants and stable isotopes.

Eggs

We will collect 15 eggs from Herring Gulls at East Bay, with a single egg taken from each nest, to test for contaminants through the CMP National Contaminants Monitoring Program. Eggs will be collected early in the season while fresh, and shipped south for analysis.

We also hope to collect 15 Thick-billed Murre eggs from Coats Island during the last week of June. This is early in the egg-laying season, so we expect females to re-lay, thereby minimizing any possible population effects.

3. PARASITES IN EIDERS

PANACUR is an anti-parasite treatment (active ingredient is fenbendazole) that has been shown to be effective against nematodes, lungworms and cestodes in birds, as well as acanthocephalans in monkeys (Norton et al. 1991, Poultry Science ; Yazwinsky et al. 1992, Avian Pathology; Yazwinsky et al. 1993, Avian Pathology; Weber and Junge 2000, Journal of Wildlife Medicine). As common eiders are banded after being caught in the mist nets they will be given either a 2 ml oral dose of 2.5% PANACUR® (Hoechst Roussel Vet GmbH; a benzimidazole; 25 mg/ml), or alternatively a placebo treatment of 2 ml dose of distilled water. Since PANACUR is known to rid birds of endoparasites, and few negative side effects of fenbendazole at recommended dose levels are known, it is likely that the drug would only be responsible for positive effects on treated birds (Bustnes et al. 2006, Proceedings of the Royal Society B-Biological Sciences). In 2013 we administered this treatment and found that birds treated with the PANACUR had a higher nest initiation rate, suggesting that this treatment may actually increase the condition of the birds.

To test the effectiveness of the anti-parasite treatment, 10 male eiders treated with PANACUR will be held in outdoor pens lined with crushed ice (to keep the birds cool) for a period of <24 hours to collect excreted intestinal parasites, and then sacrificed to confirm the excretion of all intestinal parasites. Birds will be euthanized within <24 hours using cervical dislocation, performed by an experienced senior staff member. Birds will then be dissected, removing the entire gastro-intestinal tract for future dissection and parasite identification in the lab. Tissue samples will be stored at -20 degrees C until dissection in the lab. During the <24 hour captive period, birds will be observed every 1-2 hours and monitored for any signs of distress.

4. SATELLITE AND GPS TRACKING

Common Eider Tracking

To assess relationships between physiological condition, foraging activity, and breeding success, we plan to attach GPS units to a subset of 10 female common eiders captured and banded as described above, but not part of the parasite study. After measuring and banding, the GPS tags (Ecotone; model Uria 400) will be mounted to the birds' backs. The waterproof, remote data-download units weigh 18 g (<1% of the body mass of a Common Eider), and will be attached to female eiders by taping the unit to 5-10 dorsal feathers, approximately 5 cm above the uropygeal gland, using waterproof, cloth-backed Tesa tape. Data will be received via remote downloadable GPS receiver stations and the units will fall off the eiders when the dorsal

feathers are moulted after breeding such that the birds will not need to be recaptured to retrieve the data or the units.

Herring Gull Tracking

To determine possible areas where avian cholera may be transmitted by gulls, solar powered satellite transmitters will be attached to 10 Herring Gulls using a harness made of 6.35mm Teflon ribbon described in Mallory and Gilbert (2008). Each device will weigh less than the recommended 5% of their body mass. Solar powered satellite tags have been shown to provide up to 3 years or tracking data before battery failure. Once the tags are confirmed to have dead batteries, the gulls will be trapped, and the tags will be removed (expected 2014-2017). We will also be retrieving 15 geolocators deployed in 2012.

Snow Bunting Tracking

We will be deploying 24 new geolocators in Iqaluit in 2014 (Migrate Technology P65 model, weighing 0.75 grams) attached using a harness made of 2mm Teflon ribbon as described in Macdonald et al. (2012), which will be retrieved in 2014. We will also be retrieving any remaining geolocators from 2010-2012 deployments at East Bay.

4. OPPORTUNISTIC COLLECTIONS

Snow Buntings: Any unhatched eggs and chicks found dead in the nest will be collected and stored at -20°C for contaminant and disease testing.

All birds: Any carcass or part of a bird that is found will be collected for disease analysis.

References

- Blums, P., A. Mednis, and J.D. Nichols. 1994. Retention of web tags and plasticine-filled leg bands applied to day-old ducklings. *Journal of Wildlife Management* 58 (1): 76-81.
- Gaunt, T. and L. W. Oring (eds). 1999. Guidelines for the use of wild birds in research. Ornithological Council. 2nd ed. 52 pp.
- Goudie, I.R. 1997. A new method for live-capturing Common Eiders. *Canadian Wildlife Service*. 13 pp.
- Hanssen, S.A., Folstad, I., Erikstad, K.E., and Oksanen, A. 2003. Costs of parasites in common eiders: effects of antiparasite treatment. *Oikos* 100: 105-111.
- Mallory, M.L., and C.D. Gilbert. 2008. Leg-loop harness design for attaching external transmitters to seabirds. *Marine Ornithology* 36: 183–188.

Macdonald, C.A., Fraser, K.C, Gilchrist, H.G., Kyser, T.K., Fox, J.W. and O.P. Love. 2012.
Strong migratory connectivity in a declining arctic passerine. *Animal Migration* 1: 23-30.

Mosbech et. al. 2006. Year-round movements of Northern Common Eiders *Somateria mollissima borealis* breeding in Arctic Canada and West Greenland followed by satellite telemetry. *Ardea* 94(3):651-665

Weller, M. W. 1957. An automatic nest-trap for waterfowl. *Journal Wildlife Management* 21:456-458.

Location	Species	Number of sample	Type of sample	Live/Dead
East Bay Island	COEI	700	Blood/serum sample	Live
East Bay Island	COEI	700	Tail feather	Live
East Bay Island	COEI	1400	Covert feathers	Live
East Bay Island	COEI	10	Tissue samples (spleen, lung, liver, heart, kidneys, skeletal muscle and brain) /carcasses	Dead – sacrificed to test effectiveness of anti-parasite treatment
East Bay Island	COEI	10	GPS	Live
East Bay Island	COEI/HERG/SNBU/Geese/Guillemots (any dead bird found)	200	Tissue samples (spleen, lung, liver, heart, kidneys, skeletal muscle and brain) /carcasses	Found Dead
East Bay Island	HERG	30	Blood sample	Live
East Bay Island	HERG	60	Feathers	Live
East Bay Island	HERG	10	Satellite tags	Live
East Bay Island	HERG	15	eggs	Live
East Bay Island	SNBU	200	Blood	Live
East Bay and Iqaluit	SNBU	200	Feathers	Live
Iqaluit	SNBU	25	Geolocators	Live
Coats Island	TBMU	15	eggs	Live

COMMUNITY CONSULTATION PLAN:

Grant Gilchrist will be visiting Coral Harbour and Cape Dorset in May 2014 to discuss results from 2013 research and talk about plans for 2014 with the Hunters and Trappers Association. At this time, Grant will also distribute a series of posters (in both English and Inuktitut), which summarize research activities and project results. The HTO's in both of these communities have already received a report on research activities in 2013.

PROPOSED USE OF LOCAL KNOWLEDGE:

We rely heavily on local ecological knowledge to guide us in our eider surveys based out of Cape Dorset. We will be visiting Cape Dorset in July 2013, to meet with the HTO and other knowledgeable community members to determine where there have been possible avian cholera die-offs in the past and where the best islands to survey are. The goals of this project are to help establish a community-based monitoring program to detect avian cholera outbreaks in the future.

OPPORTUNITIES FOR LOCAL PARTICIPATION:

East Bay Island - we hope to hire 2 field assistants from Coral Harbour to assist with the logistics of setting up and dismantling camp, ferrying crew and equipment from the airstrip to the camp, and service and maintain equipment (ATV, snowmobile, generator). We have worked with Josiah Nakoolak for over 15 years and we are now hoping to also hire Juipi Angotealuk such that he may be mentored by Josiah.

Cape Dorset colony surveys - we hope to hire 2 boat captains and 4 crew for 8 days to help with logistics, conduct surveys, and collect fecal samples from nests.

Local HTOs are consulted about all hiring, and recommend appropriate community members.