7th ANNUAL NEWSLETTER

The Snow Bunting Report

CANADIAN SNOW BUNTING NETWORK

This Year's Highlights

- Dr. Francois Vezina on opening the new arctic wildlife research lab in Alert, Nunavut
- Studying snow buntings as a gateway to a career in science
- UWindsor grad student Keta Patel on snow bunting physiology
- Dr. Robert Montgomerie on the history of snow buntings as food

Issue for Winter 2018-2019

Newsletter Editor – Jason Chappus

Welcome to the 7th annual newsletter!

Hello Snow Bunting enthusiasts! Happy winter and welcome to the 7th annual Snow Bunting Report! As 2018 comes to a close, we will gather to band, track, observe and admire the most fascinating bird on the planet, *Plectrophanax nivalis*. Winter this year is predicted to be very cold and very snowy... Bad news for most, but good news for us! Thank you all for your effort in the previous year, and welcome newcomers to the Canadian Snow Bunting Network.

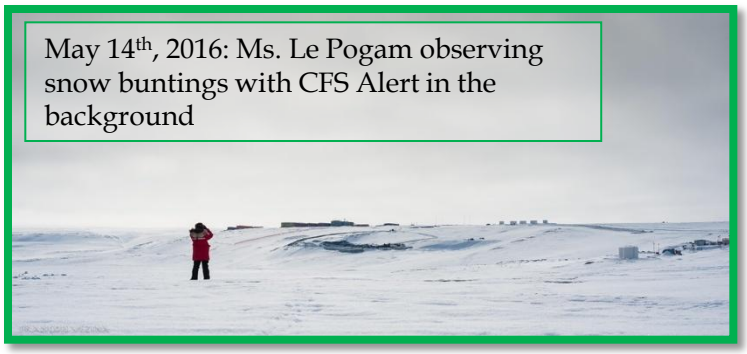
Want updates? Like us on Facebook at www.facebook.com/SNBUnetwork

Got questions about snow bunting research in Canada? Contact Oliver Love at olove@uwindsor.ca

Northernmost Wildlife Research Laboratory Now Open at the Canadian Forces Station Alert, Thanks to Snow Buntings!

Dr. François Vézina
Université du Québec à Rimouski

There is active snow bunting research going on the top of the world. The Canadian Forces Station Alert (82°N, Ellesmere Island, Nunavut) is the northernmost permanently inhabited place on earth, about 800km from north pole, and, since 2015, it has hosted a team of scientists conducting research on snow buntings. This started with the work of a PhD student, Ms. Audrey Le Pogam, co-supervised by Dr. François Vézina (Université du Québec à Rimouski, UQAR) and Dr. Oliver Love (University of Windsor).



May 14th, 2016: Ms. Le Pogam observing snow buntings with CFS Alert in the background

Audrey's project aimed at understanding how buntings adjust their physiology to cope with winter conditions in Canada but also with the challenge of migrating through a winter landscape in the spring to go breed in the Arctic. Among her exciting findings, Audrey's results suggest that buntings might maintain their cold endurance at winter level throughout summer, although temperatures on the breeding ground can be in the 10-25°C range. This phenomenon would be an adaptation to cope with highly unpredictable Arctic weather, where breeding birds can be surprised by cold and snow even in July! Work by another UQAR student of Drs. Vézina and Love, Ms. Justine Drolet, suggest that, while buntings can sustain with ease temperatures well below –50°C, they seem to have lesser tolerance for moderate heat. In fact, Ms. Drolet's fist results suggest that birds actively provisioning nestlings can be at risk of overheating if they work in full sun at temperatures as low as 16°C! These findings truly show that snow buntings are real champions of the cold. However, they also cause concern for researchers because rapidly rising temperatures in the Arctic could potentially affect their capacity to maintain their breeding effort in the years to come.

Drs. Vézina and Love are therefore more determined than ever to expand knowledge on this amazing long distance migrant of the cold and this just got easier. Indeed, snow bunting projects at Alert, sponsored by Environment and Climate Change Canada and by the Molson Foundation, have been very well perceived by the Department of National Defense (DND). This led, in 2018, to the opening of a new wildlife laboratory on site as part of a parallel project aiming at developing

Above: Ms. Justine Drolet setting up her instruments for snow bunting research at Alert's wildlife laboratory in June 2018

knowledge on Arctic birds and mammals and at the production of a wildlife management plan for Alert. This UQAR-DND project, led by Dr. Vézina and Dr. Dominique Berteaux also greatly improved capacities for research on snow buntings as there is now a real laboratory space available to conduct projects and sample analyses otherwise impossible in the field. Clearly this improvement in research facilities should lead to new exciting snow bunting discoveries!

A male snow bunting with a beak full of spiders for its nestlings

Editorial: Beginning a Career in Science by Studying Snow Buntings

Jason Chappus
Graduate Student - University of Windsor

As far back as I can remember, I've wanted to pursue a career in science, and I've spent most of my life working toward that goal. Two decades of intensive schooling eventually brought me to my final year as an undergraduate student at the University of Windsor. Several of my friends there were taking an undergrad thesis course in biology, and I realized that writing a thesis could be a gateway to scientific research. About a year ago I registered for the course and went about searching for a supervisor, and I eventually chose to approach Dr. Oliver Love, who had taught a couple courses I truly enjoyed. I asked if he'd supervise me for a project, and I was surprised at how enthusiastic he was about taking me under his wing (no pun intended). After a series of discussions, he told me that he had an unfinished project begun in 2008 examining the impact of crop harvest practices on the population of snow buntings in North America, and that he believed I'd be the best student to finish it. His passion for snow buntings was (and is) contagious, thus I excitedly took on the project.

Before meeting Dr. Love, I knew almost nothing about snow buntings aside from seeing them occasionally eating seeds in my back yard it was too cold to go outside. I learned that surprisingly little was known about the movements and general ecology of snow buntings in winter, and that their population had declined over 60% in the last 40 years. We wanted to answer several questions: Have snow buntings been in decline since the beginning of the 20th century? Is crop area and yield related to bunting population trends? Is climate change a factor? To answer these questions, first we had to acquire population estimates, and for this we looked to Audubon's Christmas Bird Count (CBC). Next, we needed the area of farmland and yield for crops we believed the birds to be feeding on (corn, wheat, barley, etc.). We also searched for data on climate indices (notably the North Atlantic and Arctic oscillations), as well as temperature and snowfall for the winter months. I noticed there was almost no research into the impact of pesticides and other chemicals on snow buntings specifically, so I searched for data on chemical applications too.

Our efforts ultimately brought a huge dataset to fruition. We had almost 500 possible variables to test; 100 years worth of snow bunting CBC estimates, area and yield for 9 different crops, and climate and weather measurements, all for 9 Canadian provinces and 15 American states. Interestingly (and perhaps concerningly), we couldn't find much long-term data on chemical applications to farmland in these regions. Analyses of this dataset are still ongoing, but we have answered some of our previously asked questions. The winter population in Canada does not appear to have declined significantly over the last 100 years, though the American winter population has declined significantly over this period. We believe that this could be due to the birds wintering further north in recent times, or it could mean the CBC observers were more sparse in the North and have increased their effort in recent years. We also found that crop area and yield have increased substantially since 1900, and winter temperatures have generally been increasing over time.

Examining the relationships between crops and snow buntings revealed complex results. The effect of the area of oats, for example, was significant in 9 different regions, but the yield of oats was only significant in 3 regions, and these relationships were positive in some regions but negative in others. Climate variables also had confusing effects, though overall we could conclude that increasing temperatures were negatively correlated with snow bunting numbers. The effect of crops and climate on snow bunting populations was so variable between provinces and states that we couldn't find any patterns across the continent. I still believe that more in-depth analyses can be done with this data, so I will continue to work on this project into the new year.

I received a bachelor's degree in biology in May 2018, and I decided to come back to the University of Windsor to continue studying birds with Dr. Love. I've found a new appreciation for snow buntings in the last year, though I still have a passion for other birds as well, from small passerines to seabirds to raptors. Dr. Love and I have many questions about the movement ecology and physiology of birds that remain to be answered, and I am planning to answer these questions in a master's thesis. Concerning snow buntings, there is still much to be learned about the movements of populations in the eastern half of North America during the winter, and we would love to explore this gap in knowledge using telemetry techniques such as GPS dataloggers and the Motus network (assuming that the tags used in these methods can fuction in sub-zero climate!). As well as this, we thought about examining the birds' breeding physiology as well, using temperature-sensitive passive integrated transponder (PIT) tags. This way, we can monitor the their movements in and out of nests, and possibly examine their body temperature, to see if they are pushing their thermal limits during the incubation period. We may also attempt these methods on tree swallows as well, which are subject to similar gaps in our knowledge. Overall, I'm thankful to have been introduced to a career in academia thanks to snow buntings, and I'm excited to continue studying them in the future.

Above: Jason Chappus presenting his undergraduate thesis on snow bunting population trends in North America.

Using Genetic Approaches to Quantify Reproductive Output in Unfaithful Birds

Keta Patel
M.Sc. Candidate
University of Windsor

Assessing reproductive success of individuals of a given bird species was very simple couple of decades ago. It would have involved an ornithologist walking through the study site and simply counting the number of eggs in each of the nests that he/she encounters. If one of these nests had six eggs that successfully hatch, what are the chances that all of those chicks are biologically related to the adults of that nest? If you say all, you are assuming that these birds are truly monogamous, in other words: they mate for life. In true monogamy, male and female form an *exclusive* partnership for the purposes of mating and raising their young! However comforting this may sound, it is not always the case, especially in songbirds like snow buntings. Parentage assignment based on observational data alone is largely unreliable due to the extra-pair relationships between individuals.

Extra-pair copulations (EPCs) occur when a male mates outside of his socially monogamous pair bond and sires an offspring, known as an extrapair offspring (EPO). This is one of the easiest way for males to increase their reproductive output as they could have many chicks, some of which are raised by other males in the population. EPOs can be reliably identified using genetics, and can be taken into consideration when coming up with estimate of overall fitness for a given individual. This is exactly what I am aiming to do through my master's project.

For the past four years, I have had the opportunity to work on the snow bunting parentage project at the University of Windsor. I have been mainly working with the blood tissue samples collected during the breeding seasons of 2010 and 2011 for the population of buntings located at the East Bay Island (EBI), Nunavut. This small island is part of the East Bay Migratory Bird Sanctuary on Southampton Island. The island provides an abundance of ideal nesting sites; granite rocky cavities, for breeding buntings. This is the main contributing factor for EBI harbouring one of the densest breeding colonies in the low Arctic tundra! Due to this characteristic, I think this location would have higher levels of EPC occurrences, making it an ideal population to study parentage in this species.

Above: Keta Patel analyzing DNA extracted from snow bunting blood samples in the environmental genomics lab, University of Windsor.

My study has three main goals: 1) Development of microsatellite markers for this species – these markers allow for the identification of EPOs in the population, allowing me to quantify realized reproductive fitness of each male at EBI; 2) Determine relationship between reproductive fitness and previously collected male quality data – some of which are life history traits, individual state, song and plumage quality, sperm quality, testosterone and oxidative status.

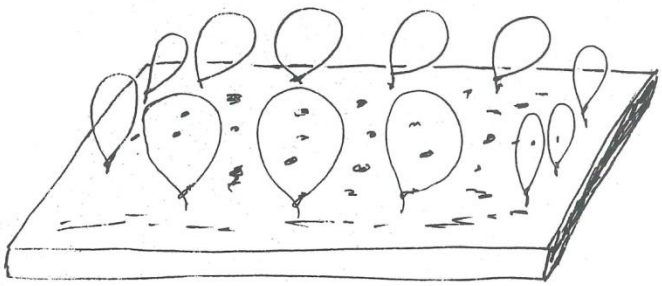
Despite it being one of the most interesting passerines (this may be biased coming from me), the snow bunting is very understudied from a genetics point of view. My research will shed some light into mating strategies and highlight the factors that affect genetic promiscuity in this species. My hope is that this project would lay out the necessary genetic foundation to study further evolutionary questions among multiple populations of this species. More importantly, this work will provide a baseline for assessing how impacts of climate change may alter breeding dynamics in this species given that increasing temperatures are expected to alter habitat characteristics and hence reproductive behaviours.

Above: Extrapair paternity in snow bunting: a male has fathered all chicks in his social nest (left) and one egg in some other nest (right).

The Ortolan of the Snows

Dr. Robert Montgomerie
Queens University

In the late 1700s, the great English explorer and naturalist Samuel Hearne wrote extensively about the birds and mammals he encountered on his expeditions through northern Manitoba and Nunavut. Many of his observations were unique and perceptive, demonstrating an appreciation of ecology and behaviour well ahead of his time [1]. But he also described how to hunt or catch each species and its suitability as food, thereby providing a guide to other explorers who would have to live off the land—an 18th century version of TripAdvisor. Here is what he said about the Snow Bunting: *These birds make their appearance at the Northern settlements in the Bay about the latter end of May, or beginning of April, when they are very fat, and not inferior in flavour to an ortolan... At that time they are easily caught in great numbers under a net baited with groats or oatmeal; but as the Summer advances, they feed much on worms, and are then not so much esteemed* [as food]. *They sometimes fly in such large flocks, that I have killed upwards of twenty at one shot, and have known others who have killed double that number...In Autumn they return to the South in large flocks, and are frequently shot in considerable numbers merely as a delicacy; at that season, however, they are by no means so good as when they first make their appearance in Spring.* [2]

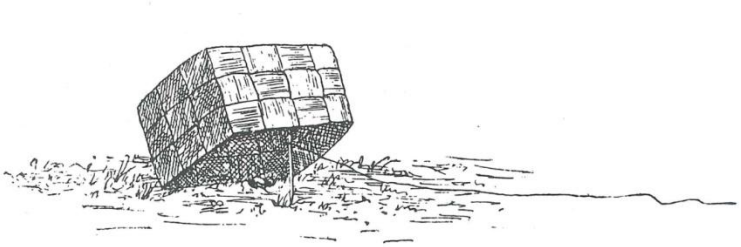


Above: Horsehair snares on a board, from Lapland, similar to the ones used in Québec

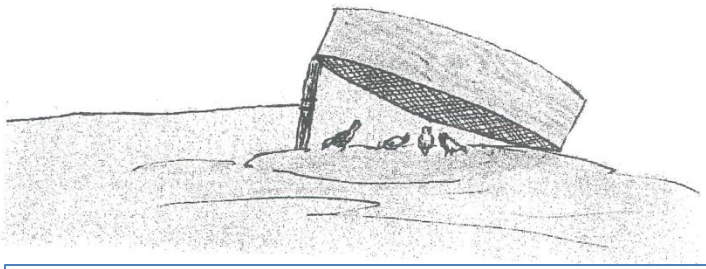
The Ortolan Bunting (*Emberiza hortulana*) has long been considered a culinary delicacy in Europe, particularly in France where their consumption is now banned though they are still available illegally to people of wealth and power. Thus, Hearne's comparison of the Snow Bunting to the ortolan is incredible praise indeed. Even Linnaeus noted that it was called *ortolan de neige* in France.

My wife's mother grew up in Sept-Îles in eastern Québec on the north shore of the St Lawrence River during the 1930s. When I first met her, and told her about my arctic research, she rather sheepishly admitted that her family used to catch Snow Buntings with noose carpets in the winter, to provide a little fresh protein and fat for their limited diet. This little bird has in fact been an important food source for people throughout its winter range, shot—and trapped with noose carpets, box-and-stick, grain seives, and drag ropes—wherever they were abundant [3]. In 1903, for example, a State game warden found nearly 80,000 snow bunting carcasses in a cold storage warehouse in a 'large eastern' city, ready to ship to local markets and restaurants [4]. We can be grateful that the conservation of birds became a cause early in the twentieth century because, even in 1876, it was clear to

Below: Box-and-stick trap from northern Finland, similar to ones used in Newfoundland



some that the Snow Bunting could not stand that sort of hunting pressure: *It is to be hoped that they will not become in demand to supply the market, else, from the readiness with which they can be captured, we should look for the early extinction of the most agreeable feathered companion which the northern residents possess during their long, tedious winters.* [5]



Above: Grain sieve from Lapland, dropped on the birds to crush them

References

1. Montgomerie R. 2018. The history of ornithology in Nunavut. pp 49-69 IN Richards JM, Gaston AJ. *The Birds of Nunavut*. Vancouver: UBC Press.
2. Hearne S (1795) *A journey from Prince of Wales's Fort in Hudson's Bay to the Northern Ocean*. London: Strahan and Cadell.
3. Svanberg I (2001) The snow bunting (*Plectrophenax nivalis*) as food in the northern circumpolar region. *Fróðskaparrit (Annales Societatis Scientiarum Faroensis*) 48:29–40.
4. Dutcher W (1903) Report of the AOU committee on the protection of North American birds. *The Auk* 20:101–159.
5. Anonymous (1876) The Snow Bunting. *American Agriculturalist* 35:253.

Ontario

BIRD STUDIES CANADA
ÉTUDES D'OISEAUX CANADA

NUNAVUT ARCTIC COLLEGE

NUNAVUMMI QAUJISAQTULIRIJIKKUT NUNAVUT RESEARCH INSTITUTE

Mitacs

UQAR

Environment Canada

NSERC CRSNG

Baillie Fund

Queen's University

OBBA
ONTARIO BIRD BANDING ASSOCIATION

University of Windsor