❄ 9th annual newsletter ❄

The Snow Bunting Report

CANADIAN SNOW BUNTING NETWORK

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This year's highlights

❄ New research students at the University of Windsor (UWin) and the Université de Quebec à Rimouski (UQAR)

❄ An exciting summer studying buntings in Iqaluit, Nunavut!

❄ New bander in Alberta!

Welcome back to the 9th "annual" Canadian Snow Bunting Network! After a year hiatus, we are excited to be back to highlight the hard work of students and community members!

If you have any questions about Snow Bunting research in Canada, please feel free to contact Oliver Love at olove@uwindsor.ca

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Newsletter Editors: Samuelle Simard-Provençal, Rebecca Jardine, and Alysha Riquier

Wandering the Tundra

by Rick Ludkin

In southern Ontario, wintering Snow Buntings are ushered in by cold temperatures and snow. Without one or the other we don't see them and when they have arrived, if we lose either of those factors, they disappear. These are cold weather birds, adapted over many millennia to be able to not only tolerate but to thrive under these conditions. Seeing them in a blizzard one thinks that they must be on the verge of perishing, but this isn't the case. As long as they can find food – plant seeds – they will be fine. Experimental research done at the University of Quebec at Rimouski (UQAR) has shown that they are capable of withstanding temperatures as low as -90 C!

Almost all Snow Buntings nest in the Arctic (there are a few small populations that nest at high elevations; e.g., in Scotland). The Arctic is warming at twice the rate of the rest of the globe. What impact might this warming have on Snow Bunting breeding success? How tolerant are they of *warm* temperatures. Initial experiments suggest that Snow Buntings, interestingly, while they are very efficient at conserving body heat in cold conditions, are quite inefficient, compared to birds in temperate latitudes, in dissipating it. They seem to be able to handle air temperatures up to ~22 C but above this they would have to initiate evaporative water loss, an activity at which they are quite inefficient or….they would have to reduce activity, which raises body temperature, to avoid *hyper*thermia. Warm temperatures occur at nesting time. Would reducing behaviours, out of necessity, impact their ability to forage, mate, and feed young? What would be the impact of reducing these behaviours on long-term nesting success?

Researchers at the University of Windsor and at UQAR began to look at these questions based in Iqaluit….and I got to tag along to help the effort. The first thing we needed to do was identify breeding pairs, find their nests and, wherever possible, catch, band and colour-band the members of each pair. Also, each member of a pair was fitted with a PIT tag in order to identify each individual and then monitor its temperature and activity around the nest (e.g., how often it entered the nest to fed young).

Nest searching was a delight albeit, at times, a frustrating delight. Ideally you would like to identify and catch a pair early while they are building the nest so you can follow them through the whole cycle. This can be difficult as the birds move through different stages in the breeding process: initially the female, attracted to a particular male's territory, will go "prospecting". She will check out every nook and cranny until she is happy with one particular spot. All the time she's on the move she is attended by the male. At this stage, find a male and the female will be close by. But…the female may fly 100's of meters or disappear over a ridge or into a rock crevasse always with the male in tow and you lose sight of them. And she's doesn't seem to be in any rush and may spend several hours feeding before prospecting again. At this stage you could spend many hours for little or no return other than to be fairly certain that this pair will breed in this area…and you'll check later.

The next stage, once a site is chosen, is to build the nest. Nests are located in cracks in rock faces or in holes in or under piles of rocks. Building takes 4-5 days and follows a set pattern: 1-2 days laying down a base of moss; 1-2 days laying down grass and shaping it into a cup; 1 day lining the cup with white feathers. (It's surprising how many white feathers can be found on the tundra!) It's relatively easy at this stage to find a nest – just by following a female carrying nesting material. But it's important not to disturb the female around the nest area so trapping (we were using baited potter traps) might be done in the vicinity but NOT at the nest site. Sometimes you get lucky but more often than not the female is intent on nest building and ignores the trap. You're more likely to catch the male who isn't averse to eating when the female is working…as long as he can keep her in sight. But for good data you really need to catch both.

If you haven't found birds/nests in a particular area but feel quite confident that they are there due to regular sightings of single birds, the next 2 stages are the hardest: egg laying and then incubation. The female lays one egg per day but doesn't start to incubate until the 4th egg is laid. In the meantime she usually doesn't visit the nest and will often feed some distance from it. When incubating she rarely leaves the nest. We would then look for males carrying food as they often will feed the female on the nest, especially when conditions are tough. Many times I've watched a male fly by me carrying food from down low in a valley and then disappear over a ridge. And by the time I cleared the height it was nowhere to be seen. The birds are quite secretive at this time – and it just makes sense: the birds don't want to alert predators to a nest site with eggs by their actions.

The easiest time to find nests is when the eggs have hatched and the parents are busy feeding young. Both parents take part in this so if you see a bird carrying food you know that they are provisioning a nest filled with chicks. This is a busy time as the birds are "on the clock" – the young will fledge in about 12-13 days and they have to be fed regularly. In terms of studying the impact of warming on their activity it's a little late to be catching them…..but we did.

This type of research is very satisfying. There's the immediate "rush" when you find a pair and then their nest. But the larger joy, if you will, is that you often have to spend the day wandering the tundra. In the Iqaluit area the tundra consists of thousands of square kilometers of rolling rocky hills and valleys where you can see for ever because there's NO trees- except of course for dwarf willow. A dwarf willow forest would consist of a 10-meter square patch of knee-high stems or branches, usually in a low, sheltered spot. And there's lots of vegetation: grasses, sedges, and flowers. The same sort of flowers you might find at high elevations; hardy but very colourful. The flowers are serviced by a variety of pollinators, including bumblebees, butterflies, and…mosquitoes (although the mosquito numbers just can't compare to what you'd find in the boreal or on the Hudson Bay Lowlands – annoying, yes, but not maddening). The tundra is alive! And, except for the wind and bird calls, silent.

Passerine diversity in the area is limited but I think of Snow Buntings as just one of "The Big Five": Snow Bunting, Northern Wheatear, American Pipit, Horned Lark, and Lapland Longspur. All were found in substantial numbers around Iqaluit. It was interesting to see how they used different habitats for nesting. Snow Buntings and Northern Wheatears used similar niches: rocky crevasses and holes in jumbles of rocks although I've found wheatears more often in cracks. The most vigorous fights I saw were between these two species in the vicinity of potential nesting sites. Pipits and larks make use of much more open habitats with sparse vegetation. Even so, their nests are extremely difficult to find as, placed under a tuft of grass, the birds sit tight until you're right on top of them – usually by chance – and even then it's difficult to find. As well, they're very wary and won't approach their nest when you're in sight And then their cryptic colouration blends right in with their surroundings. Longspurs prefer denser mats of vegetation and will burrow down into it to make their nest. The hole leading into it is very difficult to find.

But birds are opportunists and I was surprised at how many nests we found in and around town. A pair of wheatears had a nest in a jumble of rocks in a retaining wall holding up the neighbour's parking space, just 20 meters away. I found it by chance when I got out of bed one morning and just happened to see it from my window. (It later fledged at least 4 young.) Running through town was a small stream and all along it were Snow Bunting nests hidden in rocks or, in one case, in a pile of rocks in a metal ring anchoring a telephone pole. But the area with the greatest concentration of buntings was the town's sewage lagoon. There were at least 5 nests around the perimeter in jumbles of rocks. The bouquet added to the experience for the researchers and the insect numbers made feeding young easier for the birds. I think future research may look at differences in nesting success between city and country nests.

Local knowledge is an important source of information and especially in the case of Snow Buntings. There were a number of local collaborators that helped us find nests and monitor them in Iqaluit. When we asked when they might expect to see buntings returning in the Spring they surprised the daylights out of us with the observation that they saw Snow Buntings THROUGHOUT THE WINTER!!! What!? We always thought of buntings as migrants but evidently there is a sub-group that spends the winter in Iqaluit sustaining themselves at feeders. Three different and very reliable townsfolk made the same observation (and all fed them through the Winter). As well, there is a population of Common Redpolls that stay, using feeders. Are these local birds? One collaborator thinks they're birds from the high Arctic that spend their Winters in the balmy environs of Iqaluit. This surprising observation we will certainly follow up on.

Three new master's students starting at the University of Windsor in Dr. Oliver Love's lab are working to tackle climate change questions and how Snow Buntings can cope with changing weather and environmental conditions.

Buntings on the Move

By Samuelle Simard-Provençal

Movement patterns of Snow Buntings remains still much of a mystery. Fall and spring migration timing is not well studied in this species, and because of climate change, it is possible that it may be shifting. Thanks to all the incredible work done by the brave and fearless CSBN banders, winter banding has revealed that individuals can travel at least 150 kilometers from their original banding site during the winter, but finer-scale movement patterns are harder to discern given that foreign recaptures (capturing a bird elsewhere from its original banding site) are rare and unpredictable even for species whose movements are well understood. The goal of my master's thesis is to better understand what drives the nomadic movement of the wintering buntings in southwest Ontario. This will be accomplished by using the Motus Wildlife Tracking System and radio tracking technology. Winter tracking was attempted once before by McKinnon *et al.* (2019), but as the first ever winter tracking birds with Motus in the winter, the results were not as robust as anticipated. Now, we believe we are better prepared to tackle this again. I will be equipping birds with nanotags in two locations, Long Point and Fergus, ON. I will be releasing some birds caught from each location at their original banding site, and I will also be performing a reciprocal translocation between both locations, meaning I will be taking birds from Fergus and driving them to Long Point, and vice versa. The data from this experiment, used in conjunction with local weather stations, will help us better understand the mechanisms that influence where the buntings move.

Too Hot to Handle?

By Rebecca Jardine

The Arctic is experiencing rapid rates of climate change, where temperatures are increasing faster than the global average. *What will happen to the many cold weather specialist species that inhabit this region as we continue to see temperatures climb higher than ever?* For snow buntings, one of the only times they are exposed to temperatures above 0°C is when they are breeding in the Arctic. Unfortunately, this is also when Snow Buntings must work extra hard in to feed and raise young, making them especially at risk of experiencing heat stress. Previous work completed by O'Connor *et al.* 2022, found that even at low air temperatures (11.7°C), buntings will be forced to alter their breeding behaviour, to offset the costs of heat. The objective of my research is to examine whether free-living buntings are actually changing their breeding behaviour even at these low temperatures.

I am also interested in examining body temperature and activity level of birds throughout their entire breeding period, to see whether individual birds are responding to heat differently. For example, whether birds that start breeding later are more constrained by high temperatures, since later in the nesting period is when temperatures should increase. To address my question, I will be using Radio-Frequency Identification (RFID) thermal tags implanted in breeding birds to record how they are responding to differing ambient and radiative temperatures throughout the breeding season. These tags are similar to the PIT tags that are used in household pets, which when passed close to an antenna will record a unique ID number. Antennas will be placed at each nest so that every time a bird enters their nest, I will get an ID and temperature reading. The results from this research will help us further understand how buntings are responding to global warming, which is especially important as Arctic temperatures continue to rise.

Mismatch because of a warming arctic in a cold-adapted passerine

By Alysha Riquier

Climate change has been taking a toll on many bird species. From heat stress to changes in distribution, many birds are feeling the consequences with reduced survival rates and fitness. A well studied consequence of climate change is asynchronization between the phenology (i.e. the timing of recurring biological events) of predators (birds) and their prey (arthropods). This is also known as mismatch.

With the arctic heating up twice as fast as the globe overall, arctic birds such as Snow Buntings are expected to be greatly affected by climate variability. Because the mechanism behind the population decline of Snow Buntings is unknown, I will be looking into mismatch as a consequence of climate-induced changes on breeding Snow Buntings. In my thesis, I will be examining the link between food availability (arthropods) and laying phenology of Snow Buntings and forecasting whether the phenological synchronicity of arthropods and buntings will diverge as climate change accelerates. To determine if there is mismatch between insect peak and nestling peak energy requirements, I work with a breeding bunting population located on Mitivik Island, Nunavut, a small island with a high concentration of Snow Bunting pairs. I took breeding measures such as lay date and clutch size, as well as eventual success outcomes (e.g., hatching and fledging success). Pitfall traps were used to collect arthropod samples to quantify biomass present throughout the Snow Bunting nesting season and by using historical data (2007-present). These questions will help to determine whether Snow Buntings have the flexibility in their laying decisions to keep pace with the expected increases in the effects of climate change in the north. As a result, I hope that my research will help to guide conservation efforts and policy changes to ensure we make attempts to reverse declines of arthropod-dependent arctic breeding species!

Getting started in the Prairies

by Dick Stauffer

Preamble written by Rick Ludkin

Preamble – The Canadian Snow Bunting Network (CSBN) grew out of a chance observation of a magazine article by the Audubon's Society that outlined the sharp decline of 20 or so North American bird species over the past 30 years. One of these was the Snow Bunting (Plectrophenax nivalis) which reportedly had declined by 64%!

Oliver Love, my travelling companion at the time (we were returning from a research project on Somerset Island), and I were taken aback and in the ensuing discussion realized that not much was known about Snow Buntings. So with the help of Christie Macdonald, we started up the CSBN. The initial aim was to try to get banders in southern Canada interested in observing and banding them. We were interested in their responses to changing local weather conditions and figuring out as much as possible their travel routes. Since the early days the research has broadened to include responses to climate change and connectivity – where do the birds we see in the winter nest and whether there are important areas of concentration during migration which need to be protected for them.

We've had pretty good luck engaging banders in Ontario and Quebec (don't get me wrong it can always be better) but we've had virtually no response from western Canada – and the prairies are a major wintering area….but where do these birds come from?

This is about to change! Dick Stauffer, in Olds Alberta – north of Calgary - makes good banding pliers. I ordered some from him and in the course of doing business we got to talking about birds and banding. I discovered that he too was a bander but had never banded (or even considered banding) Snow Buntings. When he learned about the CSBN project, he got pretty excited. Following are his thoughts, concerns, and the steps he's taken in getting involved:

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I am semi-retired and radioactive carbon dating is entirely necessary to determine my age. Both Rick & Dr. Love have purchased banding pliers from my company and Rick suggested that I start banding snow buntings a couple of years ago. I have been banding Mountain Bluebirds & Tree Swallows since 2004. Mountain Blues on my 300 nestbox trail have had a serious decline (90%) in the last 2 years.

Last spring, I told Rick I would send out an email to our nestbox monitoring group (Calgary Nestbox Monitors Society) to see if there was any interest. I got an over whelming response, so here we go.

What I thought was going to be hard and frustrating turned out to "easy peasy." Getting a permit from the Banding Lab turned out to be no problem! Then it came to building some traps…. I made 15 and I have to say that I got a lot faster building the last five then the first 10. To Quote "RED GREEN" – *if they don't find you handsome, at least they should find you handy!*

©Dick Stauffer

Now for the real issue… Finding some birds to trap & band! I have a network of people watching for the buntings with only 1 flock (20) spotted in the ditch feeding. I have baited the area to see if the flock will return, nothing to report.

We have 2 large grain handling facilities in the area, one north of town & one south of town, both are a kilometer from town. I stopped at both facilities thinking with grain spills they might have had Snow Buntings feeding. The first response I got was "**WHAT IS A SNOW BUNTING**"… oh boy, now I get to enlighten these people!

But neither facility had ever seen any buntings, only lots of pigeons & House Sparrows.

©MapTrove


©Samuelle Simard-Provençal

Now I have two of my worst fears:

1. We don't catch any SNBU's!
2. We get 50 buntings in our first trapping session… which I don't want on my first attempt at bunting banding!

I am going to try and clear a spot in the pasture where I saw the large flock on the road and set some bait mounds out and see what happens.

Best case scenario …. Trap 10-12 birds at a time!


©Samuelle Simard-Provençal

Four Masters and PhD students starting at Université du Québec à Rimouski in Dr. François Vézina's lab and co-supervised by Dr. Oliver Love working on a diverse set of questions which will help us understand more on bunting physiology.

Look at all the gear on me. The buntings use zero gear yet are better in the cold than me!

Responses of Snow Buntings to the rapidly warming Arctic

By Sachin Anand

Hello Snow Bunting enthusiasts, I have just started my PhD with Prof. François Vézina and Prof. Oliver Love. It's incredible the cold hardiness displayed by buntings weighing just 30-50gms whereas myself, a highly evolved mammal (*sarcasm*), weighing ~68 kgs (*weight varies around holidays*) with all my layers, am still not as proficient as these little birds in winter. Unfortunately, these cold-adapted birds are currently facing a new challenge: a rapidly warming Arctic caused by climate change. A recent study from our research group has predicted that buntings would find it hard to maintain normal activity in ambient temperatures above just 11.7°C. This temperature is already occurring on their breeding grounds; hence the alarming discovery of their relatively low heat tolerance is where I begin my doctoral studies. My objective is to investigate this species' capacity to tolerate heat.

Over the coming years, I plan to conduct a few experiments to understand their heat tolerance, with a few I will explain below: **1)** I will acclimate captive buntings to different ambient temperatures from current to future predicted temperatures and then measure their markers of condition (body composition) and performance (metabolic rate during activity, body temperature, cold and heat tolerance). This will give us a good idea of the extent to which they can acclimate to heat.

2) For buntings', their extreme cold endurance may result in a weak tolerance for even moderate heat. To test this, I will measure the metabolic rate and body temperature of buntings by placing them in climate-controlled chambers and constantly increase (for heat tolerance measurement) or decrease the ambient temperature (for cold tolerance measurement). Finding a negative relationship between cold endurance and heat tolerance at the individual level would mean that natural selection could favour a shift away from being an extreme cold specialist to being able to perform better in warmer temperatures. This could mean that these birds might be able to adapt to their new warmer conditions by reducing their cold hardiness.

Overall, my thesis will provide a fundamental understanding of the responses of cold-adapted snow buntings facing rapidly warming climate.

New project: buntings, weather, farmlands, and diet: what's the link?

By Inès Fache

I just arrived in Canada, as a PhD student, to be part of the bunting team at Université du Québec à Rimouski (UQAR).

The main goal of my PhD is to understand more about the state of Snow Bunting populations in North America. Thanks to Audubon's Christmas Bird Count, I can look at the past to understand more about the state of Snow Bunting populations in North America. As for the why, we all know that climate change and agriculture's modernization have changed the north American landscape significantly. So, I will be looking at environmental variables (such as temperature & snowfall) as well as agricultural variables (such as crop yield and total area) to determine potential constraints that might have contributed to the Snow Bunting's negative population trends.

An increase in farmlands area could be a good thing for birds searching for energy-rich seeds in winter. However, the introduction of new crops (mainly soy and canola) and the quality of these new seeds for buntings raises new questions. *Are these types of food good enough for buntings to survive the winter and to prepare for the long migration awaiting them?* And above all, *are they interested by new crops?*

With these questions in mind, I am currently developing experiments to determine their food preferences, and potentially whether this choice differs among areas in Canada. For instance, banders in the west reported that they couldn't attract snow buntings to their feeding patch with corn (no interest whatsoever in the seeds) whereas, in Ontario and Québec, corn works just fine. With this observation, I want to know what their actual preference is when several types of seeds are available. The next step is to export this experiment on a wide scale and determine if the birds indeed have different preferences across Canada and how weather may affect their choices. *What food do they choose when it's cold and windy or when it's sunny?* It is under the supervision of Dr. Vézina (UQAR) & Dr. Love's (University of Windsor) that I work on this fascinating project. Looking forward to work with all of you!

Samples of the seeds I'll be working with (oat, barley, soy, wheat…)

Reserve management, flight performance and crossing paths to Greenland during spring migration in buntings

By Baptiste Courtin

Hello, Snow Bunting friends! I am Baptiste Courtin, a French student starting my PhD at Université du Québec à Rimouski (UQAR) under the guidance of Drs. F. Vézina (UQAR) and O. Love (Windsor). Before that, I was studying residency and migration patterns of a tropical dolphin in the French West Indies then my passion for the study of animals led me to migrate myself. I now work on a cold-specialist bird which breeds in the Arctic, and never touches water. What a change!

My main objective is to understand the management of energy reserves and its impact on spring migration in eastern Canadian snow buntings. My general hypothesis is *that buntings accumulate reserves throughout their migration in preparation for their Labrador Sea crossing*. However, continued mass gain may lead to a gradual loss of manoeuvrability and an increased risk of predation, in addition to increased flight costs. Banding data suggest that buntings may slow their rate of reserve accumulation during the first part of their travel to avoid tipping over a certain mass. And this would likely require a stop in Newfoundland to accumulate enough fuel to cross the Labrador Sea (see **Fig.1**).

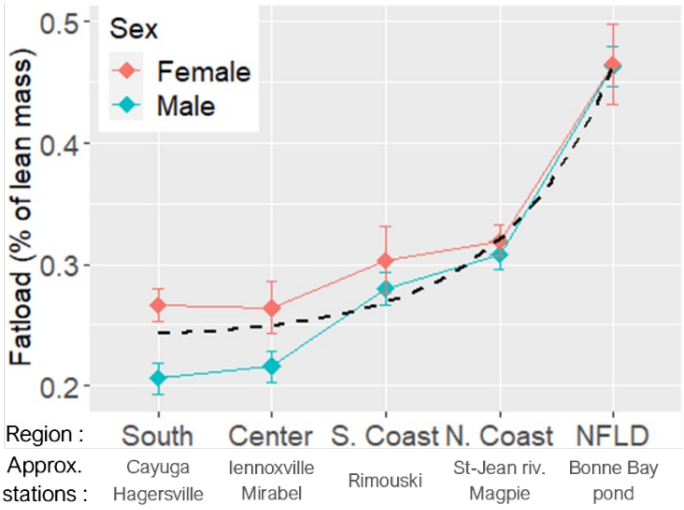

Figure 1. Preliminary analysis of snow buntings fatload during their spring migration based on banding data *vs.* expected exponential curve (in black)

I first plan to confirm the fattening patterns suggested by these preliminary analyses. To do so, I will use a larger data set, thanks to the CSBN community, and combine it with precise non-invasive body composition measurements. I will also conduct take-off and flight experiments on captive birds at UQAR during spring fattening to assess the critical mass at which they lose manoeuvrability or flight performance.

I am also very interested in their migration route, particularly their crossing points to Greenland, which is not known yet. The small size of these birds makes it nearly impossible to use GPS technology to track them. Therefore, I will use precise non-invasive body composition measurements and meteorologic data to estimate if and whether birds in Newfoundland could potentially handle a direct flight to Greenland (Yellow path, **Fig. 2**). Alternatively, buntings could migrate along the Labrador coast to cross at a narrower point (red path, **Fig. 2**) but this may require refuelling in an environment where food resources might be scarcer. In both cases, isn't it amazing that these little birds can travel such distance without stop?

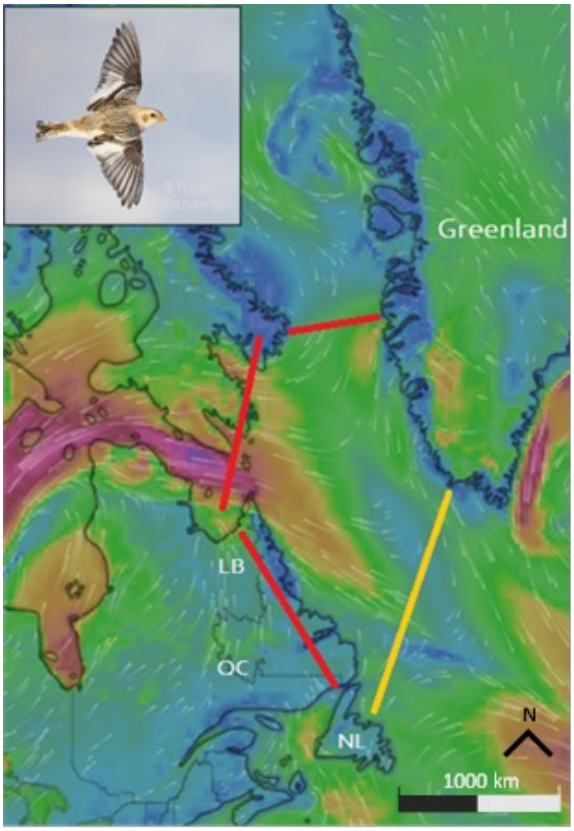

Figure 2. Snow buntings potential crossing paths to Greenland © Windy

Snow Bunting's physiological differences between sexes according to wintering sites

By Marianne Turcotte

I just started my masters last summer with Dr. François Vézina and Dr. Oliver Love. In eastern North America, the wintering range of Snow Buntings differs between sexes, along a latitudinal gradient, which implies different physiological constraints depending on the sex. Indeed, in the more northern portion of the wintering range, there is a greater proportion of males while a greater proportion of females is found further south. There is also evidence that females have a higher proportion of body fat than males, regardless of latitude. This signature, if true, could have consequences on the proportion of lean tissue, made largely of muscles which are involved in heat production.

However, this conclusion is drawn based on the Fat Index, a visual categorical measure. Females are also structurally smaller, which could imply higher heat loss than males. Thus, females would have a double constraint compared to males, loosing more heat and having less muscle to produce heat, which could potentially contribute to bunting's sexual segregation in the winter.

My project aims to further document differences between sexes in the body composition of Snow Buntings with non-invasive measurements of their lean and fat mass. It also aims to compare heat loss between sexes.

I am planning to capture Snow Buntings at three different locations, where I will have the great pleasure to collaborate with some of you: Cayuga (Ontario), a mostly female biased wintering site, Rimouski (Québec), a male biased wintering site, and Fergus (Ontario), an intermediate site regarding sex composition and latitude. At each site, I will be using a quantitative magnetic resonance (QMR) device to measure body composition (lipid mass and lean mass). I also plan to use specialized instruments, to measure individual heat loss in birds and determine whether females truly lose more heat than males.

For now, I am planning my field season, which will take place in January 2023 and working on getting everything ready before the holidays.

My project will contribute to better understand differences between sexes, and maybe identify some factors that could be involved in sexual segregation in the winter in our marvellous Snow Bunting.

The Snow Bunting Report

CANADIAN SNOW BUNTING NETWORK

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