Environment and Climate Change Canada | Environnement et Changement climatique Canada

Ontario
Ministry of Natural Resources and Forestry

Moose Cree First Nation

BIRDS CANADA

TRENT UNIVERSITY

James Bay Shorebird Project

2019 Report

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Summer 2020

Photo: Longridge Point

Report summarizing 2019 shorebird survey results from two camps on the western James Bay coast.

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Land Acknowledgment

We would like to begin by acknowledging that the work carried out and reported upon here was in Treaty 9 territory and the land on which the study sites are located is the traditional territory of Mushkegowuk (Cree), Ojibwe/Chippewa, Oji-Cree, Algonquin, and Métis Peoples.

Introduction

The Hudson Bay Lowlands are the third largest wetland complex on earth and the coastal ecosystems of southwestern Hudson Bay and James Bay are a global hotspot for breeding and staging waterbirds, waterfowl, shorebirds and other migratory birds (Manning 1952, Ross *et al.* 2003, Abraham and Keddy 2005, Abraham and McKinnon 2011). For shorebirds, the Lowlands are known or believed to harbour significant proportions of the provincial breeding populations of Hudsonian Godwit (*Limosa haemastica*) and Whimbrel (*Numenius phaeopus hudsonicus*) (Manning 1952, Morrison 1987, Skeel and Mallory 1996, Peck and James 1983, Peck 2007, Peck and Sutherland 2007, Prevett 1987, Walker *et al.* 2011). Several Arctic and sub-Arctic breeding shorebird species stage along the Hudson Bay and James Bay coasts to add fat reserves and undertake partial moults (e.g., White-rumped Sandpiper (*Calidris fuscicollis*), Semipalmated Sandpiper (*C. pusilla*)) or complete moults (e.g., Dunlin (*C. alpina*)) in preparation for their migrations (Harrington *et al.* 1991, Parmelee 1992, Warnock and Gill 1996, Hicklin and Gratto-Trevor 2010, Abraham and McKinnon 2011).

Research on shorebirds throughout the Americas in the 1970s led to the establishment of the Western Hemisphere Shorebird Reserve Network (WHSRN) program in 1985 (Morrison 1983, 1984, Myers *et al.* 1987a, b). A site must meet two criteria to be considered for WHSRN designation: demonstrated importance to shorebirds and expressed landowner agreement. Three categories of WHSRN sites are recognised based on peak counts or use by a percentage of a population of a species:

- **Sites of Hemispheric Importance** host at least 500,000 shorebirds annually, or at least 30% of the biogeographic population for a species;
- **Sites of International Importance** host at least 100,000 shorebirds annually, or at least 10% of the biogeographic population for a species; and
- **Sites of Regional Importance** host at least 20,000 shorebirds annually, or at least 1% of the biogeographic population for a species (WHSRN 2009).

Landowners must agree to three conditions: to make shorebird conservation a priority at the site; to protect and manage the site for shorebirds; and to update WHSRN annually about the status of the site (WHSRN 2009).

During the 1990s, Environment and Climate Change Canada's Canadian Wildlife Service (CWS) compiled an inventory of potential WHSRN sites along the coasts of both Hudson Bay and James Bay (Morrison *et al.* 1991, 1995, Ross *et al.* 2003). In 2016, the Moose Cree First Nation nominated a portion of the James Bay coast as a WHSRN Site of Hemispheric Importance.

The James Bay shorebird project (hereafter: the project) began when the Royal Ontario Museum (ROM) and the Ontario Ministry of Natural Resources and Forestry (OMNRF) partnered to survey birds at sites along the James Bay coast in 2009. Since then, CWS, ECCC's Wildlife and Landscape Science, Bird Studies Canada (BSC), Nature Canada, Moose Cree First Nation, and Trent University have joined this partnership to continue surveys of southbound staging shorebirds. This work initially included surveys at sites known to support staging shorebirds, with an emphasis on Red Knot (*C. canutus rufa*) to enable identification of critical habitat, as well as surveys for two federal Species at Risk, the Yellow Rail (*Coturnicops noveboracensis*) and Short-eared Owl (*Asio flammeus*). Additional work to collect natural heritage information by staff at the Natural Heritage Information Centre of the OMNRF has been

conducted in concert with more recent surveys. Currently, the project involves annual surveys of shorebirds staging at established survey sites along the southwestern coast of James Bay.

The overall intention of the project is to contribute to shorebird population assessments and conservation, site designations and protection (e.g. Important Bird Area and WHSRN), and species recovery and protection (e.g. Endangered *rufa* Red Knot[1], other declining shorebirds). The goals of the project are to:

- Produce reliable estimates of shorebird species staging along the south-western James Bay coast;
- understand local and flyway scale movement patterns of shorebirds staging in James Bay; and
- identify sites and habitats needed to sustain staging shorebirds.

The objectives to meet these goals are to estimate the:

- variability in shorebird migration phenology (both annually and among species);
- length of stay of staging shorebirds;
- annual variation in the abundance of staging shorebirds;
- habitat and food resource availability for staging shorebirds; and
- minimum proportion of the global Red Knot, subspecies *rufa*, population that uses the southwestern James Bay coast.

Two field camps operated on the southwestern coast of James Bay in 2019; Little Piskwamish Point and Longridge Point 13 July and 11 September (see Figure 1). From these field camps, dedicated volunteers and staff counted shorebirds during their southbound migration. The timing of these counts was driven by the tide cycle, in that birds are more easily counted when they concentrate because of the flooding (incoming) and ebbing (outgoing) tides.

Motus Wildlife Tracking System

The Motus Wildlife Tracking System (Motus; https://motus.org/) is a network of automated radio telemetry towers that track the movements of tagged organisms in terrestrial environments. The purpose of Motus is to facilitate landscape-scale research and education on the ecology and conservation of migratory animals. It is a program of Birds Studies Canada in partnership with Acadia University, Western University, the University of Guelph and collaborating researchers and organizations.

As of February 2020, the network contained over 800 automated VHF radio-receiving stations, world-wide. A digital "nanotag" tracking device is secured to an animal and they can be detected in real-time up to 15 km from any station. This array can often track tagged animals across a variety of landscapes covering thousands of kilometres.

The resulting data, which often include millions of individual records, are stored locally and (optionally) transmitted back to a centralized data management system at BSC's National Data Centre where data are filtered, archived, visualized, and disseminated. Researchers, decision makers, non-government organizations, and the public can then query those data and examine the movements and behaviours of any species being tracked. This state-of-the-art system is the first of its kind in the world and is open to all researchers and organizations.

[1] The Red Knot was listed as Endangered in Ontario in 2008 under the provincial Endangered Species Act *2007*; in 2007 COSEWIC designated the Red Knot as Endangered; and in 2012 the *rufa* subspecies was listed as Endangered, *roselaari* subspecies was listed as Threatened, and the islandica subspecies was listed as Special Concern under Schedule 1 of the federal *Species at Risk Act* (SARA).

Shorebirds were captured at Longridge Point with the objective of affixing over 35 VHF radio tags (nanotags) to individuals of five target species: Semipalmated Plover, Semipalmated and Pectoral sandpipers, Lesser Yellowlegs, and Hudsonian Godwit.

Study Areas

The Longridge Point field site (51.798942°N, 080.69204°W) has been surveyed annually since 2009. It is located approximately 60 km northwest of Moosonee (Figure 1). The site is characterised by a prominent point that juts out into James Bay. Sheltered areas have formed on either side of the point, where fresh water tributaries flow out into the bay. These areas provide excellent roosting and feeding opportunities for migrant shorebirds. The gradient of the shoreline is very flat. The spruce forest is close to the high tide line, generally within 1 km, and opens to willow thickets and meadow marsh, eventually grading into brackish and saline tidal marshes. Based upon aerial surveys and this project's surveys , the area hosts large concentrations of shorebirds (e.g., Semipalmated Sandpiper, Red Knot, and Pectoral Sandpiper) during autumn migration.

The Little Piskwamish Point field site (51.683427°N, 080.565783°W) has operated each year since 2011. It is located approximately 45 km northwest of Moosonee, and about 20 km southeast of Longridge Point (Figure 1). The habitat is similar to Longridge, except that there is no prominent point. Based upon aerial surveys, and supported by ground surveys of this project, the area is known to host large concentrations of shorebirds (e.g., Red Knots, Dunlin and White-rumped Sandpiper) during southern migration.

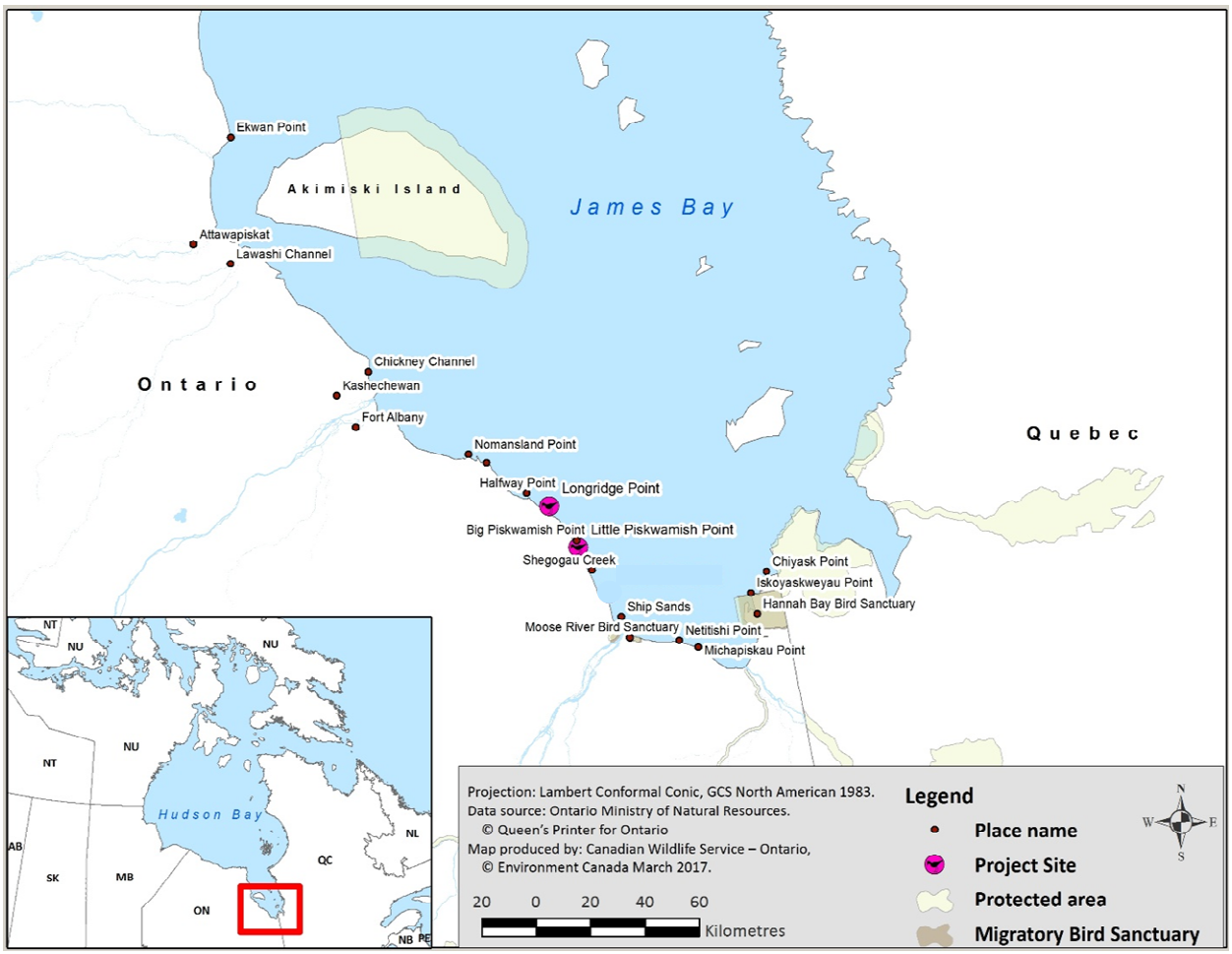


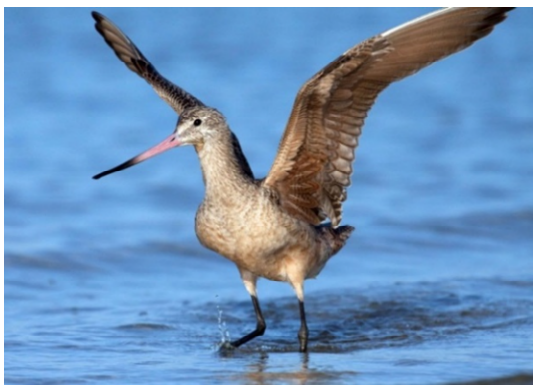
Figure 1. Field camp sites of the James Bay Shorebird Project. Longridge Point and Little Piskwamish Point were operational in 2019.

Images of the most commons species encountered at study sites along James Bay

Semipalmated Plover

Hudsonian Godwit

Lesser Yellowlegs



Marbled Godwit

Greater Yellowlegs

Ruddy Turnstone

All Photos © Mark Peck

Red Knot – with individual colour marked flag banded in Argentina

Pectoral Sandpiper

Sanderling

White-rumped Sandpiper

Semipalmated Sandpiper

Least Sandpiper

Dunlin

All Photos © Mark Peck

Results and Discussion

Longridge Point

A maximum of seven people were stationed at Longridge Point during the 2019 season. The field site was active from 13 July to 11 September 2019. The work in this period was focused on daily surveys to generate estimated totals for the area, passive banding, and banding target species and affixing radio tags to these birds. A total of 590 birds was banded and 38 target shorebird species were equipped with nanotags during the period. The radio tags send signals to strategically placed towers notifying researchers of each bird's arrival and departure.

During this season at Longridge Point, 576 hours was spent in the field, which is the second highest raw measure of effort at the site. There were 187 bird species recorded during this time, which is above the average of 150. After scaling to effort, however, Longridge Point 2019 results were the second lowest (32.47 species/100 field hours; Figure 2). Tables 1 and 2 show the top ten estimated high counts of bird species and shorebird species, respectively, encountered each month during the survey period, not corrected for effort.

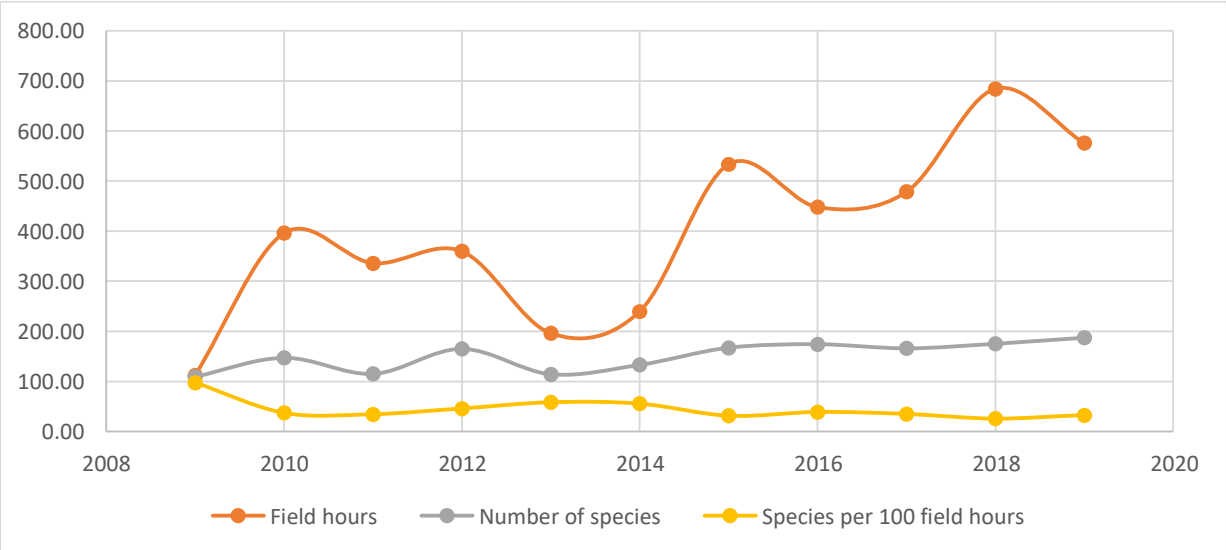


Figure 2. Field hours, total number of species, and species per 100 field hours at Longridge Point over the years 2009-2019.

The following summarises the avian highlights at Longridge Point in 2019; counts are not corrected for effort.

Brant, 4. Highest August count recorded at any site.

Greater Scaup, 186 (July), 290 (August), 294 (September). Highest monthly counts recorded at any site.

Ruby-throated Hummingbird, 1. First record for the project (July). A hummingbird sp. was recorded at Longridge in August 2015.

American Coot, 9 (July), 14 (August). Highest monthly counts and third seasonal record of the species.

Yellow Rail, 3 (July), 2 (August). Among the lowest all-time counts for the species.

Black-bellied Plover, 998 (August). Second highest count for the project (record high of 1,250 at Longridge September 2015).

Semipalmated Plover, 318 (September). Highest count for September for the project.

Whimbrel, 192 (August). Third highest all-time count for the project, second highest for the site.

Ruddy Turnstone, 431 (July). Second highest July count for the project.
Long-billed Dowitcher, 1 (September). Second record of the species for the project and the first with photographic documentation. The first record was in July 2012, also at Longridge.
Wilson's Phalarope, 20 (August). Second highest count for the project.
Bonaparte's Gull, 2,231 (September). Highest count for the project.
Lesser Black-backed Gull, 1 (September). Third record of the species, first since 2015.
Common Loon, 17 (August). Second highest count for the project.
Broad-winged Hawk, 11 (August). Second highest count for the project.
Yellow-shafted Flicker, 6 (July & August). Second highest count for the project.
Olive-sided Flycatcher, 5 (August). Second highest count for the project.
Northern Shrike, 3 (July & August). Second highest count for the project.
Blue Jay, 1 (August). An uncommon species, this represents the sixth year it was recorded.
Cliff Swallow, 77 (August). Second highest count for the project.
Gray Catbird, 1 (August & September). Uncommon species, fifth year recorded.
Gray-cheeked Thrush, 1 (September). Fourth record of the species.
Hermit Thrush, 6 (July). Highest count for the project.
Pine Grosbeak, 1 (August). Only third year where the species was recorded.
White-winged Crossbill, 206 (August). Second highest count for the project.
White-throated Sparrow, 73 (September). High count for September.
Savannah Sparrow, 321 (August). Second highest count for the project.
Meadowlark sp., 1 (July). Only one record of Eastern Meadowlark (2014) and one record of Western Meadowlark (2010) previously observed.
Prothonotary Warbler, 1 (August). A remarkable record, first for the project and second for the region.
Tennessee Warbler, 40 (August). Highest count for the project.
Connecticut Warbler, 1 (August). Second record for the project. The first was at Piskwamish in 2011.
Common Yellowthroat, 35 (August). Highest count for the project.
Magnolia Warbler, 8 (July). Highest count for the project.
Palm Warbler, 82 (August). Highest August count for the project.
Yellow-rumped Warbler, 88 (August). Highest count for the project.
Canada Warbler, 1 (August). Uncommon species; last recorded in 2014.
Scarlet Tanager, 1 (July). A remarkable record. First record for the project.

Table 1. Top 10 estimated single-day high counts of bird species encountered each month at Longridge Point, 13 July to 11 September 2019, not corrected for effort.

Common Name	July High Count
shorebird sp.	2,000
Black Scoter	1,531
White-rumped Sandpiper	1,052
Semipalmated Sandpiper	842
peep sp.	809
Red Knot	495
Ruddy Turnstone	431
Lesser Yellowlegs	424
Greater Yellowlegs	210
Canada Goose	202

Common Name	August High Count
White-rumped Sandpiper	6,242
Black Scoter	2,840
peep sp.	2,080
Semipalmated Sandpiper	1,732
Bonaparte's Gull	1,320
Black-bellied Plover	998
Hudsonian Godwit	695
Red Knot	679
Canada Goose	526
Ruddy Turnstone	500

Common Name	September High Count
Canada Goose	3,419
Bonaparte's Gull	2,231
Black Scoter	895
Semipalmated Sandpiper	571
Semipalmated Plover	318
Greater Scaup	294
Northern Pintail	282
Pectoral Sandpiper	225
Common Goldeneye	200
Green-winged Teal	178

Table 2. Top 10 estimated single-day high counts of shorebird species encountered each month at Longridge Point, 13 July to 11 September 2019, not corrected for effort.

Common Name	July High Count
shorebird sp.	2,000
White-rumped Sandpiper	1,052
Semipalmated Sandpiper	842
peep sp.	809
Red Knot	495
Ruddy Turnstone	431
Lesser Yellowlegs	424
Greater Yellowlegs	210
Pectoral Sandpiper	185
Least Sandpiper	126

Common Name	August High Count
White-rumped Sandpiper	6,242
peep sp.	2,080
Semipalmated Sandpiper	1,732
Black-bellied Plover	998
Hudsonian Godwit	695
Red Knot	679
Ruddy Turnstone	500
Greater Yellowlegs	401
Calidris sp.	400
Least Sandpiper	376

Common Name	September High Count
Semipalmated Sandpiper	571
Semipalmated Plover	318
Pectoral Sandpiper	225
Hudsonian Godwit	136
Dunlin	106
peep sp.	73
Black-bellied Plover	60
Sanderling	60
Greater Yellowlegs	59
Least Sandpiper	43

Flag resighting continued at Longridge Point in 2019. About 19 hours over 154 resight sessions was spent collecting 206 unique flag resights. Red Knot resights were greater than 50% of the total, followed by Lesser Yellowlegs (~25%) (Table 3).

Table 3. Number of unique flag reads per species and the proportion of the total resightings observed at Longridge Point, 13 July to 11 September 2019.

Species	Number of Unique Flags	Proportion of Total
Red Knot	111	0.539
Hudsonian Godwit	2	0.010
Least Sandpiper	3	0.015
Lesser Yellowlegs	50	0.243
Pectoral Sandpiper	4	0.019
Short-billed Dowitcher	1	0.005
Semipalmated Plover	8	0.039
Semipalmated Sandpiper	5	0.024
Solitary Sandpiper	1	0.005
White-rumped Sandpiper	15	0.073
Ruddy Turnstone	4	0.019
Sanderling	1	0.005
Dunlin	0	0.000
Spotted Sandpiper	1	0.005
Total	**206**	**1**

Little Piskwamish Point

A maximum of seven people were stationed at Little Piskwamish Point. The field site was active from 13 July to 11 September 2019. During this period just over 474 hours were spent in the field recording a total of 180 bird species. This is the third highest measure of raw effort and this is the highest number of species and well above the average 141, despite being among the lowest when scaled for effort (37.92 species/100 field hours; Figure 3).

Tables 4 and 5 show the top ten estimated high counts of bird species and shorebird species, respectively, encountered each month during the survey period, not corrected for effort. The following summarizes the avian highlights at Little Piskwamish Point, 2019.

Blue-winged Teal, 104 (August). All-time high count for the project.
Lesser Scaup, 120 (August), 200 (September). Highest monthly counts at any site.
Yellow Rail, 1 (August). A first with no records in July and among the lowest August count for the site.
Black-bellied Plover, 256 (August). Highest count at the site for August.
American Golden-Plover, 19 (August). Second highest count at the site for August.
Semipalmated Plover, 373 (August). Second highest count at the site for August.
Killdeer, 12 (September). Second highest count for September.
Red Knot, 4,436 (August). Fourth highest count for the project.
Sanderling, 359 (September). Second highest count for September.
Parasitic Jaeger, 5 (September). Highest count for the project.
Pacific Loon, 1 (August). Second record of the species, first for the site.
Turkey Vulture, 1 (July). Third record of the species, first two were in 2012 at Longridge and Little Piskwamish.
Northern Hawk Owl, 1 (August). First record of the species.
Yellow-bellied Sapsucker, 1 (August). First record of the species for the site.
Cliff Swallow, 48 (August). Highest count for the site.
Ruby-crowned Kinglet, 41 (September). Highest count for the site in September.

Pine Grosbeak, 1 (August). Only third year where the species was recorded.
Common Redpoll, 168 (August). Highest count for the project.
White-winged Crossbill, 827 (August). Highest count for the project.
Lapland Longspur, 65 (September). Highest count for the project.
Savannah Sparrow, 417 (August). Highest count for the project.
Rusty Blackbird, 90 (August). Highest count for the project.
Black-throated Green Warbler, 1 (July). Second record for the project.

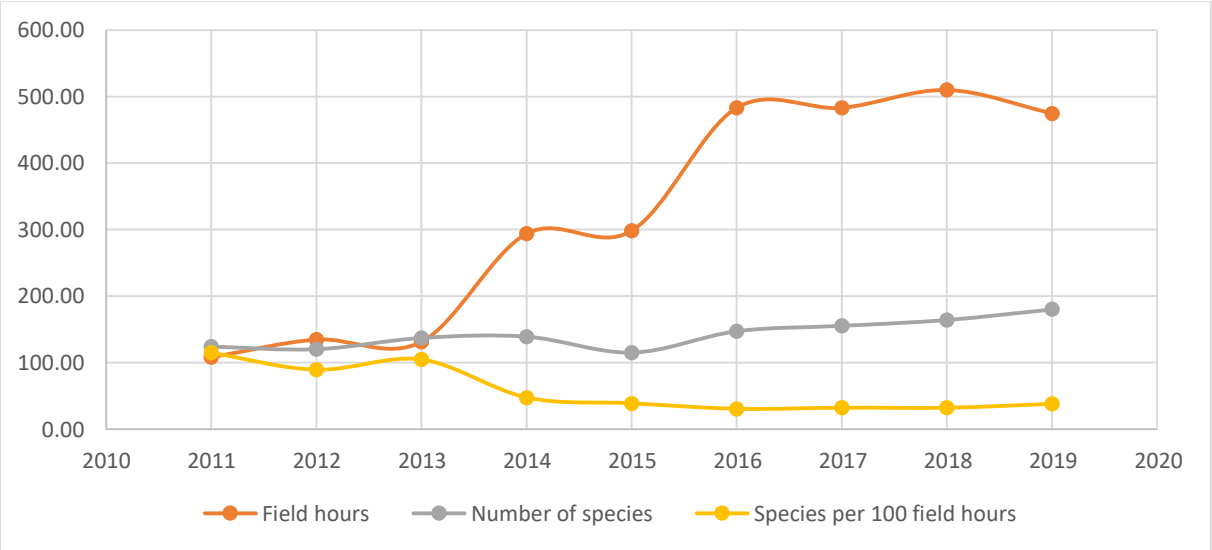


Figure 3. Field hours, total number of species, and species per 100 field hours at Little Piskwamish Point over the years 2011-2019.

Table 4. Top 10 estimated single-day high counts of bird species encountered at Little Piskwamish Point, 13 July to 11 September 2019, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	6,144
White-rumped Sandpiper	5,613
peep sp.	1,200
Red Knot	691
Lesser Yellowlegs	331
Greater Yellowlegs	262
Canada Goose	260
Hudsonian Godwit	238
Mallard	219
Pectoral Sandpiper	218

Common Name	August High Count
White-rumped Sandpiper	27,482
Red Knot	4,436
Semipalmated Sandpiper	3,627
Calidris sp.	2,508
Northern Pintail	1,606
Canada Goose	1,533
Hudsonian Godwit	1,475
Black Scoter	1,400
Bonaparte's Gull	846
White-winged Crossbill	827

Common Name	September High Count
Canada Goose	3,600
Northern Pintail	2,241
Dunlin	1,725
Calidris sp.	1,009
duck sp.	700
Sanderling	359
Mallard	329
Greater/Lesser Scaup	300
Semipalmated Sandpiper	288
Mallard/American Black Duck	250

Table 5. Top 10 estimated single-day high counts of shorebird species encountered at Little Piskwamish Point, 13 July to 11 September 2019, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	6,144
White-rumped Sandpiper	5,613
peep sp.	1,200
Red Knot	691
Lesser Yellowlegs	331
Greater Yellowlegs	262
Hudsonian Godwit	238
Pectoral Sandpiper	218
Greater/Lesser Yellowlegs	206
Semipalmated Plover	114

Common Name	August High Count
White-rumped Sandpiper	27,482
Red Knot	4,436
Semipalmated Sandpiper	3,627
Calidris sp.	2,508
Hudsonian Godwit	1,475
peep sp.	650
large shorebird sp.	600
Lesser Yellowlegs	397
Semipalmated Plover	373
Dunlin	328

Common Name	September High Count
Dunlin	1,725
Calidris sp.	1,009
Sanderling	359
Semipalmated Sandpiper	288
White-rumped Sandpiper	202
Red Knot	178
Greater Yellowlegs	177
Semipalmated Plover	162
Pectoral Sandpiper	113
peep sp.	83

Flag resighting continued at Little Piskwamish Point in 2019. Over 10 hours during 84 resight sessions was spent collecting 378 unique flag reads. Red Knot was the most resighted species with over 97% of the total number of unique flag resightings (Table 6).

Table 6. Number of unique flag reads per species and the proportion of the total resightings observed at Little Piskwamish Point, 13 July to 11 September 2019.

Species	Number of Unique Flags	Proportion of Total
Red Knot	368	0.974
Hudsonian Godwit	2	0.005
Least Sandpiper	1	0.003
Lesser Yellowlegs	3	0.008
Pectoral Sandpiper	1	0.003
Short-billed Dowitcher	0	0.000
Semipalmated Plover	0	0.000
Semipalmated Sandpiper	1	0.003
Solitary Sandpiper	0	0.000
White-rumped Sandpiper	1	0.003
Ruddy Turnstone	0	0.000
Sanderling	0	0.000
Dunlin	1	0.003
Spotted Sandpiper	0	0.000
Total	**378**	**1**

All-site summary

Across all sites in 2019, there are a number of interesting and notable records. Counts noted below are cumulative, same-day counts across all sites, uncorrected for effort. Table 7 shows maximum cumulative one-day high counts in 2019 (i.e., sum of Little Piskwamish Point and Longridge Point daily count) and mean count across all project sites between 2009-2018 for shorebirds.

Canada Goose, 372 (July). The lowest count recorded for the month of July. Additionally, counts for this species were among the lowest for the second straight season, peaking at just over 7,000, which is below the typical peak at this time greater than 8,000.
Blue-winged Teal, 104 (August). High for the project in August.
Northern Pintail. Among the lowest counts recorded by the project throughout the season. Counts peaked at just over 2,500 in September, which typically peak around 5,000 at that time.
Greater Scaup. Project high counts throughout the season: 180 (July), 290 (August), and 294 (September).
Lesser Scaup. High for the project in August (120) and September (200).
Ruby-throated Hummingbird, 1 (July). First project record.
American Coot. Only the third year where the species was recorded. At least one breeding pair hatched young. High counts for July (9) and August (14).
Yellow Rail. Among the lowest counts recorded by the project. The wet conditions favoured by this species were not widely available within our study area in 2019.
Black-bellied Plover, 1,135 (August). Second highest count for the project, the highest count was recorded in September 2015 (1,284). Conversely, the lowest count recorded in September (72) was recorded in 2019, when counts are typically closer to 300.
Semipalmated Plover, 466 (September). High for the project in September.
Whimbrel. Low for the project in July (43) and September (3). Conversely, August had the second highest count for the project (195).

Hudsonian Godwit. Low for the project in July (277) and second lowest in September (136).
Marbled Godwit. Low counts throughout the season (<10). Probable breeding was observed at Little Piskwamish Point.
Red Knot. Low for the project in July (821) and September (178). The August count (4,490) is on par with previous seasons.
Stilt Sandpiper, 9 (August). Ties the project high set in 2016.
Pectoral Sandpiper. Low for the project in August (297) and September (316), and second lowest count in August (377).
Semipalmated Sandpiper. Low for the project in August (3,690) and September (711). Third lowest count for July (6,986).
Long-billed Dowitcher, 1 (September). Second project record.
Lesser Yellowlegs. Below average counts throughout the season.
Parasitic Jaeger, 5 (September). High for the project.
Bonaparte's Gull. Low for the project in July (131). High for the project in September (2,235).
Ring-billed Gull. Low for the project in July (63), August (92), and September (50).
Herring Gull. Low for the project in September (18).
Lesser Black-back Gull 1 (September). Third record for the project.
Pacific Loon 1 (August). Second project record.
Double-crested Cormorant, 4 (August). Low for the project.
Turkey Vulture, 1 (July). Second record for the project.
Northern Harrier, 34 (August). Project high for the month.
Northern Hawk Owl, 1 (August). First project record.
Northern Flicker. High for the project in July (6) and September (3).
American Kestrel. Not observed annually, tied the project high of 2 (August).
Peregrine Falcon. Low counts throughout the season, peaking at 3 in September.
Northern Shrike, 4 (August). High for the project.
Cliff Swallow. High for the project in August (91) and September (14).
Ruby-crowned Kinglet, 43 (August). High for the project.
Gray Catbird. Not observed annually. An individual continued through August and September at Longridge Point.
Gray-cheeked Thrush, 1 (September). Third year this species has been recorded, first record was 2017.
Hermit Thrush, 7 (July). High for the project.
Purple Finch, 8 (August). High for the project.
Common Redpoll, 186 (September). High for the project. In addition, a high count was recorded for July (132).
White-winged Crossbill, 980 (August). High for the project.
White-throated Sparrow, 73 (September). High for the project.
Savannah Sparrow, 654 (August). High for the project.
Meadowlark sp., 1 (July). Third Meadowlark record for the project, with one each of Eastern and Western meadowlarks recorded in 2014 and 2010, respectively.
Rusty Blackbird, 90 (August). High for the project.
Prothonotary Warbler, 1 (August). A remarkable record and only the second for the region. The first was recorded in the Moosonee area in the 1980s.
Tennessee Warbler, 40 (August). High for the project.
Nashville Warbler, 8 (August). High for the project.
Connecticut Warbler, 1 (August). Only the second record for the project; the first was a single bird in 2011.
Common Yellowthroat, 36 (August). High for the project.

Magnolia Warbler, 8 (July). Ties the project high.
Palm Warbler, 86 (August). High for the month.
Yellow-rumped Warbler, 92 (August). High for the project.
Black-throated Green Warbler, 1 (July). Only the second record for the species; the first was in 2016.
Canada Warbler, 1 (August). First record since 2015 and only the sixth year it has been observed.
Scarlet Tanager, 1 (July). A remarkable record and the first for the project. This record is among a handful of other records from the region.

Table 7. Cumulative, one-day maximum counts of shorebird species recorded in 2019, across all sites and mean cumulative counts for those species across all project sites over the period 2009-2019, not corrected for effort. Mean maximum counts were calculated using the sum of maximum count of each species across each site of each year.

Species	Month	Maximum 2019 count	Mean maximum count
Black-bellied Plover	July	19	30
Black-bellied Plover	August	1,135	400
Black-bellied Plover	September	72	407
American Golden-Plover	July	2	2
American Golden-Plover	August	25	15
American Golden-Plover	September	62	78
Semipalmated Plover	July	125	142
Semipalmated Plover	August	481	371
Semipalmated Plover	September	466	252
Killdeer	July	6	20
Killdeer	August	27	25
Killdeer	September	19	11
Whimbrel	July	43	96
Whimbrel	August	195	108
Whimbrel	September	3	13
Hudsonian Godwit	July	277	711
Hudsonian Godwit	August	1,615	2,074
Hudsonian Godwit	September	136	968
Marbled Godwit	July	6	125
Marbled Godwit	August	9	40
Marbled Godwit	September	NA	6
Ruddy Turnstone	July	434	329
Ruddy Turnstone	August	536	657
Ruddy Turnstone	September	15	169
Red Knot	July	821	1,918
Red Knot	August	4,490	4,042
Red Knot	September	178	596
Stilt Sandpiper	July	1	2
Stilt Sandpiper	August	9	5
Stilt Sandpiper	September	5	3
Sanderling	July	76	147
Sanderling	August	87	258

Species	Month	Maximum 2019 count	Mean maximum count
Sanderling	September	382	402
Dunlin	July	86	2,089
Dunlin	August	339	2,898
Dunlin	September	1,728	5,614
Baird's Sandpiper	July	1	3
Baird's Sandpiper	August	20	12
Baird's Sandpiper	September	14	13
Least Sandpiper	July	126	221
Least Sandpiper	August	598	615
Least Sandpiper	September	67	204
White-rumped Sandpiper	July	5,784	7,680
White-rumped Sandpiper	August	30,438	30,307
White-rumped Sandpiper	September	236	8,859
Buff-breasted Sandpiper	July	10	3
Buff-breasted Sandpiper	August	11	8
Buff-breasted Sandpiper	September	NA	10
Pectoral Sandpiper	July	377	607
Pectoral Sandpiper	August	297	908
Pectoral Sandpiper	September	316	585
Semipalmated Sandpiper	July	6,986	18,703
Semipalmated Sandpiper	August	3,690	17,579
Semipalmated Sandpiper	September	711	2,077
peep sp.	July	1,759	1,394
peep sp.	August	2,280	4,400
peep sp.	September	109	802
Calidris sp.	July	14	8,542
Calidris sp.	August	2,508	5,469
Calidris sp.	September	1,009	1,070
Short-billed Dowitcher	July	6	9
Short-billed Dowitcher	August	11	20
Short-billed Dowitcher	September	1	5
Long-billed Dowitcher	July	NA	12
Long-billed Dowitcher	September	1	1
Wilson's Snipe	July	30	24
Wilson's Snipe	August	75	45
Wilson's Snipe	September	14	18
Wilson's Phalarope	July	1	2
Wilson's Phalarope	August	22	10
Wilson's Phalarope	September	NA	1
Red-necked Phalarope	July	1	2
Red-necked Phalarope	August	6	6
Red-necked Phalarope	September	3	6
Spotted Sandpiper	July	5	6

Species	Month	Maximum 2019 count	Mean maximum count
Spotted Sandpiper	August	19	11
Spotted Sandpiper	September	2	1
Solitary Sandpiper	July	4	7
Solitary Sandpiper	August	20	8
Solitary Sandpiper	September	1	1
Greater Yellowlegs	July	326	483
Greater Yellowlegs	August	510	662
Greater Yellowlegs	September	217	317
Lesser Yellowlegs	July	676	816
Lesser Yellowlegs	August	613	712
Lesser Yellowlegs	September	46	99

Across both sites, just under 29 hours over 238 resighting session was spent collecting 386 unique flag resights. Flag resights provide information on individual movements and site use. Using flag resighting data, we can model the passage population of individual species. MacDonald (2020) generated *rufa* Red Knot passage population estimates from models using flag resightings. Refining these models, MacDonald and colleagues (2020) determined that 14,425 (11,197-26,637) Red Knots, 10,618 (9,564-11,868) of which were adults (74%), which represents approximately 25% of the estimated adult *rufa* population (MacDonald et al. 2020). In 2017, their estimate for total passage population during southbound migration was 11,525 (7,887-18,005) Red Knots, of which 7,774 (5,898-9,923) were adult birds (67%), which represents approximately 18% of the estimated adult *rufa* population (MacDonald et al. 2020). Results for 2019 are not yet available.

Motus towers, banding and tagging

In May 2019, six temporary Motus towers were set-up at sites on the southwestern coast of James Bay (Figure 5). These autonomous VHF receivers detect and store records of individual nanotagged birds. Individuals tagged at the study sites and elsewhere (either on northbound migration or on the breeding grounds), while in the vicinity of the tower, are recorded on a regular interval depending on the duty cycle of the nanotag (e.g., every nine seconds). These towers operated from 22 May to 12 November 2019.

Banding and tagging activities were focussed at Longridge Point; no trapping and banding took place at Little Piskwamish Point. Shorebird trapping followed a non-standardized[2] approach using mist-nets; trapping was conducted both day and night and throughout the tidal cycle. Along with recording standard morphometrics (age, weight, exposed culmen, wing cord, flattened wing cord, fat score), each shorebird was marked with a uniquely coded alphanumeric leg flag and a uniquely coded USGS metal band. In addition, we contributed to the range-wide Lesser Yellowlegs study (Appendix 1).

Non-standard mist-netting was also conducted in a variety of habitats within each study site. Non-shorebird species were banded with a uniquely coded USGS metal band and standard

[2] Non-standard banding means that although we followed standard banding procedures, we did not band at the same time or location each day, or with the same effort each trapping session. Standard banding is a term used by banding groups such as those in the Canadian Migration Monitoring network. This requires that banding stations keep nets in the same location year-to-year and operate them for specified periods each day the station is operational in a given season.

morphometrics were recorded. Other banding activities resulted in trapping and banding shorebirds and local breeding individuals and their young. Together with the shorebird trapping effort, 590 individuals of 26 species were banded. Close to 55% of the individuals banded were shorebird species, accounting for 54% of the species banded (Table 8).

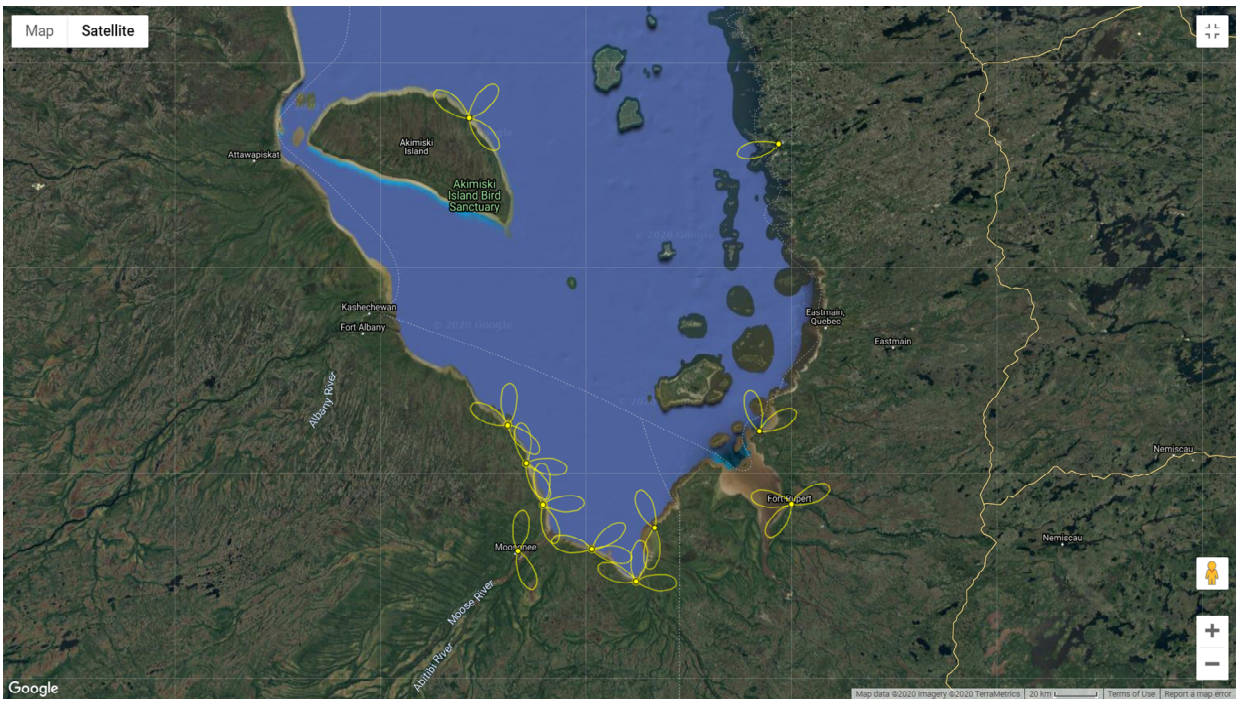


Figure 4. Locations of Motus towers, showing direction of antennas. Active 22 May – 12 November 2019. Towers at Moosonee and on the Quebec side are operated by other groups and contribute to the Motus detection dataset.

Nanotag efforts targeted three shorebird species (Semipalmated Plover, Pectoral Sandpiper, and Lesser Yellowlegs). Species and age targets were established; there were no targets established for birds that were marked with a leg flag or a metal band only. Age and species targets for nanotags were revised during the season to account for changes in abundance of the target groups and to maximize data collection while birds were staging in the study areas. In addition to affixing a nanotag, marking with a leg flag and metal band, and recording standard morphometrics, blood samples (up to 200µL) were taken. Blood sampling is primarily for determining correlates of length of stay, including condition related changes in fatty acids, DNA sex typing, and to establish diet through stable isotope analysis. A total of 38 nanotags were affixed to individuals of our target species (Table 8). 60% of the individuals tagged were after-hatching year

Table 8. Species, ages, and numbers of birds banded, including numbers of shorebirds affixed with a leg flag and/or nanotag at Longridge Point, 2019.

Species	Age	Number Banded	Number Leg Flagged	Number Nanotagged
European Starling	Hatching Year	4		
Greater Yellowlegs	After Hatching Year	1	1	
Greater Yellowlegs	Hatching Year	2	2	
Green-winged Teal	After Hatching Year	1		

Species	Age	Number Banded	Number Leg Flagged	Number Nanotagged
Green-winged Teal	Hatching Year	1		
Hudsonian Godwit	Hatching Year	1	1	1
Least Sandpiper	After Hatching Year	14	14	
Least Sandpiper	Hatching Year	28	28	
LeConte's Sparrow	Second Year	1		
Lesser Yellowlegs	After Hatching Year	2	2	
Lesser Yellowlegs	Hatching Year	72	72	15
Nelson's Sparrow	After Hatching Year	2		
Northern Waterthrush	After Hatching Year	1		
Northern Waterthrush	Hatching Year	10		
Palm Warbler	After Hatching Year	1		
Palm Warbler	Hatching Year	1		
Pectoral Sandpiper	After Hatching Year	15	15	8
Pectoral Sandpiper	Hatching Year	2	2	
Red-winged Blackbird	After Hatching Year	2		
Red-winged Blackbird	After Second Year	2		
Red-winged Blackbird	Hatching Year	13		
Red-winged Blackbird	Second Year	2		
Ruddy Turnstone	After Hatching Year	2	2	
Rusty Blackbird	Hatching Year	5		
Savannah Sparrow	After Hatching Year	15		
Savannah Sparrow	Hatching Year	200		
Savannah Sparrow	Second Year	2		
Semipalmated Plover	After Hatching Year	30	30	8
Semipalmated Plover	Hatching Year	3	3	
Semipalmated Plover	Second Year	2	2	2
Semipalmated Sandpiper	After Hatching Year	10	10	
Semipalmated Sandpiper	Hatching Year	42	42	
Short-billed Sandpiper	After Hatching Year	3	3	3
Solitary Sandpiper	After Hatching Year	1	1	
Solitary Sandpiper	Hatching Year	12	12	
Spotted Sandpiper	Hatching Year	4	4	
Swamp Sparrow	Hatching Year	4		
Tennessee Warbler	After Hatching Year	1		
Tennessee Warbler	Hatching Year	2		
White-rumped Sandpiper	After Hatching Year	45	43	
Wilson's Phalarope	After Hatching Year	1		1
Wilson's Phalarope	Hatching Year	1		
Wilson's Snipe	Hatching Year	26	26	
Yellow Rail	After Hatching Year	1		
Total		**590**	**315**	**38**

Lesser Yellowlegs migration, population structure and demography

The Lesser Yellowlegs is a shorebird species that breeds in the boreal forests of Alaska and Canada and winters in Central and South America. The species has experienced an average 5.3% decline per year and has lost an estimated 90% of their population size since 1970, with an additional 50% projected loss within the next 15 years (Sauer et al. 2013). We collaborated with a study that aims to fill knowledge gaps and investigate the causes of declines, which include unregulated hunting on wintering grounds. Listed below are the study's four primary objectives. The order of objectives listed is based on priority level, with number 1 being of highest priority. Methods described in this protocol follow the Arctic Shorebird Demographics Network Breeding Camp Protocol (Brown et al. 2014).

1. Deploy GPS Argos PinPoint and geolocator tags on breeding adults to identify migratory timing and routes, including key stopover sites and wintering locations utilized by individual Lesser Yellowlegs within sub-populations in Alaska and Canada.
2. Individually mark and resight individual Lesser Yellowlegs to estimate apparent annual survival rates.
3. Collect biological samples to examine potential genetic variation in sub-populations of Lesser Yellowlegs.
4. Collect information on reproductive rates of Lesser Yellowlegs to better understand nest and brood survival, and juvenile recruitment.

See Appendix 1 for the complete report.

Aerial Survey

Between 11 and 13 August 2019, Guy Morrison (Environment and Climate Change Canada (ECCC), Emeritus Research Scientist) and Ken Ross (retired ECCC Canadian Wildlife Service Biologist), along with Ontario Ministry of Natural Resources and Forestry (OMNRF) pilot Mike Ellis, conducted an aerial survey of the southern James Bay coast from Eastmain River in Quebec to the east, including offshore islands, to Ekwan Point in Ontario to the northwest, including Akimiski Island, Nunavut (Figure 6). This year's survey marks the first inclusion of the Quebec side of southern James Bay in the survey area. They flew an OMNRF Eurocopter A Star 350 B2. General identification to size category (small, medium, and large shorebird) were made. Where species are readily identified, such as Red Knot and Hudsonian Godwit, these individuals were recorded to species.

The crew met in Timmins on 11 August 2019, flew to Moosonee in the OMNRF helicopter, and began the survey based on the predicted high tide in the early afternoon. Beginning at the Moose River, the crew flew northwards along the coastline towards Ekwan Point. Between the Moose River and Little Piskwamish Point, they recorded 6,700 Red Knots, among a total of just under 22,000 individual shorebirds. This region of southwestern James continues to be a regular staging area for *rufa* Red Knot. Chickney Channel, which is north of the Albany River, historically hosts large numbers of shorebirds, particularly godwits. This area had over 11,000 shorebirds including 2,150 Hudsonian Godwits, 700 Marbled Godwits, and over 6,000 peeps! The survey concluded for the day after surveying northwards to Ekwan Point and all but the northwestern portion of Akimiski island. The most abundant species on the south coast of Akimiski was Marbled Godwit, with over 1,200 individuals. Overall, over 2,100 Marbled Godwits were recorded between the Moose River and Ekwan Point on the mainland and on Akimiski Island. The population estimate of the Hudson and James Bays Marbled Godwit is 2,000 (Andres et al. 2012). The crew spent the night at the White Wolf Inn in Attawapiskat.

The next day, the crew surveyed the northwest portion of Akimiski Island in the morning. On the northwest side of the island, almost 3,000 Red Knots were recorded in the same area that 8,300 had been observed in 2018: this was a new location for knots, based on previous aerial surveys dating back to the 1970s. This section of Akimiski holds the bulk of shorebird individuals on the island with nearly

8,000 birds, comprised of peeps (~3,500), Red Knot (~3,000), and Hudsonian Godwit (~1,500).

From Akimiski, the crew flew south to complete the survey from the Moose River east to the Quebec border. This section of the coast held just over 2,000 individual shorebirds. Hannah Bay Migratory Bird Sanctuary held the greatest abundance of birds with over 1,300 individuals, primarily peeps (~900), yellowlegs (~170), and Hudsonian Godwits (240).

On 13 August, surveys were carried out on the southeast James Bay coast of Quebec, though low cloud and fog prevented coverage of Charlton Island. Over 80% of the birds were recorded in Boatswain Bay, within the region between Rocher Emachisteweyach and Île Sisichisiniku. The bulk (99%) of the individuals recorded in Quebec were comprised of peeps (~4,600), Black-bellied Plover (~150), yellowlegs (~350), and Hudsonian Godwit (~650). These sites had not been surveyed from the air since the 1990s when hydro development was under consideration. Inclusion of these sites allows assessment of most available shorebird habitat on both sides of the Ontario-Quebec border.

Over 48,000 individual shorebirds were recorded on the Ontario side during the survey, well under half of the totals from 2016 (about 110,000) and 2017 (about 105,600), and significantly lower than in 2018 (about 240,000). However, locations of concentrations remained consistent from year to year (Figure 5). On almost every front, counts were lower than in any of the previous three years. Red Knot counts totalled just under 9,000 individuals, as compared to 2016 (~10,600), 2017 (~2,800), and 2018 (~13,700).

Reasons for such low counts of birds in 2019 are unclear. Initial reports from the eastern Arctic suggested that the breeding season was good. However, reports at stopover locations in Quebec and the Maritimes indicated that this season was atypical with similarly lower counts. Julie Paquet, CWS Atlantic Region shorebird biologist, noted that Semipalmated Sandpiper migration timing was unusual in the Bay of Fundy in 2019. Adults appeared to move through the region early and juveniles showed up close to the end of August. At Mingan, very few Red Knots were counted in 2019 compared to recent years. Breeding conditions in the Arctic may influence the number of birds staging in James Bay and elsewhere on the east coast of North America. In a successful breeding year, adults could stay longer on the breeding grounds helping to raise young. In an unsuccessful year, adults may leave early, and fewer juveniles appear at migration sites. The counts from later in August (Figure 7) and juvenile counts from our James Bay field sites in 2019 suggest 2019 was not a successful breeding year for Semipalmated Sandpiper, if not for other species, too. Warmer than average temperatures in 2019 in the eastern Arctic (Government of Canada 2019), coupled with reported low insect estimated abundance (Baffin Island, Leafloor pers. comm.; East Bay, English pers. comm.) could have affected breeding success and, possibly, adult survival.

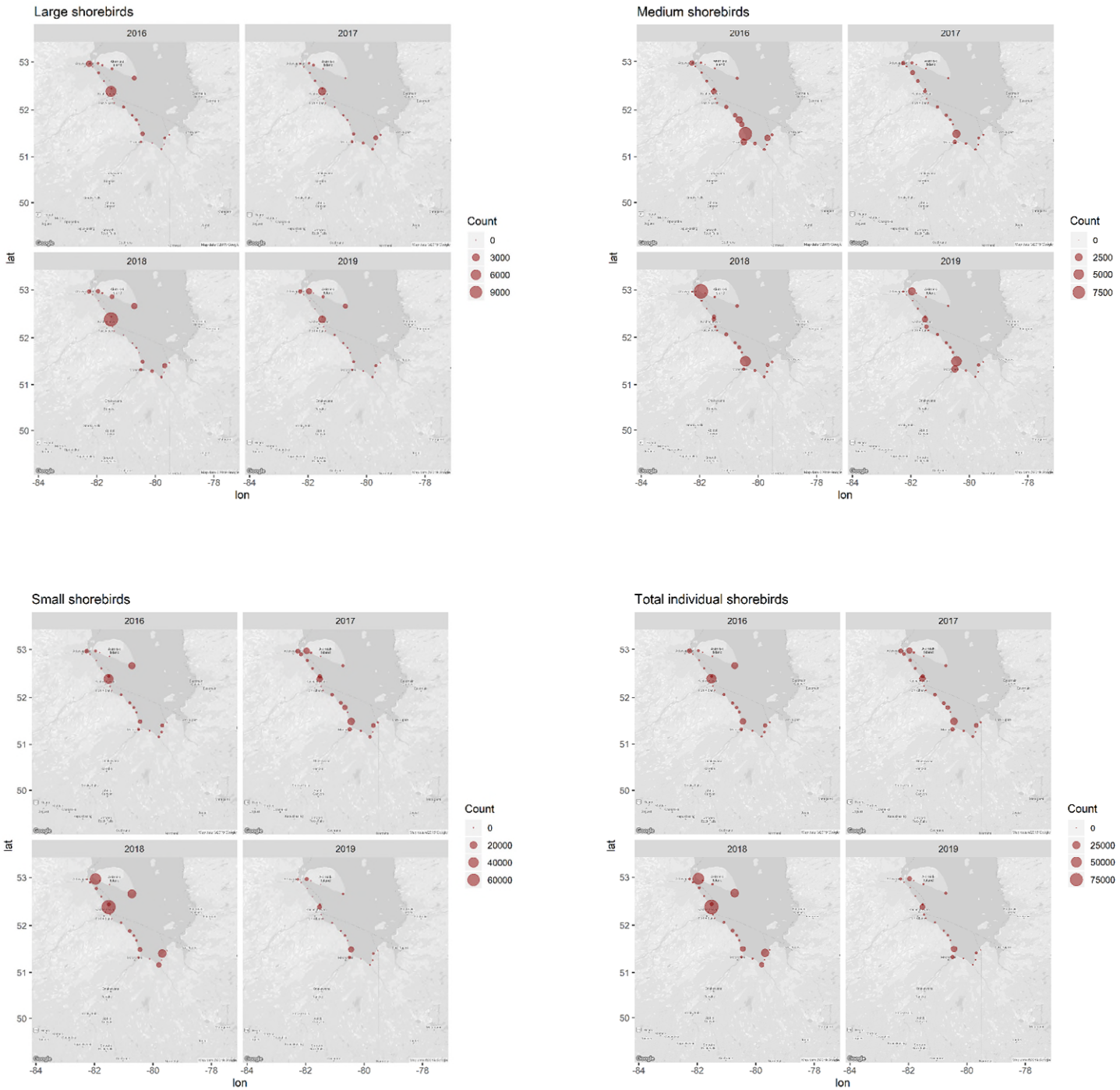


Figure 5. Distribution and abundance of shorebirds by size category and year, as determined by aerial surveys 2016-2019.

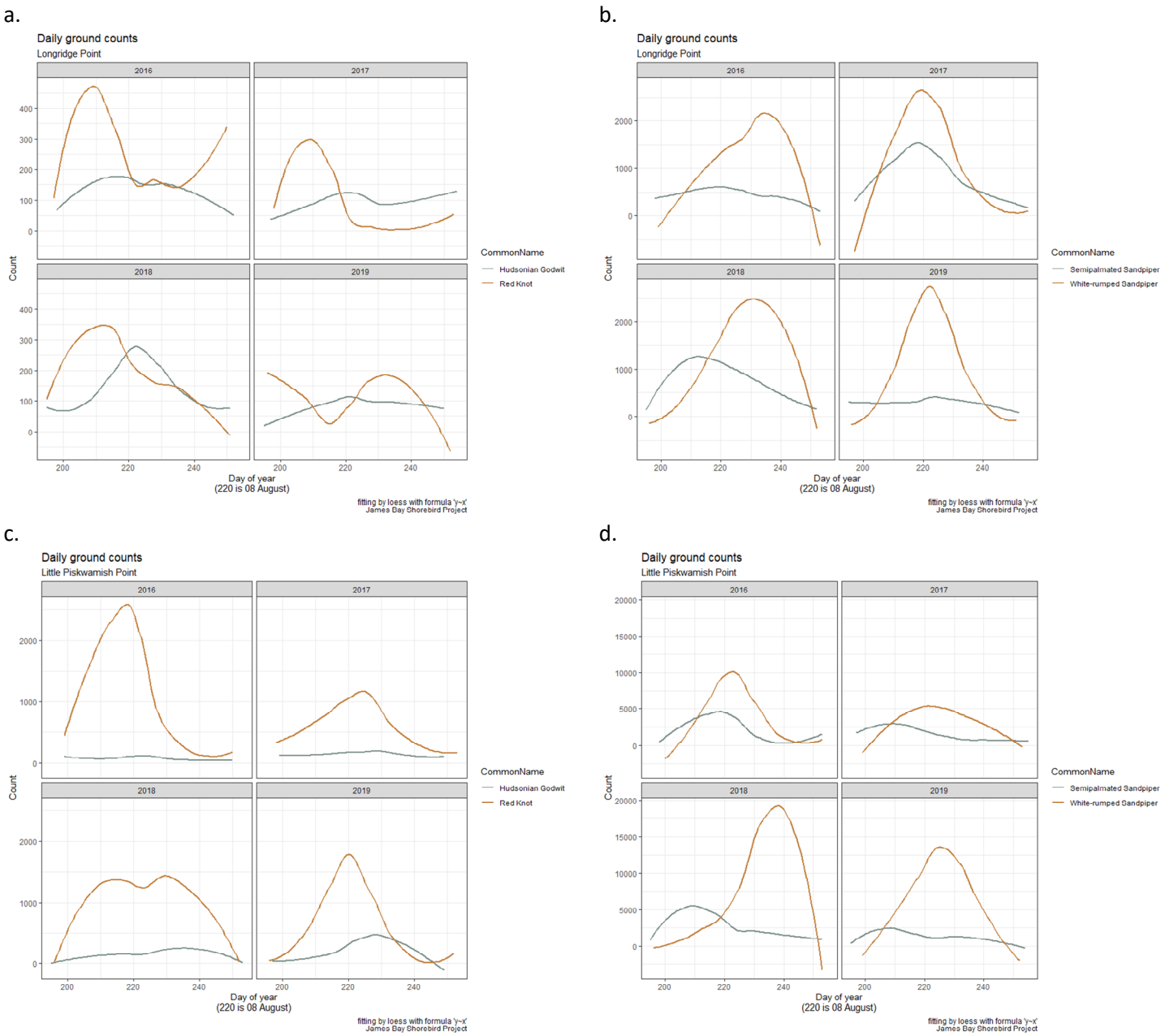


Figure 6. Daily counts of Red Knot and Hudsonian Godwit (a, c) and Semipalmated and White-rumped Sandpiper (b, d) at two James Bay shorebird project sites, Longridge Point (c, d) and Little Piskwamish Point (a, b), 2016-2019. Day of year 220 is 8 August.

Significant concentrations of shorebirds were noted between Northbluff Point and Little Piskwamish Point (sector 7; the highest concentration at over 16,000 individuals), around Chickney Channel (sector 14), and the south shore of Akimiski Island (sector 19) (Figures 6 and 8). A lower proportion of small shorebirds, and a concurrent increase in medium and large shorebird proportions were observed in 2019 (Figure 9). Small shorebird proportions of the total numbers were >70% over the 2016-2018 period (Friis 2017, Friis 2018, Friis 2019).

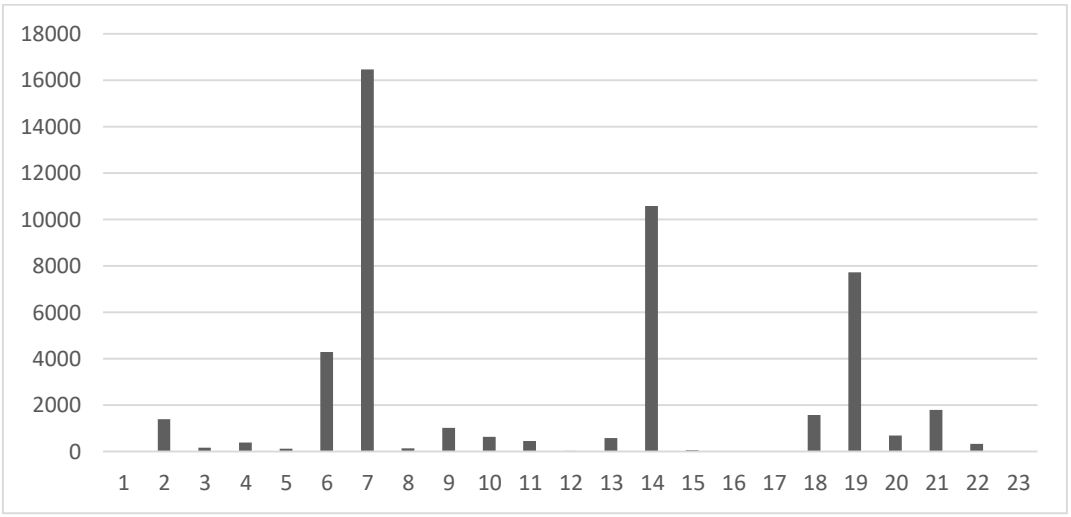
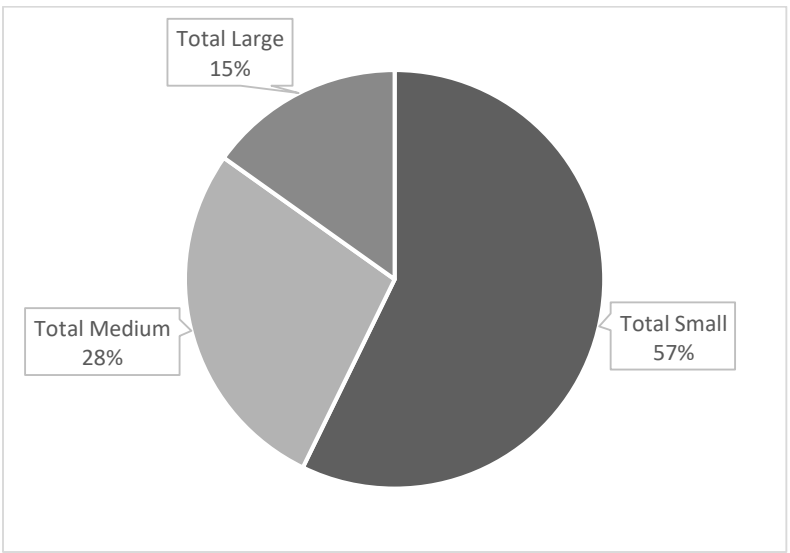


Figure 7. Total shorebird records at each sector during the James Bay coastal aerial survey from the Quebec border in the east to Ekwan Point in the northwest, including Akimiski Island 11-12 August 2019.



Size category	Species
Small shorebird	Semipalmated Sandpiper
	Least Sandpiper
	White-rumped Sandpiper
	Sanderling
Medium shorebird	Black-bellied Plover
	Greater Yellowlegs
	Lesser Yellowlegs
	Unidentified Yellowlegs
	Ruddy Turnstone
	Red Knot
Large shorebird	Whimbrel
	Hudsonian Godwit
	Marbled Godwit

Figure 8. Proportion of each shorebird size category recorded during the aerial survey, 2019. Table shows the species size-category assignments.

Future plans

Currently, the project is in an evaluation phase. Analyses are underway to understand the need for and design options for regular surveys of staging shorebirds at James Bay sites, including beyond the traditional southeastern James Bay focus of this project. A goal for defining and evaluating design options is winter 2021. Following results of the evaluation, the project will seek to implement the best way forward.

With sufficient resources and pending the outcomes of various analyses, we plan to allocate effort to addressing each of the project's objectives over the coming years. To address the objectives of estimating variation in migration phenology and in the abundance of staging shorebirds, we plan to continue daily monitoring of shorebirds on the ground. In addition, we plan to conduct aerial surveys following standardized methodology used in previous aerial surveys of the James Bay coast. To address the objective of estimating the availability of staging habitat and food resources, we plan to use results

of analyses conducted to date on recent sampling efforts. Continuation of invertebrate sampling effort and collecting tissue and fecal samples will be based on these results. To address the objectives of estimating the length of stay of staging and the value of southern James Bay to the global *rufa* Red Knot population, we plan to continue our daily effort for flag resighting at key locations. In addition, we plan to continue to deploy temporary Motus towers at various sites along the coast that will be used to detect nanotagged shorebirds. This project will continue to contribute to the larger Motus network. More information about Motus is available at motus.org.

Acknowledgements

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Appendix 1: Lesser Yellowlegs migration, population structure and demography

Summary of James Bay shorebird project contributions to an international project

Background

The Lesser Yellowlegs is a shorebird species that breeds in the boreal forests of Alaska and Canada and winters in Central and South America. The species has experienced a population decline of -5.3% per year on average and has lost an estimated 90% of their population size since 1970, with an additional 50% projected loss within the next 15 years (Sauer et al. 2013). The study aims to fill knowledge gaps and investigate the causes of declines, which includes unregulated hunting on wintering grounds. Listed below are the studies four primary objectives. The order of objectives listed is based on priority level, with number 1 being of highest priority. Methods described in this protocol follow the Arctic Shorebird Demographics Network Breeding Camp Protocol (Brown et al. 2014).

1. Deploy GPS Argos PinPoint and geolocator tags on breeding adults to identify migratory timing and routes, including key stopover sites and wintering locations utilized by individual Lesser Yellowlegs within sub-populations in Alaska and Canada.
2. Individually mark and resight individual Lesser Yellowlegs to estimate apparent annual survival rates.
3. Collect biological samples to examine potential genetic variation in sub-populations of Lesser Yellowlegs.
4. Collect information on reproductive rates of Lesser Yellowlegs to better understand nest and brood survival, and juvenile recruitment.

Project Study Sites

Geographic locations for this study cover the longitudinal extent of the Lesser Yellowlegs breeding range and include the following study sites: Anchorage and Matanuska Susitna Valley, AK; McClelland Lake, AB; Yellowknife, NT; Churchill, MB; James Bay, ON; and Mingan, QC. Sites that have the potential to be added in the future include Fairbanks, AK and Kanuti National Wildlife Refuge, AK. The expected duration of this project is May 2018 to April 2022.

Methods

Captures Objectives

- Capture and uniquely mark at least 20 individuals per study site per year and make a concerted effort to resight individuals in subsequent years.
- Deploy 10-15 GPS Argos PinPoint tags on breeding Lesser Yellowlegs to better understand their duration and extent of migratory movements.

All adults captured Lesser Yellowlegs were banded with a unique government-issued metal band, alphanumeric flag and darvic color band. Colour bands were site-specific (green for James Bay). Standard morphometrics or each bird were taken, including wing length, exposed culmen, total head, nares to tip, tarsus length, and mass. All birds were examined for body and flight feather moult, and for subcutaneous fat score. Blood samples were collected from the brachial vein under the wing to determine sex of individuals using genetic sexing techniques in the lab. Determining sex using plumage characteristics or measurements is unreliable. Feather and claw samples were collected from all

captured adults. Claws (2-3 per individual) were cut at the quick and placed in a labeled coin envelope. The S1 secondary feather from the right wing was pulled at the base and placed in a labeled coin envelope. Photos were taken of each bird prior to release to document band combinations and the bird's condition.

Lotek PinPoint GPS tags were attached using leg-loop harnesses to adult Lesser Yellowlegs weighing over 80g; seven tags were provided to the James Bay crew. Each harness was made out of 1mm stretch magic jewelry chord and 3mm jewelry crimps. Tagged birds were placed in a holding cage for up to 30 minutes to monitor for potential adverse effects of the tag on gait and center of gravity. Birds were released once it was confirmed that no ill effects were observed.

Summary and discussion of 2019 results at James Bay

Seventy-four Lesser Yellowlegs were trapped and processed at Longridge Point in 2019. Seventy-two were hatch-year birds, while two were adults harnessed with PinPoint tags. These two birds both departed James Bay mid-August in a southeast trajectory. One of these birds was not detected after a transmission over the Atlantic (42.0534401 -54.6131592). The other completed migration to the nonbreeding grounds, where it spent its time near São Luís, Brazil (-2.6606719 -45.1188087), returning north near the end of April 2020. It spent time southwest of Peawanuck near the Winisk River (54.6810226, -87.753585) and was last detected 14 July 2020 near Waskaganish, QC.

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