ENVIRONMENT AND CLIMATE CHANGE CANADA'S CANADIAN WILDLIFE SERVICE, ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY, BIRD STUDIES CANADA, MOOSE CREE FIRST NATION AND TRENT UNIVERSITY.

James Bay Shorebird Project

2017 Report

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Photo: Longridge Point

Report summarizing 2017 shorebird survey results from three camps on the western James Bay coast.

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 hosting at least 500,000 shorebirds annually, or at least 30% of the biogeographic population for a species;
- Sites of International Importance hosting at least 100,000 shorebirds annually, or at least 10% of the biogeographic population for a species; and
- Sites of Regional Importance hosting 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 OMNR 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.

Three field camps operated on the southwestern coast of James Bay in 2017; Little Piskwamish Point, Longridge Point, and Northbluff Point between 15 July and 12 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; http://motus-wts.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 Bird Studies Canada (BSC) in partnership with Acadia University, Western University, the University of Guelph and collaborating researchers and organizations.

As of February 2017, the network contained over 350 automated VHF radio-receiving stations, positioned throughout the Western Hemisphere. A digital "nano-tag" tracking device is secured to an animal and they can be detected in real-time up to 15 km away from any station. This array can often track tagged animals across a diversity 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.

Shorebirds were captured at Longridge Point and Northbluff Point with the objective of affixing over 200 VHF radio tags (nanotags) to individuals of five target species: Semipalmated Plover,

[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).

Semipalmated, Least and White-rumped sandpipers, Dunlin, Red Knot, Lesser Yellowlegs, and Hudsonian Godwit.

Study Areas

The Longridge Point camp (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 camp (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.

The Northbluff Point camp (51.4879571°N, 080.4398775°W) is the most southerly of the project's field camps surveyed in 2017 and has been surveyed in 2009, 2011, and 2014-2017. Like the other two sites, the shoreline gradient is very flat. From the spruce tree line, willow thickets and meadow marsh eventually grade to brackish ad saline tidal marshes. The area is known to host large concentrations of shorebirds (e.g., Semipalmated Sandpiper and White-rumped Sandpiper) during southern migration.

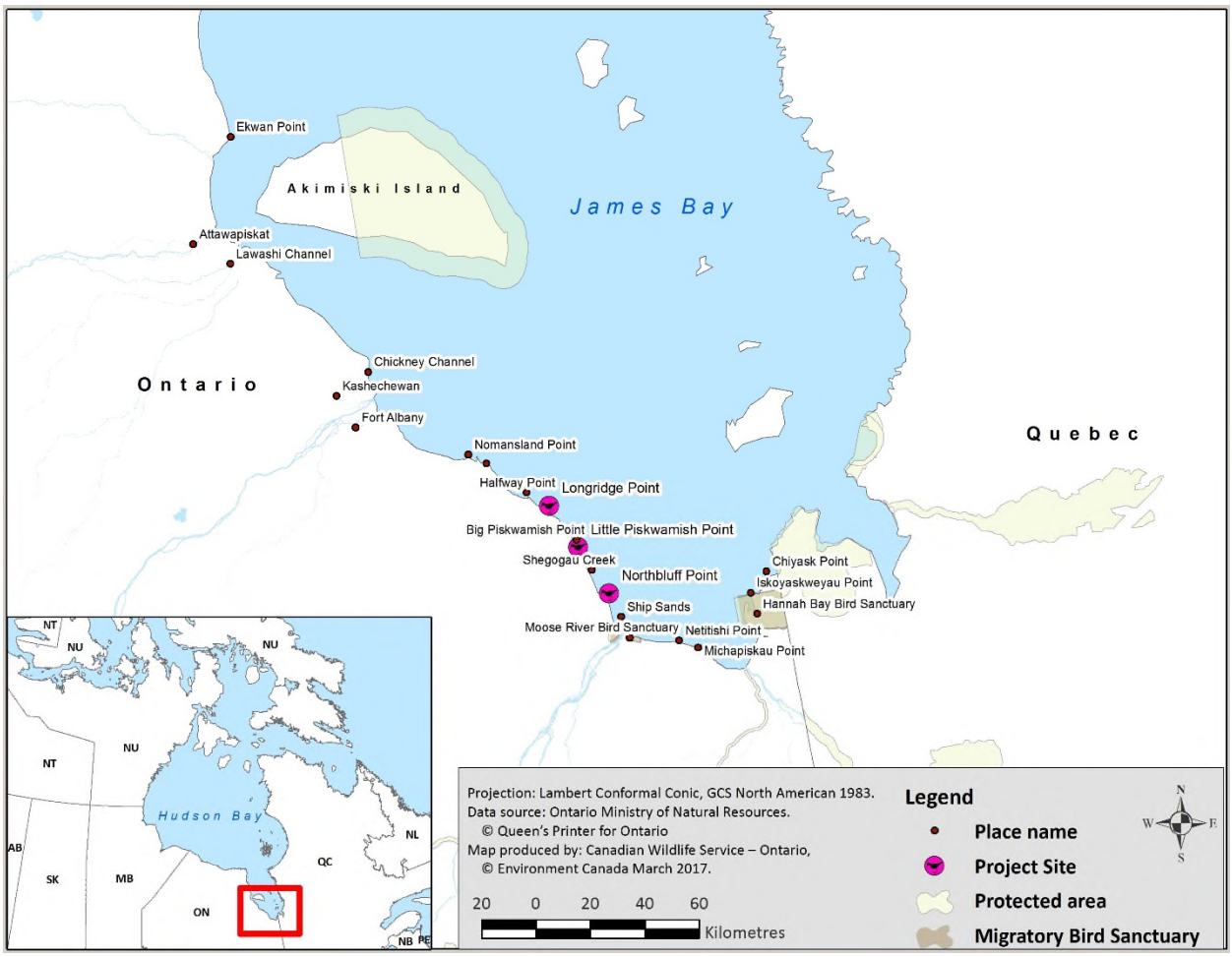


Figure 1. Field camp sites of the James Bay Shorebird Project, 2017.

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

Semipalmated Plover

Hudsonian Godwit

Greater Yellowlegs

Marbled Godwit

Lesser Yellowlegs

Ruddy Turnstone

Red Knot – with individual colour marked flag banded in Argentina

Least Sandpiper

Sanderling

White-rumped Sandpiper

Semipalmated Sandpiper

Pectoral Sandpiper

Dunlin

Results and Discussion

Longridge Point

A maximum of ten people were stationed at Longridge Point during the season. The camp was active from 15 July to 12 September 2017. 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 nanotags to these birds. In total, 265 birds were banded and 93 shorebirds were equipped with nanotags during the period. The nanotags send signals to strategically placed towers, creating data values for each individual bird's arrival and departure.

During this season at Longridge Point, a total of 478.5 hours was spent in the field, which is the second highest raw measure of effort at the site, behind 2015. There were 166 bird species recorded during this time, which is above the average of 159. After scaling to effort, however, Longridge Point 2017 results were on the low end (34.69 species/100 field hours; Table 1). Tables 2 and 3 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 first Wood Duck record at the site was made in July and is the third record for the project. Mallard counts were among the lowest recorded at the site since the beginning of the project (26 in July, less than 45 in August and September). The highest Green-winged Teal counts on record were made; 206 in August, 417 in September. The first Long-tailed Duck record for the project was made in August, and this bird continued into September. Northern Harriers were counted in their highest numbers for the project in September (a high of 14). The first Virginia Rail and American Coot records at Longridge were made in August and September, respectively. The coot record is only the second after breeding birds were observed at Little Piskwamish Point in 2015. August had a number of notable shorebird observations. The highest American Golden-Plover count (30) for the project, along with the lowest Killdeer and Red Knot counts at Longridge Point. The low Red Knot count could reflect a poor breeding season for this species, particularly after challenging spring migration conditions. The highest all-time Sanderling count (305) also occurred in August. The lowest counts in September for Least and White-rumped sandpiper at 12 and 282, respectively. The highest site count for Wilson's Snipe (17) and the highest all-time count for Solitary Sandpiper (10) were made in July. August also brought the project's second Iceland Gull record. Longridge's first Northern Saw-whet Owl record and all-time high counts of Boreal Chickadee (49) and Lapland Longspur (54) were made in September. Common Yellowthroat counts throughout the season were higher than recorded before at Longridge. The second Northern Parula record for the project, a first for Longridge, was recorded in September. The first was recorded at Northbluff in 2016. A project first was the August record of Black-throated Blue Warbler, and the project's second Yellow-headed Blackbird was recorded in September. It is worth noting that no European Starlings were observed at Longridge in 2017.

Table 1. Number of species, field hours, and species per 100 field hours at each site for years 2009 to 2017. The number of species per 100 field hours ranks locations.

Year	Location	Number of species	Field hours	Species per 100 field hours
2009	Ship Sands Islands	27	8.00	337.50
2009	Northbluff Point	55	32.00	171.88
2009	Missisicabi River	52	32.00	162.50
2009	South of Attawapiskat	40	32.00	125.00
2011	Little Piskwamish Point	124	108.00	114.81
2013	Little Piskwamish Point	137	131.00	104.58
2009	Longridge Point	109	112.00	97.32
2016	Little Piskwamish Point South	90	94.92	94.82
2012	Little Piskwamish Point	120	134.50	89.22
2009	Albany	41	48.00	85.42
2014	Northbluff Point	142	180.83	78.53
2012	Chickney Point	122	193.47	63.06
2013	Longridge Point	114	195.83	58.21
2014	Longridge Point	133	239.42	55.55
2011	Northbluff Point	113	215.50	52.44
2014	Little Piskwamish Point	139	293.83	47.31
2012	Longridge Point	165	359.80	45.86
2013	Hannah Bay--East Point	132	291.43	45.29
2017	Northbluff Point	153	348.25	43.93
2015	Northbluff Point	161	384.67	41.85
2016	Longridge Point	174	448.00	38.84
2015	Little Piskwamish Point	115	298.00	38.59
2010	Longridge Point	147	396.00	37.12
2016	Northbluff Point	145	393.75	36.83
2017	Longridge Point	166	478.50	34.69
2011	Longridge Point	115	336.00	34.23
2017	Little Piskwamish Point	155	483.17	32.08
2015	Longridge Point	167	533.50	31.30
2016	Little Piskwamish Point	147	483.08	30.43

Table 2. Top 10 estimated single-day high counts of bird species encountered each month at Longridge Point, 15 July to 12 September 2017, not corrected for effort.

Common Name	July High Count
peep sp.	2545
Semipalmated Sandpiper	1680
Red Knot	1400
White-rumped Sandpiper	1400
Pectoral Sandpiper	670
Black Scoter	500
Ruddy Turnstone	245
Lesser Yellowlegs	217
Canada Goose	200
Calidris sp.	200

Common Name	August High Count
White-rumped Sandpiper	7892
Semipalmated Sandpiper	5299
Canada Goose	3018
Black Scoter	1501
peep sp.	1370
Bonaparte's Gull	1095
Snow Goose	540
Hudsonian Godwit	502
Northern Pintail	449
Pectoral Sandpiper	437

Common Name	September High Count
Canada Goose	2080
Black Scoter	820
Hudsonian Godwit	762
Northern Pintail	599
Horned Lark	550
Dunlin	542
Semipalmated Sandpiper	466
Bonaparte's Gull	433
Green-winged Teal	417
White-rumped Sandpiper	282

Table 3. Top 10 estimated single-day high counts of shorebird species encountered each month at Longridge Point, 15 July to 12 September 2017, not corrected for effort.

Common Name	July High Count
peep sp.	2545
Semipalmated Sandpiper	1680
White-rumped Sandpiper	1400
Red Knot	1400
Pectoral Sandpiper	670
Ruddy Turnstone	245
Lesser Yellowlegs	217
Calidris sp.	200
Semipalmated Plover	115
Greater Yellowlegs	114

Common Name	August High Count
White-rumped Sandpiper	7892
Semipalmated Sandpiper	5299
peep sp.	1370
Hudsonian Godwit	502
Pectoral Sandpiper	437
Lesser Yellowlegs	314
Sanderling	305
Dunlin	302
Greater Yellowlegs	291
Ruddy Turnstone	279
Red Knot	279

Table 3 (continued). Top 10 estimated single-day high counts of shorebird species encountered each month at Longridge Point, 15 July to 12 September 2017, not corrected for effort.

Common Name	September High Count
Hudsonian Godwit	762
Dunlin	542
Semipalmated Sandpiper	466
White-rumped Sandpiper	282
Pectoral Sandpiper	257
Calidris sp.	200
Ruddy Turnstone	180
Sanderling	172
Black-bellied Plover	129
Red Knot	100

Little Piskwamish Point

A maximum of four people were stationed at Little Piskwamish Point. The camp was active from 15 July to 12 September 2017. During this period a total of 483 hours were spent in the field recording 155 bird species. This matches the 2016 effort and is the highest species total recorded by the project at the site, despite being among the lowest when scaled for effort (32.08 species/100 field hours; Table 1).

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.

Piskwamish represents the most important of our study sites for Red Knots. The August high count for the species reflects this importance (Tables 4 & 5). Despite lower counts at the other sites, Piskwamish supported a significant concentration of knots in 2017. The September count is a high for the project and could indicate late breeders' movements.

Snow Goose counts in August and September were the highest on record at the site for the project. The September Cackling Goose count (16) is a project high count, as was the Northern Pintail count in the same month (8,108). The fourth Pied-billed Grebe record (3) for the project occurred in August. The September Black-bellied Plover high count (43) is a site record count. Semipalmated Plovers were counted in their highest numbers of all three sites at Piskwamish throughout the season. August had the site high count for Hudsonian Godwit (604). Least Sandpipers were counted in their lowest numbers on record for Piskwamish throughout the season. The July Semipalmated Sandpiper count is the highest on record for the site, and it could indicate early departure from breeding grounds. The second Glaucous Gull observed at Piskwamish, and sixth for the project, was recorded in July. September brought the first records at Piskwamish for Mourning Dove, Boreal Owl and Belted Kingfisher. American Crows were counted in the highest numbers on record for the site throughout the season. Horned Lark counts in September (518) are the highest on record for the site. Finally, Golden-crowned Kinglet counts were the highest on record for the site throughout the season, and were project high counts in July (25) and September (31).

Table 4. Top 10 estimated single-day high counts of bird species encountered each month at Little Piskwamish Point, 15 July to 12 September 2017, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	8019
White-rumped Sandpiper	4803
Red Knot	1375
Canada Goose	600
Dunlin	434
Pectoral Sandpiper	319
Hudsonian Godwit	254
peep sp.	202
Bonaparte's Gull	178
Black Scoter	170

Common Name	August High Count
White-rumped Sandpiper	9950
Semipalmated Sandpiper	4565
Red Knot	4174
Northern Pintail	2405
Canada Goose	1584
Dunlin	1140
Hudsonian Godwit	604
peep sp.	600
Bonaparte's Gull	471
Snow Goose	467

Common Name	September High Count
Northern Pintail	8108
Dunlin	4959
Canada Goose	4266
White-rumped Sandpiper	2811
Semipalmated Sandpiper	1233
Red Knot	560
Horned Lark	518
Hudsonian Godwit	382
Snow Goose	364
American Black Duck	319

Table 5. Top 10 estimated single-day high counts of shorebird species encountered each month at Little Piskwamish Point, 15 July to 12 September 2017, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	8019
White-rumped Sandpiper	4803
Red Knot	1375
Dunlin	434
Pectoral Sandpiper	319
Hudsonian Godwit	254
peep sp.	202
Greater Yellowlegs	128
Semipalmated Plover	117
Lesser Yellowlegs	105

Common Name	August High Count
White-rumped Sandpiper	9950
Semipalmated Sandpiper	4565
Red Knot	4174
Dunlin	1140
Hudsonian Godwit	604
peep sp.	600
Pectoral Sandpiper	258
Semipalmated Plover	214
Greater Yellowlegs	200
Sanderling	137

Table 5 (continued). Top 10 estimated single-day high counts of shorebird species encountered each month at Little Piskwamish Point, 15 July to 12 September 2017, not corrected for effort.

Common Name	September High Count
Dunlin	4959
White-rumped Sandpiper	2811
Semipalmated Sandpiper	1233
Red Knot	560
Hudsonian Godwit	382
Sanderling	191
Pectoral Sandpiper	161
Greater Yellowlegs	99
Semipalmated Plover	80
Black-bellied Plover	43

Northbluff Point

A maximum of five people were stationed at Northbluff Point. The camp was active from 31 July to 12 September 2017. During this period, a total of 348 hours was spent in the field. The work in this period was focused on daily surveys to generate estimated totals for the area, banding target species and affixing nanotags to these birds. There were 153 bird species observed during this time; the second highest total after 2015. When scaled for effort, the results were less dramatically different (43.93 species/100 field hours; Table 1). In total, 517 birds were banded and 118 target shorebird species were equipped with nanotags during the period. The nanotags send signals to strategically placed towers, creating data values for each individual bird's arrival and departure.

Tables 6 and 7 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. Generally, shorebird counts were lower than typical seasons at Northbluff. For example, Hudsonian Godwit and Semipalmated Sandpiper were counted in the lowest number on record for the site.

Snow and Canada geese counts were site high counts for both August and September. The second Mute Swan for the site, and fourth for the project, was recorded in August. The first Tundra Swan record for the site, and second for the project, was recorded in September. The lowest counts for Mallard in August and September at Northbluff were recorded in 2017. The project's first Swainson's Hawk was recorded in September. A single Yellow Rail was recorded in July an August, representing the lowest count on record for Northbluff. The highest site counts for Marbled Godwit (43, August), Ruddy Turnstone (523, August), Dunlin (Tables 6 & 7), and Baird's Sandpiper (11, August) were recorded in 2017. The lowest site counts for Least (153), Pectoral (136), and Semipalmated (4,545) sandpipers were recorded in August. However, the highest count recorded by the project in September for Semipalmated Sandpiper (1,986) occurred in 2017, possibly indicating late breeders. The third record for Black Guillemot, and first since 2015, at Northbluff was in August. A Short-eared Owl was recorded in September, representing the first observation at Northbluff since 2015. Horned Lark was counted in project-high record number in September (775). The project's first Eastern Bluebird was recorded in September. The site's first Grey-cheeked Thrush record was in September. A site-high count for Swainson's Thrush (14) and Lapland Longspur (35) were recorded in September. Finally, the site's first American Tree Sparrow record was made in September; only Longridge has had American Tree Sparrow records to this year.

Table 6. Top 10 estimated single-day high counts of bird species encountered each month at Northbluff Point, 1 August to 12 September 2017, not corrected for effort.

Common Name	August High Count
White-rumped Sandpiper	10502
Semipalmated Sandpiper	4545
peep sp.	4200
Canada Goose	2366
Northern Pintail	720
Red Knot	611
Hudsonian Godwit	594
Ruddy Turnstone	523
Snow Goose	456
Dunlin	438

Common Name	September High Count
Dunlin	5351
Canada Goose	4236
Calidris sp.	2000
Semipalmated Sandpiper	1986
peep sp.	1530
Northern Pintail	1285
White-rumped Sandpiper	964
Snow Goose	803
Horned Lark	775
Pectoral Sandpiper	315

Table 7. Top 10 estimated single-day high counts of shorebird species encountered at Northbluff Point, 31 July to 12 September 2017, not corrected for effort.

Common Name	August High Count
White-rumped Sandpiper	10502
Semipalmated Sandpiper	4545
peep sp.	4200
Red Knot	611
Hudsonian Godwit	594
Ruddy Turnstone	523
Dunlin	438
Lesser Yellowlegs	265
Greater Yellowlegs	250
Semipalmated Plover	213

Common Name	September High Count
Dunlin	5351
Calidris sp.	2000
Semipalmated Sandpiper	1986
peep sp.	1530
White-rumped Sandpiper	964
Pectoral Sandpiper	315
Red Knot	313
Sanderling	268
Greater Yellowlegs	173
Hudsonian Godwit	121

All-site summary

Across all sites in 2017, there are a number of interesting and notable records. Counts noted below are cumulative, same-day counts across all sites.

Northern Pintail was counted in highest numbers on record in August (3,094) and September (8,465). As noted in Northbluff Point's summary above, the first Swainson's Hawk was recorded in September. This year was one of the lowest Yellow Rail seasons on records, with less than 10 individuals across all sites at any one time during the season. Killdeer were also recorded in low numbers in July, with less than 15 across all sites. Whimbrel numbers were below average (Table 7). Despite the high counts recorded in September, Hudsonian Godwit counts were also below average (Table 7). Red Knot counts in 2016 were record setting for the project, lifting hopes that 2017 would have a similar result. In the end, it was a slightly above average year for Red Knot (Table 7). Ruddy Turnstone was recorded at an all-time high of 852 in August. It was a below-average year for White-rumped and Semipalmated sandpipers, and Greater and Lesser yellowlegs. September brought significant numbers of Horned Larks to all three sites, including a one-day high count of 1,658. Boreal Chickadee moved through the area in September, peaking at 54 individuals across all three sites. As noted above, the first Eastern Bluebird

and Grey-cheeked Thrush records for the project occurred in September; and the first Black-throated Blue Warbler for the project was recorded in August. Finally, Swamp Sparrow counts reached an all-time high in August (112).

Table 8. Cumulative, one-day counts of shorebird species across all sites surveyed in 2017 and average cumulative counts for those species within the same area (i.e., Northbluff Point to Longridge Point) over the period 2009-2016, not corrected for effort.

Species	Month	Count	Average Count
Whimbrel	July	65	94
Whimbrel	August	57	103
Hudsonian Godwit	July	280	732
Hudsonian Godwit	August	1,129	2,2162
Hudsonian Godwit	September	1,173	1,275
Red Knot	July	2,061	1,817
Red Knot	August	4,243	3,990
Red Knot	September	707	549
White-rumped Sandpiper	July	6,203	7,996
White-rumped Sandpiper	August	19,842	27,969
Semipalmated Sandpiper	July	8,900	19,415
Semipalmated Sandpiper	August	11,460	20,057
Greater Yellowlegs	July	216	503
Greater Yellowlegs	August	626	694
Lesser Yellowlegs	July	322	821
Lesser Yellowlegs	August	710	780

Motus towers, banding and tagging

In May 2017, seven temporary Motus towers were set-up at sites on the southwestern coast of James Bay (Figure 2). One of these, Washiskogau, failed very early in the season and did not record tags in 2017. The eastern most tower was moved further north to Hannah Bay in 2017. 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 near 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 17 May to 28 November 2017. Various attempts to avoid flooding and other technical issues have been pursued to date. For example, we have tried placing the battery and gnome above the flood line, repositioning the tower, plugging all holes entering the gnome and the action packer holding the battery and gnome. Some technical issues are difficult to avoid.

Banding and tagging activities were focussed at Longridge Point and Northbluff 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.

Figure 2. Locations of Motus towers, showing direction of antennas. Active 17 May to 28 November 2017. Washiskogau failed early in the season and did not record any tags. Note that Moosonee and Fort Rupert Towers are operated by other projects and contribute tag detections to the Motus network.

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 morphometrics were recorded.

Nanotag efforts targeted five shorebird species (Semipalmated Plover, Semipalmated Sandpiper, Least Sandpiper, White-rumped Sandpiper, Pectoral Sandpiper, Red Knot and Hudsonian Godwit).

[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.

Species and age targets were established; there were no targets established for bird that were marked with a leg flag and/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, condition related changes in fatty acids, DNA sex typing, and to establish diet through stable isotope analysis. In total, 212 nanotags were affixed to individuals of our target species (Table 8). Over 60% of the individuals tagged were hatch-year birds.

Movement of tagged birds followed large-scale patterns from previous years: birds departed James Bay flying directly to the Eastern Seaboard (Figures 4-9). In an analysis of resighting and Motus data from 2010 to 2017, Amie MacDonald determined that Red Knots flew to and from Mingan, QC (Figure 3); this is a novel and surprising observation.

Table 9. Species and ages of shorebirds banded and affixed with a nanotags at Longridge Point and Northbluff Point, 2017.

Species	Age	Count
Least Sandpiper	AHY	4
Least Sandpiper	HY	26
Lesser Yellowlegs	HY	3
Pectoral Sandpiper	AHY	9
Pectoral Sandpiper	HY	21
Semipalmated Plover	AHY	5
Semipalmated Plover	HY	36
Semipalmated Plover	SY	1
Semipalmated Sandpiper	AHY	13
Semipalmated Sandpiper	HY	36
White-rumped Sandpiper	AHY	47
White-rumped Sandpiper	HY	11
Total		**212**

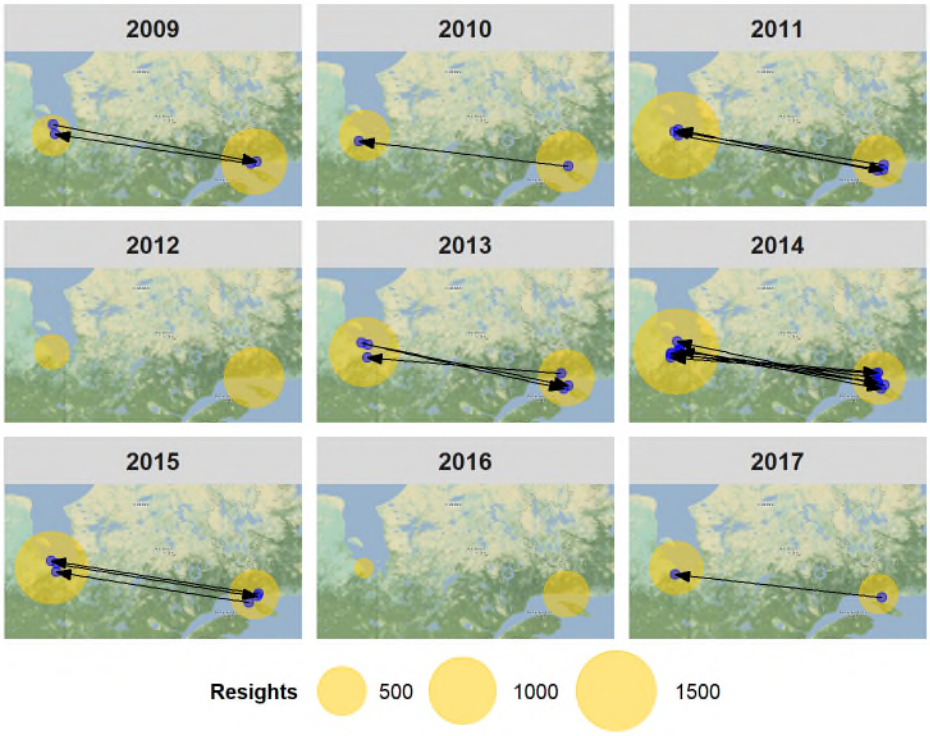


Figure 3. Movement of Red Knot between James Bay, ON and Mingan Archipelago, QC. Arrows indicate direction of movement between sites. Figure courtesy of Amie MacDonald, Trent University.

Other banding activities resulted in trapping and banding shorebirds and local breeding individuals and their young. Together with the shorebird trapping effort, 782 individuals of 20 species were banded. Most of the individuals banded were shorebird species (97%), accounting for 65% of the species banded (Table 9).

Table 10. Species and ages of birds banded at Longridge Point and Northbluff Point, 2017.

Species	Age	Number of individuals banded
Baird's Sandpiper	HY	1
Boreal Chickadee	HY	1
Dunlin	HY	3
Least Flycatcher	HY	1
Least Sandpiper	AHY	5
Least Sandpiper	HY	76
Lesser Yellowlegs	HY	3
Yellow-rumped (Myrtle) Warbler	ASY	1
Yellow-rumped (Myrtle) Warbler	HY	1
Pectoral Sandpiper	AHY	9
Pectoral Sandpiper	HY	22
Red-necked Phalarope	HY	1
Ruddy Turnstone	HY	5
Sanderling	AHY	4
Sanderling	HY	4
Savannah Sparrow	AHY	2
Savannah Sparrow	HY	12
Short-billed Dowitcher	AHY	1
Semipalmated Plover	AHY	6
Semipalmated Plover	HY	70
Semipalmated Plover	SY	1
Semipalmated Sandpiper	AHY	45
Semipalmated Sandpiper	HY	432
Solitary Sandpiper	AHY	1
Swamp Sparrow	HY	2
Palm Warbler (Western)	HY	3
White-rumped Sandpiper	AHY	55
White-rumped Sandpiper	HY	14
Yellow Warbler	HY	1
Total		**782**

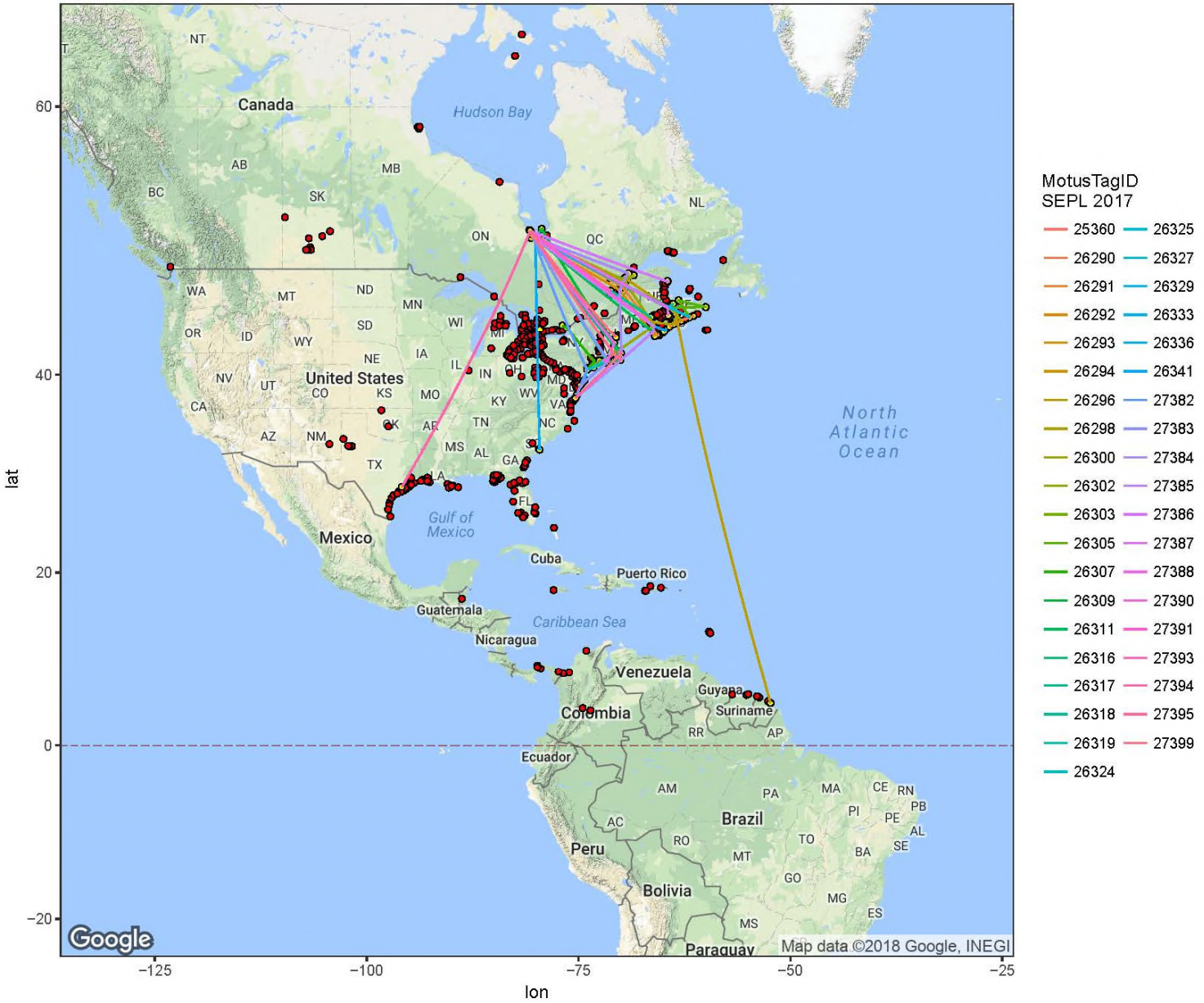


Figure 4. Movement of individually nanotagged Semipalmated Plovers across the Motus Network, 2017. Red dots represent active towers in the network; yellow dots represent towers where individual tags were detected.

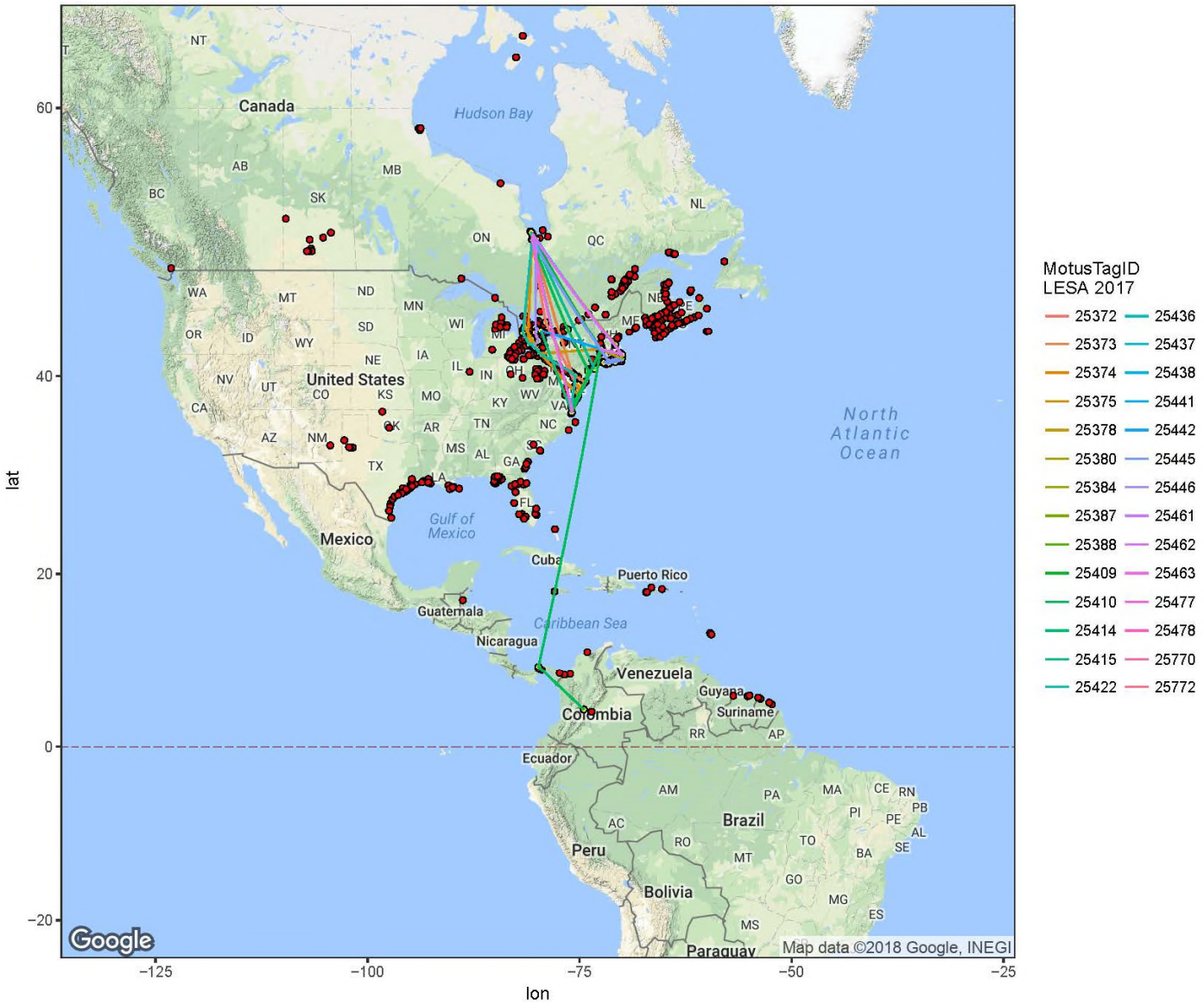


Figure 5. Movement of individually nanotagged Least Sandpipers across the Motus Network, 2017. Red dots represent active towers in the network; yellow dots represent towers where individual tags were detected.

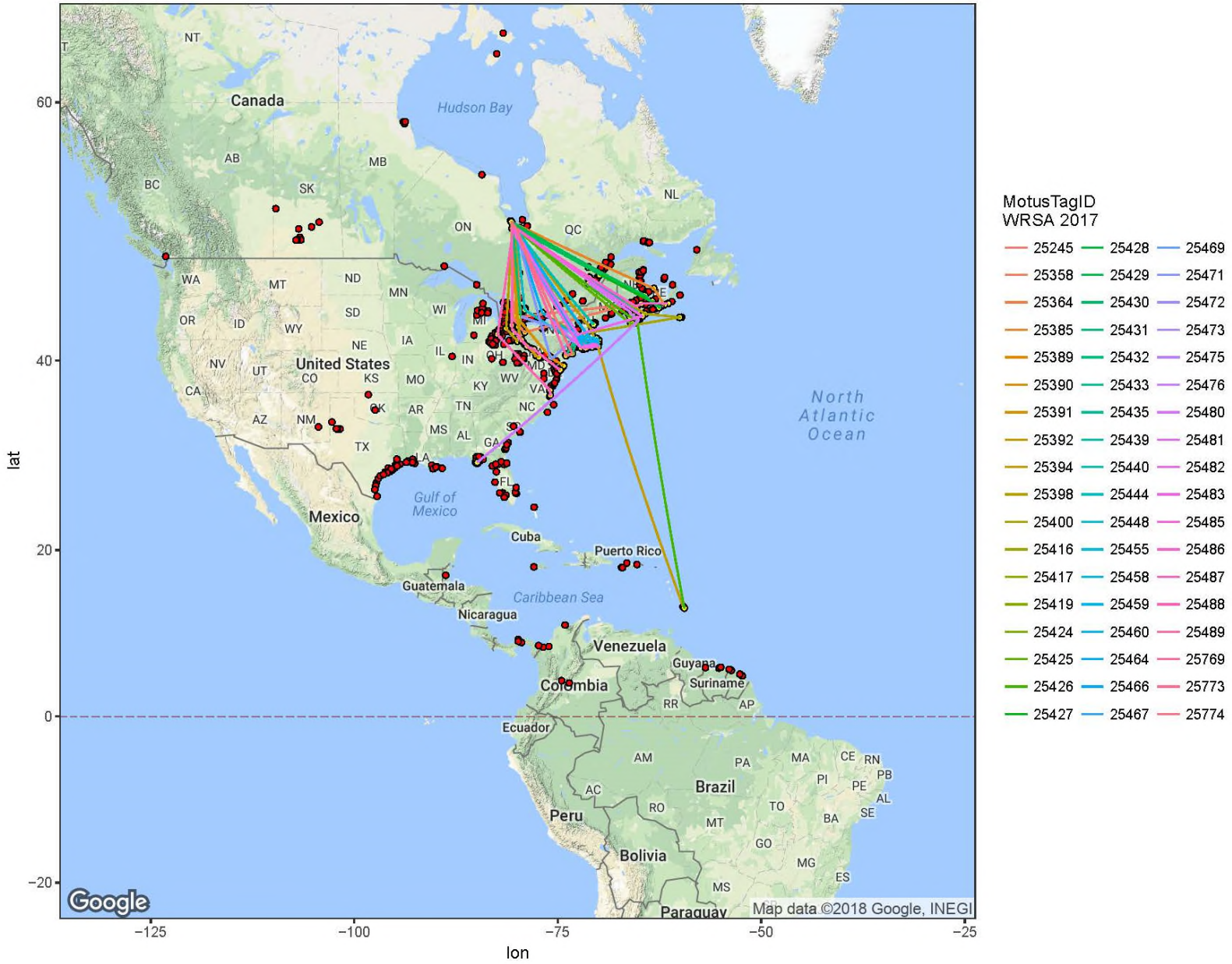


Figure 6. Movement of individually nanotagged White-rumped Sandpipers across the Motus Network, 2017. Red dots represent active towers in the network; yellow dots represent towers where individual tags were detected.

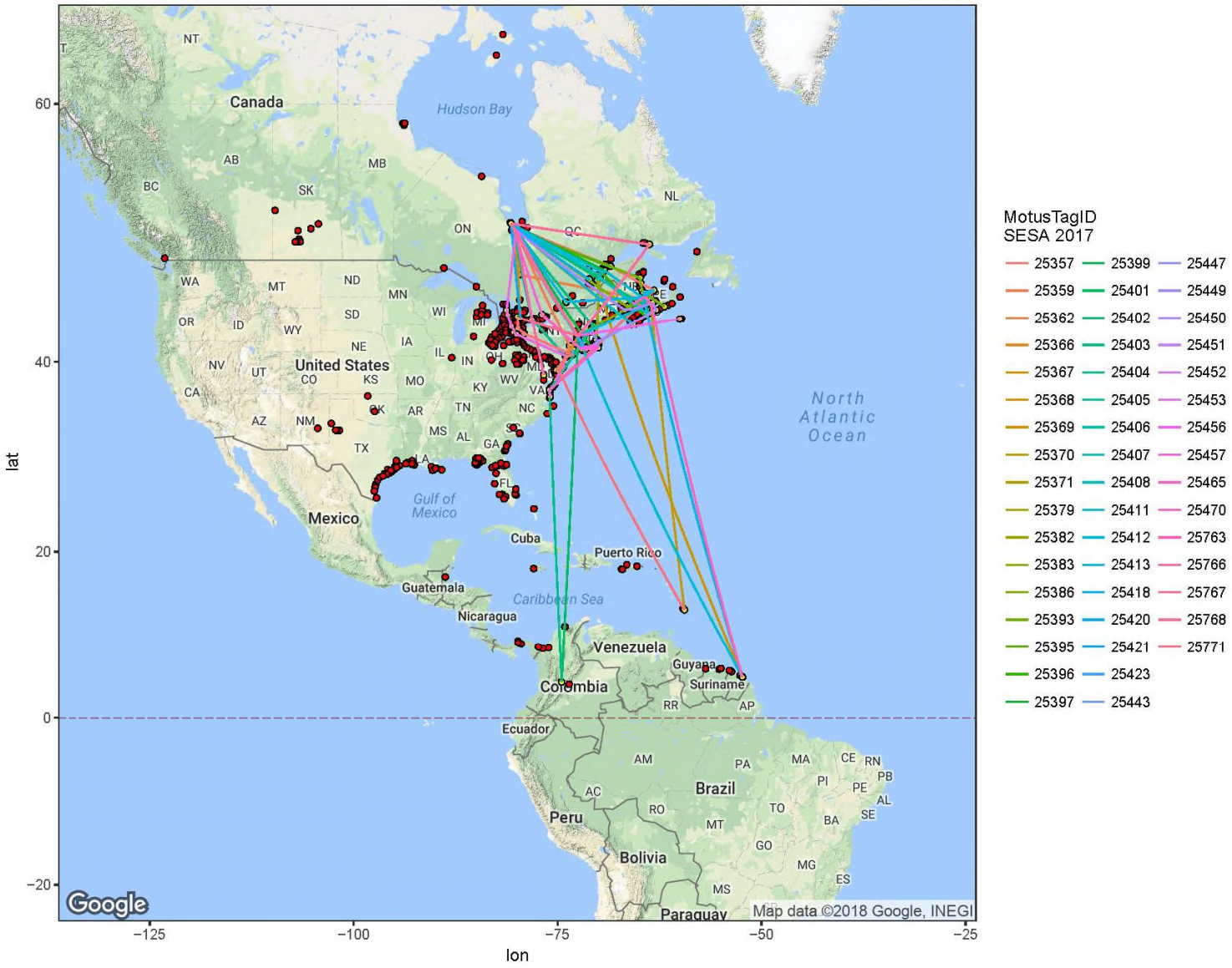


Figure 7. Movement of individually nanotagged Semipalmated Sandpipers across the Motus Network, 2017. Red dots represent active towers in the network; yellow dots represent towers where individual tags were detected.

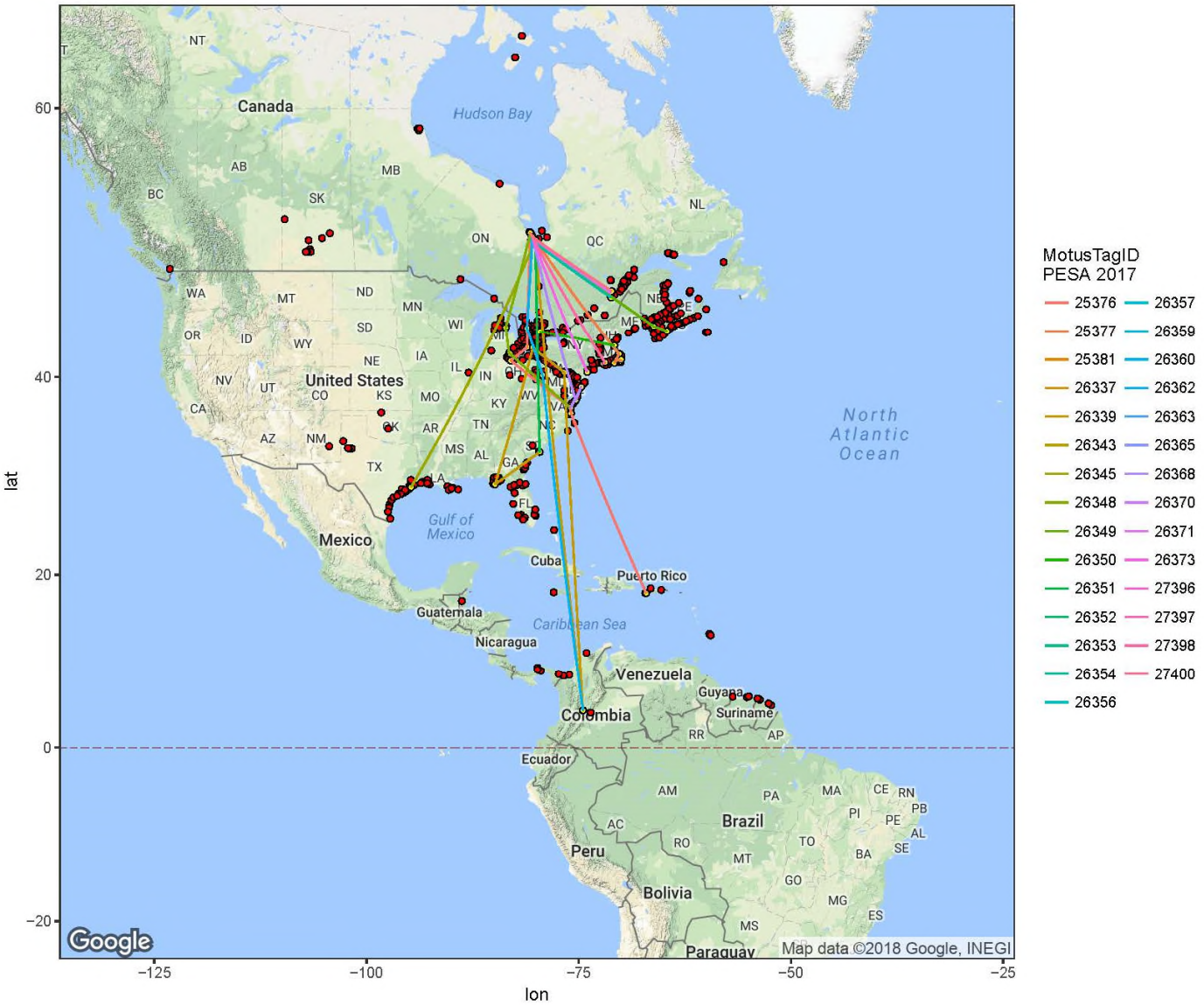


Figure 8. Movement of individually nanotagged Pectoral Sandpipers across the Motus Network, 2017. Red dots represent active towers in the network; yellow dots represent towers where individual tags were detected.

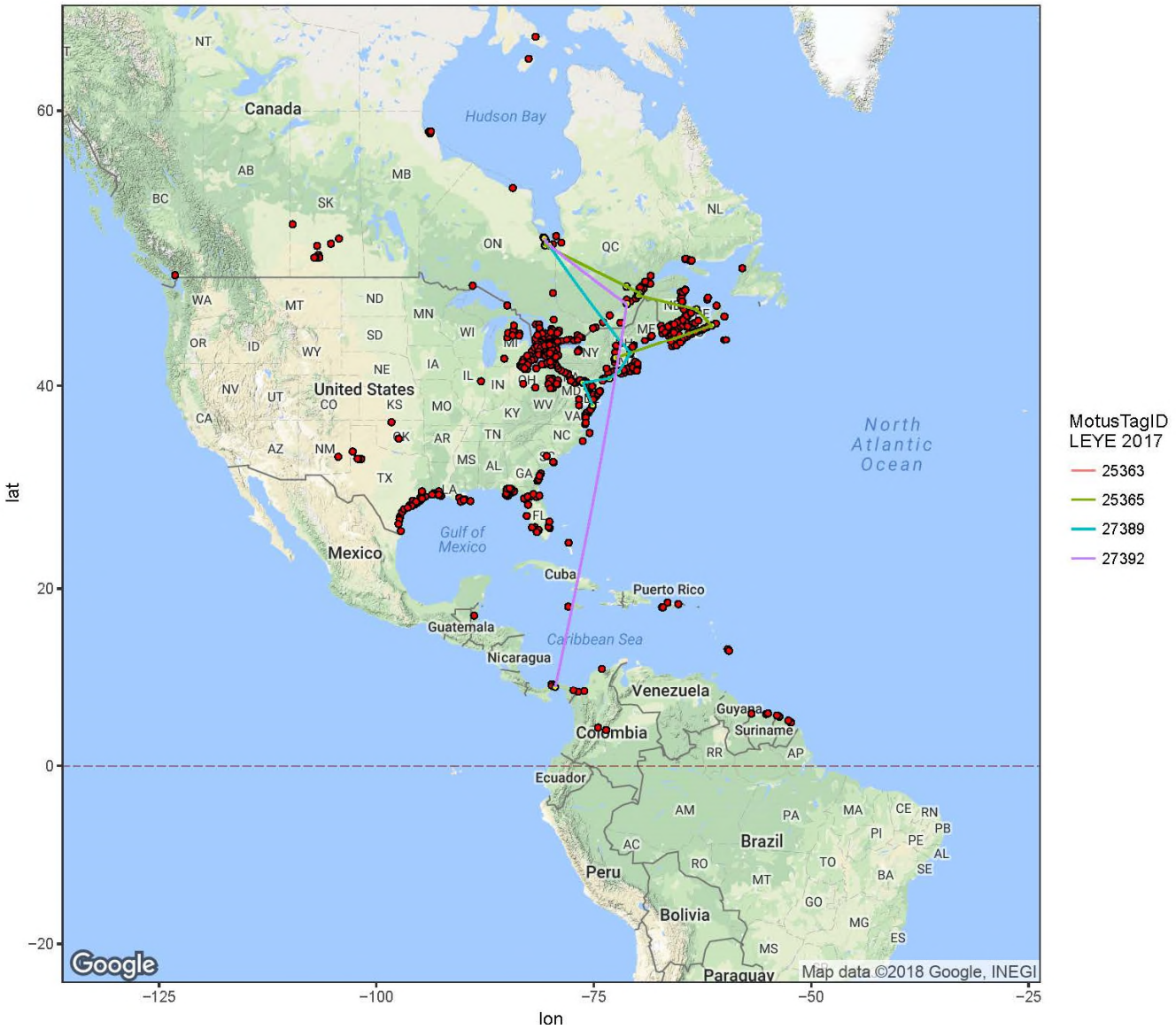


Figure 9. Movement of individually nanotagged Lesser Yellowlegs across the Motus Network, 2017. Red dots represent active towers in the network; yellow dots represent towers where individual tags were detected.

Aerial Survey

Surveys were conducted by helicopter, led by Guy Morrison and Christian Friis between 8 and 9 August 2017. They flew an OMNRF Eurocopter A Star 350 B2 covering the coast from the Quebec border in the east up to Ekwan Point to the northwest, including Akimiski Island (Figure 12). 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. Significant concentrations of shorebirds were noted between Northbluff Point and Little Piskwamish Point (sector 7; the highest concentration at over 20,000 individuals), around Chickney Channel (sector 14), and the south shore of Akimiski Island (sector 19; Figures 10 and 12). These concentrations are about half of what was recorded in 2016 (Friis 2018). Moreover, the total count across the entire survey area of under 3,000 individuals for Red Knot, represents 30% of the count made in 2016, and the total count for Hudsonian Godwit is about half of the 2016 count (Friis 2018). Conversely, the count for small shorebirds was higher in 2017 (Figure 11), resulting in a total individual count at just below the 2016 total; 105,605 and 109,190, respectively.

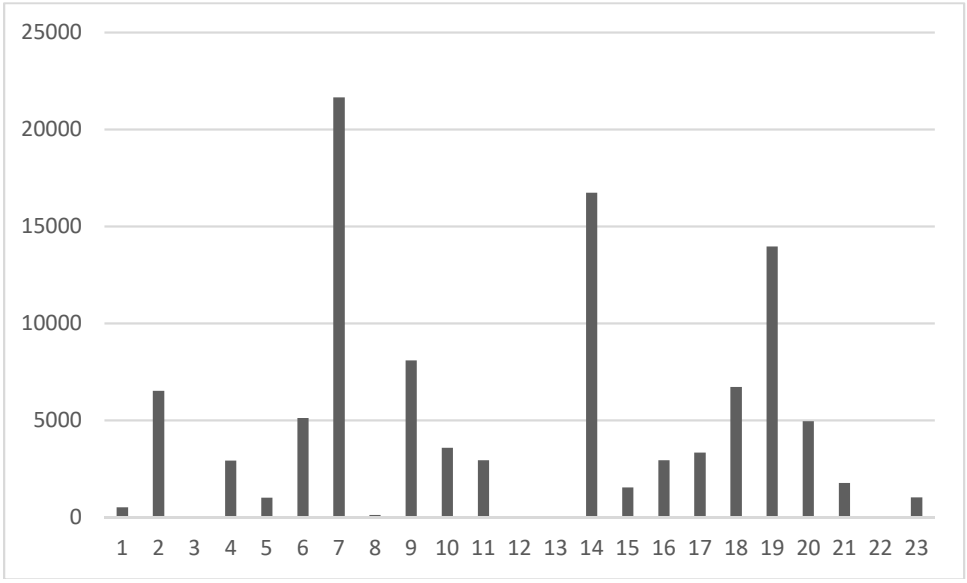
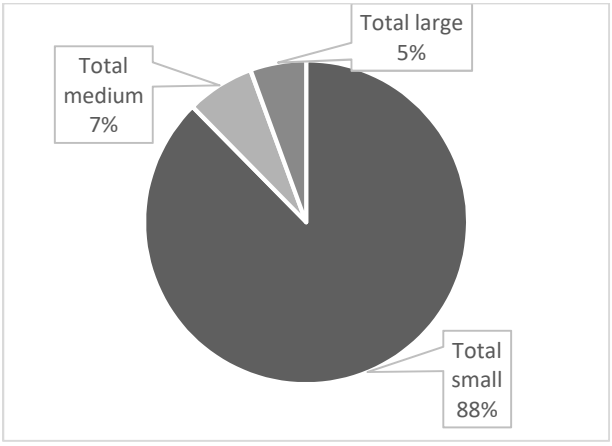


Figure 10. Total shorebird records at each sector during the James Bay coastal aerial survey from the Quebec border in the east to Ekwan Point in the northwest, including Akimiski Island 8-9 August 2017.



Size category	Species
Small shorebird	Sanderling
Small shorebird	Peep
Medium shorebird	Black-bellied Plover
Medium shorebird	Greater Yellowlegs
Medium shorebird	Lesser Yellowlegs
Medium shorebird	Greater/Lesser Yellowlegs
Medium shorebird	Ruddy Turnstone
Medium shorebird	Red Knot
Large shorebird	Whimbrel
Large shorebird	Hudsonian Godwit
Large shorebird	Marbled Godwit

Figure 11. Proportion of each shorebird size category recorded during the aerial survey, 2017. Table shows the species size-category assignments.

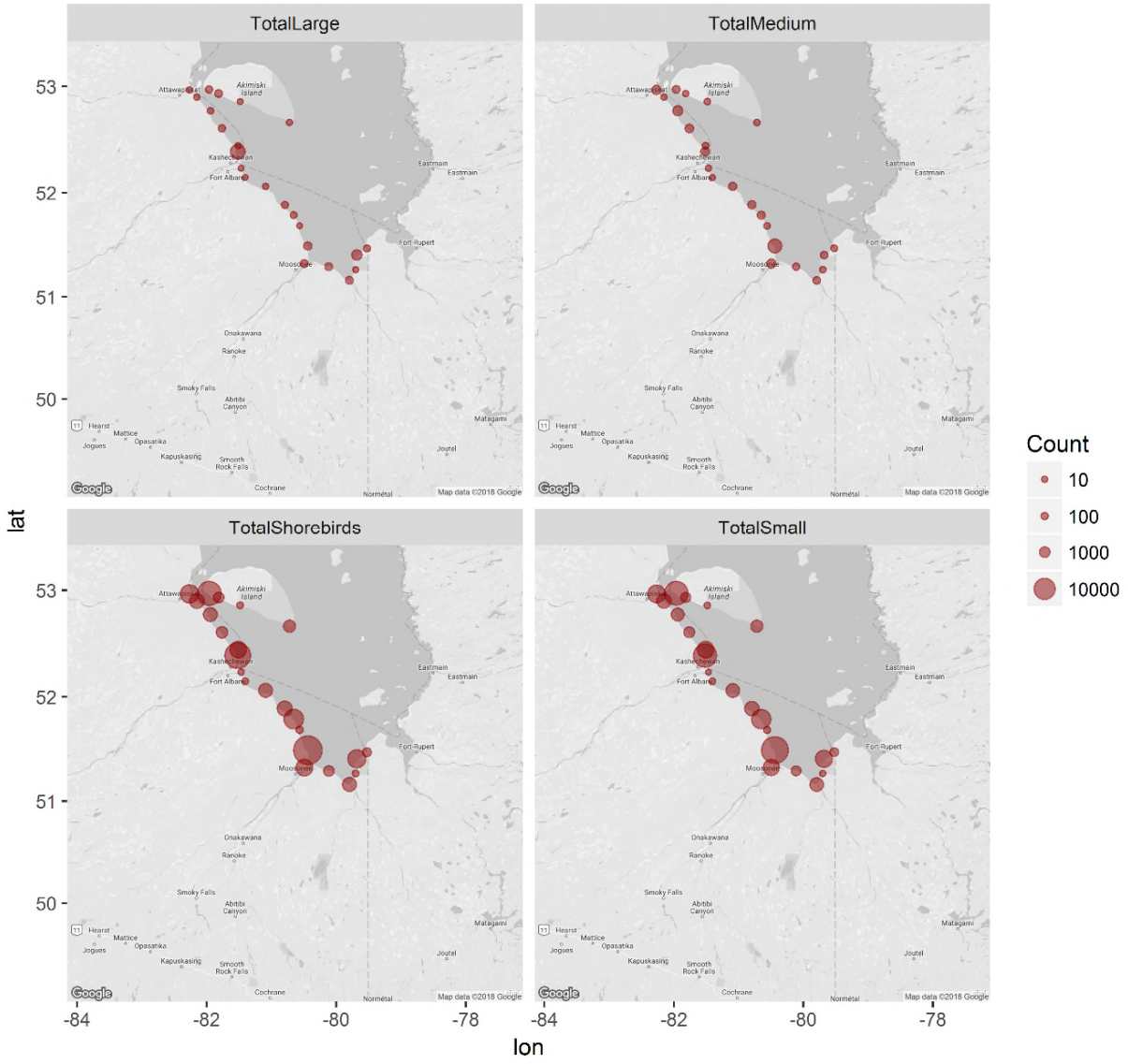


Figure 12. Counts and concentrations of size groupings of shorebird species, including sum total (TotalShorebirds) of all individual recorded during the aerial survey 8-9 August 2017.

Advances in methodology

In 2017, we continued to implement the segment survey protocol. In addition, through the efforts of Amie MacDonald (Trent University MSc. candidate), we bolstered the flag resighting effort, with dedicated surveyors at each camp following standardized protocol. The results of the flag resighting work will be used to determine a super-population of Red Knot, following Lyons et al. (2016).

Future Plans

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 will continue daily monitoring of shorebirds on the ground. In addition, we will 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 will continue invertebrate sampling and collecting tissue and fecal samples to understand the availability of key food resources for staging shorebirds. To address the objectives of estimating the length of stay of staging and the value of southern James Bay to the global Red Knot, subspecies *rufa*, population, we will increase our daily effort for flag resighting. In addition, we will 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 is available at motus.org.

Finally, analyses are underway to understand how best to approach annual surveys of staging shorebirds at sites along the western James Bay coast. Part of this work entails drafting a sampling plan, with a goal for completion of winter 2019. In the meantime, surveys either will continue in an effort to maintain annual coverage at core sites, such as Longridge Point, while gaining new or updated information from other survey locations that are new to the project or where surveyed historically.

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