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Winter Distribution and Migration Ecology of The Ipswich Sparrow in the mid-Atlantic

Year 2019 Annual Report

Background

Ipswich sparrows spend their lives on the wild edge where the Atlantic Ocean meets land. The entire population breeds on one small sandy island (the aptly named Sable Island) off the coast of Canada, and they occupy sandy coastal habitat during migration and in winter. These sparrows have evolved in this constantly changing environment, their plumage blending in perfectly with the open sand and tones of mid-winter vegetation. The dunes in which Ipswich sparrows spend their winters are susceptible to high-intensity nor'easters that strip seeds from plants and flatten or rearrange entire swaths of habitat. Heavy snow storms on the outer coast can bury most of the available seed crop. Severe cold temperatures on the northern end of their winter range likely cause some degree of facultative migration to warmer climes. Still, these birds persist, and the degree to which they have adapted to this harsh environment is nothing short of amazing.

This study is the first to examine overwintering survival of Ipswich Sparrows. This species, which is listed as a species of Special Concern in Canada and a variety of levels in the USA (COSEWIC 2009), is subject to numerous anthropogenic threats (Nickerson et al. 2007, Longcore & Smith 2013) and severe weather (Huang et al. 2017) along its known non-breeding range. Understanding the spatial and temporal patterns of Ipswich Sparrow migration is necessary before conservation actions can mitigate these threats (Runge et al. 2014).

There are few populations of songbirds that can be comprehensively studied during all phases of their life history: breeding, migration and wintering. The research adds to our knowledge of how demographic parameters in a songbird interact and influence population dynamics in this species, and as such, contribute to global understanding of the population dynamics of songbird species. Pin-pointing demographic limitations will improve management efforts throughout the range of Ipswich Sparrows, allow us to anticipate how population size may respond to altered environmental conditions, allow conservation strategies to be tailored to the specific needs of sparrows, and provide insight into mitigating any future declines. This is especially important given the susceptibility of migratory species to change (Shaw 2016).

The overarching goals of this project are to:

1) Evaluate migratory patterns of habitat corridors that Ipswich Sparrows use during winter.

2) Quantify the temporal and spatial attributes of spring migration in the Ipswich Sparrow by age and sex cohorts.

3) Determine survival of Ipswich Sparrows during breeding, spring migration, wintering, and fall migration by age cohorts. To do this, we will collect two years of radio-telemetry data from sparrows as they migrate from wintering grounds in the eastern USA (DE to NC) to Sable Island and establish a marked population of sparrows and complete resighting surveys on wintering and breeding grounds as part of a mark-recapture analysis.

After year 1, we established that Ipswich sparrow abundance was greatest in undeveloped dune habitats (Figure 1) and found neither a negative nor a positive temporal trend. Our aim for year 2 was to

determine what factors may affect abundance within natural dune habitats, determine winter mortality estimates with a mark-recapture analysis, and gather more migration route data through the Motus Wildlife Tracking System.

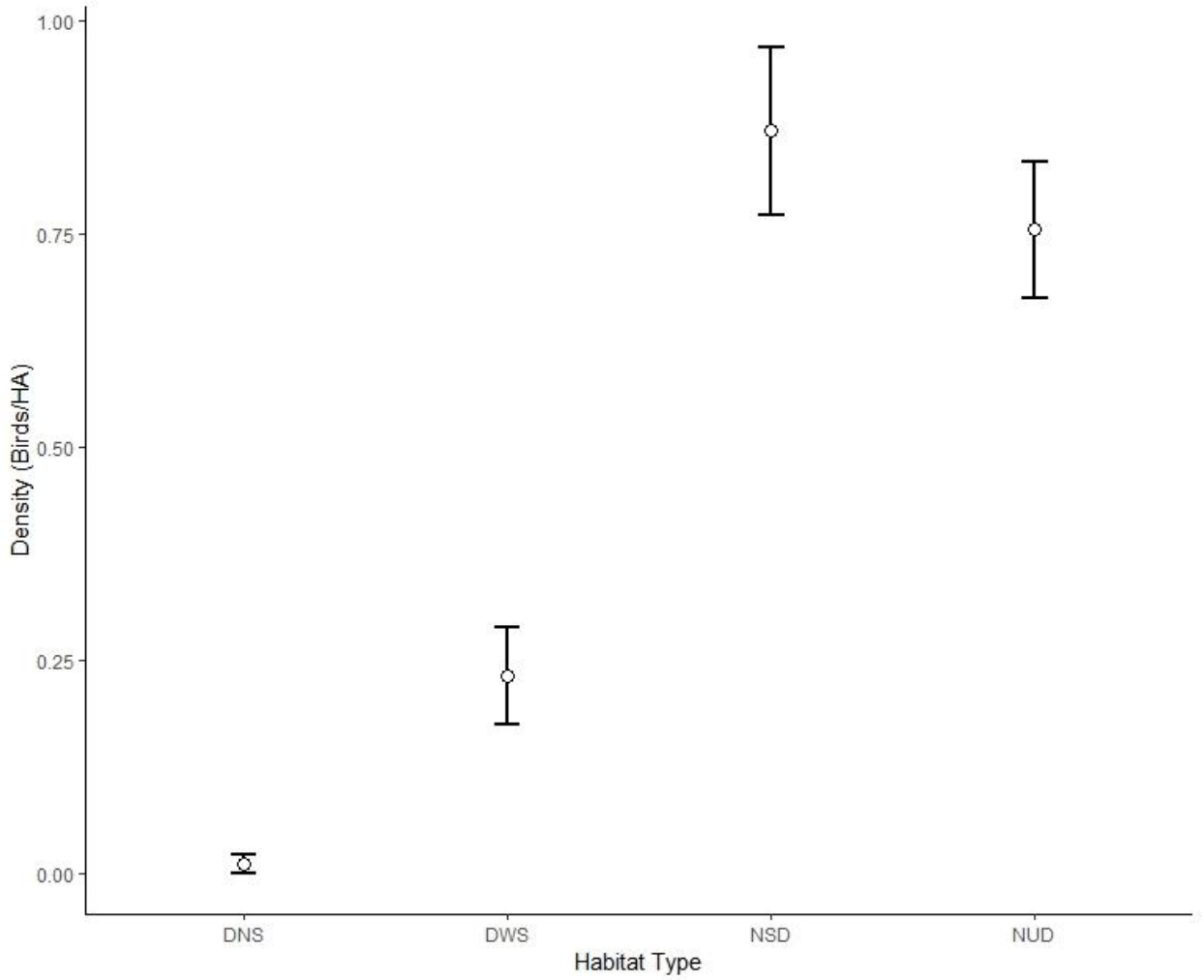

Figure 1. Plot depicting predicted density (birds per hectare) of Ipswich Sparrows observed at different habitat types; developed dune with no setback (DNS), developed dune with setback (DWS), natural stable dune (NSD), and natural unstable dune (NUD) during the 2017-2018 winiter.

Methods

Line Transect Surveys – Observers walked 1 km transects along uniform sections of habitat searching for sparrows. When a sparrow was located, the observer took a GPS location, estimated distance (m) to bird (with a digital rangefinder), and estimated the displacement angle of the bird from the transect line (with a compass). Observers also quantified vegetation along transects by counting and identifying all stems to species (when possible) in 20 randomly generated 0.52 m^2 circular plots.

Capturing – Sparrows were captured using sets of portable Japanese mist nets that were set up and taken down to target specific birds within trapping sites. Once captured, sparrows were banded with a standard USGS tarsal band and a unique combination of color bands. Morphometric measurements that were taken included: wing chord (mm), tail length (mm), culmen length (0.1 mm), tarsus length (0.1 mm), and mass (0.1 g). Age (hatching year, second year, after-hatching year) was determined using a combination of skull pneumatization, iris color, and molt limits. We also took a small blood sample to analyze for sex determination. We also attached 0.68 g coded nanotags to a subset of birds to track along their spring migration.

For survival analyses, we visited eight capture sites three times throughout the 2018-2019 winter. These capture windows were: Dec 12 – Jan 16, Jan 17 – Feb 21, and Feb 22 – Mar 14. During these capture events, we searched dune habitat and captured and/or resighted (previously banded) Ipswich sparrows when observed.

All statistical analyses were performed in program R using the packages 'marked' for transect data and 'unmarked' for capture-recapture data.

Survey Results

We observed 51 Ipswich Sparrows along 10 total km of transects from North Carolina to Delaware (Figure 2). Generally, sparrow abundance was positively associated with forb cover. (Figure 2).

The two survey locations at Assateague Island National Seashore, NUD 07 and NUD 08, accounted for 4 and 8 Ipswich Sparrows, respectively.

The two survey locations at Chincoteague NWR, NSD 14 and NDP 03 accounted for 6 and 7 Ipswich Sparrows, respectively.

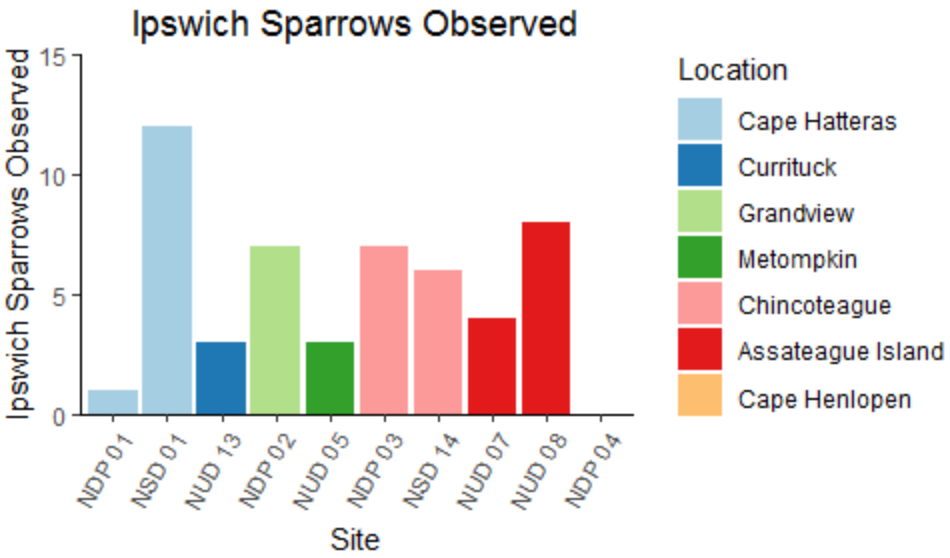

Figure 2. Barplot depicting total number of Ipswich Sparrows observed at each transect during the 2018-2019 winter. Transects are arranged by South to North.

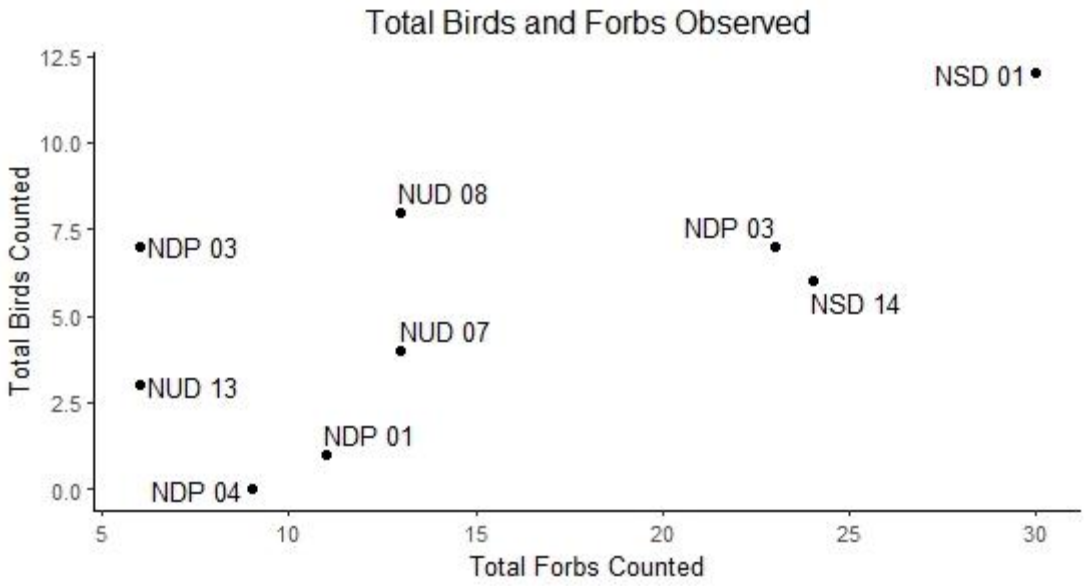

Figure 3. Plot depicting counts of Ipswich sparrows and forbs counted in vegetation plots at each site during the 2018-2019 winter.

Capture Results

We captured all birds from 6 Dec 2018 to 14 Mar 2019 and 53.4% of the birds we captured were male. We applied transmitters to 69 of 214 newly or previously banded and recaptured Ipswich Sparrows. We recaptured six birds originally banded on breeding grounds at Sable Island, Nova Scotia and one bird that we banded during the 2017-2018 winter. We also resighted two additional birds banded on Sable Island and two additional birds that we banded during the 2017-2018 winter. One sparrow moved from Wild Beach (NSD 14) to Tom's Cove (NDP 03) during the season. Apparent survival during the study

period was approximately 0.84 (SE ± 0.10) and the likelihood of recapturing and/or resighting individual birds was 0.46 (SE ± 0.08). Dr. Phil Taylor (Acadia Univeristy) and Sydney Bliss (Dalhousie University) are currently analyzing the migration data.

Table 1. Locations where we captured birds and applied transmitters.

State	Location	Birds Captured	Transmitters Attached
North Carolina	Cape Hatteras NS	30	8
	Currituck NWR	13	0
Virginia	Chincoteague NWR	41	10
	Grandview Island	30	0
Maryland	Assateague NS	69	39
Delaware	Delaware Seashore SP	5	5
	Cape Henlopen SP	26	7

Discussion/Future Direction

The National Seashores play a crucial role in preserving this species winter habitat and the National Park Service has agreed to fund one additional year of this project. Ipswich densities and winter survival was relatively high at Assateague Island. However, densities were also high in other National Parks lands, like North Carolina's Cape Hatteras NS, despite reportedly being ancillary habitat in the 1970s (Stobo and McLaren 1971). Loss of habitat to coastal development in the last 50 years, climate change, and Ipswich sparrow population increase could all factor into this change. Next year we plan to expand activities as far north as Massachusetts beyond the northern limit of Ipswich core winter population described by Stobo and McLaren (1971) to determine if birds are shifting south or simply expanding beyond historic range limits. Line transects will continue to be surveyed at our long-term sites to better learn about annual changes in winter density, site fidelity throughout the bird's winter range, and how beach grass plantings effect Ipswich sparrow densities. We will continue collecting survival data via capture/recapture methods to determine whether year-to-year mortality is stable, though this portion will be limited to three locations in 2019-2020 (Cape Hatteras NS, Assateague Island, and Grandview Nature Preserve). We will also attach transmitters to sparrows at Assateague Island to determine fine-scale habitat use and gather more spring migratory data.

Acknowledgements

The 2018-2019 winter work was conducted with the help of many partners, land managers, and funding agencies, including the National Park Service, U.S. Fish & Wildlife Service, Dalhousie University, Acadia University, Delaware State Parks (Cape Henlopen, Delaware Seashore, and Fenwick Island), Delaware Department of Natural Resources Division of Fish & Wildlife, Virginia Department of Conservation and Recreation, The Nature Conservancy, Maryland Department of Natural Resources, Virginia Department of Game and Inland Fisheries, the North Carolina National Estuarine Research Reserve, and the North Carolina Wildlife Resources Commission. Zak Poulton, Nick Newbury, and Courtney Check all contributed significant volunteer time and effort in support of this study.

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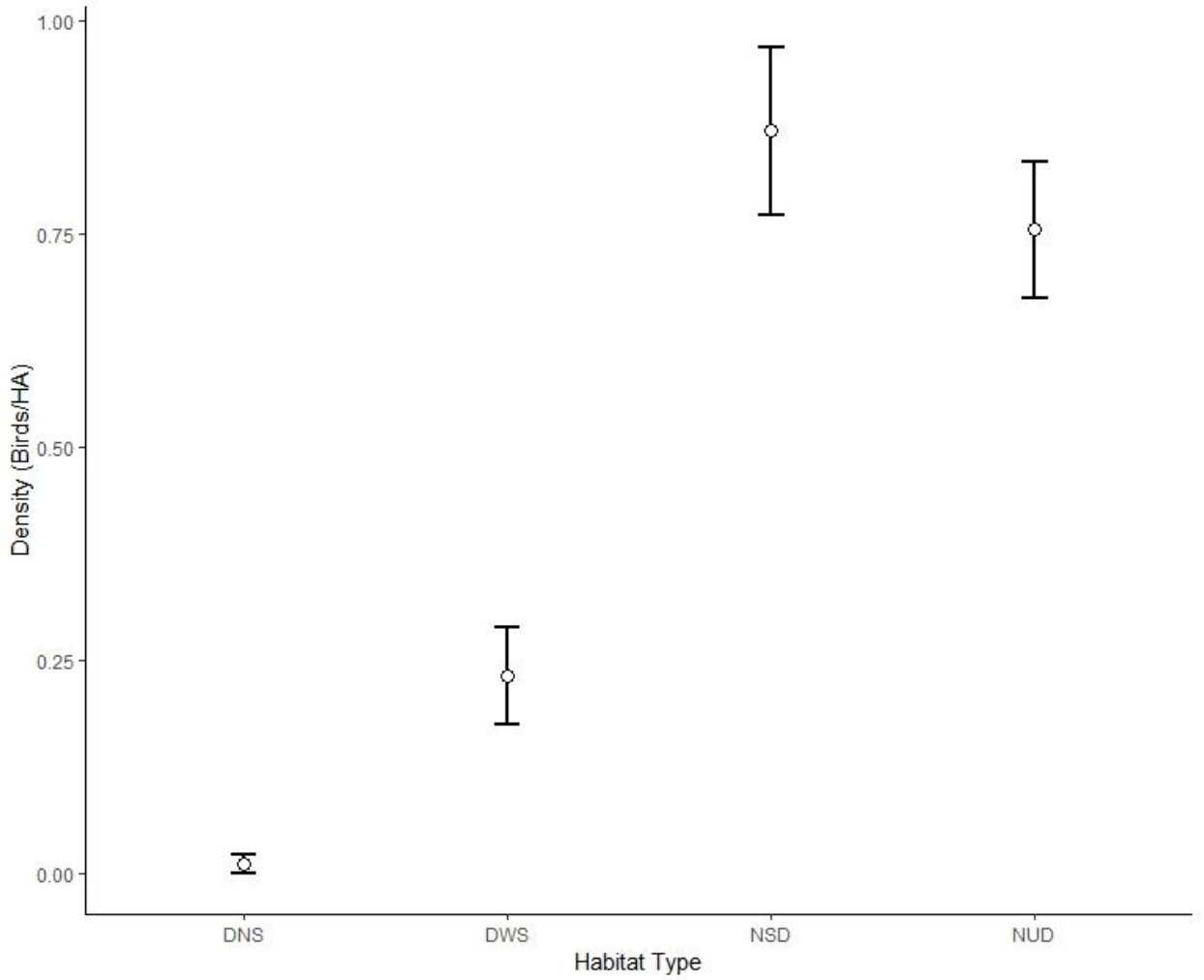

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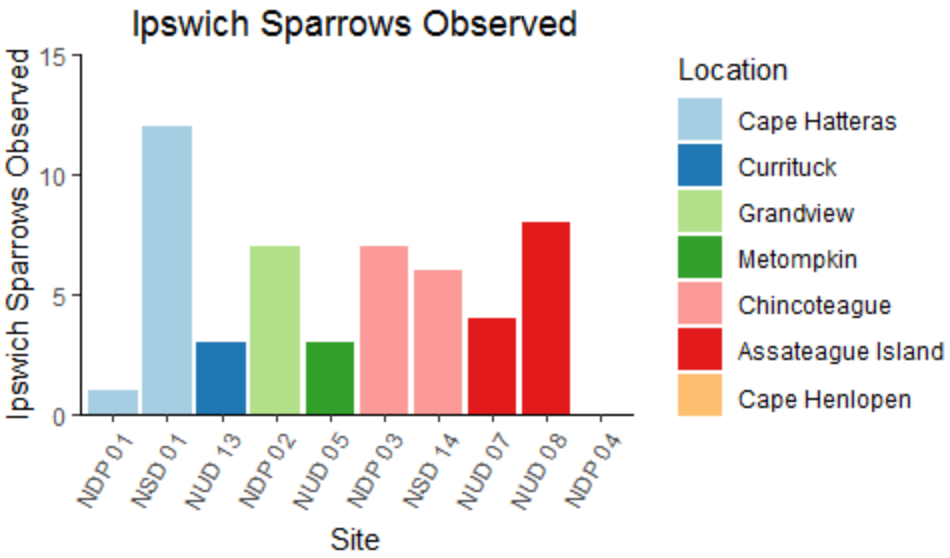

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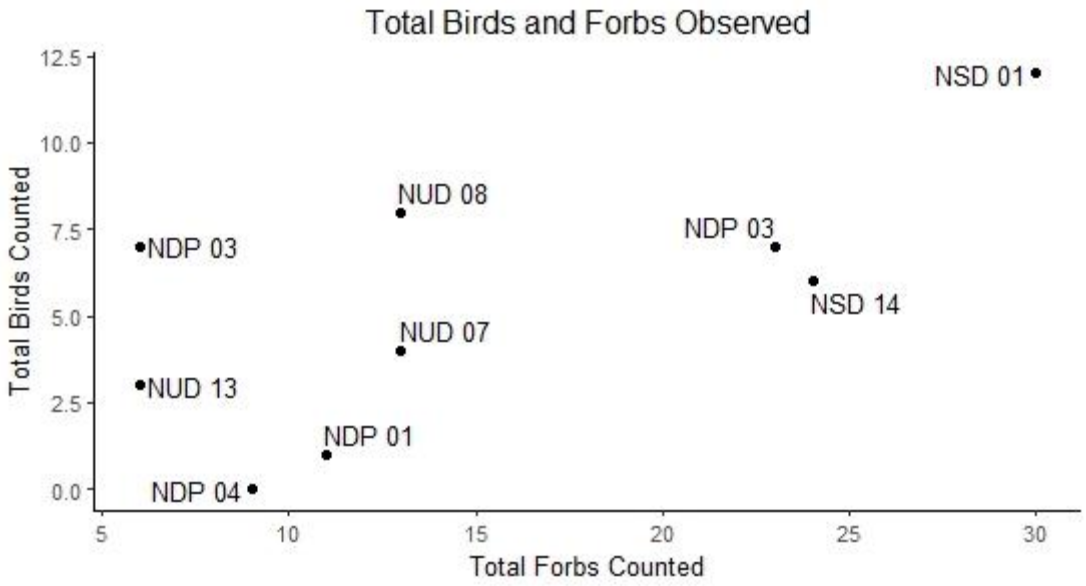

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