Sea Duck Joint Venture
Annual Project Summary
FY23 (October 1, 2022 – September 30, 2023)

Project Title Estimating sea duck productivity in eastern North America using a photographic survey

Principal Investigators

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Project Description:

Sea duck demography is difficult to study because their breeding and non-breeding range is challenging to access and/or work in. Recent population modeling (Koneff et al. 2017) has identified specific demographic parameters that are most sensitive to harvest, hence improving management and providing a sustainable recreational opportunity. Increased knowledge about annual productivity (i.e., juvenile:adult ratios) is thought to greatly improve estimates of harvest potential. Most biologists can identify and correctly assign sea ducks to an age class and sex based on plumage characteristics when a bird is in hand. However, capturing a representative number of birds to make this assessment is costly and difficult. A promising and cost effective alternative is using photos of sea ducks from winter to assign birds to the correct age and sex cohorts, by species. Age ratios (juveniles:adults) obtained from photos, can then be used to inform population models, identify factors that influence breeding success, and examine spatial distribution of age and sex classes.

We propose to collect, analyze, then use ground-based photographs of sea ducks to classify age and sex cohort in eastern North America for black scoter (Melanitta americana), surf scoter (M. perspicillata), white-winged scoter (M. deglandi), and long-tailed duck (Clangula hyemalis). Our goal is to produce annual productivity estimates for all four species at the eastern North America scale, focused on critical geographies of the Atlantic coast and the Great Lakes. We have conducted this survey in the Atlantic Flyway, along the Atlantic coast, the previous two years (winters of 2018/19 and 2019/20) but the survey has been limited with respect to availability of

field staff time, access to high-quality camera equipment, and data processing time. Nonetheless, we have amassed enough photos and data points to summarize pilot data which has been presented in a report (see results of pilot; additional data upon request). We propose to expand the spatial extent of the survey, and data collection within the current extent, through the addition of personnel resources. The addition of a dedicated project coordinator (MS student) will add capabilities to organize photo collection among a larger group of participants within current partner states and the addition of new states and provinces, particularly the Great Lakes area. We propose a two-year project that will be able to continue the time-series, expand spatial coverage, and analyze results of the entire time-series of sea duck productivity in eastern North America.

Project Objectives:

1) Identify additional collaborators from states and provinces to expand our work scope to additional areas including the Great Lakes region.
2) Provide suitable equipment for active participants.
3) Improve data management.
4) Analyze annual survey results and determine factors that may influence annual productivity for our focal species.

Preliminary Results

We classified 2,098, 1,192, 3,263, and 2,653 individual birds from collected photos to age/sex cohort in 2019, 2020, 2021, and 2022, respectively (Figure 1). We achieved the desired sample size of 100 birds for calculating proportion estimates each species and year, except for white-winged scoters and long-tailed ducks in 2019 (Table 1). Mean number of classifications of each photo was 9.31 across all years. Mean classification agreement to species was high at 99% across all years (Table 2). Mean classification agreement to cohort among all cohorts was 95% for black and surf scoters (BLSC and SUSC hereafter, respectively), 93% for long-tailed ducks (LTDU), and 82% for white-winged scoters (WWSC). Among cohorts, mean classification agreement was greatest for adult males (99%), followed by brown birds (94%), juveniles (88%), and adult females (86%).

The photo for each species varied by year but was greatest for WWSC in 2020 (0.778) and least for LTDU in 2019 (0.301). White-winged scoters consistently exhibited the greatest recruitment rates, with an average WWSC Pphoto = 0.709 across all years, followed by SUSC (0.540), BLSC (0.460), and LTDU (0.422).

Paired t-test comparison revealed that photo survey P did not vary significantly ($\alpha < 0.05$) in any focal species with respect to photo sampling approach (Figure 2) or photo survey methodology (Figure 3). LTDU P did not differ significantly ($\alpha < 0.05$) across survey regions.

we obtained 1,235 focal species harvest records from the PCS in 2019-2022; we used 684 records of juveniles and adult females to calculate Ppcs for each year (Table 1). The power

analysis indicated a minimum PCS sample size of $n > 22$ would be necessary to detect differences between Ppcs and Pphoto. Sample sizes of all four focal species in 2022 and surf scoters in 2021 fell short of the minimum threshold; we excluded these Ppcs estimates from PCS-photo survey t-tests and V calculations.

Ppcs was significantly greater ($p < 0.05$) than Pphoto in all four focal species, and greater in all years (Figure 5). we subsequently derived estimates of V for each species (Table 3).

Figures 1 and 5 below; see J. Hewitt thesis for all tables and figures

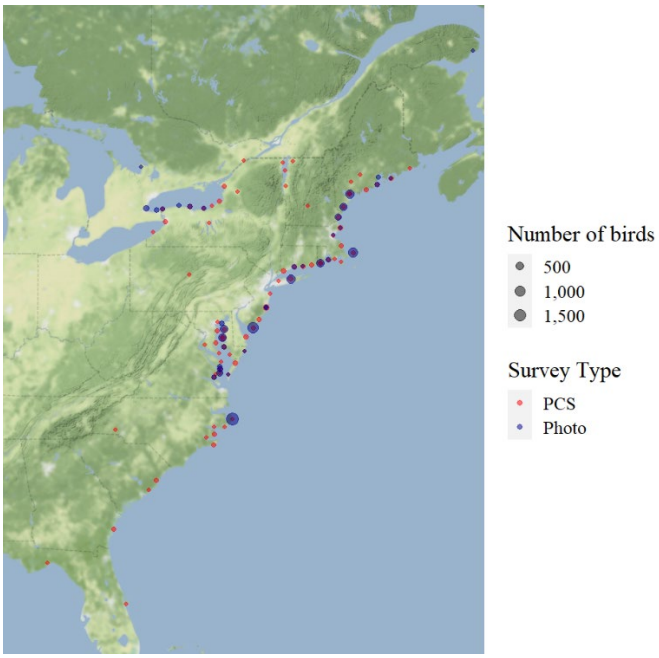

Figure 1: Locations and sample sizes of photo survey photos (blue dots) and parts collection hunter harvest survey (PCS) wings (red dots) of Atlantic Flyway sea ducks from 2019-2022. Counts at each location were aggregated at the county level.

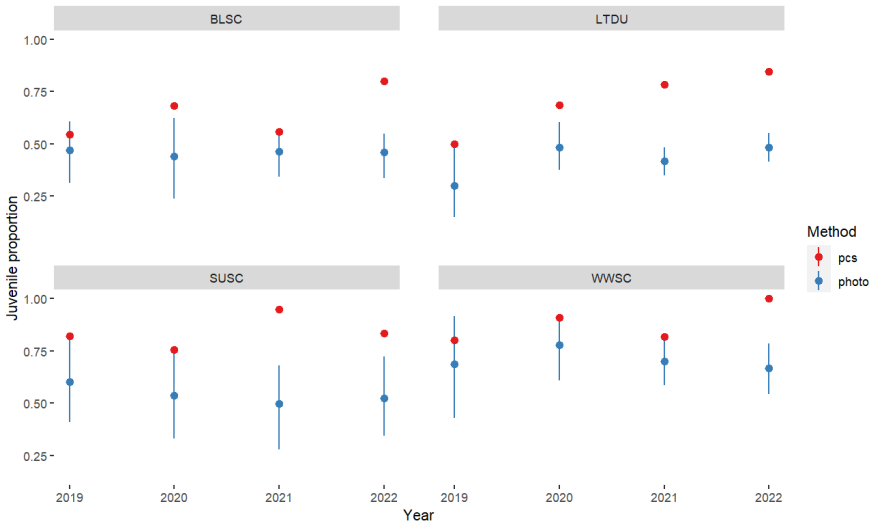

Figure 5: Estimates of photo (Pphoto) and parts collection survey (Ppcs) Atlantic Flyway juvenile proportions in long-tailed ducks (LTDU) and black (BLSC), surf (SUSC), and white-winged scoter (WWSC) populations in 2019-2022 with associated 95% credible intervals (photo survey only).

Project Status

1) Identify additional collaborators from states and provinces to expand our work scope to additional areas including the Great Lakes region. **(Completed)**
2) Provide suitable equipment for active participants. **(Completed)**
3) Improve data management. **(Completed)**
4) Analyze annual survey results and determine factors that may influence annual productivity for our focal species. **(Completed)**

Project Funding Sources (US$). Complete only if funded by SDJV in FY23. This is used to document: 1) how SDJV-appropriated funds are matched, and 2) how much partner resources are going into sea duck work. You may include approximate dollar value of in-kind contributions in costs. Add rows as needed for additional partners.

(NOTE: All funding source data were reported in previous fiscal years.)

SDJV (USFWS) Contribution	Other U.S. federal contributions	U.S. non-federal contributions	Canadian federal contributions	Canadian non-federal contributions	Source of funding (name of agency or organization)

Total Expenditures by Category (SDJV plus all partner contributions; US$). Complete only if project was funded by SDJV in FY23; total dollar amounts should match those in previous table.

ACTIVITY	BREEDING	MOLTING	MIGRATION	WINTERING	TOTAL
Banding (include only if this was a major element of study)					
Surveys (include only if this was a major element of study)					
Research					