Sea Duck Joint Venture
Annual Project Summary
FY22 (October 1, 2021 – September 30, 2022)

Summaries should not exceed 2-3 pages, if possible; photos or illustrations are encouraged. Project summaries will be posted on the SDJV website (seaduckjv.org). Please submit the completed report in MS Word format to kate_martin@fws.gov.

Project Title: Estimating sea duck fecundity and survival using age-at-death data (SDJV Project #159):

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Project Description: Reliable population indices and survival estimates for most sea duck species remain inadequately estimated. Currently, data available to evaluate scoter and long-tailed duck annual survival and longevity is limited and consists of recovery and recaptures of banded birds or use of satellite telemetry data, both with relatively small sample sizes. The initiation of larger and longer-term capture and banding efforts would provide insightful information but has its limitations due to the costs and effort required to perform sea duck banding projects and the dependency on hunters reporting banded birds.

Most scoter species are long-lived (9-18 years; Mallory 2015), and often do not begin breeding until two or three years of age. Current aging techniques (i.e., plumage, bursal measurements) for scoters can reliably age individuals up to 2-3-years of age when the entire bird is in hand (Iverson et al. 2003). Recent studies have refined a technique to safely collect a small skin sample from live birds or carcasses and, with subsequent laboratory analysis, measure a biomarker, pentosidine (Cooey et al. 2010; Cooey 2008; Fallon et al. 2006a,b). Pentosidine is a naturally occurring protein crosslink that forms in all animals, including birds, and is accumulated and stored in skin collagen throughout an individual's lifetime (Sell et al. 1996). Pentosidine concentration in skin collagen can be measured to reliably age individuals, similarly to counting growth rings on a tree. Though the relationship between pentosidine concentrations and age has been measured in a number of species, pentosidine accumulates more rapidly in short-lived bird species and at a more gradual rate in longer-lived species (Cooey 2008). Previous studies have determined pentosidine accumulates at varying rates and levels between species with various life histories (Fallon et al. 2006b), indicating a species specific, or potentially a genus specific, relationship between age and pentosidine levels is required.

The first step of the process to age sea ducks using pentosidine was completed in SDJV Project #148 that estimated the age/pentosidine curve for white-winged scoters with remarkably good fit. This quantitative relationship can be used to estimate the age of scoters that are captured or harvested. A sample of age-at-death data can be used in life table analyses to derive estimates of survival and fecundity.

Project Objectives: The primary long-term goal of this project is to obtain an estimate of fecundity and survival for the four target species. We believe the results of this project may lead to regular surveys of age-at-death data to track fecundity and survival through time, if the method proves cost-effective and there is some evidence for changing survival through time. There are two primary objectives we will pursue in the study proposal to strengthen our existing data in building a quantitative age index curve:

1) Collect additional skin biopsy samples from known-aged captive surf scoter, white-winged scoter, and long-tailed ducks. Use these skin biopsies to measure pentosidine concentrations in skin samples from known-aged individuals and build an age index curve for each species;
2) Compare the quantitative age index curve between scoter species to determine if curves are comparable and may be useful for black scoters that do not have known-age individuals available to sample.

Preliminary Results *(include maps, photos, figures/tables as appropriate):*

Project Status: This project has encountered multiple obstacles. The project was delayed during 2020, due to the COVID-19 pandemic, where field collections and captive bird sampling had to be postponed. During this delay, the laboratory manager at West Virginia University, where samples were to be analyzed, retired and the position has currently not been filled. Upon being notified of this change, we contacted the USDA National Wildlife Research Center, Mississippi Field Station, to inquire about project collaboration and their facility analyzing the samples. The USDA laboratory has experience and necessary equipment to analyze bird samples for pentosidine (Dorr et al. 2017). The USDA lab is interested in collaborations on this project and is in the process of conducting quality control/assurance procedures and securing a laboratory manager. The USDA laboratory is currently not ready to accept or analyze samples.

Captive facilities are still willing to collaborate, to collect samples from captive scoters and Long-tailed Ducks (*Clangula hyemalis*), when a collaborating lab is ready. We have also delayed collecting samples from wild hunter harvest birds until a lab is ready. Depending on the timing of a collaborative lab's ability to receive and analyze samples, sampling of captive and hunter harvest birds could happen as early as fall 2023 and winter 2023/2024.

Project Funding Sources (US$). Complete only if funded by SDJV in FY22. 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.

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)
$24,478					SDJV
	$3,500				USGS
	$3,000				USFWS
		$6,048			BRI
		$12,500			WVU

Total Expenditures by Category (SDJV plus all partner contributions; US$). Complete only if project was funded by SDJV in FY22; 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					**$49,526**

Literature Cited:

Cooey, C.K. 2008. Development and evaluation of a minimally invasive sampling technique to estimate the age of living birds. Ms. Thesis, University of West Virginia, Morgantown. 163pp.

Cooey, C.K., J.A. Fallon, M.L. Avery, J.T. Anderson, E.A. Falkenstein, H. Klandorf. 2010. Refinement of biomarker pentosidine methodology for use on aging birds. Human-Wildlife Interactions 4(2):304-314.

Deevey, E.S. 1947. Life Tables for Natural Populations of Animals. The Quarterly Review of Biology 22:283-314.

Dorr, B.S., R.S. Stahl, K.C. Hanson-Dorr, and C.A. Furcolow. 2017. Using pentosidine and hydroxyproline to predict age and sex in an avian species. Ecology and Evolution, 7:8999-9005.

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Fallon, J.A., R.L. Cochrane, B. Dorr, H. Klandorf. 2006b. Interspecies comparison of pentosidine accumulation and its correlation with age in birds. The Auk 123(3):870-876.

Mallory, M.L. 2015. Site fidelity, breeding habitats, and the reproductive strategies of sea ducks. Pp.337-364 in J.-P.L. Savard, D.V. Derksen, D. Esler, and J.M. Eadie (editors). Ecology andconservation of North American sea ducks. Studies in Avian Biology (no. 46), CRC Press, Boca Raton, FL.

Sell, D.R., M.A. Lane, W.A. Johnson, E.J. Masoro, O.B. Mock, K.M. Reiser, J.F. Fogarty, R.G. Cutler, D.K. Ingram, G.S. Roth, and V.M. Monnier. 1996. Longevity and the genetic determination of collagen glycoxidation kinetics in mammalian senescence. Proceedings of the National Academy of Sciences USA 93:485-490.