Sea Duck Joint Venture
Annual Project Report
FY25 (Oct 1, 2024 – Sept 30, 2025)

Project Title: SDJV Project #180 Evaluating the Pathogenesis of Avian Influenza Virus in Priority Seaducks (Common Eider, Surf Scoter)

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Project Description:

While avian influenza viruses (AIVs) have long circulated in wild waterfowl and gulls, previous efforts have demonstrated that sea duck species traditionally express low rates of active infections but high antibody prevalence suggesting that such viruses pose little threat to these species. However, the emergence of a new strain of highly pathogenic avian influenza (HPAI), belonging to H5N1 clade 2.3.4.4b, in 2020 dramatically changed the disease dynamics for wild birds, including sea ducks, with large scale mortalities observed in species such as Common Eiders, Bufflehead, and Common Merganser. Despite these mortalities, studies that elucidate minimum viral loads for infection, clinical effects, virus shedding and duration, and ability for

different species to transmit disease is widely unknown beyond for some focal dabbling duck species.

To address these data gaps and help managers assess population level risks given the recurrent nature of the ongoing HPAI outbreak, our team is working to incorporate Common Eiders and Surf Scoters into HPAI Challenge Studies. This effort will produce at least two scientific manuscripts (one per species) that will be published in the literature as well as presented at one or more scientific meetings. Additionally, upon completion, all results will be shared publicly through a data release.

Project Objectives:

The overarching goal of this project is to improve our understanding of how avian influenza viruses impact sea ducks and to help understand the potential conservation implications of the current outbreak on this species. We aim to build capacity with a collaborating laboratory through this effort, focusing initially on Surf Scoters and Common Eiders, developing a framework for continued work with additional species. This goal can be broken down into three objectives focused on this initial phase of research:

Objective 1 – Build capacity at St. Jude Children's Research Hospital to conduct challenge studies for sea duck species through sharing husbandry expertise developed by the USGS EESC seaduck colony animal care team. This objective leverages the long-standing challenge study facilities already in place for poultry and dabbling ducks at St. Jude as well as the experience in husbandry and challenge studies for sea duck species available from staff at USGS EESC.

Objective 2 – Characterize the pathogenicity of relevant HPAI viral strains in Surf Scoters and Common Eiders. Specifically, we aim to identify infectious dose, viral shedding rates, mortality rates, and capacity to transmit virus between individuals. Additional aspects such as age-based differences in pathogenicity will be explored as viable based on number of available ducks.

Objective 3 – Incorporate emerging techniques, including transcriptomics and metatranscriptomics, to respectively inform host gene expression and host microbial function and composition into the design of the challenge study. This will allow exploration of potential mechanisms to identify immune response prediction in wild birds and an understanding of unrecognized sub-lethal impacts.

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

Duck Husbandry

We had initially planned to treat the FY25 breeding season as a pilot year for production of Common Eider chicks while we worked through difficulties in timing, initial egg fostering, and incubation for this species. We were able to successfully hatch 13 Common Eider chicks (Figure 1) and have proceeded with two challenge studies in year 1 instead of the planned single study on Surf Scoter.

As expected, Surf Scoter husbandry was successful yielding 15 chicks.

Figure 1. Juvenile Common Eiders shortly after hatching at our captive colony.

Experimental Results

As of September 2025, we have successfully completed the egg production and BSL-3 components of the challenge studies with 13 Common Eider and 15 Surf Scoter. Data analysis is ongoing, and initial mortality curves have been generated (Figure 2). Note that while SDJV funds were not used to conduct a challenge with Mallards, a common HPAI host, such a study was independently conducted to provide a comparison point to these diving duck species. A similar leveraged effort to provide further context to our findings is planned for November with Lesser Scaup, a species that has baseline study on earlier HPAI lineages.

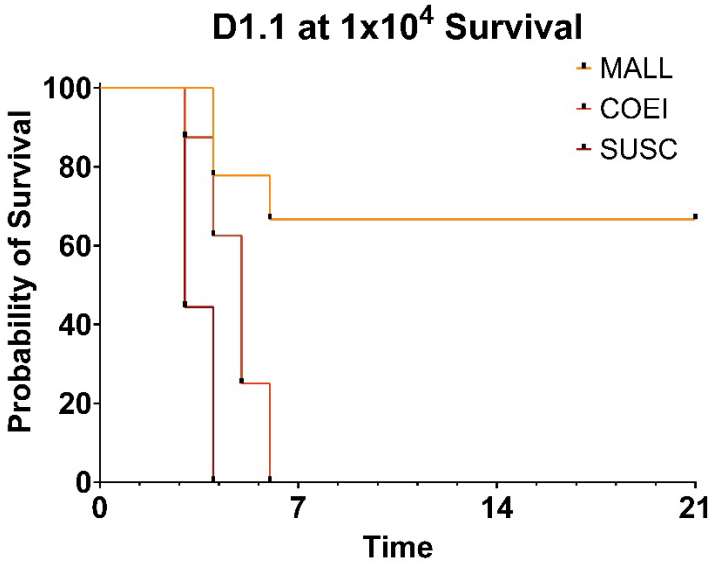

Figure 2. The time to mortality for juvenile Common Eiders, Surf Scoters, and Mallards infected with HPAI (2.3.4.4b H5N1 genotype D1.1) at approximately 8 weeks of age. (This information is preliminary and is subject to revision. It is being provided to meet the need for timely best science. The information is provided on the condition that neither the U.S. Geological Survey nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the information.)

Project Status *(e.g., did you accomplish objectives, encounter any obstacles, what are your future plans)*:

We are on schedule for this project, having completed two challenge studies. In FY26 we intend to analyze data collected to date for the common eider and surf scoter studies, submit at least 2 publications, and provide professional development opportunities for the early career scientists to share our results. We will have a cross collaborator (USGS, St. Jude, UMassBoston, URI) meeting to work through the challenge study findings and advance the preliminary transcriptomic techniques, including potential avenues for linking with field-driven wild bird data. We will also explore the potential to test theories regarding exposure routes (e.g., bivalves, water) for these species which would provide valuable links between direct AIV transmission to the avian hosts and indirect / environmental transmission – an important route that is understudied. Finally, given the husbandry advances accomplished at the colony in FY25, EESC has produced lesser scaup chicks that can be provided for AIV cross-lineage challenge study (ie, to compare infection outcomes in this species to exposure to earlier strains). Chicks will be transported to St. Jude in November following their annual lab shutdown and cleaning and enter challenge study later that month.

Despite multiple unanticipated obstacles to the in-kind contributions for the federal leads (EESC) in FY25, we have not only kept to our targets but produced more than we had outlined in year one of this proposal.

Project Funding Sources (US$). 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)
$66,795					Sea Duck Joint Venture
	$136,493				USGS EESC
		$54,837			St. Jude Children's Research Hospital
		$28,232			University of Massachusetts-Boston
		$19,668			University of Rhode Island

Total Expenditures by Category (SDJV plus all partner contributions; US$). Complete only if project was funded by SDJV in FY24; total dollar amounts should match those in previous table.

NA – Funded in FY 25