

## Sea Duck Joint Venture

### Annual Project Summary for Endorsed Projects

FY 2004 – (October 1, 2003 to September 30, 2004)

**Project Title:** No. 47: Cross-Seasonal Resource Use and Selenium Levels in Boreal Breeding White-winged Scoters (*Melanitta fusca*)

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#### **Project Description (issue being addressed, location, general methodology):**

Scoters have declined by *c.a.* 58% since the late 1970s based on May Waterfowl Breeding Population Surveys (WBPS), with most of that decline being driven by changes to the Northwest Territories (NT) populations. Reasons for the decline are unknown and an important step towards conserving these birds is to better understand potential cross-seasonal effects on reproduction, which would allow us to put into perspective historic and future habitat change in different parts of their range. The source of reproductive nutrients is one such potential cross-seasonal issue. Scoters fatten substantially on herring spawn in late winter and early spring, presumably in preparation for migration and egg laying. The allocation of these marine based reserves, relative to nutrients acquired on freshwater systems to egg production is unknown. As well, contaminants, such as Selenium (Se) may be acquired during wintering and migration, their physiological effects might not be fully observed until they reach the breeding grounds because egg viability is most sensitive to Se contamination.

We collected pre-nesting White-winged Scoters from the Lower Mackenzie River Basin to assess body condition, reproductive status, and Se levels, and determine the source of lipids for egg laying. As well, we took lipid biopsy samples from spring staging (pacific coast) and pre-nesting scoters captured with floating mist nests, and collected food samples from both marine and fresh water systems. Eggs were also collected from breeding grounds in Alaska (AK) and Saskatchewan (SK). Isotopic and fatty acid signatures of pre-nesting lipids and egg lipids will be compared to signatures of staging lipids and food sources.

Hepatic Se and Mercury (Hg) levels will be compared to those found in Lesser Scaup and Ring-necked Ducks. These other species offer a good contrast because scaup (both species combined) have also declined at alarming rates similar to scoters through their boreal breeding grounds, while ring-necked ducks have been stable or increasing and both these species have minimal spatial overlap with scoters outside the breeding season. As well, continental scaup and scoter populations have shown remarkable correlation over the past 25 years ( $r = 0.87$ ), and spatial population trend analyses suggest that they share limiting factors in the NT, their core breeding area. Se contamination is considered a potential cause of scaup declines. Hg levels are also determined due to the possible interaction of Se and Hg *in vivo*.

Finally, we will attempt to delineate likely large scale (e.g. Pacific Coast vs. Atlantic Coast) wintering origins of the birds collected on the breeding grounds based on isotopic signatures of head feathers to test for regional differences in arrival body mass, sources of reproductive lipids, and levels of Se.

**Objectives (*should identify how the project addresses SDJV priorities*):**

- 1) Determine the relative contributions of food sources from wintering (marine-derived) and breeding areas (freshwater) to reproduction at AK, NT, and SK breeding areas.
- 2) Measure selenium levels in scoters arriving on breeding areas, and assess the relationship between contaminant loads, breeding status, and body condition.
- 3) Document the wintering locations of birds breeding in the northern boreal forest, and determine whether these explain variation in nutrient acquisition strategies or contaminant levels.

**Preliminary Results:**

We collected 50 White-winged Scoters on the breeding grounds and obtained lipid samples from about 40 additional pre-breeding female scoters. Birds returned in very poor condition, which made lipid biopsies very difficult. [Need to expand this to include other sampling]

Body condition analyses of birds collected on their breeding grounds in 2003 are approaching completion and processing of 2004 birds has commenced. Fat samples collected from breeding birds in 2004 were recently sent to Eric Anderson for fatty acid analysis.

To establish tissue signatures derived from marine prey, fat and blood samples were collected from over 280 White-winged scoters during winter (late December) and multiple spring (late February to early May) periods in 2002-04 combined in the Strait of Georgia. Additional tissue samples were collected in Puget Sound, and seasonal collections of important prey items of scoters (e.g., bivalves, crustaceans, spawn) were completed in multiple areas throughout Puget Sound and the Strait of Georgia. Preliminary data for (1) stable isotopes in blood samples have been completed, and (2) fatty acids in fat samples have been sent to Dalhousie University for final analyses.

Results from liver samples of 2003 birds show normal levels of Se in most female Lesser Scaup and Ring-necked Ducks, but potentially elevated levels in female White-winged Scoters (Figure 1). The level observed in scoters was equivalent to the level of Se found in dabblers at Kesterson National Wildlife Refuge where reproductive

performance was impaired. These data suggest that Se is not likely to have an effect on the reproductive success of the scaup and Ring-necked Ducks, but further investigation into the source and effects of Se in scoters is required. Hg levels in all three species were within background levels. Contaminant results were presented at the 2004 Delta Waterfowl student seminars.

Pending the completion of body condition and contaminants analyses, we will begin analyzing stable isotope and fatty acid signatures from birds collected in both years to determine wintering locations and dietary contributions to reproduction.

**Project Status (e.g., did you accomplish objectives, encounter any obstacles, do you have plans for the future?)**

We have collected enough samples to complete this project, pending additional funds for laboratory analyses. To date we have not encountered any major obstacles.

This collaborative study has two distinct components (energetics and contaminants). Both components have potential to deliver important information about the ecology of White-winged Scoters, but are distinct enough that they deserve independence. Consequently, we will be dividing the project to reflect these differences and pursue them separately. The energetics portion of the study will continue to be a collaborative venture with all current investigators, while the contaminants will be taken up by Devink, Slattery, and Clark.

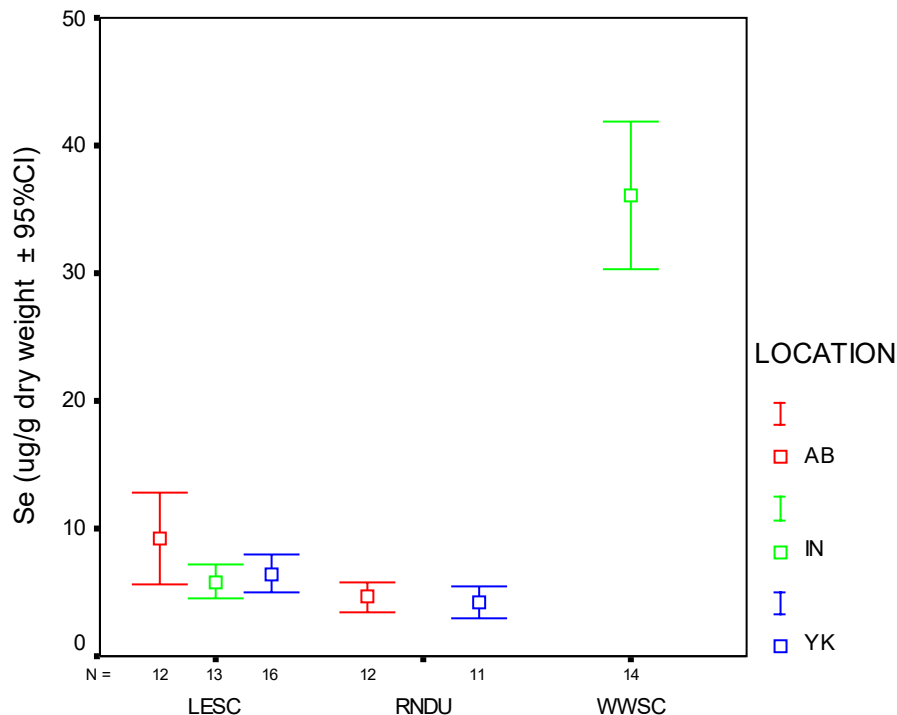


Figure 1. Hepatic Selenium levels (mean  $\pm$  95% CI) of female lesser scaup, ring-necked ducks and white-winged scoters collected in 2003 from three locations in the boreal forest.