Sea Duck Joint Venture
Annual Project Summary for Endorsed Projects
FY 2004 – (October 1, 2003 to September 30, 2004)

Project Title: Project #20- Breeding Ecology of Scoters Nesting in the Lower Mackenzie River Watershed, NWT. YEAR 1 of a 3 YEAR STUDY

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Partners: Sea Duck Joint Venture/USFWS, Ducks Unlimited Canada, Gwich'in Renewable Resource Board

Project Description: The continental population of scoters (all three species combined) has declined by over 58% since 1978, from about 1.75 million to about 700,000 birds. We cannot reliably predict where limitations on these taxa have occurred or where they might be most responsive to management because we lack basic data on population dynamics. However, retrospective analyses examining correlations between declining scaup and scoter populations suggest that these birds share limiting factors in the NWT. We are using a combination of aerial surveys, mark-recapture techniques (including radio-marking prenesting females), nest searching, and brood observations to estimate demographic parameters of scoters nesting in the Lower Mackenzie River watershed. This region is within the NWT, where over 65% of the scoter breeding population historically occurred, and declines approach 70% over the past 24 years. The project is also a sister study to our scaup breeding ecology work at the same site and will permit comparisons of demographic rates without confounding effects of spatial and temporal variation between studies.

Objectives: The primary objective of this study is to address a high priority SDJV information need by estimating vital rates associated with breeding in white-winged scoters, particularly breeding propensity, clutch size, nest success, annual and breeding survival of adult females, and duckling survival. Such information will help us develop population models to identify what demographic rate(s) constraints may be acting on, develop more advanced hypotheses about limiting factors, and assess sensitivity of population trajectory to changes in different vital rates as a way to evaluate potential targets for management actions. Another objective is to test for effects of handling on prenesting female scoters using multi-year radios to better understand researcher-induced impacts on nesting effort. Multi-year radios should also allow us to assess return rates and increase annual sample size to obtain tighter estimates of demographic rates. Finally, we have tested effects of mock satellite transmitters on survival of scoters marked in the breeding season to help interpret results of the Alaskan scoter marking program, and are continuing collaborations to examine contaminants, reproductive energetics, and population delineation of white-winged scoters.

Preliminary Results:
Marking: We captured 40 female and 97 male White-winged Scoters from 2 – 16 June 2004 using floating mist nets. Based on back-dating ages of scoter broods, we estimated that mean

(sd) nest initiation was June 19th (±7 days, n = 93 broods), so this trapping period included both the pre-nesting and early nesting periods. Ice conditions prevented us from beginning trapping effort earlier. All female WWSC were marked with an intra-abdominal radio transmitter with an external antenna and battery life of 18 months, an aluminum leg band, and nasal markers. These radios were more powerful than those used previously and yielded far better resolution of bird movements. We had no mortalities during surgeries. Cumulative catch during the 2002-2004 pre and early nesting periods (% female) is: 256 White-winged Scoters (32%), 19 Long-tailed Ducks (11%), 5 Surf Scoters (5%), 2 Greater Scaup (0%), 1 Lesser Scaup (0%).

Adult female survival: We observed 17 unique nasal marker codes and recaptured 3 females, mostly during the prenesting period. No previously marked males were recaptured and only one of the recaptured females was observed during fieldwork. Encounter rates (# females encountered/# marked) were 58% and 44% for birds marked in 2002 (n = 15 females marked) and 2003 (n = 27), respectively. We will continue observing marked females in subsequent years and use these data to obtain an estimate of annual adult female survival. We had no known mortalities of radio marked females during the breeding period.

Prenesting body condition: Body condition and mass of captured females declined across the three years of study (Figure 1, test for year effect in condition: $r^2 = 0.26$, P = <0.0001, and mass: $r^2 = 0.27$, P = <0.0001), with 2004 body mass being 207g and 120g lower than in 2002 and 2003, respectively. There were no year effects on male body condition or mass (P > 0.90). Females were heavier for their structural size than were males in 2002 and 2003, but lighter in 2004 (Figure 1). Arrival weights in 2004 are also 90g lighter than those recorded for 1985 by Dobush at Redberry Lake, Saskatchewan. The cause of this interspecific difference in patterns of annual variations is unknown. However, we could not find evidence of sampling bias and so think this result is representative. As well, fewer female scoters in 2004 showed physical characteristics suggesting reproductive effort (loose cloaca, soft pubic bones, oviducal egg) compared to those during the same time period in 2003 (28% vs. 74%). The accuracy of these characteristics as indicators of reproductive effort is still untested and we are awaiting results from blood vitellogenin assays (a yolk precursor) and dissections of collected female scoters to better understand how well these physical characteristics correspond to the onset of rapid follicular growths.

Reproductive success: Birds were tracked daily to multiple times per day during pre and early nesting, daily throughout the remaining nesting period, and then at least weekly until the 20th of August. Residency rate (# birds remaining on the study area after the prenesting period/total marked) was 47% (n = 19). This rate was much lower than previous years (2002- 92%, 2003 - 100%). We found 11 scoter nests in 2004 but only three of those nests were from radio-marked females, although movement data and behavioral observations suggest that at least two other females attempted to nest but nests were depredated before completion of the clutch. This data also suggests that females spent little time on the nest during egg laying, making it difficult to detect a nesting attempt. Other nests were found by foot searching. Using only radio birds for which nests were found, apparent nesting effort was 15.8% for resident birds, numerically higher than that observed in 2003 (11%, n=27), but lower than in 2002 (23.1%, n=13). Vitellogenin assays for 2004 birds will allow us to compare apparent nesting effort with the reproductive status at capture. Average clutch size was 7.3 eggs (1.4, n = 8 nests), which is much smaller than the 9.24 eggs reported by Bellrose (1980) for scoters nesting on the prairies. We also observed

93 unique unmarked broods on surveys, and when corrected for observer effort, annual variation in observation rates mirrored nesting effort of radio-marked females (15.3, 4.6, and 8.3 broods per observer for 2002, 2003, and 2004 respectively). Corrections for observer effort were crude and will be improved in the future.

Mayfield-Green estimate of nest success was 30%, with one of the three nests of radio marked females surviving until hatch. None of our scoter nests survived to hatch in 2003 (n = 5), so nest success may have contributed to annual variation in brood observation rates. Scoter nest success results are also consistent with annual variation in Lesser Scaup nest success (Mayfield-Green nest success: 2003- 15%, n = 121, 2004- 28%, n = 138), suggesting that 2003 was a higher predation year than 2004. The successful radio marked female did not have a brood when she was first observed at 3 days after hatch. This female nested over 2 km from water.

Collaborative work: We continued monitoring small mammals as potential alternate prey for nest predators as a node in the NWT small mammal monitoring survey. Additionally, we provided logistical support for collection of scaup and scoter females for comparative analyses of reproductive energetics and contaminants (collaboration with Canadian Wildlife Service/University of Saskatchewan). Birds were collected about 10 – 15 km from our study site. We also obtained feathers to broadly identify wintering areas of birds in our marked sample (east coast/west coast/fresh water) to correlate with various parameters, blood samples for genetic analyses (taken while females were under anesthetic) to delineate subpopulations structure (collaboration with USGS AK Science Centre), and < 1 g lipid biopsy samples (also taken during surgery) to assess marine vs. fresh water sources of reproductive lipids (collaboration with CWS/Simon Fraser University/University of Wyoming).

Project Status: We did not have and do not foresee any significant deviations from original objectives, methodology, or partnerships. All partners are committed to this project and, pending acceptance of our progress and unexpected budgetary constraints, we anticipate receiving funding at about the same level as in FY2004. Therefore, we plan to continue comparative research on the breeding ecology of scoters and scaup in 2005 using the same basic approach.

The low apparent nesting effort observed by this and other recent, telemetry-based scoter projects does constrain our ability to estimate demographic rates beyond adult female survival, clutch size, nest success (which might be biased see below), and possibly breeding propensity. Low apparent nesting effort can result from any combination of a handling effect, a radio effect, low breeding propensity, or high nest mortality during the egg laying period, which would make detection of a nesting effort very difficult and confound estimates of nest success. From a conservation perspective, we are most interested in breeding propensity and early nest mortality. However, the role of radio-marking has not yet been teased out. With our high encounter rates, multi-year radios, and large sample of birds marked in 2004, we expect about 20 females marked with multi-year radios to return in 2005, and possible similar numbers in 2006. These birds will not only bolster our annual sample sizes (potentially n = ~60 radio marked females if we have similar trapping success and low radio failure), but comparison of nesting effort between previously and newly marked birds will allow us to better understand the role of researcher-induced disturbance, and thereby narrow the possible explanations of low apparent nesting effort. Other methods for obtaining demographic rates, particularly duckling survival, will be explored over the winter.

Project Funding Sources (US$):

SDJV (USFWS) Contribution	Other U.S. federal contributions	U.S. non-federal contributions	Canadian federal contributions	Canadian non-federal contributions	Source of funding (agency or organization)
$30,000					USFWS/SDJV
				$75,248[a]	DU Canada
			$2,600		Canadian Council for Human Resources in the Environment Industry
			$910		Human Resources Development Canada
				$4,550[b]	Gwich'in Renewable Resource Board

[a] Includes prorated salary of the PI.
[b] In-kind support.

Total Expenditures by Category (US$):

ACTIVITY	BREEDING	MOLTING	MIGRATION	WINTERING	TOTAL
Banding					
Surveys					
Research	$113,308				$113,308
Communication					
Coordination					

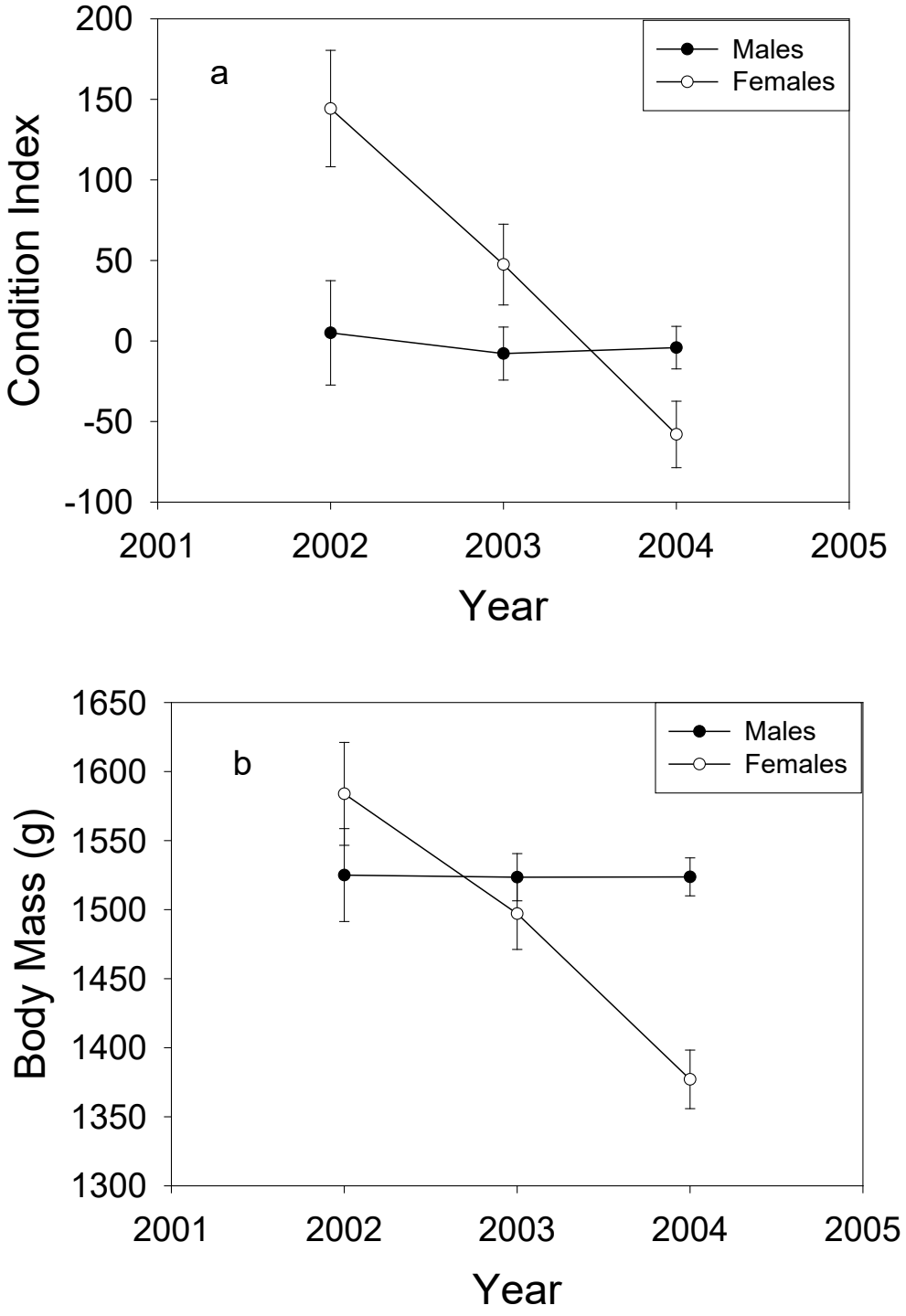

Figure 1. Annual variation in mean (sd) (a) body condition and (b) mass in prenesting white-winged scoters captured in the Cardinal Lake Region. Sample sizes: Females- $n_{2002} = 13$, $n_{2003} = 27$, $n_{2004} = 40$, Males- $n_{2002} = 16$, $n_{2003} = 62$, $n_{2004} = 97$.