Sea Duck Joint Venture
Annual Project Summary for Endorsed Projects
FY 2008 – (October 1, 2007 to Sept 30, 2008)

Survey Title: SDJV PR96: Pacific Black Scoter Breeding Survey

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Project Description: Based on scoter observations from extensive aerial surveys flown at various times and locations from 1989 to 1997, we designed an aerial survey for monitoring Alaska's breeding population of Black Scoter (*Melanitta nigra*). Using fixed-wing aircraft and standard aerial survey protocol on 200m wide transects, a left-seat pilot observer and a rear-seat observer recorded all observed Black, White-winged, and Surf scoters (*M. nigra, M. perspicillata, M. fusca*), Greater and Lesser scaup (*Aythya marila, A. affinis*), and Long-tailed Ducks (*Clangula hyemalis*). Timing of the survey was appropriate for late-nesting species, about 3 weeks after the standard North American Waterfowl Breeding Pair survey was flown. From 2004 to 2007, we flew systematic transects sampling 154,645 km^2 of western Alaska tundra wetlands divided into 12 strata of high and low relative scoter density in various geographic regions. Using these results, we then redesigned the survey to be more practical and effective by excluding some areas of low density and increasing sampling where variance was high. In 2008, transects were flown to sample 113,732 km^2 of wetlands in 6 combined strata, covering 74% of the original area and 84% of the 2004-07 average scoter population. Certain other regions, such as the small area of high-density black scoter nesting habitat near Nelson and Izembek Lagoons on the Alaska Peninsula, will be surveyed periodically. Lowest-density nesting habitat of scoters will be assessed only when surveys are conducted to provide relative habitat value and distribution for all waterfowl species.

Objectives: Annual aerial survey population indices of black scoters observed in nesting habitat, with correction for possible variation in detection rate, provides sufficient data to estimate breeding population size, determine population trend, and identify important scoter habitat. The survey precision should provide meaningful results at a regional scale within a time period relevant for management. The survey was funded from 2004 to 2006 as part of SDJV Project #38, Black Scoter Integrated Study, and it continues to complement goals of that project as data on population delineation, seasonal movement, and estimated harvest are compiled.

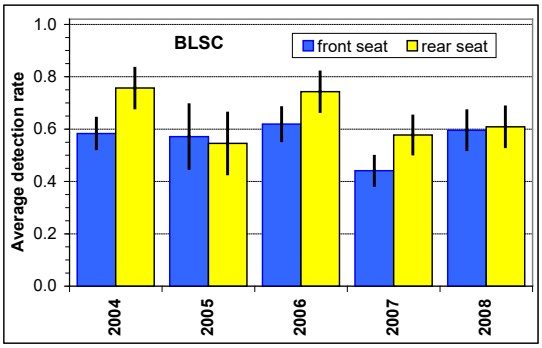
Preliminary Results: We completed a fifth year of aerial survey with 742 BLSC, 6 WWSC, and 3 SUSC counted on an observed area of 1,343 km^2 along 85 sections of 67 designed transects. The indicated total bird population index was 62,606 scoters (standard error = 8,278) in 2008 (Table 1). For scaup, the total bird population index was 88,284 (se = 12,756). We decided to discontinue counting Long-tailed ducks on this survey because the survey is timed too late in the season for this species. Instead, we added 2 other species to the survey protocol. In 2008, Tundra Swans (*Cygnus columbianus*) had an estimated total bird index of 75,498 (se = 13,188) and we estimated jaeger species (*Stercorarius parasiticus, S. longicaudus, S. pomarinus*) at 1,427 (se = 282) birds.

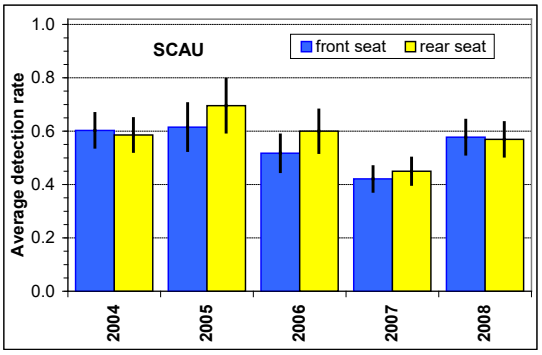
Table 1. Uncorrected population indices from systematic aerial transect surveys flown sampling 113,732 km^2 of western Alaska tundra wetlands, the principal nesting habitat for Black Scoter.

Year	Scoter species	Black Scoter	Scaup	Long-tailed Duck	Tundra Swan	Jaeger species
1989-1997	121,158		147,026	27,503	78,453	3,752
2004	67,563	65,418	99,932	10,026		
2005	61,393	60,821	107,345	9,658		
2006	77,901	76,034	116,076	12,645		
2007	83,620	81,506	113,562	9,852		
2008	62,606	62,048	88,284		75,498	1,427

Analysis of the 2004-2008 Black Scoter aerial index data (combined observers, no adjustment for detection) within the new survey area indicated an average population growth rate of 1.016 (se = 0.050, 90% confidence interval = 0.937 - 1.101). Average growth rate for scaup was 0.981 (90% ci = 0.920 - 1.046). Neither species showed a significant trend, but 5 years of data are not really sufficient. Both species were less abundant averaged over the last 5 years compared to the expanded surveys in various locations flown slightly earlier in the season between 1989 and 1997. The precision of the scoter survey was indicated by a coefficient of variation of 10.8% based on the average annual sampling error from the last 5 years. Using an approximate formula (Gerrodette 1987), we calculated that with our 5 years of data, a constant annual change of -8.3% (50% decline in 8 yrs, or a 35% decline in 5 years) would have been detected with 80% power at a significance test probability = 0.10. Annual change of -3.41% (50% decline in 20 years), if it should occur, would be expected to be detected as significant with 9 years of data. For the high density YKD stratum with an average CV of 15.7%, annual change of -3.41% should be significant with 11 years of data, and for the high density Bristol Bay stratum with a 24% sampling error CV, 15 years of data would be required.

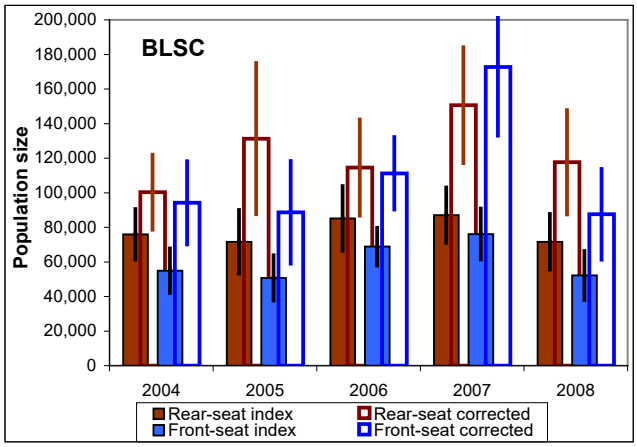
For each year and observer, we estimated the average detection rate using mark-resight analysis of independent front- and rear-seat observations. On approximately every fourth transect, the rear seat observer would switch to the left side of the aircraft behind the pilot and observe the same side of the transect. We matched observations based on time (location), species, group size, and notes recorded on behavior and distance from the aircraft. The 5-year average detection rates for black scoter were 54% and 64% for the front- and rear-seat observers, respectively. Front- and rear-seat average detection rates were 51% and 53% for scaup. This compares with 86% and 52% detection for these species based on the ratio of counts from fixed-wing aircraft compared to a helicopter recorded on the Yukon Delta, 1989-1991. Assuming the observer in the helicopter detected 100% of the birds, these



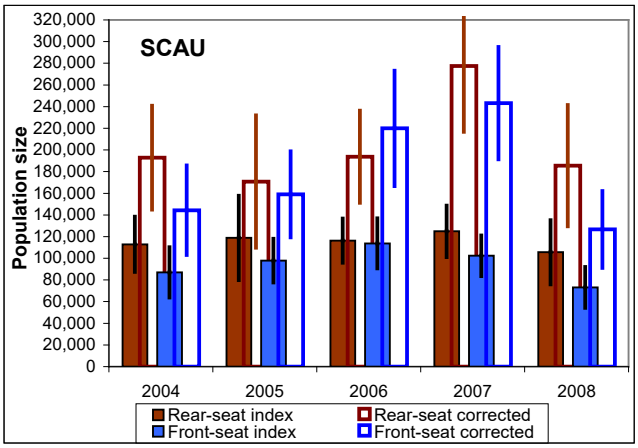


ratios are used for visibility correction factors for tundra habitat (Smith 1995) on the standard waterfowl breeding pair survey (WBPHS).

Detection rate varied with all the factors examined such as species, size of group, seat, observer, region, and year. When subdividing the data to obtain the homogeneous sets necessary to calculate unbiased estimates of detection rate, large sampling error associated with small sample size complicated the patterns. We will need to use a better analytical approach to assess the relative importance of all interacting factors that influence detection rate. In spite of these complications, because the double count data were collected systematically representing all days, regions, conditions, observers, etc., the combined data should result in a relatively unbiased estimate of average detection rate provided the magnitude of heterogeneity is not extreme. We estimated average detection rate for each species, seat, and year to calculate appropriate corrected population estimates.



The aerial population index divided by detection rate estimates the actual population size. The 5-year average population index of 69,412 Black Scoters was corrected to an estimate of 116,900 indicated total birds. The 5-year average population index of 105,262 Scaup was increased to an estimate of 191,336 total birds. The various population trends did not differ significantly in either slope or accuracy whether calculated from aerial indices or corrected population estimates, or from either single seats or combining both observers. For both scoter and scaup, the relatively high population index in 2007 in combination with a relatively low detection rate in 2007 caused a marked increase in the estimated populations that increased both trend and its variability. With the limited data available so far, the corrected population estimates were not less variable than the aerial indices, either among years or between observers.



The 5 years of recent observations indicate stable or perhaps somewhat increasing populations, but realistically, a longer period is needed to detect anything but severe change.

Comparing the historic aerial indices from 1989-1997 to the recent aerial indices (Table 1) show reduced population sizes for scoter, scaup, long-tailed duck, and jaegers, but the same population size for swans. The 2-3 week difference in seasonal timing when the surveys were flown could account for some of these differences.

P**roject Status:** The survey data obtained has met the objectives of monitoring the size, distribution, and trend of the black scoter nesting population. We have produced estimates of average detection rate by matching observations made by independent front- and rear-seat observers. Improved methods for analysis of these mark-resight data, and detailed exploration of matching criteria, are still needed. The lower detection rate in 2007 has no apparent explanation especially considering the increased observer experience and consistently high quality of data recorded in that year. The expected reduction in detection rate for a less-experienced rear-seat observer in 2008 for the YKD and Bristol Bay regions was not substantiated by the data collected. We may learn more with continued data collection.

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)
11,000					
	6000				USFWS MBM Alaska
	3339				Selawik NWR
	5000				Yukon Delta NWR
	400				AK Peninsula NWR
	200				Togiak NWR

Total Expenditures by Category (SDJV plus all partner contributions; US$).

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)	**25,939**				
Research					