Sea Duck Joint Venture
Annual Project Summary for Endorsed Projects
FY 2007 – (October 1, 2006 to Sept 30, 2007)

DEMOGRAPHY AND MOLT ECOLOGY OF SURF SCOTERS IN EASTERN NORTH AMERICA (SDJV#49)

Multi-year funding, year three of three.

2007 September 27

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Project Description:
This study had two components that will provide information on Surf Scoter demography and molting ecology. Estimates of demographic parameters are required for understanding population dynamics and may be important for identifying factors related to scoter declines. To our knowledge, there is no estimate of survival for Surf Scoters, nor are there any indices of harvest rates available. In addition, molting and migration constitute major energy expenditures in migratory birds (King 1974). For Surf Scoters, little is known about annual variation in molt chronology, about the resources that make sites attractive to molting birds or about their behavior, food, habitat requirements or energetic requirements during molt. Follows are preliminary results from the pilot study that was endorsed by the SDJV in 2004 and funded by the SDJV in 2005 to 2007.

Objectives:
The project had two major components: 1) A traditional banding program to measure vital rates of male Surf Scoters, and their affiliations between molting and harvest areas. We hope to improve survival estimates and measure site fidelity by using mark-recapture models that combine information from live recaptures and band recoveries (Barker 1997). Also, estimates of recruitment and population growth rate from mark-recapture data should provide an independent assessment of population trajectory to the aerial surveys currently in place (Pradel 1996, Nichols et al. 2000). 2) A study of molting ecology (chronology, behavior and habitat use) of Surf Scoters. Specific objectives for this component of the project are:
Demography:

1) measure direct and indirect band recovery rates for scoters,
2) refine and develop new capture techniques for molting scoters,
3) band up to 1000 birds per annum,
4) develop methods for aging molting male Surf Scoters,
5) develop annual indices for species, age, sex composition and recruitment,
6) evaluate mark-recapture or mark-resighting techniques for estimating survival,

Ecology:

7) evaluate use of stable isotopes analyses of juvenile feathers to identify affiliations between molting and breeding areas,
8) screen a sample of birds for heavy metal and organic contaminants and parasites,
9) determine differences in molt chronology of subadult and adult males, and to document annual variability in chronology,
10) compile time-activity budgets throughout the molting period and to estimate the energetic costs of molting activity,
11) monitor behavioral effects of disturbance on molting scoters,
12) document habitat use during the molting period,
13) determine differences in geographic ranges occupied during feather replacement from stable isotope signals in feathers of males, females and sub-adults.

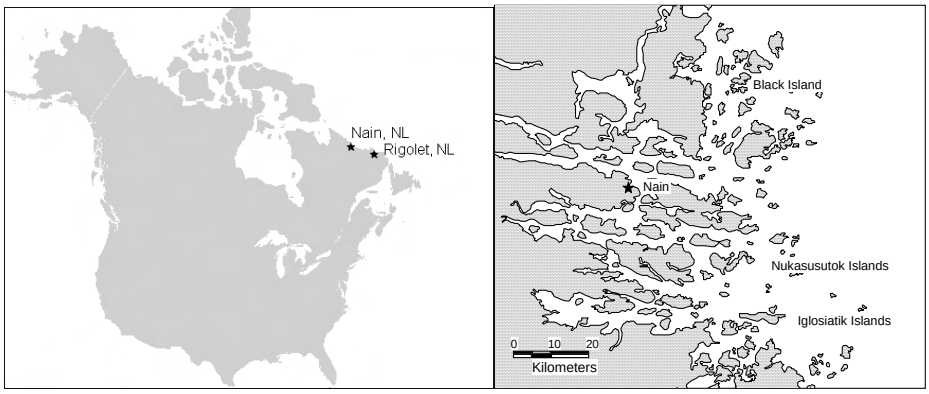
Preliminary Results:
Here we update the banding component of the study, the status of components for which the field component has been completed is summarized under Project Status. Our primary study area has been near Nain in northern Labrador. In 2007, we continued banding operations at Nain, and explored opportunities to capture birds at the Backway

near the community of Rigolet, Labrador (Fig. 1). Follows is a general schedule of field activities:

12 July:	Arrive at Rigolet.
14 to 26 July:	Banding operations Backway.
27 July to 1 August:	Relocate to Nain
3 July to 15 August:	Banding operations Nain
16 to 19 August:	Tear down camps and return from field.

Fieldwork was again limited by windy weather in 2007. Spring phenology was about three weeks late, and sea ice persisted on the Labrador coast into late June. This affected shipping into coastal Labrador and delayed arrival of much our field equipment by 10 days in Nain. We incurred further delays while we waited for replacement parts (propellers, gas cans and anchors) that were stolen during shipment. A combination of logistical constraints and poor weather limited banding operations to four days in the Backway and two days in Nain.

a). b)



c).

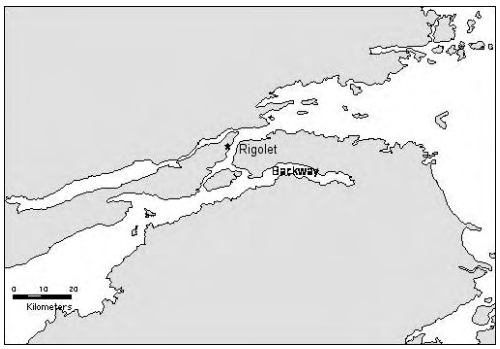


Fig. 1. Maps showing the general location of the study area (a) and specific location of the study sites near Nain (b) and Rigolet (c).

Captures--. From 2004 to 2006, we used gill nets to capture molting scoters. This method has worked well in Nain where near shore waters are deep (> 3m within 25 m of the shore line), and molting flocks are distributed among several large archipelagos. Although the gill nets have been effective for capturing molting sea ducks, captures are

limited to 10 to 30 birds per set, and many sets are needed to band adequate numbers of ducks. In 2007, we tested a drive-trap to catch Surf Scoters. This technique has been used to capture large numbers of Steller's Eiders in Alaska (T. Bowman pers. comm) and Common Eiders in Maine (B. Allen pers. comm.).

The morphology of the Backway is suited to drive-trapping. The bay is a long linear bay with an extensive shallow intertidal zone (Fig 1c), and large numbers of scoters (25,000 to 35,000) utilize the bay during molt (Gilliland et al. in prep). We used a shore based drive trap based on a design used for catching molting Steller's Eiders in Alaska. These traps were set with the pot on dry land and the trap orientated perpendicular to the shoreline (land sets; T. Bowman pers. comm.). We used 20 mm mesh size knotless nylon netting to construct the traps. The pot was made from a section of 1.5 m by 30 m section of net, and the wings from 2.1 m by 30 m net sections. To assist in directing the birds into the trap we constructed two 30 m ropes with net floats attached to the rope at 3 m intervals. The ropes were used to extend the wings of the trap 60 m from the pot. In addition to two 6 m boats and 4 m zodiac used for the gill net traps, we used two 3 m inflatable kayaks for molt drives.

Weather conditions were suitable for trapping on only four days between 16 and 26 July 2007. Large numbers of Surf Scoters used the Backway during molt, and we encountered several flocks from 500 to 6,000 birds. Flocking behavior was different than we had observed in Nain, with the birds forming loose aggregations that covered large expanses of water. Flocks did not respond well to herding efforts, it was difficult to form a cohesive group, and all birds dove repeatedly when the large boats approached within 250 to 300 m of the flock. Regardless, with so many birds we were successful in moving several large flocks into position. We speculate that the sensitivity of the birds to the boats was a result of local hunting activities.

Generally, scoters were very reluctant to move into shallow water and were very nervous when we positioned them within the mouth of the trap. Over two days we made four land sets, on two occasions we had between 1,500 and 3,000 birds within the mouth of the trap, but it was impossible to drive them the last 20 m to the beach. On the third day we modified the pot nets by sewing 2 nets together, making them 3m deep, and adding a heavy leadline to the foot of the net. We made three sets between 200 and 300 m from shore in 1.5-1.8 m deep water with trap orientated parallel to the shore line. Using this configuration, we caught 10 Surf Scoters. On the fourth day, we switched to the gill net sets and caught 2 Black and 39 Surf Scoters (Table 1).

Between 27 July and 1 August we relocated and established the field camp in Nain. Late arrival of field equipment (see above) delayed capture efforts until 7 August. This had little impact on capture effort as windy conditions precluded trapping from 2 to 12 August. We caught 102 sea ducks on 13 and 14 August, after which winds precluded further trapping attempts.

Banding Activities and Recoveries--. From 8 to 17 August 2004, 21 July to 22 August 2005, and 28 July to 17 August 2006, 14 July to 15 August 2007 we caught 657, 671, 443 and 155 molting sea ducks, respectively (Table 1). Male Surf Scoters comprised about 95% of all captures. There was a significant difference in the age composition of male Surf Scoters between years (Chi-square =23.3, df=2, $p \leq 0.0001$) with about 10% of captures in 2004 and 2007, and 4% of captures in 2005 and 2006 being second-year

males (Table 2). Differences in age composition may reflect annual variability in recruitment rate and suggest significant annual variability in productivity and/or over-winter survival of immature males.

Table 1. Number of waterfowl caught in molt drives, Nain, Labrador, 2004 to 2007.

		Species[1]				
Year	Sex	COEI	SUSC	WWSC	BLSC	LTDU
2004	Female	1	37	2	1	0
2004	Male	3	595	19	0	0
2005	Female	1	40	0	1	0
2005	Male	6	622	1	0	0
2006	Female	0	15	0	0	0
2006	Male	1	415	4	2	0
2007	Female	0	8	0	0	22
2007	Male	5	110	11	3	0
Total		17	1842	37	7	22

1. COEI = Common Eider; SUSC = Surf Scoter; WWSC = White-wing Scoter; BLSC = Black Scoter; LTDU = Lon-tailed Duck

Table 2. Age composition (%) of male Surf Scoters caught in molt drives, Nain, Labrador, 2004 to 2007.

Age[1]	2004 (n=595)	2005 (n=622)	2006 (n=415)	2007 (n=105)
AHY	90	96	96	95
SY	10	4	4	10

1. AHY= after hatch year, SY= Second year.

The number of live recaptures has been low, with one within-year recapture in each of 2005, and 2006, and nine among-year recaptures from 2005 to 2007 (Table 3). Surf Scoters do not appear to be faithful to molt sites among years evidenced by more than half of the recapture occurring at sites other than the capture location (Table 4). Thirty-three hunter-shot band recoveries of Surf Scoters were reported to the banding office up to 1 February 2007. Recoveries were reported from PQ, NS, ME, NY, CT, NJ, MD, VA and NC. We estimated the harvest rate of Surf Scoters was between 2.4% and 4.0% for 2004 and 2005 (Table 5).

Table 5. Hunter shot band recoveries for Surf Scoters banded in Nain, Labrador 2004 to 2006.

		Recovery Year		
Year	Banded	04-05	05-06	06-07
2004	595	8	2	3
2005	584	-	13	6
2006	406	-	-	2
Total	1585	8	14	11
Harvest rate[1]		2.4%	4.0%	0.9%[2]

1. Estimated from direct recovery rates corrected for crippling loss and reporting rate. We used a crippling loss rate of 0.2 (Anderson, D. R., and K. P. Burnham 1976) and a reporting rate of 0.7 (the preliminary estimate for U.S. reporting rate from reward banded black ducks - P. Garretson, pers. comm.).
2. Incomplete data

Table 3. Live recaptures of Surf Scoters during banding operations in Labrador 2005 - 2007.

		Recapture year		
Year Banded	No. Banded	2005	2006	2007
2004	632	3	3	1
2005	662	-	1	0
2006	430	-	-	1
2007	112	-	-	-

Table 4. Recapture matrix showing movements between capture and recapture locations from 2005 to 2007.

Location	Black	Nukasusutok	Iglosiatik
Black	0	-	-
Nukasusutok	1	5	-
Iglosiatik	1	6	0

Satellite Telemetry--. We successfully tracked movements of seven birds from the molt site in Nain using satellite Platform Transmitter Terminals (PTTs) deployed in August 2006. The data identified two routes used by birds dispersing from the molting area. One followed an inland route over central Labrador stopping at a staging area off Sept-Iles, QC (Fig. 2a), and the other followed a more coastal route passing thought the Gulf of St. Lawrence with stopovers in the Magdalene Islands, QC and in western Prince Edward Island (Fig. 2b). From these fall stopover areas, the path of most birds

converged of South-western Nova Scotia (Fig. 3a), and all birds passed through Nantucket Sound, MA. The birds winter over across the eastern seaboard of the USA, from Nantucket Sound to Pamlico Sound, NC (Fig. 3b). Four birds were tracked north to spring staging areas along the Gaspe Bay and Sept-Iles, QC. Only two birds have been tracked back to their molt site: one molted within 20 km of the capture site, while the other traveled to western Hudson's Bay and molted at the Salikuit Islands, NU in eastern Hudson's Bay (Fig. 4). This is about 1000 km west of the location this bird molted in the Labrador Sea in 2006. Results from both the banding and satellite telemetry data suggests that Surf Scoters may shift among molt sites at local and sub-continental scales.

a). b).

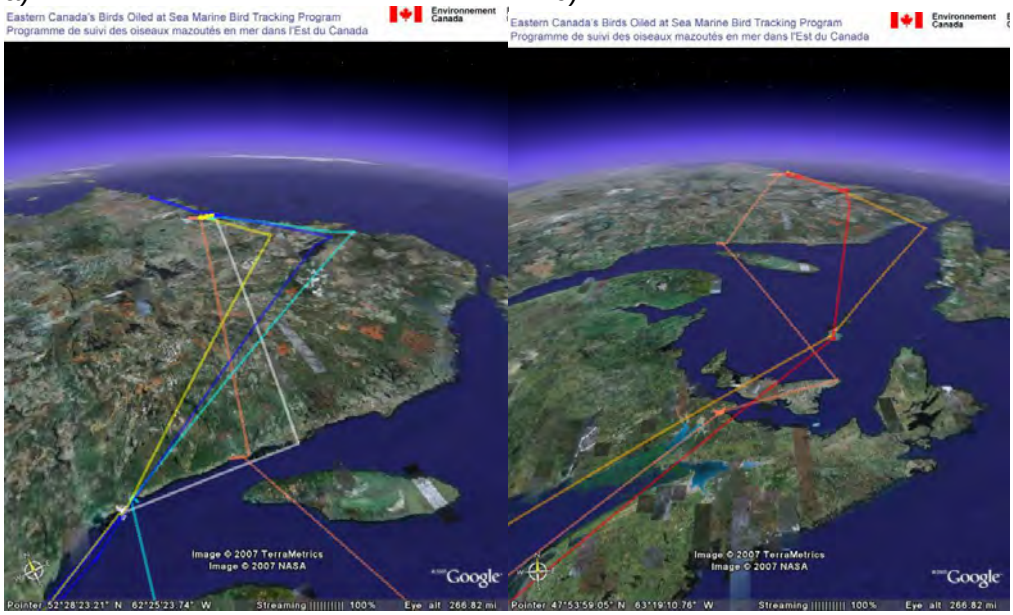


Figure 2. Fall dispersal along an inland (a) and coastal (b) corridors of Surf Scoters that molted near Nain, Labrador.

a). b).

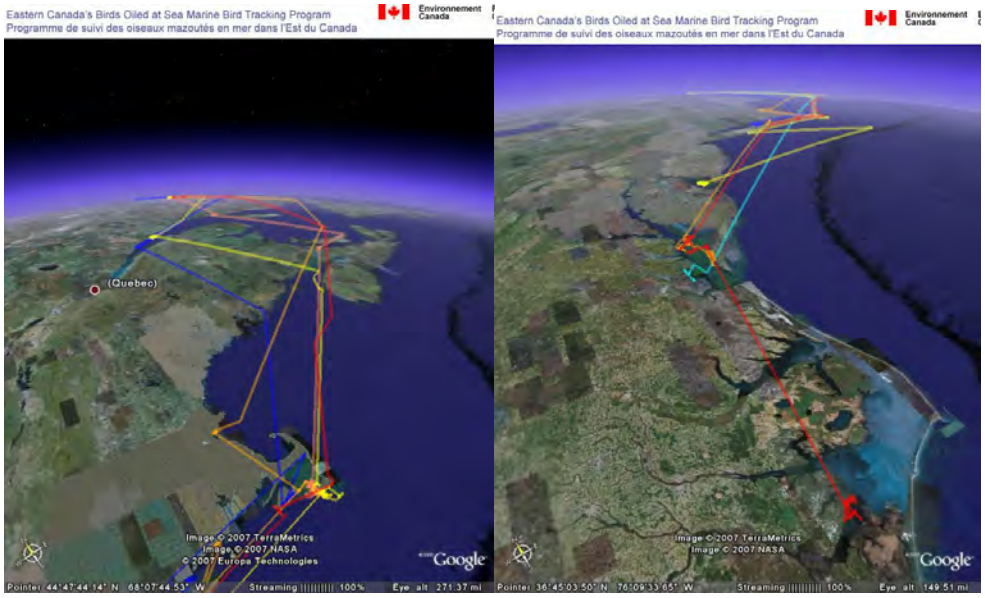


Figure 3. Fall migration routes (a) and wintering areas (b) of Surf Scoters that molting near Nain, Labrador.

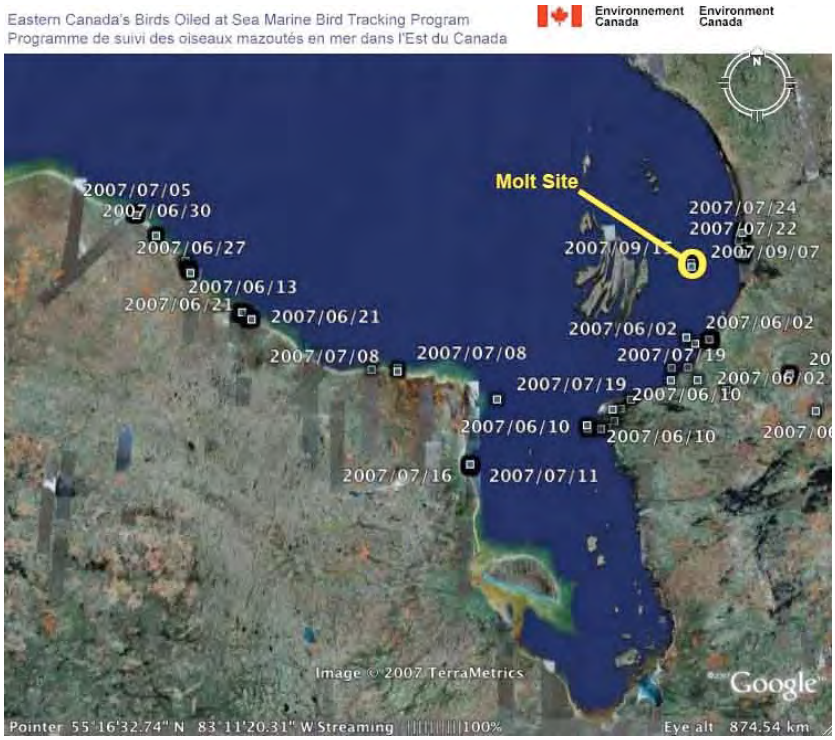


Figure 4. Summer 2007 movements of a Surf Scoter that molted in the Labrador Sea in 2006 and Hudson's Bay in 2007.

Project Status:
In 2007, we focused on the banding component of the project. We tested alternate trapping techniques and banding sites in an attempt to identify a more efficient method to capture large numbers of birds. We've determined that Surf Scoters are not easily caught using drive traps, and we do not believe that is feasible to capture large numbers of scoters with this method. We suspect local hunting activities affected the behavior of scoters in the Backway making them difficult to capture and we are not certain if our experience is broadly applicable across other sites.

Preliminary analyses of band recovery data provided interesting results and indicate that we will be able to produce the first estimate of survival for adult male surf scoters in eastern North America. Estimates are still relatively imprecise due to the small number of years since the start of the study and low numbers of band recoveries (mean survival for 2004-2006: 0.54; 95% CI: 0.27-0.79). However, survival estimates will gain in precision as the data accumulated through additional years of band recoveries and the addition of newly banded birds in the population. The live recapture data is sparse and will likely not be as useful in estimating survival and population growth rate as originally thought. The low level of banding in 2007 will cause some precision problems for survival and recovery rate estimation in 2007-08, but will nonetheless contribute to our understanding of the demography of this species. To circumvent the low sample size problem that we are facing for 2007, we propose to pool 2007 band recovery data from banding sites in Nain and Rigolet, NL and Îlets Jérémie, QC in future analyses. We think this is appropriate because surf scoters from different staging areas of eastern North America appear to congregate to specific areas shortly after banding and likely mix on the wintering grounds (see PTT results above). We foresee funding constraints that may preclude a banding effort in Labrador for 2008. To maintain a scoter banding program we propose to combine efforts with C. Lepage in the Gulf of St. Lawrence, QC (see SDJV Project No. 87) for 2008. We will use available data (PTT and band recovery data in years where banding occurred at different sites) to determine the potential impact of using data from birds banded in different molting areas on survival and recovery rate estimates. We believe that maintaining a banding operation, albeit in a different location, will improve significantly the quality of parameter estimates with each additional year of marking and will provide useful information for the management of this species.

Follows are brief summaries for various project elements:

1) Behaviour. O'Connor, Titman, Savard, Gilliland. A MSc project is nearing completion with the final submission expected in December 2007. The thesis consists of two chapters: 1) Behavioural changes in moulting Surf Scoters", and 2) Surf Scoter movements during wing moult. The chapters have been prepared in journal format and publications will be submitted on completion of the thesis.
2) Contaminants. Burgess, Gilliland. Analyses were completed in October 2006 and the data has been summarized. Our general conclusions are that there were no concerns about the metal concentrations having any adverse effects on the health of the scoters. Results have been archived in a National Contaminants Database and representative tissue samples are maintained the Canadian Wildlife Service Specimen Bank. We will combine he results of these analyses with data from other locations in Atlantic Canada to produce a general paper

summarizing contaminant levels in eastern Canada in the next two years.

3) Parasites. Muzaffar, Gilliland- Analyses competed in Fall 2006. A technical report has been prepared to document parasite loads of individual birds and a manuscripts has been submitted

   Sabir Bin Muzaffar and Scott Gilliland. submitted. Endoparasites of Surf Scoters (*Melanitta perspicillata*) from Nain, Labrador: parasite loads reflect feeding ecology of adults and juveniles. J. of Wildlife Diseases.

   Sabir Bin Muzaffar and Scott Gilliland. In prep. Parasitological survey of molting Surf Scoters (*Melanitta perspicillata*) from Nain, Labrador. Canadian Wildlife Service, Atlantic Region, Mount Pearl, Technical Report Series No. XX.

4) Nutrient Dymanics. Gilliland, Budge, Savard. An analysis of carcass composition was completed in March 2006 and a database has been prepared. We are arranging to collect a reference sample of 10 wintering adult males. These will be analyzed in winter 2008 with a manuscript to follow.
5) Aging Molting Males. Gilliland, Reed, Savard. Dissections were completed in March 2006. Data has been analyzed and a manuscript will be prepared in winter 2008.
6) Movement and Affiliations. Gilliland, Savard, Reed, Perry, McAloney. Data from 2006 PTT effort has been archived. If funds are available additional PTT work on Surf Scoters we will postpone preparation of a manuscript until completion of this work. If no further funds are available, we will synthesize the PTT data from projects on Chesapeake Bay MD, Nain NL and Lac Malbaie QC and produce a manuscript of eastern Surf Scoter movements and affiliations.

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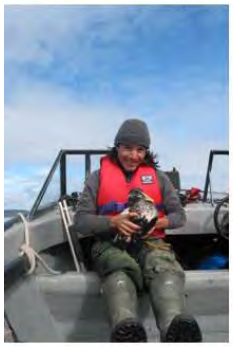





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