Sea Duck Joint Venture – Annual Project Summary for Endorsed Projects
FY08 – (October 1, 2007 to September 30, 2008)

Project Title: SDJV#16, Ducks Unlimited Canada's Common Eider Initiative (year five of a five year study)

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Partners: Ducks Unlimited Canada, Institute for Wetlands and Waterfowl Research, Atlantic Canada Opportunities Agency, Environment Canada – Science Horizons, EcoAction, and Environmental Damages Fund, and Canadian Wildlife Service, Newfoundland and Labrador Department of Environment and Conservation – Inland Fish and Wildlife Division, Memorial University of Newfoundland, Newfoundland and Labrador Legacy Nature Trust, Quebec-Labrador Foundation, Eastern Habitat Joint Venture, Eagle River Development Association, and White Bay Central Development Association.

Project Description: The goal of the Eider Initiative is to develop a population model to guide Common Eider *Somateria mollissima dresseri* harvest regulations and management decisions. Development of such models requires current, detailed information on life-history traits throughout the life-cycle of the species. We chose Newfoundland and Labrador as the focal point for this research because Common Eider populations in this region have experienced relatively little growth following their protection by the Migratory Bird Conservation Act, compared to that of other populations south of this area. Specific reasons for depressed population growth of eiders nesting in this region are unknown. Factors that may contribute to low growth rates include anthropogenic affects such as harvest or increased disturbance through aquaculture, inter-tidal harvests, or shipping and natural processes such as shifts of the predator-prey dynamics or recruitment levels. Understanding constraints to population growth requires a strong understanding of species-specific life history traits. This information is critical for developing and implementing management strategies that promote sustainable and harvestable populations.

Objectives: The objectives of the Eider Initiative address Sea Duck Joint Venture (SDJV) priorities for conservation of sustainable sea duck populations. Specific priorities to be addressed are: 1) adult female survival, seniority (proportion of experienced breeders in the population), recruitment (proportion of first time breeders in the population), and realized population growth rates; 2) breeding propensity (proportion of females breeding during any one season); 3) sub adult survival; 4) age at first breeding; and 5) the links between breeding and wintering areas and migration pathways. The ultimate objective is to build a successful population model that will inform harvest and conservation decisions.

Methods The Eider Initiative was established as a five-year (2004 – 2008) research initiative. Methods include capturing and banding adult and duckling Common Eiders in mist nets, on the nest and by actively driving $\geq$ 30 day-old ducklings with accompanying females into submerged drive traps. Mark-recapture techniques will be used to obtain estimates of juvenile and adult survival, as well as estimates of breeding propensity, and age of first breeding. Collection of this data will allow for a stronger understanding of possible constraints on population growth.

Study Area: Primary research sites include 1) Grey Islands Newfoundland; 2) St. John Bay, Newfoundland, and 3) Table Bay, Labrador (Figure 1).

Figure 1. Study areas for Ducks Unlimited Canada's Eider Initiative.

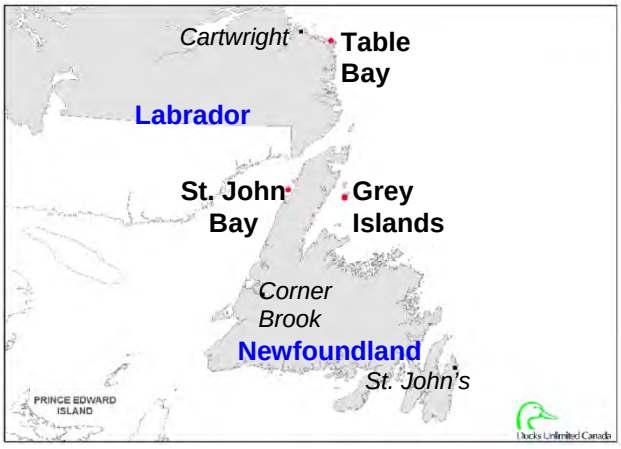
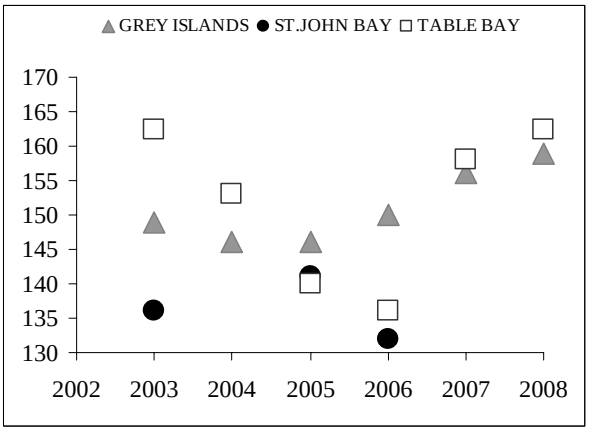


Figure 2. Median nest initiation dates for eiders nesting in Newfoundland and Labrador.



Preliminary Results: Median nest initiation date varied by year and site (Figure 2). The range in median initiation dates reflects spring weather and ice conditions. Tables 1 and 2 provide annual number of captures of adult and duckling (1 day old) Common Eiders. In addition, we captured 1,011 prefledged juvenile eiders (≥30 days of age) on the water at Table Bay during 2005 – 2008 (2005: 242, 2006: 234, 2007: 279, 2008: 256). Recaptures include 29 known age eiders (includes birds initially banded as one day old ducklings on the nest or juveniles captured on the water; Table 3) Nesting status of the five 1 year old and one 2 year old female was unknown. Of the 14 females that were originally banded as one day old ducklings and later recaptured on the nest 93% (13/14) were recaptured on same island they hatched on. Mean age of first nesting was 2.6 ±0.9SD years. Recapture of both known age males and females provide evidence of natal philopatry for both sexes.

Table 1. Number of adult Common Eiders captured in Newfoundland and Labrador under DUC's Eider Initiative during 2003-2008. This represents 2279 unique individuals. **2003 = pilot year only.*

	Year						
Field Site	2003	2004	2005	2006	2007	2008	***Total***
Grey Islands	73	75	205	168	0[a]	0[b]	**521**
St. John Bay	30	27	26	52	33	NA	**168**
Table Bay	9	124	446	676	608	480	**2343**
Total	**112**	**226**	**677**	**896**	**641**	**480**	**3032**

[a] Polar Bear disrupted eider nesting [b] Fox disrupted eider nesting

Table 2. Number of one-day-old Common Eider ducklings captured and banded under DUC's Eider Initiative during 2003-2008. **2003 = pilot year only*

	Year						
Field Site	2003	2004	2005	2006	2007	2008	***Total***
Grey Islands	0	420	914	482	10[a]	0[b]	**1826**
St. John Bay	23	NA	66	41	NA	NA	**130**
Table Bay	20	1078	1418	1785	1978	1334	**7613**
Total	**43**	**1498**	**2398**	**2308**	**1988**	**1334**	**9569**

[a] Polar Bear disrupted eider nesting [b] Fox disrupted eider nesting

Table 3. Known age Common Eiders captured in Table Bay, Labrador during 2003-2008, relative to the number of individually marked one-day old ducklings and juveniles originally captured during the corresponding year.

Year	Number of known age recaptures				# individuals originally captured					
	Age				Age					
	1	2	3	4	1	2	3	4	5	Total
2004					43					43
2005					1498	43				1541
2006	3f, 1m	4f			2640	1498	43			4181
2007	2f	2f, 1m	4f, 2m		2542	2640	1498	43		6723
2008		4f, 1m	3f	2f	2267	2542	2640	1498	43	8990

f=female, m=male

For the second consecutive year nesting was disrupted by mammalian predators at the Grey Islands field site (2007 Polar Bear, 2008 fox). The initial survey of the main nesting colony during 2008, Green Island, found no viable nests.

In 2008, adverse weather conditions reduced captures during both the nesting and the brood rearing periods. In June high seas prevented crews from accessing the majority of the nesting sites. Only islands located directed within Table Bay, protected against the surf were accessible. In addition one of the most historically productive islands, where more then 300 ducklings were captured in 2007, was disturbed by a black bear. High seas and winds continued during August, impairing captures of pre-fledged juveniles.

Due to differences in years of capture effort, models for apparent survival were performed separately for each site. Model results for apparent survival at Table Bay suggest a stable to declining trend in annual female adult survival, ranging from $0.86 - 0.68$ ($\hat{c}$ = 2.29; $QAIC_c$ value ≤ 3; Table 3). Estimated growth for the same time was 17%, indicating high levels of recruitment (38%) for this local breeding population. See Figure 3 for weighted model average estimates of adult apparent survival and recapture probabilities.

Table 3. Top 3 of 6 candidate models of apparent survival (ϕ) and capture probability (p) based on 1294 individual adult Common Eiders captured on coastal islands within Table Bay, Labrador during 2003–2008. Parameter estimates included variation among year (t), linear decline over time (L) and models with no time variation (.). Models are ranked in accordance $QAIC_c$ values.

Model Number/Name	$\Delta QAIC_c$ [a]	$QAIC_c$ Weights	No. of Parameters	QDeviance
1. $\phi(.)\ p(t)$	0.00	0.39	6	29.79
2. $\phi(L)\ p(t)$	0.29	0.34	7	29.06
3 $\phi(t)\ p(.)$	1.09	0.22	6	30.88

[a]lowest $QAIC_c$ value was 689.10

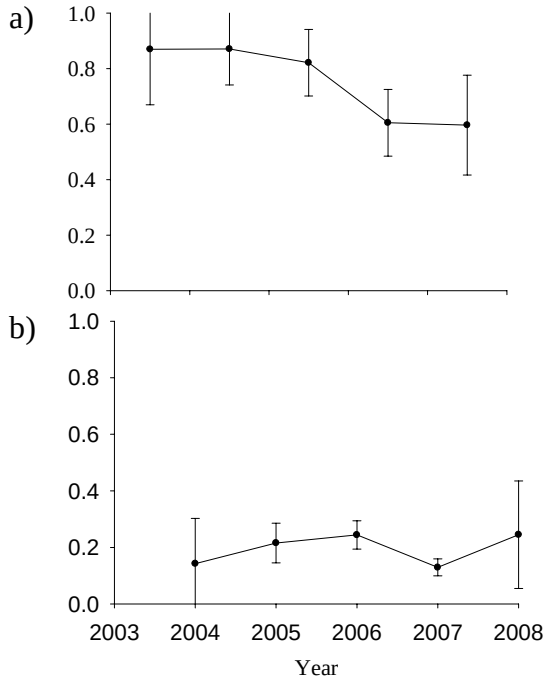
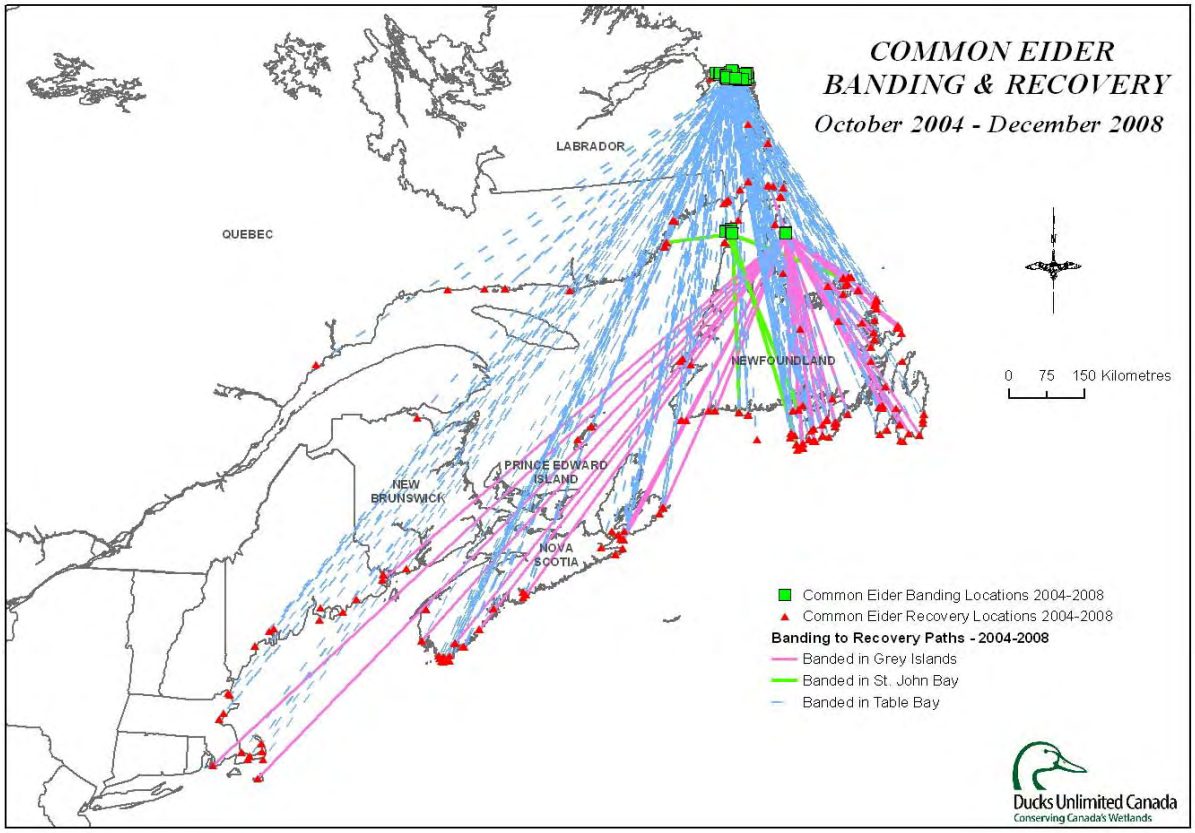


Fig. 2. Estimates of a) apparent survival and b) recapture probabilities (±SE) for adult Common Eiders banded at Table Bay, Labrador during 2003-2008. Values were calculated using the sin-link function and are the weighted averages based on 6 candidate models. Models include both time dependent and independent effects. Averages were weighted according to $QAIC_c$ values.

In contrast, weighted model averages of apparent survival for eiders marked at Grey Islands did not indicate a linear trend over time. Model average estimates of apparent survival were 0.71 ± 0.12, 0.83 ± 0.13, 0.63 ± 0.08 ($\hat{c}$ = 1.09) for 2004, 2005, and 2006, respectively. Weighted model average estimates of recapture probability for eiders marked at Grey Islands were 0.15 ± 0.05, 0.34 ± 0.08, 27 ± 0.03) for 2004, 2005, and 2006, respectively. Small sample size of captured eiders at St. John's Bay precluded estimates of apparent survival.

To date 357 band recoveries have been reported from: Newfoundland and Labrador (*n* = 201; includes 36 from St. Pierre Miquelon), Nova Scotia (*n* = 65), Quebec (*n* = 31), Massachusetts (*n* = 11), Maine (*n* = 8), New Brunswick (*n* = 4) and Rhode Island (*n* = 1). Most band recoveries (84%; *n* = 301) are for eiders marked at < 30 days of age. Most juvenile eiders (72%; 216/301) were shot near the coasts of Newfoundland and Labrador (Figure 3).

Figure 3. Location of hunter band recoveries of adult and locally hatched young eiders banded during summers of 2004-2007 and recovered during 2004-2007 hunting seasons. Links between breeding and recovery locations are shown in yellow and blue for young and green and red for adults banded in Newfoundland and Labrador, respectively.



Direct band recoveries (those shot during the same year as marking) provide indices to age specific hunting pressures. To date we have received 237 direct recoveries from both adults (n = 26) and young (n = 211). Direct recovery rates varied by site (Table 4). We suspect that changes in plasticine in duckling leg bands increased band loss from ducklings in 2006 and may account for the decrease in direct recoveries in 2007.

Table 4. Percent of direct hunter band recoveries of Common Eiders banded.

	2004		2005		2006		2007		Overall
Age	Grey Islands	Table Bay	Grey Islands	Table Bay	Grey Islands	Table Bay	Grey Islands	Table Bay	
Duckling	2.6% (11/420)	4.3% (46/1078)	1.4% (13/914)	3.2% (46/1418)	2.3% (11/482)	1.3% (24/1785)	10.0% (1/10)	0.1% (2/1978)	1.9% (154/8085)
Juvenile	-	-	-	6.6% (16/242)	-	9.8% (23/234)	-	6.5% (18/279)	7.5% (57/755)
Adult	0% (0/65)	0% (0/115)	2.9% (6/205)	0.9% (4/446)	0% (0/168)	1.0% (7/697)	-	1.5% (9/608)	1.1% (26/2304)

This is the final year to the field component of this project. Project investigators will collaborate with members of the scientific committee, Gregory Robertson and Scott Gilliland (both of Canadian Wildlife Service) to publish results and update population models It is anticipated the distribution of final reports related to the various project components will commence in August 2009.

Status: This research project is complete.