Sea Duck Joint Venture
Annual Project Summary for Endorsed Projects
FY05 – (October 1, 2004 to September 30, 2005)

Project Title: (SDJV #43) Factors involved in population dynamics and delineation of North American mergansers

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Project Description: A three-year project (2004 – 2006) examining reproductive ecology and site fidelity of Common and Red-breasted mergansers in south-central Alaska. Genetic samples are being collected throughout Alaska and across North American for all three species of mergansers to examine population delineation.

Objectives for 2004 – 2006:

I. Document general nesting ecology, estimate levels of fidelity, and examine how these influence population dynamics and structure of Common and Red-breasted mergansers in Alaska.

II. Assess population genetics of Common and Red-breasted mergansers in Alaska.

III. Assess phylogeography of all three merganser species across North America.

Preliminary Results (ordered by objectives listed above):

I. General nesting ecology and fidelity

1. ***Captures and marking (Table 1):***

   a. ***Pre-breeding adults.*** Similar to 2004, we focused capturing efforts on pre-nesting females to attach radios and locate nests. As in 2004, we were unsuccessful at capturing a large sample size of pre-nesting females due to river conditions and quickly educated birds. The Anchor River, where most captures were attempted, was in the active stages of melt and spring break-up in April when pairs move upriver to nesting sites. Nets were erected under bridges that were large enough for birds to fly under. Netted birds often used river currents to maneuver back out of nets before they could be pulled to shore. Birds also became quickly educated and subsequently avoided flying under bridges. Numerous capture attempts throughout April and May yielded only four marked

females, two of which were tracked to nest cavities (see 'Nesting ecology' below).

Table 1. Dates and number of Common and Red-breasted mergansers captured in south-central Alaska in 2005.

Date	Location	Species	Age & sex	Number & marker type
April 2005	Anchor River	Common	Adult females	4 (subcutaneous radios)
April 2004	Anchor River	Common	Adult males	5 banded
May & June 2005	Anchor River	Common	Adult females	3 banded
May & June 2005	Anchor River	Common	Hatch year	3 banded
July 2005	Kodiak Island	Common	Adult males	83 banded
August 2005	Anchor River	Common	Hatch year	10 captured (8 PTT's implanted)
August 2005	Anchor River	Common	Adult female	2 banded
August 2005	Kenai Peninsula	Red-breasted	Hatch year	6 banded
Total				**12 radios & 116 banded**

b. Brood-rearing adults. We attempted captures of Common and Red-breasted merganser females and broods during June–August. Female Common mergansers with very small ducklings could be reliably trapped using mist nets. However, we were unable to capture most of the small ducklings even with specially constructed duckling traps. Thus, we did not pursue this capture method due to our concerns with increased duckling mortality, female abandonment, and our desire to reliably assess brood survival. Red-breasted merganser females also abandoned associated broods during capture attempts (but returned a short time later). Without an attending female, Red-breasted merganser ducklings did not remain a cohesive unit that could be easily captured. Additionally, we wished to capture pre-fledging ducklings (see below) and increasing brood mortality may have decreased the number of older ducklings available for capture.

c. Molting adults. In contrast to other time periods, we were very successful at capturing sub-adult and adult Common mergansers during molt. Based on observations by the Kodiak National Wildlife Refuge and with their substantial support, we conducted standard waterfowl molt drives of birds on a large freshwater lake on Kodiak Island. Only males were observed molting at this location. Such, sexual segregation of Common mergansers at molt sites has also been observed in Scotland (M. Marquiss, pers. comm.). Surprisingly, one captured male was previously banded near Seward, Alaska in April, 2004, which represents a molt migration of approximately 400 km.

d. Pre-fledging young. An interest in juvenile natal site fidelity prompted us to attempt capture of a large sample of pre-fledging males and females on the Anchor River. Eight satellite transmitters were donated by the USGS Alaska

Science Center and seven were implanted in five female and two male hatch year birds in late August. These preliminary data will serve as a pilot project for future study of juvenile dispersal patterns.

2. ***Nesting ecology.*** Two of the four radio-marked Common merganser females yielded nest site information. The remainder failed (n = 1) or migrated out of our study area (n = 1). Both nests were in natural cavities of black cottonwood (*Populus* spp.) that were approximately 15 m above the ground. One tree was 50 m from the river, whereas the second was 200 m from the river. Neither nest successfully hatched.

3. ***Site fidelity.*** One of our core objectives was to examine patterns of site fidelity by breeding females using both demographic (banding) and genetic markers. Pursuing this objective was severely hampered by the difficulty of capturing breeding birds. Initial genetic analysis of Common mergansers suggests that molecular methods may offer a robust method to characterize site faithful behaviors (see below). However, we plan to again pursue capture and marking of birds in 2006 to complement our genetic analyses (see 'Project status' below). Lastly, it should be noted that similar difficulties with capture and investigations of nesting ecology have faced other merganser researchers (M. Marquiss, pers. comm.).

II & III. Genetic analysis of Alaska and North American samples

A total of 1,176 DNA samples (404 Common, 239 Red-breasted, and 530 Hooded) are now archived at the Alaska Science Center, Molecular Ecology Laboratory. Samples were collected from several sites in Alaska, Canada, the lower-48 United States, and Europe. Sample collection for Hooded mergansers is complete. Final sample collections for Common and Red-breasted mergansers will be made in 2006.

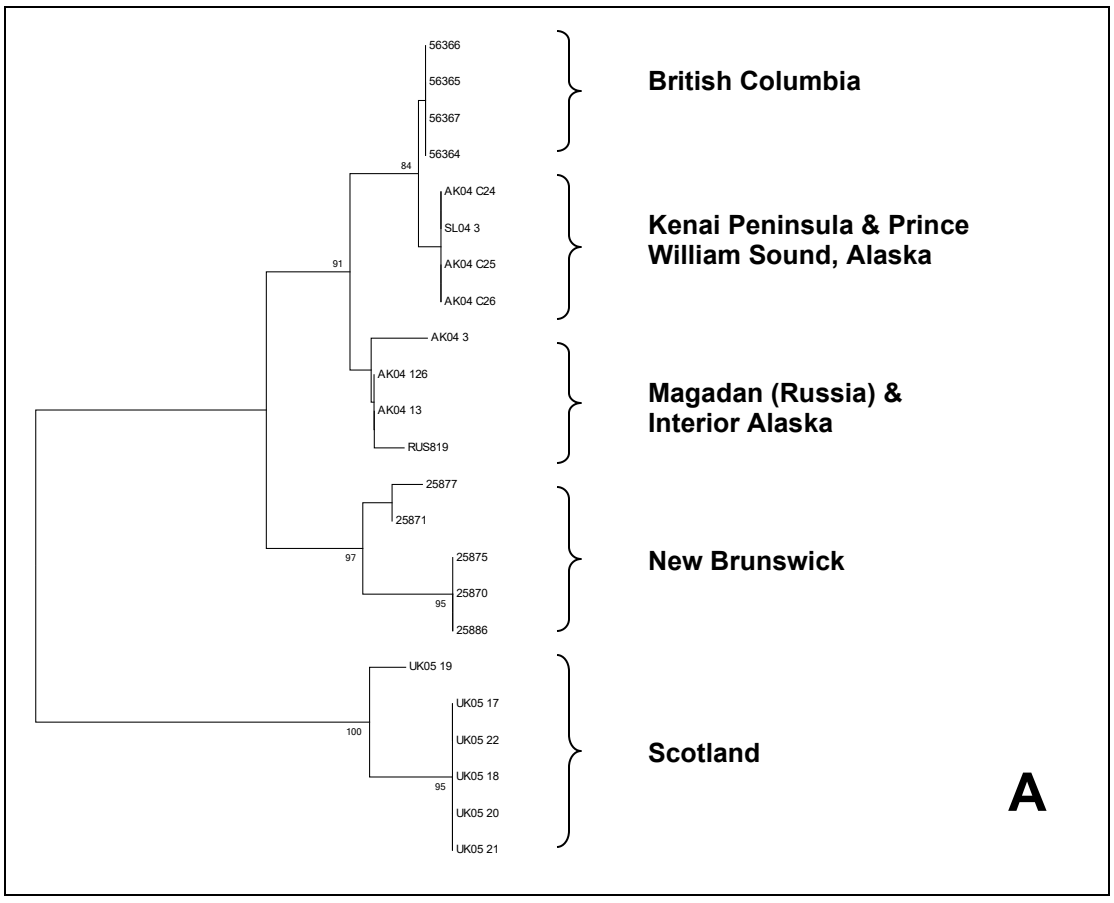
Completed lab tasks include:

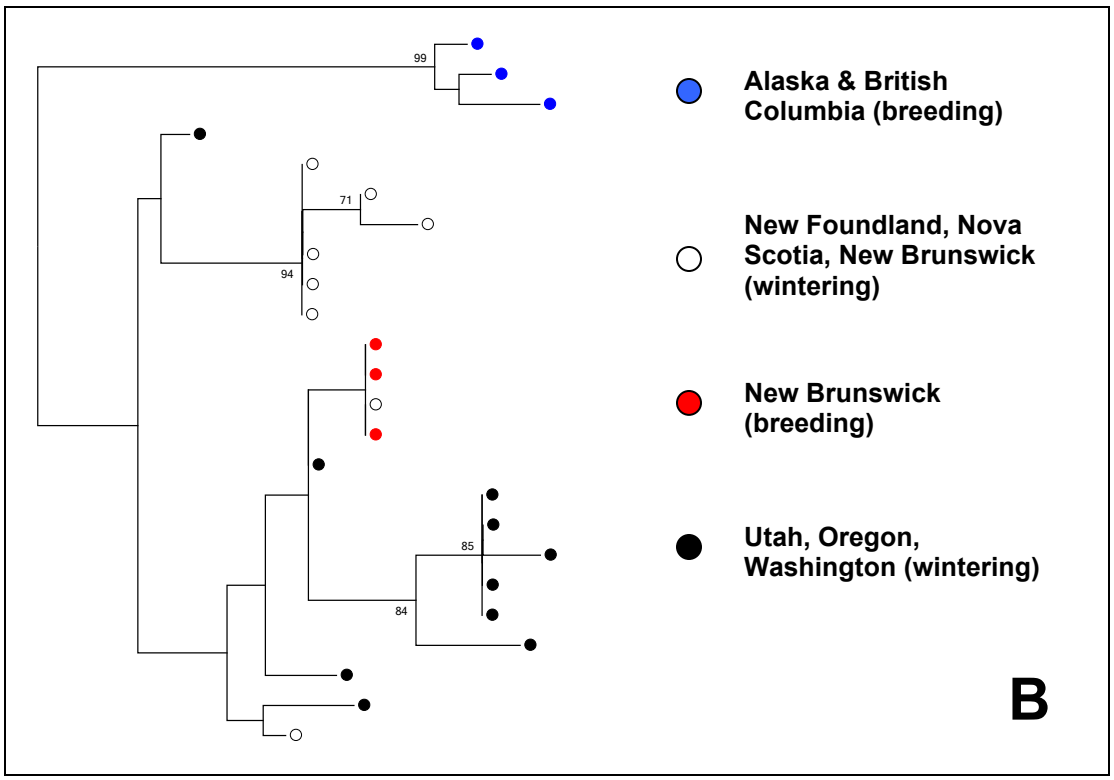
1. Extraction of DNA from 90% of all archived samples.
2. Screening and selection of suitable microsatellite loci for population genetic analysis of all three species.
3. Summaries of initial range wide variation for Hooded mergansers (see our 2004 SDJV Annual Report) and Common mergansers (see below) using mtDNA control region sequence data.

Current lab activities include:

1. Screening all three species for additional nuclear intron sequence variation.
2. Completing analysis of mtDNA control region variation in Hooded and Common mergansers for Alaska and North American perspectives on population structure (see below).
3. Initiate mtDNA analysis of Red-breasted mergansers.

An initial analysis of 23 breeding and 28 wintering common merganser samples from across their range was conducted during the summer of 2005 using 437 base pairs of the mtDNA control region. Substantial differentiation was observed among Alaskan breeding areas, between Alaska and the lower-48 United States, and between Pacific and Atlantic wintering areas (Fig. 1). Bootstrap values > 70% are shown and are based on 1,000 permutations. Values > 70% indicate high levels of support for a given branch of the tree. Samples from Scotland represent the nominate race (*M. m. merganser*), whereas all other samples are from *M. m. americanus*. As discussed and shown in Fig. 2 of our main proposal, some signal of glacial refugia is present in the breeding sample data (Figure A below) as birds from interior Alaska are more closely associated with a single sample collected near Magadan, Russia. This clade is well supported and different from a clade containing samples that were obtained from the Kenai Peninsula and Prince William Sound. A tree of wintering birds (Figure B below) is more complex and will require more analysis of breeding samples to interpret. Initially, it appears that either birds breeding near the eastern Atlantic (New Brunswick) are similar to those being shot in the western U.S. or that the western U.S. was colonized by birds originally from the eastern U.S. The lack of association between Alaska breeding samples and lower-48 wintering samples from the western states (Utah, Oregon, California) bolsters previous conclusions that Common mergansers are essentially non-migratory in some areas (Erskine 1972, Mallory & Metz 1999, Pearce et al. 2005).





I. Other activities (not funded by SDJV):

1. ***Analysis of historic North American banding data for Hooded mergansers.*** We are conducting a band-recovery analysis using data from four regional locations across North America (Northeast US, Great Lakes US, Southern US, and Missouri). Band-recovery data involved both sexes and ages and span the years 1968–2003. These data will be used to estimate annual survival for each region based on the best approximating model in Program MARK. We will also plot the geographic locales of band recoveries to examine movements of adults and juveniles between summer and winter areas. Results will be presented along with genetic data for this species at the 2005 North American Sea Duck Conference in Annapolis, Maryland.

2. ***Stable isotope analysis of Hooded merganser wing feathers.*** Using feathers from hunter harvested birds taken across North America, we are investigating the use of stable isotope ratios to infer contemporary movement patterns across the United States by combining these data with existing band-recovery and genetic data for this species.

II. Project Status (revised plans for 2006):

1. ***Nesting ecology*:** Spring captures will again be attempted along the Anchor River in 2006. We plan to again use mist nets, but also capture boxes that were erected during the summer of 2005. No additional funding is requested from SDJV for subcutaneous or prong radios for this effort.

2. ***Juvenile dispersal:*** Based on preliminary data gathered from satellite transmitters deployed in 2005, we will explore the use of 20-month conventional implant radios to track movements of juvenile birds post-fledging. Radios for this effort are already in hand as a result of this project and donations of unused radios by USGS, Alaska Science Center. Thus, SDJV funds are not requested for this effort.

3. ***Molt captures:*** We will again capture males on Kodiak Island during the molt period. Additional molting areas were located by aerial surveys on Kodiak Island and in Cook Inlet near Homer, Alaska. These areas will also be visited for assessment of molt captures, especially of adult females. Over time, these captures will allow an estimation of annual survival and molt site fidelity. The use of molt captures and survival estimation may be the best way to investigate "Population Dynamics" of Common and Red-breasted mergansers, identified as a high priority for this species by the SDJV Management Board (2001). SDJV funds are not requested for this effort.

4. ***Genetic data analysis*:** Final sample acquisition will continue in 2006 within Alaska and across North America. Laboratory analyses are on-going (see above). We do request that the final year of Sea Duck Joint Venture funding for this effort.

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)
$26,650	***$63,150***				U.S. Geological Survey
	$8,500				Kenai National Wildlife Refuge
		$1000			Various state wildlife agencies and private individuals
			$1000		Canadian Wildlife Service

Total Expenditures by Category (US$).

ACTIVITY	BREEDING	MOLTING	MIGRATION	WINTERING	TOTAL
Banding					
Surveys					
Research	**$100,300**				**$100,300**
Communication					
Coordination					