Sea Duck Joint Venture
Annual Project Summary for Endorsed Projects
FY 2003 – (October 1, 2002 to Sept 30, 2003)

Project Title: # 34 : Effects of nutrients on the physiology, energetics, and behavior of captive seaducks relative to seaduck feeding ecology in Chesapeake Bay.

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Project Description: The Chesapeake Bay has undergone extensive changes in the food sources it offers wintering waterfowl, due to the degradation of water quality. There is a need for research on the availability and nutritional quality of these food sources for wintering seaducks as a possible explanation for the decline in the wintering populations. The availability of food resources is especially important in areas of the Chesapeake Bay at depths of 20-40 feet where seaducks typically feed. These areas may be the first to be impacted by anoxic conditions if poor water conditions occur during the summer months. A captive colony of seaducks can be used for studies dealing with food webs and food habits.

Captive seaducks on various diets are a part of a physiological study dealing with blood and other non-lethal techniques to develop an extensive database for seaducks that would be invaluable for field studies conducted throughout North America. This study establishes and implements techniques and protocols to obtain and maintain a captive colony of several species of seaducks that are being used in a study dealing with nutrition, physiology, and behavior of seaducks at USGS-Patuxent Wildlife Research Center (PWRC). Initial focus is on the three species of scoters (black, surf, and white-winged) and long-tailed duck.

Eggs collected from the wild from nests of scoters (black, surf, and white-winged) and long-tailed ducks in areas where these species are successfully breeding will be used for the captive colony. Eggs will be transported to PWRC and incubated artificially. Data on growth, nutrients, energetics, and blood physiology will be collected on ducklings to establish background information on these species during their formative years. Food habits of the ducks and food availability in the Chesapeake Bay will be evaluated to provide a better understanding of the feeding ecology of seaducks in their wintering habitat.

Experimental diets will be formulated based on most current food habits analyses of the gullet and gizzard of seaducks and also by proximate analyses of foods collected from benthic sampling in feeding areas. The diets will vary by energy and protein. Extensive behavioral observations and blood sampling will be conducted. Two large aquariums (dive tanks) have been constructed indoors for use with feeding trials at PWRC. Food preference will be evaluated to determine if their preferred food source is the most energetically efficient and available in the Chesapeake Bay. Feeding performance of ducks will be studied in dive tanks to see environmental factors such as

water depth, type of water (salt or fresh), food density, and depth of substrate covering the food influence behavior and energetics of the ducks. To measure how a shift between food sources influences the foraging energetics we will evaluate each food type in terms of profitability (energy intake – cost of diving). With this information, we will model the feeding ecology and energetics of these species in response to changes in prey preference, availability, density, and size, and depth of substrate.

Objectives: The overall goal of this study is to help restore declining seaduck populations on wintering areas by modeling the feeding ecology and energetics of seaducks in response to changes in prey preference, availability, density, and size, and depth of substrate. Initial focus will be on the three species of scoters (black, surf, and white-winged) and the long-tailed duck.
This proposed study has a number of objectives:

- Compare food available at various depths in the Chesapeake Bay with known food habits of seaducks.
- Determine the influence of nutrients on condition, behavior, and blood chemistry of captive seaducks in winter.
- Determine what available food sources are preferred by each target species.
- Measure energetic intake and expenditure for each available food source at varying water depths, food densities, and substrate depths.

Preliminary Results: During the spring of 2003, egg collection was conducted in Quebec (Lac Malbaie) for surf scoters and in Saskatchewan (Redberry Lake) for white-winged scoters. A crew of five persons conducted extensive nest searches in Labrador for surf scoters for one week in June, however, no nests were found. Incubation of eggs and propagation of ducklings was conducted at Patuxent Wildlife Research Center, Laurel, MD. Of the 16 surf scoter eggs collected from two nests (8 each) all were viable and all but one hatched (94% hatchability). Six ducklings unfortunately died during the first two weeks leaving a total of 9 remaining live ducklings. Of the 44 white-winged scoter eggs only 22 were viable and 18 hatched (82% hatchability). Six died during the first two weeks leaving 12 remaining live ducklings. In the past month, two ducklings have died. One from aspergillosis, a fungal infection of the respiratory system, and the other from what appeared to be a hemolytic disease. Presently, histopathology analyses are being completed on the tissues of the duckling in hopes of determining the actual cause of death.

Measurements were taken of the length, width, and weight of each egg (Table 1). Ducklings were weighed at hatching and once a week after hatching until fully grown. Other measurements of growth included length of tarsus, culmen, and 10th primary feather. Growth patterns of the two scoter species showed normal exponential increase to a certain plateau when compared to other diving duck growth patterns. No significant differences were detected between the two clutches of surf scoters over the first two months of life. Length of tarsus and culmen also did not differ significantly for the two clutches during the first two months of life. Because white-winged scoters came from numerous nests, it was not possible to separate clutches and attempt to determine differences among clutches. Growth of combined ducklings was similar to surf scoters and other diving duck species from past studies. Length of tarsus, culmen, and 10th

primary feather showed growth over a two-month period that appeared similar to growth of surf scoters and other species.

In addition to the scoter species 36 common eider eggs were collected in Maine in 2003 and incubated at Patuxent. Twenty-four eggs hatched (67% hatchability), but two ducklings died during the first two weeks. An additional four ducklings died during the following two months from aspergillosis. We believe the mortality from aspergillosis could be related to the extremely wet and humid conditions experienced in Maryland during the summer of 2003. It is possible that seaducks that normally breed in more northern areas may be more susceptible to fungal infections. The growth of eiders based on weight showed a similar pattern as the scoters.

Table 1. Mean dimensions, weights (egg and hatchling), and percent hatchability of common eider, surf scoter, and white-winged scoter eggs collected from breeding areas along the Atlantic Flyway and incubated in a constant environment.

	n	Length (mm)	Width (mm)	Weight (g)	Hatch Wght	% Hatch
COEI	36	77.00	52.18	106.94	NA	67.00
SUSC	16	6.23	4.26	57.25	40.55	94.00
WWSC	22	6.67	4.61	74.77	48.00	94.00

Project Status: Obviously we are in the very beginning stages of this long-term study. We plan on starting the experimental diet component of the study in October 2003 on the ducks we have at present. The availability of food resources component of this study will begin this winter. Next spring we hope to collect more eggs of all four species with our primary emphasis on black scoters and long-tailed ducks. Egg collection this year was very time consuming and costly. We hope to collect more eggs of surf scoters from Lac Malbaie with the continued cooperation of Jean-Pierre Savard, Canadian Wildlife Service. We also expect to obtain more white-winged scoter eggs from salvage activities at Redberry Lake, Saskatchewan as part of a research study being conducted by Ray Alisauskas and Cindy Swoboda of the University of Saskatoon. The dive tank component will begin as soon as the building and the tanks are completely constructed. The projected completion date is the fall of 2004.

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)
	80K				USGS

Total Expenditures by Category (US$):

ACTIVITY	BREEDING	MOLTING	MIGRATION	WINTERING	TOTAL
Banding					
Surveys					
Research	**15K**			**65K**	**80K**
Communication					
Coordination					