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

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

Principal Investigator(s): Matthew C. Perry and Alicia M. Wells-Berlin, USGS-Patuxent
Wildlife Research Center, 12100 Beech Forest Drive, Laurel, MD 20708
Matt_Perry@usgs.gov; Alicia_Berlin@usgs.gov

Partners: USFWS; CWS

Project Description: Summary reports on the status of seaducks have revealed that populations have declined for some species and there has been an increased concern for the status of seaducks in general (Elliot 1997; Kehoe 1994; Petersen and Hogan 1996). Surveys of seaducks wintering on the Atlantic coast (1991-99) have shown major declines for the long-tailed duck (*Clangula hyemalis*), black scoter (*Melanitta nigra*), and surf scoter (*M. perspiculla*), whereas, the white-winged scoter (*M. fusca*) remained stable (Caithamer et al. 2000).

The Chesapeake Bay is an important wintering area for the three scoter species and the long-tailed duck. However, the Chesapeake Bay has undergone extensive changes in the food sources it offers wintering waterfowl due to water quality changes. The availability of food resources to ducks is especially important in areas of the Chesapeake Bay at depths of 10-30 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. As the quality and (or) quantity of food declines, ducks may travel farther between suitable food items or food patches to maintain adequate energy/nutrient intake. The food taken at any one time depends on both the preferences of the ducks and the availability of the food items. Thus as the availability of any food item changes, the food habits and possibly the relative abundance of the ducks may change, and result in movement into or away from an area.

In addition, if a food organism is present below a certain density it may no longer be profitable in terms of energy gain for a duck to seek it (Sugden 1971) so it may cause the duck to switch to a more abundant lower energy food source. The rate of acquisition of energy and nutrients depends on the intake rate of food items, and the food's size, nutrient content, and digestibility (Richman and Lovvorn 2002, 2003). Change in intake rate with prey density is a basic component of a number of models of waterbird foraging (Richman and Lovvorn 2002, 2003). A type II functional response, in which intake rates increase with increasing prey density up to an asymptote, often typifies diving duck foraging on benthic foods (Takekawa 1987, Giles 1990, Lovvorn and Gillingham 1996, Richman and Lovvorn 2002).

Objectives: The goal of this study is to determine what are the preferred food sources of seaducks wintering on the Chesapeake and whether this selection is a function of prey availability or energetic value. We will fulfill this goal by achieving the following objectives:

1. Determine the preferred food sources for each species based on what is available in the Chesapeake Bay in winter.
2. Determine what cues influence prey selection whether it is size, shape, color, or energy.
3. Examine the effects of prey density (prey availability) on prey selection by each species.
4. Develop a hypothetical model of seaduck feeding ecology.

Preliminary Results: During the spring of 2004, egg collection was conducted in Quebec (Lac Malbaie) for surf scoters, in Saskatchewan (Redberry Lake) for white-winged scoters, and in Churchill, Manitoba for long-tailed ducks. Incubation of eggs and propagation of ducklings was conducted at Patuxent Wildlife Research Center (PWRC), Laurel, MD. Due to unforeseen weather complications, no surf scoter eggs were collected. Of the 30 white-winged scoter eggs only 12 were viable and 9 hatched (75% hatchability). When the eggs were candled it was noted that they possessed a very large air cell, approximately 50% of the egg, and we believe this may have caused the lower hatchability. One hatched with a deformed leg and did not survive through the night. One died during the first two weeks leaving 7 remaining live ducklings. In the past month, one more duckling has died from a bacterial infection. In Manitoba, 50 viable long-tailed duck eggs were collected and transported to PWRC, where 46 hatched successfully (92% hatchability). Due to various reasons such as bacterial infections and behavioral complications we presently have 18 ducklings thriving. We are working closely with our veterinarian to conduct research in hopes of determining what happened this summer and to prevent it from happening again in the future.

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 wing chord. Growth patterns of all species showed normal exponential increase to a certain plateau when compared to other diving duck growth patterns. Long-tailed duck length of tarsus, culmen, and 10th primary feather showed growth over a two-month period that appeared similar to data collected last year for surf and white-winged scoters.

Table 1. Mean dimensions, weights (egg and hatch), and percent hatchability of common eider, long-tailed duck, surf scoter, and white-winged scoter eggs collected from breeding areas in Maine and Canada and incubated in a constant environment.

Species	n	Length (mm)	Width (mm)	Weight (g)	Hatch Wght. (g)	% Hatch
COEI	36	77.00	52.18	106.94	NA	72.22
LTDU	50	54.24	38.80	37.39	24.56	92.00
SUSC	16	62.30	42.60	57.25	40.55	87.50
WWSC	20	66.70	46.10	74.77	48.00	70.00

Project Status: No eggs were collected during fiscal year 2005. Ducks from previous collections were maintained and are doing well, in spite of a few mortalities. Mortalities seem to be caused from West Nile Virus and stress related problems. We plan on starting the experimental dive tank experiments component of the study in the next month on a subsample of the colony. A major amount of time, unfortunately, was expended on working with Facilities staff to build and equip the dive tank building.

We are in the beginning stages of this long-term study that has definite steps in the establishment of the colony and the necessary research facilities. We plan on starting the preference component of the study in November 2005 on the ducks we have at present. The research on the availability of food resources in the Chesapeake Bay will begin this winter. The diving component dealing with feeding ecology and energetics will begin as soon as the dive tanks are completely constructed which is projected to be November 2005. Once they are completed, training of the ducks to dive for their food resources will begin immediately.

Project Funding Sources (US$) (complete only if funded by a SDJV partner e.g., USFWS, CWS, DU, USGS, or Flyway rep; this is used to document how SDJV appropriated funds are matched):

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)
	$ 76,500				USGS

Total Expenditures by Category (US$) (complete only if project is funded by a SDJV partner e.g., USFWS, CWS, DU, USGS, or Flyway rep; dollar amounts should include all partner contributions):

ACTIVITY	BREEDING	MOLTING	MIGRATION	WINTERING	TOTAL
Banding					

Surveys					
Research	**$ 46,500**			**$ 30,000**	**$ 76,500**
Communication					
Coordination					