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THE EFFECT OF VARYING PROTEIN LEVELS ON BLOOD CHEMISTRY, FOOD CONSUMPTION, AND BEHAVIOR OF CAPTIVE SEADUCKS

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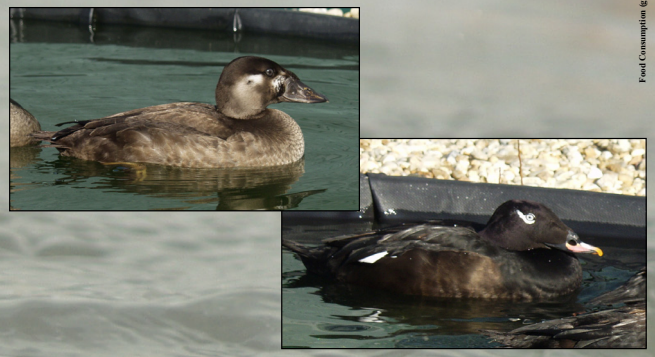
INTRODUCTION

Historically, the Chesapeake Bay has been an important area for wintering populations of waterfowl especially seaducks and diving ducks. However, Chesapeake Bay has undergone extensive changes in food resources available to wintering waterfowl due to water quality degradation. Research on the availability and nutritional quality of these food resources as a possible explanation for the decline in the wintering populations is needed. As the quality and quantity of food declines, ducks may travel farther searching for suitable food items or food patches to maintain adequate energy/nutrient intake. The food consumed at any one time depends on both preference and availability.. Thus, as availability of food items change, food habits and abundance of the ducks may change, and result in movement into or away from an area.

OBJECTIVES

The goal of this study was to evaluate the effects of protein on overall food consumption, body condition, and behavior of captive seaducks during winter. This study had two objectives:

1. Determine the influence of protein content on consumption, condition, and behavior of captive seaducks in winter.
2. Determine whether varying levels of protein influenced the blood profiles of seaducks.



METHODS

A captive colony of seaducks was established at Patuxent Wildlife Research Center, Laurel, Maryland (PWRC). Eggs were collected from the wild in northern Canada from nests of surf scoters (*Melanitta perspicillata), white-winged scoters (M. fusca)* and long-tailed ducks (*Clangula hyemalis)* in areas where these species are successfully breeding. All incubation of eggs and propagation of young was conducted at PWRC.

Objective One:

- Three different species were randomly fed three formulated commercial diets varying in percent protein only (14%, 18%, and 22%).
- Monthly body weights were collected on all individuals.
- Behavioral trials were completed one week every month on each pen.

Objective Two:

- Blood samples were collected from wild caught surf scoters as well as from the surf and white-winged scoters in captivity.
- In addition, the blood collected from captive seaducks was tested for *Aspergillus* antigen, a common disease of captive seabirds.

RESULTS

Objective One:

- *No significant difference between protein levels as a function of body weight for each species.*
- *All ducks showed an overall decline in body weight as the winter progressed.*

Figure 1. Average seaduck food consumption when offered formulated diets varying in percent protein (14, 18, 22) for November to February 2003.

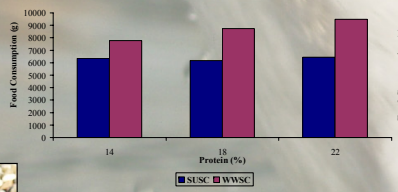
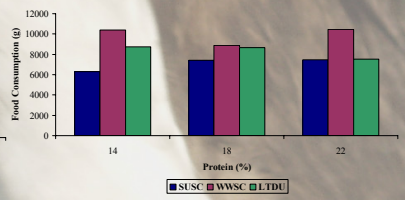


Figure 2. Average seaduck food consumption when offered formulated diets varying in percent protein (14, 18, 22) for November to February 2004.



- No significant difference found between protein levels as a function of average food consumed.
- Surf scoters consumed on average approximately 6000 grams of food over the winter, whereas the white-winged scoters consumed on average approximately 8000 grams of food. The long-tailed ducks consumed on average approximately 7500 grams during the winter.

RESULTS

- No significant effect of varying protein levels was found on the behavior of seaducks.
- The most common behaviors found were inactive, preening, sleeping, alert, swimming, and surface feeding.
- Most activity occurred in the morning compared to afternoon and early evening.

Objective Two:

- There was no significant difference in blood parameters between the varying protein levels.
- There was a significant difference found between white-winged scoter and surf scoters for glucose, cholesterol, CPK, uric acid, and *Aspergillus* antigen.
- There was also a significant difference found between wild and captive surf scoters for lymphocytes, glucose, aspartase aminotransferase (Ast), phosphorus, sodium, potassium, chloride, creatinine phosophokinase (CPK), and uric acid.

Table 1. Baseline blood chemistry for captive white-winged and surf scoters.

Blood Parameters	Means	
Species	WWSC	SUSC
Hermatocrit (%)	46.92	50.56
WBC ($10^3/\mu L$)	5.32	7.67
Het/Poly (%)	31.42	25.56
Lymphocytes (%)	65.08	72.44
Monocytes (%)	0.42	0.44
Eosinophils (%)	0.08	0.11
Basophils (%)	3.00	1.44
Morphology	NORMAL	NORMAL
Glucose (mg/dL) *	208.25	168.67
Total Protein (g/dL)	4.35	4.87
Albumin (g/dL)	2.05	2.33
Ast (sgot) (U/L)	36.00	26.44
Cholesterol (mg/dL)*	278.25	349.22
Calcium (mg/dL)	10.02	11.33
Phosphorus (mg/dL)	0.61	1.08
Sodium (mEq/L)	152.92	153.89
Potassium (mEq/L)	2.12	2.62
Chloride (mEq/L)	114.92	110.33
Globulin (g/dL)	2.30	2.53
CPK (U/L)*	259.25	457.67
Uric Acid (mg/dL)*	8.17	3.72
Asper Antigen	2.44	1.28

* Significant at the 5% level.

Table 2. Baseline blood chemistry for captive and wild surf scoters.

Blood Parameters	Means	
	Wild	Captive
Hermatocrit (%)	50.61	50.56
WBC ($10^3/\mu L$)	7.43	7.67
Het/Poly (%)	39.00	25.56
Lymphocytes (%)*	58.85	72.44
Monocytes (%)	0.54	0.44
Eosinophils (%)	0.08	0.11
Basophils (%)	1.54	1.44
Morphology	NORMAL	NORMAL
Glucose (mg/dL) *	206.70	168.67
Total Protein (g/dL)	4.66	4.87
Albumin (g/dL)	2.18	2.33
Ast (sgot) (U/L) *	53.00	26.44
Cholesterol (mg/dL)	315.31	349.22
Calcium (mg/dL)	10.68	11.33
Phosphorus (mg/dL) *	2.90	1.08
Sodium (mEq/L) *	155.54	153.89
Potassium (mEq/L)*	3.03	2.62
Chloride (mEq/L) *	113.60	110.33
Globulin (g/dL)	2.48	2.53
CPK (U/L)*	891.69	457.67
Uric Acid (mg/dL) *	5.65	3.72

* Significant at the 5% level.

FUTURE OBJECTIVES

- Compositional analyses including amino acid profiles will be completed on each natural food item that seems to be selected based on food habits data.
- Assimilation trials will be completed for each prey species and each seaduck species.
- Prey selection will be evaluated without costs of diving, with costs of diving, and with costs of searching in substrate for prey.
- Trials will be completed that alter the availability of each prey item to determine the effects of prey availability on prey selection.
- Create a compartmental model to explain the relationship between energy and availability in relation to prey selection.