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Nutritional, Physiolgical, and Behavioral Research on Captive Seaducks

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Historically, the Chesapeake Bay has been an important area for wintering populations of waterfowl (specifically seaducks and diving ducks), approximately 25-35% of the Atlantic Flyway population of waterfowl. However, the Chesapeake Bay has undergone quite a change in the food sources it offers wintering waterfowl due to the degradation of water quality. 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 (Melanitta perspicillata), whereas, the white-winged scoter (Melanitta fusca) increased in numbers (Caithamer et al. 2000). There is a need to test the hypothesis that the availability and nutritional quality of these food sources for wintering seaducks has changed and is a possible explanation for the decline in the wintering populations. Combined with information collected in the field, a captive colony could be used to study food webs and habits. This study established techniques and protocols to obtain and maintain a captive colony of the three species of scoters (black, surf, and white-winged) and long-tailed duck. The effects of experimental diets varying in protein and energy levels on the physiology and behavior of these species will be determined. Also, we will attempt to determine if seaducks exhibit an endogenous rhythm in regard to body weight and condition during the winter. Two large aquariums (dive tanks) were constructed and installed (2 x 3 x 3m) in a pen facility for use on feeding trials. 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. 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 will be tested to determine the influences of environmental factors such as depth of water, density of food, and depth of substrate covering the food. To measure how a shift between food sources influences foraging energetics, we will evaluate each food type in terms of profitability (energy intake – cost of diving), measuring both (1) the assimilation frequency (fraction of ingested energy absorbed by the gut) of different food sources found along migration and (2) the functional response (food intake rate for different prey sizes, densities, and depth in substrate)(Richman and Lovvorn in prep). 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. Changes in the distribution and abundance of food resources will be important in relation to changes in the distribution and abundance of seaducks, which is an important factor in managing seaduck populations on wintering habitats.