

FACTORS AFFECTING PREY CHOICE IN A DESPOTIC HERBIVORE: USING INDIVIDUALS TO PREDICT A POPULATION RESPONSE

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Abstract: The spatial distribution of animals is correlated to the location and abundance of food resources. The ability to predict how individuals should distribute themselves has implications for both conservation and our understanding of the ways in which animals make economic decisions. We are using East Canadian High Arctic Light-bellied Brent geese (LBBG) wintering in Ireland in order to gain insights into these processes. LBBG feed on the marine grass *Zostera* spp., grazing by the geese depletes this resource by early winter and they switch to feeding on alternative food sources including agricultural land. Given the despotic nature of Brent geese coupled with their preference for *Zostera* over terrestrial grasses we predict the dominance of larger social groups will influence the timing of diet switching and extent of inland feeding. We are using local gradients in stable carbon and nitrogen isotopes as markers to delineate the extent of terrestrial versus marine feeding in geese (estimated from stable isotope signatures in LBBG blood). We discuss our findings with respect their social / demographic status and present a preliminary individual-based model, allowing us to predict population level responses. Finally, we will discuss the implications of our findings in terms of conservation management decisions relating to this internationally protected population.

CANADA GOOSE BROOD-REARING BEHAVIOR: FURTHER EVIDENCE OF NUTRIENT LIMITATION ON AKIMISKI ISLAND, NUNAVUT

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Abstract: Brood behavior is considered a reasonable measure of habitat quality; therefore a change in behavior indicating decreased feeding time may adversely affect gosling growth and survival, and suggests local resource limitation. We studied behavior of Canada Geese (*Branta canadensis interior*; hereafter CAGO) on Akimiski Island, Nunavut, to determine if behavior differed on two areas differing in goose density, species', and food resources. During 1998-1999, CAGO goslings in an area with Lesser Snow Geese (*Chen caerulescens caerulescens*; hereafter LSGO) spent more time in locomotion and feeding, while those in an area without LSGO spent more time resting. We did not detect a difference in vigilance behavior of adults relative to area. Overall, differences in CAGO brood behavior was likely a function of higher brood densities (CAGO and total broods), reduced habitat integrity, or lower food availability in the mixed-species area. Increased locomotion and feeding by goslings in the mixed-species area suggests that area had lower quantity or quality forage. On Akimiski Island, competition of brood-rearing CAGO is not strictly limited to that with LSGO, rather it is the cumulative effects of all geese (i.e., CAGO, LSGO, and Atlantic Brant) using coastal brood-rearing areas that probably will result in long-term population declines of breeding Akimiski Island CAGO.

EFFECTS OF ELEVATED CO₂ ON KEYSTONE HERBIVORES IN MODERN ARCTIC ECOSYSTEMS

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Abstract: Elevated atmospheric CO₂ generally decreases plant quality (i.e., lower protein, increased fiber), especially of C₃ plants such as those that dominate arctic ecosystems. Predicting how changes in the quality and distribution of plants will affect higher trophic levels in arctic ecosystems requires knowledge of the reciprocal interactions between keystone herbivores and their food plants. Arctic-nesting geese are good indicators of the health of arctic ecosystems because the ecological limitations associated with being an avian herbivore require them to respond sensitively to changes in plant quality and quantity. Field studies have demonstrated that goslings that grow up in areas with poor habitat quality are smaller as adults and have reduced survival and fitness compared to geese in good quality habitat. Recent captive-rearing experiments with goslings have elucidated some of the important physiological responses of geese to poor quality forage. This work emphasizes the importance of phenotypic flexibility in the digestive system of geese, and of digestive constraints in determining the lowest quality of food eaten by such herbivores. Thus, predicting the effects of elevated atmospheric CO₂ on arctic ecosystems requires understanding the interplay between phenotypic flexibility, adaptation, and migration of the arctic biota.

DEPLETION OF FOOD PLANTS BY BRANACLE GEESE

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Abstract: The growing numbers of Snow geese in the Canadian arctic have resulted in irreversible changes in the arctic tundra breeding habitats. The European populations of most goose species also showed a tremendous increase in the last decades. The entire population of Barnacle geese breeding on Spitsbergen has grown from 2000 individuals in 1960 to more than 20,000 in 2002. We studied whether evidence can be found for changes in the breeding habitat as a consequence of these growing numbers of Barnacle geese. An experiment is currently being carried out to study the depletion of food plants experimentally. Captive Barnacle geese were used to create plots with a low and high grazing pressure in a wet and dry habitat. Geese showed considerable changes in the selection of food plants in the second year of this experiment suggesting depletion of their preferred food plants. Similar changes in the selection of food plants could be observed in an area with a growing breeding population of Barnacles where diet samples were collected since the establishment of the first breeding birds. Although evidence is found for depletion of food plants, enclosure experiments illustrate the reversibility of these effects on the tundra vegetation.