Evidence of bottom-up control of diet driven by top-down processes in a declining harbor seal (*Phoca vitulina richardsi*) population

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Two mechanisms of population control dominate most biological systems; bottom-up and top-down regulation. It is possible however, that top-down mediation may lead to bottom-up control of a population if predators simultaneously compete for the same prey. Harbor seals (*Phoca vitulina richardsi*) in Glacier Bay (GB) and Prince William Sound (PWS), Alaska have declined drastically since the 1970's, with PWS recently stabilizing and GB continuing to decline. Hypotheses for the declines include both bottom-up and top-down processes. We hypothesized that increased competition and predation risk by other predators is causing harbor seals in GB to forage on lower quality prey. We used a combination of prey remains and isotope analyses to compare seal diets in these areas. Seal diets in GB and PWS varied spatially and temporally due to changes in resource availability and sexual segregation. Adults showed clear divergence in diet during specific times of year in both areas. Sexual segregation of diet in GB was most prevalent during spring and fall, while segregation was greatest during late summer in PWS. Diet of seals in PWS showed annual variation not found in GB, likely following prey cycles. In GB during the summer, all seals switched to a diet of more intertidal/demersal species of lower fat content such as rockfish and sculpin. This switch coincided with an increase in competitors and predators entering GB. The change in diet combined with high estimates of emigrants out of GB, suggest that increased competition and risk of predation may contribute to overall population declines.

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