## How Many Fish Does it Take? Developmental and Seasonal Patterns of Food Intake and Body Mass in Three Arctic Seal Species

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Understanding how progressive climate changes in the Arctic ecosystem will affect marine mammals requires empirical data. This includes details of the energy intake of individual animals and the relationship between food intake and physical growth. Such information enables species-level food requirements to be determined and potential responses to changing environmental conditions – such as changes in sea ice cover and redistribution of prey species – to be more accurately modeled. Such data can be difficult or impossible to obtain from wild animals, but valuable insights can be gleaned from animals studied under human care. To provide fine-scale information about developmental and seasonal patterns in the energetic requirements of Arctic phocid seals, we documented longitudinal changes in food intake, body mass, and standard length in four spotted seals (*Phoca largha*), three ringed seals (*Pusa hispida*), and two bearded seals (*Erignathus barbatus*). Individuals were studied for up to 9 years in sub-Arctic and/or temperate climates while living at the Alaska SeaLife Center (Seward, AK) or Long Marine Laboratory (Santa Cruz, CA). Seals were fed using behavioral criteria that allowed their food intake and body mass to vary naturally. Gross energy intake (GEI) increased with age in all species, reaching a plateau as seals matured. GEI was greatest for the largest species (bearded seals) and lowest for the smallest (ringed seals). Mass-specific GEI declined with age, and was similar between spotted and ringed seals, with bearded seals consuming about half that of the smaller species. Overlaid upon long-term developmental changes were predictable seasonal cycles in food intake and body mass which became more pronounced as seals matured. Seasonal cycles in food intake and body mass did not always reflect simple cause-and-effect relationships. For example, seasonal peaks in food intake were regularly associated with simultaneous declines in body mass. The consistency of energy intake patterns, despite seals being maintained in semi-artificial conditions in different local climates, supports the hypothesis that seasonal oscillations are guided by underlying hormonal changes linked to key life history events and mediated by the physical environment. The described physiological patterns serve to highlight times of year when free-ranging Arctic seals may be more sensitive to environmental perturbations.