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Title:

Seasonal changes in body condition for spotted, ringed, and bearded seals

Abstract:

As high-latitude species, Arctic seals manage considerable changes in environmental and ecological conditions annually. They depend upon sea ice for rest, predator avoidance, and to carry out key life-history processes; however, this critical substrate is declining rapidly in persistence, thickness, and extent. During times of nutritional stress and/or when energy demands exceed energy intake, seals can mobilize lipids from their insulating layer of blubber to fuel metabolic processes. Thus, blubber thickness can vary greatly throughout the year and is often used as a metric of body condition. Here, we used the traditional truncated cones method to examine fine-scale changes in blubber mass for three Arctic seal species. Subjects included 4 spotted (*Phoca largha*), 3 ringed (*Pusa hispida*), and 1 bearded (*Erignathus barbatus*) seal. Energy intake was allowed to vary naturally and seals were trained to participate in data collection. Photogrammetric and direct morphometric measurements were collected weekly at defined locations along the body. Blubber depth was measured at the same locations using a portable ultrasound machine. All measurements were averaged monthly for a minimum of 1 year and used to determine body composition. On average, spotted seals experienced a 43% annual change in blubber mass, although this value was highly influenced by one individual (range 27% - 72%). Ringed seals incurred a 19% annual change in blubber mass (range 13% - 26%), while the bearded seal exhibited a 12% change. In spotted and ringed seals, blubber mass decreased prior to and through the molt, followed by an increase post-molt; this relationship was less defined for the bearded seal. Our data suggest physiological and environmental parameters are important in driving body condition patterns in these species. Ultimately, longitudinal assessments of body condition can be used to identify critical periods when seals may be most vulnerable to disturbance or environmental change.

