Ice Seal Energetics: Measuring Seasonal Changes in Metabolism for Ringed, Bearded, and Spotted Seals

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Ringed (*Pusa hispida*), bearded (*Erignathus barbatus*), and spotted (*Phoca largha*) seals are important components of Arctic and sub-Arctic ecosystems with unique life-histories and foraging strategies. Although all ice seals will be affected by ongoing climate change and sea-ice loss, the nature and extent of consequences will differ by species. Information about seasonal patterns in metabolic requirements can provide insight into individual and population-level resource needs—including identification of sensitive life-stages and improved understanding of the energetic costs associated with specific seasonal physiological cycles. Resting metabolic rate (RMR) is a commonly accepted measure of individual energy needs. As the foundation of individual energy budgets, it scales with other measures of energy expenditure and is a standardized measure to compare metabolic requirements both within and across species. We are using open-flow respirometry to longitudinally measure the in-water RMR of ringed (n = 2), bearded (n = 1), and spotted (n = 4) seals. Study animals are trained to rest daily in a metabolic enclosure, in a post-absorptive state, which enables measurement of rates of resting oxygen consumption. Standard calculations are employed to convert oxygen consumption into units of energy. The seals are located at two research institutions in the United States: Long Marine Lab (Santa Cruz, CA) and the Alaska SeaLife Center (Seward, AK); environmental conditions vary between institutions, but behavioral and research protocols are matched. While measurements are ongoing, preliminary results confirm that all species exhibit seasonal changes in RMR reflective of both physiological cycles (e.g.,molt, reproductive status) and environmental conditions (e.g., water temperature). Using this comparative framework, we have documented species-specific differences in RMR, which appear to extend beyond differences that would be predicted based on body size alone.