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Cardiorespiratory patterns in resting Alaskan seals

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When submerged, marine mammals enter a well-defined dive response characterized by apnea, bradycardia, and peripheral vasoconstriction. Further, phocid seals exhibit periods of apnea with accompanying physiological markers of the dive response while resting on land and ice. Given that most data have been obtained from a small number of well-studied species, relatively little is known about the cardiorespiratory patterns of seals from a comparative perspective. In the present study, paired respiratory and electrocardiogram data were obtained non-invasively from three species of Alaskan seals. Data were collected from nine healthy individuals conditioned to haul out and rest calmly on conductive electrode plates while breathing patterns were recorded. Preliminary analyses indicate that spotted seals (*Phoca largha*) show an expected bi-modal cardiorespiratory pattern during haul out with prolonged apnea (> 45 s) interrupted by extended eupnea (> 7 breaths). Heart rate in the spotted seals declined by ~ 60% during apnea. Ringed seals (*Pusa hispida*) showed similar alternating intervals of apnea and eupnea with some apparent differences, including shorter periods of apnea (> 25 s) and a higher heart rate during eupnea. Ringed seal heart rate declined by ~ 70% during apnea. The larger reduction in ringed seal heart rate when compared to spotted seals was primarily a consequence of higher heart rates during eupnea, as these species exhibited similar heart rates during apnea. In contrast to these smaller species, the bearded seal (*Erignathus barbatus*) showed an overall lower heart rate, increased and more regular breathing rate, and highly abbreviated apneustic intervals (< 10 s). Depth of bradycardia in the bearded seals was relatively shallow, with heart rate declining by only ~ 30% during apnea. These data suggest that bearded seals—the largest and most phylogenetically isolated Alaskan phocids—have a reduced innate dive response relative to that of more derived species. Ultimately, this initial description of cardiorespiratory patterns in spotted, ringed, and bearded seals contributes to our understanding of species-specific physiological adaptations to marine living.