Snow Conditions Predict Optimal Survey Periods for Ringed Seals

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Aerial surveys during spring have been used in population estimation and to monitor trends in distribution and density of ringed seals, but reliable estimates of the proportion of seals visible to aerial observers are lacking. We telemetrically monitored 8, 10, and 14 ringed seals in the Alaskan Beaufort Sea in spring of 1999, 2000, and 2001, respectively. At the same time, we measured weather and snow conditions on the ice. Each time a radio tagged seal was out of the water, we recorded whether or not it was concealed in a subnivean lair. The proportion of seals visible changed rapidly during the spring aerial survey period as seals shifted from resting in lairs to resting in the open. Emergence from lairs was not synchronous nor was it unidirectional; under some conditions seals moved back and forth between lairs and resting in the open. Each year, the end of the period during which seals emerged preceded snowmelt but coincided with an abrupt change from a thermally stratified to an isothermal snow pack. At the same time, changes in snow condition were also detected in satellite-borne, Ku-band backscatter data. After emergence, windchill temperatures explained much of the variability in the proportion of the seals visible. The annual onset of snowmelt varies by 5-6 weeks in the Beaufort Sea, and suitable survey periods cannot be determined based on calendar dates. Optimal survey periods can be determined by monitoring snow and weather conditions. Specifically, an isothermal snow pack and an increase in Ku-band backscatter indicate the beginning of the optimal survey period. During that period, weather data can be used to evaluate the impact of windchill on the proportion of seals visible.

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