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Seasonal Variation of Markers of Skin Health in Alaskan Ice Seals

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Abstract

Bearded (*Erignathus barbatus*), ringed (*Pusa hispida*), and spotted seals (*Phoca largha*) are Arctic and sub-Arctic pinnipeds that rely on seasonal sea ice for key life history stages, including pupping and molting.[1] Recent unusual mortality events (UMEs) involving skin pathology in Alaskan pinnipeds highlight the potential sensitivity of these species to the complex effects of climate change, as well as the lack of available reference data for healthy individuals. The Alaska Pinniped UME (2011–2016) included seals and walruses that presented with abnormal behavior, disrupted molts, and unusual skin lesions.[2] Despite intensive investigation, the etiology remains unknown.[3] In 2018, there was an increase in seals presenting with similar symptoms and a new UME was declared.[4]

Thyroid hormones,[5–10] vitamin A,[9] and cortisol[7,10] have been shown to play essential roles in skin health and seasonal molt in other pinnipeds. Unfortunately, it was not possible to evaluate these factors in cases associated with the UME since no comparative levels were available from healthy animals. To better understand health parameters that may inform conservation and management efforts, diagnostic information was gathered between 2000 and 2022 from Alaskan ice seals in short-term rehabilitation and those living in long-term human care. Thyroid hormones (TT4, TT3, and FT4), Vitamin A, and cortisol levels are reported for 5 ringed (42 samples), 6 spotted (46 samples), and 4 bearded seals (6 samples) at the Alaska SeaLife Center including samples taken from the same individuals throughout the year. In general, observed ranges for the target parameters were higher than seen in harbor seals. There were differences between individuals as well as seasons, with peak values observed in late spring during the annual molting period. The information reported in this study, although limited by sample size and sampling intervals, can be used to support veterinary management of Alaskan ice seals under human care. These values establish an initial baseline for skin health monitoring in wild populations and in stranded individuals with known skin lesions or pathology. As more data become available, we hope to resolve seasonal, physiological, and clinical patterns in these important health parameters.

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Literature Cited

1. Goertz, C.E.C., Reichmuth, C., Thometz, N.M., Ziel, H., and Boveng, P. (2019). Comparative Health Assessments of Alaskan Ice Seals. Front. Vet. Sci. *6*, 4. 10.3389/fvets.2019.00004.
2. Burek Huntington, K.A. (2012). Histopathological and Ancillary Diagnostic Findings from 2011 Northern Pinnipeds UME in the Arctic and Bering Strait Regions of Alaska, USA. In.
3. Fisheries, N. (2018). Unusual Mortality Events for Large Whales, Ice Seals Closed | NOAA Fisheries. NOAA. https://www.fisheries.noaa.gov/feature-story/unusual-mortality-events-large-whales-ice-seals-closed.
4. Fisheries, N. (2022). 2018–2022 Ice Seal Unusual Mortality Event in Alaska | NOAA Fisheries. NOAA. https://www.fisheries.noaa.gov/alaska/marine-life-distress/2018-2022-ice-seal-unusual-mortality-event-alaska.
5. Ashwell-Erickson, S., Fay, F.H., Elsner, R., and Wartzok, D. (1986). Metabolic and hormonal correlates of molting and regeneration of pelage in Alaskan harbor and spotted seals (*Phoca vitulina and Phoca largha*). Can. J. Zool. *64*, 1086–1094. 10.1139/z86-163.
6. Atkinson, S., Arnould, J.P.Y., and Mashburn, K.L. (2011). Plasma cortisol and thyroid hormone concentrations in pre-weaning Australian fur seal pups. Gen. Comp. Endocrinol. *172*, 277–281. 10.1016/j.ygcen.2011.03.014.
7. Kydyrmanov, A.I., Karamendin, K.O., Kassymbekov, E.T., Dmitrieva, L., and Goodman, S. (2018). Quantitative Analysis of Thyroid Hormone Levels in the Caspian Seal Pusa caspica (Gmelin, 1788). Russ. J. Mar. Biol. *44*, 390–393. 10.1134/S1063074018050073.
8. Oki, C., and Atkinson, S. (2004). Diurnal patterns of cortisol and thyroid hormones in the Harbor seal (Phoca vitulina) during summer and winter seasons. Gen. Comp. Endocrinol. *136*, 289–297. 10.1016/j.ygcen.2004.01.007.
9. Routti, H., Jenssen, B.M., Lydersen, C., Bäckman, C., Arukwe, A., Nyman, M., Kovacs, K.M., and Gabrielsen, G.W. (2010). Hormone, vitamin and contaminant status during the moulting/fasting period in ringed seals (*Pusa [Phoca] hispida*) from Svalbard. Comp. Biochem. Physiol. A. Mol. Integr. Physiol. *155*, 70–76. 10.1016/j.cbpa.2009.09.024.
10. Thometz, N.M., Hermann-Sorensen, H., Russell, B., Rosen, D.A.S., and Reichmuth, C. (2021). Molting strategies of Arctic seals drive annual patterns in metabolism. Conserv. Physiol. *9*, coaa112. 10.1093/conphys/coaa112.