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Physiology and Health of Cooperating Arctic Seals (PHOCAS)

The Arctic region has become one of the most graphic examples of the effects of climate change. Sea ice loss is progressing at an unprecedented rate, and ice-dependent seals, including ringed (*Pusa hispida*), bearded (*Erignathus barbatus*), and spotted (*Phoca largha*) seals may be particularly ill-equipped to tolerate such rapid environmental transformation. These high tropic level predators exert top-down control within Arctic ecosystems and are of critical importance to subsistence communities. Unfortunately, much remains to be learned about their basic biology and physiology. As a result, management agencies and conservation practitioners have an incomplete understanding of the physiological requirements and limitations of these species, and thus, a weak ability to make predictions about the capacity of ice-dependent seals to respond to rapidly changing environmental conditions. Currently, it is difficult or impossible to collect many types of physiological data from ice-dependent seals in the wild, which makes information gained from captive individuals vital to the conservation and management of these species. We have recently developed a cooperative research program between the Long Marine Lab in Santa Cruz, California, and the Alaska SeaLife Center in Seward, Alaska to work with and study trained ringed, bearded, and spotted seals in order to obtain valuable information about their biology and physiology. The broad objectives for this partnership are to determine short- and long-term energetic requirements, define thermal strategies and limitations, and describe critical life history periods including molt. In addition, we will examine and quantify key physiological constraints to diving and foraging for each species. Ultimately, these comparative data will be used to more accurately determine habitat requirements, define physiological limitations, and predict species' resilience to changing conditions in the Arctic. Data from this research program will provide fundamental information to managers and conservation practitioners attempting to understand and predict population-level consequences of environmental change and support efforts to take appropriate action.