World Marine Mammal Science Conference, Barcelona, December 9-12, 2019

All Authors:
Holly Hermann-Sorensen, University of California Santa Cruz **(Primary Presenter)**
Kathy Woodie, Alaska SeaLife Center
Nicole Thometz, University of San Francisco
Colleen Reichmuth, University of California Santa Cruz and Alaska SeaLife Center

Title:
In vivo measurements of ringed seal (Pusa hispida) lung volumes: Insights from biomedical imaging.

Abstract:

Pinnipeds rely on blood, muscle, and lung oxygen stores to support breath-hold diving. Defined by impressive blood volumes, hemoglobin concentrations, and myoglobin content, pinnipeds have a greater capacity to store oxygen in their blood and muscles than their terrestrial counterparts. Thus, these parameters are more commonly the focus of comparative physiological research, with lung structure and function less well studied. Deep diving pinnipeds rely heavily on blood and muscle oxygen stores while diving and collapse their lungs at depth to avoid tissue trauma and pressure related injury. More shallow diving pinnipeds may not fully collapse their lungs on routine dives, and likely rely on lung oxygen stores to a greater degree. Ringed seals (*Pusa hispida*) are among the smallest phocids. They are relatively shallow divers that exhibit short dive durations (typical dives < 100 m and < 8 min), and may rely on lung oxygen stores to a greater extent than other phocids. Currently, there are few studies aimed at understanding how respiratory control and lung oxygen storage is regulated in living marine mammals. Most studies rely on postmortem excised lungs to estimate total lung volume. In this study, we used high-resolution CT scans to provide the first in vivo measurements of total lung volume in ringed seals (n=5) ranging in age from 5 months to two years. All seals were anesthetized and intubated for scheduled veterinary procedures. Full body scans were obtained in 2.5 mm sections at a range of lung pressures (0, 30, and/or 37 mm Hg). By determining total lung volumes from 3-dimensional models of air spaces in living animals, we advance current understanding of diving lung oxygen stores. Further, these data can be combined with previously established estimates of blood and muscle oxygen stores to evaluate overall diving capacity and constraints in this species.