Metabolic Costs of Stationary Diving and Submerged Swimming in Bearded Seals (*Erignathus barbatus*)

Nicole Thometz[1,2], Madilyn Pardini[2,3], Madeline Meranda[2], Brandi Ruscher[2], David Rosen[4], and Colleen Reichmuth[2,3]

[1]University of San Francisco, [2]University of California Santa Cruz, [3]Alaska SeaLife Center, [4]University of British Columbia

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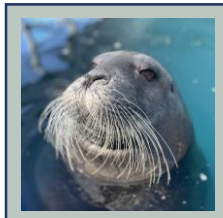
To more accurately predict the consequences of sea ice loss on free-ranging bearded seals (*Erignathus barbatus*), physiological source data are needed to parameterize bioenergetic and population models. Specifically, estimates of metabolism when resting, diving, and swimming are central to quantifying the energetic costs of associated behavioral changes. The PHOCAS (Physiology and Health of Cooperating Arctic Seals) research program uses a unique resource of non-releasable seals studied in human care to fill data gaps that cannot be addressed by studying wild seals. Here, we used open-flow respirometry to empirically measure stationary diving and submerged swimming metabolic rates, as well as resting metabolism at the surface, with one adult male and one juvenile female bearded seal.

Diving treatments: seals rested at the bottom of saltwater pools on a single breath hold for one of four consecutive treatment durations: 1, 3, 5, 7 minutes.

Swimming treatments: seals swam the perimeter of circular pools at preferred swimming speeds while submerged for set intervals up to 5 minutes.

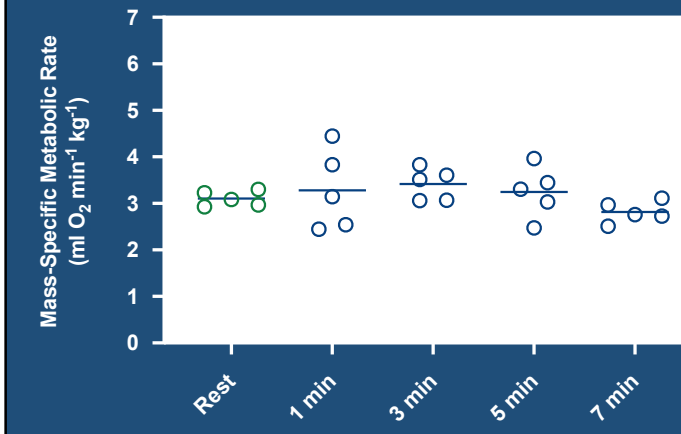
Data collection: seals entered a metabolic dome immediately following diving or swimming behaviors, where rates of oxygen consumption were measured using Sable Systems International respirometry equipment.



Adult Male Bearded Seal

Cost of stationary diving was consistent across durations (**avg: 3.19±0.55 ml O_2 min^{-1} kg^{-1}**) and comparable to his resting metabolism (**3.06±0.20 ml O_2 min^{-1} kg^{-1}**).

Metabolic rate during submerged swimming was **4.73±1.02 ml O_2 min^{-1} kg^{-1}** when traveling at about 0.9 m/sec.



Stationary diving metabolism measured in an adult male bearded seal; no difference between conditions [Kruskal-Wallis ANOVA: H = 5.18 , p=0.27].

Swimming metabolism in an adult male bearded seal is higher than metabolism during stationary diving or rest [One-way ANOVA: $F_{(2,39)} = 23.28$, $p<.0001$]

Juvenile Female Bearded Seal

Displayed higher mass-specific resting metabolic rate than adult male, conforming to ontogenetic trends. See AMMS poster by Pardini *et al.*

Preliminary data indicate a diving metabolic rate of **4.16±1.58 ml O_2 min^{-1} kg^{-1}**, compared to her resting rate of **4.89±0.11 ml O_2 min^{-1} kg^{-1}**

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