

Direct measures of pinniped field metabolic rate: implications for fisheries models

Mario Acquarone¹, Erik W. Born² & John R. Speakman³

¹National Environmental Research Institute of Denmark, P.O. Box 359, DK-4000 Roskilde, Denmark, and Royal Veterinary and Agricultural University, DK-1870 Frederiksberg, Denmark

²Greenland Institute of Natural Resources, P.O. Box 570, DK-3900 Nuuk, Greenland

³Aberdeen Centre for Energy Regulation and Obesity (ACERO), School of Biological Sciences, University of Aberdeen, Aberdeen AB9 2YZ, United Kingdom and ACERO, Division of Energy Balance and Obesity, Rowett Research Institute, Aberdeen, AB91 9SB

Abstract

The food requirements of free-ranging pinniped species can be derived from measures of Field Metabolic Rate (FMR) by the Doubly Labelled Water (DLW) method. However, fisheries models typically rely on indirect estimates of pinniped food requirements based on their theoretical basal metabolism multiplied by 3-4. Reluctance to employ direct measures of metabolism might be due to the limited body-size range of the seven pinniped species for which DLW studies are available to date. The measure of FMR of walrus in this study extends this range by a factor of 10. It also allows the derivation of a predictive equation for pinniped FMR ($\text{L}\cdot\text{O}_2\cdot\text{FMR}(\text{MJ}\cdot\text{day}^{-1}) = 0.173 \cdot 0.836 \cdot \text{L}\cdot\text{Total Body Mass}(\text{kg})$) and it suggests that pinniped food requirements might be double as high as assumed in fisheries models.

Keywords: food requirements, metabolic rate, feeding rates, pinnipeds, marine mammals, doubly labelled water, *Odobenus rosmarus*