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Metabolic Response of Individual Mysids to Changes in Pressure and Temperature

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Many zooplankton undergo diel vertical migration (DVM) and in doing so are exposed to striking changes in both temperature and pressure. While the DVM of these animals is thought to serve as an important link between productivity at the surface and deeper water communities, the metabolic costs associated with DVM have not been thoroughly explored. We developed a microrespirometer using PreSens Optical DO sensors and 1 ml glass vials to measure the oxygen consumption of individual zooplankton under various conditions. The glass vials were fitted with a flexible nitrile closure to allow for the transmission of hydrostatic pressure into sealed vials containing mysids. Individual mysids (Americamysis bigelowi) were subjected to 2 hour incubations at hydrostatic pressures representing depths of 0, 1000, or 2000m at either 15 or 20 C. The results of one-way ANOVAs indicated no significant change in oxygen consumption over the range of hydrostatic pressures tested at either temperature. However, while oxygen consumption was consistently lower at 15 C, the difference was not significant from the 20 C metabolic rate at the 1000m depth ($t(26)=1.21$, $p=0.24$). These results suggest that mysids are well adapted to the pressure changes associated with DVM and are able to successfully conserve energy in deeper, cooler water. Future studies will focus on expanding the range of pressures and temperatures examined, particularly exploring the confounding similarity in metabolic rate at the 1000m depth seemingly independent of temperature, while also evaluating the response of other taxa to similar environmental conditions.

Keywords: metabolism, hydrostatic pressure, diel vertical migration

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