

**AEROBIC CAPACITY, MITOCHONDRIAL DENSITY AND TEMPERATURE SENSITIVITY:  
A LATITUDINAL COMPARISON**

SA Morley<sup>1</sup>, LS Peck<sup>1</sup>, HO Pörtner<sup>2</sup>

<sup>1</sup>British Antarctic Survey, Cambridge, Cambridgeshire, United Kingdom, <sup>2</sup>Alfred Wegener Institute, Bremerhaven, Germany

Mitochondrial membrane density is a key factor defining aerobic capacities of animals. This is highlighted in the Southern Ocean where fish red muscle has elevated mitochondrial densities ( $\approx 30\%$ ) to overcome the limiting effects of cold on physiological rates. The current paradigm states that elevated mitochondrial densities lead to a sharp increase in maintenance costs in response to warming, which rapidly outstrips the organism's ability to supply oxygen to its tissues. A latitudinal comparison of mitochondrial inner membrane densities within foot muscle of the bivalve *Laternula elliptica* tested whether similar adaptive mechanisms have evolved in Antarctic marine benthos ( $60\text{--}67^\circ\text{S}$ ). Comparisons were then made with the congeners *L. truncata* and *L. boschasina*, which experience a similar annual temperature variation of  $4^\circ\text{C}$ , but in the tropics ( $27\text{--}31^\circ\text{C}$ ).

Burrowing activity is the major aerobic activity of infaunal bivalves as they re-bury within the sediment. Both Antarctic and tropical *Laternula* species are stenothermal with a 50% reduction of burrowing capability at  $+1^\circ\text{C}$  above maximum summer temperature ( $+2^\circ\text{C}$ ) in *L. elliptica* ( $67^\circ\text{S}$ ) and  $+4^\circ\text{C}$  above maximum summer temperature ( $+35^\circ\text{C}$ ) in *L. truncata* ( $1^\circ\text{N}$ ). Using re-burying as a proxy for an animal's ability to undertake aerobic work, the temperature sensitivity of aerobic capacity was linked with mitochondrial membrane density and life history strategy.