

Schmidt, A. , Handrich, Y. , Fahlman, A. , Woakes, A. J. & P. J. Butler

The aim of this study was to link thermoregulatory strategies with different levels of energy expenditure in the king penguin (*Aptenodytes patagonicus*). We relate temperatures in different regions of the body in birds at sea with average heart rate, and thus rate of oxygen consumption, to estimate and model the energetic cost of different activities at sea.

The king penguin is one of the diving species where experimental measurements of diving energetics, and thus theoretical aerobic diving performance, are not in accordance with behavioural observations. Therefore, the use of bio-logging techniques with free ranging individuals is of key importance if we are to understand the adjustments that occur in these animals when they are at sea.

The use of data-loggers (J.P. Gendner, CEPE Strasbourg-F, A.J. Woakes, School of Biosciences Birmingham-GB & Wildlife computers-USA) recording body temperatures, heart rate and environmental features (ambient temperature, pressure), enabled us to elucidate the possible energy-sparing strategies of these animals during diving, as well as demonstrate high levels of energy expenditure during resting at sea.

The results are from 18 penguins over 2 years. There were reductions in temperature from different regions of the body during underwater foraging. Although temperature drops in the peripheral tissues (up to -20°C) were not unexpected, even the locomotory muscles underwent temperature reductions during diving (up to -4°C compared to resting value). Surprisingly, resting periods, generally over night, were characterized by high body temperatures, even in the peripheral tissues (skin: 36°C in water at 4°C).