

Evidence of Behavioural Thermoregulation by Dugongs (*Dugong dugon*) at the High Latitude Limit to Their Range in Eastern Australia

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Abstract : Marine mammals live in an environment with water temperatures nearly always lower than the mammalian core body temperature of 35 - 38°C. Marine mammals can lose heat at high rates and have evolved a range of adaptations to minimise heat loss. Our project tracked dugongs to examine if there was a discoverable relationship between the animals' movements and the temperature of their environment that might suggest behavioural thermoregulation. Twenty-nine dugongs were fitted with acoustic and satellite/GPS transmitters in 2012, 2013 and 2014 in Moreton Bay Queensland at the high latitude limit of the species' winter range in eastern Australia on 30 occasions (one animal was tagged twice). All 22 animals that stayed in the area and had functional transmitters made at least one (and up to 66) return trip(s) to the warmer oceanic waters outside the bay where seagrass is unavailable. Individual dugongs went in and out of the bay in synchrony with the tides and typically spent about 6 hours in the oceanic water. There was a diel pattern in the movements: 85% of outgoing trips occurred between midnight and noon. There were significant individual differences, but the likelihood of a dugong leaving the bay was independent of body length or sex. In Quarter 2 (April - June), the odds of a dugong making a trip increased by about 40% for each 1°C increase in the temperature difference between the bay and the warmer adjacent oceanic waters. In Quarter 3, the odds of making a trip were lower when the outside -inside bay temperature differences were small or negative but increased by a factor of up to 2.12 for each 1°C difference in outside - inside temperatures. In Quarter 4, the odds of making a trip were higher when it was cooler outside the bay and decreased by a factor of nearly 0.5 for each 1°C difference in outside - inside bay temperatures. The activity spaces of the dugongs generally declined as winter progressed suggesting a change in the cost-effectiveness of moving outside the bay. Our analysis suggests that dugongs can thermoregulate their core temperature through the behaviour of moving to water having more favourable temperature.

Keywords : acoustic, behavioral thermoregulation, dugongs, movements, satellite, telemetry, quick fix GPS

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