

Crocodylian thermal relations

GORDON GRIGG¹ and FRANK SEEBACHER¹

Sinusoidal daily and seasonal patterns of change in body temperature (T_b) measured at 15°S latitude in 30–1 000 kg *Crocodylus porosus* are explicable by comparatively simple mathematical equations into which are fed only behaviour pattern, environmental data and body mass. This confirms that *C. porosus* and, by implication, other crocodylians in this size range, are simple ectotherms in which endogenous heat production, changes in regional blood flow and mouth gaping are insignificant influences on core temperature. Daily patterns of T_b in *Crocodylus johnstoni* at 17°S latitude, up to about 20 kg, are more similar to patterns typical of heliothermic reptiles, having a daily preferred T_b range which is achieved by shuttling between basking sites and the water. The preferred T_b range cycled with season in this species, suggesting thermal metabolic acclimatization. Competition for basking sites may prevent lesser status animals from achieving preferred T_b , and this must have significant implications for individual success in the population. Hysteresis of heating and cooling rates is known to occur in *C. johnstoni* and all other crocodylians in this size range examined so far, and is likely to augment behavioural thermoregulation under field conditions. Amphibious habits and the pronounced daily and seasonal cycles in operative temperatures give crocodylians many options for behaviourally modifying T_b . The options and, hence, the behaviours seen, are vastly different in small and large animals. Small individuals, despite being able to thermoregulate within a preferred range during sunny days, will inevitably face large daily cycles in T_b , even though they live in tropical habitats. This means that most crocodylians conduct most of their lives at temperatures away from their preferred ranges and are well able to hunt prey and be active over a wider range of T_b . Only large individuals, more than perhaps 500 kg, are able to be essentially thermostable (± 1 – 2°C) throughout the day and night, but even individuals of 1 000 kg show significant seasonal cycles in T_b . The extent to which these generalizations apply across most crocodylians is unknown, but what data there are from other species suggest that similar patterns probably prevail. Alligatoridae have a wider latitudinal and climatic range than Crocodylidae and this, along with their capacity to tolerate cooler conditions, needs further exploration.