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Research paper

Behavioral and endocrine responses to season and social dynamics of captive male southern hairy-nosed wombats (*Lasiorhinus latifrons*)

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ABSTRACT

Although southern hairy-nosed wombats (SHN wombats; *Lasiorhinus latifrons*) rarely breed in captivity, further knowledge of their reproductive physiology and behavior is likely to improve their breeding potential. This study examined the effect of seasonal variation and changes in social dynamics on the physiology and behavior of a captive population of male SHN wombats (n = 6). Seasonal changes in urinary testosterone metabolites (UTM), urinary cortisol metabolites (UCM), qualitative estimates of spermatorrhoea (QS), aggressive behavior and reproductive behavior were measured over an 11-month period. While there was no effect of month on QS (GLM ANOVA, P = 0.27), reproductive behavior (GLM ANOVA, P = 0.19) or aggressive behavior (Tukey pairwise comparisons), the secretion of UTM (GLM ANOVA, P = 0.051) was only marginally affected by season, compared to that reported for wild male SHN wombats. Mean UCM concentrations of July and August 2016 were significantly higher than those between October 2015 and January 2016 (Tukey pairwise comparisons). To examine social dynamics, two trials of animal positioning exchange with the enclosure system were implemented and behavioral data were examined for each trial over a six week period; UTM, UCM and general behaviors (n = 27) were measured for each trial. Neither UTM nor UCM concentration varied significantly ($P \geq 0.45$) before and after the exchanges. "Scratching" decreased at the group level following the animal exchange in both trials, suggesting reduction in self-grooming may be a behavioral response to novel stimuli. UCM and UTM concentrations were both positively correlated with "standing still" and "body rub" behaviors. This may be evidence of a hormonal control of a "freezing behavioral response" to external stimuli and marking behavior, respectively. As there was no evidence that changing the social dynamics affected reproductive or agonistic behavior or hormone concentrations, it was concluded that captive male wombats in this study showed reduced reproductive seasonality compared to wild wombats and that animal exchange resulted in a behavioral response to novel stimuli but was not sufficient to affect testosterone or cortisol secretion, within the context of our study.

1. Introduction

The southern hairy-nosed wombat (SHNW – *Lasiorhinus latifrons*) is a large, herbivorous, nocturnal, fossorial marsupial that is endemic to Australia. Wild SHNWs are mainly distributed in South Australia and southern Western Australia (Gaughwin et al., 1998). According to the International Union for Conservation of Nature and Natural Resources (IUCN), this species is currently listed as 'near threatened' (Woinarski and Burbidge, 2016) and the population sizes of free-ranging SHNW have been estimated to be declining due to a series of threats that include habitat fragmentation (Alpers et al., 1998), disease (e.g. sarcoptic mange; Ruykys et al., 2009; Sparrow, 2009) and climate change (Finlayson et al., 2005; Kellermann et al., 2009). The SHNW has routinely been kept in captivity since the 1970s (Hogan et al., 2013; Jackson, 2003) but given that no second generation offspring (F2) have been born in captivity, the captive population is incapable of being maintained without recruitment of animals from the wild (Hogan et al., 2013). The limited success in captive breeding has resulted in an unsustainable *ex situ* population (Hogan et al., 2010a, 2013), primarily attributable to a dearth of knowledge with respect to their reproductive physiology and behavior (Hogan et al., 2013). Gaining more information on physiology and behavior of this species will not only improve captive breeding success, but could also help with the management of critically endangered

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