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**Reproductive Behaviour, Endocrinology and
Captive Breeding of the Malayan Sun bear
(*Ursus malayanus*)**

A thesis presented in partial fulfilment of the
requirements for the degree of

**Master of Science
in
Zoology**

**at Massey University, Turitea, Palmerston North,
New Zealand**

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2000

Abstract

A better understanding of Sun bear (*Ursus malayanus*) reproductive biology is essential to implement more effective management of zoo populations. The objective of this study was to document and describe reproductive behaviour, monitor ovarian and testicular cycles, and review approaches to captive breeding. Because Sun bears exhibit no fixed breeding period in captivity, identifying a set of behaviours associated with oestrus, pregnancy and impending parturition are important. During 1997 three male:female pairs at two zoos were studied for periods of up to <10 months. Bears spent the majority of time in solitary behaviours, but oestrus was marked by and an increased rate of affiliative encounters, with females actively soliciting the male, and exhibiting characteristic behaviours including rolling, backward walking and inguinal presentation. Oestrus lasted ~2 weeks, the end being marked by rapid loss of sexual interest, and mutual avoidance. During mid-late gestation females became increasingly intolerant of the male, and altercations were common. Several weeks before term females acted reclusive, and extensive nesting occurred when suitable material was available. Parturition occurred ~3 months after mating, with pseudopregnancy lasting an equivalent period to 'true gestation', and being accompanied by similar behaviour changes and overt physical signs (e.g. mammary development). Separation of the female, provision of a high level of isolation and maintenance of privacy was necessary for successful rearing to occur.

Faecal sex steroids were analysed in samples collected from 13 (9 male:4 female) Sun bears housed in zoological parks in North America and New Zealand, over periods of <27 months. Male samples were assayed for testosterone and female samples for oestradiol 17 β and progestagens. Testosterone levels were often elevated during mating periods, with peaks frequently accompanying breeding behaviour and copulation. There was no significant effect of season ($p>0.05$) on testosterone concentrations, which fluctuated throughout the year, with most animals showing sustained increases in androgen excretion at 4-6 month intervals. The mean length of the follicular and luteal phase was 11.2 ± 1.3 days and 93.3 ± 3.0 days, respectively. Increased faecal oestradiol concentrations were associated with the onset of oestrus behaviours and breeding activity; an analysis of endocrine-behaviour data suggests that these behaviours may serve as useful indicators of physiological oestrus. The pattern of oestradiol and progesterone metabolite excretion during pregnancy and pseudopregnancy was similar, indicating that sex steroid monitoring may be of limited use for unequivocal pregnancy diagnosis in ursids.

Analysis of studbook data and breeding records from Sun bears in North American and New Zealand zoos revealed that reproduction in these populations is strongly seasonal with the majority (>75%) of births occurring during summer and autumn. A bimodal pattern of reproduction was observed, resulting from sharp peaks in the birth rate during July and October. Findings suggest a correlation between breeding activity and monsoon patterns in this species' native habitat. The factors limiting reproductive success in captive Sun bear populations are not understood. Difficulties confirming pregnancy, coupled with the failure of some zoos to separate potentially pregnant females or implement remote surveillance, reduces reliable statistics for birth or neonate mortality and prevents an investigation of the causes of cub fatality. A review of breeding records from various zoos indicates that standardising approaches to husbandry might also improve Sun bear reproduction in captivity.

Acknowledgements

Foremost, I would like to express thanks and deepest respect to my supervisor Prof. R.Fordham who provided professional guidance, unwavering support and strong encouragement throughout this study. I am grateful to Dr J.Cockrem for his advice and assistance during the project, and to Prof. K.Lapwood for readily imparting his knowledge and last-minute assistance. My appreciation also to Profs. P.Stockdale, N.Gregory and D.Mellor for helpful discussions resulting from their special interest in the project.

Many thanks to the management and staff of Wellington Zoological Gardens for their assistance; especially to the Sun bear keepers and staff from the Carnivore/Hospital Section, particularly B.Blanchard for her kind support. The co-operation and assistance of the Zoological Society of San Diego is highly appreciated. I would like to recognise the help of the Sun bear Forest Team, C.Penny and the staff at CRES; also to V.Hare for sharing her insight on environmental enrichment. A special mention to C.Gaylor for assistance above and beyond the call - including the generous contribution of personal time he devoted to searching for and providing important literature. Thanks are due to the Woodland Park Zoo, Seattle; my gratitude to S.Wasser for sharing his expert advice and collaboration on the project, also to M.Spector and K.Cooper for their patient teaching and laboratory expertise, and to C.Frederick for her co-operation and assistance in the role as North American Studbook keeper for the Sun bear. A big thank you to the Sun bear keepers of Jackson Zoological Park, Mississippi; Metro Washington Park Zoo, Oregon; Miami Metrozoo, Florida; Minnesota Zoo; Oakland Zoo, California; St Louis Zoo, Missouri; and Woodland Park Zoo, Washington for their extensive efforts in sample collection for the SSP project. I would like to recognise the assistance of technicians J.Candy and P.Barrett, and the creative talents of J.Jorgensen for development of an unusual but fundamental tool for sample collection. My thanks to D.Hederley and E.Minot for ideas on statistical analysis. Credit is due to J.Heuseveldt and M.Jones for expert translation of scientific papers. My thanks also to Sirtrack, Havelock North and City Aerials, Wellington for the loan of remote monitoring equipment.

Finally, my sincere appreciation to fellow bear enthusiasts who have shared their research and ideas from afar: L.Kolter, B.Boone, T.Tsubota, F.Schwarzenberger, S.Herrero, D.Garshelis, C.Servheen, D.Middleton, V.Watkins and G. Frederiksson. Last (but certainly not least), I would like to commend T.Jordan for his personal dedication and support throughout the project, which included providing a high level of technical assistance with telemetry, computers and other practical work.

Funding for travel and research was provided by the Ecology Department Development Fund and through postgraduate allowances from both the Ecology and Physiology Departments at Massey University. Contribution to the Sun and Sloth bear SSP project was made possible by Professor R.Fordham's munificent donation to cover shipping and laboratory analyses. Arataki Honey generously provided financial support toward international travel. I also extend heartfelt appreciation to a private benefactor for financial assistance during the project.

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