The Devil's Advocate

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Devoted to news about carnivorous marsupials.
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Enriching the Devil (Part 1)

By David Schaap, Australian Mammals Division, Taronga Zoo, Australia. (Editor's Note: This article was adapted from "Enriching the Devil: The Tasmanian Devil," which was originally published in The Shape of Enrichment Vol. 11, No. 1. It is reprinted here by permission of the author, and due to its length, will be presented as a series. Look for Part 2 in the next issue of The Devil's Advocate.)

The Tasmanian devil might be accurately described as the "Australian hyena." It is most commonly a scavenger, but on occasion it is also an opportunistic hunter, and therefore quite an active animal constantly in search of its next meal. Devils can eat more than a quarter of their body weight per day. For a wild devil, that requires a lot of foraging.

Prior to the implementation of our enrichment program, Taronga Zoo's male Tasmanian devil, named Munstan, displayed undesirable behaviors such as pacing that were probably caused by the complacency of never having to search for that next meal. Life for Munstan was easy. He knew that his next meal was not only coming but he knew *when* it was coming. The feeding schedule consisted of one morning feed and one afternoon feed. This regime led to long periods of inactivity for Munstan in between. Then he would exhibit a burst of activity prior to the afternoon feed as he paced in anticipation. The methods of feeding rarely presented a challenge. In a short period of time (averaging 10 minutes, in comparison to 35 to 90 minutes in the wild) the food was eaten and Munstan was once again asleep.

The goal of the enrichment program was to provide additional forms of stimulation in order to address this undesirable lethargy. Various forms of enrichment that were designed to encourage natural behaviors and stimulate senses were collated. These were then implemented, using different methods of feeding, varying the feeding times, and providing non-food related enrichment opportunities.

The program is designed around Taronga Zoo's existing Tasmanian devil diet, which consists of day old chicks, mice, rats and rabbit but it is presented in a more varied manner. The feeding times are randomized and a "timesheet" is included with the program. The keeper for the day records the times in which the various activities are conducted. This enables the keeper on duty the following day to check the activity times and ensure they are not duplicated. Additionally, the enrichment program is designed so that the activities are not always food oriented. Sometimes Munstan is released into his exhibit to his full daily ration of food, at other times only non-food enrichment is present. This produces variability in the devil's environment.

To be continued . . .

photo by Louise Schaap

Research Update

From: Dr. Menna Jones, Research Fellow
School of Botany and Zoology
Australian National University
& School of Zoology
University of Tasmania
Sent: November 05, 2002

The Tasmanian marsupial carnivore research group has just commenced a project examining the impacts of logging (clear-fell harvesting in native forest logging and plantation establishment) on populations and individuals of the spotted-tailed quoll. Clare Hawkins, who did her PhD on fossa in Madagascar has taken on this project as a post-doc.

Heather Hesterman, who is doing her PhD on behavioural endocrinology for captive breeding of Tasmanian devils and spotted-tailed quolls is now in the lab processing a freezer full of blood and faecal samples.

We are documenting the slow spread of an epidemic of lymphocarcoma in the Freyincet devil population. I am collaborating with the Regional (Government) Veterinary Pathology Laboratory to understand the pathology and causes of this disease. It appears to be fatal over about 6-9 months. Devils initially develop tumours in and around the mouth and head.

These can grow to 10cm diameter. In the later stages, they develop numerous soft tissue tumours throughout the body. This disease has only been recorded in the last 5 years and appears to be spreading down the eastern half of Tasmania.

ISIS Summary

It is sometimes discouraging to work with carnivorous marsupials. For example, there are only five individual devils living in North America, and they are all quite old. Optimist that I am, I spent an hour with the ISIS website, to get a feel for the big picture.

Here is a summary of dasyurids held in ISIS participating zoos worldwide. Regions are Australia (Aus), North America (NA) and Europe (Eur). The number of animals is given by males.females.unknown (m.f.u). For detailed information, see the ISIS website at www.isis.org.

It shows that there are quite a few dasyurids out there. What is more, we all know that there are animals that are happy and healthy at institutions that are not counted by ISIS. So be of good cheer, where there is life, there is hope!

Species	Reg	m	f	u
Antechinus agilis	Aus	3	2	0
Antechinus bellus	Aus	3	4	1
Dasycercus byrnei	Eur	23	30	4
Do.	NA	3	1	0
Do.	Aus	2	6	0
Dasycerus cristicauda	Aus	6	10	16
Dasyurus geoffroii	Aus	4	3	0
Dasyurus hallucatus	Aus	7	9	5
Dasyurus maculatus	Aus	6	3	2
Dasyurus viverrinus	Aus	8	5	0
Parantechinus apicalis	Aus	10	12	1
Parantechinus bilarni	Aus	0	1	0
Phascogale culura	Aus	16	24	84
Phascogale tapoatafa	Aus	0	3	0
Phascogale t. pirata	Aus	0	3	0
Phascogale t. tapoatafa	Aus	15	25	1
Planigale maculata	Aus	13	6	1
Pseudantechinus macdonnellensis	Aus	3	3	0
Sarcophilus l. harrisii	NA	2	3	0
Do.	Aus	13	13	0
Sminthopsis crassicaudata	Aus	11	11	2
Sminthopsis douglasi	Aus	3	5	0
Sminthopsis hirtipes	Aus	0	0	3
Sminthopsis longicaudata	Aus	0	2	0
Sminthopsis ooldea	Aus	0	0	1
Sminthopsis virginiae	Aus	0	2	0
Sminthopsis youngsoni	Aus	1	3	0
TOTALS		152	189	121

In the Literature

The following articles are new to *Devil's Advocate Annotated Dasyurid Bibliography*. You may borrow them if you wish (see below).

Armstrong LA, Krajewski C & Westerman M. 1998. Phylogeny of the dasyurid marsupial genus *Antechinus* based on cytochrome-beta,

12S-rRNA, and protamine-P1 genes. Journal of Mammalogy 79(4): 1379-1389.
Banks PB & Dickman CR. 2000. Effects of winter food supplementation on reproduction, body mass, and numbers of small mammals in montane Australia. Canadian Journal of Zoology 78(10): 1775-1783.
Davison MJ & Ward SJ. 1998. Prenatal bias in sex ratios in a marsupial, *Antechinus agilis*. Proceedings of the Royal Society of London Series B Biological Sciences 265(1410): 2095-2099.
Kraaijeveld- Smit FJL, Ward SJ, Temple-Smith PD, *et al*. 2002. Factors influencing paternity success in *Antechinus agilis*: last-male sperm precedence, timing of mating and genetic compatibility. Journal of Evolutionary Biology 15(1): 100-107.
Kraaijeveld- Smit FJL, Ward SJ, Temple-Smith PD, *et al*. 2002. Multiple paternity in a field population of a small carnivorous marsupial, the agile antechinus, *Antechinus agilis*. Behavioral Ecology and Sociobiology 52(1): 84-91.
Krajewski C, Wroe S, Westerman M. 2000. Molecular evidence for the pattern and timing of cladogenesis in dasyurid marsupials. Zoological Journal of the Linnean Society 130(3): 375-404.
Lindenmayer DB, Cunningham RB & Pope ML. 1999. A large-scale "experiment" to examine the effects of landscape context and habitat fragmentation on mammals. Biological Conservation 88(3): 387-403.
Lindenmayer DB & Lacy RC. Small mammals, habitat patches and PVA models: A field test of model predictive ability. Biological Conservation 103(3): 247-265.
Lynch C, Long S & Earnhardt J. 2001. Management Recommendations for the Marsupial & Monotreme Taxon Advisory Group. Prepared with assistance from the American Zoo and Aquarium Association Population Management Center in Chicago. 8 pp. *(Breeding: genetic management of five species including devils)*
MacNally R, Parkinson A, Horrocks G, *et al*. 2001. Relationships between terrestrial vertebrate diversity, abundance and availability of coarse woody debris on south-eastern Australian floodplains. Biological Conservation 99(2): 191-205.
Mills AL, Taggart DA, Bradley AJ, *et al*. 1999. Reproductive biology of the brush-tailed phascogale, *Phascogale tapoatafa* (Marsupialia: Dasyuridae). Journal of Zoology (London) 248(3): 325-335.
Obringer A, Lund A, Pryor W, Crichton E, Loskutoff N, Kirchner E. 2002. Sex and the devil: Monitoring reproductive activity in the Tasmanian devil (*Sarcophilus harrisii*). Abstract in Program of the Indiana Academy of Science 118th Annual Meeting: p. 106. (*Reproduction: urine analysis)*
Schaap D. 2001. Enriching the Devil: The Tasmanian devil. The Shape of Enrichment 11(1): ___.
Schaap D. 2002. Breeding Action Plan for the Tasmanian Devil, *Sarcophilus harrisii*. Zoological Parks Board of New South Wales. 12 pp.
Shimmin GA, Taggart DA, Temple-Smith PD, *et al*. 2000. Sperm competition and genetic diversity in the agile antechinus (Dasyuridae: *Antechinus agilis*). Journal of Zoology (London) 252(3): 343-350.
Soderquist T & MacNally R. 2000. The conservation value of mesic gullies in dry forest landscapes: Mammal populations in the box-ironwood ecosystem of southern Australia. Biological Conservation 93(3): 281-291.
Toftegaard CL & Bradley AJ. 1999. Structure of specialized osmetrichia in the brown antechinus, *Antechinus stuartii* (Marsupialia: Dasyuridae). Journal of Zoology (London) 248(1): 27-30.
Toftegaard CL, McMahon KL, Galloway GL, *et al*. 2002. Processing of urinary pheromones in *Antechinus stuartii* (Marsupialia: Dasyuridae): Functional magnetic resonance imaging of the brain. Journal of Mammology 83(1): 71-80.
Toftegaard CL, Moore C & Bradley AJ. 1999. Chemical characterization of urinary pheromones in brown antechinus, *Antechinus stuartii*. Journal of Chemical Ecology 25(3): 527-535.
Weidensaul S. 2002. Raising the dead. Audubon May-June 2002: 58-69. (*Reproduction: popular article about effort to clone thylacines*)

Westman W, Kortner G, Geiser F, *et al*. 2002. Developmental thermoenergetics of the dasyurid marsupial, *Antechinus stuartii*. Journal of Mammology 83(1): 81-90.

For the purpose of searching computerized literature databases, it is useful to summarize that the genera of dasyurids are: *Antechinomys, Antechinus, Dasycercus, Dasykaluta, Dasyuroides, Dasyurus, Ningaui, Parantechinus, Phascogale, Planigale, Pseudantechinus, Sarcophilus* and *Sminthopsis*.

Send us your news!

We're all hungry for your news. Whether you're a zookeeper, curator or researcher, your observations, insights or questions might be just the spark that the rest of us need. Send your brief submissions via email Wpryor@sf.edu or paper mail to the address shown above.

Useful Websites

Cooperative Research Centre for the Conservation and Management of Marsupials
www.marsupialcrc.com.au/

International Species Information System
www.isis.org

Amercian Association of Zoological Parks and Aquariums www.aza.org

Australasian Regional Association of Zoological Parks and Aquariums www.arazpa.org.au

European Association of Zoos and Aquaria www.eaza.net

AZA M&M TAG
www.ellentroutzoo.com/m&mtag/

Studbook Keepers

Dasyuroides (=Dasycercus) byrnei AZA Vacant
Dasyurus maculatus AZA Brandi Smith (AZA)
Dasyurus viverrinus ARAZPA Janelle Clapton (Healesville Sanctuary).
Sarcophilus harrisii ARAZPA Carla Srb (Healesville Sanctuary); AZA Elisabeth Koncza (Zoological Society of Florida).

Annotated Dasyurid Bibliography Available

You can obtain a current copy of *the Devil's Advocate Annotated Dasyurid Bibliography* in one of three convenient formats: emailed file, mailed computer disk, or paper copy. The *Bibliography* contains over 300 citations related to carnivorous marsupial biology, any of which are available for you to borrow. I'll loan you up to three at a time, for up to 30 days.

To obtain the email version (for free), send me a message (Wpryor@sf.edu) from the address to which you want the file sent. For free copy on disk (Microsoft Word format), mail me a self-addressed, stamped envelope containing a blank IBM formatted 3.5" disk. For a printed copy, send me a check for $5.00(USD) (make it out to Warren Pryor) to cover postage and the proverbial handling.

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