

# Reproductive strategies of the red-tailed phascogale (*Phascogale calura*)



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## Who's Your Daddy?

**Over the last year, there has been some action happening quietly behind the doors of the Animal Health and Research Centre, and I'm not referring to the treatment of sick animals.**

I'm talking about sex, and lots of it! This is the six-hour continuous lovemaking that has you hanging from the roof kind of sex. The new partner every day kind of sex. The make love til you drop kind of sex.

What! I hear you exclaim. That's outrageous!

Well before you get too outraged maybe I should clarify a couple of things. The individuals involved in this rampant love-making are an endangered carnivorous marsupial known as the red-tailed phascogale. This species was once found over large regions of Australia, but is now only found in south-west WA, where they are rarely seen due to their small size and their tree-top antics occurring at night.

As I alluded to above, their sex-life is not for the fainthearted. They only breed once a year with mating occurring over a few weeks in winter – maybe close body contact makes cold days easier to bear. Both males and females have multiple partners, which can result in a litter of young having multiple fathers – so it really is a question of 'who's your daddy?'

At the end of those several weeks of frenzied sex, the males escape any parental duties by dying. Ah, the life of a male – live off mum for a quarter of your life, go out wandering the world for half your life while building up those muscles, then pick fights with any other bloke you meet, chase the girls and have sex as much as possible for the last quarter.

Meanwhile, mum is left with eight babies to raise without a single child support payment. Luckily the young are born smaller than a tic-tac, which makes giving birth easier. Of the fourteen or so young born, only eight manage to find a teat – for the others it is just bad luck. Mum carts the kids around continuously for about seven weeks, then decides they are big enough to stay in the nest while she goes 'out on the tree'. Another seven weeks later and the kids are finally ready to leave home, having cleaned out mum's pantry and strained her sanity. Finally if she's survived all that she gets a bit of peace and quiet before jumping on the breeding roundabout again for a second year.

These sexy little creatures are the focus of my PhD project, which I'm doing with the assistance of Adelaide Zoo and Alice Springs Desert Park. By learning more about their sex-life, we hope to be able to improve the management of phascogales in captivity with the plan to release them back into some of their former range.

Though there are a lot of cute animals in the zoo, I happen to think the red-tailed phascogales are the zoo's sexiest animals. What about you?

**In 'South Australia's Zoo Times'. pp. 14.**

## Table of Contents

Declaration .....	i
Acknowledgements .....	iii
Conference presentations.....	v
Additional manuscripts.....	v
Awards.....	v
<b>Abstract .....</b>	<b>1</b>
<b>Introduction .....</b>	<b>3</b>
<b>The paradox of sex.....</b>	<b>3</b>
<b>Reproductive investment .....</b>	<b>4</b>
Limitations on female reproduction .....	4
Limitations on male reproduction .....	5
Investment in offspring .....	6
<b>Polyandry .....</b>	<b>7</b>
Sperm competition .....	8
Sperm choice .....	8
Multiple paternity.....	9
<b>Male semelparous dasyurids – strategy I life history .....</b>	<b>10</b>
<b>Evolution of the strategy I life history .....</b>	<b>11</b>
Environmental predictability.....	11
Female mortality .....	12
Sperm competition .....	12
<b>Reproductive investment in strategy I dasyurids .....</b>	<b>12</b>
Sex ratio .....	13
Size dimorphism .....	13
<b>Polyandry in strategy I species .....</b>	<b>14</b>
<b>Red-tailed phascogales .....</b>	<b>15</b>
Red-tailed phascogales as a model species .....	16
<b>Aims .....</b>	<b>17</b>
<b>Timing of births and reproductive success in captive red-tailed phascogales, <i>Phascogale calura</i> .....</b>	<b>19</b>
<b>Statement of Authorship .....</b>	<b>20</b>
<b>Abstract .....</b>	<b>21</b>
<b>Introduction .....</b>	<b>21</b>
<b>Methods .....</b>	<b>23</b>
Animals .....	23
Body mass and pouch changes.....	23

Faecal hormones .....	24
Sperm storage .....	25
Estimate of sperm storage duration .....	25
Timing of births and breeding success .....	25
<b>Results .....</b>	<b>26</b>
Female body mass .....	26
Pouch development of the female. ....	26
Faecal hormones .....	27
Sperm storage .....	27
Estimate of sperm storage duration .....	27
Timing of births .....	29
Breeding success.....	31
<b>Discussion.....</b>	<b>32</b>
<b>Acknowledgements.....</b>	<b>35</b>

**Changes in sperm production in a species exhibiting obligatory spermatogenic failure..... 37**

<b>Statement of Authorship .....</b>	<b>38</b>
<b>Abstract.....</b>	<b>39</b>
<b>Introduction.....</b>	<b>39</b>
<b>Methods.....</b>	<b>41</b>
Animals.....	41
Changes in scrotal diameter and testis and epididymal mass .....	42
Spermiogenesis .....	42
Post-mating epididymal sperm counts.....	42
Testosterone.....	42
<b>Results .....</b>	<b>43</b>
Seasonal changes in scrotal diameter and testis and epididymal mass.....	43
Spermatogenesis .....	43
Epididymal sperm storage .....	45
Relationship between testis mass, epididymal mass and scrotal diameter .....	46
Post-mating epididymal sperm counts.....	47
Testosterone levels and male body mass.....	47
<b>Discussion.....</b>	<b>48</b>
<b>Acknowledgements.....</b>	<b>51</b>

**Comparison of growth and development of the red-tailed phascogale (*Phascogale calura*) in three captive colonies..... 53**

<b>Statement of Authorship .....</b>	<b>54</b>
<b>Abstract.....</b>	<b>55</b>
<b>Introduction.....</b>	<b>55</b>
<b>Materials and methods .....</b>	<b>56</b>
Animals.....	56
Housing.....	56

Diet.....	56
Body measurements .....	56
Equations of growth curves.....	57
Developmental stages.....	57
<b>Results.....</b>	<b>57</b>
Pouch.....	57
Crown-rump length .....	57
Head length .....	57
Other measures.....	57
Bodyweight changes .....	58
Wild-caught and small captive litter .....	58
Developmental stages.....	59
Development of vibrissae.....	60
<b>Discussion .....</b>	<b>60</b>
<b>Acknowledgements .....</b>	<b>63</b>
<b>References.....</b>	<b>63</b>

**Generation of sex ratio biases in the red-tailed phascogale (*Phascogale calura*) .....** **65**

<b>Statement of Authorship .....</b>	<b>66</b>
<b>Abstract .....</b>	<b>67</b>
<b>Introduction .....</b>	<b>67</b>
<b>Materials and methods.....</b>	<b>68</b>
Animals .....	68
Embryo collection .....	68
Sex determination.....	68
Statistical analysis .....	68
Sex ratio of male semelparous dasyurids .....	69
<b>Results.....</b>	<b>69</b>
Embryo collection .....	69
Sex ratio .....	69
Maternal bodyweight and sex ratio .....	69
Numbers of corpora lutea and embryos .....	69
Maternal bodyweight and numbers of corpora lutea .....	70
Sex ratio of male semelparous dasyurids .....	70
<b>Discussion .....</b>	<b>70</b>
<b>Acknowledgements .....</b>	<b>71</b>
<b>References.....</b>	<b>71</b>

**Gender and parental influences on the growth of a sexually dimorphic carnivorous marsupial .....** **73**

<b>Statement of Authorship .....</b>	<b>74</b>
<b>Abstract .....</b>	<b>75</b>
<b>Introduction .....</b>	<b>75</b>

<b>Methods.....</b>	<b>76</b>
Animals.....	76
Weight variation with parental weights.....	76
Litter size and sex ratio in relation to maternal weight.....	76
Emergence of sexual dimorphism.....	76
Adult weight dimorphism.....	76
Meta-analysis of sexual dimorphism.....	76
Adult skeletal dimorphism.....	77
<b>Results .....</b>	<b>77</b>
Weight variation.....	77
Litter size and sex ratio variation with maternal weight.....	77
Sex differences during suckling.....	77
Adult weight dimorphism.....	77
Meta-analysis of sexual dimorphism.....	77
Adult skeletal dimorphism.....	78
<b>Discussion.....</b>	<b>79</b>
<b>Acknowledgements.....</b>	<b>81</b>
<b>References .....</b>	<b>81</b>

**Captive breeding with multiple paternity: an example in the semelparous red-tailed phascogale, *Phascogale calura* ..... 83**

<b>Statement of Authorship .....</b>	<b>84</b>
<b>Abstract.....</b>	<b>85</b>
<b>Introduction.....</b>	<b>85</b>
<b>Methods.....</b>	<b>87</b>
Captive breeding.....	87
Microsatellite genotyping.....	88
Recruitment success and male body mass.....	90
2004 effective population size.....	90
<b>Results .....</b>	<b>91</b>
Primer selection.....	91
Breeding and genotyping success.....	91
Recruitment success and male body mass.....	92
Effective population size.....	93
<b>Discussion.....</b>	<b>94</b>
<b>Acknowledgements.....</b>	<b>98</b>

**Concluding statement..... 99**

<b>Problems encountered .....</b>	<b>101</b>
<b>Future directions .....</b>	<b>102</b>

**References ..... 104**

***Declaration***

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Wendy Foster  
31<sup>st</sup> March 2008







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### **Conference presentations**

- Foster WK, Taggart DA, Donnellan S (2005) Reproductive biology of the red-tailed phascogale (*Phascogale calura*). 'Australian Mammal Society Annual Meeting'. (Albany, Western Australia)
- Foster WK, Taggart DA, Donnellan S (2006) Who's your daddy? Multiple paternity in the red-tailed phascogale. 'Australian Mammal Society Annual Meeting'. (University of Melbourne, Victoria)
- Foster WK, Taggart DA, Donnellan S (2007) Captive breeding with multiple paternity: a case study using the red-tailed phascogale, *Phascogale calura*. 'Biodiversity Extinction Crisis Conference - a Pacific Response'. (Sydney University, New South Wales)
- Foster WK, Taggart DA, Donnellan S (2007) How many babies, which sex and who's their daddy? Fecundity, prenatal sex ratio and paternity in the red-tailed phascogale. 'Australian Mammal Society Annual Meeting'. (University of New England, New South Wales)
- Foster WK, Taggart DA, Donnellan S (2007) Mating strategies of the red-tailed phascogale. 'Parasites, Conservation, and Evolutionary Ecology; Connecting some Disparate Threads'. (Flinders University, Adelaide, South Australia)
- Foster WK, Taggart DA, Donnellan S (2008) Captive breeding with multiple paternity: a case study using the red-tailed phascogale, *Phascogale calura*. 'Australasian Regional Association of Zoological Parks and Aquaria Annual Conference'. (Taronga Zoo, Sydney, New South Wales)

### **Additional manuscripts**

- Bradley AJ, Foster WK, Taggart DA (2008) Red-tailed phascogale. In 'Mammals of Australia'. (Eds S Van Dyck and R Strahan). New Holland: Sydney
- Foster WK (2005) 'Who's your Daddy?' In 'South Australia's Zoo Times'. pp. 14.
- Foster WK, Andrews L (2007) 'Proposal for translocation of red-tailed phascogales from Alice Springs Desert Park to Warraweena Conservation Park.' Royal Zoological Society of South Australia, Adelaide.

### **Awards**

- 2008 Research Award from the Australasian Regional Association of Zoological Parks and Aquaria
- Runner-up best overall presentation at the Australasian Section of the Society for Conservation Biology Meeting 2007, Biodiversity Extinction Crisis – a Pacific Response



**Abstract**

This thesis examines the reproductive biology of red-tailed phascogales, an obligate male semelparous dasyurid species, which is part of a captive breeding colony at Alice Springs Desert Park. The red-tailed phascogale belongs to a group of dasyurids that shows an unusual reproductive strategy amongst mammals, one which provides opportunity for understanding means by which individuals maximise their reproductive success and the role of sperm competition. The broad aim was to gain an understanding of the reproductive biology of red-tailed phascogales and explore means by which individuals can affect their reproductive success.

Examination of the red-tailed phascogale reproductive biology showed that females mated with multiple males and were capable of storing sperm in their oviducts for at least a five day period. Captive female red-tailed phascogales showed greater plasticity in their breeding season than has been observed in *Antechinus*, which exhibits the same life history strategy. Females were observed to invest heavily into the production of young, producing almost twice as many ova ( $15.1 \pm 1.9$ ) as young they can raise and 76% of females filling six to eight of the eight available teats in a breeding attempt. A 63% male bias was observed in young attaching to the teats, which could be produced through differential attachment of the sexes to teats at birth. Of the 846 young born in the captive breeding colony, 68% were weaned, with weaning occurring between 90-110 days of age and a 53% female bias observed in young being weaned.

By weaning, a litter of young weighed 380% of the mothers mass with male young tending to be heavier than females by weaning. No relationship was observed between maternal weight and either litter sex ratio or sex biased growth of young. A positive relationship between maternal body mass and body mass of offspring at weaning was observed, with the body mass of young at weaning correlated with its body mass at maturity. Multiple paternity was observed in more than half of the litters examined, with heavier males having increased siring success compared to lighter males. Genotyping showed that the effective population size for the captive colony was 1.9x that observed from the group managed studbook.

Male reproduction was also not as tightly constrained as in *Antechinus*, with spermatogenic failure not occurring in captive populations until after mating had occurred, meaning males are not reliant on epididymal stores alone for successful breeding. Scrotal diameter showed a

positive relationship with testis and epididymal mass across male life, although this relationship was not evident when analysis was restricted to the time of peak sperm production. Captive males showed the opposite pattern of testosterone fluctuations to that observed in wild animals, with lowest levels occurring during the mating period. Captive animals were able to survive up to five years in captivity, in contrast to the obligate semelparity observed in wild males.

Although most captive females can survive to breed in a second year and females are known to breed in a second year in the wild, the reproductive strategy of females appears to be aimed at maximising the returns on their first breeding attempt. In males, the need to maximise the investment into the first breeding season is amplified through the complete absence of opportunity to breed again; either through post-mating mortality in the wild or spermatogenic failure in captivity.

The results of this study have implications for captive breeding of red-tailed phascogales, with their reproductive biology; spermatogenic failure, restricted breeding season, teat number limiting the number of young raised, high lactational investment into young, sex biases, the need to maintain genetic diversity and biases in siring success; providing challenges for the maintenance of a captive population. The results of this study also provide comparative information that contributes to understanding the unusual life history strategy of *Phascogale* and *Antechinus*, and contributes to the growing body of knowledge about mating strategies in marsupials.