

# **NICHE PARTITIONING AMONG FUR SEALS**

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## STATEMENT OF AUTHORSHIP

Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis submitted for the award of any other degree or diploma.

No other person's work has been used without due acknowledgement in the main text of the thesis.

The thesis has not been submitted for the award of any degree or diploma in any other tertiary institution.

This thesis is presented as a series of published and soon to be published papers. Although I did the significant aspects of analysis and interpretation of the results, the following people are co-authors of some of these papers because they assisted in the pursuit of the research or preparation of the thesis as summarised below:

J McKenzie, A Morrissey, R McIntosh, SD Goldsworthy, A Baylis, N Calvert, M Berris, D Dowie, PD Shaughnessy, A Welling, M Chambellant, T Dorr, R van Veen and many others assisted with fieldwork. MA Hindell, MD Sumner and M Coyne gave advice of the analysis of dive data, satellite tracking data and oceanography data, respectively. SD Goldsworthy and MA Hindell supervised this project and received grants that funded part of this research. I offered co-authorship on papers to the people who helped considerably on this project.

All research procedures reported in the thesis were approved by the La Trobe University Animal Ethics Committee and the South Australian Department for Environment and Heritage Animal Ethics Committee.



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## PUBLICATIONS

The following peer-reviewed papers resulted from work completed during candidature

Page B, Welling A, Chambellant M, Goldsworthy SD, Dorr T, van Veen R. 2003.

Population status and breeding season chronology of Heard Island fur seals.

Polar Biology. 26: 219-224.

Page B, McKenzie J, McIntosh R, Baylis AMM, Morrissey A, Calvert N, Haase T, Berris

M, Dowie D, Shaughnessy PD, Goldsworthy SD. 2004. Entanglement of

Australian sea lions and New Zealand fur seals in lost fishing gear and other

marine debris before and after Government and industry attempts to reduce the

problem. Marine Pollution Bulletin 49: 33-42

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sympatric New Zealand and Australian fur seals. Marine Ecology Progress

Series 293: 283-302

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Zealand fur seals (*Arctocephalus forsteri*). Canadian Journal of Zoology 83:

293-300

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Zealand fur seal diving behaviour. Marine Ecology Progress Series 304:

249-264

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separation of foraging habitats among New Zealand fur seals. Marine Ecology

Progress Series

McKenzie J, Parry LJ, Page B and Goldsworthy SD. 2005. Estimation of pregnancy

rates and reproductive failure in New Zealand fur seals (*Arctocephalus forsteri*)

using serum progesterone concentrations and observation of live births. Journal

of Mammalogy 86: 1237-1246

Baylis AMM, Page B, Peters K, McIntosh R, McKenzie J and Goldsworthy SD. 2005.

The ontogeny of dive behaviour in New Zealand fur seal pups (*Arctocephalus*

*forsteri*). Canadian Journal of Zoology 83: 1149-1161



## **ABSTRACT**

At Cape Gantheaume, Kangaroo Island (South Australia), adult male, lactating female and juvenile New Zealand (NZ) and Australian fur seals regularly return to the same colony, creating the potential for intra- and inter-specific foraging competition in nearby waters. I hypothesised that these demographic groups would exhibit distinct foraging strategies, which reduce competition and facilitate their coexistence. I analysed the diet of adult male, adult female and juvenile NZ fur seals and adult male Australian fur seals and studied the diving behaviour of adult male and lactating female NZ fur seals and the at-sea movements of juvenile, adult male and lactating female NZ fur seals. Female diet reflected that of a generalist predator, influenced by prey availability and their dependant pups' fasting abilities. In contrast, adult male NZ and Australian fur seals used larger and more energy-rich prey, most likely because they could more efficiently access and handle such prey. Juvenile fur seals primarily utilised small lantern fish, which occur south of the shelf break, in pelagic waters. Juveniles undertook the longest foraging trips and adult males conducted more lengthy trips than lactating females, which perform relatively brief trips in order to regularly nurse their pups. Unlike lactating females, some adult males appeared to rest underwater by performing dives that were characterised by a period of passive drifting through the water column. The large body sizes of adult males and lactating females facilitated the use of both benthic and pelagic habitats, but adult males dived deeper and for longer than lactating females, facilitating vertical separation of their foraging habitats. Spatial overlap in foraging habitats among the age/sex groups was minimal, because lactating females typically utilised continental shelf waters and males used deeper water over the shelf break, beyond female foraging grounds. Furthermore, juveniles used pelagic waters, up to 1000 km south of the regions used by lactating females and adult males. The age and sex groups in this study employed dramatically different strategies to maximise their survival and reproductive success. Their prey and foraging habitats are likely to be shaped by body size differences, which determine their different physiological constraints and metabolic requirements. I suggest that these physiological constraints and the lactation constraints on females are the primary factors that reduce competition, thereby facilitating niche partitioning.

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## TABLE OF CONTENTS

STATEMENT OF AUTHORSHIP .....	II
PUBLICATIONS .....	III
ABSTRACT .....	V
ACKNOWLEDGEMENTS.....	VI
LIST OF FIGURES .....	XIII
LIST OF TABLES.....	XVIII
<b>CHAPTER 1. GENERAL INTRODUCTION.....</b>	<b>1</b>
INTER-SPECIFIC NICHE PARTITIONING .....	2
INTRA-SPECIFIC NICHE PARTITIONING .....	3
Sexual selection.....	3
Phenotypic variation and niche partitioning .....	5
Life history constraints and niche partitioning.....	6
Risk of mortality and niche partitioning .....	7
Ontogeny and niche partitioning.....	8
Summary.....	9
INTRA-SPECIFIC NICHE PARTITIONING AMONG PINNIPEDS .....	9
INTER-SPECIFIC NICHE PARTITIONING AMONG PINNIPEDS .....	13
SUMMARY OF THE PREDICTIONS ADDRESSED IN THIS THESIS.....	15
OBJECTIVES OF THIS STUDY.....	17
ORGANISATION AND STRUCTURE OF THIS THESIS .....	18

<b>CHAPTER 2. DIETARY RESOURCE PARTITIONING AMONG SYMPATRIC NEW ZEALAND AND AUSTRALIAN FUR SEALS.....</b>	<b>19</b>
INTRODUCTION.....	20
MATERIALS AND METHODS.....	23
RESULTS.....	27
Adult female NZ fur seal diet.....	27
Adult male NZ fur seal diet.....	37
Juvenile NZ fur seal diet.....	39
Adult male Australian fur seal diet.....	40
Seasonal trends in fish, cephalopod and bird consumption.....	40
Variation in the prey size taken by different age, sex and species groups.....	41
Age group, sex and inter-specific dietary differences.....	43
DISCUSSION.....	47
Inherent diet study biases.....	47
Competition for marine resources.....	48
Inter-specific competition between adult males.....	51
Interactions between NZ fur seals and little penguins.....	52
<b>CHAPTER 3. INTER-SEXUAL DIFFERENCES IN NEW ZEALAND FUR SEAL DIVING BEHAVIOUR.....</b>	<b>54</b>
INTRODUCTION.....	55
MATERIALS AND METHODS.....	58
Study site.....	58
Capture and restraint.....	59
Data collection.....	59
Data analyses.....	60
RESULTS.....	64
DISCUSSION.....	72

<b>CHAPTER 4. DRIFT DIVES BY MALE NEW ZEALAND FUR SEALS .....</b>	<b>79</b>
INTRODUCTION.....	80
MATERIALS AND METHODS .....	81
Study site .....	81
Capture and restraint.....	82
Data collection .....	82
Data analyses .....	83
RESULTS .....	84
DISCUSSION .....	88
 <b>CHAPTER 5. SPATIAL SEPARATION OF FORAGING HABITATS AMONG NEW ZEALAND FUR SEALS .....</b>	 <b>92</b>
INTRODUCTION.....	93
MATERIALS AND METHODS.....	95
Study site .....	95
Capture and restraint.....	95
Data collection .....	96
Data analyses .....	97
RESULTS.....	100
Foraging trip duration .....	102
Summary of foraging behaviour .....	102
Inter-sexual differences: foraging behaviour.....	104
Inter-sexual differences: oceanography.....	110
Habitat separation among male, female and juvenile NZ fur seals .....	114
DISCUSSION .....	119
Lactating female foraging behaviour.....	119
Adult male foraging behaviour.....	121
Juvenile foraging behaviour .....	122
Habitat separation among male, female and juvenile NZ fur seals .....	124
Summary.....	125

<b>CHAPTER 6. GENERAL DISCUSSION .....</b>	<b>126</b>
Summary.....	127
Phenotypic constraints on habitat selection.....	127
Life history constraints on habitat selection .....	128
Risk of mortality and habitat selection .....	129
Future work .....	130
<b>REFERENCES.....</b>	<b>133</b>
<b>APPENDIX 1. ENTANGLEMENT OF AUSTRALIAN SEA LIONS AND NEW ZEALAND FUR SEALS IN LOST FISHING GEAR AND OTHER MARINE DEBRIS BEFORE AND AFTER GOVERNMENT AND INDUSTRY ATTEMPTS TO REDUCE THE PROBLEM .....</b>	<b>153</b>
ABSTRACT .....	154
INTRODUCTION.....	154
MATERIALS AND METHODS.....	157
Species .....	157
Study sites .....	157
Data collection and analyses.....	157
RESULTS .....	159
Australian Sea lions .....	161
New Zealand fur seals.....	162
DISCUSSION .....	164
Australian Sea lions .....	167
New Zealand fur seals.....	170

<b>APPENDIX 2. POPULATION STATUS AND BREEDING SEASON CHRONOLOGY OF THE FUR SEALS AT HEARD ISLAND.....</b>	<b>172</b>
ABSTRACT .....	173
INTRODUCTION.....	173
MATERIALS AND METHODS .....	174
RESULTS AND DISCUSSION .....	176
Breeding population .....	176
Haulout of itinerant males.....	179
Tagged fur seals .....	180
Subantarctic fur seals.....	180
Implications for the management of Heard Island.....	181

## LIST OF FIGURES

### CHAPTER 2. DIETARY RESOURCE PARTITIONING AMONG SYMPATRIC NEW ZEALAND AND AUSTRALIAN FUR SEALS

- Fig. 1. Location of Cape Gantheaume and the islands mentioned in the text, in relation to the continental shelf, shelf break (200, 500, 1000 and 2000 m depth contours) and pelagic waters..... 21
- Fig. 2. Changes in the percent biomass contribution by fish, cephalopods and birds in each season for each seal age/sex/species group..... 38
- Fig. 3. Intra-specific and inter-specific variation in the diet of adult female, adult male and juvenile NZ fur seals and adult male Australian fur seals. Each point represents the biomass contribution in a season for an age/sex/species group. Variables (prey taxa) that had significant correlation coefficients are shown on the ends of each axis. Three-dimensional stress = 0.07 ..... 44
- Fig. 4. Seasonal niche overlap index (O) based on the percentage estimated reconstructed biomass contribution of each prey taxa consumed by each age/sex/species group. AF = adult female NZ fur seal, AM NZ = adult male NZ fur seal, Juv = juvenile NZ fur seal, AM Aust = adult male Australian fur seal ..... 46

### CHAPTER 3. INTER-SEXUAL DIFFERENCES IN NEW ZEALAND FUR SEAL DIVING BEHAVIOUR

- Fig. 1. Location of Cape Gantheaume in relation to the continental shelf, shelf break (200, 500, 1000 and 2000 m depth contours) and pelagic waters..... 58
- Fig. 2. Two-dimensional dive profiles in various resolutions from 2 adult NZ fur seals. Left panels: adult male 270, right panels: adult female 15 (Table 1). Dive profiles have resolutions of 2.5 days (top row), 14.5 and 8 h (second row), 2 and 1 h (third row) and 30 and 80 min (bottom row). Putative U-shaped foraging and V-shaped foraging, departure and arrival dives are indicated ..... 61
- Fig. 3. Frequency distribution of arrival (white bars) and departure times (black bars) (local time), calculated from the dive records of 26 adult female (top) and 13 adult male (bottom) NZ fur seals. Data from first foraging trip ..... 66

Fig. 4. Mean dive depths and the mean proportion of DBT in relation to local time and season for 26 adult female (white bars) and 13 adult male (black bars) NZ fur seals. Data from first foraging trip. Standard error bars are shown ..... 67

Fig. 5. Mean proportions of DBT spent in 20 m depth intervals during each season for 26 adult female (top) and 13 adult male (bottom) NZ fur seals (see Fig. 4 for sample sizes in each season). Data from first foraging trip. Standard error bars are shown ..... 68

Fig. 6. Intra-sexual, inter-sexual, intra-seasonal and inter-seasonal variation in adult male (white points) and female (black points) NZ fur seal diving behaviour. Each individual's foraging trip is represented by a single point. Polygons enclose the 3 behavioural dive groups: DAYTIME (bottom polygon), DEEP (middle) and SHALLOW (top). Variables (diving parameters) that had significant correlation coefficients are shown on the ends of each axis. Three dimensional stress = 0.077 ..... 70

**CHAPTER 4. DRIFT DIVES BY MALE NEW ZEALAND FUR SEALS**

Fig. 1. Two-dimensional profile of an adult male NZ fur seal (seal No. 270) dive record showing: 12.5 hours (top), 2 hours (middle) and 40 min (bottom). Putative V-shaped foraging dives, U-shaped foraging and drift dives are indicated. The approximate rates of change in depth during active descent and drift segments are indicated on 1 drift dive..... 84

Fig. 2. The proportion of drift dives (open bars, x axis) and foraging dives (solid line) and the average drift dive depth (solid bars, z axis) recorded during 2 hour intervals. Standard error bars indicate the variation in the proportion of dives made by different seals (x axis) and in the drift-dive depth (z axis)..... 87

**CHAPTER 5. SEPARATION OF FORAGING HABITATS AMONG NEW ZEALAND FUR SEALS**

Fig. 1. Time spent in 25 km<sup>2</sup> cells by (A) lactating female (n = 25), (B) adult male (n = 21) and (C) juvenile (n = 6) NZ fur seals, which were satellite-tracked from Cape Gantheaume. Location of Cape Gantheaume in relation to the continental shelf, shelf break (200, 500, 1000 and 2000 m depth contours shown) and pelagic waters (south of the shelf break) ..... 103

Fig. 2. Relationship between the average distance (km, top plot) from Cape Gantheaume and the average horizontal speed (m/s) travelled by lactating female and adult male (y axis) and juvenile (z axis) NZ fur seals at different stages of the foraging trip (percent duration, bottom plot). Standard error bars are shown ..... 105

Fig. 3. Inter-individual, inter-seasonal and intra-seasonal variation in the parameters that described the behaviour of lactating female (black points, n = 25), adult male (white points, n = 21) and juvenile (letters, n = 6) NZ fur seals. Each individuals' single foraging trip is represented by a single point and seasons are represented by different numbers. A polygon encloses each age/sex group. Up to 4 variables (behavioural parameters) that had significant correlation coefficients are shown on the ends of each axis. Two-dimensional stress = 0.058..... 106

Fig. 4. Time spent in 25 km<sup>2</sup> cells by adult male NZ fur seals during (A) summer (n = 3), (B) autumn (n = 4), (C) winter (n = 7) and (D) spring (n = 7) ..... 107

Fig. 5. Time spent in 25 km<sup>2</sup> cells by lactating female NZ fur seals during (A) summer (n = 3), (B) autumn (n = 4) and (C) winter (n = 18)..... 108

Fig. 6. Time spent in 25 km<sup>2</sup> cells by juvenile NZ fur seals during (A) summer (n = 3) and (B) autumn (n = 3) ..... 109

Fig. 7. Inter-individual, inter-seasonal and intra-seasonal variation in the parameters that described the physical and biological oceanography in the habitats used by lactating female (black points, n = 25), adult male (white points, n = 21) and juvenile (letters, n = 6) NZ fur seals. Each individuals' single foraging trip is represented by a single point and seasons are represented by different numbers. A polygon encloses groups that used pelagic waters (top right polygon: 6 juveniles, 2 lactating females, 1 adult male), shelf break waters (middle polygon: 18 adult males) and continental shelf waters (bottom polygon: 23 females, 2 adult males). Up to 3

variables (oceanographic parameters) that had significant correlation coefficients are shown on the ends of each axis. Two-dimensional stress = 0.070..... 111

Fig. 8. Relationship between the depth of each 25 km<sup>2</sup> cell on the x axis (note the different scales for each plot) used by seals and the mean proportion of time spent in those cells on the y axis by lactating females (top, n = 25), adult males (middle, n = 21) and juveniles (bottom, n = 6). The cumulative proportion of time spent over each depth is represented for each age/sex group (y axis), indicating the minimum number of cells required to constitute 95% of time spent at sea ..... 113

Fig. 9. Relationship between the proportion of time spent in the same 25 km<sup>2</sup> cells by the different age/sex groups, depicting the overlap based on the minimum size of the PAV during the entire trip (i.e. 100% of cells visited) and the overlap based on the minimum size of the potential area visited during 99, 90, 80 and 50% of the time spent foraging for each age/sex group. Power curves are plotted to indicate the relationship between the amount of time that each age/sex group spent foraging in areas of overlap..... 115

Fig. 10. Spatial distribution of 25 km<sup>2</sup> cells, which were used by more than 1 age/sex group, based on the minimum size of the PAV in 50% of the time spent at sea for each age/sex group. In the areas of overlap, the time spent in each 25 km<sup>2</sup> cell is plotted for (A) females and (B) adult males..... 117

Fig. 11. Spatial distribution of 25 km<sup>2</sup> cells, which were used by only 1 age/sex group, based on the minimum size of the PAV in 50% of the time spent at sea for each age/sex group. For the areas used exclusively by 1 age/sex group, the time spent in each 25 km<sup>2</sup> cell is plotted for (A) females and (B) adult males..... 118

**APPENDIX 1. ENTANGLEMENT OF AUSTRALIAN SEA LIONS AND NEW ZEALAND FUR SEALS IN LOST FISHING GEAR AND OTHER MARINE DEBRIS BEFORE AND AFTER GOVERNMENT AND INDUSTRY ATTEMPTS TO REDUCE THE PROBLEM**

Fig. 1. The number, sex and age class of entangled Australian sea lions observed at Seal Bay, Kangaroo Island, between 1988 and 2002 ..... 160

Fig. 2. The number, sex and age class of entangled NZ fur seals observed at Cape Gantheaume, Kangaroo Island, from 1989-91 and 2000-2002 ..... 163

Fig. 3. New Zealand fur seal and Australian sea lion entanglement rates and annual fisheries efforts (indexed against 1988 values) in the Great Australian Bight Trawl Fishery (trawl hours), South East Trawl Fishery (trawl hours), Southern Shark Fishery (kilometres of gillnet) and the South Australian rock lobster fishery (pot lifts) ..... 167

**APPENDIX 2. POPULATION STATUS AND BREEDING SEASON CHRONOLOGY OF THE FUR SEALS AT HEARD ISLAND**

Fig. 1. Coastal map of Heard Island showing fur seal haulouts referred to in the text 174

Fig. 2. The number of Antarctic fur seal pups born at Heard Island. Trendlines are based on data from either 1962/63-2000/01 or 1986/87-2000/01 as estimates prior to 1986/87 are thought to be incomplete (Shaughnessy et al. 1988) ..... 178

Fig. 3. Number of Antarctic fur seals ashore at Heard Island between 1963 and 2001 and the number of fur seals in the sector between Stephenson Lagoon and Spit Camp in 2000/01. Counts from 1963-1992/93 are extrapolated to estimate the total number of seals ashore during the peak haulout period in February/March (see methods). ..... 179

## LIST OF TABLES

### CHAPTER 1. GENERAL INTRODUCTION

Table 1. Mass and length (measured from the nose to tail) of the age/sex groups in this study. Data for NZ fur seals are from Page et al. (in press) and data for Australian fur seals are from Warneke and Shaughnessy (1985). .....	16
---	----

### CHAPTER 2. DIETARY RESOURCE PARTITIONING AMONG SYMPATRIC NEW ZEALAND AND AUSTRALIAN FUR SEALS

Table 1. References for formulae and weights used to estimate the biomass contribution of each prey taxa.....	25
Table 2. Percent frequency of occurrence (FO) and percent numerical abundance (NA) of prey taxa found in scats and regurgitates from (A) adult female, (B) adult male and (C) juvenile NZ fur seals and (D) adult male Australian fur seals at Cape Gantheaume. The number of scats and regurgitates examined, the number with prey remains and the min. number of individuals are in brackets. Totals for each prey group are in bold.....	29
Table 3. Percent biomass contribution of prey taxa found in scats and regurgitates from (A) adult female, (B) adult male and (C) juvenile NZ fur seals and (D) adult male Australian fur seals at Cape Gantheaume. Totals for each prey type are in bold. Prey taxa that averaged <0.05% biomass are omitted.....	33
Table 4. The number of otoliths/beaks measured and the average mass in grams and length in mm (FL: fork, SL: standard, TL: total or ML: mantle) from adult female, adult male and juvenile NZ fur seal and adult male Australian fur seal prey. Prey taxa that were not consumed ( $n > 1$ ) by at least 2 age/sex/species groups are omitted. Significant differences in the pooled prey weights ( $P < 0.05$ , $t$ -tests) and totals for prey taxa are in bold. SD: significantly different weight to—1: adult female NZ fur seals, 2: adult male NZ fur seals, 3: juvenile NZ fur seals, 4: adult male Australian fur seals .....	42

### **CHAPTER 3. INTER-SEXUAL DIFFERENCES IN NEW ZEALAND FUR SEAL DIVING BEHAVIOUR**

Table 1. Summary statistics and basic dive parameters from the dive records of 13 adult male and 26 adult female NZ fur seals. Data from first foraging trip.....	63
Table 2. Diving parameter, seal mass, seal length, seal age and foraging trip duration summaries for the 3 behavioural dive groups identified by MDS for adult male and female NZ fur seals. Panels separate diving parameters into: combined day and night periods (top), night hours only (middle) and daylight hours only (bottom). Data from first foraging trip.....	71

### **CHAPTER 4. DRIFT DIVES BY MALE NEW ZEALAND FUR SEALS**

Table 1. Summary statistics and key drift dive parameters from the dive records of 13 adult male NZ fur seals (23 foraging trips) .....	85
---	----

### **CHAPTER 5. SEPARATION OF FORAGING HABITATS AMONG NEW ZEALAND FUR SEALS**

Table 1. Summary data on the age, body size and foraging trip characteristics of the 25 lactating female, 21 adult male and 6 juvenile NZ fur seals. <sup>a</sup> Incomplete foraging trips recorded because the transmitters failed at sea. The estimated trip durations for Seals 305 and 309 are 72.3 and 52.9 days, giving an estimated mean trip duration for juveniles is $42.3 \pm 22.7$ days . <sup>b</sup> Excludes values for seals 305 and 309 .....	101
Table 2. Summary data on the parameters that described the physical and biological characteristics of the habitats used by the 25 lactating female, 21 adult male and 6 juvenile NZ fur seals .....	112

**APPENDIX 1. ENTANGLEMENT OF AUSTRALIAN SEA LIONS AND NEW ZEALAND FUR SEALS IN LOST FISHING GEAR AND OTHER MARINE DEBRIS BEFORE AND AFTER GOVERNMENT AND INDUSTRY ATTEMPTS TO REDUCE THE PROBLEM**

Table 1. The debris observed entangling Australian sea lions at Seal Bay, Kangaroo Island, between 1988 and 2002..... 160

Table 2. The debris observed entangling NZ fur seals at Cape Gantheaume, Kangaroo Island, from 1989-91 and 2000-02. The category *other* includes rubber o-rings (2 seals), a string of burst balloons (1 seal) and a rock lobster pot (4 seals) ..... 163

**APPENDIX 2. POPULATION STATUS AND BREEDING SEASON CHRONOLOGY OF THE FUR SEALS AT HEARD ISLAND**

Table 1. The number of pup births and the rate of increase (percent per annum) in each sector around Heard Island from 1986/87 to 2000/01 ..... 177