

**The ecology of reintroduced lions on the
Welgevonden Private Game Reserve, Waterberg**

by

Petrus Johannes Kilian

Submitted in partial fulfilment of the requirements for the degree of

Magister Scientiae (Wildlife Management)

at the

Centre for Wildlife Management

Faculty of Natural and Agricultural Sciences

University of Pretoria

Pretoria

February 2003



*Dedicated to my parents for their love, support and encouragement throughout my
life, and for providing me with the opportunity to fulfil my dreams.*

**The ecology of reintroduced lions on the
Welgevonden Private Game Reserve, Waterberg**

by

Petrus Johannes Kilian

Supervisor: Prof. J. du P. Bothma

Co-supervisor: Prof. W. van Hoven

Centre for Wildlife Management

University of Pretoria

Pretoria

ABSTRACT

Five lions were reintroduced to the Welgevonden Private Game Reserve in 1998. These lions were studied to increase the limited knowledge of the ecology of reintroduced lions on small wildlife reserves, and to provide baseline data to the reserve management from which to develop management decisions.

In the past, reintroduction attempts of felids have often failed because the animals failed to establish ranges in the new environment. During the current study, homing behaviour and range establishment of the reintroduced lions were studied and used as an indication of the success of the reintroduction attempt. The ease with which lions

on Welgevonden established ranges indicated that they did not experience problems with adapting to their new environment

The population dynamics of the reintroduced lion population were investigated. The population grew rapidly due to early breeding and short inter-litter intervals. The collected data were used to model the lion population using VORTEX population modelling software. Various potential management strategies to reduce the population growth were also modelled and discussed.

The feeding ecology and predation patterns of the reintroduced lions were investigated to give an indication of the predator-prey relationships on Welgevonden. These data were used in a model that investigated the effect of lion predation on the various prey populations of Welgevonden. The model was also used to test the influence of other factors on the prey populations, as well as the number of killing lions that can be supported by the prey population.

The study has shown that reintroduction can be used successfully to establish a lion population on a small game reserve, but that certain management actions will increase the chances of success. However, continual monitoring and management will be necessary to ensure the long-term viability of the lion and prey populations.

ACKNOWLEDGEMENTS

During the years of this study, I was blessed to have met and worked with several people who hugely influenced my life. Thank you to all for encouragement, support and love.

Foremost in my thoughts are my parents, Johan and Elsie, for all their support and love, not only during this study, but also through my whole life. Thank you for giving me the opportunity to fulfil my dreams. The love, patience and wisdom with which you brought us up gave us the courage to walk into life with our heads held high. We will always remember what we have learned, because we know who taught us!

To my study leader, Prof. J. du P Bothma, thank you for your patience and trust in me, and for your input during this study.

To the Welgevonden management team, Erwin and Jenny Leibnitz, Hennie en Drienie Roets, André Burger, Jack and Karen Greeff, thank you for your support and friendship during this study. Whenever I needed help, all of you were always willing to help with smiling faces. André, a special thanks to you, you were a great help during this study and one of the best friends anyone can ask for. To the Leibnitz and Roets families, you became very dear friends to me over the last five years.

To the Welgevonden trustees and owners, thank you for providing me with the opportunity to do this study. The logistic support of a vehicle and housing are very much appreciated. Thanks to Martin Sherwood for financial assistance and friendship, especially during the early parts of the study. I became good friends with several of the owners for which I am very grateful. Special thanks to the Kisner family, the Picas family, the Amorosino family and McJannet family. I will always remember your friendship and all the lovely dinners I had with you.

Thank you to all the numerous friends that I have made during the study, I cannot mention you all, but you all made the study more enjoyable. However, I would specially like to mention Libby Kruger, Mariska Grobler, Michelle Dale, Jenny Frost and Andrew Parker. You are the most amazing friends anyone can ask for. All of you played huge parts in my life and I will always treasure our friendship.

To the rangers and guides at the different lodges, many became good friends, thanks for being a valuable source of information on the movements of the lion. The study would have been much more difficult without your help.

Luke Hunter, thanks for all the interesting discussions, tips and advice during this study. Also, a big thanks to Gus van Dyk, Dr. Markus Hofmeyr, Dr. Butch Smuts, Prof. Rob Slotow and Dr. Gus Mills for inputs and valuable advice during various stages of this project.

To the staff and students at the Centre for Wildlife management, especially Ben Orban, Liset Swanepoel, Prof Koos Bothma and Prof Wouter van Hoven, thanks for all the help and friendship during the time when I was a student there.

To all the Welgevonden staff, thanks for all your help. Lukas Shongwane was a valuable guide during the earlier parts of the fieldwork and showed me old roads that everybody had long forgotten about. Johannes Mashamaite and his wife, Johanna, were a big help and kept my camp spotless clean and neat.

This study would not have been possible without a post-graduate bursary from the University of Pretoria.

Numerous other people contributed in some way or the other to this project. Thanks, I am in debt with you all!

TABLE OF CONTENTS

Abstract.....	ii
Acknowledgements.....	iv
Table of contents.....	vi
 Chapter 1: Introduction.....	 1
 Chapter 2: Study area	
Location.....	8
Climate.....	10
Geology, geomorphology and soils.....	13
Vegetation.....	13
Habitat types.....	15
History of the reserve.....	15
History of the lion introduction.....	17
 Chapter 3: General methods.....	 20
 Chapter 4: Behaviour after reintroduction	
Introduction.....	22
Methods.....	23
Results.....	23
Discussion.....	26
Conclusion.....	28
 Chapter 5: Post-release movements	
Introduction.....	29
Methods.....	31
Results.....	33
Dispersal after release.....	33
Daily distance moved after release.....	34
Direction of movement after release.....	44

Discussion.....	44
Dispersal and daily movements after release.....	45
Direction of travel and homing behaviour.....	45
Contribution of management actions to the success of a reintroduction.....	48
Conclusions.....	50

Chapter 6: Range establishment, use and habitat selection

Introduction.....	52
Methods.....	56
Results.....	60
Radio-telemetry.....	60
Range establishment and use.....	61
The influence of other factors on range size.....	61
Habitat selection.....	77
Discussion.....	77
Range establishment and use.....	77
Habitat selection.....	80
Conclusions.....	82

Chapter 7: Population dynamics

Introduction.....	84
Methods.....	87
Results.....	93
Age of first breeding.....	93
Litter sizes.....	93
Survival of cubs and subadults.....	93
Patterns of reproduction.....	97
Population growth rate.....	98
VORTEX simulations.....	98
Discussion.....	106
Age at first breeding.....	112
Survival of cubs and subadults.....	113
Inter-litter intervals.....	115

Genetic diversity.....	115
Conclusions.....	117

Chapter 8: Feeding ecology

Introduction.....	119
Methods.....	122
Results.....	127
Prey types.....	127
Number and biomass of prey killed.....	128
Frequency of predation.....	132
Prey preference.....	132
Scavenging.....	134
Selection for age and sex classes of prey.....	134
Number of lions versus prey consumed.....	135
Meat consumed.....	135
Habitat types.....	141
Discussion.....	141
Prey types.....	141
Prey selection.....	142
Prey size and meat intake.....	148
Age of prey.....	149
Habitat types.....	150
Conclusions.....	151

Chapter 9: Modelling the impact of the lions on the prey populations

Introduction.....	153
Methods.....	155
Results.....	162
Model 1.....	162
Model 2.....	163
Discussion.....	178
Model 1.....	178
Model 2.....	178

Stocking rate of the lions.....	185
Conclusions.....	187
 Chapter 10: Management implications	
Management considerations.....	190
 Summary.....	
Opsomming.....	196
References.....	200
Appendix I. Common and scientific names of all animals mentioned in the text.....	204
	217