

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

THE BROWSING IMPACT AND ABUNDANCE OF
EUROPEAN BROWN HARES (*Lepus europaeus*) IN
THE CENTRAL NORTH ISLAND, NEW ZEALAND

A thesis presented in partial fulfilment of the requirements for the degree of
Masters of Science in Ecology at Massey University,
Palmerston North, New Zealand

Michael Edmund Perry

October 2003

Abstract

The browsing impact and abundance of hares were investigated at several sites in the Central North Island, New Zealand. The traditional view has been that hares have a relatively minor effect on the vegetation when compared to larger ungulates due to their low, stable densities. However in some areas large grazing mammals have been controlled yet the vegetation continues to degrade, consequently attention is now being shifted towards the problems created by ongoing herbivory by smaller mammals. While the impact of hares on high altitude vegetation has generally been considered to be an issue of low conservation priority, they are now considered to be the main grazers in many alpine systems and there is a large shortfall in knowledge.

The suitability of the cleared plot pellet count method for assessing hare abundance, habitat use, and biomass consumption was investigated and was found to produce precise, easily obtainable results. It was found that hare numbers fluctuated over the course of a year, with a decrease in winter, followed by an increase in spring. Hare abundance was thought to primarily relate to habitat quality, with competition and anthropogenic influences also playing a role.

Hare impact was assessed using a variety of techniques including the utilization of existing exclosures, the construction of new exclosures, and selected monitoring of preferred browse species. The long-term exclosure plots indicated that hares were having no effect on any aspect of vegetation condition, either native or exotic in the Moawhango region. Conversely hares were having a significant effect upon the vegetation in the Manson region of the Kaweka ranges. Where hare browsing appeared to be benefiting native species through the suppression of exotics grass species. However, targeted monitoring of preferred browse species showed that hares browse heavily upon a range of native plant species.

While these results appear contradictory, when the results are considered collectively, and with knowledge of hare density a proposed feeding strategy was formulated. I suggest that the degree to which hares impact native vegetation is dependent upon the level of exotic species present. Where exotic species are present (particularly grasses), they are the preferred browse species. Where exotic species are not readily available, or

competition is high, hares then subsist at lower densities by browsing native vegetation. However if a native species occurs that fulfils hare nutritional requirements, then it will be preferentially targeted by hares resulting in significant detrimental effects.

Acknowledgements

During the course of this thesis I received help and encouragement from many people that are too numerous to name, so I would like to thank everyone who helped in any way, even if it was just a cup of tea at the hut, I appreciated it!

First up I would like to say a big thank you to my chief supervisor, Alastair Robertson, for his advice and guidance, expert photography skills, assistance in the field, and for aiding me at all stages throughout the course of this thesis in his sometimes hectic schedule. I also thank Robin Fordham for acting as my co-supervisor, giving me his advice and encouragement, and for his detailed editing of my drafts.

I would like to thank the Miss E. L. Hellaby Indigenous Grassland Research Trust for funding a large portion of this project, also the trustees who freely provided their advice on the experimental design of the project.

The Department of Conservation was instrumental in several aspects of this thesis. I would firstly like to thank the East Coast Conservancy for funding the construction of the Manson exclosures, helicopter flights and helping wherever they could. I would especially like to thank Eddie Te Kahika and Colin Taylor for their invaluable help on numerous occasions, and Chris Ward for his help with experimental design and recognizing the need for this project. From the Tongariro/Taupo Conservancy I thank Nick Singers, Steve Deverell, and Sean Husheer, for help along the way in both the plentiful amounts of advice and encouragement, and for fieldwork assistance. Also for permission to work in the National Park.

For access into the Moawhango region I thank the New Zealand Army for allowing access into Army training area, in particular John Mangos for his assistance. Bill Fleury and Geoff Rogers for their help in trying to find the historic data from the Moawhango plots. Also Tama Wipaki and for access into Motuamati, and Tony Batley for allowing me to use his families hut, this was greatly appreciated especially when it started to snow!

I would also like to thank all those individuals, and the Ecology discussion group who helped by reading over my sometimes confusing drafts and for gave me plenty of

helpful advice. Also I thank Ian Henderson for his all-knowing statistical expertise and for patiently answering my endless questions, and Jill Rapson for helping me identify many of the plant species.

And finally the field assistants upon whom I inflicted numerous blisters, cold, heat, and often boredom; Kyle Blenkhorn, Rob Fraser, Lesley Pearce, Katie Perry, Mortz Piripi, and Clelland Wallace, your help was invaluable. I would especially like to thank Mortz and Lesley who came back into the field several times, even when they knew what to expect.

Last but not least I would like to thank the support I received from my family, Kate, Rachel and Danny, my parents, Bill and Anne, for your encouragement, support and monetary contributions, I thank you. Finally I would especially like to thank Lesley, for her understanding of my frequent absences, support during all stages of the thesis, and for helping wherever she could.

Table of Contents

Chapter 1: GENERAL INTRODUCTION	1
1.1 BACKGROUND	2
1.1.2 Hares in New Zealand	4
1.1.3 Impacts on vegetation	5
1.2 GENERAL ECOLOGY OF HARES IN NEW ZEALAND	6
1.3 STUDY SITES	9
1.3.1 Kawekas	9
1.3.2 Moawhango	10
1.3.3 Tongariro National Park	12
1.3 THESIS OBJECTIVES	14
Chapter 2: THE USE OF CLEARED PLOT PELLET COUNTS TO ASSESS HARE POPULATIONS IN ALPINE VEGETATION	15
2.1 INTRODUCTION	16
2.1.1 Population census techniques	16
2.1.2 Faecal pellet counts	18
2.2 METHODS	22
2.2.1 Experimental design	22
2.2.2 Analysis	23
2.3 RESULTS	25
2.3.1 Regional variation in recruitment rates	25
2.3.2 Variation in recruitment rates for the Manson region	26
2.3.3 Standing crop: recruitment rates correlation	30
2.4 DISCUSSION	31
2.4.1 Further interpretations using recruitment rate data	31
2.4.2 Regional variation	35
2.4.3 Seasonal and spatial variation at Manson	36
2.4.4 Standing crop: recruitment rate correlation	39
2.4.5 Evaluation of method	40
2.4.6 Conclusions	45

Chapter 3: LONG TERM EFFECT OF HARE BROWSE ON SPECIES COMPOSITION AND VEGETATION STRUCTURE.....	46
3.1 INTRODUCTION	47
3.2 METHODS	48
3.2.1 Study sites	48
3.2.2 Vegetation assessment	49
3.2.3 Statistical analysis	50
3.3 RESULTS	51
3.3.1 Vegetation condition and herbivore impacts	51
3.3.2 Nonmetric Multidimensional Scaling	54
3.3.3 Cluster analysis	56
3.4 DISCUSSION	57
3.4.1 Vegetation condition and herbivore impacts	57
3.4.2 Implications and recommendations for management	61
3.4.3 Conclusions	63
Chapter 4: DEVELOPMENT OF A MONITORING PROTOCOL TO ASSESS HARE BROWSING IMPACTS.....	64
4.1 INTRODUCTION	65
4.2 METHODS	68
4.2.1 Selection of monitoring protocol	69
4.2.2 Field procedure	71
4.3 RESULTS	74
4.3.1 Vegetation description	74
4.3.2 Nonmetric Multidimensional Scaling	74
4.3.3 Temporal changes	76
4.3.4 Cluster analysis	83
4.3.5 Herbivore use of exclosure plots	84
4.4 DISCUSSION	85
4.4.1 Vegetation changes	85
4.4.2 Future composition shifts	86
4.4.3 Herbivore use of exclosure plots	87
4.4.4 Improvements to sampling design	88
4.4.5 Recommendations	90
4.4.6 Conclusions	90

Chapter 5: IMPACT OF HARE BROWSING ON HIGHLY PREFERRED PLANT SPECIES	92
5.1 INTRODUCTION	93
5.2 METHODS	96
5.2.1 Study areas and species	96
5.2.2 Sampling protocols	98
5.3 RESULTS	101
5.3.2 Tongariro National Park	101
5.3.3 Moawhango exclosures	105
5.3.3 Manson exclosures	109
5.4 DISCUSSION	111
5.4.1 Tongariro National Park	111
5.4.2 Moawhango exclosures	114
5.4.3 Manson exclosures	116
5.4.4 General observations	116
5.4.5 Recommendations	118
5.4.6 Conclusions	119
Chapter 6: GENERAL DISCUSSION	120
6.1 Synopsis	121
6.2 Proposed general feeding strategy	122
6.3 Are hares a pest?	123
6.4 Application of herbivore impact modelling	124
6.5 Conclusion	125
References	126
Appendices	135