

**ECOLOGY AND CONSERVATION OF THE LEOPARD (*PANTHERA PARDUS*
LINNAEUS 1758) IN NORTHCENTRAL NAMIBIA**

A Dissertation Presented

by

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Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

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by

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DEDICATION

For the farmers, wildlife managers and conservationists of Namibia.

PREVIEW

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PREVIEW

ABSTRACT

ECOLOGY AND CONSERVATION OF THE LEOPARD (*PANTHERA PARDUS* LINNAEUS 1758) IN NORTHCENTRAL NAMIBIA

MAY 2008

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The conservation of large carnivores is dependent on comprehensive research programs within and surrounding protected areas. In many locations, protected areas are not large enough to support viable large carnivore populations, and thus it is essential to understand the ecology of predators outside of protected areas. On the commercial farms of northcentral Namibia, farmers have systematically removed the largest predators in order to protect their livestock. Leopards are the largest remaining carnivore, aided by their adaptable and secretive nature. In order to properly manage regional leopards, there were several questions about their population size, feeding ecology and movements that needed to be addressed. Leopard population estimates were generated through camera-trapping surveys within and surrounding the Waterberg Plateau Park. These surveys suggest that leopard population density is significantly higher outside of the park, most likely due to environmental factors within the park that limit potential prey. Leopards were shown to primarily feed on wild ungulates, preferring kudu over livestock which they appear to avoid even when livestock densities

are higher than individual wild ungulate species. Leopard home ranges and movements were investigated on commercial farmlands where they were not shown to move between the farms and the park. Home range estimates were similar to previous studies for similar environments with marginal resources. Beyond the ecological studies, the attitudes and perceptions of farmers were incorporated into the study in order to assess local predator management with particular emphasis on leopards. Farmers used a variety of livestock husbandry techniques, with varying success. Although there were no clear techniques to reduce conflict, farmers were able to substantially reduce losses by using at least one technique to protect their stock against predators. Farmers listed depredation as the source of highest livestock loss, and leopards the species which caused the most conflict by occurrence. Farmers removed approximately 11 leopards per year in the region which is equal to a 14% off-take for the local population. Farmer tolerance was assessed by the % calf loss that farmers were willing to lose to predators annually. Tolerance rates were then compared to annual livestock loss. Leopards, being a charismatic animal for tourists and trophy hunters, were evaluated for potential financial benefits for farmers to mitigate losses. Region-wide management strategies are discussed.

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PREFACE

In recent decades, the plight of wildlife species has become more commonly known and understood. The populations of many species have been greatly reduced throughout their ranges leading to alarming extinction rates (Woodroffe et al. 2005). These population reductions have been caused by anthropogenic factors such as habitat loss, invasive species introduction, and human-wildlife conflicts. For species such as the large carnivores, competition with people for food has led also to a reduction in prey base. Human-carnivore conflicts can be particularly acute as large carnivores can also pose a direct threat to human lives, creating negative relations (Quigley and Herrero 2005). In regions where protected areas are present, the conflict between humans and wildlife is particularly pronounced along park borders (Newmark et al. 1994, Woodroffe and Ginsberg 1998). Although initially designed as a safe haven for the protection of wildlife, many parks are too small to maintain viable populations of wildlife, and those individuals wandering beyond the park boundaries risk persecution from humans (Woodroffe and Ginsberg 1998). Private and communal lands throughout Africa are thought to accommodate approximately 70% of all local wildlife, creating a situation by which wildlife officials and conservationists must engage with local people to conserve wildlife. With the advent of wildlife utilization policy, many countries in southern Africa have created initiatives that have explored the use of wildlife for the benefit of the landowner with varying success (Lewis and Jackson 2005, Walpole and Thouless 2005).

Namibia, a semi-arid country in southwest Africa, is at the forefront of wildlife policy on private and communal lands. The landscape of Namibia is one of contrasts, spanning an area of 835,00 km² from the arid Skeleton Coast, through the thornbush

savannas, to fertile areas along the Caprivi Strip, to the Zambezi River in the east. Across this area the mean annual rainfall increases from 25 mm in the Namib Desert up to 800 mm in the northeast. The lack of groundwater over much of the country is the primary reason for the paucity of available resources for the population of 2 million citizens.

Namibia's changing political climate also has recently created a favorable environment for progressive wildlife management and conservation strategies. During pre-colonial times, people and wildlife lived a tenuous existence, with subsistence herder and hunter-gatherers inhabiting the marginal lands. During the colonial period (1888-1917), the Germans assumed control of wildlife and land throughout the large central portion of the country for commercial livestock production (Jones and Murphee 2001). Indigenous communities were forced into a reserve system that was created to provide tribes with their own homeland. These policies were continued with subsequent British and South African rule until 1990 when Namibia gained its independence from South Africa.

During British rule, the ownership of common wildlife was transferred to white commercial farmers under strict management regulations. By gaining the ownership of wildlife, white farmers could utilize common species for commercial purposes such as sport hunting and game meat sales. Although wildlife utilization was allowed for these commercial farmers in 1968, the Nature Conservation Ordinance was officially passed in 1975, at which point black communal farmers still could not utilize wildlife (Jones and Murphee 2001). It was not until the 1990's that the Community Based Natural Resource Management (CBNRM) initiative was started on communal lands where communal farms formed areas co-operatively managed for the sustainable use of natural resources called

‘conservancies’ (Jones 2001). These conservancies provided a legal status to the communal lands with which participants could begin to exploit the wildlife resources on their land for financial gains. The Policy on Wildlife Management, Utilization and Tourism in Communal Areas in 1995 and the Nature Conservation Amendment Act in 1996 provided the government backing for the further development of the communal conservancy framework (Jones 2001).

With these shifts in wildlife ownership, the majority of Namibia’s wildlife is now being managed by private land-owners under the guidance of the Ministry of Environment and Tourism (Jones and Murphee 2001). My approach to this study was to incorporate not only the ecological aspects of large carnivore conservation, but also the socioeconomic factors driving wildlife management within white-owned commercial farms and the Waterberg Plateau Park (WPP) in the northcentral region. For this approach, the leopard (*Panthera pardus*) was chosen as a focal species since it is the largest remaining carnivore in the region with the potential to adversely impact livestock farms.

This dissertation is a comprehensive look at the ecological (Chapters 1-7) and socioeconomic (Chapters 8 and 9) factors involved in the management and conservation of leopards on Namibian commercial farms. The first chapter outlines our current knowledge of leopard biology range-wide, creating a context in which we may examine the current ecological study of leopards in northcentral Namibia. To further develop this context, chapter 2 assesses the occurrence and relative abundance of mammalian and avian species with the WPP and the surrounding farmlands. In Chapter 3, I examine the relative abundance of the leopards’ primary prey through a variety of survey techniques.

These surveys are compared in order to assess accuracy across techniques. The fourth chapter explores the feeding ecology of leopards and their ecological overlap with the brown hyena, *Hyaena brunnea*, the largest potential competitor with leopards in the region. Further discussion of leopard and brown hyena capture efficiency is reviewed in Appendix A. Along with these capture efficiencies, I present individual animal measurements and compare them with range-wide data in Appendix B. Captured adult leopards were fitted with tracking collars allowed detailed tracking of individuals over several years. From these data, I have calculated the range size of and use by leopards within the study area (Chapter 6). Leopard population estimates are presented in Chapter 7 for both the WPP and the surrounding farmlands. These estimates are the first regional estimates resulting from intensive cameratrapping. In Chapter 8, I present the economic costs and potential benefits of maintaining leopards on commercial farmland through surveys of farmers, tourists and trophy hunters. Chapter 9 presents survey results related to the attitudes of all of the commercial farmers surrounding the WPP. These farmers described their individual perceptions of predators, management practices, and tolerance levels towards predators with a particular emphasis on leopards. The final chapter is a cohesive summary of the results presented in the preceding chapters. Within the summary, leopard conservation on Namibian commercial farmlands is discussed in terms of current management trends and the future of the species.