Chapter 3: Ecological correlates of leopard-stock interactions in the Baviaanskloof Mega-Reserve

3.1 Introduction

Large predators in South Africa are generally confined to protected areas. However, these areas are seldom large enough to sustain a viable population of wide-ranging predators (Brashares *et al*. 2001), especially leopards. Leopards have large home ranges that vary from 14.8 km^2 (Bailey 1993) to 1370 km^2 (Bothma *et al*. 1997), depending on habitat type and prey availability. For this reason, the bulk (estimated at 87%) of the leopard population in South Africa occurs on privately owned land (Martin & de Meulenaer 1988), where there are proportionately higher densities of domestic ungulates compared to wild ungulates (Mishra 1997). This leads to stock losses, and ultimately results in economic losses to farmers. Farmers in turn attempt to prevent these losses by the retaliatory killing of predators. According to Woodroffe & Ginsberg (1998) this conflict with humans is the leading cause in the decline of carnivore numbers, worldwide. This is also the case for leopards in the Western Cape (Martins & Martins 2006), and probably for the Baviaanskloof leopards as well. The leopard populations of the Cape region have suffered a substantial range retraction, and now persist in the mountainous areas of the Western (Martins & Martins 2006) and Eastern Cape (Skinner & Chimimba 2005). In order for conservation of predators on private lands to be effective, this human-carnivore conflict needs to be resolved and the number of carnivores killed on private lands needs to be minimized (Woodroffe 2001).

Several studies have indicated that carnivore-stock conflict is influenced by habitat characteristics such as scrub and woodland cover and topographical features, and prey abundance (lynx predation on livestock, Stahl *et al*. 2002). Thus, it can be expected that leopard-livestock conflict in the BMR will also be affected by these factors. Therefore, certain properties will have relatively more livestock losses attributed to leopards due to habitat selection and the availability of prey. However, leopards are not the sole depredators of livestock on private lands. Most of the large African predators kill livestock (lion, Patterson *et al*. 2004; hyaena, Ogada *et al*. 2003; cheetah, Marker 2002; African wild dogs, Woodroffe *et al*. 2005), and this behaviour has also been documented in meso-predators (black-backed jackal, *Canis mesomelas*, Kaunda & Skinner 2003; caracal, *Caracal caracal*, Melville *et al*. 2004). Therefore, it is important to assess the extent of leopard predation on livestock and the importance thereof relative to other carnivores.

The development of a strategy that maintains leopard populations and their habitats outside protected areas is required. In order for such a conservation strategy to be developed, the factors that play a role in leopard-stock interactions need to be understood. Stock losses attributed to leopards and other carnivores are believed to be high in the areas surrounding the Baviaanskloof Nature Reserve (Boshoff *et al*. 2008). There are no studies that have quantified stock losses to predators in this area, or the factors involved in livestock depredation. Here the biological factors that contribute to leopard-stock interactions were investigated by gathering information on the distribution and extent of them, via landowner surveys. The habitat selection of leopards in terms of stock losses was examined. This also incorporated a comparison of leopard-stock losses between properties that border the reserve and those that do not. The characteristics of these leopard-stock incidents as well as the authorities involved in the management of these incidents are also described. The stock losses attributed to leopard was compared with those attributed to other carnivores and the effects leopards have on the amount of stock taken by other predators was also investigated.

3.2 Methods

3.2.1 Subjects

Through introducing the project via quarterly farmers' association meetings in the study area, the farmers were familiarised with the project and subjects were recruited for the survey. These farmers' associations were selected based on their proximity to the BMR. Only the areas that fall within the BMR Planning Domain (Figure 2.1) were sampled, although some farms extended beyond the planning domain. These included the farms in the Baviaanskloof, Cockscomb, Willowmore, Steytlerville and Kareedouw areas. In each area a representative sample of landowners that border the reserve and those that are located further from the reserve was selected. In addition to these farmers' association meetings, a general launch event was held in February 2008. The aim of this was to formally introduce the farming communities to the project, its supporters and funders. In certain areas, it was not possible to introduce the project at a farmers' association meeting. Where this was the case, the chairperson of the respective farmers' association was contacted and asked if he was willing to provide a list and contact details of farmers in the area. Thereafter farmers were contacted telephonically and meetings were set up with individual landowners. The subjects (n = 73) used in the analysis were considered to be a representative sample of the population of farmers occurring in the BMR planning domain. The locations of the participants are shown in Figure 3.1. The dominant landuse in the Hankey area is Citrus farming and a large proportion of the properties on the southern border of the BMR (Joubertinia area) are irrigated croplands, hence of limited relevance to this study.

3.2.2 Survey Instrument

Interviews were used to gather information regarding the various aspects of carnivore-stock conflict. These interviews were conducted between October 2007 and November 2008, using a structured questionnaire type approach. Details of the questionnaire are shown in **Appendix I**. The initial draft questionnaire was tested on five farmers from different areas within the study area, and they were asked to comment on the design and the questions asked. These comments were used to revise the questionnaire.

The questionnaires were designed to address two broad issues that play a role in carnivore-stock interactions, namely: ecological and socio-economic correlates of such interactions. In this chapter, I will only be focusing on ecological aspects of carnivore-stock conflict. The socio-economic aspects will be addressed in Chapter 4. Information regarding the ecological factors of carnivore-stock interactions was divided into the following two sections:

i. Predators of livestock

This section focused on the identification of various livestock predators, the amount of livestock taken by each predator (number and percentage), and the change in patterns of stock losses attributed to these predators for the last decade. The study area's most prevalent livestock predators, according to the pilot study, were incorporated into this section. These included black-backed jackals, caracals, leopards, black eagles (*Aquila verreauxii*), stray dogs (*Canis familiaris*) and baboons (*Papio cyanocephalus ursinus*). Two other categories, "Unknown" and "Other" were included. The "Unknown" category included information where livestock carcasses could not be found, or the predator responsible for killing it could not be identified. Here, stock losses due to stock theft and natural mortality are also included. The "Other" category allowed for the inclusion of livestock predators that were not mentioned in the questionnaire. Data on the amount of stock taken or percentage stock loss and the change in pattern of stock losses over the last ten years for each predator was collected. Birds of prey, such as black eagles, martial eagles (*Polemaetus bellicosus*), and corvids (crows and ravens) were grouped together in a single "Birds" category due to the lack of accurate identification by the respondents.

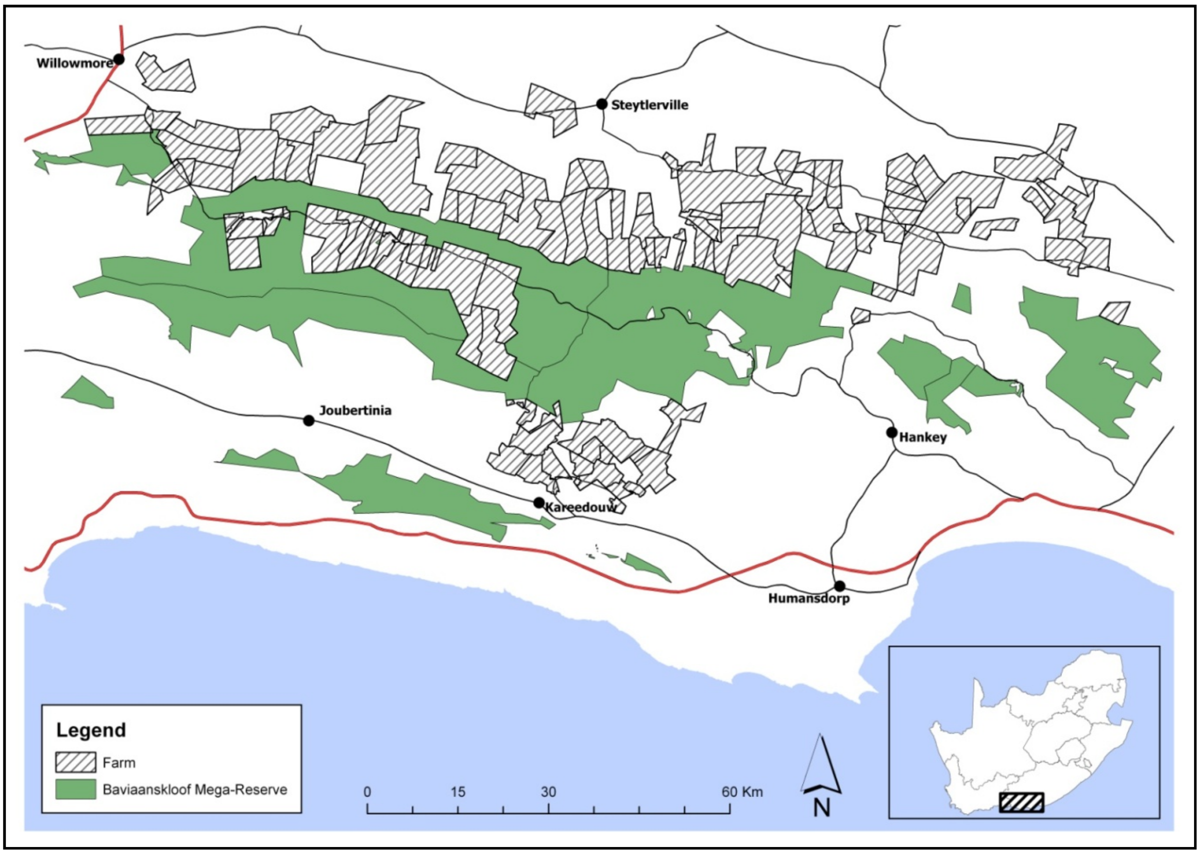

Figure 3.1: The farm boundaries of the participants in the survey (n = 73) in relation to the Baviaanskloof Nature Reserve and surrounding towns.

Farmers were also asked to identify, on a map, the areas where they lose livestock to leopards. This information was then mapped into a GIS using ArcGIS version 9.2 (ESRI 2006) in order to determine spatial information such as the distribution of leopard predation and possible habitat selection by leopards. This layer was then overlaid onto a Mammal Habitat Class (MHC) layer. MHCs were used as the spatial units, which were obtained from the Sub-tropical Thicket Ecosystem Planning (STEP) project (Vlok & Euston-Brown 2002; Cowling & Heijnis 2001). Habitat selection was determined by comparing the proportional frequency of available area for each MHC with the frequency of occurrence of leopard-stock interactions of each MHC. MHCs were considered selected for when the frequency of use was greater than the proportional area of available habitat, whereas MHCs were avoided when the frequency of use was smaller than the frequency of available habitat. MHCs that were used in proportion to availability were not selected (Neu *et al.* 1974).

ii. Leopard-stock incidents

This section specifically focuses on collecting information on leopard-stock incidents and various aspects thereof, as well as the occurrence of leopard signs and tracks on farmlands. Information regarding leopard depredation events such as time of day and season of occurrence, as well as the characteristics of reporting of leopard-stock incidents was collected. The characteristics of reporting include information on the authority involved, type of action taken and effectiveness thereof.

3.2.3 Statistical Analysis

Both qualitative and quantitative information was collected via the questionnaires. All variables measured were shown to be distributed non-normally by the Shapiro-Wilk test (Zar 1996), and had unequal variances according to the Levene's test (Zar 1996). In the case of the quantitative data, an arcsine transformation did not improve on normality. Non-parametric statistical techniques were thus applied (Zar 1996).

Quantitative data included percentage stock lost to the various livestock predators and the comparison of leopard-stock losses between farms bordering the BNR and those that did not. Stock losses were compared between predators using a Kruskal-Wallice ANOVA on ranks and a *post-hoc* Tukey-type test for multiple comparisons. In order to determine if leopards take more stock on farms bordering the Baviaanskloof Nature Reserve compared to those that do not, a comparison of leopard-stock losses between farm locations was made by employing a Mann-Witney U test. For these data sets, respondents were asked to provide an average for the last three years of farming. However, if a range was given (for example, 20 to 30% stock lost to leopards), the arithmetic mean was taken. Stock losses were calculated as the percentage of the total stock number, including all breeds of livestock and not the percentage loss of offspring.

Qualitative data consisted of categorical variables (for example, the pattern of stock losses is increasing, decreasing or remains constant), which were analysed using a Pearson's chi-squared test. Here, log-linear analysis was used to analyse habitat selection and contingency tables were employed for the analysis of categorical variables. The Yates correction factor was used for small degrees of freedom (Zar 1996). Spearman's rank correlation was also used to determine the relationship between the frequency of seeing leopard signs and tracks, and leopard-stock interactions.

All data were analysed using STATISTICA version 8.0 (StatSoft 2007).

3.3 Results

A total of 73 farmers provided data for this survey. Respondents managed a total of 267 678 ha. Of these, 34 respondents bordered the Baviaanskloof Nature Reserve while 39 did not.

3.3.1 Predator Comparison

Most respondents reported that they had stock losses attributed to caracals (91.8% of respondents), followed by black-backed jackals (74.0%) and unknown losses (68.5%, Table 3.1). Only 32.9% of respondents reported a leopard problem. Of the predators assessed, 68.5% of the respondents agreed that the black-backed jackal problem is on the increase (χ^2 = 31.4, p = 0.00), trends in all the other predator problems were consistent over time (Table 3.1).

Even though most respondents reported caracal, black-backed jackal, and bird problems (Table 3.1), this was not the case when comparing the amount of stock taken by the various predators (Figure 3.2). On average, farmers reported that they lose 12.6% of their livestock per annum. Of the total amount of livestock losses, black-backed jackals were reported to take on average 4.7%, followed by caracal (2.5%) and unknown losses (1.7%). The amount of stock taken by leopards (0.7%) was significantly lower than that of black-backed jackals (Z = 5.6, p = 0), caracal (Z = 6.16, p = 0), and unknown losses (Z = 3.9, p = 0.006). Stock losses attributed to leopards did not significantly differ from those attributed to birds (Z = 2.78, p = 0.299), baboons (Z = 0.48, p = 0.006), stray dogs (Z = 1.91, p = 0.006), bushpigs (*Potamochoerus larvatus*; Z = 2.48, p = 1.000), Cape foxes (*Vulpes chama*; Z = 2.74, p = 0.339), African wild cats (Z = 3.01, p = 0.145), or mongooses (Herpestidae; Z = 3.13, p = 0.097).

Table 3.1: Responses of land managers regarding predators of livestock and the change in predation rates over time in the BMR (n = 73).

Variable	**Response**	**Percentage of respondents (n)**	**Stock loss pattern for the last decade**
Caracals	Yes	91.8 (67)	Consistent
Black-backed jackals	Yes	74.0 (54)	Increase
Unknown	Yes	68.5 (50)	Consistent
Birds	Yes	58.9 (43)	Consistent
Leopards	Yes	32.9 (24)	Consistent
Baboons	Yes	27.4 (20)	Consistent
Stray dogs	Yes	15.1 (11)	Consistent
Bushpigs	Yes	8.2 (6)	Consistent
Cape foxes	Yes	5.5 (4)	Consistent
African wild cats	Yes	2.7 (2)	Consistent
Mongooses	Yes	1.4 (1)	Consistent

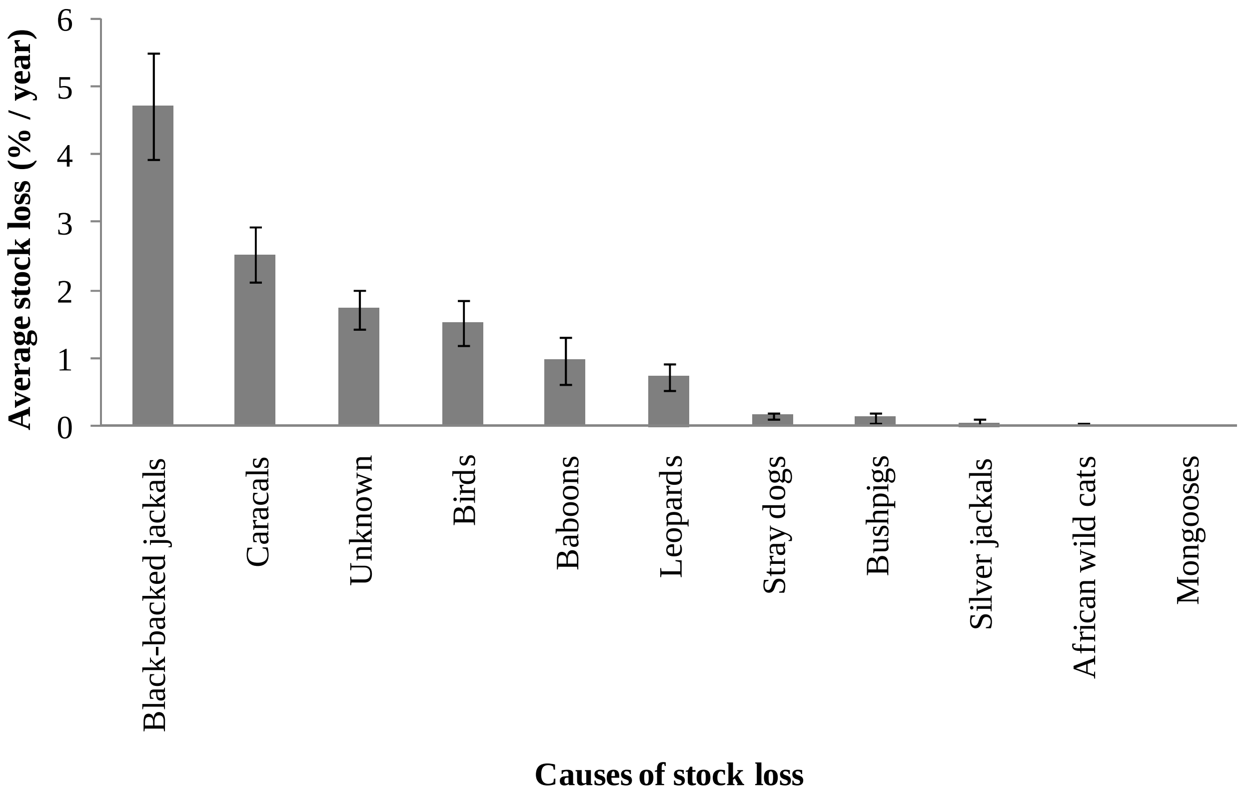

Figure 3.2: Comparison of perceived stock losses (percentage of stock) to various predators of livestock in the BMR. Birds include raptors and corvids.

3.3.2 Leopards

Only 32.9% of respondents (Table 3.1) attributed stock losses to leopards. These respondents were asked to comment on the temporal and seasonal characteristics of leopard depredation events (Table 3.2). Nearly half (45.5%) of respondents, with stock losses attributed to leopards, believe that these incidents occur at night. Most respondents (37.0%) did not know in which season leopards killed the most livestock. However, 30% of respondents believed that most of the leopard attacks occurred in winter. Yet, there was no statistical difference in reported leopard-stock losses between seasons (χ^2 = 10.96, p = 0.25).

Of the 24 respondents who had stock losses due to leopards, only 10 reported these stock losses, most of who reported to the Department of Economic Development and Environmental Affairs (DEDEA; Table 3.3). However, the majority (58.3%) of respondents experiencing leopard-stock losses did not report these incidents. Eighty percent of those respondents who reported stock losses believed that action was taken by DEDEA. This was in the form of supplying cagetraps for the live capture of leopards, which were then either collared with GPS-collars and released back onto the farm or translocated to other reserves. Respondents could not agree on the effectiveness of the issuing of permits to hunt leopards or setting of cage traps to capture leopards in reducing leopard-stock losses (χ^2 = 0.4, p = 0.94). However, 60% of the respondents believe that these actions were either moderately effective or very effective in reducing leopard-stock losses.

Leopards took significantly more stock on farms that bordered the BNR (1.2% livestock per year) compared to farms that did not (0.3% livestock per year; U = 414; p = 0.006, Figure 3.3). The areas with leopard-stock interactions are indicated in Figure 3.3.

The presence of leopard tracks and signs was strongly related to stock lost to leopards, with a higher frequency of reported leopard problems on farms that reported leopard signs. Only two farmers had leopard problems, but were not aware of any signs or tracks. In contrast, nine farmers reported no stock lost to leopards, but were aware of signs of leopards on their farms. There was no correlation between the frequency of tracks or signs of leopards and the percentage stock lost to leopards (R = 0.14, df = 30, p = 0.52).

Table 3.2: Temporal and seasonal characteristics of leopard-stock incidents as reported by land managers in the BMR (Only incorporates land managers that recorded stock losses due to leopards; n = 24).

Variable	**Response**	**Percentage of each respondents (count)**	χ^2	***p***
Time of day when leopard-stock incidents take place	Dawn	21.2 (7)	15.030	0.005
	Day	9.1 (3)		
	Dusk	15.2 (5)		
	Night	45.5 (15)		
	Don't know	9.1 (3)		
Season when the most leopard-stock incidents take place	Spring	14.8 (4)	10.960	0.250
	Summer	18.5 (5)		
	Winter	29.6 (8)		
	Autumn	0.0 (0)		
	Don't know	37.0 (10)		

There was a significant difference (χ^2 = 38.2, p = 0.01 df = 22) between the use and availability of habitat across individual MHCs (Figure 3.4). Seven of the MHCs were preferred. The preferred MHCs had relative frequencies of occurrence ranging from 16.8 for Groot Valley Thicket to 0.4 for Oudtshoorn Broken Veld. Most MHCs (12) had fewer reported leopard-stock losses than predicted by their relative area, and had relative frequencies ranging from -13.7 for Central Valley Thicket with Succulent Karroo to -0.2 for Kromme Fynbos / Renosterveld mosaic and Zuurberg Grassy Fynbos. Of these MHCs, eight had no reported leopard-stock incidents whatsoever. Only three MHCs had leopard-stock losses in proportion to the relative area (relative frequencies close to zero). This included, Steytlerville Broken Veld, Thicket / Valley Thicket with Mountain Karroo, and Kouga Mountain Fynbos.

Table 3.3: Characteristics of reporting of leopard-stock incidents by land managers in the BMR (Only incorporates land managers that recorded stock losses due to leopards; n = 24).

Variable	**Response**	**Percentage of each respondents (n)**	χ^2	***p***
Report leopard-stock incidents	Always	25.0 (6)	7.000	0.030
	Occasionally	16.7 (4)		
	Never	58.3 (14)		
Agency leopard-stock incidents reported to ‡	DEDEA [a]	70.0 (7)	11.600	0.009
	NGO's	20.0 (2)		
	Other	10.0 (1)		
	No one	0.0 (0)		
Was action taken by the agency? ‡	Yes	80.0 (8)	10.410	0.005
	No	20.0 (2)		
	Don't know	0.0 (0)		
What type of action was taken? ‡	Permit [b]	40.0 (4)	3.600	0.308
	Cage traps	40.0 (4)		
	None	20.0 (2)		
Was the action taken effective? ‡	Very	30.0 (3)	0.400	0.940
	Moderate	30.0 (3)		
	Not	20.0 (2)		
	Don't know	20.0 (2)		

‡ Only incorporates responses of farmers who report leopard-stock incidents (n = 10); a = Department of Economic Development and Environmental Affairs; b = leopard can only be hunted when issued with a permit

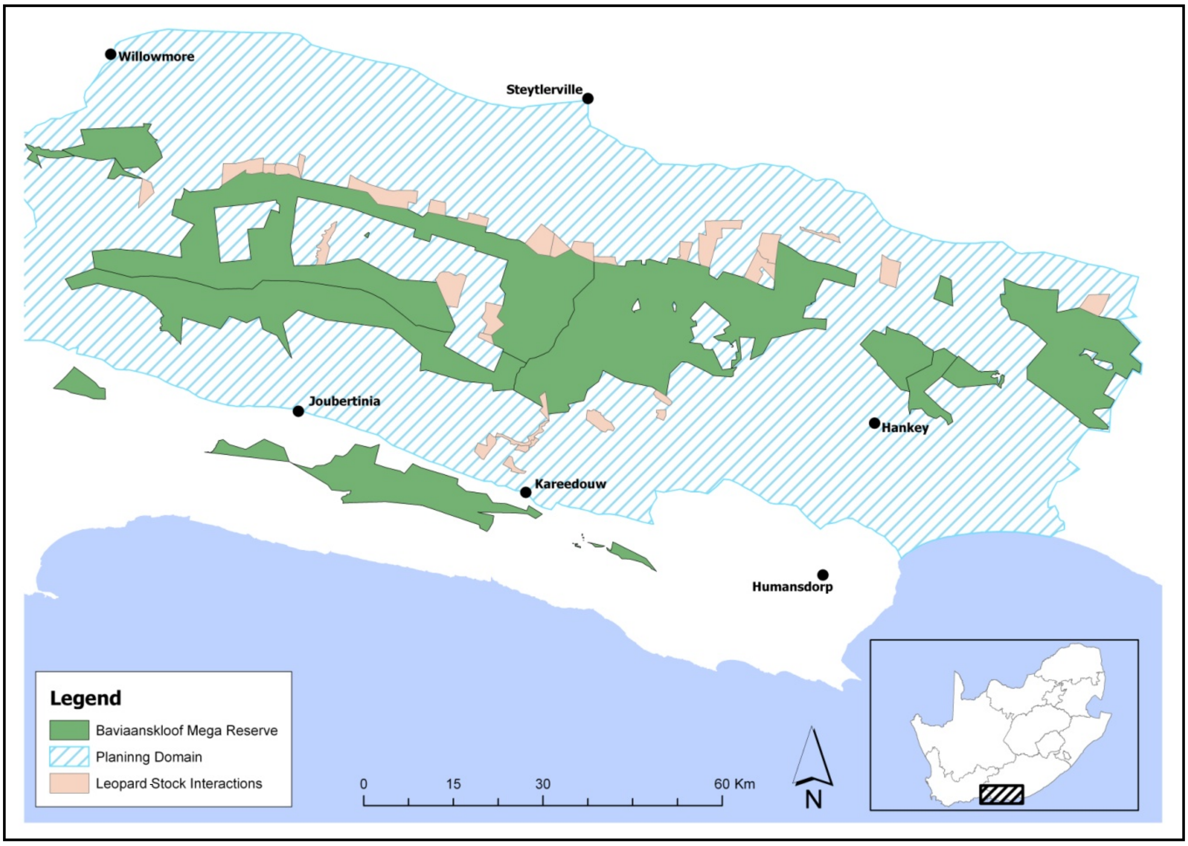

Figure 3.3: The locations of leopard-stock interactions as reported by landowners in the BMR.

Table 3.4: The effects of the presence of leopards-stock interactions on stock losses caused by other predators in the BMR (n = 73).

	Percentage of each response (count)			
Predator	**Leopard problem**	**No leopard problem**	χ^2	p
Black-backed jackals	17.8 (13)	56.2 (41)	15.5	0.0
Caracals	31.5 (23)	60.3 (44)	6.0	0.0
Stray dogs	8.2 (6)	6.8 (5)	0.0	1.0
Baboons	13.7 (10)	13.7 (10)	0.1	0.8
Bushpigs	2.7 (2)	5.5 (4)	0.2	0.7
Cape foxes	2.7 (2)	2.7 (2)	0.3	0.6
African wild cats	0.0 (0)	2.7 (2)	0.5	0.5
Mongooses	0.0 (0)	1.4 (1)	0.0	1.0
Birds	27.4 (20)	31.5 (23)	0.1	0.8

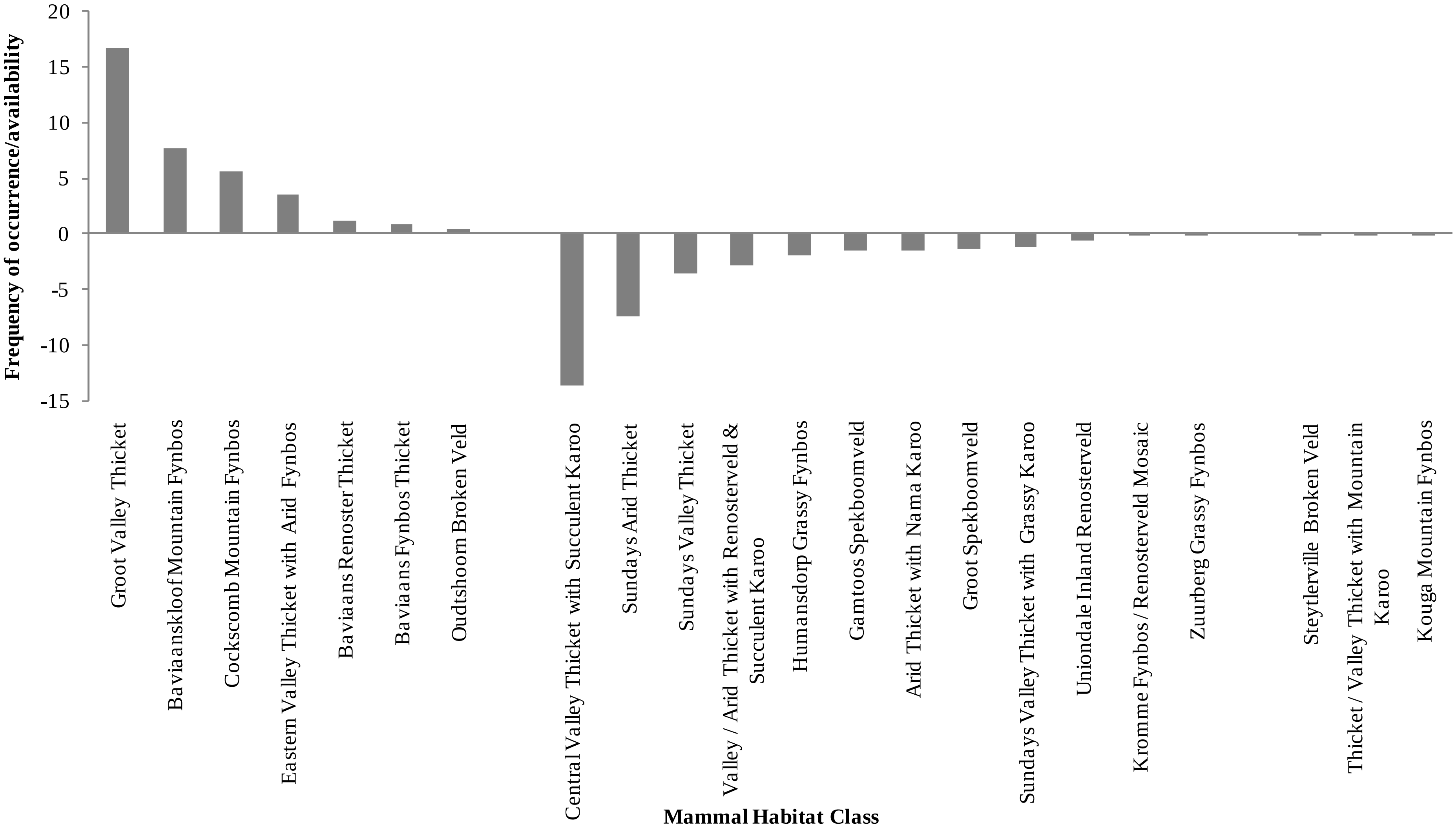

Figure 3.4: Frequency of leopard-stock interactions in relation to the proportional availability of Mammal Habitat Classes (MHC) on the surveyed properties. Preferred MHCs have a positive frequency of occurence, whereas avoided MHCs have a negative frequency of occurences. MHCs with a zero frequency of occurence are used in proportion to availability.

Farms that did not report any leopard problems (Table 3.4) had significantly more stock losses attributed to black-backed jackals (χ^2 = 15.5, p = 0.0) and caracals (χ^2 = 6.0, p = 0.0). There were, however, no significant differences in stock losses due to the other predators between farms with or without reported leopard problems (Table 3.4).

3.4 Discussion

This technique proved to be very useful in determining the insights and opinions of land managers regarding stock losses to various predators. However, the technique does have some limitations or shortcomings, which are inherent in these types of data gathering techniques. The information obtained is based on the opinions and experiences of individual land managers (Lawson 1989). It may thus, suffer from certain biases in the amount of stock lost, and predators involved (Lawson 1989). The interpretation of the results and the conclusions reached must be done with these limitations in mind.

3.4.1 Predator comparison

Stock losses to the various predators are not uniform in space and time. They also varied a great deal in terms of the predators involved, and the extent of predation by each predator. When comparing the extent of the predator problems (Table 3.1) to the amount of stock taken by each predator (Figure 3.2), inferences can be made regarding the severity of predator problems. For example, 67% of respondents reported stock losses due to caracals followed by black-backed jackals with 54%. One would thus expect the proportion of stock lost to these predators to reflect this ratio. However, this is not the case. Black-backed jackals were reported as causing 37% of livestock losses per annum, compared to the 20% reportedly lost to caracals. In other words, black-backed jackals take proportionately more livestock than caracals, judging from the frequency of individual farms reporting the problem. This was also the case for leopards and baboons, with baboons reportedly taking proportionately more livestock than leopards. All the other predators took livestock in accordance with the extent of the reported depredation problem. Therefore, black-backed jackals target livestock because they kill more livestock than what would be expected.

Stock losses to leopards are believed to be high in the areas surrounding the BMR. However, stock losses attributed to leopards are significantly less than those attributed to black-backed jackals, caracals, and unknown losses. This corresponds with research elsewhere in Africa (Kolowski *et al*. 2006; Patterson *et al*. 2004; Ogada *et al*. 2003), where stock losses attributed to leopards was significantly lower than the stock losses attributed to other carnivores. Irrespective of the relatively small amount of stock lost to leopards, there is still tremendous focus on leopards as predators of livestock. This is because leopards take relatively large amounts of stock in one incident (according to respondents they can kill up to 30 head of sheep) compared to caracal, for example, which take one or two individuals per incident (den Hertog 2008). Leopards are also a protected species and the major predators of livestock (black-backed jackals and caracals) are not. According to the land managers this is very important, as the other predators can be managed via various techniques (see Chapter 4) and leopards cannot (den Hertog 2008). This indicates the importance of the perceptions of land managers (Naughton-Treves 1997) regarding the threat of various predators (see Chapter 4). These perceptions and attitudes have a large influence on the retaliatory killing of carnivores (Bjerke *et al*. 1999) and consequently carnivore conservation. Therefore, attitudes need to be assessed in order to conserve carnivores on private lands (Woodroffe & Ginsberg 1998; see Chapter 4). Thus, more attention and research should be focussed on the other predators of livestock, especially black-backed jackal and caracal, which are the dominant causes of livestock mortality in the BMR.

3.4.2 Characteristics of leopard-stock incidents

The responses of farmers regarding the seasonal and temporal characteristics of leopard-stock incidents (Table 3.2) as well as the institutions involved in assisting landowners with leopard-stock losses vary greatly (Table 3.3). According to the respondents who had perceived stock losses to leopards, most of these leopard-stock incidents occurred at night. This probably reflects the popular beliefs, that leopards are only active at night (Norton & Henley 1987). Indeed this is the case for leopards in most areas (Kalahari Desert, Bothma & Bothma 2006; Kenya, Hamilton 1981). However, Norton & Henley (1987) showed that the leopards in the Cederberg are mostly active during the day, with peak activity in the late morning and late afternoon. This is probably the case for the Baviaanskloof leopards as well. Respondents of this survey believed that most leopard-stock incidents occurred in winter. The land managers in the Stellenbosch and Cederberg areas also believe that most stock losses occur in winter (Norton & Lawson 1985; Norton & Henley 1987). According to Norton & Henley (1987) this is not the case, which probably holds true for the leopards in the BMR because they occur in a similar habitat as the Cederberg leopards. There is, however, currently no information regarding the activity or hunting patterns of leopards in the BMR. Therefore, these perceptions cannot be confirmed or rejected. This indicates that more research needs to be undertaken regarding the spatial ecology of leopards in the BMR.

The majority of land managers with leopard-stock interactions did not report these stock losses to any organisation. These respondents apparently believed that these organisations (Table 3.3) could not assist in reducing stock losses to leopards. However, of the farmers that did report perceived stock losses to leopards, most reported these to the Department of Economic Development and Environmental Affairs (DEDEA). The actions taken by DEDEA included the supply of cage traps and permits for the removal of "problem" leopards. Sixty percent of the respondents that experience leopard predation believed these actions to be either very or moderately effective. This leads one to question the attitudes of land managers towards these organisations because if these actions are effective, why do most farmers not make use of these services? According to den Hertog (2008), who studied the power relations between farmers of the BMR and the organisations involved in leopard-stock incidents, there is a lack of trust between the land managers and the various conservation organisations involved. If the level of trust and cooperation between farmers and conservation organisations are not restored, conservation of carnivores will not be a reality (Marshall *et al*. 2007).

3.4.3 Predator interactions

The influence of habitat selection and inter-specific social dominance has been shown to play an important role in the structuring of carnivore communities (Durant 1998). One would thus expect that these interactions are also present in the areas where land managers lose stock to more than one predator. This was, in fact, the case in the BMR. Most notable is the apparent interaction between leopards, the dominant carnivore in the Baviaanskloof Mega-Reserve, and black-backed jackals and caracal (Table 3.4). The presence of leopards on certain properties influenced the reported predation by caracal and black-backed jackal in such a way that there is a perceived reduction in the amount of stock taken by these two predators. This indicates the possibility of interspecific competition between these carnivores, which may result in ecological separation (caracal and leopards in the mountains of the Western Cape, Norton & Henley 1987; cheetah and lions and hyaenas in Namibia, Marker 1998) or avoidance behaviour (black-backed jackals and leopards in the Kruger National Park; Bailey 1993). However, the exact mechanisms are not known. Thus, the data presented here cannot exclude other possibilities such as availability of natural prey and habitat selection by individual carnivores (Karanath *et al*, 2000), which may contribute to this observed pattern.

There is also a possibility that land managers blame most of their stock losses on leopards (den Hertog 2008), thus skewing the results. It is difficult to determine whether this reduction in stock taken by black-backed jackals and caracal is due to behavioural, social and ecological factors or simply just an artefact of the inconsistencies in identifying the predator involved in stock losses.

It is clear that leopards prefer certain habitats above others, in terms of reported stock losses (Figure 3.4). This is probably due to the presence of a core leopard population in the BNR, with individual territories extending onto bordering farms (Norton & Henley 1987). Because of the historical conflict between leopards and farmers, leopards are forced to persist in remote areas, away from contact with farmers (Martins & Martins 2006). This selection of habitat is also evident in Figure 3.4, where the majority of the preferred MHCs occur in the mountainous areas adjacent to the BNR (Figure 3.3) and incorporate steep slopes, river courses, and deep gorges. Radio telemetry data for the leopards in the Baviaanskloof Nature Reserve also supports this observation (Rogers 2008). Topographical characteristics, such as these, play an important role in increasing the risk of livestock predation (Stahl *et al*. 2002) by leopards. A large proportion of preferred MHCs had a thicket component, which provides a large amount of vegetation cover for leopards. This has been shown to influence the habitat suitability for large felids (Palma *et al*. 1999), and probably plays an important role in habitat selection by leopards in the BMR. Judging from the location of preferred MHCs on individual properties, these areas are often the most remote portions on the individual properties, situated far from human habitation, and have the least amount of human activity, due to the remote and rugged terrain. Stahl *et al*. (2002) showed that in the French Jura, the proximity to human habitation plays an important role in lynx predation on livestock, with flocks in remote areas being attacked more regularly. This is probably the case for leopards in the BMR as well. There is thus a suite of factors that may influence habitat selection of leopards in terms of stock losses. However, further research is required to determine this.

In conclusion, leopards in the BMR are not the largest causes of livestock mortality. Irrespective of this, most attention is still given to leopard-stockfarmer interactions. These interactions are prevalent in the mountainous areas bordering the BNR. Therefore, the Eastern Cape Parks Board (ECPB), as the Managers of the Baviaanskloof Nature Reserve and with a mandate to conserve species such as the leopard, needs to engage with their neighbours to manage what is fundamentally a shared leopard population. In doing so, the level of trust and cooperation between the ECPB and private landowners will be restored. This is the first and most important step for leopard conservation in the BMR.