Guarding dogs as a mitigation tool in human–wildlife conflict

Case study:

The Anatolian Shepherd Dog breeding project in Namaqua National Park

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Abstract

This study conducted an evaluation of farmer and shepherd perceptions on Anatolian Shepherd dogs, used as livestock guarding dogs to mitigate farmer–wildlife conflict and meet conservation ends. The case study involved Anatolian Shepherd dogs bred at the Anatolian Shepherd Dog Breeding Project in the Namaqua National Park, and placed mostly on farms and at stock posts near the Namaqua National Park in the Northern Cape. The data were collected during structured and semi-structured interviews with livestock farmers and shepherds that received Anatolian Shepherd dogs from the Breeding Project. Anatolian Shepherd dogs were evaluated in terms of their contribution to reduce livestock losses and conservation of wildlife species. In terms of effectiveness in preventing or reducing livestock losses, 84% of the dogs eliminated or reduced livestock losses. Respondent satisfaction with the dogs was high, with 95% of respondents willing to recommend the Breeding Project and the use of Anatolian Shepherd dogs. Of the respondents, 95% perceived their dogs to be economically beneficial. Another 48% of respondents reported some form of behavioural problems at least once during the placement of the dogs. The most common reported problem was resting in the shade rather than accompanying the livestock. However, corrective training was effective in all cases where training was undertaken immediately. In terms of conservation, fewer respondents used lethal predator control methods in the years after placement of the dogs than before their placement. The overall perception regarding the use of lethal control methods (e.g. gin traps, shooting and poison) was that such control is cruel and that it is better to use non-lethal control methods only. However, a few respondents reported that lethal control measures were occasionally necessary to make a living when no other control measures were available, especially when the herd was relatively large. The effects of Anatolian Shepherd dogs on non-predator species in this study were minimal. The presence of the dogs therefore aided predator conservation and improved farmer tolerance of predators, especially by effectively reducing livestock losses.

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Chapter 1: Introduction

> While staying at this estancia, I was amused with what I saw and heard of the shepherd-dogs of the country. When riding, it is a common thing to meet a large flock of sheep guarded by one or two dogs, at the distance of some miles from any house or man. I often wondered how so firm a friendship had been established (Darwin, The Voyage of the Beagle, New York: P.F. Collier and Son, 1909, p.163 as cited in Coppinger & Coppinger, 2014).

1.1 General introduction and motivation for research

The conflict between farmers and predators has been found to be the most widespread form of human–wildlife conflict worldwide (Graham, Beckerman & Thirgood, 2005; Thirgood, Woodroffe & Rabinowitz, 2005). With more and more land being converted to agriculture land, human-occupied areas are increasingly overlapping with home ranges of wild animals. As a consequence, wildlife is forced to live within close proximity to humans. These circumstances have a negative effect on the functionality of ecosystems and result in increased competition between humans and wildlife for food and space (Treves & Karanth, 2003). This presents major challenges to the improvement of ecological and economic sustainability (Aryal, Brunton, Barraclough & Raubenheimer, 2014).

The conservation of wild animals, particularly carnivores, is challenging because it often places those who wish to conserve and restore carnivore populations in conflict with people who may be experiencing severe economic losses due to predation of livestock (Rust, Whitehouse-Tedd & MacMillan, 2013). It is difficult to place the responsibility for human–wildlife conflict on the predators, as these animals are simply following their instincts. On the other hand, if humans continue to view wildlife as the problem, predators will continue to face deaths at the hands of farmers.

Farmers have tried to reduce livestock losses to carnivores using both lethal and non-lethal methods. However, these methods are often expensive to use in terms of labour and equipment, and can be impractical, especially in developing countries, such as South Africa. Furthermore, many of the traditional approaches to reducing livestock losses depend on removing or excluding predators from the system concerned (Treves & Karanth, 2003), and this has conservation implications in areas where predators themselves are threatened. The challenge for conservation biologists is to change

attitudes by identifying, evaluating and presenting practical, cost-effective solutions and alternative methods, which facilitate the co-existence of people and carnivores outside protected areas.

In South Africa, predators are often killed to limit livestock losses due to predation. This has resulted in many of the large apex predators, such as leopard (*Panthera pardus*) and cheetahs (*Acinonyx jubatus*), to be eliminated from large portions of unprotected areas. The consequence has been an explosion of meso-predators, such as caracal (*Caracal caracal*) and black-backed jackal (*Canis mesomelas*), which has created significant problems on small stock farming operations (Rust & Marker, 2013). The real and perceived costs of these predators to livestock farmers have led to the use of lethal control methods in South Africa. Lethal methods often provide short-term solutions for controlling predators. However, the widespread application of these solutions does not encourage sustainable management of threatened carnivore species (Breitenmoser, 1998), while non-targeted species may also be trapped or killed. In this study, non-targeted species refers those that have not been reported as killers of livestock. Given the limited number of predators, it is vital that conservation efforts include effective mitigation of human–wildlife conflict and the use of potentially non-lethal methods to limit livestock depredation.

Livestock guarding dogs (*Canis familiaris*) are potentially one such method. It combines the advantages of requiring no technological expertise and being relatively inexpensive, with allowing predators to remain part of the natural system. Dogs have been used by herders in Europe and Asia for millennia to protect domesticated animals such as sheep, against wild predators and stray dogs. Over the centuries, a distinct set of dogs, known as livestock guarding dogs, has been developed throughout Eurasia (Rigg, 2001). They are large, have a threatening bark, and show attentive, trust. worthy and protective behaviour toward the livestock with which they are raised. They are not bred to herd stock, but deter predators by placing themselves between the herd and the threat and barking loudly (Rigg, 2001).

South African National Parks (SANParks) established an Anatolian Shepherd Dog Breeding Project in the Namaqua National Park (also known as the Anatolian Breeding Project), situated in the Northern Cape Province in 2005 (see Section 3.1). This initiative started in response to the success of the Cheetah Conservation Fund's Livestock

Breeding Programme in Namibia (see Marker, Dickman & Schumann, 2005; Potgieter et al., 2013), the Cheetah Outreach Project in South Africa (see Rust et al., 2013), and the need to protect wildlife. According to the Project Manager at Namaqua National Park, Elanza van Lente, farmers and shepherds target predator species such as black-backed jackals and caracals that kill livestock. However, non-predator species, such as honey badgers (*Mellivora capensis*), aardvark (*Orycteropus afer*) and tortoises (*Testudinidae*) are also killed in traps that are set for jackals and caracals (Van Lente, personal communication, 11 October 2015).

In the past, mitigation measures were often evaluated from only one side of the human–wildlife conflict: either in terms of the benefits to conservation, or in terms of reducing livestock losses. In order to develop suitable mitigation measures, it is important to recognise the double-sided nature of human–wildlife conflict when evaluating specific mitigation measures. The present study set out to evaluate farmers' perceptions of the effectiveness of the Anatolian Shepherd dogs, both in terms of reducing livestock losses as well as in terms of the conservation of wildlife species.

Naturally, mitigating this conflict in Namaqualand and in the rest of South Africa will require a long-term, multi-disciplinary approach that considers the complex human and predator systems involved (Marker & Dickman, 2004; Potgieter, 2011). However, the focus of this study is to evaluate the use of a specific conflict mitigation method, namely the use of dogs from the Anatolian Breeding Project as livestock guarding dogs in Namaqualand.

1.2 Aim and objectives

The aim of this research was to evaluate perceptions of farmers and shepherds regarding the use of Anatolian Shepherd dogs, whether they are effective in mitigating the farmer–predator conflict, and whether they are able to meet conservation needs in Namaqualand.

In order to address the aim of the project, five objectives were identified. In terms of predation, the aims were:

- to determine the perceived ability of Anatolian Shepherd dogs to reduce livestock losses;
- to determine the extent of the farmers' and shepherds' satisfaction with the performance of the Anatolian Shepherd dogs in terms of attentiveness,

trustworthiness and protectiveness, as well as the farmers' and shepherds' perceptions regarding the Anatolian Shepherd Dog Breeding Project; and

- to investigate the prevalence and potential causes of common behavioural problems with Anatolian Shepherd dogs.

In terms of conservation, the aims were:

- to test the assumption that Anatolian Shepherd dogs act as a non-lethal form of predator control; and
- to examine whether the introduction of Anatolian Shepherd dogs has led to the anticipated reduction in the killing of predators by farmers and shepherds.

1.3 Outline of the dissertation

This dissertation consists of six chapters.

This introductory chapter, Chapter 1: Introduction, covers the general introduction and the motivation of the study and provides the outline of the dissertation. It also states the aim and objectives of the study.

Chapter 2: Theoretical and local context reports on the literature on human–wildlife conflict, farmer perceptions of human–wildlife conflicts, meso-predator release, and conflict mitigation measures. The second part of Chapter 2 draws on existing literature evaluating the use of livestock guarding dogs for livestock protection and the conservation of predators and non-predators. The chapter concludes with a look at livestock predation in Namaqualand in particular, and the use of Anatolian Shepherd dogs to mitigate the human–predator conflict in the area.

Chapter 3: Methodology and study area introduces the study area and provides details of the research methodology employed. The chapter also provides a discussion of the ethical considerations, research agreements and possible limitations of the study.

The results of the key informant interviews and semi-structured interviews are presented in Chapter 4: Results. The focus is on the performance of the Anatolian Shepherd dogs in terms of reducing livestock losses and predator conservation. The chapter also provides a discussion of the working conditions of the Anatolian Shepherd dogs and typical behavioural problems experienced by respondents with dogs.

Chapter 5: Discussion and recommendations reflects the main findings of the study. The chapter also provides some recommendations for the use of Anatolian Shepherd dogs

as a mitigation measure for farmer–predator conflict, both for potential dog owners and for the management of the Breeding Project.

Chapter 6: Conclusion draws the dissertation to a close by summarising the main findings of the study on the use of Anatolian Shepherd dogs as a potential control method.

Chapter 2: Theoretical and local context

> Dogs … are of the greatest importance to us who feed the woolly flock, for the dog is the guardian of such cattle as lack the means to defend themselves, chiefly sheep and goats. For the wolf is wont to lie in wait for them and we oppose our dogs to him as defenders (Varro, written 2000 BC).

2.1 Human–wildlife conflicts

Human–wildlife conflicts are defined as occurring whenever an action by either humans or wildlife has an adverse influence on the other (Kansky & Knight, 2014). This conflict is one of the most widespread and critical issues facing conservationists today (Dickman, 2010). Major consequences of human–wildlife conflict include injury and loss of life of humans and wildlife, livestock depredation, trophic cascades, collapse of wildlife populations, and a decline of geographic ranges (Bergstrom et al., 2014).

The conflict between farmers and predators is the most widespread form of human–wildlife conflict worldwide (Woodroffe, Thirgood & Rabinowitz, 2005). With more and more land being converted to agriculture, human-occupied areas are increasingly overlapping with home ranges of wild animals. As a consequence, wildlife are forced to live within closer proximity to humans. These circumstances have a negative influence on the functionality of ecosystems and result in increased competition between humans and wildlife for food and space (Treves & Karanth, 2003). This presents major challenges to ecological and economic sustainability (Aryal et al., 2014).

Human–wildlife conflict most often arises in agricultural areas when predators target domestic livestock. This form of human–wildlife conflict is prevalent on every continent, except Antarctica (Soulé et al., 1988). In Africa, for example, lions (*Panthera leo*), leopards (*Panthera pardus*), cheetahs (*Acinonyx jubatus*), caracals (*Caracal caracal*), baboons (*Papio familiaris)* and black-backed jackals (*Canis mesomelas*) prey on cattle, sheep and goats (Balme, Slotow & Hunter, 2009; Marker, Mills & Macdonald, 2003; Thorn, Green, Dalerum, Bateman & Scott, 2012). In North America and Europe, coyotes (*Canis latrans*) and wolves (*Canis lupus*) target sheep (Rigg, 2001; Treves & Karanth, 2003). In Asia, tigers (*Panthera tigris*), leopards (*Panthera pardus*) and snow leopards (*Panthera uncial*) kill livestock (Aryal et al., 2014; Treves & Karanth, 2003). Jaguars

(*Panthera onca*) and puma (*Puma concolor*) prey on cattle in South America (Palmeira, Crawshaw, Haddad, Ferraz & Verdade, 2008) and in Australia, wild dogs (*Canis lupus familiaris*) and dingoes (*Canis lupus dingo*) are the cause for the great decline in sheep flock (Letnic, Ritchie & Dickman, 2012; Van Bommel, 2010).

All over the world, human–wildlife conflict is a controversial issue among government departments, conservation groups and local communities. The external groups involved in conflict mitigation often have different views to the farmers and shepherds directly affected by predator conflicts (Madden & McQuinn, 2014). Understanding conflicts between different stakeholder groups is central to understanding and resolving human–wildlife conflict (Hill, 2015).

Livestock farmers and shepherds incur high costs from the loss of livestock due to predators, especially when valuable livestock are killed (Aryal et al., 2014). Predation of livestock can cause loss of food and income, which has an adverse effect on the standard of living, rural development, agricultural production and food security (Treves & Karanth, 2003; Woodroffe et al., 2005). However, farmers are not a homogenous group and have different traditions, socio-economic backgrounds, attitudes towards wildlife, and predator management methods among them (Dickman, 2010; Messmer, 2000).

Conservation of wild animals, particularly carnivores, is challenging because it often places those who wish to restore carnivore populations in conflict with farmers and shepherds who may experience severe economic losses due to livestock predation (Rust et al., 2013). It is difficult to place the responsibility for human–wildlife conflict on the predators, as the animals are simply following their instincts. On the other hand, if humans continue to view wildlife as the problem, predators will continue to face severe losses.

In the past, mitigation measures were often evaluated from only one side of the human–wildlife conflict: either in terms of the benefits to conservation, e.g. reducing the killing of predators (Balme et al., 2009; Suryawanshi, Bhatnagar, Redpath & Mishra., 2013) or in terms of the success of addressing human needs, e.g. reducing livestock losses (Marker, Dickman & Schumann, 2005). A lack of effective methods to reduce human–wildlife conflict has contributed to feelings of alienation and a lack of inclusion among local communities, especially among rural African communities living adjacent to protected areas (Hill, 2004).

In order to develop suitable mitigation methods, it is important to recognise the double-sided nature of human–wildlife conflict and the complexities arising from both the predators and the human communities (Messmer, 2000; as per Potgieter, 2011; Treves & Karanth, 2003; Woodroffe et al., 2005). Effective mitigation measures require long-term biological and socio-economic studies that are tailored to local conditions (Treves & Karanth, 2003). Both sides of the human–wildlife conflict should be taken into account when evaluating specific mitigation measures (Madden & McQuinn, 2014). The use of a method that is 'friendly' to predators, but still results in thousands of livestock losses, only benefits the predators. The use of a method that protects livestock from being killed, but in the process kills thousands of non-targeted animals, is also not sustainable. The challenge for conservation biologists is to change attitudes by presenting practical and cost-effective solutions that make it possible to co-exist with wildlife. The next section reflects a discussion of how farmer perceptions and expectations influence the level of human–wildlife conflict.

2.2 Farmer perceptions and expectations

Farmers' perceptions and expectations shape their attitudes and responses to livestock losses and greatly influence the level of human–wildlife conflict (Dickman, 2010; Treves & Karanth, 2003). Thus, it is important to understand human–wildlife conflict from the perspective of farmers because their beliefs are likely to influence their attitudes and behaviour (Hill, 2004). Farmers' perceptions of human–wildlife conflicts differ from those of other stakeholders as the farmers suffer direct economic losses. Economic costs are an important factor shaping perceptions, although these costs are relative and differ among different groups. For instance, farmers who receive a greater share of their income from their farms are less tolerant of livestock losses (Messmer, 2000). Farmers producing high-value livestock, which are vulnerable to predation, tend to be less tolerant to wildlife. The distribution of losses is not necessarily uniform. For instance, while livestock losses may be relatively low at district level, certain individual farmers may suffer very large losses (Dickman, 2010).

Farmers' perceptions of risk are shaped by cultural factors, experience, values, history and ideology (Hill, 2004). Perceptions are also influenced by predator characteristics. For example, cheetahs (*Acinonyx jubatus*) and African wild dogs (*Lycaon pictus*) are often disproportionately blamed for livestock losses because they are diurnal and more visible

to farmers (Dickman, 2010). Spotted hyenas (*Crocuta crocuta*) often provoke negative perceptions because of their association with witchcraft (Dickman, 2010).

Farmers' perceptions of risk may not accurately reflect actual conditions. Even those farmers who do not incur significant losses often complain loudly about human–wildlife conflict (Hill, 2004). Farmers who believe that they have little control over the conflict situation are likely to inflate perceptions of risk further. In Botswana and Nigeria, for example, where hunting is banned since 2014, rural farmers believe that one of their most effective means of livestock protection has been removed (Mbaiwa, 2016). Farmers who believe that their needs are not met report a reduced tolerance for livestock losses due to predation. In addition, perceptions are often influenced by extraordinary or extreme events, rather than more frequent occurrences (Hill, 2004).

These examples demonstrate the complexity involved in human–wildlife conflict. In order to address this conflict effectively, it is important to consider both actual livestock losses due to predation, as well as the perceptions and expectations of the farmers (Rigg, 2001). Only reducing wildlife damage will often fail to produce long-term conflict resolution (Dickman, 2010). Understanding farmers' expectations prior to any intervention may facilitate the development of mitigation procedures that adequately satisfy all stakeholders. For example, before initiating a project such as the Anatolian Breeding Project, one should understand the expectations of the local community. As Hill (2004) stated, when initial expectations are unrealistic, part of the intervention should focus on ensuring that local people have a realistic vision of what can and what cannot be achieved.

2.3 Farmer–predator conflict in South Africa and meso-predator release

There is still a relative lack of research in South Africa on the predation of small livestock by the jackal and caracal, and also specifically on the methods used to control predation by these animals. In order to understand why there is farmer–predator conflict in present-day South Africa, this section provides a brief history of farmer–predator conflict in South Africa over the last two centuries.

Livestock farming has been practised in Southern Africa since before the arrival of Europeans in the 17th century (Beinart & McGregor, 2003). Farming was mainly for subsistence, and farming practices are believed to have been mostly nomadic, with high-intensity livestock guarding practices due to the large number of free-ranging predators.

In the early 19th century, the British brought a new wave of intensive agriculture and farming to South Africa, consisting of large-scale animal domestication and employing advanced technology to control the environment (Beinart, 1998). Between 1865 and 1891, the number of domestic sheep (*Ovis aries*), cattle (*Bos taurus*) and goats (*Capra hircus*) increased from 13 million to 26 million (Van Sittert, 1998)

Unfortunately, the new form of agriculture and farming had a negative effect on wildlife species, and especially the larger predators. The species that posed a potential threat to humans, such as lions and hyenas (*Hyaenidae*), were the first to be eradicated from settlement areas (Van Sittert, 1998). Game species, such as the quagga (*Equus quagga quagga*) and blue antelope (*Hippotragus leucophaeus*), were hunted to extinction. The decrease in free-roaming natural prey is one of the main reasons predators started to prey on livestock *(*Breitenmoser, 1998).

The disappearance of the larger apex predators led to large-scale meso-predator release, with caracal and black-backed jackal becoming the primary predators of livestock and wildlife in southern Africa, which created problems for livestock farming (Sillero-Zubiri, Hoffmann & Macdonald, 2004; Beinart, 1998). Apex predators reside at the top of the food chain, upon which no other predators prey, occupying the highest trophic levels, for example lions, cheetahs and leopards. Meso-predators are medium-sized middle-trophic predators, which both predate and are predated upon, for example jackals and caracals. Meso-predator release describes a phenomenon whereby mid-size carnivores became far more abundant after being 'released' from the control of large, dominant predators (Soulé et al., 1988). In effect they become the 'new apex' predators in an area. Meso-predators thrive outside protected areas and on the farmlands. Because they tend to prey on species valued by humans, their presence can impose significant economic costs on rural communities (Berger, 2006).

In South Africa, black-backed jackals are considered common and abundant meso-predators outside protected areas, especially in some farmlands (Sillero-Zubiri et al., 2004). The ability of black-backed jackals to adapt to changing conditions and alter their ecology to compensate for disturbances have made these animals very successful in disturbed agricultural landscapes and one of the most problematic animals for livestock farming in South Africa (Beinart & McGregor, 2003).

Bergman et al. (2013) note that in the early 20th century, the primary focus of predator control was on the black-backed jackals and caracals, which occurred widely in South Africa. By the 1910s, carnivores were responsible for between 5 and 12% livestock losses per year (Beinart, 1998; Beinart & McGregor, 2003). During the 1910s, there was a movement towards predator-proof fencing. Fencing was made compulsory in sheep-producing areas. The costs for fencing were shared by farmers and government, who each paid for half of the cost of installation and maintenance. The Fencing Act (No. 17 of 1912) was passed by the government in 1912, and they provided loans and mechanisms to install predator-proof fencing (Beinart & McGregor, 2003; Bergman et al., 2013; Van Sittert, 1998).

By the early 20th century, black-backed jackals were considered to be the worst form of 'vermin' known to man. Caracals and leopard were also considered to be a pest, and farmers controlled them by shooting or using trapping, dogs and poison (Bergman et al., 2013). In 1916, it was estimated that 7.5–10% of the 15 million wool sheep in the Cape were killed by these predators each year (Beinart, 1998). By 1914, hunting clubs were replacing poisoning clubs. A total of 25 000 caracals were reportedly killed between 1914 and 1923. In the Karoo region alone, approximately 2 200 caracals were killed annually between 1931 and 1953 (Beinart, 1998; Bergman et al., 2013).

In 1924, the Vermin Extermination Commission estimated that annual losses to predation amounted to 1.5 million sheep (Bergman et al., 2013). Livestock producers used control methods such as firearms, trapping, strychnine, bounties, fencing and hunting dogs. During the 1950s, the provincial administration of the Cape phased out bounties by supplementing hunting clubs in the Cape Province (Bergman et al., 2013). During the 1960s, the government subsidised hunting clubs, with 110 such clubs located in the Cape Province alone (Beinart, 1998; Hey, 1964).

In the 1960s and 1970s, the idea of protecting areas representative of all biodiversity became increasingly popular (Carruthers, 2008). Although conservation was seen as vital for the survival of many species, it was only significant in national parks, while wildlife became increasingly threatened outside of these protected areas (Humphries, 2014).

In 1968 the leopard was removed from the 'vermin' list in the Cape Province and in 1974 was declared a 'protected wild animal'. This meant that a permit was then required to trap and kill leopard (Nature Conservation Ordinance No.19 of 1974). In 1978, the first farming

conservancy was established in the KwaZulu-Natal Midlands by local farmers under the guidance of the Natal Parks Board (Humphries, 2014). The primary objective was to protect game on the farmlands. This initiative became the first to protect natural areas outside of formally protected reserves (Humphries, 2014).

As the political climate became increasingly influenced by animal rights groups, and with a lack of funding, the government phased out their official subsidisation of predator control by the early 1990s (Bergman et al., 2013). Most of the original predator-proof fences have exceeded their effective lifespan and were not effective anymore, unless they had been maintained or replaced at the farmer's own expense. Since the 1990s, the South African government ceased all subsidies to farmers for predator control, and farmers themselves are now responsible for predator management on their farms (Du Plessis, 2013).

Predators are currently managed on farms by using a range of different lethal measures, e.g. shooting, gin traps, and poisoning, as well as non-lethal measures e.g. fencing (Du Plessis, 2013). However, these lethal and non-lethal measures have not been as successful as expected (McManus, Dickman, Gaynor, Smuts & MacDonald, 2015).

Van Niekerk (2010) undertook a study on predation in the five major small livestock-producing provinces. Farmers in the Western Cape, Eastern Cape and Northern Cape, the Free State and Mpumalanga have reported losses of between 5.3% and 11.3% of their total stock per year. Predation losses due to predators were estimated at approximately R1 390 million (Van Niekerk, 2010). The province where the current research study took place, the Northern Cape Province, reported the highest predation losses of R540 million (Van Niekerk, 2010).

Conradie and Piesse (2013) found that the removal of leopard and caracal increased livestock losses in the subsequent year. In response to an increase in predator control, black-backed jackals have been known to adapt their reproductive strategies, by breeding at a younger age and increasing litter sizes (Beinart & McGregor, 2003; Nattrass & Conradie, 2013). When a dominant jackal is killed, sub-adults may move into the vacant territory, which could lead to smaller and higher-density home ranges (Brassine, 2011).

Although farmers have faced these problems for decades, there is still a distinct lack of knowledge of the ecology of predators on farmlands in South Africa (Du Plessis, 2013; Van Niekerk, 2013).

Currently the black-backed jackal and caracal are still defined as damage-causing animals, and may still be killed if the problem occurs. Under the National Environmental Biodiversity Management Biodiversity Act, No. 10 of 2004 (NEMBA: 2004), the black-backed jackal and caracal are not protected species and can be killed when needed.

Despite longstanding narratives around preying on livestock by predators, there is still little research on understanding of predators preying on livestock in South Africa (Du Plessis, 2013). The following section discusses lethal and non-lethal methods to approach the farmer–predator conflict.

2.4 Lethal and non-lethal approaches to farmer–predator conflict

There is no coherent nationwide strategy to reduce losses due to predation in South Africa. Control measures vary between individual farmers and shepherds, and a range of lethal and non-lethal methods are used to reduce predation.

Lethal methods are those that kill the predator. The most common methods are shooting, hunting with dogs, setting snares and traps, and poisoning (McManus et al., 2015). The use of lethal methods to prevent livestock depredation has contributed to the decline of several carnivore species, e.g. cheetah numbers in Namibia (Potgieter, 2011). These methods are largely indiscriminate and often kill non-target species. In South Africa, this includes threatened species such as the Cape vulture (*Gyps coprotheres*) (Bamford, Diekmann, Monadjem & Mendelsohn, 2007) and the Cape leopard. Despite the declaration of the leopard as ‘protected wild animal’, leopards are still being killed in the Western Cape Province. A major conservation concern for the Cape leopard in these areas is due to existing legislation which makes it possible to set deadly traps for caracal and black-backed jackal without a permit (Van Niekerk, 2010). Often the lethal methods used for the removal of these ‘problem animals’ by farmers, such as gin-traps or caracal cages, are indiscriminate, creating a high risk of farmers trapping leopard (Martins & Martins, 2006). The increasing loss of wilderness areas through farming and human habitation is a major factor in the loss of habitat for leopard prey species especially rock hyrax and small antelope. Not only does this increase the likelihood of leopards preying on stock for survival, it also increases farmer – predator conflict (Martins & Martins, 2006).

In general, lethal control methods are publically unacceptable, environmentally damaging and often illegal (Treves & Karath, 2003). With public disapproval and legal restrictions

limiting the use of lethal control methods in many countries, the use of non-lethal control measures is becoming more popular.

Non-lethal methods reduce predation without killing the predator, e.g. the corralling of small livestock or indoor housing, shepherds, lights and guard dogs (Potgieter, Marker, Avenant & Kerley, 2013). Corralling or ("kraaling" in Afrikaans) refers to herding livestock from the kraal to the water point during the day and back to the kraal at night to protect livestock from predators and theft (Todd & Hoffman, 1999; Swanepoel, 2016). Herding is the act of bringing livestock together into a group, known as a herd, and moving the herd from place to place. Herding can be performed by a shepherd or a trained animal such as a herding dog (Samuels et al., 2013; Todd & Hoffman, 1999).

Non-lethal control methods have traditionally centred on livestock farming. By day, livestock were guarded by human shepherds or dogs and by night, they were kept in enclosures near human settlements (Ogada, Woodroffe, Oguge & Frank, 2003; Potgieter et al., 2013). A number of practises could reduce livestock predation by minimising the proximity of the livestock to predators in areas especially at times when livestock are most vulnerable. These practices include herding, corralling livestock in large paddocks during the day or small corrals at night, using breeding seasons, and corralling calving and sick animals.

There is strong evidence that non-lethal methods can reduce predation, e.g. livestock guarding dogs have reduced cheetah predation in Namibia (Breitenmoser, 1998; Marker, Dickman & Macdonald, 2005). Increasingly, 'predator-friendly' farming methods are being implemented, not only to reduce livestock losses but also to conserve predator species (Dickman, 2010; Potgieter, 2011). These methods may have the added benefits of positive public perception, improved animal welfare and reduced non-target casualties (McManus et al., 2015; Treves & Naughton-Treves, 2005). The methods may also be less likely to trigger perturbation effects, such as meso-predator release (McManus et al., 2013). On the other hand, non-lethal methods are sometimes considered more expensive (Mitchell, Jaeger & Barrett, 2004) and less effective than lethal control methods (McManus et al., 2015; Shivik, 2006). Comprehensive evaluations of these control methods are therefore still required.

2.5 The need for conservation outside protected areas

Parks and conservation areas alone cannot ensure the survival of species and ecological communities. In South Africa, nearly 80% of the total land area is privately owned. The total land area covered by statutory protected areas is around 6%, with little scope for increase (Cousins, Sadler & Evans, 2008). This is not only too small to protect biodiversity in the long term, but does not adequately represent all habitat types. As a result, conservation outside of protected areas requires the support of private landowners (Cousins et al., 2008). It is important that land outside protected areas be managed in ways that promote conservation and biodiversity.

Predators often come into conflict with livestock owners when they move outside of protected areas. Livestock owners may kill these animals in response to the real and perceived threats to their livestock (Potgieter, 2011). The use of unselective lethal methods (e.g. poison) to control predators on farms can have negative ecological effects (Avenant & Du Plessis, 2008). An essential component of conservation is to reduce predator killing outside of protected areas (Marker, Mills & Macdonald, 2003).

In the present study, the Namaqua National Park situated in the Northern Cape was the protected area, where meso-predators (jackal and caracal) were responsible for a significant amount of damage due to livestock losses around the park on private and communal land. At the same time, predator conservation is vital because of their importance in terrestrial ecosystems. The farmer–predator conflict is especially acute in Namaqualand on private and communal land, with significant economic damages, in large part due to the meso-predators (Berger, 2006).

2.6 Farming practices in Namaqualand

In the past two centuries, Namaqualand has undergone extensive and significant land use change. Desmet (2007) reported that the predominant land use in Namaqualand is small stock farming (sheep and goats), with irrigation crop production (mainly grapes) being confined to the areas around the Olifant and Gariep Rivers. Collectively, goats and sheep are referred to as ‘small stock’ and are often managed by shepherds, who are either hired or who are the farm owners themselves (Desmet, 2007).

Livestock activities in Namaqualand range from communal to commercial farming. Commercial farming is on private land where livestock are managed and sold on a large scale profit. Conversely, communal farming is on government-owned land where some

resource rights are given to the occupier (Desmet, 2007). Commercial stock farming on privately owned land account for approximately half of the land area (Desmet, 2007). Despite the large area occupied by commercial farmers, Namaqualand has relative few commercial stock farmers, around 600 (Desmet, 2007). Around half of Namaqualand's inhabitants live in communal areas, which cover around 25% of the region (Hoffmann, Todd, Ntshona & Turner, 2014). Herding practices between private farms and communal farms differ. Non -adoption of herding on private farms is often because commercial farms use fences instead of herders to manage grazing (Desmet, 2007).

According to Rohde and Hoffman (2008), the people of Namaqualand are amongst the poorest communities in South Africa relying mainly on pension funds and social grants, whilst the wealthier members of the community also earn income from livestock sales (Samuels, 2013). Livelihoods in the communal areas are complex and usually constitute multiple activities and sources. Livestock production in these communities does not only serve as an income, but livestock products such as meat and milk also contribute to their livelihood, where the sharing of these form part of a social structure and alternative economy (Desmet, 2007). The loss of livestock due to predators could therefore threaten farming livelihoods and agricultural production, as well as potentially threatening food security (Thorn, Green, Scott & Marnewick, 2013).

As is typical for human–wildlife conflict management, mitigating predator conflict in Namaqualand will require a long-term, multi-disciplinary approach that considers the complex human and predator systems involved (Marker & Dickman, 2004; Potgieter, 2011). However, the focus of this study was to evaluate the use of a specific conflict mitigation method – using Anatolian Shepherd dogs from the Anatolian Breeding Project as livestock guarding dogs in Namaqualand.

2.7 Training and raising livestock guarding dogs

Livestock guarding dogs are medium to large-sized dogs that are kept with livestock to protect them from predators (Van Bommel, 2010). The use of dogs to protect sheep and other livestock from predators probably originated over 2000 years ago in Europe (Coppinger & Coppinger, 2001). The use of livestock guarding dogs as a farmer–predator mitigation method was popularised in the 1970s in the United States (Potgieter et al., 2013; Smith, Linnell & Swenson, 2000). In South Africa, they are mainly used to protect sheep, goats and cattle, although trial programmes are being run with other animals such

as springboks and ostriches. As indicated in Van Bommel (2010), these dogs live permanently with 'their' stock, and regard them as their social companions, protecting them from anything they see as a threat.

Livestock guarding dogs should not be confused with herding dogs, although both are working dogs and are often referred to as sheep or cattle dogs (Van Bommel, 2010). As defined in Van Bommel (2010), herding dogs gather livestock in groups and move them from place to place, while guarding dogs protect livestock but do not herd them. Herding dogs have been bred to be similar to predators in their appearance and behaviour, which makes livestock wary of them, and enables the dogs to control the livestock's movements. Guarding dogs, on the other hand, have been bred to be inoffensive in appearance and behaviour. They avoid direct confrontation with livestock and are generally calm around stock. This allows them to integrate themselves with groups of livestock and be accepted. Herding dogs are generally highly trainable and obedient, but cannot be trusted with livestock unsupervised. Guarding dogs are more difficult to train and tend to make their own decisions. They were bred to live and work unsupervised with livestock and are independent of humans (Van Bommel, 2010).

Over the years, training methods have been refined and guidelines (such as Van Bommel, 2010) have been produced for farmers and shepherds using livestock guarding dogs under various conditions. Ideally, guarding dogs should be bred from lines of working dogs and the parents should be active working livestock guarding dogs (Potgieter, 2011; Sims & Dawydiak, 2004;).

It is crucial for livestock guarding dogs to form a bond with the livestock. This is only possible during the critical social bonding stage when they are between 4 and 16 weeks old (Coppinger & Coppinger, 2014). Guarding dog puppies should preferably be raised with a few lambs in a small corral or isolated area, starting at 6–8 weeks of age when they develop a strong bond with sheep or goats (Andelt, 2004). During the bonding period, excessive playing with livestock should be corrected, although gentle play is a sign of successful social bonding (Potgieter, 2011). Many livestock guarding dogs develop incomplete predatory behaviours, such as grab-biting, which should be corrected immediately (Coppinger & Coppinger, 2001).

A puppy should be treated as a working dog from the beginning. During the critical bonding period, there should be limited human handling of the puppies and they should

not be treated as pets (Lorenz, Coppinger & Sutherland, 1986). According to Andelt (2004), puppies should not be allowed to play with herd dogs or children, or stay around the house. The puppies should be exposed to the sights, smells and sounds of a livestock stock post from as young as possible (Coppinger & Coppinger, 2001). Puppies should be introduced to equipment, machinery, other livestock, and herding dogs, so that they do not guard “their” herd from them (Andelt, 2004).

There should be supervision of juvenile dogs while they accompany livestock into the field, to ensure that they remain with the livestock and to correct undesirable behaviour immediately. The owner and puppy should spend some time together to ensure that the dog is not afraid of the owner and can be collected. The puppy should not be rewarded when it wanders away from the sheep (Andelt, 2004).

Andelt (2004) recommends that the puppy should be raised with lambs or kids that will be incorporated into the main herd. Once a group of sheep or goats accepts the dog, other sheep or goats unfamiliar to guarding dogs tend to accept it more quickly. High-quality dog food should be provided in a self-feeder near the herd at all times (Andelt, 2004). A barrier should be placed around the feeder to exclude the livestock, otherwise the dog may remain near the feeder to guard it from the livestock. When a dog matures and begins to work, it will stay with sheep willingly and accept them as family. The dog’s barking and scent marking with urine will increase, which will let predators know that a dog is present and help to chase them away. Predators usually remain in the area, but are prevented from killing the livestock (Andelt, 2004).

Guarding dogs protect livestock from predators by confrontation, disruption and territorial exclusion (Van Bommel, 2010). Confrontation involves the dog directly confronting and intimidating a predator and forcing it to withdraw. If necessary, the dog will attack, fight and even kill the predator, although violent interactions are typically rare. Disruption occurs when the presence and behaviour of the dog confuses and interrupts the hunting behaviour of the predator. Guarding dogs become noisy and active when any unfamiliar animal or person approaches. Most dogs are large and have a deep bark, which makes it easy to make their presence known to an approaching predator. In most cases, the predators seek different prey elsewhere. Territorial exclusion occurs when the predator recognises the dog’s area as the territory of another predator and avoids entering it (Coppinger & Coppinger, 2001; Van Bommel, 2010).

2.8 Effectiveness of livestock guarding dogs in reducing livestock losses

There are many factors which influence the effectiveness of livestock guarding dogs in protecting livestock, including the dog's physical characteristics, the environmental conditions of the farm, and training and monitoring (Marker, Dickman & Macdonald, 2005; Potgieter et al., 2013). The physical traits include the size, strength, sense of smell, eye sight and hearing of the breed. Environmental conditions, such as rough terrain, dense bush and extreme heat could hamper mobility and thus significantly limit effectiveness. However, the most important factor for effectiveness seems to be the bond that the dog forms with the livestock, which is determined by training. Having a herder working with the dog is also thought to increase its effectiveness as it allows for better monitoring of the dog's behaviours and swift responses to any behavioural or health problems (Coppinger & Coppinger, 2001).

Coppinger and Coppinger (1980) propose three distinct behavioural traits that are crucial to effectiveness, namely –

- attentiveness – the tendency of the dog to stay with the herd;
- trustworthiness – the lack of predatory behaviour towards the herd and the lack of other behavioural problems; and
- protectiveness – the tendency of the dog to display protective behaviour towards the herd.

In many cases, livestock guarding dogs have been found to be remarkably successful at reducing livestock losses due to livestock predation on farms (Andelt & Hopper, 2000; Coppinger, Coppinger, Langeloh, Gettler & Lorenz, 1988; Green & Woodruff, 1988; Marker, Dickman & Macdonald, 2005; Marker, Dickman & Schumann, 2005; McGrew & Blakesley, 1982; Potgieter et al., 2013; Rust, 2011). Coppinger et al. (1988) found that livestock guarding dogs could reduce predation losses by 60% or more, while Green and Woodruff (1988) confirm that 82% of the dogs provided an economic benefit to farmers. Andelt and Hopper (2000) report that out of 160 producers using dogs in Colorado, 84% rated their dogs' overall predator control performance as excellent or good, 13% as fair, and 3% as poor. Other studies (Green & Woodruff, 1988; McGrew & Blakesley, 1982, Rust et al., 2013) report reduction in predation of between 11% and 93%, mostly in the 70% range, in short-term studies.

However, while guarding dog programmes show great promise, they are not a quick solution. Successful programmes require funding, education, and commitment. Marker, Dickman and Schumann (2005) found that a comprehensive corrective process was necessary to assist dogs that display inappropriate behaviour, such as biting or roaming.

2.9 Effectiveness of livestock guarding dogs for conservation

The lethal control of predators to protect livestock from predation is a significant threat to the long-term conservation of predators worldwide (Potgieter, 2011; Woodroffe et al., 2005). Livestock guarding dogs, including Anatolian Shepherd dogs, have been promoted as a widely socially acceptable and non-lethal method of reducing human–predator conflict (Gehring, VerCauteren & Landry, 2010; Marker, Dickman & Macdonald, 2005).

However, only very few studies have evaluated the effectiveness of livestock guarding dogs in terms of predator conservation and the effect on non-target species. For instance, the results reported in Potgieter, Kerley and Marker (2016) challenge the classification of livestock guarding dogs as a non-lethal conflict-mitigation method and find that the dogs are a lethal control method in certain circumstances. The classification of Anatolian Shepherd dogs and other breeds of livestock guarding dogs as a non-lethal method of predator control should therefore be further evaluated. The present study comprised an evaluation of Anatolian Shepherd dogs as a mitigation tool based on farmers' perspective and views of livestock protection as well as conservation.

The next section outlines the background to the Anatolian Breeding Project. The section also describes the study area and the methodology employed in this short research study.

Chapter 3: Background, study area and methodology

> So well aware are the sheep of the fatherly care of these dogs, and that they themselves have nothing to fear from them, that they crowd round them, as if they really sought their protection; and dogs and sheep may be seen resting together, or trotting after the shepherd in the most perfect harmony ("A Summer in the Pyrenees" by the Hon. James Erskine Murray, published in 1837).

3.1 Background to the Anatolian Shepherd Dog Breeding Project

Livestock guarding dogs were first introduced into southern Africa in the early 1990s, when Dr Laurie Marker, Founder and Executive Director of the Cheetah Conservation Fund (CCF), imported 10 Anatolian Shepherd dogs to Namibia to initiate a Breeding Programme. The Anatolian breed was chosen due to certain characteristics such as its large size, short coat, and independent nature. The CCF felt that this breed would make it best suited to the conditions faced on the Namibian farmlands. The breeding programme was named the Livestock Guarding Dog Programme (Marker, Dickman & Schumann, 2005). The programme has been highly effective at reducing predation rates and thereby reducing the inclination of farmers to trap and kill cheetahs in Namibia. By the end of 2015, the CCF had placed approximately 500 dogs in Namibia (Marker, Dickman & Schumann, 2005; Potgieter et al., 2013).

Research conducted on dogs placed between 1994 and 2001 showed that the dogs were very effective at reducing the reported rates of stock predation on Namibian farms, with 73% of responding farmers reporting a large decline in the levels of stock loss since getting a dog (Marker, Dickman and MacDonald, 2005). The majority of farmers felt that they had benefited economically from having a guarding dog, and 93% of the farmers were willing to recommend the programme (Marker, Dickman & Macdonald, 2005). Not only did the programme result in a reduction of livestock losses, it also had an effect on the conservation of cheetah numbers: the number of cheetahs killed annually per farmer dropped considerably after the placement of dogs (Van Lente, personal communication, 11 May 2015).

Based on the success of the project in Namibia, breeding programmes were started in South Africa in 2005 by De Wildt's Wild Cheetah Management Project (WCMP) and the Cheetah Outreach. By 2005, the Cheetah Outreach had placed 125 livestock guarding

dogs in Limpopo and North West Province. Rust (2011) found that livestock losses due to predation on participating farms were reduced by 95–100%. In the 86 established sheep, goat and cattle herds in the cheetah range, total annual losses due to predation decreased from 1 815 without guard dogs to 14 after dog placement. The annual net savings of the average farmer in the Cheetah Outreach programme was estimated at $2 500 (Rust, 2011). Due to the success of these programmes, the Namakwa National Park established a breeding programme in 2008 (Van Lente, personal communication, 11 May 2015).

South African National Parks (SANParks) established an Anatolian Shepherd Dog Breeding Project in the Namaqua National Park, situated in the Northern Cape. This initiative started in response to the success of the CCF's Livestock Breeding Programme in Namibia, the Cheetah Outreach Project in South Africa, and the need to protect wildlife (as discussed in Chapter 2). According to Van Lente, farmers and shepherds target black-backed jackals and caracals that kill livestock. However, non-target species, such as honey badgers (*Mellivora capensis*), aardvark (*Orycteropus afer*) and tortoises (*Testudinidae*) get killed in traps that are set for jackals and caracals (Van Lente, personal communication, 11 May 2015).

In June 2004, seven Anatolian Shepherd puppies were donated to the Namaqua National Park by the Cheetah Conservation Fund in Namibia. The puppies were placed on farms as an initial experiment to evaluate the potential effectiveness of the Breeding Project. Subsequent to the initial experiment, Elanza van Lente was asked to initiate an Anatolian Breeding Project locally and to manage the Breeding Project in the Namaqua National Park. The Anatolian Shepherd Dog Breeding Project was officially established in 2008 (Van Lente, personal communication, 11 May 2015).

Anatolian Shepherd puppies bred by the Breeding Project are distributed on farms and stock posts in the Northern Cape, with particular emphasis on the Kamiesberg region and areas surrounding the Namaqua National Park. A number of puppies were placed on farms outside of the Northern Cape. During the initial four years of the project, the small stock (sheep and goats) where Anatolian Shepherd dogs in the Breeding Project were placed were generally farmed on a small to medium scale, and livestock corralling occurred at night.

All the Anatolian Shepherd dogs that are used as breeding dogs (Photo Sheet 1) at the Breeding Project stay in the Namaqua National Park near the Skilpad Office entrance. At the time of this study, there were three breeding pairs (Van Lente, personal communication, 5 May 2015). Each breeder dog stays in a 15 m x 15 m camp. A dog house is placed in each breeder camp for the dogs to sleep in. The dogs are fed twice a day and plenty of water and shade are also provided in each camp. Each dog has a large area where it can walk or run for exercise. The camps are secured by electrified fencing powered by a solar panel, in order to provide better protection against possible theft (Van Lente, personal communication, 5 May 2015).

Puppies are raised by their mothers for at least the first 8 to 12 weeks, with minimal human contact. Puppies are fed a good quality puppy food. This is very important as the puppies are growing quickly at this stage and their bones need to develop properly. The Breeding Project covers the cost, and takes responsibility for the injections of the puppies, as well as deworming and neutering. During the first eight weeks, the puppies are also taken to an area in the Namaqua National Park with lambs (Skilpad farm stall), in order for the puppies to get use to the smell of the lambs (Van Lente, personal communication, 11 May 2015).

In order to be eligible to receive a puppy from the Breeding Project, farmers need to submit an application letter comprising information such as the farm setup, the size of the farm, and the type and size of the livestock. There are currently (2016) 70 people on the waiting list to receive puppies. Preference is given to applicants in Namaqualand and to applicants reporting very high numbers of livestock losses and/or applying harmful methods to get rid of predators. The puppies are given to successful applicants free of charge at 8–12 weeks old along with a year's supply of dog food. This aids in offsetting the high initial costs of obtaining an Anatolian Shepherd dog (Van Lente, personal communication, 11 May 2015).

At this time, the new owner or farmer attends a training session at the Breeding Project or at the farm, where the raising and training of the Anatolian puppy is covered in detail. Breeding Project staff use the Guidebook on Livestock Shepherd Dogs by Stannard (Cheetah Outreach) during the training session. When placed on a farm, the dog is kept with a small flock of their intended stock species, in order for imprinting to occur (i.e. to form a bond with the herd), before being released with the rest of their herd (Photo Sheet

2). The Breeding Project retains the right to resume ownership of the dog, especially in cases where it is mistreated or the owner is unable to handle the dog. Between 2008 and 2015, approximately 47 dogs were provided by the Breeding Project to farmers and shepherds (Van Lente, personal communication, 10 May 2015).

3.2 Study area

The majority of this study was conducted in Namaqualand (Figure 1), with a few exceptions on farming areas further afield such as Zeerust (one case) and Riversdal (one case). Namaqualand is situated in the north-western corner of South Africa. Namaqualand covers approximately 52 000 km² and extends from the Olifants River and the Bokkeveld Mountains in the Western Cape, northwards towards Loeriesfontein in the Northern Cape, to just east of Vioolsdrif on the Orange River and to the west at Alexander Bay (Cowling, Pressey, Lombard, Desmet & Ellis, 1999; Desmet, 2007).

As discussed in section 2.6, the study area forms part of the Succulent Karoo biome, one of only two semi-arid biodiversity hotspot areas in the world (Mittermeier, 2004). Namaqualand makes up approximately a quarter of the Succulent Karoo and boasts at least 3 500 plant species, of which 25% are endemic to Namaqualand (Anderson & Hoffman, 2007; Cowling et al., 1999; Todd & Hoffman, 1999).

Namaqualand is classified as a semi-arid, winter rainfall region (Cowling et al., 1999). For the greater part of Namaqualand, rainfall is reliable, especially when compared to other arid regions (Desmet, 2007). Summers are hot and can reach mean maximum temperatures of 30 ˚C, while temperatures can drop to 5 ˚C in the winter months of June and July. Frost can occur but its frequency and duration varies from one year to the next (Rutherford, Mucina, Powrie, Mucina & Rutherford, 2006, cited in Mucina & Rutherford, 2006). The highest peaks of the Kamiesberg experience snow occasionally. The Namaqualand landscape is characterised by granite gneiss, better known locally as Kamieskroon gneiss. This creates a scene of dome-shaped hills with flatter valleys in between (Desmet, 2007; Van Deventer & Nel, 2006).

The Namaqua National Park is situated approximately 500 km north from Cape Town. It was proclaimed as a national park in 1988 and was established as an extension of the original 930 ha Skilpad Wildflower Reserve (Van Lente, personal communication, 11 May 2015). The main predatory species in the area are leopard, black-backed jackal and caracal. Black-backed jackals and caracals are the new apex predators of the area while

the leopard has become very scarce. Baboons (*Papio familiaris*) seem to be common on the more mountainous farms and are becoming a problem with some individuals or troops killing sheep during droughts and raiding vegetable crops on farms.

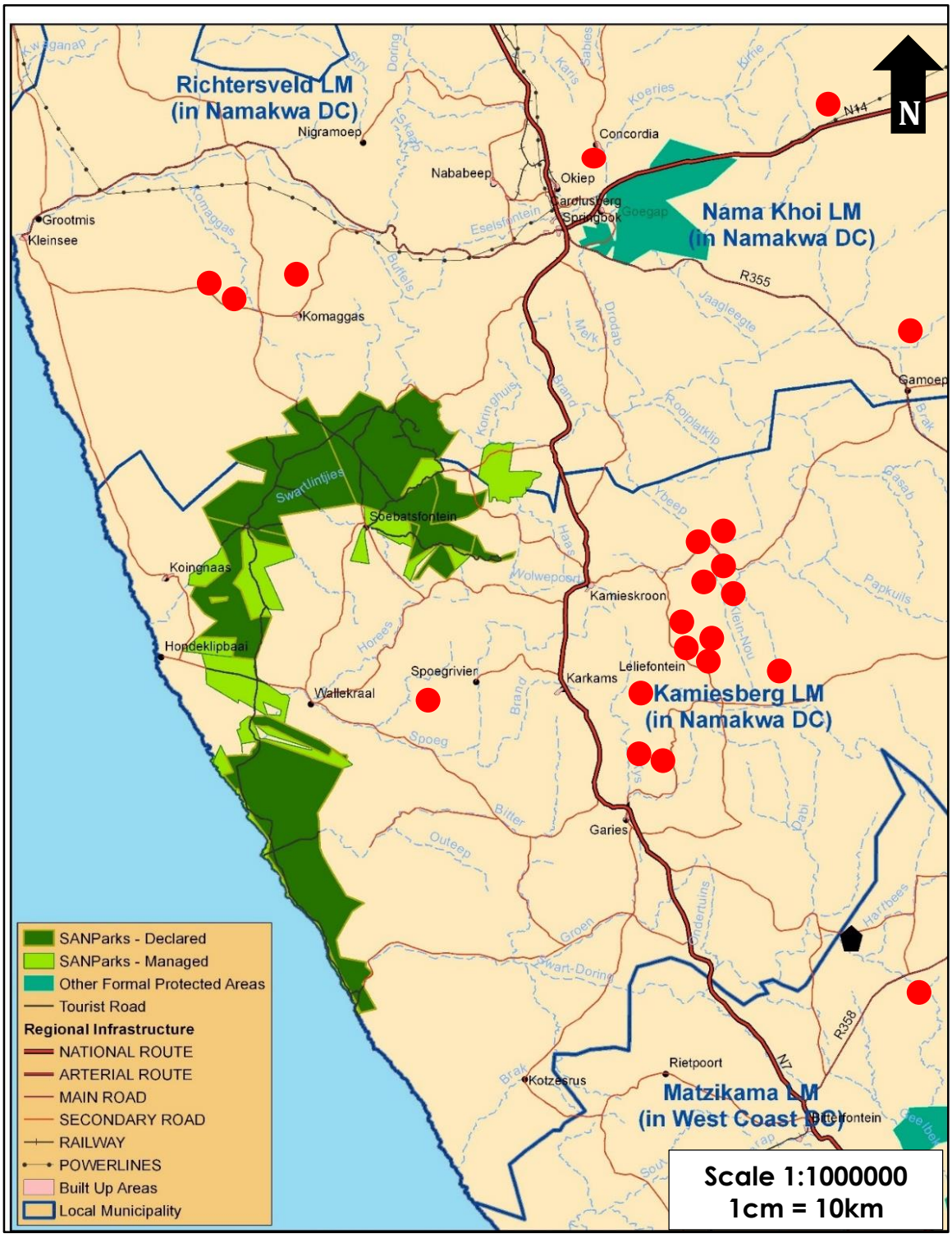

Figure 3.1: Estimated locations of the farms and stock posts where the Anatolian Shepherd dogs were placed in Namaqualand, South Africa. Locations of the farm in Zeerust, North West and Riversdal, Western Cape are not indicated on this map.

The people of Namaqualand are amongst the poorest communities in South Africa (Benjaminsen, Rohde, Sjaastad, Wisborg & Lebert 2006). The neighbouring farmers of the Namaqua National Park farm with mostly with small livestock. Livestock on the farms and in the veld around the stock posts comprise mainly of boer goats and a variety of sheep breeds, e.g. Dorper, Damara, karakul, Merino, Persian and indigenous Afrikaner breeds (Van Lente, personal communication, 11 May 2015). The small to medium livestock farms in this study mainly raise Merino and Dorper sheep and boer goats. All of the communal and subsistence farmers who participated in the present study practised herding. Commercial farmers do not generally herd since they use fences as it is perceived that fencing would not cause large scale degradation. Kraaling is perceived to cause degradation.

There is a general perception amongst farmers and shepherds of this area that their livestock is being killed by small predators escaping from the park onto their properties. One prominent issue is the lack of adequate fencing surrounding the park. The Namaqua National Park is surrounded by about 500 km of fencing. About 190 km of fencing was replaced over the last five years, but the remainder is more than 40 years old (Namaqua National Park Management Report, 2012). The farmers and shepherds react in various ways, mostly by placing traps, snares, poison and other means on the park fences and even inside, indiscriminately killing various animal species.

In the past, this has led to conflict between the farmers and the Namaqua National Park. The Namaqua National Park's Anatolian Breeding Project is an attempt to manage the conflict. The programme aims to assist farmers and shepherds with a more predator-friendly way of protecting their livestock (Namaqua National Park Management Report, 2012). The farms where the dogs were placed are illustrated in Figure 3.1.

3.3 Research methodology

Previous studies on livestock guarding dogs have used interviews or surveys to test performance of the livestock guarding dogs based on the level of livestock saved from predation (e.g. Andelt & Hopper, 2000; Coppinger et al., 1988; Marker, Dickman & Schumann, 2013; Potgieter et al., 2013) and to test the satisfaction of the owner. The present study used a combination of both qualitative and quantitative approaches. The

main method employed was fieldwork consisting of semi-structured interviews and one key informant interview.

3.3.1 Sampling

The Anatolian Breeding Project estimates that it has placed around 47 dogs since inception. However, a number of these dogs had to be excluded from the interview sample (Table 3.1).

Table 3.1: Dogs placed by the Breeding Project.

Total dogs in interview sample	25 dogs
Total dogs excluded from sample:	
Part of research project by Cape Leopard Trust.	9 puppies
Unaccounted for (4 are domestic dogs)	8 dogs
Early removal from farms	5 dogs
Estimated total of dogs placed	47 dogs

Research commenced in May 2015. The Breeding Project provided an initial list with names and telephone numbers of individuals who had received Anatolian puppies from the Breeding Project. The list did not contain every puppy placed since the inception of the breeding programme in 2008, as some of the documentation had been lost during the initial years of the programme or contact was lost between the project and the owners.

Setting up interviews with farmers and shepherds in advance proved to be practically challenging due to geographically widespread stock posts and farms. In addition, the owners' contact details were often incorrect or they lacked phone reception. Appointments were made telephonically 1–3 days in advance. All interviews were conducted at the residence of the owners, or at the stock posts of the shepherds.

Eight of the Anatolian Shepherd dogs that had been placed by the Breeding Project could not be accounted for, because the owners could not be reached. This was either because the Breeding Project did not have any contact details for them, or because the contact details on record were incorrect or had expired, or the farmers did not reply on communication sent to them regarding this research project. However, the Breeding Project is aware that four of these dogs became non-working domestic dogs. That explains the fact that some of the contact details had expired over time, since there was

no need any longer for the owners to make contact with the programme as the dog was now a non-working dog.

Five of the Anatolian Shepherd dogs were removed from the owners and farms where they had been placed. Two dogs were taken away from the owners at a very young age due to mistreatment. One of the mistreated dogs was adopted as a pet, while the other was blinded and returned to the Breeding Project as a non-breeding dog. These two dogs did not form part of the evaluation, as they only worked for a short period of time before being removed from their owners, and because the previous owners could not be contacted. Three dogs displayed behavioural problems at a very young age and were removed from the farms. Two of these are non-working domestic dogs and were excluded from the sample.

Another of the dogs in the interview sample was also removed from the owner at the age of eight months due to throat cancer. It was returned to the Breeding Project in the Namaqua National Park as a non-breeding dog. Nevertheless, an interview was conducted with the owner, who indicated that the dog was very effective before being removed.

Nine of the approximately 47 working dogs placed by the Breeding Project were excluded from the study, as they were being monitored at that stage under a separate research project by the Cape Leopard Trust and SANParks, and were not permitted to participate in this research project. Therefore, no interviews were conducted with the owners of the puppies. At the time of this study, these nine dogs were working on farms in the Northern Cape. The dogs were all puppies at the time of this research project. It is important that information on these nine dogs, as well as the contact details of the owners, be collected from the Cape Leopard Trust to allow for ongoing monitoring by SANParks in future.

This resulted in a total of 21 respondents and 25 dogs, as four of the participants each owned two dogs. Of the interviews, 19 were held with the actual owner of the dog who worked directly with the dog, and two of the interviews were held with shepherds employed by the owner. Of the respondents, 11 were commercial farmers and 10 were communal farmers. In this research report, all farmers and shepherds are referred to as ‘respondents’, unless otherwise indicated (Photo Sheet 3).

This leaves a total of 25 dogs in the interview sample, as is summarised in Table 3.1. At the time of this research three of the respondents who previously owned one dog each

owned a second dog. The owners owned the dogs several years apart, and the dogs did not work with the same herd. Each owner who had two Anatolian Shepherd dogs was interviewed twice (once for each dog). Only one of the respondents owned two dogs that were working together at the time of the study with the same herd (2016). This resulted in a total of 21 interviews and 25 dogs.

3.3.2 Data collection: semi-structured interviews

The study comprised semi-structured questionnaires with 21 farmers and shepherds who received Anatolian Shepherd dogs from the Breeding Project in the Namaqua National Park between 2008 and 2014. The questionnaire was informed by previous questionnaires designed to evaluate dogs in Namibia, as per Marker, Dickman and MacDonald (2005) and Potgieter (2011).

A semi-structured questionnaire is a mix of structured and unstructured questions. Some of the questions and their sequences are determined in advance, while others evolve as the interview proceeds. A semi-structured interview is a qualitative method, which allows for a broad range of data collection as the interviews unfold in different directions. It provides a means of collecting 'rich data', by allowing the collection of a large amount of information quickly (Cousins et al., 2008). It also ensures that important topics are covered, while providing the flexibility to incorporate diverse opinions and topics deemed to be important by the interview participant (Cousins et al., 2008).

The first section of the questionnaire was structured and consisted of closed-end questions that required either a single response (e.g. Yes/No), scaled responses, or a choice of predefined options (Appendix 1: Questionnaire questions).

The second section of the questionnaire consisted of open-ended questions. Open-ended questions can be useful for interviews that target a small group of people. These questions can provide valuable input from each participant and do not require statistical analysis. Open-ended questions give the participants a chance to express their own opinions and feelings on a certain topic. In some cases, open-ended questions can lead to a lower response rate and lower quality data. However, in other cases, open-ended questions can lead to richer insights by providing more depth and context than structured questions.

The questions were carefully worded, and long questions, difficult words and jargon were avoided. A pilot interview was conducted with one of the participants, in order to test the clarity of the questions and the reaction of the participants. Where a dog had had multiple owners, the interviews were conducted with the current owner of the dog or the shepherd who cared for and worked with the dog.

Upon arrival at the respondents' house or stock post, I introduced myself and explained the nature of the research. Interviews were conducted face to face with the owners of the dogs, with the exception of a few interviews via telephone, due to the remote locations of the farms. It took between 45 minutes and 1.5 hours to administer the questionnaire. All interviews were conducted by the researcher in Afrikaans, as the first language of all the respondents was Afrikaans.

The questionnaire was intended to investigate several questions, such as: How did livestock farmers rate the effectiveness of the guard dogs? Did farmers consider the dogs an economic asset? What was the impact of the dogs on the killing of predators by farmers and shepherds?

The questionnaire (Appendix 1) requested the following information for each guard dog: sex, current age, and age when acquired; current status (working, non-working, dead); health; behavioural problems and corrective measures; effectiveness as a predator deterrent (5 predefined options were given as choices, as per Marker, Dickman and MacDonald (2005) and Potgieter et al. (2013); economic assets; break-even or liability; whether the dog injured or killed livestock; whether the dog stayed with the livestock; and whether the dog was aggressive towards other dogs, predators, and other wildlife (bark, chase or/and kill).

Other questions asked for information on the type of livestock guarded by the dog, the number of livestock involved, and where the livestock slept at night. The questionnaire established the average annual livestock losses due to predation before and after placement of the dog, as well as the causes of these losses. It also covered the methods of predator elimination in the area before and after placement of the dog. Finally, the questionnaire asked whether the participants would recommend the use of guard dogs and which lessons were learned from participation in the Anatolian Breeding Project programme.

Consistent with work published on the CCF dog programme (Marker, Dickman and MacDonald, 2005; Potgieter et al., 2013), five scores were used to evaluate the effectiveness of Anatolian Shepherd dogs in reducing livestock losses (Objective 1, 2 and 3). As in the above-mentioned studies, guarding dog behaviour was defined using the three components suggested by Coppinger and Coppinger (1980):

- attentiveness – the tendency of the dog to stay with the flock;
- trustworthiness – the lack of predatory behaviour towards the flock and the lack of other behavioural problems; and
- protectiveness – the tendency of the dog to display protective behaviour towards the flock.

To create the scores, the calculations provided by Marker, Dickman and MacDonald (2005) and Potgieter et. (2005) were used. For all questions, the most positive response (e.g. “Excellent” for “How is your dog working?” or “Yes” for “Is it doing what you thought it would do?”) was scored as +2 and the most negative response (“Poor” or “No” respectively for the questions above) was scored as -2. For those questions that had a range of options the scores were as follows: Excellent = 2, Good = 1, Fair = -1, Poor = -2. The numbers generated for each of the answers were then combined to produce the mean scores for attentiveness, trustworthiness, protectiveness to establish the farmer satisfaction score.

A number of studies, including studies by Coppinger et al. (1988), Marker, Dickman and MacDonald (2005), Potgieter (2011) and Potgieter et al. (2013), have measured the total effectiveness of guard dogs by calculating a composite Total Effectiveness Score. This measure is calculated by combining the answers to questions related to three criteria: attentiveness, trustworthiness and protectiveness. The three measures are calculated for each dog by averaging the assigned scores of responses. The three scores are then averaged to calculate a composite Total Effectiveness Score for each dog. Table 3.2 reports the questions and scores that were used to create the composite Total Effectiveness Score. For all the questions, the most positive answer was assigned a score of +2, and the most negative answer was assigned a score of -2. The Total Effectiveness score was calculated as the average of the six responses.

Table 3.2: Total Effectiveness Score Calculation.

Attentiveness	Trustworthiness	Protectiveness
Q: During the night, where does your dog stay	Q: Does the dog have any behavioural problems?	Q: How would you rate your dog's protectiveness of your stock?
A: With the flock = +2; Home = -2	A: Yes = +2; No = -2	A: Excellent = +2; Very good = +1; Good = -1; Poor = -2
Q: Does the livestock accept the dog as 'one of them'?	Q: How effectively has the dog guarded the flock against predators?	Q: How many livestock losses did you have per year since the dog due to predation?
A: Yes = +2; No = -2	A: Excellent = +2; Very good = +1; Good = -1; Poor = -2	A: No Losses = +2; Losses reduced = +1; Similar = -1; Increased = -2

Similarly, a Total Satisfaction Score can be calculated by combining the answers to two questions related to satisfaction with the dog. These questions and assigned scores used to calculate the Total Satisfaction Score are summarised in Table 3.3.

Table 3.3: Total satisfaction score calculation.

Satisfaction
Q: How well do you think your dog works for you?
A: Excellent = +2; Very good = +1; Good = -1; Poor = -2
Q: Have you saved money by having the dog that protects the livestock?
A: Yes = +2; No = -2

The Anatolian dogs' behavioural problems were evaluated in four main categories: chasing wildlife, biting livestock, staying home, and attacking people (as per Marker, Dickman & MacDonald, 2005; Potgieter, 2011; Potgieter et al., 2013). Anatolian Shepherd dogs that displayed a combination of behavioural problems (e.g. staying home and chasing wildlife) were added to both problem categories. Staying home typically referred to occasions when the dogs refused to accompany the livestock.

Following Potgieter (2011), to compare levels of livestock losses and predator killing before and after the Anatolian Shepherd dog introduction, the respondents were asked to recall on average the events in the years before and after they had received a dog. The data therefore relied upon the respondents being present on the farm or at stock post before the placement of the Anatolian puppy. Some respondents could not answer the questions and some were not able to give exact figures of livestock losses or predators

killed, but were able to say whether there had losses and whether predators had been killed on the farm. The majority of the respondents gave an average per year. These uncertain responses reduced the opportunity to use the sample sizes for statistical testing. However, in this research study, having more accurate (albeit fewer) responses was more important than trying to get uncertain respondents to produce figures (Potgieter, 2011).

Unanswered questions were treated as non-responses. Non-responses were usually due to the respondent not witnessing the dog's behaviour, or being unable to identify specific behaviour. At the end of the questionnaire, respondents were also given the opportunity to express any feelings, opinions or views they had as an owner or shepherd of an Anatolian dog. At this point, the majority of the participants told interesting stories or incidents involving their dog. This provided additional context and insight into the relationships between farmers and shepherds and their dogs, as well as the functioning of the Breeding Project.

Finally, one key informant interview was conducted with the manager of the Breeding Project, who is also the Tourism and Marketing Officer of the Namaqua National Park Project. The questions were tailored to gain information on the background and the operation of the Breeding Project.

3.3.3 Data selection and analysis

The interview responses and field notes served as the primary data for the study. Some interviews were recorded with the consent of the participants, allowing for efficient and accurate data collection as it ensured that all information from the interview was captured. All questionnaire data were collated in an Excel spreadsheet and relevant graphs and charts were produced in order to report and illustrate the results.

Given the limited scope of the study and the lack of any previous data on the Breeding Project, the aim was to provide a small baseline study, which could inform further research and actions relating to the Breeding Project.

Table 3.4 reports the respondent details. A total of 19 interviews were held with the actual owner of the dog who worked directly with the dog. Two of the interviews were held with shepherds and in both cases they had worked with the dog for several years. Of the respondents, 11 were commercial farmers and 10 were communal farmers.

Table 3.4: Respondent details.

Respondent	Farming practice	Number of dogs
A	Communal	2
B	Communal	1
C	Communal	1
D	Communal	1
E	Communal	1
F	Communal	1
G	Commercial	2
H	Commercial	1
I	Communal	1
J	Communal	1
K	Commercial	1
L	Commercial	2
M	Commercial	1
N	Communal	2
O	Commercial	1
P	Commercial	1
Q	Commercial	1
R	Commercial	1
S	Commercial	2
T	Communal	1
U	Commercial	1

3.3.4 SANParks research agreement

A research application was submitted to SANParks and an indemnity form was signed by the researcher, in order to obtain a research agreement to conduct this study.

3.3.5 Ethical considerations and moral accountability

All ethical considerations as outlined in the University of Cape Town Code for Research involving Human Subjects were taken into account during the study. A research

statement was submitted to the Faculty of Science Research Ethics Committee and ethical clearance was obtained for this study (approval code: FSREC 03-2015).

Participants were presented with information on the nature and purpose of the research, as well as a background description of the interviewer. It was also explained prior to the interviews that the research was being conducted independently from SANParks. The participants were under no obligation to take part in the interviews. Respondents' anonymity was assured, unless permission to use names or positions was granted. This study was rooted in action research and aimed to understand the experiences, views and perceptions of farmers and shepherds that form part of the pilot Breeding Project for the use of Anatolian dogs as a mitigation method for human–wildlife conflict in Namaqualand. More importantly, the study attempts to gain information from those who spent time with the dogs on a daily basis. During the interviews, it was important not to restrain the participants, but to give them time to share their experiences of working with their dogs, especially during the open-ended questions. All of the participants were free to withdraw from the interviews but none chose to do so.

3.4 Limitations of the study

The research was not conducted as a controlled experiment. The following factors therefore have to be taken into account when interpreting the findings.

Firstly, the participants interviewed were not randomly selected. Instead the Breeding Project provided a list with contact details of owners and/or shepherds with dogs. These farmers were not fully representative of all the farmers and shepherds in South Africa with Anatolian Shepherd dogs. They did represent a heterogeneous group, as factors such as the initial level of livestock predation, livestock management, and stocking rates varied among them. They represented a group of farmers who were willing to work with a predator conservation programme. As such, they were likely to have more positive attitudes towards predator conservation and the use of Anatolian Shepherd dogs for livestock protection (Potgieter, 2011).

The list did not contain every puppy placed since the inception of the Breeding Project in 2008, as some of the documentation had been lost during the initial years of the programme. The list also excluded the nine most recent puppies from the programme placed on farms. At the time of this study, these puppies were being monitored under a separate research project by the Cape Leopard Trust and SANParks.

Secondly, there was a lack of external data on predator and livestock populations from before the introduction of the Anatolian Breeding Project on the farms and at the stock posts, with which to compare the findings. This made it difficult to determine the number of predators in the area either before or after the implementation of the Anatolian Breeding Project and limited the conclusions that could be drawn from the study (Potgieter, 2011). The study therefore had to rely on the data collected through the interview process. The questions referring to the years before Anatolian Shepherd dogs were introduced relied on the respondents' memories of several years before the interviews were conducted (especially for older dogs). In future, farmers and shepherds should be interviewed before Anatolian Shepherd dogs are placed and follow-up interviews should be conducted annually.

Nevertheless, the study provided useful data and insights into the effectiveness of the Anatolian Breeding Project for reducing livestock losses and conservation of wild animals and perhaps a starting point for any further studies.

Mishke and Knut

Zoro

Matahari

Kleintjie

Kahlua and Ziva

Photo Sheet 1: Breeding dogs at the Anatolian Dog Breeding Project. (Photos taken by Steven Newbould)

Photo Sheet 2: Puppies are kept with a small flock of their intended stock species, in order for imprinting to occur, before being released with the rest of their herd.

Photo Sheet 3: Respondents from the research study, Northern Cape. (Photos taken by Elizabeth le Roux)

Chapter 4: Results

> Of the Molossian breed of dogs, such as are employed in the chase are pretty much the same as those elsewhere; but sheepdogs of this breed are superior to the others in size, and in the courage with which they face the attacks of wild animals (Artistotle, The History of Animals, IX, part I, ca. 347 BC).

4.1 Anatolian Shepherd dogs

All 25 dogs in the interview sample were Anatolian Shepherd dogs. The sample comprised 12 male and 13 female dogs placed on farms

However, two of the respondents acquired their dogs from previous owners when they were one and two years old respectively. In one case, the dog was placed with another livestock guarding dog and adapted very well to the new herd and worked well with the other dog. In the other case, the dog was placed on a new farm. However, the dog struggled to adapt to the new farm and the new livestock.

4.1.1 Livestock types

When respondents were questioned which type of livestock the dogs were guarding, three stated that they guarded sheep, 12 guarded goats (boer goats), while 10 guarded a combination of goats and sheep. Respondent O, who had lost his dog to an accident on the farm, mentioned that he would like to get another dog, but only when he has enough money for a GPS (global positioning system) collar for the dog. He further explained that in future he would only put a dog with Merino sheep and not Dorpers, as the Dorpers tend to scatter over a large area. After the initial pilot years of the Breeding Project, the project will no longer place dogs with types of livestock that scatter, i.e. Dorper sheep (Van Lente, personal communication, 8 May 2015).

When respondents were questioned about the number of livestock guarded by each dog, the sizes of the herds varied widely, ranging from 15 to 350 head of livestock per dog. Each dog guarded on average 100 head of livestock. A total of nine dogs were used to guard 100 or more head of livestock, while 15 were used with small to medium herds with fewer than 100 head of livestock. Of the farmers, 17 used night-time corralling, where the livestock was herded into a corral at dusk for the night, and out at dawn into the land. On

four of the farms, the livestock stayed in a large camp, as the respondents reported it is time consuming to herd livestock into and out of a corral on a daily basis.

The majority of respondents were of opinion that the dogs performed better with herd-bound livestock. Herd-bound livestock tend to stay close to each other. The respondents further explained that, if the livestock is spread out too widely in the veld (such as Dorper sheep), it is difficult for the dog to protect every animal. One of the respondents said that he had changed his farming practise to suit his dog, by changing from livestock that scattered (Dorpers) to livestock that are herd-bound (Merino).

4.1.2 Relationship of the dog with the flock

With regard to the questions that sought to identify the relationship of the dog with the flock, 92% (23) of the respondents agreed that the livestock accepted the dog as part of the flock, and in no cases had the dogs killed any of the livestock it was guarding. Respondent D commented that the herd of goats would walk towards the dog when they see the dog, and he was of the opinion that the goats seemed “satisfied and peaceful when the dog is around them”. Another respondent commented that the “flock knows the dog well and they don’t ever fight” (Respondent F, personal interview, 10 May 2015). Respondents H and S stated that their livestock were afraid of the dog. However, Respondent H – one of only two respondents whose dogs slept at home during the night and not with the livestock – reported that the livestock did not accept the dog as part of the herd.

4.1.3 Relationship of the dog to other dogs

With regard to the questions that sought to identify the dog’s relationship with other dogs, 13 of the respondents stated that other dogs (such as Sheepdogs and Greyhounds) were present with the herd. In five of these cases, the respondents reported that the Anatolians worked well with the Shepherd dogs and/or the Greyhounds. In one case, there used to be two additional Sheepdogs with the herd, but these were killed by a neighbour’s Anatolian dog when they strayed too far into his territory. This suggests that the Anatolians will work well with other dogs with which they are familiar.

In two cases, two Anatolian dogs worked together with the same herd. The first respondent was given a puppy when his first dog became old and ill and it was expected that the older dog would retire from working. However, the old dog kept accompanying the puppy and shepherd to the veld for an additional eight months. This was beneficial to

the owner, as the older dog assisted him in training the puppy. The shepherd could trust the puppy at eight months old to take the goats out of the kraal in the morning to the veld, and to return the goats safely to the kraal by late afternoon, without any supervision.

The second respondent with two Anatolian dogs took over another herd, and received an 11-month-old Anatolian dog with the herd. The two goat herds and the two Anatolian dogs were all placed together in a kraal and accepted each other. However, the first and older of the two Anatolian dogs was the dominant figure ('alpha male') of the herd and would always sleep in the kraal at night. The new dog walked behind the herd and slept at the gate of the kraal. The dogs remained downwind of the herd during the day to smell any predators nearing the herd.

The Anatolian dogs interacted with other dogs in nine cases, often domestic dogs or pets. There did not seem to be any issues with the other dogs in these cases. In some of these cases, the Anatolian dogs just seemed to ignore the domestic dogs, and in others they were friendly ("playful"). Again, this suggests that the Anatolian dogs interact well with other dogs that are familiar to them. In one case, the respondent reported that the dogs interacted well, except when they (the other dogs) "came close to their [the Anatolian dogs'] food bowls".

4.1.4 Care and health of dog

Of the dogs that were still alive at the time of the interview, the majority of respondents reported that they were in good or excellent health. A number of dogs had experienced health problems, with physical injuries and illnesses such as biliary fever (*Canine Babesiosis*) and cancer being the most common. In one case, the dog contracted rabies, for which it was treated.

Four of the respondents reported that their dogs had contracted biliary or tick bite fever in the past, as is evident in the following quotes:

> The witbosluis is a problem. The dog gets very sick of the witbosluis. (Respondent C, personal interview, 12 May 2015)

> The dog gets tickbite fever and it affects the dog … if the dog is sick, it will stay around the house and not go out with the flock. The dog does not want anyone to touch him while he is sick and no one is able to come close to the him [the dog] during that time … it is difficult to see if there are any ticks on the dog then. If you spray the dog with Deadline, the dog will be tick-free for three

> months. The problem is that it is very difficult to spray the Deadline on the dog, because the dog hates any funny [foreign] smell on it (Respondent E, personal interview, 15 May 2015).
>
> He [the dog] had rabies once and the owner gave him an injection for it, but other than that, the dog is very healthy. (Respondent J, personal interview, 12 May 2015).
>
> The dog's health is very good, but from time to time he gets tickbite fever. (Respondent K, personal interview, 11 May 2015)
>
> The dog doesn't get sick very often. The dog had tick fever once. The dog had a growth on its paw. Elanza* took a sample to see if the dog needs an operation but I have not heard back from the Park. Sometimes the dog doesn't want to go out for a day or two … I don't know why. (Respondent I, personal interview, 11 May 2015)
>
> *Elanza van Lente is the Breeding Project Manager at Namaqua National Park
>
> She was very healthy until she got throat cancer at eight months old and she went back to the Park [Breeding project at Namaqua National park]. (Respondent P, personal interview, 12 May 2015)

The age of the dogs did not seem to affect the number of accidental injuries sustained, since the injuries varied between dogs of four months and nine years old.

> She [the dog] once had a fight with a badger and got hurt. (Respondent O, personal interview, 11 May 2015)

All the respondents reported that they fed the dogs with dog pellets, often Montego pellets. In some cases, this was supplemented with mealie pap, vegetable peels and bones. The majority of respondents (21) fed the dog twice a day (mornings and evenings). Two respondents fed them once a day (evenings) and two were unsure of when exactly the dog ate since the dogs use self-feeders in the veld. A number of respondents asked the Project to provide food for the dogs. It is a problem for the success of the Project when the food sponsors run out.

4.1.5 Mortality

Six (24%)[1] of the dogs had died in the years before the interviews were conducted (May and June 2015). One dog was diagnosed by a veterinarian as having died from cancer at the age of nine. Two dogs died after jumping from a vehicle. One died as a result of being trapped in a caracal cage. One was shot intentionally by a neighbour because the dog had jumped over the fence and caught the neighbour's chickens on several occasions. These five dogs were evaluated as part of the questionnaire, as they were able to work for a period before their death and the respondents were able to answer all the relevant questions. The final dog died after a fight with a baboon, when it was only four months old and before it had a chance to become a working dog.

It is also important to note that five of the six dogs that died prematurely were guarding the herd on their own, i.e. without a shepherd present. If the dogs are placed on farms where they will be expected to work without a shepherd present, there should be better training and inspection of the farm. For instance, if there are trap cages on the farm, there is a possibility that the dogs could get caught. The use of GPS collars for the dogs could prevent such deaths in future, since the owner could track the dog's whereabouts.

4.2 Effectiveness of Anatolian Shepherd dogs in preventing livestock losses

4.2.1 Livestock losses due to predation

When respondents (n=25) were questioned regarding livestock losses due to predation since receiving the dog, 52% (13) of the farmers reported no stock losses since receiving the dog. Another 32% (8) of the respondents reported that, although they still experienced losses due to predation, their losses had reduced after receiving the dog. Only 16% (4) reported similar losses and none of the respondents reported increased losses since receiving the dog due to predation (Figure 4.1). All respondents still experienced livestock losses after placement of dogs from time to time. However, this was most commonly reported as due to drought and/or theft.

[1] The estimated total number of dogs placed since 2005 are 47 dogs. If the death rate is taken for all 47 dogs (working and non-working) placed, the rate drops to only a 12% death rate.

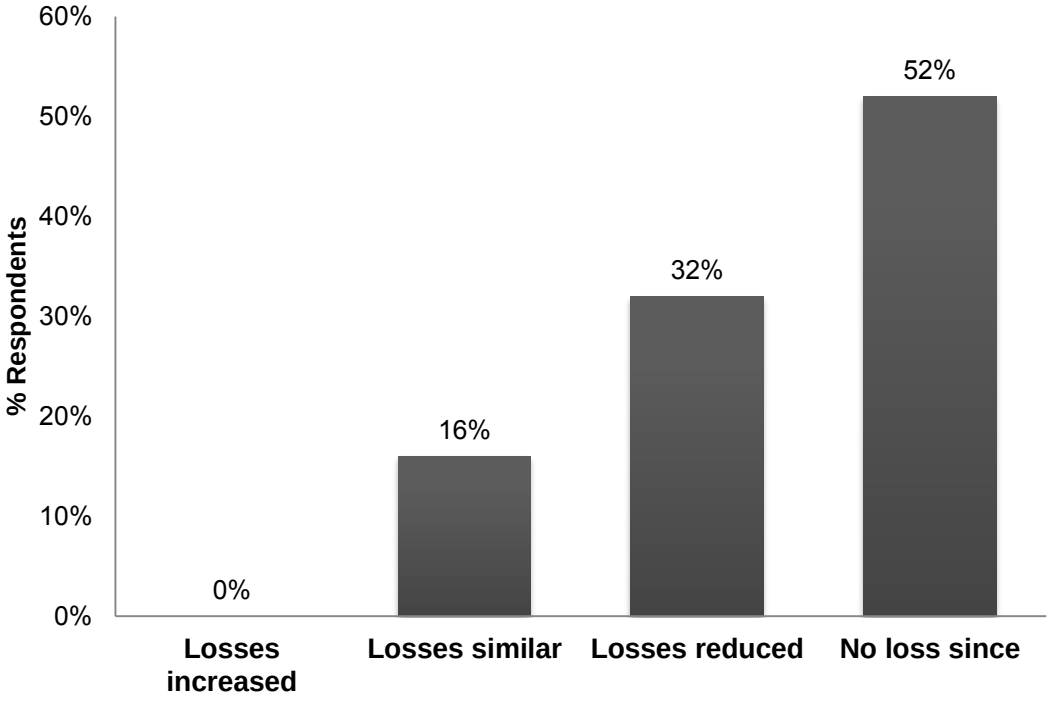

Figure 4.1: Percentages of respondents reporting different relative levels of losses due to predation since receiving an Anatolian Shepherd dog (n=25).

4.2.2 Changes in the level of livestock loss due to predation

The Anatolian Shepherd dogs appeared to have a significant influence on the level of livestock losses due to predation with differences recorded before and after the dog placement. Following Potgieter (2011), livestock losses were recorded in categories, as most of the respondents could not provide the exact numbers of annual livestock losses and were only able to give average annual estimates. Levels of livestock loss experienced were categorised as follows: no losses (< 1 head of livestock lost annually); low losses (1–5 head of livestock lost annually); medium losses (6–10 head of livestock lost annually); high losses (> 10–40 head of livestock lost annually); and very high losses (> 40 head of livestock lost annually).

When respondents were asked about the average annual level of livestock loss due to predation before receiving a dog, all of the respondents had losses due to predation: 32% (8) reported very high losses of more than 40 livestock losses annually (Figure 4.2). The majority of respondents mentioned that it was mostly lambs that were taken by predators. After the placement of the dogs, 52% (13) of the respondents reported zero livestock losses due to predation, while only one still reported a loss of more than 40 livestock per

year. In no cases did livestock losses increase subsequent to receiving the dogs. Thus, perceived average annual depredation rates were substantially lower after the placement of dogs.

Figure 4.3 reflects a detailed illustration of the responses by individual respondents. The midpoint of each category (e.g. 1–5 = 3) was chosen as an estimate of livestock losses, and a value of 41 was chosen for the category "> 40" livestock saved (Agresti, 2007, as cited in Potgieter, 2011). The X-axis represents each response regarding a dog separately (Dog A to W) and the Y-axis shows the approximate number of livestock losses due to predation before and after the placement of the dogs. The numbers are approximated by taking the middle of the ranges and 41 for the top range (> 40).

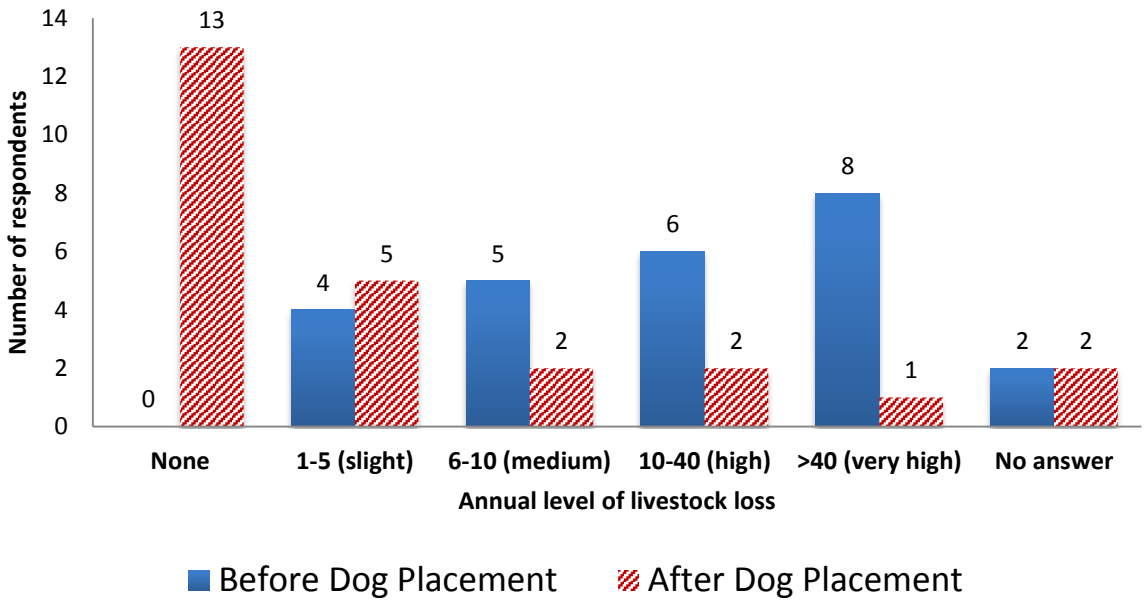

Figure 4.2: Change in the number of livestock losses due to predation reported by respondents, before and after Anatolian Shepherd dog placement with livestock (n=25).

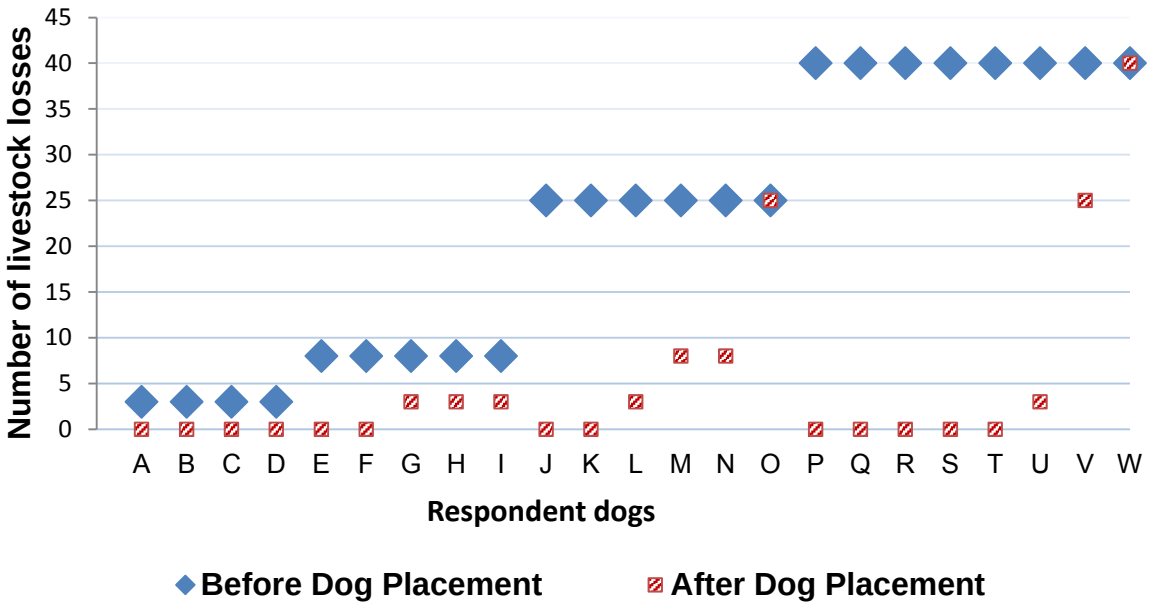

Figure 4.3: Livestock losses before and after receiving the dog, per respondent dog (n=23).

All but two of the respondents who could provide numbers of livestock losses reported a decrease in livestock losses due to predation after the placement of the dogs. In five cases, there was a decrease from more than 40 average annual losses per year to zero (dogs P, Q, R, S and T).

The two cases (dogs O and W) where respondents reported a similar loss before and after dog placement were examined in detail to determine the reasons for this (i.e. where the blue diamond and the red block are at the same spot). In these cases, the dogs were already one-year-olds when placed on the respondents' farms with a new herd of goats and without a shepherd. Both respondents reported that their dogs (dogs O and W) stayed close to the house as a puppy and became accustomed to being close to the house. The dogs were returned to the veld and the herd, but they still returned to the house, especially if there were no lambs. The fact that both dogs were raised as puppies close to the house with regular human contact, was most likely the reason why their owners experienced similar losses before and after dog placement.

Respondent S was not able to provide numbers of livestock losses and was therefore not included in Figure 4.4. He reported that the dog never formed a bond with the herd because the dog was not kept with the livestock long enough during the critical bonding

period between the herd and the new puppy. The owner stopped taking the dog back to the herd, and this resulted in the dog becoming “more of a shepherd dog”. The respondent highlighted the importance of keeping the puppy with the herd during the critical bonding period of 12–16 weeks with minimal human contact. The respondent further said, “you can’t teach new tricks to an old dog”. The dog slept at home and during the day the dog would accompany the farmer on his bakkie. The dog eventually jumped from the back of the bakkie and died. The respondent mentioned that he had never heard of a successful livestock dog (Respondent S, personal interview, 15 May 2015).

4.2.3 Effectiveness

High predator activity at night appeared to be the major problem for all the respondents. When respondents were asked where their livestock slept at night, the majority of the respondents (72%) revealed that their animals were herded into a night-time corral or enclosure. The respondents also reported that the majority of dogs (92%) slept with the flock during the night. Respondents G and S indicated that the dogs slept at the house in the evenings. This is an important element in the effectiveness of livestock protection, because predation is most prevalent at night (Beinart, 1998).

Many of the respondents indicated a difference in jackal activity throughout the year and at specific times of day. Many of the farmers and shepherds explained that predation is highest during lambing season, as this period often coincides with the jackal breeding season and parents are in search of food for their young. It was also reported that predation is high during droughts. Livestock is weak then and easier targets for predators. Most respondents stated that their Anatolian dog was extremely protective towards the lambs. Several farmers noted that their dogs would try and push the mother away from her lamb, in order for the lamb to drink from them (the dog). The dogs take on a very caring role during lambing season and will stay out in the field with the mother and lamb, until they return together to the corral. Two respondents reported that their dogs ate the afterbirth. According to the Livestock Guarding Dog Training manuals (Van Bommel, 2010), eating afterbirth helps with bonding. illustrates the responses to the questions, “How would you rate your dog’s protectiveness of your stock?” and “How effectively has the dog guarded the flock against predators?” The majority (68%) of respondents rated the protectiveness and effectiveness of their dogs as “Excellent”, compared to only 1 and 2 respondents (8% and 12%) who rated them as “Poor”. In one case, the respondent

reported, “the dog does not only chase away predators, but also unknown people and livestock that is not part of his flock”. Respondent G reported the flock was too large for the dog to protect the whole flock and to be everywhere. However, no losses would occur in the area where the dog was present. This implies that the dog may be more effective when the flock is smaller in size or when two dogs work together.

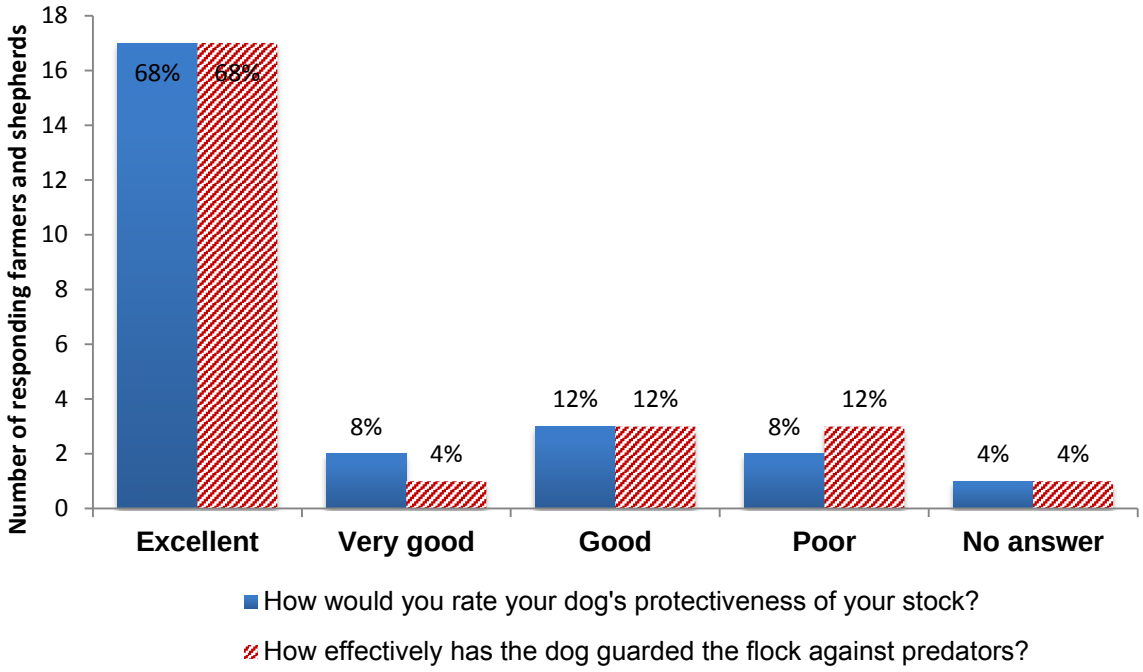

Figure 4.4: Protectiveness and effectiveness (n=25).

A number of studies, such as Coppinger et al. (1988), Marker, Dickman and MacDonald (2005) and Potgieter et al. (2013), have measured the total effectiveness of guard dogs by calculating a composite Total Effectiveness Score. As explained in section 3.3.2, this measure is calculated by combining the answers to questions related to three criteria: attentiveness, trustworthiness and protectiveness. The three measures are calculated for each dog by averaging the assigned scores. The three scores are then averaged to calculate a composite Total Effectiveness Score, which is calculated as the average of the six responses.

Figure 4.5 illustrates the relationship between the Total Effectiveness Score and the approximate decreases in livestock losses, again approximated by taking the middle of the reported ranges. There is a strong positive relationship between the effectiveness rating and the decrease in livestock losses after the placement of the dogs. The two dogs

with the lowest Total Effectiveness Score were also those where the farmers did not experience any decrease in livestock (dogs O and W).

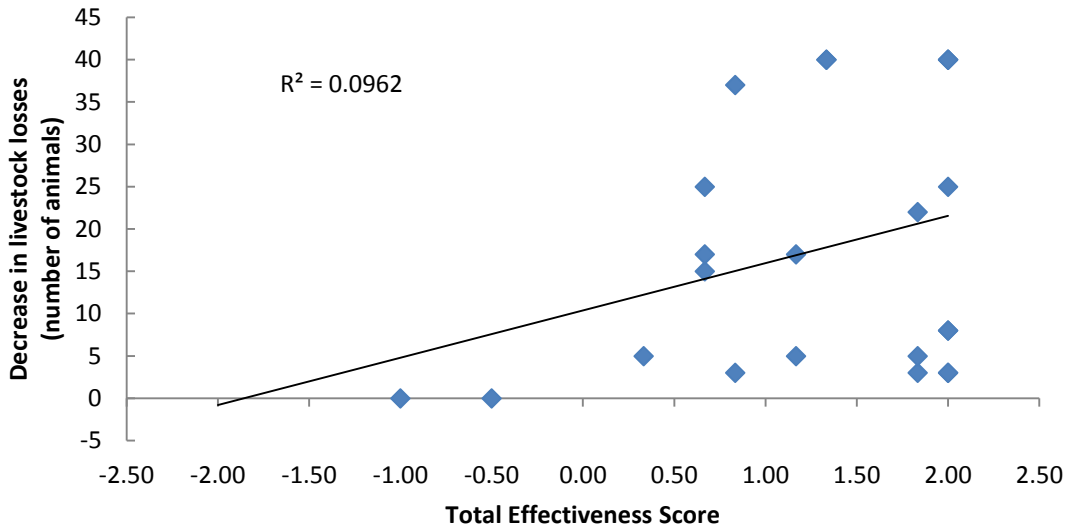

Figure 4.5: Relationship between the decrease in livestock losses and the Total Effectiveness Score.

When the respondents were asked whether there was a shepherd present with the dog, 16 dogs had a shepherd, while nine dogs were without a shepherd. A total of six of the 16 respondents (who were with a shepherd) reported that a new shepherd was introduced to the dog, with three indicating that the introduction had an adverse influence on the effectiveness of the dogs. In these three cases, the respondents reported that the introduction of another shepherd confused the dog, that the dog did not want to listen to the new shepherd, and that it took a while for the dog to get used to the new shepherd.

Two respondents reported that the dog was moved to a different flock. One respondent reported that it was very difficult for the dog to accept the new herd for the first month. Another respondent reported, “the dog tried to come back home any chance he could”. The previous owner had apparently raised the puppy too close to the farm house.

4.2.4 Satisfaction

When questioned about satisfaction, it was clear that most owners were happy with the dog (Figure 4.6). Clearly, the majority of respondents were satisfied with the performance

of their Anatolian dogs, with 48% (12) responses of “Excellent” and only 12% (3) responses of “Poor”. In one case, the respondent reported that the dog was effective (“Good”) in summer, but particularly effective (“Excellent”) in winter. The category *“*very good*”* was assigned to the answer.

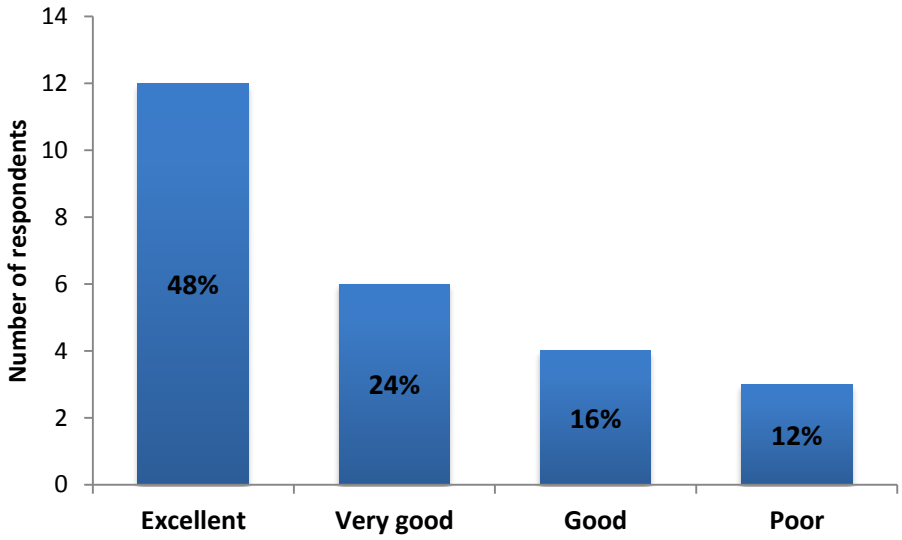

Figure 4.6: Responses to the question “How well do you think your dog works for you?”

Respondents were also generally satisfied with the performance of the dogs relative to their expectations. Five of the respondents responded very positively to the question, “What did you expect from your dog and how well does it live up to these standards?”

Respondent A, for instance, had owned two Anatolian dogs. One died of cancer two days before the interview and the other was six months old at the time of the interview. “I expected the dogs to help look after the livestock and that, as I became older, it would not be necessary for me to go out with the dog and livestock every day for the whole day.” (Respondent A, personal interview, 9 May 2015). He reported that it was indeed not necessary to go out with the dog and the livestock for the whole day anymore. In the mornings, he would feed the dog and take the livestock out of the kraal and walk with them to the veld. He could trust and rely on the dog to take the livestock out for the day and bring the livestock back safely to the kraal. He is extremely satisfied with the work that the first dog did for him. He already trusts the second dog to be alone in the veld with the flock and to bring them back safely in the late afternoon.

Figure 4.7 illustrates the strong positive relationship between the Total Effectiveness Score and the Total Satisfaction Score. This is consistent with expectations and with previous studies, such as Marker, Dickman and MacDonald (2005) and Potgieter et al. (2013).

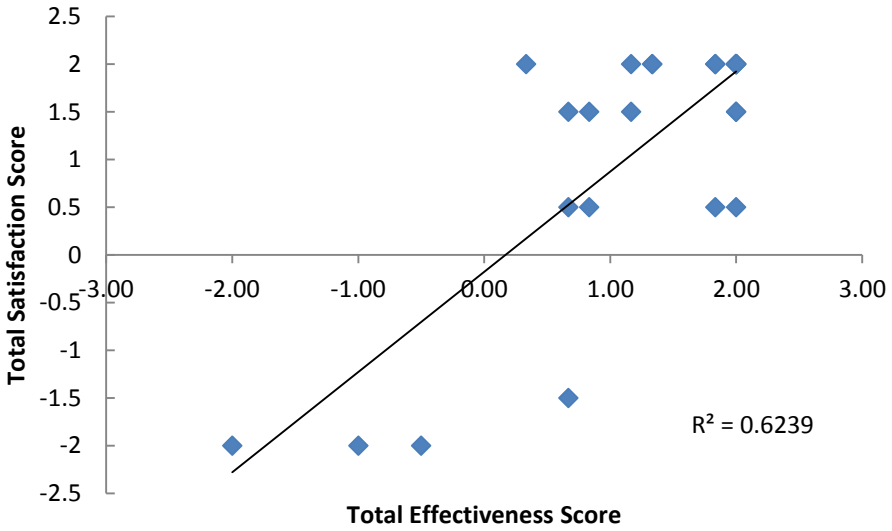

Figure 4.7: Relationship between Total Satisfaction Score and Total Effectiveness Score.

4.2.5 Economic benefit, practicality and costs

Respondents provided insufficient data to permit analysis of the actual financial costs. However, all but two of the dogs were provided to farmers for free, with the Anatolian Breeding Project and sponsors bearing all the costs for the breeding costs and the raising, vaccinating and neutering of the dogs. In some cases, the project also provided dog food to the farmers for the first year. This means it is difficult to get clear financial insights to the true cost for a farmer. In future studies, with more data available, it will be important to determine the actual financial cost.

Respondents were initially asked whether they were of the opinion that their dogs were an economic benefit to their farming operation. In cases where the respondent was unsure about what 'economic benefit' meant, the question was replaced by asking whether the respondent had saved money since having the dog protecting the livestock. Of the respondents, 84% (21) felt that the dogs resulted in financial savings. Of those respondents who reported saving money, five said they saved a significant amount of money. This is compared with only four (8%) respondents that reported no difference. In

one of those cases, the dog was very young when it died and could not be taken as representative. Two of the respondents commented that their dogs were still too young (< 2 years old) to determine whether the dog saves any money, but both respondents were positive that the dogs would start saving them money over the next season.

The majority of the respondents were unable to provide an amount the dog saved per year. However, one respondent (subsistence farmer) reported making R20 000 more per year than before receiving the dog (Respondent A, personal interview, 6 May 2015) and another respondent reported saving R60 000 per year (Respondent R, personal interview, 13 May 2015).

4.3 Behavioural problems and removals

The Anatolian dogs' behavioural problems were evaluated in four main categories: chasing wildlife, biting livestock, staying home and attacking people (as per Marker, Dickman and MacDonald, 2005; Potgieter, 2011). There was also an additional "Other" category where respondents could indicate any other behavioural problems that they had observed with their dog not in the four main categories, e.g. resting in the shade. Where relevant, more than one category could be selected.

Of the respondents, 13 (52%) reported some form of behavioural problems at least once during the placement of the dogs. These respondents were then asked whether the behaviour problems were reported to the Breeding Project. Three respondents replied "yes", three respondents replied "no", while seven respondents were unsure whether it was reported or not. The respondents who were unsure, either received the dog at a later stage from another farmer, or in one case was a shepherd who was rotated and was not always with the same dog. They were therefore unsure whether someone else had reported the problems to the Breeding Project.

In a few cases, behavioural problems were not reported to the Breeding Project. In one of the cases, the farmer consulted a veterinarian for advice, and in another, the owners were familiar with Anatolian dogs, having owned several dogs previously and did not feel the need to take up the issue with the Breeding Project. The farmer implemented corrective behavioural training, which was successful. This again implies that prior experience and training are important factors that could influence the effectiveness of the dogs (Coppinger et al., 1988).

The most common behaviour problem (six cases) was that the dogs slept or rested in the shade on very hot days. However, the majority of these respondents reported that the dogs would stay in the vicinity of the flock and would still remain alert to possible threats. The respondents indicated that they did not view it as an actual behaviour problem that needed any corrective measures, since it was more important that the dog also rested in the day, in order to be alert during the night.

A majority of the stock farmers who moved their livestock to different areas during winter and summer, indicated that sleeping in the shade was more frequent in the hot summer months than in winter. “You can’t expect the dog to be awake for 24 hours a day in this heat; he also needs to rest” (Respondent D, personal interview, 6 May 2015). This was seen to be less of a problem when a shepherd was also present with the flock. “The dog is allowed to take afternoon naps especially in summer … the dog is always on night-shift” (Respondent C, personal interview, 8 May 2015). Respondents were especially concerned about the dogs’ effectiveness at night, when predation was most prevalent.

As far as corrective behaviour is concerned, Respondent C reported that they would walk with the flock over to the area where the dog was resting or sleeping in the shade. In this way the dog learnt that it “had to be with the flock all the time” and not to let the flock “drift off too far”. Respondent D reported that the shepherd would “wake up the dog and walk him back to the flock”. This is how the dog learnt to “stay close to the flock”. Respondent H reported that no corrective behaviour was necessary because they had not lost any livestock during the day, when a shepherd was present, or during night, when the dog was “on duty”.

The second most common behavioural problem (five cases) was that the dogs would sometimes remain at home or return home from the veld, instead of remaining with the flock. In two cases, the dogs just started accompanying the flock again of their own accord. However, in the other three cases, corrective behaviour was not possible because it is very difficult to teach an older dog to stay with the flock, as evident in the following two quotes.

> The dog was not kept with the livestock long enough when it was a puppy, and then later on I could not teach the dog to stay with the flock when he was already older. Now the dog stays at home in the evenings and looks after the flock during the day. (Respondent G, personal interview, 9 May 2015)

> The dog stayed in a kraal very close to the house as a puppy and became accustomed to being close to the house. They returned the dog to the veld and the livestock, but it still came back sometimes if there were no lambs. The new puppy I received in 2015 was put in a kraal far away from the house, to correct the mistake made with the older dog. The new puppy has never come to the house. (Respondent M, personal interview, 9 May 2015)

Respondent S reported that the dog was not kept with the livestock for long enough when he was a puppy. The dog was already one-year-old when he got placed on the farm. They took the dog back to the corral every time he came home, but the dog would use any opportunity it could get to get escape from the corral to come back home. It was very difficult to teach the dog to stay with the flock when he was older. The respondent stopped taking the dog to the livestock, and since then the dog has "stayed at home and on the bakkie". This implies that it is vital for the puppies to be trained well and to spend enough time with the herd at a young age in order for them to bond and be effective.

The third most common behavioural problem (three cases) noted was that the dog would bite livestock. Respondent O complained that there were behavioural problems with the dog biting lambs and eating their food (oats). He found that corrective measures, i.e. reprimanding the dog when its behaviour was unacceptable, were effective.

Lastly, only one incident was reported where the dog attacked someone. The respondent however did not view this behaviour as a problem.

> When the dog was a puppy, an unknown man beat the dog through a fence with a stick and months after the incident, the same man walked past the herd and the dog attacked the man and ripped his shirt from his body … the man has never walked that route again. (Respondent H, personal interview, 8 May 2015)

Respondent Q reported no problems, as the dog was already trained and two years old when the owner received him. His present owner bought goats from another farmer and the dog came with the goats. The dog was already familiar with the flock and no behaviour problems were experienced. (Respondent Q, personal interview, 10 May 2015)

Respondent A reported that by simply following the guidelines from the Breeding Project, it was possible to prevent or correct any behavioural problems. Respondent A further commented, "many dog owners are under the impression that the dog can just be

dropped off at the gate of the herd and that the dog will then be fine without any guidance … you have to walk with the puppy … you have to talk to the puppy … it is like a baby … you have to take care of it and it will take care of you and the flock when it is older" (Respondent A, personal interview, 6 May 2015).

Respondent K reported that the suggestions in the guidebook were effective corrective measures. For instance, "the shepherd will wake the dog up if they move to a different spot". The dog would always keep an eye on his livestock and make sure there were no predators. He further explained that "new livestock would be put in a camp next to the dog, in order for the dog to get familiar to the new stock. Then after 2–3 weeks, the new stock would be put together with the dog." Respondent K mentioned that lead-training was essential when moving livestock to a new post. Every day a shepherd would walk the dog and the livestock to their new camp, until it had learned to stay in the new territory.

Respondent K indicated that the dog should be put safely on a run-wire at night to prevent it returning to the old post. He highlighted that he has to be determined and persistent with the training measures especially when new stock is introduced to the current herd or if the dog and herd are moved to a different camp. He reported that this method worked very well, if employed until the dog has accepted the new livestock (Respondent K, personal interview, 8 May 2015).

4.4 Predator conservation

As discussed in section 2.2, both sides of the human–wildlife conflict should be taken into account when evaluating specific mitigation measures (Madden & McQuinn, 2014). The use of a method that is predator-friendly, but still results in thousands of livestock losses, only benefits the predators. The use of a method that protects livestock from being killed, but in the process kills thousands of non-targeted animals, is also not sustainable.

This section reports on objectives 4 and 5 of this research study, by reflecting on the testing of the assumption that Anatolian Shepherd dogs act as a non-lethal form of predator control and whether the introduction of Anatolian Shepherd dogs has led to a reduction in the killing of predators by farmers and shepherds.

Before receiving Anatolian Shepherd dogs, the black-backed jackal was the most frequently reported species to cause livestock losses, with 17 mentions (see Table 4.1).

Caracals were the second most common cause of livestock losses, with 11 mentions. Theft, leopards and other dogs were each mentioned once as causing livestock loss. After placements of Anatolian Shepherd dogs, fewer farmers reported losses due to jackal and caracal, although they were still the most common cause after drought. This implies that the Anatolian dogs were particularly effective at protecting the livestock from these two types of predators, as well as from theft and leopards.

Table 4.1: The number of respondents reporting predator species to cause livestock losses before and after receiving Anatolian Shepherd dogs.

Cause of livestock loss	Black-backed jackal	Caracal	Leopard	Baboon
Before Anatolian dog	**17**	**11**	**1**	**0**
Since Anatolian dog	**5**	**7**	**0**	**0**

Table 4.2 reports the methods used to protect the livestock from predation, before and after the placement of the dogs. A total of 14 respondents mentioned the use of gin traps to control predators before receiving a dog. Shepherds were the second most common method used to protect livestock, with 13 mentions, often in combination with gin traps. In a few cases, the respondents also reported using poison and shooting some of the predators.

When respondents were questioned about killing predators on their land before and after dog placement, it was clear that there was a substantial reduction in killings by respondents. In response to the question, “Did you kill any predators on your farm?”, a total of 11 respondents switched from the affirmative (“Yes”) to the negative (“No”), which is a substantial decrease. None of the respondents switched from the negative (“No”) to the positive (“Yes”) after the dogs had been placed. Before placements, 79% (19) of respondents reported killing predators on their farms, compared to 21% (5) after the dogs had been placed. This is a substantial reduction. In three of the five cases, respondents who reported killing predators after they had received the dogs, said that they had killed fewer predators than before.

Table 4.2: Methods used by farmers to protect livestock before and after placement of dogs.

Before placement of dog		After placement of dog	
Methods used to protect livestock	**No. of mentions**	**Methods used to protect livestock**	**No. of mentions**
Gin traps	14	Gin traps	2
Shepherd	13	Shepherd and dog	12
Shooting	4	Shooting	3
Poison	2		
Cages	1	Cages	1
Fences	1		
Bells around the neck	1		
		Only dog	13

Before receiving the dogs, the respondents mostly killed jackals (14 mentions) and caracals (four mentions). Some commercial farmers stated that, at times, it became necessary to shoot jackals when there was an increase in the jackal population in their area.

It is notable that all the farmers who continued to use lethal methods, such as shooting and gin traps, were also the farmers with the five largest herds of livestock. This suggests that large farm operations should consider the use of more than one dog to protect their livestock. In these cases, it was reported that lethal methods were not used in the camps where the dogs worked, for the protection of the dogs. In two cases, however, dogs stepped in gin traps set on the boundary line. In both cases, the neighbours were subsequently requested not to set gin traps on the boundary line.

Respondent Q commented that, at certain times of the year when jackal activity is high, they would shoot jackals. The respondent further explained that they would never shoot the large male jackals, since this would cause an increase in young males in the area. The respondent indicated that, although they made use of gin traps and cages in the past, this was not the case anymore. “Other animals get caught and die in the traps, and never the jackal. We would catch aardvarks and let them go again” (Respondent Q, personal interview, 12 May 2015).

In one of these cases, the farm had six large herds of livestock. Because the farmer could not have six dogs on the farm, additional control methods were necessary in the other

camps. In another case, Respondent U reported that gin traps were used to combat their difficulties with jackals, but were rarely successful. They were also erecting fences, but this was “very expensive and took a long time”. As a result, they were forced to sit in the camps in the evenings, while shining the vehicle lights on the camp, to try to protect the livestock and to chase away predators (Respondent U, personal interview, 12 June 2015).

In one case, the respondent reported the shooting of on average 10 caracals per year. It must be noted that this specific respondent also rated the performance of his dog as poor. The dog seemed to have had too much contact with humans as a puppy, which resulted in the dog not staying with the herd and returning to the farm house frequently.

One respondent’s dog died during an accident on the farm, and the farmer was therefore shooting jackals at certain times of the year on the farm. The respondent explained that the government subsidised the fences in the 1960s, but all the fences were old with holes in due to aardvarks (*Orycteropus afer*). The respondent also mentioned that the Namaqua National Park was expanding, and as the park expands, fences are broken down and the “Park and its wildlife are ‘coming closer’ to our farmlands”.

From these responses it seemed that the dogs were relatively effective at predator conservation. However, it is possible that the dogs were killing a significant number of predators or enough to cancel out the gains from fewer predator killings by the farmers.

When respondents were questioned about the dog killing any wild animals, 11 (44%) reported that the dogs had killed wild animals at some stage, while in nine of these cases they had killed predators. Thus, in nine cases (36%), the dogs were a lethal predator control method on targeted predator species. In six cases, the dogs killed black-backed jackals and in three cases, the dogs killed caracals. In all nine of these cases, the respondents reported that the dogs had killed to protect the livestock. In no cases did the dogs eat the carcasses of the predators. To get an idea of magnitudes, one respondent reported that the dog killed around five caracals per year, and five reported around one to two jackals or caracals per year.

Three Anatolian dogs were reported to have killed non-predator species. One of the dogs killed a hare (*Lepis*) and another killed an unknown number of hyraxes (*Procavia capensis)* and a skunk (*Mephitidae*). In no cases did the dog kill any of the livestock that it was supposed to protect, or any other livestock. In one case, there used to be two

additional Sheepdogs with the herd, but these were killed by a neighbour's Anatolian Shepherd dog when they strayed too far into the neighbour's area.

Although the dogs acted as a lethal control measure in some cases, it seemed that they killed fewer predators than the farmers and shepherds did before their placement. In many cases, it seemed that the dogs acted mostly as a deterrent, rather than a lethal predator control measure. Farmers supported the view that the dogs only killed when it was necessary to protect the herd, as evident in the following quotes.

> My dog will not kill predators. The dog barks extremely loud and that is enough to scare the intruders away. The dog will bark during dawn, he will not stop and he will chase any jackal away. (Respondent F, personal interview, 10 May 2015)

> My dog will chase away the predators and the dog will only kill the predators if they get too close to the sheep, like when they are right between the sheep. (Respondent G, personal interview, 10 May 2015)

A total of 13 of the respondents reported that they did not use any control measures to protect the livestock in addition to the dogs (except for a shepherd in seven cases). Respondent H said that one could not use gin traps "when the dog is also in the veld with the livestock. The dog stepped into a neighbour's gin trap once, and it was very difficult to get the dog out". Subsequently, he asked the neighbour not to set traps along that boundary.

4.4.1 Perceptions of lethal control of livestock predators and non-predator species

The overall perception from respondents regarding the use of lethal control methods (e.g. gin traps, shooting and poison) is that it is cruel and that it is better to use only non-lethal control methods. They also reported that other animals (e.g. other dogs, horses, game) easily get caught in the gin traps and that it is very difficult to free them. As explained in section 3.4, the respondents represented a group of farmers and shepherds who were willing to work with predator conservation programmes and therefore were likely to have positive attitudes towards Anatolian Shepherd dogs and non-lethal control methods (Potgieter, 2011).

The following quotes regarding lethal control were noted during the interviews:

> It is better to have the dogs to protect the livestock than having to set gin traps or use other deadly control methods. Then the gin traps are not necessary and other animals do not get trapped in the gin traps. It is a good thing to have a dog. (Respondent C, personal interview, 7 May 2015)
>
> Gin traps are bad. Other animals such as dogs and horses can fall into the trap and get hurt or die. (Respondent D, personal interview, 7 May 2015)
>
> It is cruel to let animals suffer in gin traps. (Respondent E, personal interview, 7 May 2015)
>
> By killing lambs, predators cause economic damage to farmers. But predators definitely have a function and place in nature … with the project of Elanza, you have the dogs that keep the jackals away. If you take the jackal out of the system, it causes other problems. With the dog, people don't need to set gin traps or use poison or 'doodslaners'. (Respondent H, personal interview, 8 May 2015)
>
> Die natuur is reg geskape, sonder enige fout, dit is ons as mense wat die natuur omgooi en verander. (Nature has been created well, without any flaw. We, as humans, are disturbing and changing nature.) (Respondent H, personal interview, 8 May 2015)
>
> Gin traps are not good. If dogs or other animals get trapped in a gin trap, it is nearly impossible to free the animal. You cannot have gin traps on your land, and dogs. If the dog is trained well and you care for your dog and a shepherd is also with the dog and the flock, then you do not need any other method to protect your livestock. (Respondent I, personal interview, 8 May 2015)
>
> No, it is wrong and a danger to other animals and people. (Respondent J, personal interview, 20 May 2015)
>
> It [gin traps] is extremely cruel. (Respondent K, personal interview, 9 May 2015)
>
> I do not like the idea of using lethal control methods and do not use gin traps on the farm as well. There are many different game on my farm. Setting gin traps, other animals get caught. (Respondent Q, 14 June 2015)

However, a few respondents reported that lethal control measures were occasionally necessary to make a living when no other control measures were available, especially when the herd is relatively large.

> It is necessary to make a living. (Respondent M, personal interview, 14 June 2015)

The overall perception of respondents was that predators exist naturally in the environment where they farm with their livestock. Although the respondents recognised that predators caused severe financial damage to farmers by killing their livestock, 14 of the respondents thought it was important to protect predators in the area, while two respondents were unsure. A number of respondents spoke of “a balance in nature” and “predators being part of the food chain”. However, a number of respondents thought that the predators should stay within the boundaries of the Namaqua National Park.

4.5 Responses related to satisfaction of the Anatolian Shepherd Dog Breeding Project

When questioned about satisfaction with the Anatolian Breeding Project, eight respondents reported that they shared information on the dog and its progress with the Anatolian Breeding Project. Another eight did not have contact and two were unsure. Sixteen respondents reported that the Breeding Project had given them enough direction, guidance and help. One respondent reported that the guidebook provided very helpful information. Two respondents were unsure, and one reported the Breeding Project “said they would follow up and visit once a year, and would make an appointment, but would never show up”.

A total of 20 respondents said that they would recommend the Anatolian Breeding Project to other farmers and shepherds, while only one said that he would not recommend the project. Clearly, the respondents were of the opinion that the project has some merit. However, the respondent that indicated that he would not recommend the project, reported having had three Anatolian dogs in the past (two dogs not from the Breeding Project), all of which were ineffective.

Most of the respondents who would recommend the project said that the dogs were an excellent control method to protect livestock, e.g. “Hy werk soos ’n bom” (He is extremely efficient). They also trusted the dogs and the dogs made them feel at ease. For example, “the dog is doing all the work now and it is not necessary for me to accompany the dog

for long hours in the veld every day" (Respondent A, personal interview, 6 May 2015). A number of respondents also said the dogs were a good predator-friendly way of protecting livestock without having to kill predators.

Most of the respondents emphasised the need to train the dogs well. For instance, "The dog works very well if you spend time training him from the start according to the guidebook and if you care about your dog" (Respondent I, personal interview, 10 May 2015). He did not think the dog would work well with communal farmers, because of the danger of the dog attacking unfamiliar people walking past.

4.6 Advice for prospective owners of Anatolian Shepherd dogs

A number of respondents had advice for prospective owners of Anatolian Shepherd dogs. Most of the respondents emphasised the importance of training the dog correctly from the beginning, i.e. 6–8 weeks old, as evident in the following quote.

> You have to spend a lot of time with the dog and teach the dog to stay with the sheep and bring them home safely. (Respondent R, personal interview, 10 May 2015)

The fact that behavioural problems could not easily be corrected later in the dog's life was a topic that often came up in numerous interviews.

> It is important to place puppies with their livestock herd at 6 to 8 weeks [of age]. The dog should be kept with the herd from the beginning to create a bond. The dog will form a stronger bond with the flock if there are lambs when the dog is still a puppy. The farmer should try to receive the puppy at the time when there are lambs on the farm. (Respondent L, personal interview, 12 May 2015)

> The dog should not be in contact with many people or other dogs. The puppy should not receive any unnecessary human attention. It is difficult not to want to touch and play with the puppy when it is tiny and cute…but you have to hold yourself back…if you do not hold yourself back…you will not be able to correct the mistake later. (Respondent U, personal interview, 9 June 2015)

The respondents also stressed the importance of taking good care of the dogs.

> There has to be a fine balance between the amount of physical contact you have with a puppy. This may lead to the development of a stronger bond between the dog and humans than between the dog and the herd. At the same

> time, the puppy needs to be handled occasionally to ensure that, as an adult, the dog will be used to being handled, especially when you need to take the dog to the veterinarian. (Respondent T, personal interview, 12 May 2015)
>
> You always have to make sure there is water available [for the dog] and you have to spray the dog to protect him against tick bites and tick fever. (Respondent G, personal interview, 9 May 2015)
>
> The dogs should also be raised in a kraal that is far away from the house, otherwise the dog will start coming home when he gets bored or gets too familiar with people or if there is no lambs in the veld. While the puppy is in the corral, it should be exposed to everything that it would encounter on the farm, such as horses and cattle. (Respondent T, personal interview, 12 May 2015)

A number of respondents pointed out that the dogs were particularly effective when guarding herd-bound livestock. They were less effective with livestock types that were widely dispersed or scattered. Thus, placing the Anatolian Shepherd dogs with goats or herd-bound sheep would make it easier for the dog to look after the entire flock. The Anatolian dogs are very effective and work well in herd-bound flock.

> Do not put the dogs with livestock like the Dorper, who are scattered out. Place them with goats, or herd-bound sheep. If you have many different camps on your farm it will be difficult to place a dog in each camp. Other control methods are still necessary in the camps without any Anatolian dogs and in the camps where the herd is scattered all over the camp. (Respondent M, personal interview, 9 May 2015)
>
> I would say the maximum recommended herd size is 150 livestock per dog. If the camps are large then farmers should get GPS collars to keep track of the dog, otherwise the dog can easily disappear for days. The maximum number of dogs together, I would say, I will have recommended two … except if there are strong fences, otherwise the dogs will fight with each other … and the farmer will not be able to mix the herds at a later stage. (Respondent O, personal interview, 10 May 2015)

4.7 Advice or questions for the Anatolian Breeding Project

A number of respondents had suggestions and questions for the Anatolian Breeding Project. The majority of respondents suggested that the farmers and shepherds who

receive Anatolian puppies need to be selected very carefully. A number of respondents were curious about other farmers who received dogs.

> I want to suggest to the Breeding Project that we have workshops, like information sessions with the other people with dogs, then everyone can share knowledge about the dogs, like a gathering with everyone with dogs, one person might learn something from his dog that the other one don't know. (Respondent E, personal interview, 8 May 215).

He also wanted to know whether there is an injection for dogs against tick fever.

> When the dog is sick, like now, it stays home, it does not want to come close, which makes it very difficult to spray Deadline on the dog. (Respondent E, personal interview, 8 May 2015)

Two respondents (C & K) both requested the Breeding Project to bring food to help feed the dogs. Both bought their dogs from the Breeding Project on the understanding that the money would be refunded, but they have not received the money back. This suggests a misunderstanding between the farmers and the Project.

Chapter 5: Discussion

5.1 Effectiveness of Anatolian Shepherd dogs in reducing livestock losses

The results indicate that the Anatolian Shepherd dogs were highly effective at reducing livestock losses, with over 80% of respondents reporting that the dogs reduced livestock losses. This finding is in keeping with numerous studies on livestock guarding dogs (e.g. Andelt & Hopper, 2000; Coppinger et al., 1988; Hansen & Smith, 1999; Horgan, 2015; Marker, Dickman & MacDonald, 2005; Potgieter et al., 2013). The effectiveness of reducing livestock losses is at the high end of the range of livestock guarding dog success rates reported elsewhere (66–90%), as reviewed by Smith et al. (2000).

These results support the current reputation of Anatolian Shepherd dogs as a useful tool for farmers to reduce livestock losses (Potgieter et al., 2013; Rigg, 2001; Shivik, 2006). There is a general increase in the number of farming communities worldwide adopting livestock guarding dogs as part of their livestock management practices (Andelt & Hopper, 2000; Stannard, 2006). However, livestock guarding dogs are unlikely to eliminate losses entirely, and for maximal effect, should be used as part of a broader livestock management strategy (McGrew & Blakesley, 1982).

The participating dogs guarded widely varying flock sizes (of goats and sheep) and there was the perception that they were more effective with smaller herd sizes. Respondent O, for instance, who had a herd size of 350, recommended a maximum of 150 livestock per dog. It seems that the dogs were also more effective when guarding livestock that are characteristically herd-bound, rather than widely dispersed. Coppinger et al. (1988) also found that ineffective dogs were those where sheep scattered widely over a large area. In almost all cases, the dog was accepted as one of the herd, and in no cases did the dog kill any of the livestock that it was supposed to protect. However, in some cases, the introduction of new stock into the herd had an adverse effect on the short-term effectiveness of the dogs. The interviews suggested that combined efforts with a shepherd is the most effective method, with emphasis placed on the use of dogs mostly at night. According to Linnel, Odden, Smith, Aanes and Swenson (1999), the solution of herding livestock is an important deterrent to predators. In addition to reduced predation,

herding may contribute to improved rural livelihoods, reduced stock theft, and improved biodiversity management.

This implies that experience and training improve the effectiveness of the livestock guarding dogs. Respondents who had previously owned a dog seemed to be better able to implement corrective measures and improve the effectiveness of their dogs than those who did not have dogs. This confirms the findings of Horgan (2015), who found a significant positive correlation between the effectiveness of the dog and the length of time that a farmer had been using livestock guarding dogs. This also implies that workshops, where knowledge is shared, would be beneficial in improving the effectiveness of dogs. The interviews also indicated that it is vital for the puppies to be trained well and to spend enough time with the flock at a young age in order for them to form a social bond and be effective at protecting their herd.

5.2 Perceptions of and satisfaction with the Anatolian Shepherd Dog breeding project

Marker & Dickman (2010) states that for a livestock guarding dog programme to be truly successful, the farmer must perceive a benefit to having a livestock guarding dog. This situation seemed to be the case in the present study, with more than a third of respondents classifying their Anatolian dog's performance as very good or excellent.

Unfortunately, the respondents provided insufficient data to permit analysis of the actual financial costs. Nevertheless, the vast majority of respondents felt that they had benefited economically from having an Anatolian dog. This is comparable to the studies in the United States (Green et al., 1984) and Namibia (Potgieter et al., 2013), where 89% and 82% of farmers respectively considered their guarding dogs to be profitable. Commercial farmers in the United States who bought their own livestock guarding dogs from independent breeders reported that their livestock guarding dogs were cost-effective (Andelt, 2004).

Although the majority of respondents in this study felt that they had benefited economically from the dog, it must be noted that all Anatolian dogs were provided to farmers and shepherds free of charge, with the Anatolian Breeding Project and sponsors bearing all the costs for the breeding and the raising, vaccinating and neutering of the dogs. In some cases, the Breeding Project also provided dog food to the owners for the first year.

The economics of using livestock guarding dogs depend on various factors, including the rate of predation, the effectiveness of the dog, and the costs involved with the purchase and maintenance of the dog (Green et al., 1984). These costs can be considerable and include, time and money invested in training, health care, food, veterinary expenses, travel and damage caused by the dog. Future studies should therefore determine the actual financial cost for the Breeding Project, as well as the financial costs to the farmers in caring for a dog.

Nevertheless, all but one of the respondents were willing to recommend the Breeding Project to other livestock farmers. The project was therefore viewed positively by farmers and shepherds participating in this study.

5.3 Behavioural problems and training

All the dogs were initially placed with their herd when they were between 6 and 12 weeks of age. Various studies (Coppinger & Coppinger, 2001; Rigg, 2001) and training manuals (Cheetah Outreach Training Manual by Stannard) suggest that introducing a livestock guarding dog to its stock at an early age can facilitate bonding with the herd and consequently minimises behavioural problems later in life. Slightly more than half of the dogs evaluated in this study showed behavioural problems at some stage. These had mostly to do with resting in the shade on hot summer days and not staying with the herd. Most behavioural problems were able to be corrected with the appropriate training, and successful behavioural changes were reported.

In many cases, the respondents did not regard resting in the shade as a serious behavioural issue during the hot summer months. It was more important for the dogs to be alert and protective during the night when predation was more prevalent. Woodroffe et al. (2005) support this claim as they found that livestock attacks occurred mainly in late afternoons and evenings. Different times of the day and times of the year are more critical than others. A more comprehensive system approach might be necessary to protect livestock effectively, with extra protection at appropriate moments.

Inattentive behaviour (not leaving the house) is usually linked to a lack of bonding between the puppy and the livestock and inadequate training while the dog is young. These behavioural issues can be addressed with proper training initially or corrective training later. It seemed that good training from an early age was crucial to ensure a bond with the herd. Dogs should be placed at 6–8 weeks, preferably when there are lambs on

the farms. The dog should be kept with the same type of livestock during the critical social bonding period (Coppinger & Coppinger, 2001; Potgieter, 2011). Human handling of puppies should be limited during the critical period, to ensure a strong social bond with livestock (Lorenz, Coppinger & Sutherland, 1986). Supervision of young dogs in the field would ensure that they remain with the herd and allow for instant correction of undesirable behaviour (Potgieter et al., 2013).

The dogs often seem to adopt a specific area as their territory and will return to it even when the livestock has moved to a new area (Stannard, N.d.). Lead-training is therefore essential, as the dog can be accompanied with the livestock by a shepherd, until it learns to stay in the new area. As a short-term measure, the dog should be put on a run-wire at night to prevent it from returning to the old post. Care should be taken to secure the dog in a manner that is safe and to reassure the dog that it is not being punished.

In many cases, having a human shepherd present seemed to improve the behaviour of the dogs. Corrective training could be implemented immediately when a human shepherd was present. Dogs that were not accompanied by a shepherd were more likely to return to the farmhouse, especially when there were no lambs. It is also important to note that five of the six dogs that died prematurely were guarding the herd alone, i.e. without a shepherd present. It is not unusual for livestock guarding dogs to exhibit a relatively high premature mortality rate. According to Coppinger et al. (1988), the death rate of dogs guarding livestock is about 10% by the age of 30 months. Marker, Dickman & Macdonald (2005) found that more than a third of livestock guarding dogs died prematurely in Namibia, while Rust et al. (2013) found that 30% of livestock guarding dogs in South Africa died prematurely. It is likely that up to 35% of dogs guarding livestock will die within the first two years. The probability of premature death could be decreased by properly caring for the health of dogs and by taking precautions to avoid accidents (Woodruff & Green, 1990).

If the dogs are placed on farms where they will be expected to work without a shepherd present, there should be very good training and inspection of the farm beforehand.

The literature also suggests herders could improve the effectiveness, behaviour and health of livestock guarding dogs (Marker, Dickman & Macdonald, 1999; Ogada et al., 2003; Woodroffe et al., 2007). However, a study in Botswana by Horgan (2015) indicated otherwise. The study indicated that livestock guarding dogs accompanied by human

herders were less effective, saving less money and displaying higher levels of behavioural problems, such as chasing game. One possible explanation for this finding was that the proximity of a human might threaten the bond that the livestock guarding dog has with its livestock, compromising the ability to guard effectively. This implies that there should be a fine balance in the amount of human contact with the dogs. The farmer or shepherd should be able to take care of the dog (e.g. take it to the veterinarian), but should not compromise the bond between the dog and the herd.

5.4 Effectiveness of Anatolian Shepherd dogs in predator conservation

As discussed in section 2.2. both sides of human–wildlife conflict should be taken into account when evaluating specific mitigation measures (Dickman, 2010). The use of a method that protects livestock from being killed, but in the process kills thousands of predators, is not sustainable.

The results indicated that the dogs were relatively effective at predator conservation. Fewer respondents reported killing predators, and those that still did so reported killing fewer predators. The large decrease in livestock losses meant that fewer farmers found it necessary to kill predators. The use of lethal control methods decreased significantly after placement of the dogs. All of the communal farmers reported that they ceased killing predators since receiving the dogs. The farmers who continued to kill predators were also the commercial farmers with the largest herds. This suggests that large farm operations should consider the use of more than one dog to protect their livestock. The use of multiple dogs on large farm operations had been successful in the United States when accompanied by good training (Coppinger & Coppinger, 2001).

The results of the present study indicated that in some nine cases, the dogs acted as a lethal form of predator control, although it seemed that they killed fewer predators than the farmers and shepherds did before their placement. In many cases, it seemed that the dogs acted mostly as a deterrent, rather than as a lethal predator control measure. Farmers supported the view that the dogs only killed when it was necessary to protect the herd, as they did not eat the carcasses.

The overall attitude of the respondents to non-lethal control measures was receptive. The overall perception of respondents was that predators exist naturally in the environment and that predators “form part of a bigger system”. The farmers and shepherds that were part of the Breeding Project at the time of this research, represented farmers and

shepherds in South Africa who were willing to form part of the pilot study or who requested assistance from conservation groups such as SANParks to provide them with non-lethal control methods. The responses from these 'predator-friendly' respondents should be applied with caution to the broader livestock farming community (Potgieter, 2011).

The use of livestock guarding dogs as a control measure is more socially acceptable than other lethal methods and does not face the same legal restrictions limiting the use of lethal control methods. Livestock guarding dogs are considered by the public and the majority of the respondents as a non-lethal, 'environmentally friendly' method of predator management (Fox & Bekoff, 2011). However, in some studies Anatolian Shepherd dogs have been found to be a lethal predator control method. Potgieter (2011), for instance, found that the Anatolian Shepherds working in Namibia killed more black-backed jackals than the farmers had previously killed in retaliation for depredation.

The findings of the present study therefore indicate that the Anatolian Shepherd dogs acted as a non-lethal form of predator control in some cases, using their bark as a deterrent, while resorting to lethal control in relatively rare instances where a predator or unwanted animal came into the dog's territory or significantly threatened the flock and was presumably not deterred by barking. The findings presented here therefore challenge the classification of livestock guarding dogs as a purely non-lethal form of predator control since Anatolian Shepherd dogs were found to kill meso-predators, particularly jackal.

The effects of Anatolian Shepherd dogs on non-predator species in this study were minimal. Only two of the dogs were reported to kill non-predator species, namely a few hyraxes, one skunk and one hare. Because the farmers reduced their use of gin traps and other lethal methods, the non-predator species were less at risk from these lethal methods.

The results also indicated that there was a substantial reduction in predator killings by farmers, down to almost a quarter of the original value. The presence of Anatolian Shepherd dogs provided the greatest conservation benefit for jackals in this study. The presence of the dogs therefore aided predator conservation and improved farmer tolerance of predators, especially by effectively reducing livestock losses.

5.5 Recommendations

One of the main problems with the Breeding Project in Namaqualand is the sheer distances involved, as the recipient farmers are widely distributed across a vast area of

the Northern Cape. This problem was also reported in a study conducted by Marker, Dickman and Schumann (2005) in Namibia. Communication can be hard, especially in the communal areas where phones are not available or the signal bad. This makes regular visiting and checking up on all the dogs that have been placed a tiring, time-consuming and expensive task. This should be taken into consideration with future puppy placements. If puppies are placed in areas too remote or too far from the Namaqua National Park Breeding Project Office, it will prove difficult to monitor the puppy or dog on a regular basis. Alternative monitoring efforts should be enforced, such as cooperating with other Breeding Projects in South Africa, which have monitoring staff in different provinces or farming communities. While the vast majority of respondents in the study said they would recommend the Anatolian Breeding Project to other farmers, they also suggested that the farmers and shepherds who receive Anatolian puppies should be selected very carefully.

A lack of reliable record-keeping also makes it hard to quantify the real effect that these dogs are having on the levels of livestock losses accurately (Marker, Dickman and Schumann, 2005). There is little information available on the levels and causes of livestock losses before and after dog placement. Electronic records, as well as hardcopy records, should be kept for all of the dogs. These should include date of birth, information regarding the parents of the dog, date of spaying, and complete contact details of the owners and shepherd of each dog. Copies should be kept at different locations and not only at the Namaqua National Park offices, to minimise the risk of losing the information. With a complete track record of the breeding lines of each puppy, future research could evaluate and compare the effectiveness of puppies from the same litter. This could help to determine which breeding pairs produce the best offspring and bloodlines.

The interviews also revealed that there is an urgent need for the farmers to share their knowledge and to discuss any questions or concerns they have with other owners of Anatolian Shepherd dogs. Annual workshops should be held in easily accessible towns, such as Kamieskroon and Springbok, for current and prospective owners. This will create a platform for individuals to share information and first-hand experience, especially people without any access to platforms such as the Internet, research libraries or even basic telephone connections.

5.6 Potential future research

Firstly, a study that classifies the responses according to dogs placed on communal land, where they are assisted by herders, and dogs that mostly work alone on private farms, may be useful for future projects with a larger sample of dogs. Since livestock numbers and management systems are different on commercial and communal farmers, different responses to dog introduction might be anticipated.

Secondly, while not a major finding in this pilot study of the Breeding project, human-human conflict on communal and private land may be investigated in future studies, specifically where puppies are placed at two adjacent farms or stock posts.

Lastly, future research could investigate the possible conservation effectiveness of the intervention from the perspective of other stakeholders. For instance, the views of the conservation sector and other independent stakeholders could be investigated.

Chapter 6: Conclusion

The conflict between farmers and predators is the most widespread form of human–wildlife conflict worldwide (Graham, Beckerman & Thirgood, 2005; Thirgood, Woodroffe & Rabinowitz, 2005). Different stakeholder groups involved in conflict mitigation often have widely differing views on these conflicts, as external groups often have different views to the farmers and shepherds directly affected by predator conflicts. In complex human–ecological systems like these, different human (communal, commercial) and ecological (farmland, conservation land) systems could result in different effects being experienced and different desired goals. Understanding conflicts between different stakeholder groups is central to understanding human–wildlife conflict and in designing mitigation measures.

In the past, mitigation measures were often evaluated from only one side of the human–wildlife conflict: either in terms of the benefits to conservation, or in terms of reducing livestock losses. In order to develop suitable mitigation measures, it is important to recognise the double-sided nature of human–wildlife conflict and to take both sides into account when evaluating specific mitigation measures. Effective mitigation measures require clever solutions that are tailored to local conditions.

The initial aim of the Anatolian Breeding Project was to aid conservation. The results of this study, however, showed that not only is the project effective in terms of predator conservation, but it has had benefits for local livestock farmers in terms of reducing livestock losses. This shows how different stakeholders, with different primary goals, could work together to achieve positive results for all stakeholders group involved.

The study has shown that Anatolian Shepherd dogs as livestock guarding dogs could be an effective tool for farmers. This could have important implications in many similar areas close to protected areas and national parks elsewhere. Although Anatolian and other types of livestock guarding dogs have been successful in reducing livestock predation and predator killing by farmers in South Africa, they should not be considered a ‘silver bullet’ for conflict mitigation (Potgieter, 2011). The effectiveness of these dogs is influenced by a variety of factors and their use requires a commitment by their owners.

The initial training of the Anatolians dogs in the critical social bonding phase as well as timely corrective behavioural training is essential for the effectiveness of the dogs.

The Anatolian Breeding Project shows great promise, although there is still room for improvement. The project should focus on rigorous and reliable record-keeping to quantify the value of these dogs accurately. The project should also continue to monitor the effectiveness of the dogs. Regular workshops should also be held for participants at accessible locations in order to create a platform for individuals to share information and first-hand experience.

The results challenge the classification of livestock guarding dogs as a purely non-lethal form of predator control, as the dogs were found to kill meso-predators in a few cases. With respect to conservation, the Anatolian dogs in this study were found to be an efficient form of predator control, with a relatively minor effect on non-target species. The conservation of predators, especially those with ranges that stretch outside protected areas, is challenging and complicated. However, conservation can be achieved through appropriately tailored strategies.

In my interviews with the farmers and shepherds who owned and worked with Anatolian Shepherd dogs, I noticed something quite special and unexpected. The respondents were truly happy with their dogs and spoke of them as part of the team working on the farm and caring for the farm. I realised that farmers and shepherds loved working with animals and Anatolian Shepherd dogs provided a way to use an animal to solve the biggest problem they face. I realised that the farmers and shepherds had respect for all animals, whether it was a sheep, a dog or a caracal. The use of Anatolian dogs is a relatively conservation-friendly and sustainable control method, protecting livestock from predators and protecting predators from other lethal control methods. It therefore enriches the connection between people and animals, and it improves the lives of both.

The present study was conducted on farmers and dogs that formed part of the pilot years of the Anatolian Breeding Project at the Namaqua National Park. The use of livestock guarding dogs, such as Anatolian Shepherd dogs, is still a new concept for many South Africans. The limited awareness of this method is possibly due to the fact that using livestock guarding dogs comprises a relatively new method and many breeding projects are still in their pilot phases. Anatolian Shepherd dogs were only introduced into South Africa in 2005 (Van Lente, personal communication, 11 October 2015) It is evident that

many people have simply not heard of the existence of Anatolian Shepherd dogs. However, this seems to be slowly changing as breeding projects are expanding across South Africa. Future studies should keep on monitoring this promising conflict mitigation measure.

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Appendix 1

Vraelys

Namakwa Nasionale Park – Anatoliese Herders Hond Projek

Datum:	**Eienaar se naam:**
Onderhoud gevoer met:	**Plaas naam:**
Adres:	**Kontak No.:**
Naam en geslag van hond:	**Ras van hond:**
Huidige ouderdom van hond:	**Ouderdom van hond waneer geplaas met vee:**
Tipe vee/ras:	**Aantal vee:**
Is die hond steeds 'n werkende hond:	

1. Hoe verrig die hond sy werk? Uitstekend □ Baie goed □ Goed □ Swak □

2. Wat het u verwag van die hond toe u die hond gekry het en leef die hond op tot die standaarde?

3. Het u enige geld gespaar deurdat die hond die vee beskerm? Is dit ekonomies voordelig om die hond te hê?

4. Waar bly die vee in die aande? _____In 'n Kraal □ In 'n oop kamp □

5. Gedurende die aand, bly jou hond: Met die vee □ Met die herder □ By die huis? □ Op 'n ander plek? □ Indien op 'n ander plek, waar? _____

6. Sou u sê dat die vee die hond aanvaar as deel van hulle?_____

7. Is daar enige ander honde saammet die vee? Ja □ Nee □

8. Kom die hond in aanraking met ander honde? Ja □ Nee □

9. Hoeveel vee het u verloor in die jaar/jare **voor** u die hond gekry het?

As nie presiese getalle het nie:

0 (nul) vee verloor □ Tussen 1 en 5 vee elke jaar verloor □ Tussen 6 en 10 vee elke jaar verloor □

Meer as 10 vee elke jaar verloor □ Meer as 40 vee elke jaar verloor? □

10. Wat was die oorsaak van die vee verliese?
Rooijakkals □ Luiperd □ Rooikat □ Diefstal □ Siekte □ Droogte (2006) □ Weet nie□

11. **Voor u die hond gekry het,** watter beheermaatreels/metodes het u gebruik om die vee te beskerm teen roofdiere? (bv gif / jin traps)

12. Hoeveel vee het u verloor in die jaar/jare **nadat** u die hond gekry het?
0 (nul) vee verloor □ Tussen 1 en 5 vee elke jaar verloor □ Tussen 6 en 10 vee elke jaar verloor □

Meer as 10 vee elke jaar verloor □ Meer as 40 vee elke jaar verloor? □

13. Wat was die oorsaak van die verliese?
Rooijakkals □ Luiperd □ Rooikat □ Diefstal □ Siekte □ Droogte □ Weet nie□

14. Hoe beskermend is die hond teenoor sy trop skape/bokke ?
Uitstekend □ Goed □ Redelik □ Swak □ Glad nie □

15. Hoe effektief het die hond die trop beskerm teen roofdiere?
Uitstekend □ Goed □ Redelik □ Swak □ Glad nie □

16. Het die hond enige wilde diere doodgemaak? Ja □ Nee □
16.1.Indien ja, watter tipe diere en hoeveel? _____
16.2.Indien ja, eet die hond die karkasse van die diere wat doodgemaak word?
16.3.Indien ja, hoeveel van die karkas? _____
16.4.Waarom dink u het die hond die diere doodgemaak?:
Om die trop te beskerm? □ Om wildediere te jag? □ Onseker □

17. Het die **hond** al enige van die vee doodgemaak? Ja □ Nee □
18. Het **u** enige roofdiere doodgemaak op die plaas/ gemeenskaplike land **voor** u die hond gekry het?
Ja □ Nee □

18.1.Indien ja, watter tipe roofdiere en hoeveel? _____

19. Het **u** enige roofdiere doodgemaak op die plaas/gemeenskaplike land **nadat** u die hond gekry het?
Ja □ Nee □

20. Indien ja, watter roofdiere en hoeveel? _____
21. Het die hond enige van die volgende gedragsprobleme:
Jaag wild □ Byt die hond die vee □ Bly die hond by die huis terwyl hy die vee moet oppas □

Val die hond mense aan □ Lê heeldag by die kos bakke □ Ander probleme □

21.1.Watter maatreëls tref u om die gedrags probleme optelos? _____
_____

21.2.Is/was die maatreëls effektief? _____

21.3.Het u vir die Anatoliese Herders Hond projek by die Namakwa Nasionale Park (Elanza) laatweet van enige gedrags probleme? Ja □ Nee □

21.4.Indien nie, hoekom het u nie vir hul laatweet nie? _____

22. Was daar 'n verandering van herder vandat u die hond gekry het? Ja □ Nee □

22.1.Indien ja, dink u dit het 'n invloed gehad op die hond en op watter manier?
Goeie invloed □ Slegte invloed □ Geen invloed □
Op watter manier?_____

23. Is die hond geskuif na ander vee om te beskerm? Ja □ Nee □

23.1.Indien ja, dink u dit het 'n invloed gehad op die hond en op watter manier?
_____

24. Deel u inligting oor die hond en sy vordering met die Anatoliese projek (Elanza van Lente) by die Namakwa Nasionale Park? _____

25. Hoe sal u die gesondheid van die hond beskryf? Siektes?
_____

26. Watter tipe kos eet die hond? _____

27. Hoeveel keer per dag eet die hond? _____

28. Het die Anatoliese projek by die Namakwa Nasionale Park genoeg hulp en rigting gegee oor die hond?
Genoeg rigting en hulp □ Nie genoeg rigting en hulp? □ Teveel rigting en hulp? □

29. Sal u ander boere en herders aanbeveel om 'n Anatoliese hond te kry?

29.1.Indien Ja, hoekom? _____

29.2.Indien Nee, hoekom nie? _____

30. Het u enige raad/advies aan ander boere en herders wat honde wil he? _____

31. Het u enige raad/advies/vrae aan die Anatolies projek by die Namakwa Nasionale Park?

32. Gebruik u enige ander beheermaatreels / metodes tesame met die hond, om vee te beskerm?

33. Wat dink u van slagysters en ander dodelike beheermaatreels wat roofdiere doodmaak?

34. Dink u dit is belangrik dat roofdiere ook beskerm moet word in u area?