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Jackal Narratives and Predator Control in the Karoo, South Africa

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Abstract

*This paper discusses the historical roots of, and scientific evidence for, rival 'jackal narratives' about the problems posed by black-backed jackals (*canis mesomelas*) for sheep farmers in the Karoo, South Africa. The jackal recolonized farms as government policy changed away from subsidising predator control and as farm employment contracted and sheep farming became less economically and politically important. The influential 'environmental jackal narrative' that lethal control is undesirable and ineffective, is rooted in the science of predator ecology but the linked recommendation that farmers learn to 'live with the jackal' is on less solid ground. The rival 'farmer jackal narrative' that jackal populations need to be suppressed on agricultural land resonates with conservation theories justifying the culling of jackals in national parks. Contestation over values remains important, but these competing plausible hypotheses about jackal control suggest that further scientific studies may be helpful in the construction of policies that are acceptable to both sides.*

Introduction

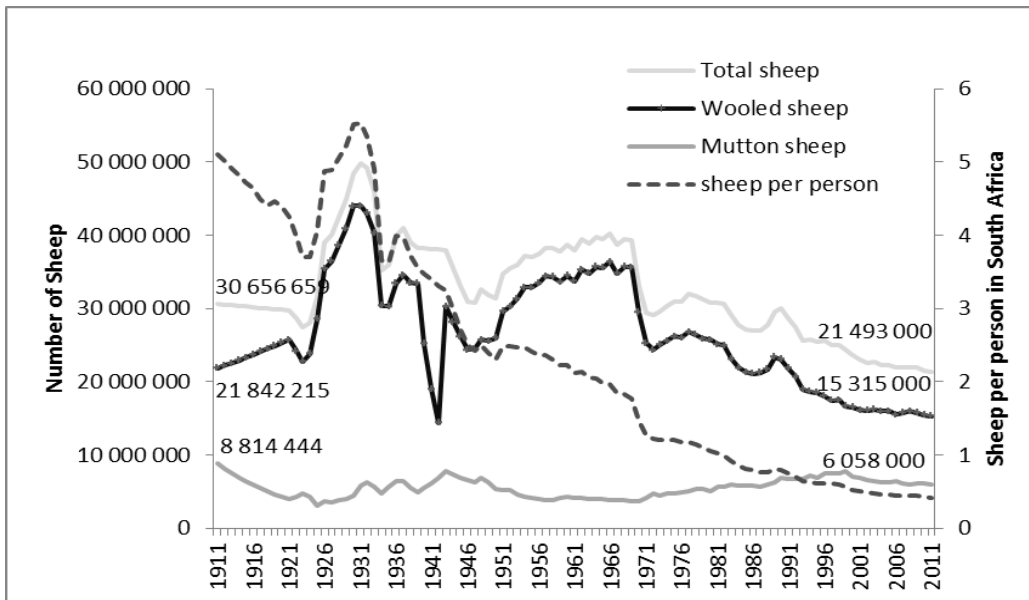
This paper discusses the historical roots of, and scientific evidence for, rival 'jackal narratives' about the problems posed by the black-backed jackal (*canis mesomelas*) for South African sheep farmers. We begin with a brief history of sheep farming and predator control, and then focus on the current contestation over the lethal control of jackals in the Karoo. Ecological science can be mobilised on both sides, and in this respect there is room for further scientific studies to help resolve the issue. But as the recent conflict demonstrates, policy is as much shaped by values and politics as it is by science.

Table 1: The declining economic importance of agriculture

	% National population rural	Agriculture as % GDP	Number of commercial farms	Average size of commercial farms (ha)	Farm employees and domestic workers on farms	Wool, lamb and mutton as % of gross agricultural output
1911	75.3%	21.0%				
1946	63.7%	13.0%	112,453	837		15.2% (1948)
1960	53.3%	12.3%	105,859	867	907,705	17.00%
1970	52.2%	8.2%	91,154	979	1,299,850	12.00%
1980	51.6%	7.1%	69,372	1,252	1,235,200	6.60%
1990	48.0%	4.6%	62,084	1,335	1,184,700	7.80%
1994	46.0%	4.6%	57,980 (1993)	1,427 (1993)	921,700	4.7% (1993)
2000	43.1%	3.30%	45,818 (2002)		977,610*	3.70%
2007	39.8%	3.40%	39,966		773,900	4.00%
2011	38.0%	2.40%				3.70%

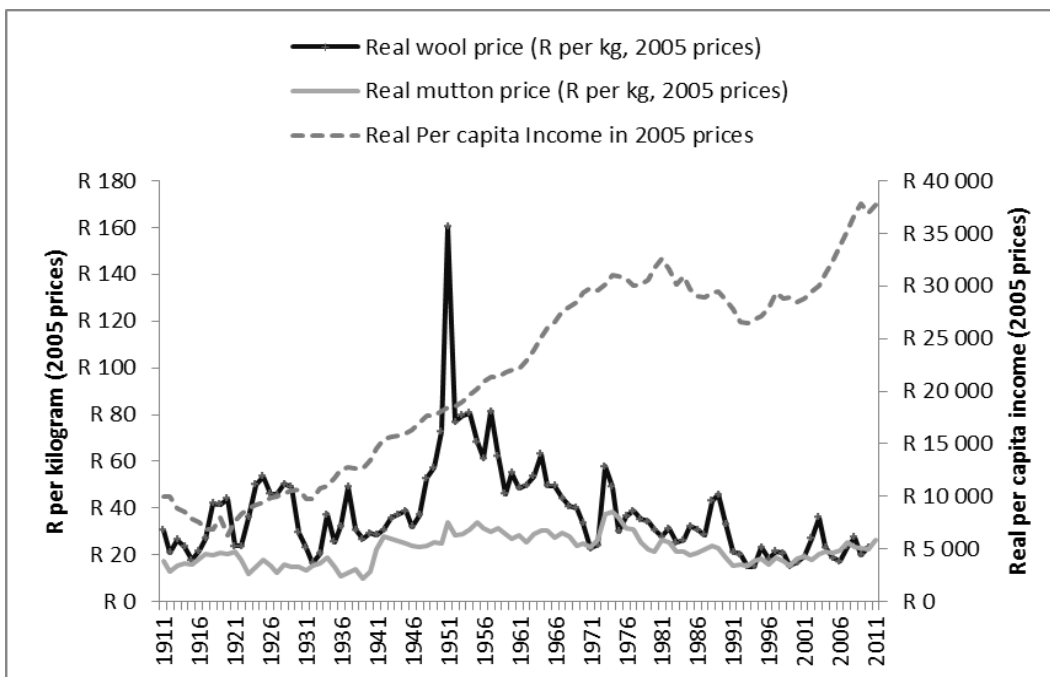
Sources: South African Statistics 1964, 1978, 1982; World Development Indicators, Abstract of Agricultural Statistics 2012 (Department of Agriculture, Forestry and Fisheries). * Estimated from average trend between 1990 and 2002.

Table 1 shows that over the past century, the contribution of agriculture to the GDP has shrunk ten-fold (from 21% to 2%), and there has been a sharp downward trend in the number of farms and farm workers. The economic importance of sheep farming (wool, mutton and lamb) declined even faster with the contribution of sheep products to total gross agricultural output falling from 15.2% at the end of the Second World War to 7.8% in 2011. As can be seen in Figure 1, the number of sheep in South Africa in 2011 was two-thirds the level a century earlier and that the number of sheep person in South Africa fell from 5.1 in 1911 to 0.4 in 2011. Figure 2 shows that the real price of wool and mutton was only marginally higher in 2011 than it was a century earlier. Given that costs, especially labour, rose in real terms over the period, these data suggest that living standards for sheep farmers have probably fallen over the century, although they were boosted at times of high prices, particularly in 1951 when the Korean War caused a spike in the wool price. This is in contrast with real average earnings in the broader economy, which rose almost four-fold between 1911 and 2011.



Sources: Various issues of South African Statistics, Abstract of Agricultural Statistics 2012 (Statistics South Africa) and the ASSA demographic model.

Figure 1. Sheep in South Africa



Source: Hobart Houghton 1976, Abstract of Agricultural Statistics 2012, various issues of the Union of South Africa Official Year Book and the Republic of South Africa South African Statistics. Prices were deflated by producer price indices prior to 1948 (the only price indices available), and by the GDP deflator thereafter.

Figure 2: A century of real wool and lamb/mutton prices and per capita income

During the apartheid era, white farmers benefitted from subsidies, generous tax deductions and institutional support (e.g. marketing boards), but from the 1980s onwards, agricultural policy was liberalised and became steadily less racially discriminatory (Kirsten and van Zyl 1996). As South Africa made the transition to democracy in 1994, agricultural policy shifted away from predator control towards land reform, supporting emerging black farmers and protecting farm workers. Increasingly surrounded by game farms and week-end retreats for ‘Engelse mense’ (English people), sheep farmers, especially Afrikaners living on old family farms in the dry interior Karoo, experienced the resurgence in jackal predation as both an economic hardship and a symbol of their political and economic marginalisation. It is in this context that the emotional and value-laden debate over predator control in contemporary South Africa needs to be understood.

Controlling the Black-backed Jackal: A Brief History

The black-backed jackal is an omnivorous and opportunistic hunter/scavenger that has occupied Eastern and Southern Africa for over 2 million years (Hendey, 1974). It has a preference for mammals, especially rodents and small ungulates, but has been known to feed on reptiles, birds eggs, human refuse, carrion, beached marine mammals, seals, fish, fruit and insects (Brassine, 2011; Loveridge and Nel, 2004: 163-4). Jackals eat whatever prey is available, and in farming areas, jackal scat includes sheep remains (e.g. Merwe *et al*, 2009).

The jackal evolved alongside indigenous pastoralists, adapting to include domestic live-stock in its prey base and developing a reputation as a ‘voracious killer of lambs and sheep’, especially during the breeding season (Ginsberg and MacDonald, 1990: 15). By the time that Van Riebeck arrived at the Cape in 1652, the indigenous Khoikhoi herders had well-established flocks of fat-tailed sheep and wore clothes made out sheep skin and jackal pelts (Wilson, 1969: 55). As Beinart observes, in contrast to other settler farming areas such as Australia and Argentina where colonists introduced livestock farming for the first time, ‘the Cape’s predators were ready for colonial livestock from the start’ (Beinart, 2003: 197). Herding and kraaling sheep was essential.

Sheep became an important part of the Cape economy during the seventeenth century (Katzen, 1969). By the end of the eighteenth century, ‘trekboers’ (settler

pastoralists) had pushed into the interior grasslands and the dry Karoo, decimating the once prolific wild game of the Cape Colony in the process (Van Sittert, 1998: 334). The first merino (wool) sheep were imported in 1789, and by the middle of the nineteenth century wool was accounting for three-quarters of export revenues (Katzen, 1969: 291) and was providing the impetus for the development of related enterprises, banking and retail (Hobart Houghton, 1971: 5). It is no surprise that in this context, jackals and other predators were regarded by farmers and government officials alike as a ‘very serious evil’ (in *ibid*: 7).

Early Cape governments placed bounties on predators and as the larger animals (lions and hyenas) were eradicated from farm lands, the jackal bounty increased from 1/25th of that on leopards in 1814 to almost ¾ the level by 1899, by which time the government was paying out over 60,000 jackal bounties per year (Beinart 2003: 204; Van Sittert 1998: 343). Yet jackal predation persisted. Government investigations in 1899 and in the 1920s highlighted the jackal’s remarkable capacity to evade persecution, divisions between farmers (cattle farmers had no interest in controlling jackals and some crop farmers welcomed them because they controlled rodents and other herbivorous mammals), and the role played by unoccupied farms and forest reserves as “breeding grounds” for jackals (Beinart, 2003: 211-4).

The ‘jackal problem’ was elevated to the highest political level in the Western Cape in the early 20th century by Sir Frederic de Waal, Administrator of the Cape from 1911 to 1925. He took over the reins of government at a time when economic recession was imposing hardship across the economy, and where jackal numbers had increased during the ‘Boer War’ between the Afrikaner republics and the British (1899-1902) as farms and livestock were left unprotected (even destroyed by the British) and carrion was abundant (*ibid*: 214). De Waal stressed the importance of local co-ordinated action against ‘freebooting jackals’ and sought to transcend the festering war wounds by arguing that jackals were ‘non-political chaps’ who would ‘eat lamb impartially’ irrespective of the politics of the owners (quoted in *ibid*: 225-6). As the price of wool and mutton rose significantly between 1914 and 1920 (see Figure 2), De Waal prioritised the interests of sheep farmers over crop farmers and urban dwellers by increasing the bounties paid on jackals, expanding hunting and poisoning in state forest land, subsidising hound packs and supplying poison at cost to vermin clubs and landowners.

Between 1914 and 1923, 317,787 jackal bounties were paid (*ibid*: 229) but ultimately what appears to have reduced jackal numbers in the early twentieth century was the widespread use of ‘jackal proof’ wire-mesh fences and co-

ordinated hunting efforts within enclosed areas – the so-called ‘fence and clean-up’ approach. This principle had been tried and tested as early as the 1850s when Michael van Breda, a Calendon farmer, erected a four and a half foot wall around 7,000 morgen of his land, and then cleared the area regularly with a pack of fox-hounds. In his first year, he killed 24 jackals, and then his annual kill dropped to two or three (*ibid*: 220). But this was too expensive for wide-spread replication. It was only with the advent of industrial wire fencing production in the 1890s, that cheaper alternatives became available (Van Sittert, 1998: 348). Anders Ohlsson, a Swedish brewing magnate in Cape Town, demonstrated that mesh wire fences could be effective by erecting them around 70,000 acres of his land, and then killing jackals within the boundaries, allowing sheep, exotic deer and birds to flourish there (Beinart, 2003: 222). Other sheep farmers were able to follow his example when rising wool and mutton prices in the early part of the century provided them the resources to do so. Also important was the 1905 Fencing Act that encouraged farmers to form fencing co-operatives, and the 1912 Fencing Act (amended in 1922) which further assisted the process by providing loans and mechanisms to encourage joint action by neighbours (*ibid*: 224; Van Sittert, 1998: 351). Between 1926 and 1929, 15,302 kilometres of jackal-proof fencing was constructed in the Cape Province alone (De Wet, 2006: 17).

The spread of fencing and of early wind-pump technology transformed the technology of sheep farming, especially in the Karoo. Notably, it allowed commercial farmers to switch away from the kraaling system, and for sheep to range freely in fenced camps supplied by artificial water sources (Archer, 2000: 683-5). But for this to be economically sustainable, it was necessary to ‘clean up’ the jackals, and for this to be successful, co-ordinated effort was essential. Under the 1917 ‘Vermin Control Ordinance’, the Cape was divided into 17 ‘circle committees’ comprising local provincial counsellors and divisional council appointees. These committees defined the duties of hunting/poisoning clubs, framed regulations for laying poison, supervised hunting with dogs and administered the bounty system¹ (Beinart, 2003: 227). The circle committees could authorise hunting clubs to enter private property without the consent of the landowners and to charge them five times the price of the bounty for animals killed on their land (*ibid*: 228). Actions against jackals varied across the province, but in Beinart’s assessment, with this ‘more organised assault, the night of the jackal finally arrived’ (*loc.cit*). According to the 1923 Vermin Extermination Commission, districts which previously had suffered from stock

¹ The provincial government contributed two-thirds of the cost of the bounties (Stadler 2006: 16).

losses as high as 12%, were by then experiencing negligible problems. Jackals were not entirely eradicated from the Karoo, and bounties continued to be paid out over the following decades, but at stabilised and much lower levels, suggesting that the jackal problem had been reduced to a mere shadow of what it had been at the turn of the century (Beinart, 2003: 231).

The notion of what constituted ‘vermin’ changed shortly thereafter. From concentrating on predators, the Vermin Control Ordinance was amended (in 1923 and again in 1946) to include a range of animals that damaged fences (e.g. porcupines), were perceived as preying on chickens (notably raptors), or which competed with livestock for grazing (e.g. hyraxes known locally as the Cape dassie). In 1956, the final year of the bounty system, bounties were paid on 20,084 jackals, but also on 219,322 dassies, 15,323 silver foxes, 8,478 African wild cat, 7,012 baboons, 5,640 crows, 3,408 caracal, 814 mongooses, 359 porcupines, 153 eagles, 121 ardwolfs, 99 otters, 90 leopards and 40 badgers (Hey, 1964: 60).

The bounty system came to an end soon after the administration of the Vermin Control Ordinance was delegated to the Western Cape Department of Nature Conservation in 1955. The Director, Dr Douglas Hey, regarded the blanket targeting of entire species as inefficient, ecologically unsound, and as running counter to the principle of conservation (Stadler, 2006: 13). In 1957, following a commission of inquiry, the Cape Provincial Government removed all animals except black-backed jackal, caracal, Cape dassie, baboon and bush pig from the list of vermin (*ibid*: 14), and replaced the bounty system with ‘technical aid’ and financial support to hunt clubs, but with bounties remaining on the heads of jackal and caracal until hunt clubs were up and running.

Hey was a conservationist, but one who took human-wildlife conflict seriously and the need for selective predator control as part of a broader strategy to protect biodiversity. Writing in the mid-1960s he observed:

‘Today, the Cape Province is largely subdivided into farms and consequently the farm has become the habitat of surviving forms of wildlife. Wildlife conservation can, therefore, only be effective with the support and good will of the farming community. The South African farmer, the descendent of pioneering stock, is a rugged individualist and the master on his own property. Conservation measures cannot be enforced, they can only be introduced on a basis of cooperation and mutual understanding. While the majority of farmers are prepared to accept wild animals as residents on their farms, they will not tolerate undue crop damage or losses of livestock’ (1964: 59).

Significant additional resources were provided to the hunt clubs as the bounty system was phased out. A hound breeding and research station was established at Vrolijkheid nature reserve (1962) to supply hunting packs to farms, and to provide training courses in trapping and poisoning (Hey 1964: 61). By the mid-1960s there were 110 hunt clubs in the province maintaining hound packs, employing full-time hunters, and receiving subsidies from the government (*ibid*: 59). In Hey's assessment, the system was 'proving increasingly effective and is sound conservation practice, for animals are hunted only when they are a nuisance and not merely for the sake of hunting' (1967: 158).

The jackal, however, was seen as requiring additional control measures. Sodium monofluoroacetate, a poison known as 1080 that is highly effective against canids, but causes a slow and agonising death, was introduced in 1961 and the 'coyote-getter', a baited trap which discharges a cyanide cartridge, was introduced after the US Fish and Wildlife services, on Hey's request, adapted it to meet local conditions (Hey, 1967: 158). Whilst declaring the jackal to be 'relatively well controlled' by these methods, Hey nevertheless signalled some disquiet about the non-selective impact of the poison, and that the coyote getter also killed vultures, bat-eared foxes, silver jackals, mongoose, dogs, genets, iguanas and hyenas (*ibid*: 159-160) He also reported that the jackal's natural wariness and keen sense of smell meant that baiting the getter was an unpleasant challenge (recommended recipes included 'equal parts of well-rotted beef, subcutaneous beef fat and Rocquefort cheese' (*loc. cit*)) and that even when jackals were successfully attracted to the trap, a significant proportion managed to 'pull' the getter without getting killed. In 1964 he wrote that:

'It has been our experience that a jackal will not pull a getter a second time and we have no intention of developing a race of jackals educated to the getter. At it is, hunters claim that jackals can almost read and write' (1964: 63).

Three year on he was still complaining of mechanical defects and the need to rectify them because 'one seldom has a second chance at a smart Jackal!' (1967: 159). Subsequent research on the capacity of jackals to avoid coyote getters found that over a three year period, the proportion of jackals that came into contact with coyote getters fell from 53% in year one, to 49% in year two and to 8% in year three (Brand *et al*, 1995) – thereby confirming what the early biologists and farmers had long suspected about the adaptive capacity of the jackal in this regard.

Although Hey was innovative in his attempts to assist farmers to kill jackals, he was clear that total extermination was neither feasible nor desirable, noting that

‘The Karoo will have lost something irreplaceable should the call of the Jackal no longer be heard on a calm moonlight night!’ (1964: 69). He also observed that a ‘program of total extermination, particularly of minor predators such as bat-eared foxes and mongooses would in time lead to excessive populations of rodents and insects which might prove more difficult and expensive to control’ (1964: 69). Such broader ecological concerns steadily gained ground in conservation circles and in 1973 the Hazardous Substances Act restricted the use of sodium cyanide, 1080 and strychnine (Snow, 2006). However, the use of poison was not eliminated from agricultural lands as farmers found creative ways of obtaining it from permit holders and some (perhaps many) experimented illegally with agrochemicals as poisoning agents.

In 1978, a commission of investigation recommended that the list of declared vermin be amended to just three: black-backed jackal, caracal and vagrant dogs (Stadler, 2006: 15). Nine years later the Problem Animal Control Section of the Department of Nature Conservation was closed and the provision of baits and lures to farmers and hunters was ended (Stadler 2006: 16). Subsidies to hunt clubs were phased out between 1988 and 1993, and in 1989 the hound breeding facilities were closed (*ibid*). Farmers now had to control predators themselves, or hire hunters to do it for them on an unsubsidised basis. But by then, real sheep and mutton prices were lower than they had been a century earlier (see Figure 2), and farmers had limited capacity to do so. They also had to contend with more protective labour legislation, higher minimum wages and a shift in the focus of agricultural extension efforts towards emerging farmers in the post-apartheid period.

As farm employment contracted and agricultural land use shifted to include more game farms and ‘life-style’ or ‘week-end farmers’ jackals recolonized sheep-farming districts. By 2006, the National Wool Growers Association was describing predation as a major threat to small stock production, calling for more financial, organisational and technical support from the state (e.g. De Beer, 2006). There is, unfortunately, no systematic data on jackal numbers, but anecdotal information from farmers suggests that the ‘jackal problem’ re-emerged in the mid-1990s as a consequence of a range of social and economic changes. In a posted comment on a South African hunting website, Yol Bolsun, a Karoo farmer observed:

‘Hier in Tarkastad in die area waar ek boer het ek in die vroeë negentigs vir die eerste keer met rooijakkals kennisgemaak. In die begin was dit net n snaaksigheid en ons het staaltjies van die ou boere gehoor van hoe hulle jakkalse gejag het. Toe hulle my lammers begin eet was dit nie meer snaaks nie. Hier by 1995 – 1997 rond. [I farm in the Tarkastad area and first

encountered the black-backed jackal in the early 1990s. At first they were a curiosity and we slowly started hearing about how the old farmers had hunted jackals. But when jackals started eating my lambs (in about 1995-7) it was no longer a joke].

Ou boere het n staande reeling gehad om elke donderdagoggend te jag. Hulle kan nou nog vertel waar hulle die laaste jakkalse gedood het. Vermoed laat 60 vroeë 70s. So die storie dat die jakkies nooit gewen was nie is nonsens. [The old farmers had an agreement to hunt jackals every Thursday afternoon. They can still tell you where they killed the last jackal, sometime in the late 60s, early 70s. So the story that the ‘jakkies’ were never overpowered/defeated is nonsense.]

Volgens my eie teorie was dit a.g.v: omtrent alle plase was bewoon; baie werkers op plase (menslike voetspoor was oral); sif/ jakkalsproefdraad was in stand gehou; almal het kleinvee gehad; nie groot areas waar net wild of beeste geboer was nie; regering het hulp gebied. [My theory is that this was because almost all farms were occupied, there were many people on the land (human tracks everywhere); jackal-proof fences were in good condition, everyone had small stock, there were no huge areas where just cattle and game were farmed, and the government provided assistance].

Nou is seker minder as die helfte van die boere oor met seker n nog groter vermindering in aantal werkers. Heinings is glad nie meer jakkalsproef. Baie wild /beesboere tussenin. Ek glo die jakkies is nou vir altyd hier. [The number of farms has fallen by more than half, with an even greater decline in the number of workers. Fences are no longer jackal proof. We have lots of cattle and game farmers in between us. I believe the jackal is now with us forever].’²

A farmer calling himself ‘Britsman’ endorsed this analysis, adding several observations on the relationship between hunting and the presence of jackals (emphasis in the original):

‘I have farmed on the present farm situated in the Stormberg region (Burgersdorp) of the East Cape since 1968. After the successful culling of jackals in the ring fenced areas in the 1960s I would say that the **following factors** have influenced the return of problem **black back jackals**.

- 1) Veld fires have destroyed vast sections of our netting wire fences leaving predators the ability to roam at will. These subsidized fences were erected in the 1920s and 1930s under Cape Province Fencing Act which legislated that all livestock farms at the time had to be ring fenced to a particular standard.

² Posted December 19, 2008: <http://jaracal.com/viewtopic.php?f=102&t=138&view=previous>

- 2) The average sized occupied farm has increased in size from +- 800 ha to +2500 ha today.
- 3) Because of less farm owners and excessive labour legislation, including housing rights, and the small profit margin, fewer hands are used and only immediate family members stay on the farm. In my case from +-30 to 4 on weekdays only, thus the **human presence has diminished**.
- 4) In the 1960s the farm staff's extended family members would hunt and kill, using packs of dogs, any game found from dassies to reedbuck. Everything that could be eaten by them or their dogs would be done so including fresh dead animals. Since the 1990s only sheep dogs kept in an enclosure around the homestead are allowed.
- 5) As a child when on holiday from boarding school I would roam the farm shooting dassies, meerkats and hares for the staff. There used to be hundreds of dassies. Sometimes I would shoot 4 or 5 in an afternoon using .22 Mauser equipped with open sights. To day you would be lucky to see about 4 dassies in a day. At night looking for jackals you see some springhares and a few hares. In 1990s I once counted 17 steenbokke one night. Today about 6 on the same route.
- 6) In the 1960s if a dead animal was not removed within a day +30 vultures and hundreds of crows would devour the carcass. Present time. I have in this year counted up to 19 vultures at a lynx kill and many crows. In the 1990s vultures were few, probably as the predator numbers started to increase farmers poisoned carcasses to try and kill them and ended up killing the vultures. I think today most farmers are more conservation minded and use poison only if really desperate.
- 7) Only in 1990s I started seeing black-backed jackals on the farm. After all they were reaching saturation point in the conservation areas and moving onto our farms as we lost control.
- 8) I think that in the 60s, 70s and part of the 80s **HUMANS were the MASTER PREDATORS**. I could also say that Humans were also the Master Scavengers with the help of the vultures. In those years the jackals struggled to survive. Nowadays the role has reversed and **JAKKIE is the MASTER PREDATOR**
- 9) Ons moet als net weer omswaai en die 'TOP DOG' wees' [We must turn this around again and become the top dog].³

Britsman's analysis is interesting for its interpretation of the social origins of the jackal problem and his observation that the re-emergence of the jackal appears to have reduced the number of wild animals on his land in ways that previous

³ Posted 1 February 2009: <http://jaracal.com/viewtopic.php?f=102&t=138&view=previous>

hunting by humans and dogs had not. The implication here is that the jackal has been bad for both sheep farming and biodiversity on his land. However, it is important to bear in mind that these are casual observations and that scientific studies are needed on the impact of jackals on other wildlife.

The claim that jackals have been recolonizing farm lands since the early 1990s is echoed by agricultural organisations. Petrus de Wet of the Predation Management Forum told delegates at the annual Congress of the Eastern Cape Red Meat Producers Organisation in 2011 that the ‘problem had more than doubled in the past twenty years’.⁴ That same year the *Farmers Weekly* reported that farmers were losing 10% of their stock to predation annually; 63% to jackal, 29% to caracal and 1% to dogs (Schoeman, 2011) and agricultural organisations in the Western Cape requested that the black backed jackal and the caracal be declared a disaster.⁵

CapeNature, the body responsible for biodiversity and conservation in the Western Cape Province, started a consultative process with environmental organisations, wild-life managers and farmers over strategies for dealing with damage-causing animals. In 2006, a conference on ‘Resolving Human-Wildlife Conflict: Prevention is the Cure’ sponsored by *CapeNature*, the Endangered Wildlife Trust and the National Society for the Prevention of Cruelty to Animals (NSPCA) was held to explore ‘holistic’ approaches to problems of predation in South African agriculture, the underlying principle being that indiscriminate lethal control methods such as poisoning and trapping were unacceptable and inefficient, and that non-lethal means of protecting live-stock from predators were needed.⁶ Such consultations included farmers and representatives from agricultural industry, but the process was fraught by suspicion on the part of sheep farmers towards *CapeNature* and various environmental or ‘green’ organisations. As discussed in more detail below, rival ‘jackal narratives’ emerged over how best to control the predator when *CapeNature* acted to limit the use of lethal methods.

⁴ Reported in *Farmers Weekly* 23 September 2011:

<http://www.farmersweekly.co.za/article.aspx?id=10585&h=Predation-killing-red-meat-production>).

⁵ See DCA Fact Sheet:

[http://www.capenature.co.za/search_result.htm?sm\[p1\]\[category\]=743&sm\[p1\]\[persistent\]=1#content_2178](http://www.capenature.co.za/search_result.htm?sm[p1][category]=743&sm[p1][persistent]=1#content_2178)

⁶ The conference report can be downloaded from:

http://196.22.135.28/localuser/ewt/pdf_library/documents/Action%20Plans/20061129%20HumanWildlife%20Conflict%20Workshop%20Report.pdf

Rival Jackal Narratives in the Western Cape

In 2007, a leopard died in a leg-hold (gin) trap near the Kammanassie Nature Reserve. Following wide-spread media coverage, *CapeNature* formed a ‘partnership’ with an environmental organisation called the *Landmark Foundation* to ‘try and convert farming in the region to holistic, non-lethal predator control methods that will enable livestock predation to be effectively managed’ and ‘to work towards terminating the indiscriminate use of leg-hold (gin) traps, poison traps and hunting dog packs’.⁷

These are worthy aims in that they seek to prevent cruelty to animals and conserve biodiversity whilst allowing for sustainable agriculture in the presence of predators. But achieving a balance between these aims is not easy, especially where core values are at stake. For farmers, the core value is being able to control their own landscape, including predators by any means necessary to protect their livelihoods. As Hey observed half a century earlier, Afrikaans sheep farmers are ‘rugged individualists’ who bristle at the idea of being told not to kill predators. But for the *Landmark Foundation*, which is an influential NGO whose partners and funders range from high-end retailers like Woolworths, banks, Universities, public and private environmental organisations and international NGOs,⁸ the core value is to promote ecological balance in South Africa and prevent cruelty to animals. It engages in educational and outreach programs, campaigns against leg-hold traps (including exhibiting a sculpture of a leopard crafted out of gin traps at the 2012 Grahamstown art festival) and posts horrific images of animals suffering and dying in traps on its website.⁹ It also works with several farmers in the Baviaanskloof region of the Eastern Cape to conserve leopards by introducing guard animals (Anatolian dogs, alpacas, donkeys)¹⁰ instead of traps, and by seeking to brand their products as predator friendly.

Karoo farmers, however, are suspicious of the *Landmark Foundation* for its blanket opposition to lethal control of predators, including the jackal, and for its uncompromising opposition to all leg-hold traps. Whereas other environmental

⁷[http://www.capenature.co.za/news.htm?sm\[p1\]\[action\]=content&sm\[p1\]\[cntid\]=1148&sm\[p1\]\[persistent\]=1](http://www.capenature.co.za/news.htm?sm[p1][action]=content&sm[p1][cntid]=1148&sm[p1][persistent]=1)

⁸<http://www.landmarkfoundation.org.za/partners.html>

⁹<http://www.thegreentimes.co.za/stories/creativity/item/1418-art-for-conservation-brightens-up-grahamstown>

¹⁰<http://www.landmarkfoundation.org.za/predators-on-farms.html>

organisations like the *Cape Leopard Trust* and *CapeNature* tolerate the use of ‘soft traps’ (iron traps with smooth, rubberised jaws) because non-target animals can potentially be released from them unharmed, the *Landmark Foundation* argues that animals still die of stress, dehydration and self-mutilation in these traps and that there is no such thing as ‘soft barbarism’.¹¹ For this reason it campaigns against Peter Schneekluth’s gin trap factory in Prince Albert (a quaint Karoo town popular with tourists). Bool Smuts, the Director of *Landmark Foundation*, personally visited the factory and encouraged his supporters to put pressure on the factory and on the town council. Invited to comment by the local paper he said:

‘Over the past year we have demonstrated dramatic success using only stipulated non-lethal control methods in the entire Baviaanskloof area with the full co-operation of neighbouring farmers. Since the implementation covering 13,000 small livestock animals, less than 10 individual losses attributed to predators have been reported. Recently farmers and the local community staged a public and symbolic burning of 160 gin traps to signify their confidence in the positive change.

So it was with sadness and anger that I left the beautiful and peaceful town of Prince Albert some months ago where a factory is quietly manufacturing up to 1,200 gin traps a month, two hundred of which are leopard traps – it is illegal to use these devices on protected species. The factory owner, Peter Schneekluth, boasts 3,000 farmers on his books, which means up to 15,000 of his traps enter the system each year. I wonder how the Prince Albert Tourism Association and the town’s political leadership explain such an anomaly to the tourists and other visitors to their unique town?’¹²

Peter Schneekluth responded as follows:

‘And now activists, always eager to identify a cause to fight for, have found my factory, the “Place of Evil”. The discoverer was Dr. Bool Smuts (a non-practicing medical doctor) of the Landmark Foundation. On 16th of July he entered my premises under false pretences and under the name of Dave Mills, talked his way into the factory, charmed my staff, took photos and purchased traps. A few weeks later I received a flood of toxic e-mails. The vilest language was used, mostly written by “ladies”. The mails also revealed an utter ignorance about the dreadful sheep/predator situation, and

¹¹ See e.g. <http://www.landmarkfoundation.org.za/gin-traps.html>; and <http://www.landmarkfoundation.org.za/2/post/2011/03/newsletter-burning-of-the-traps-20-sept-2008.html>

¹² See <http://princealbertfriend.blogspot.com/2008/11/jakkalse-skape-slagysters-en-aktiviste.html>

all writers lamented the fate of jackal, and not a word of pity for our sheep. However, some of the more balanced writers suggested some alternative, non-lethal (ethical) methods such as the use of Anatolian guard dogs, protective collars, alpacas and donkeys. The problem with these methods is, unfortunately, that they work only under certain favourable conditions. If they would work as well as activists claim, farmers would have adopted them long ago, and my trap factory would have had to close down. Farmers would only be too glad to dispose of traps, because trap-work is expensive, cruel, extremely labour intensive and highly frustrating, but gin traps are often the last line of defence, the final weapon when all else fails. In other words, as long as there is not a viable alternative to gin traps, they will be used, banned or un-banned. Instead of always criticizing, activists should pool their considerable resources and develop an alternative to the cruel trap.

Instead, Dr. “Dave Mills” incites his followers to threaten Prince Albert’s tourist industry with a boycott, unless this industry, with the backing of PA Municipality, throws me, and my “Evil Place”, out of town, tarred and feathered. This is blackmail and conceitedness combined, and that from an outsider via the internet. And, in doing so, “Dave Mills” is creating discontent in our town.’¹³

Joseph Steyn, a stock farmer outside Prince Albert also responded to Smuts, pointing out that:

‘Erger as wat ‘n diereliefhebber sy troeteldier liefhet, het ons ons skape en bokke lief – ons lewens hier op die plaas word deur hulle welstand gewaarborg. [We love our animals more intensely than animal-lovers love their pets because our livelihoods depend on them]

Roofdiere wat in ons area voorkom vind dit eenvoudig net makliker om ‘n skaap of boklam te vang, wat nie so vinnig en rats is om te ontvlug, as ‘n steenbok of haas wat sy natuurlike prooi verteenwoordig nie. [Predators (literally ‘thieving animals’) find it easier to catch a lamb or kid than to catch their natural wild game like hares and small buck.]

Die wreedste vorms van verminking denkbaar het ons al onder skape en bokke hier op die plaas beleef: Boklammers wat honger agter hul ma’s aanloop omdat hulle nie kan soog nie omdat ‘n roofdier hul bekkies en tonge afgevreet het; Boklammers waarvan die ore en sterte stomp afgevreet is; Skaaplammers waarvan die boudspier uitgevreet is sodat hul beswaarlik kan loop; Dorperooie waarvan die ingewande op die grond sleep as sy loop nadat ‘n jakkals haar buik op haar sy oopgeskeur het; ‘n Merinolam wat

¹³ <http://princealbertfriend.blogspot.com/2008/11/jakkalse-skape-slagysters-en-aktiviste.html>

staan en eet omdat hy honger is, maar as hy sluk val die gekoude lusern op die grond omdat sy slukderm afgevreet is deur 'n roofdier. (Selfs nie die veearts op Beaufort-wes kon nie sy lewe red nie!); Lammers wat doodgewurg lê, maar nie aan geëet is nie. [We experience cruel and barbaric mutilation of our sheep and goats: kids that follow their mothers hungrily but cannot feed because a predator has bitten off their face and tongues; kids whose ears and tails have been eaten off; lambs whose haunches have been eaten out so that they walk with great difficulty; ewes with entrails dragging on the ground behind them; a merino lamb trying to eat in vain because food falls onto the ground through a hole in his throat (not even the vet could save his life!); lambs choked to death but otherwise unscathed.]

As gevolg van boerdery eenhede (plase) wat al groter moet word omdat produktepryse elke jaar 3% minder styg as ons insetkoste, raak die beheer van roofdiere moeiliker en neem hul getalle kommerwekkend toe. Alle metodes van roofdiere afskrik, lammers beskerm tot die skuldige roofdiere elimineer word gebruik ons om ons kleinveekuddes te beskerm. [Producer prices have been rising 3% slower than input costs, necessitating a steady increase in average farm size. Predator control is becoming more difficult and their numbers are increasing at a worrying rate. We are using a wide array of deterrents and protective gear to protect our flocks under the guilty predators are eliminated].

Om roofdiere te elimineer is nodig indien die verminkings en slagtings nie gestop kan word nie. Daarvoor het ons die beproefde metodes nodig wat al eeue lank gebruik word om die probleem te beheer. Slagysters word as die laaste uitweg gebruik om sulke wrede roofdiere selektief mee weg te neem. Kleinvee is al waarmee ons in die ekstensiewe dele van ons distrik en land kan boer- moet asseblief nie die verminking van ons skape en bokke laat toeneem deur slag-ysters te verban nie. [If we can't stop the mutilation and slaughter of our livestock by predators, we have to eliminate them from our farms. This is why we are using tested methods (gin traps) that have been used for centuries in order to get rid of these cruel predators in a selective manner. Small stock is the only viable farming enterprise in arid areas. Please do not allow the mutilation to increase by banning gin traps.]

Diere is ons lewe !! [Animals are our lives!]

When singer Chris Chameleon was put under pressure not to perform in Prince Albert as a protest against the trap factory, Steyn took up an invitation to visit him and explain the farmers' side of the story. Chameleon subsequently blogged about his greater appreciation for the plight of farmers, concluding that “all the

time and energy spent attacking gin traps and all the time and energy spent defending gin traps would be time and energy better spent in search of a better alternative”.¹⁴

The *Landmark Foundation* is infamous in the farming community for its demonization of farmers. When asked by *The Farmer’s Weekly* for its response to the allegation that ‘it uses few exceptional and drastic incidence of predator control over and over again to purposefully put farmers in a bad light’, Smuts retorted:

‘Such blame of putting farmers in a bad light should be placed on people like Mr Petrus de Wet, Chairman of the National Woolgrower’s Association, who utters on national television programmes comments like “fence your property and eliminate all predators on your property. That is the only 24/7 solution to this problem”. Such position statements of the industry to the public are shocking, and dare I say, revealing’.¹⁵

Smuts subsequently appeared on television arguing that farmers should be punished by consumer boycotts if they killed predators. This prompted the creation of a *YouTube* video¹⁶ containing footage of mutilated livestock followed by a series of ‘call and shoot’ killings of jackals. The video was set to the soundtrack of Bok van Blerk’s controversial Afrikaans ballad ‘De la Rey’ which celebrates a Boer war hero, calling on him to return and lead the Afrikaners. The song has been interpreted as a “call to arms”,¹⁷ which in the context of this video it certainly is.

The *Landmark Foundation* is sceptical of claims made by organised agriculture about the costs of predation¹⁸ but most gallingly for sheep farmers, it contests the right of farmers to control predators on their own land. A newsletter from 2008 states: ‘While farmers and retailers may own their land and their businesses, and people may own and participate in their culture, the biodiversity of this country

¹⁴ See <https://www.facebook.com/Stop.Gin.Traps.SA/posts/375901299110375> and Chris Chameleon’s response ‘Gin traps and Prince Albert’: http://www.chrischameleon.com/fr_blog?postid=2065688&feature=2374523

¹⁵ Responses posted on 5 July 2009. Available on: http://www.landmarkfoundation.org.za/uploads/5/9/0/1/5901915/16_july_2009_bool_smuts_response_to_farmers_weekly_questions.pdf

¹⁶ <http://www.youtube.com/watch?v=MTXVdIBnDd8&feature=youtu.be>

¹⁷ <http://www.guardian.co.uk/world/2007/feb/26/music.southafrica>

¹⁸ Responses posted on 5 July 2009. Available on: http://www.landmarkfoundation.org.za/uploads/5/9/0/1/5901915/16_july_2009_bool_smuts_response_to_farmers_weekly_questions.pdf

and these animals belong to us all!’¹⁹ This is a direct challenge to view that has dominated nature conservation in the Western Cape since Douglas Hey assumed responsibility for managing problem animals, that the farmer is ‘master on his own property’ and that conservation measures could ‘only be introduced on a basis of cooperation and mutual understanding’.

To the great consternation of sheep farmers, the Western Cape government appeared to concur with the *Landmark Foundation*. At the 2006 ‘Resolving Human-Wildlife Conflict: Prevention is the Cure’ conference *CapeNature* officials argued in favour of holistic, non-lethal approaches, including the branding of agricultural products as predator friendly (e.g. de Wet, 2006) and in late 2008, *CapeNature* announced that effective from January 2009, ‘certain methods such as gin traps and night-hunting, may no longer be used as methods to manage damage-causing animals in the Western Cape Province’. Noting that gin traps resulted in the capture and often subsequent death of many non-target species, such as honey badgers, black eagles and leopards, Kas Hamman, the Director of *CapeNature*, explained that:

‘More often than not the wanton removal of damage-causing animals simply contributes to further loss in biodiversity and, in many instances, results in increased livestock or crop losses. This is due to the fact that animals dispersing from adjacent areas will fill the vacuum created by the unselective removal of damage-causing animals’.²⁰

According to this perspective, not only is hunting ultimately ineffective, but it may have inadvertently caused jackal numbers to increase. The *CapeNature* website states that it is “concerned that the unselective hunting of jackal and caracal is the reason for the increase in the population of these species over the last 400 years” and that this “human-induced increase of jackal and caracal” poses a threat to other species, resulting in biodiversity loss.²¹ We argue below that this environmental jackal narrative is based on a particular reading of the science of predator ecology rather than the history of predator control or the experience of sheep farmers in South Africa.

¹⁹ <http://www.landmarkfoundation.org.za/2/post/2011/03/newsletter-burning-of-the-traps-20-sept-2008.html>

²⁰ [http://www.capenature.co.za/news.htm?sm\[p1\]\[action\]=content&sm\[p1\]\[cntid\]=1426&sm\[p1\]\[persistent\]=1](http://www.capenature.co.za/news.htm?sm[p1][action]=content&sm[p1][cntid]=1426&sm[p1][persistent]=1)

²¹ [http://www.capenature.co.za/news.htm?sm\[p1\]\[action\]=content&sm\[p1\]\[cntid\]=2080&sm\[p1\]\[persistent\]=1](http://www.capenature.co.za/news.htm?sm[p1][action]=content&sm[p1][cntid]=2080&sm[p1][persistent]=1)

The Environmental Jackal Narrative

The environmental jackal narrative rests on three pillars: a value judgement that persecuting jackals is cruel; an ecological claim that it is counter-productive; and a policy stance recommending that farmers opt for non-lethal means of protecting their live-stock. For example, the NSPCA believes that control methods such as gin traps, poisons, hunting with dogs, and denning (extracting and eliminating young from dens) are ‘inhumane’ and ‘have no place in a progressive society’ and that the ‘removal of damage causing animals often leads to a vacuum being created thereby allowing other animals of the same species to compete for this territory; most often increasing the intensity of preying on domestic animals and increasing the problem’. Rather, the organisation supports the use of ‘non-lethal and ethically acceptable options’ that are ‘not only good for the welfare and conservation of wildlife, but are often more effective than shooting or trapping so-called nuisance wildlife’.²² The *Landmark Foundation* concurs, adding that the ‘best way to encourage a decrease in jackal and caracal numbers is to have stable and established family groups in areas.’²³

This environmental jackal narrative draws on a range of supportive scientific studies of coyotes (*Canis latrans*) which show that coyote populations adapt to persecution (whether by wolves or humans) and that farmers exercising lethal control may well find themselves worse off as a result. The core of the argument is that coyotes are territorial social animals where breeding is limited to the alpha pair, with subordinate animals either dispersing to new territories or staying to help their parents raise pups (e.g. Andelt, 1985; Crabtree and Sheldon, 1999; Knowlton *et al*, 1999). Coyote populations which are not persecuted by humans appear to have larger social units and higher adult survival rates and lower reproductive rates than populations subject to persecution (see summary in Knowlton *et al*, 1999: 401-2). Coyote advocates thus argue that hunting coyotes is counterproductive because it fractures their social structure, thereby allowing beta females to breed whilst incentivising the remaining adults to hunt for larger food packages (e.g. sheep rather than rodents) to feed the pups (see scientific research summary in Crabtree 1997).

This is a compelling narrative, but as Knowlton *et al* point out, the argument that coyote populations not subject to human-induced mortality pose less threat to

²² <http://www.nspca.co.za/page/23663/Damagecausing> (accessed 1 June 2013).

²³ http://www.landmarkfoundation.org.za/uploads/5/9/0/1/5901915/16_july_2009_bool_smuts_response_to_farmers_weekly_questions.pdf

livestock than persecuted populations is ultimately speculative and that ‘simultaneous measures of both reproductive rates and population size from populations in similar environments would be needed to clarify this issue’ (1999: 404). They also point out that sheep-killing behaviour varies across coyote populations, and that it might be learned, or limited to particular individuals, or an adaptive response which does not happen uniformly (*ibid*: 403).

Less is known about the black-back jackal than the coyote, though the available studies suggest clear similarities between these highly adaptive species. Like the coyote, the social structure of the jackal is based on mated pairs (the average size group is 2) who will defend demarcated territories (see e.g. Ferguson *et al*, 1983; Bingham and Purchase, 2002 and review in Bothma 2012). Some young jackals are known to help their parents raise additional litters, an evolutionary strategy stemming from the fact that they are as genetically related to full siblings as they are to their own offspring. According to a study on the Serengeti Plain in Tanzania, helpers have a positive impact on pup survival primarily because it increases the number of provisioning adults that can capture prey and make it available to the pups (Moehlman, 1979: 383).

Jackals give birth to an average of 4 pups after a short gestation period (64 days). Bingham and Purchase found an average productivity rate (viable offspring produced per adult jackal per year) of 1.5 which suggest that jackal populations are ‘capable of rapid recovery following population crashes’ and that ‘only very intense culling would have any significant long-term effect on jackal populations’ (2003: 25). Ferguson *et al* report a case where pups differing in age by a few weeks were extracted from the same den, suggesting that the alpha male had also bred with a helper female (1983: 499). They suggest that ‘as this happened in an area where human persecution on jackals is intense, polygamy may be one of the mechanisms with which jackals compensate for high mortality’ (*loc.cit*).

But even where compensatory breeding does not take place, the fact that young jackals typically disperse within a year up to 135 kilometres away from the natal den, implies that if a territory becomes vacant as a result of hunting, it ‘will be filled almost immediately by a young and vigorously reproducing pair while the boundaries of the existing ranges are adjusted’ (Bothma, 2012: 29; see also Ferguson *et al*, 1983). In short, for a range of reasons to do with compensatory breeding and in-migration, the biological science underlines the difficulty of eradicating jackals from the landscape, especially when there is an easy nutritious food source as in sheep farming areas.

In 2012, *CapeNature* released an independent ‘literature review of the ecology and control of the black-backed jackal and caracal in South Africa’ by J du P Bothma, a retired university professor and past president of the South African Biological Society and the Southern African Wildlife Management Association. The ‘Bothma report’ concluded that ‘all attempts at the control of black-backed jackal populations have failed’ (2012: 7), specifically noting that ‘Oranjejag, one of the largest and oldest carnivore hunting groups in South Africa could not succeed in controlling the black-backed jackal population in their region of operations over several decades of intensive effort’ and that in KwaZulu-Natal, the population of black-backed jackals stayed stable despite 15 consecutive years of hunting jackals with trained hounds’ (*ibid*: 8). Bothma observed that the ‘only effective program to control black-backed jackal numbers would be to exterminate all the jackals nationally’ but that this would be ‘economically impossible and unsound ecologically’ (*ibid*: 9).

The slippage in the Bothma report between ‘control’ and ‘eradicate’ is typical of the environmental narrative and one of the reasons why many farmers are suspicious of it. Their historical experience of the collective control of jackals, especially the success of fence and clean-up strategies, indicates that control is possible even in the absence of eradication. The environmental jackal narrative, however, conflates the on-going presence of the jackal with failure to control it (thereby inviting farmers like Bolsun to dismiss the claim as ‘nonsense’) by assuming that compensatory breeding and in-migration necessarily negated the effect of hunting.

The Bothma report recommends that farmers learn to practice ‘holistic ecosystem husbandry’ such as selecting for ewes who are able to protect their lambs, ensuring that abundant alternative wild food sources exist on the farm, and using non-lethal means of protecting their sheep (*ibid*: 7-9). He notes that jackals might actually benefit farmers by consuming herbivorous creatures like dassies, rodents and spring-hares, thereby providing more plant food for domestic livestock (Bothma, 2012: 6). This is consistent with Britsman’s observations that the number of dassies and hares had fallen on his land since the arrival of the jackal and there is strong evidence that jackals can usefully control rodents (a study from the Drakensberg region found that a single jackal was capable of consuming approximately 1500 field mice or 500 vlei rats per year (Rowe-Rowe, 1986)). But whether this translates into a net benefit for farmers is of course an open question, and questions remain about the impact of jackals on the wild prey base either directly through predation, or indirectly via

the suppression of other predators like the Cape fox and the bat-eared fox (Kampller *et al* 2013).

The Farmer Jackal Narrative

Sheep farmers have a rival understanding of jackals drawn from their own experiences, from discussions with older farmers who hunted them in the past, and from a small body of professional hunters who conduct their own observational studies and offer courses on jackal behaviour and hunting techniques. For example, Heinrich Funck offers training courses in calling and shooting jackals and has developed a narrative that justifies lethal control. He argues, based on his own hunting and observational studies (which include the use of GPS data) that jackals are territorial, that they do indeed recolonize vacant territories but that jackal territories shrink when there are more jackals and that jackals eat sheep even in the presence of wild game: in short, the fewer jackals on a farm, the better.²⁴ Funck promotes his views, and hosts discussions about predators on his website www.jaracal.com. He has been especially critical of *CapeNature*'s approach, penning an extended critique that includes his own data on jackal reproduction rates, tolerance for overlapping territories, and dietary preferences.²⁵

Farmers have also developed new understandings of jackal behaviour by experimenting with non-lethal control methods. Niel Viljoen, a farmer from Loxton, has been supported by the agricultural industry to conduct research on the jackal problem, and Pieter Albertyn, a farmer from Bredasdorp has experimented with many non-lethal methods of protecting sheep and advocates that farmers adopt a changing set of mixed methods to respond to the jackal's impressive capacity for adaptation.²⁶ None of these men have had their work published in peer-reviewed scientific journals, but they enjoy widespread respect within the sheep farming community for their research. Such expertise, however, is often brushed aside by environmentalists who construct farmers as ignorant of 'the science'.

²⁴ See various postings on <http://www.jaracal.com/index.html> and report in *Pacific Breeze* (<http://www.pacificbreeze353.com/newsletters/index.cfm?y=article&company=17&article=802&nl=160&click=web&subsection=63&langu=1>)

²⁵ http://www.jaracal.com/capenature_response_to_reasons_dca_management.html

²⁶ Talk given at the 'Seeking solutions to livestock – farmer wildlife conflict in the Western Cape, March 6, 2013.

For example, Dan Parker of the Wildlife and Reserve Management Research Group at Rhodes University told an interviewer from *Farmer's Weekly* emphatically that culling jackals would 'undoubtedly result in a breakdown in meso-predator social structure' because 'removing the dominant pair creates a vacuum which is often filled by dispersing sub-adult animals' and that this was 'not some outlandish idea that has been cooked up in the ivory towers of universities' because 'there are numerous published field studies across Africa (and the world) clearly demonstrating that when the population dynamics of a predator population are upset (by hunting, for example) the animals will compensate by producing larger litters, dispersing over bigger areas and altering their behaviour' (quoted in Smith, 2012).

This prompted several responses by farmers challenging his certainty and interpretation of the science. Trevor Filmer (2012) bristled at what he saw to be an arrogant appropriation of the mantle of science, arguing that:

'Until these academics have set up successful working models that prove their theories to be fact, they should have the decency to admit that their opinions are no more than theories. Academics also love to use a smokescreen of clever-sounding catch phrases such as 'apex predators killing smaller predators and altering meso predator behaviour' and predator populations 'self-regulating' if left undisturbed. I don't know who this impresses, but none of it solves the problem.'

In a posted comment on the *Farmer's Weekly* website, 'LMB' (Lukas Botes, a Laingsburg sheep farmer and head of the local farmer's organisation) engaged more specifically with Parker's assumptions, challenging him to 'confirm, without any doubt, that the larger litters of predators is caused by hunting and not by better food and conditions for the predators' noting that 'as farmers we know that the better conditions the more and bigger the litters became.' Botes went on to observe that as jackals were being culled in national parks and on game farms to protect springbok, it was unreasonable to suggest that sheep farmers desist, concluding that 'You can't keep a cat in a bird cage.'²⁷

Both Botes and Filmer placed their finger on a weak point in the environmental jackal narrative, notably the leap from what we know about the response of predators to persecution, to the untested claim that farmers should desist from lethal control in order to live in some sort of ecological balance with jackals. Note that neither rejected the science. To the contrary, both are demanding more

²⁷ (8 December 2012). <http://www.farmersweekly.co.za/article.aspx?id=32419&h=Talk-first,-shoot-later>

evidence in key areas. For example, Botes wanted to know more about the relationship between jackal population size and food supply. ‘Dawie’ (Dawie van der Vyver, a farmer and hunter from Laingsburg), posting on the jaracal website, highlighted the same question by likening *CapeNature*’s approach to trying to run a cheese factory without controlling the mice – an outcome he predicted would result in an ecological balance with all the cheese going to the mice.²⁸

The relationship between jackal numbers and food supply is an important one. Coyote populations increase with the food supply and decline (through reduced ovulation rates and litter sizes and a decrease in the percentage of adult and yearling coyotes that breed) as the food supply falls (Todd and Keith 1983; Gese *et al*, 1989, Knowlton *et al* 1999). The same may well be true of jackals on sheep farms. If jackals defend territories that are larger than necessary to sustain an adequate food supply, perhaps to keep neighbouring jackals away from their pups, then jackal populations could expand on farms where the available food supply is sufficient – as long as dominant jackal pairs allow it. Research showing that jackals tolerate over-lapping territories by juveniles (Ferguson *et al* 1983) and allow ‘commuters’ to cross their land (Jenner *et al*, 2011) suggests that such a scenario is possible. Indeed, such dynamics are at the core of the argument made by Funck in response to *CapeNature*.²⁹ Others simply cite their own experience. Consider the following observation from ‘Projag’:

‘Die storie dat die goeie jakkals ander uithou is nie heeltemal die waarheid nie. Ek gaan sit op ‘n sekere plaas so 4 jaar terug en skiet binne 2 ure 11 grotes op een plek sonder om to skuif en almal kom op dieselfde roep. Dit was Juniemaand. Duidelik 5 pare en een stokou reun wie se vrou seker al aan ouderdom gesterf her. Hoekom het die domunante jakkalspaar nie hul werk gedoen nie??? ???. [The story that a good jackal keeps others out is not entirely true. About four years ago I shot, within two hours, at the same place, 5 pairs of jackals and a very old male whose mate had no doubt died of old age. How come the dominant jackal pair had not done their work?].³⁰

Botes’s question about the culling of jackals in the national parks is even more of a challenge to the environmental jackal narrative. In 2010, *SANParks* (the national agency responsible for South Africa’s national parks) culled 344 jackals, 132 in the Karoo National Park and 212 in the Addo Elephant National Park. *SANParks* released a statement explaining that these parks, had

²⁸ See post 5 December 2008 <http://jaracal.com/viewtopic.php?t=3>

²⁹ See especially post 6 December 2008 <http://jaracal.com/viewtopic.php?t=3>

³⁰ Posted 27 February 2009 <http://jaracal.com/viewtopic.php?t=3>

experienced ‘significant sustained declines’ in the populations of certain ungulate species, notably springbok’ and that this had led them to conclude that springbok were suffering from a ‘predator trap’. *SANParks* admitted that ‘the original reason for getting into such a predator trap is not known’ but suspected that ‘high jackal predation’ was ‘severely inhibiting antelope population recoveries in these two parks’. Noting that it is difficult to restore the full complement of ecological processes (including control of jackals by larger predators like lions) in small parks, they opted to ‘mimic the outcomes of those processes’ by culling jackals and shipping in more springbok. The statement concluded by observing that the process was being studied and that the results would inform ‘conservation decisions in the face of uncertainty in complex ecosystems’ and ‘contribute towards the broader understanding of jackal-herbivore interactions and the efficacy of jackal population control within the livestock farming community.’³¹

It is not surprising that sheep farmers in the Karoo are sceptical of the environmental jackal narrative when *SANParks* officials cull jackals in the local national park, and justify their actions with a totally different scientific narrative about the need to mimic the actions of larger predators by shooting jackals in small closed systems, to find out more about ‘jackal-herbivore interactions’ and then, most astonishingly, draw implications about ‘the efficacy of jackal population control within the livestock farming community’. Such an approach constructs the problem of living with jackals in a very different light, as one shaped ‘by uncertainty in complex ecosystems’, especially in small parks and by implication on sheep farms. If *SANParks* biologists believe there are good reasons to resort to culling jackals, then why not on sheep farms? As Niekie Mostert, a problem animal trapper said in an interview with the *Farmer’s Weekly*:

‘Black-backed jackal are already being culled on a large scale in national and provincial parks. The authorities have realised these predators can wipe out a herd of small game, which then has to be bought in again at huge cost. It’s ridiculous that livestock farmers should be prevented from protecting their animals from a jackal population that is out of control’.³²

³¹ Statement available on:

http://www.chroniclesa.co.za/index.php?option=com_content&view=article&id=921:340-jackals-culled-by-sanparks&catid=1:latest-news&Itemid=72. As of May 2013, no results appear to have been published.

³² Interview published on 29 November 2010:

<http://www.farmersweekly.co.za/article.aspx?id=5528&h=Straight-talking-from-a-trapper>

The idea of culling jackals because apex predators (lions, cheetahs, hyenas) are absent is one that resonates with farmers. Consider ‘Olaf’ who posted the following comment on an online discussion string about the jackal problem:

‘I am a sheep farmer in the Karoo. I have suffered great losses over the past 12 years due to jackal and caracal. I made a move from gin traps and poison to the “greener” guard dogs and other non-lethal methods but encountered other problems which resulted in even more losses – some caused by the guard dogs themselves! This made me consider other options – with the result that I now have a pack of foxhounds and greyhounds which are taken out to actively hunt down jackals and caracal on an almost daily basis. The results are astounding – in a period of 8 weeks only one jackal was killed but all the others have moved off! We no longer find any tracks and no more losses!

What has happened here? The apex predator (leopard, hyena) was replaced with a pack of foxhounds which have driven the jackals off the property. The dogs are trained to only hunt jackal and caracal thus other small game are safe (not the case with Anatolians). The success rate of actually killing the vermin is low but who cares when they are driven off to go eat your “green” neighbour’s sheep!³³

Olaf’s comment about guard dogs causing other problems is also important and some farmers complain that they hunt wild-life when bored (an additional threat to biodiversity). Such issues need to be resolved through better management and training if this non-lethal method is going to take off in the farming community.

Unlike the environmental jackal narrative which starts with a vision of jackals and sheep farmers living in a balanced ecosystem which then gets disturbed by hunting, the farmer jackal narrative starts from the perspective of a farm. As the hunter Niekie Mostert observes, the ‘green lobbyists’ with their ‘theories about why lethal control does not work and why so-called ecological control methods should be used... conveniently forget that the ecosystem is already disturbed – its’ been like that since the land became stocked with farm animals and man banished the bigger predators like lions to nature reserves’ leaving the black-backed jackal ‘at the top of the food pyramid’. In his view, it is ‘inconceivable that these predators (which might have been scavengers 200 years ago, won’t take livestock’.³⁴

³³ Posted by Olaf <http://www.encounter.co.za/article/177.html#Comments>

³⁴ Interview published on 29 November 2010:

<http://www.farmersweekly.co.za/article.aspx?id=5528&h=Straight-talking-from-a-trapper>

Farmers are open to the notion that a more ecologically friendly approach that allows and protects a wild prey base on the land could be helpful, but some also worry about jackals eating ‘their springbok’ as many Karoo sheep farmers earn additional income from such game. Many accept that jackals can be useful too, in controlling other pests, although this needs to be carefully managed. For example, ‘Les’, a farmer from KwaZulu-Natal, responded to Olaf’s post by asking where he could buy some jackals. Olaf responded in amazement: ‘You want to know where you can “buy” some jackals? I have good news for you – just buy a sheep, the jackals will come!’. Les responded as follows (emphasis in the original):

‘I HAVE some sheep but no jackals. Perhaps not endemic so close to the coast?? Believe it or not I want to use THEM for pest control. I have done it before and provided you keep the jackal population small, while they have easy prey they will even leave sheep alone, but once they have sorted out the other pests, beware.’

In short, many farmers are open to new ideas, including farming in more ecologically sound ways, and using methods which are ‘greener’ and less cruel. Indeed, this is one of the reasons why the restrictions on night hunting caused such a furore in the farming community because the alternative to it is far worse. As ‘Yalair’ noted in a comment on a hunting website:

‘Die metode van inbeheer hou het net verander, van gif na skiet, so vir my as boer moet hulle besluit, gaan ek aan om te roep en skiet en behou dan al my ander wild soos bakore, draaijakkals ens of gooi ek gif en verwoes als’.³⁵ [The method of controlling jackals has changed from poison to shooting, so for me as a farmer, they must decide if I am going to carry on with call and shoot and keep my other wild animals like bat-eared foxes and Cape fox or do I use poison and destroy everything?]

There are thus important areas of commonality between farmers and environmentalists with regard to protecting biodiversity and reducing cruelty, but the relative value of protecting wildlife and livestock remains contested. Many farmers feel that the suffering imposed by predators on their livestock is being ignored by environmentalists and this has prompted some to engage directly with the public. For example, Lukas Botes started a *Facebook* page ‘mutilated by predators’ to which farmers post upsetting photographs of livestock damaged by jackal and caracals.³⁶ Dawie van der Vyver (who had lost 65% of his lambs in 2006 to predators) and Joseph Steyn (the farmer from

³⁵ Posted on 5 April 2009: <http://jaracal.com/viewtopic.php?f=102&t=292>

³⁶ <https://www.facebook.com/groups/mutilated/>

Prince Albert) took a similar display to several public shows including the 2009 ‘Earth Expo’ at the Cape Town International Convention Centre. They explained to visitors that they were taking action “because the media and green organisations are depicting farmers as barbarians and no one is showing our side of the story.” They explicitly justified lethal control, pointing out that non-lethal methods such as protective collars for lambs were insufficient because “the jackals bite them from behind, often leaving the lamb alive to suffer for days”.³⁷

Such efforts are aimed at challenging the moral underpinnings of the environmental narrative. Yet in engaging with the public, Van der Vyver found himself adopting a strong anti-cruelty approach, emphasising that soft traps were only used as a “final option” to catch jackals they had been unable to shoot, that they were baited with jackal scat to ensure only jackals approached the trap, and that every effort was made to reduce suffering. Reporting on the jaracal website, he said he had explained to visitors that:

“modern gin traps are not like those displayed by the greens which come from Jan van Riebeeck’s time, because they are much softer on the animal’s leg, with spring and swivel features and protection against cutting. AND MOST IMPORTANT OF ALL, WE DO NOT LIKE KILLING THESE ANIMALS but this option cannot be banned without providing us with a proven alternative” (translated from Afrikaans, emphasis in the original).

In his assessment, public reaction was positive, that “urban people were much more rational about the issue” than he had supposed and that “the greens totally over-estimate their support”³⁸ (translated from Afrikaans). Whether this is an accurate reading of broader public attitudes is moot, but farmers have managed to win some concessions in the policy arena.

Towards a New Jackal Narrative?

In 2009 *CapeNature* retreated from its earlier position and announced that that farmers could apply for permits to engage in night shooting (calling and shooting under spotlights) of up to five jackal and five caracal per night, the only *proviso* being that renewal of the permit was dependent on their providing information about the number of predators killed. *CapeNature* reiterated that farmers could act immediately to deal with damage-causing animals, and add a

³⁷ Posting on 19 October 2009: <http://www.jaracal.com/viewtopic.php?f=1&t=671&hilit=from+the+earth+expo>

³⁸ Posting on 19 October 2009: <http://www.jaracal.com/viewtopic.php?f=1&t=671&hilit=from+the+earth+expo>

hunter to the permit if necessary.³⁹ Even so, farmers still complained that they had to have permits for shooting jackals on their own land when this was not the case anywhere else in the country.

In 2010, after meeting with organised agriculture, Anton Bredell, the Provincial government Minister for Local Government, Environmental Affairs and Development Planning, resolved to make it easier for farmers to take out *CapeNature*'s hunting permit. The following year, in April 2011, the permit was extended from three months to six months. The opposition spokesman for environmental affairs accused the provincial government of issuing the licenses without following due process in order to win support from farmers (Erasmus, 2012).

Boel Smuts reacted furiously to what he called the 'Bredell cull' and similarly accused the provincial government of giving in to the agricultural lobby. Hunters enjoyed his anger, sending Smuts' partner a photograph of a hunter making a rude gesture at the camera whilst proudly displaying at least six dead jackals hanging off the back of his vehicle.⁴⁰ Smuts posted the photograph on his website and it subsequently appeared in the press, becoming emblematic of the on-going conflict.

Assuming (unrealistically) that farmers would kill five jackals and five caracals a night every night for the duration of their permits, the *Landmark Foundation* claimed that the six-month hunting permits would result in the deaths of hundreds of thousands of predators. Preliminary data from *CapeNature* indicates that only 135 jackals and 190 caracals were killed by the first 46 six-month permit holders.⁴¹ The total number of jackals killed is certainly much higher than recorded by *CapeNature*, as many farmers ignore the regulations and kill jackals without permits, but this is certainly nowhere near the scale claimed by the *Landmark Foundation*.

Nevertheless, Smuts accused the government of facilitating an on-going "biodiversity massacre"⁴² and of ignoring the findings of *CapeNature*'s own commissioned scientific review, i.e. the Bothma report. Kas Hamman (director of *CapeNature*) responded by arguing that the report "indicates that the selective use of lethal control methods in combination with a holistic approach may need to be implemented in areas where the predator-prey balance has been disturbed"

³⁹ [http://www.capenature.co.za/news.htm?sm\[p1\]\[action\]=content&sm\[p1\]\[cntid\]=1570&sm\[p1\]\[persistent\]=1](http://www.capenature.co.za/news.htm?sm[p1][action]=content&sm[p1][cntid]=1570&sm[p1][persistent]=1)

⁴⁰ Photo available on: <http://www.iol.co.za/saturday-star/da-accused-of-wildlife-massacre-1.1316885>

⁴¹ [http://www.capenature.co.za/permits.htm?sm\[p1\]\[category\]=743&sm\[p1\]\[persistent\]=1](http://www.capenature.co.za/permits.htm?sm[p1][category]=743&sm[p1][persistent]=1)

⁴² <http://www.landmarkfoundation.org.za/stop-gin-traps---join-the-petition.html>.

(in Erasmus, 2012). But this was stretching the point somewhat. The Bothma report does, indeed, see a place for lethal control, but favours highly selective measures such as placing coyote-getters around carnivore-proof overnight and maternity pens to remove specific problem animals that have become habitual killers of domestic livestock (Bothma 2012: 8). The report acknowledges that there may be a role for reducing jackal populations before the lambing season, but is dismissive of the effectiveness of call and shoot approaches and has no specific recommendations for areas where the predator-prey balance has been disturbed or which might be suffering from a predator trap.

Hamman's interpretation of the Bothma report as supportive of the lethal control methods allowed for in *CapeNature*'s hunting license is best read in the context of the broader public and political contestation and the challenge posed by the farmer jackal narrative for the environmental jackal narrative. But, whether entirely justified or not, it has opened up space for more constructive discussion between agricultural and environmental lobby groups. Ironically, the public spat between the *Landmark Foundation* and *CapeNature*, which resulted in Smuts being disinvited from consultations about predator management, reassured farmers that the government had not been fully captured by "green" interests.

On 11 June 2012, the Western Cape Wildlife Forum met for the first time, hosted by Bredell and *CapeNature*. The chairman of the newly formed body told the *Cape Times*:

'We had people around the table who a year ago would have wanted to punch each other. Now they were talking to each other. The conservationists were stunned to realise how much predators cost (farmers). These hostile tribes were at last talking to each other' (in Gosling, 2012).

One of the reasons farmers felt more comfortable engaging with conservationists was that the hunting license legitimised their management of predators and because the discourse was more open towards, and respectful of, their concerns about predator numbers in already disturbed ecosystems. Whereas in 2008, they worried that urban 'green' values were being inflicted on them at a time when their livelihoods were under threat, now they feel more in control of their own circumstances, more comfortable that their plight is being recognised within the broader public and better assisted by government.

The economic situation of sheep farmers is still dire, but at a symbolic and institutional level, they are in a stronger position to engage with government and environmental organisations. Indeed, the economic pressures they face

encourage them to work with environmental organisations which are serious about assisting them to protect their sheep and biodiversity on their land. Most farmers accept that the jackal is here to stay, and many are experimenting with both lethal and non-lethal ways of co-existing with it.

More importantly, though, the jackal narrative on both ‘sides’ has become less dogmatic and more open to learning from scientific studies. Many farmers agree with ecologists that jackals quickly re-populate areas and that lethal control is, at best, only part of the solution to their problem. And, while most argue that the old hunting clubs helped keep jackals under control, there is growing interest in finding out precisely how effective hunting was, and can be. Recent analysis of historic data from hunting clubs found that killing predators was associated with higher levels of stock losses in subsequent years (Bailey and Conradie 2012; Conradie and Piesse, 2012) – a finding consistent with the environmental jackal narrative that hunting causes more jackals and hence greater future stock losses. However such studies are inconclusive because we do not know enough about the physical characteristics of the old farms and management practices and we do not know the extent to which jackal territories overlapped farm boundaries. Only once we have a complete ecological picture over a wide area will we be able to draw conclusions about the relationship between lethal control of jackals and stock losses.

Environmentalists remain strongly in favour of holistic, ecologically-sound options, but the fact that conservationists themselves have resorted to lethal control of jackals has introduced a strong dose of humility into their narrative. There is a clear recognition that we need to know more about the ecology of the jackal in order to limit the damage it can cause to wildlife and sheep alike. As shown by a study of jackal control in the Southern Free-State, understanding where jackals den and their use of the landscape across time and space has enabled better control of the animal today than was the case thirty years ago (Deacon 2010).

Studies of coyote control in the US suggest that the impact of lethal control varies from place to place. A six year study in Idaho found no impact on mule-deer populations of the removal of coyotes and mountain lions (Hurley et al 2011) and a study of lethal coyote control in California found no impact on sheep depredation (Connor et al 1998). But a study from Wyoming found that hunting coyotes had a beneficial effect on antelope populations and cattle production (Shwiff and Merrell 2004) and Harrington and Conover (2007) found that hunting coyotes had a positive effect on the number of pronghorn and mule deer in Utah and Colorado. This suggests that the impact of the lethal control of

coyotes varies across regions and the same is likely to be the case with jackals in South Africa. More research is needed to explore this important question, and to understand the relationship between jackals, biodiversity and lambing rates on sheep farms.

There have been some mitigation studies, typically showing that introducing guard dogs and other non-lethal methods lowers sheep predation (e.g. McManus 2012). But such studies, being at farm-level, cannot speak to the issue of whether jackals were simply displaced onto neighbouring farms (as suggested by ‘Olaf’ who did not care if his green neighbour’s sheep were eaten). Ideally, we need a set of landscape level studies which collect farm characteristics, management strategies, biodiversity indicators and jackal movements to address the many open questions.

References

- Andelt, W.F., 1985. Behavioral ecology of coyotes in South Texas. *Wildlife Monographs* no. 94, October 1995: 1 – 45.
- Archer, S. 2000. Technology and Ecology in the Karoo: A Century of Windmills, Wire and Changing Farming Practice, *Journal of Southern African Studies*, vol.26, no.4: 675-696.
- Beinart, W. 2003. *The Rise of Conservation in South Africa*. Oxford University Press, Oxford.
- Bingham, J., Purchase, G.K., 2002. Reproduction in the jackals *Canis adustus* Sundevall, 1846, and *Canis mesomelas* Schreber, 1778 (Carnivora: Canidae), in Zimbabwe. *African Zoology*, 37 (1): 21 – 26.
- Bothma, J. 2012. *Literature Review of the Ecology and Control of the Black-Backed Jackal and Caracal in South Africa*. Available on: <http://www.capenature.co.za/docs/2182/Literature%20Review%20of%20the%20Ecology%20and%20Control%20of%20black-backed%20jackal%20and%20caracal%20%28Bothma%202012%29.pdf>
- Brand, D. J., N. Fairall, and W. M. Scott. 1995. The influence of regular removal of black-backed jackals on the efficiency of coyote getters. *South African Journal of Wildlife Research* 25, no. 2: 44-48.
- CapeNature/PMF. 2012. Co-operative Agreement between the Predator Management Forum (Western-Cape) and the Western Cape Nature Conservation Board (Trading as CapeNature): Guidelines for the Management of Bushpig, Black-backed jackal and Caracal that are responsible for Agricultural losses within the Boundaries of the Western Cape Province. March 2012. Available on: <http://www.capenature.co.za/docs/2010/CN%20PMF%20Draft%20Agreement%20Final.pdf>
- Conner, M. M., Jaeger, M. M., Weller, T. J., & McCullough, D. R. (1998). Effect of coyote removal on sheep depredation in northern California. *The Journal of wildlife management*, 690-699.

- Conradie, B. 2012 Are hunting clubs the solution to small stock depredation? The case of Ceres, 1979 and 1980, *Agrekon* 51(1):96 – 113
- Conradie, B.I., Piessse, J. 2013. The effect of predator culling on livestock losses: Ceres, South Africa, 1979 – 1987. *CSSR working paper 319* www.uct.ac.za/CSSR/
- Crabtree, R.L., 1997 (updated 6/21/12. Letter (scientific opinion on Coyote ecology and control measures). Available on: http://www.predatordefense.org/docs/coyotes_letter_Dr_Crabtree_06-21-12.pdf
- Deacon, F. 2010. *Aspekte rakende die ruimtelike ekologie van to rooijakkals (Canis mesomelas) as probleemdiere in the Suid-Vrystaat*. M.Sci, Universiteit van die Vrystaat.
- De Beer, S. 2006. Produsente en Probleemdiere. Paper presented to the *Resolving Human-Wildlife: Conflict Prevention is the Cure Workshop*.
- De Wet, T. 2006. Vermin>Problem Animal>Damage Control – A Wake-Up Call. Paper presented to the *Resolving Human-Wildlife: Conflict Prevention is the Cure Workshop*.
- Dugmore, H. 2012. Turning things around with Savannah goats. In *The Farmer's Weekly*, 9 November, 52-55.
- Erasmus, D. 2012. CapeNature denies claims of political intimidation. *Farmers Weekly*, 1 September 2012: <http://www.farmersweekly.co.za/news.aspx?id=27865&h=CapeNature-denies-claims-of-political-intimidation>
- Ferguson, J., Nel, J. and M de Wet. 1983. Social Organisation and movement patterns of Black-backed jackals *Canis mesomelas* in South Africa. In *Proceedings of the Zoological Society of London*, 199: 487-502
- Filmer, T. 2012. Predator Debate. *Farmer's Weekly*, 5 December. Available on: <http://www.farmersweekly.co.za/readers-letter.aspx?id=32424&h=Predator-debate>

- Gese, E.M., Rongstad, O.J., Mytton, W.R., 1989. Population dynamics in coyotes in southeastern Colorado. *Journal of Wildlife Management* 53, 174 – 181.
- Ginsberg, J. and D. Macdonald. 1990. *Foxes, Wolves, Jackals, and Dogs: An Action Plan for the Conservation of Canids*. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.
- Gosling, M. 2012. ' Hostile Tribes' Unit around Predator Issue, *Cape Times*, 13 June
- Harrington, J. and M Conover. (2007), Does Removing Coyotes for Livestock Protection Benefit Free-Ranging Ungulates?. *The Journal of Wildlife Management*, 71: 1555–1560. doi: 10.2193/2006-481
- Hendey, Q.B. 1974. Faunal dating of the late Cenozoic of southern Africa, with special reference to the Carnivora. *Quaternary Research* 4:149–161.
- Hey, D. 1964. The control of vertebrate problem animals in the province of the Cape of Good Hope, Republic of South Africa. *Proceedings of the 3rd Vertebrate Pest Conference (1964)*. Paper 30. <http://digitalcommons.unl.edu/vpc2/11>.
- Hey, D. 1967. Recent developments in the control of vertebrate problem animals in the province of the Cape of Good Hope, Republic of South Africa. *Proceedings of the 3rd Vertebrate Pest Conference (1967)*. Paper 30. <http://digitalcommons.unl.edu/vpc/30>.
- Hobart Houghton, D. 1971. Economic Development: 1865-1965. In Wilson, M. and L. Thompson (eds). *The Oxford History of South Africa: Vol.2, South Africa 1870 - 1966*, Oxford University Press, Oxford: 1-48.
- Hobart Houghton, D. 1976. *The South African Economy*. Oxford University Press, Oxford.
- Hurley, J., Unsworth, J. Zager, P, Hebblewhite, M., Garton, E. Montgomery, D. Skalski, J. and Maycock, C. 2011. Demographic Response of mule deer to experimental reduction of coyotes and mountain lions in southeastern Idaho, *Wildlife Monographs*. Vol 178 (1): 1-33.

- Kamler, J. Ute Stenkewitz, and David W. Macdonald (2013) Lethal and sublethal effects of black-backed jackals on cape foxes and bat-eared foxes. *Journal of Mammalogy*: April 2013, Vol. 94, No. 2, pp. 295-306.
- Katzen, M. 1969. White Settler and the Origin of a New Society, 1652-1778, in Wilson, M. and L. Thompson (eds). *The Oxford History of South Africa: Vol.1, South Africa to 1870*, Oxford University Press, Oxford: 187-232.
- Kirsten, J. and J. van Zyl. 1996. 'The contemporary agricultural policy environment: undoing the legacy of the past' in van Zyl, J., Kirsten, J. and H. Binswanger (eds). *Agricultural Land Reform in South Africa: Policies, markets and mechanisms*, Oxford University Press, Oxford: 199-235.
- Knowlton, F.F., Gese, E.M., Jaeger, M.M., 1999. Coyote depredation control: An interface between biology and management. *Journal of Range Management* 52, 398 – 412.
- Loveridge, A. J., and J. A. J. Nel. 2004. Black-backed jackal (*Canis mesomelas*). Pages 161–166 in C. Sillero-Zubiri, M. Hoffmann, and D. W. Macdonald, editors. *Canids: foxes, wolves, jackals and dogs. Status Survey and Conservation Action Plan*. International Union for the Conservation of Nature/Species Survival Commission, Canid Specialist Group, Cambridge, United Kingdom.. <http://www.canids.org/cap/index.htm>
- MacManus, J. 2012. A profit and loss accounting of lethal predator control and non-lethal livestock protection on commercial farms in the Eastern Cape South Africa: Comparing economic efficacy and economic viability. Paper presented to the *IVth International Wildlife Management Congress 2012*. Durban, July.
- Moehlman, P. 2002. Jackal helpers and pup survival. *Letter to Nature*, 1 Feb 1979, *Nature* 277: 382-3.
- Rowe-Rowe, D. 1986. The black backed jackal: Know your problem animal. <http://www.kznwildlife.com/index.php/bookings/167-conservation/management/860-blackbacked-jackal.html>
- Schoeman, L. 2011. Predation killing red meat production', *Farmers Weekly* 23 September.

- Shwiff, S. and R. Merrell. 2004. Coyote predation management: An economic analysis of increased antelope recruitment and cattle production in South Central Wyoming. *Sheep and Goat Research Journal*, vol.19: 29-33.
- Smith, N. 2012. Talk first, shoot later. *Farmers Weekly*, 6 December. Available on: <http://www.farmersweekly.co.za/article.aspx?id=32419&h=Talk-first,-shoot-later>
- Snow, T. 2006. Wildlife-Human Conflict Resolution Methods and Agrochemical abuse problems. Paper presented to the *Resolving Human-Wildlife: Conflict Prevention is the Cure Workshop*.
- Stadler, H. 2006. Historical Perspective on the Development of Problem Animal Management in the Cape Province, in *Resolving Human-Wildlife Conflict: Prevention is the Cure*.
- Todd, A. and L. Keith. 1983. Coyote demography during a snowshoe hare decline in Alberta. *Journal of Wildlife Management*, 47: 629-640.
- Van der Merwe, I., Tambling, C.J., Thorn, M.m, Scott, D.M., Yarnell, R.W., Green, M., Cameron, E.Z., Bateman, P.W. 2009. An assessment of diet overlap of two mesocarnivores in the North West Province, South Africa. *African Zoology* 44(2): 288 – 291.
- Van Sittert, L. 1998. Keeping the Enemy at Bay: The Extermination of Wild Carnivora in the Cape Colony, 1889-1910. *Environmental History*, 3 (3): 333-356.
- Wagner, K. K., and M. R. Conover. 1999. Effect of preventive coyote hunting on sheep losses to coyote predation. *Journal of Wildlife Management* 63:606–612.
- Wilson, M. 1969. 'The Hunters and Herders' in Wilson, M. and L. Thompson (eds). *The Oxford History of South Africa: Vol.1, South Africa to 1870*, Oxford University Press, Oxford: 40-130.