AN ASSESSMENT OF THE ECONOMIC, SOCIAL AND CONSERVATION VALUE OF THE WILDLIFE RANCHING INDUSTRY AND ITS POTENTIAL TO SUPPORT THE GREEN ECONOMY IN SOUTH AFRICA

AUTHORS:
ANDREW TAYLOR, PETER LINDSEY AND HARRIET DAVIES-MOSTERT

WITH CONTRIBUTIONS FROM: MATTHEW CHILD, IAN LITTLE, GREG MARTINDALE AND SAMANTHA PAGE

EXTERNAL REVIEWER: PETER GOODMAN

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RESEARCH AND POLICY DEVELOPMENT TO ADVANCE A GREEN ECONOMY IN SOUTH AFRICA

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www.ewt.org.za

Report prepared by the Endangered Wildlife Trust for the Development Bank of South Africa

September 2015

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ABBREVIATIONS AND ACRONYMS

BSSA	Biodiversity Stewardship South Africa
CBD	Convention on Biological Diversity
CBNRM	Community Based Natural Resource Management
CHASA	Confederation of Hunters Associations of South Africa
CITES	Convention on International Trade in Endangered Fauna and Flora
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DRDLR	The Department of Rural Development and Land Reform
DVPH	Directorate of Veterinary Public Health
EWT	Endangered Wildlife Trust
HWC	Human Wildlife Conflict
LSU	Large stock unit
MET	Ministry of Environment and Tourism (Namibia)
NAC	National Association of Conservancies
NEMBA	National Environmental Management: Biodiversity Act
OIE	World Organisation for Animal Health
PH	Professional hunter
PHASA	Professional Hunter's Association of South Africa
SAHGCA	South African Hunting and Game Conservation Association
SAMIC	South African Meat Industry Company
SANBI	South African National Biodiversity Institute
TOPS	Threatened or Protected Species
WRSA	Wildlife Ranching South Africa
WTA	Wildlife Translocation Association
WTO	World Trade Organisation

GLOSSARY OF TERMS

TERM	DEFINITION
Big Five species	A term originally used to describe the five most difficult African mammals to hunt on foot, now also used to describe the large charismatic species most sort after by ecotourists. The species are: African Lion (*Panthera leo*), Leopard (*Panthera pardus*), African Elephant (*Loxodonta africana*), Black Rhinoceros (*Diceros bicornis*) and African Buffalo (*Syncerus caffer*).
Biltong hunting	The hunting of non-domesticated animals, performed as a recreational activity by local hunters, normally using a rifle or bow, with the purpose of obtaining meat. This meat may be processed into biltong or sausage, and is mostly consumed by the hunter and his/her family or friends. It may also be sold to local butcheries.
Breeding camp	A fenced enclosure in which the behaviour of wild species may be manipulated to control which animals breed (e.g. in extreme cases by removing all breeding age males except one selected individual). There is no formal definition of camp size, which can be highly variable, ranging from <0.5 ha to 500+ ha. We did not attempt to define camps by area; rather we counted an area as a camp if defined so by the surveyed rancher. This meant that in some cases, entire ranch properties were smaller than areas defined as camps on other properties. In the cases of small properties that were not counted as camps, the ranchers did not interfere with the general ecology or behaviour of the species held therein.
Canned hunting	Shooting and killing an animal in a confined space, such as a fenced enclosure, whereby the animal has no chance of escape.
Certificate of adequate enclosure	Equivalent to an exemption permit (see below).
Colour variant	Also known as “colour morph”: A wild animal expressing a rare colour phenotype. It generally refers to a species of plains game such as Impala (*Aepyceros melampus*), Springbok (*Antidorcas marsupialis*), Blesbok (*Damaliscus pygargus phillipsi*), Blue Wildebeest (*Connochaetes taurinus*) and Gemsbok (*Oryx gazelle*), but may also refer to other groups of wild species, such as African Lions. Common examples include the golden wildebeest (a variant of the Blue Wildebeest), black impala, black springbok, white springbok and white blesbok, amongst others. Some species have more than one colour variation. Colour variants are not separate species, subspecies or hybrids; nor are they the result of deliberate genetic modifications by humans. They are naturally occurring phenomena that are thought to result from genetic mutations occurring in wild populations, and are made more common by deliberate breeding.
Conservancy	The conservancy concept covers a range of scenarios, from a situation where a collection of farms/ranches in a given area cooperate on some level to manage natural resources under the banner of a common identity, to a fully integrated model where adjacent properties are pooled to form a single management unit.

TERM	DEFINITION
Convenience sampling	A non-random method for obtaining sample data whereby the people surveyed were those who were accessible.
Culling	The selective slaughter of wild animals for management purposes, with the production of game meat being either a by-product or the management goal itself. In the context of this report, culling is applied to ungulates, primarily antelope species.
Dressed weight	Also termed the carcass weight, this refers to the mass of an animal after it has been partially butchered and had the following parts/organs removed: skin, head, legs below the knee joint, rumen, intestines, heart and lungs.
Droëwors	A traditional South African dried spicy sausage commonly eaten as a snack.
Ecological capacity	The population density of wild animals that is likely to exist in large unmanaged natural areas. Unchecked populations tend to fluctuate around this value.
Ecotourism	In the context of this report, ecotourism involves non-consumptive use of wildlife, such as photographic tourism, bird-watching, hiking and horseback riding, and ideally develops awareness about the local environment and culture and results in minimal impact on the environment.
Exemption permit	A permit issued by provincial nature conservation authorities conveying certain rights to landowners over the use of wildlife. Terminology differs between provinces: North West Province, Limpopo, Mpumalanga and Gauteng use “exemption permit”; Western Cape, Eastern Cape and Free State use “Certificate of Adequate Enclosure (CAE); Northern Cape (which previously used CAEs as well) use “Game Farm Permits”; KwaZulu Natal uses “Certificates of Sufficient Enclosure”. These permits fit the same purpose: in general, any landowner to whom such a permit has been issued may, subject to conditions specified in the permit, do the following on the land for which the permit has been issued: • Hunt any number of the species of wild animal authorised on the permit at any time of year; • Capture any wild animals of the species authorised in the permit within time periods designated by provincial nature conservation authorities and the Wildlife Translocation Association; and • Sell or trade in any wild animals of the species authorised in the permit. Exemption permits do not cover Threatened or Protected Species (TOPS) or species considered dangerous game (African Elephants, rhinos, African Buffalos, African Lions, Leopards, Hippopotamuses (*Hippopotamus amphibius*)).
Exotic species	See non-indigenous species

TERM	DEFINITION
Extensive wildlife ranching	Ranching conducted with limited interference of wildlife species. Animals are not provided with supplementary food (except perhaps during severe drought conditions) or veterinary care. Populations are expected to survive with little to no food subsidy. Included in this are conservancies.
Extra-limital species	A species that is native to South Africa but which is occurring outside its natural distribution range. Such species have generally been translocated outside their natural range to make a property more attractive to ecotourists or hunters.
Game animals	An informal term loosely referring to any non-domesticated animals hunted for meat or sport, generally including mammals and birds. In southern Africa, the meaning is mostly confined to terrestrial mammals including ungulate species (hoofed mammals including antelope species, Giraffes (*Giraffa camelopardalis*), Hippopotamuses, pigs, zebras and rhinos), as well as African Elephants, but may also include some carnivore species. Because the term is not used consistently across the wildlife industry, we do not use it in this report, unless in an historical context. Hence, although the terms "game farming" and "game ranching" are commonly used, we stick with the term "wildlife ranching" for consistency.
Game farm	An informal term often used interchangeably with the terms game ranch and wildlife ranch. The term game farm generally refers to smaller properties (<5,000 ha) where some form of constant management is necessary, and implies a relatively high degree of control over animals. It is a subjective term and we do not use it; for consistency we use the term wildlife ranch.
Game farm permit	Equivalent to an exemption permit.
Herbivore	Any plant eating animal. In the context of this report, we use the term to mean medium to large mammal species that primarily eat plants, and include all antelope species, Giraffes, Hippopotamuses, zebras, rhinos and African Elephants. We are not referring to small herbivore species that are not utilised on a commercial basis and are thus not managed by landowners, such as rodents and lagomorphs (rabbits and hares).
High value species	An informal term used by the wildlife sector to indicate uncommon herbivore species with high monetary value. These include: Bontebok (*Damaliscus pygargus pygarus*), African Buffalo, Nyala (*Tragelaphus angasii*), Sable (*Hippotragus niger*), Roan (*Hippotragus equinus*), and rhino species. It excludes colour variants, which have their own term.

TERM	DEFINITION
Intensive breeding	The confinement of wild species in small to medium sized camps or enclosures, where they are fenced in, protected from predators and provided with most of, or all their food, water and veterinary requirements. They are often held in isolation or with few other species, and most behavioural and ecological characteristics (e.g. breeding and home range areas) are unnatural and controlled by the rancher. Populations are not self-sustaining in the short term (i.e. they would quickly die without human intervention), and because they are not exposed to the processes of natural selection, animals born in captivity may have a relatively low chance of survival if released back into the wild. The purpose of these systems is to produce superior animals for live game sales or trophy hunting, and breeding may be manipulated to select animals for desirable traits (e.g. long horns, large body size or multiplication of a colour variant). To avoid inbreeding, ranchers need to change breeding males every one or two years. Intensive breeding generally involves high value species (see above)
Large stock unit	An animal with the metabolic weight equivalent of a steer weighing 450 kg. This measure has been used to calculate grazing capacity of different vegetation types though it is now considered by many to provide poor representations of carrying capacities for wild ungulates.
Lightly managed systems	These rely on a relatively limited set of human interventions directed at both population enhancement and influencing extrinsic factors. They are conservation dependent, which means that they require conservation measures that are largely directed at reducing human impacts and require action directed at extrinsic factors, such as anti-poaching protection, rather than factors such as feeding, breeding, or habitat enhancement. Populations are considered self-sustaining demographically and ecologically.
Mesocarnivore	A carnivorous mammalian species with a diet comprising 50-70% meat
Mega-herbivore	Very large herbivores including African Elephants, rhinos, Hippopotamuses and Giraffes.
Mixed farm	A property that farms or ranches wildlife alongside domestic livestock or crops or both livestock and crops.
Natural range distribution	The assumed historical geographic range distribution of a species before significant anthropogenic disturbance (by recent colonisation).
Non-indigenous species	A term for a species living outside its natural distribution range, which has been deliberately translocated there by humans. Synonyms include exotic, alien, and non-native species. Species that adapt particularly well to their new environment, increase in number and distribution quickly, and outcompete or displace indigenous species are considered to be 'invasive'. In the context of this report we use the term to indicate species not native to South Africa. We avoid the term "exotic" because that is often used by stakeholders in the wildlife ranching industry to mean rare species such as Sable and Roan. We also differentiate non-indigenous species from extra-limital species.
Open ranch/farm	A wildlife ranch or mixed farm that does not have an exemption permit.

TERM	DEFINITION
Plains game	An informal term encompassing common species of antelope occurring in open habitat such as grasslands and savannas. Examples include Blesbok, Eland (*Taurotragus oryx*), Impala, Kudu (*Tragelaphus strepsiceros*) and Springbok. The term is not generally used for small antelope species or mega-herbivores.
Semi-extensive farming/ranching	Animals are supported by regular management interventions to maintain habitat integrity and supplement the food and water supply, particularly during the dry period at the end of winter. Constant interference with animals through veterinary intervention is not the norm, but populations are not generally self-sustaining in the long term and are not considered wild.
Species richness	The number of different species occurring in a specified area, generally an individual wildlife ranch. This measure does not take into account abundance of each species.
Stocking density	The density at which wildlife populations are kept through the management practices of landowners (number of animals per unit area). This is adjusted according to the management aims.
Trophy hunting	Also known as safari hunting or sport hunting: the selective hunting of individual non-domesticated animals (primarily mammals), picked for specific traits such as large horns, tusks or body size, and performed by paying clients using a rifle or bow in the presence of a professional hunter. The primary products obtained from this activity are skins, horns and tusks, and these are often retained by the clients to be displayed as mounted trophies. When the species hunted is an ungulate, the meat from the carcass is normally taken as a secondary product and used locally.
Ungulate	A hoofed mammal, including all antelope species, Giraffes, hippos, pigs, zebras and rhinos. These are primarily herbivores, although the pig species (Suidae family) are considered omnivores.
Wildlife	An informal term that generally encompasses all non-domesticated animal and plant species. In the context of this report, we use “wildlife” to mean undomesticated wild animals because we have made no assessment of the impact of wildlife ranching on plants.
Wildlife ranch	A private property that utilises wildlife on a commercial basis. To avoid confusion in this report, we use the term to encompass all categories of wildlife enterprise, from intensive breeding to extensive ecotourism. This covers related terms such as game farming and game ranching. A wildlife ranch may be exempt or open and may include other farming activities such as livestock and crop production. These latter properties are also referred to as mixed farms.

1 EXECUTIVE SUMMARY

1.1 Introduction

In the 1960s wildlife ranching was a very small part of the agricultural sector, with a handful of landowners using wildlife commercially. The realisation in the 1970s and 1980s that the sustainable use of wildlife could be financially viable, followed by the Game Theft Act of 1991, which provided certain ownership rights to landowners over wild animals held in adequately enclosed areas, provided the incentive for a major shift in farming activities across South Africa and has led to huge growth of wildlife ranching as a land use.

Reports and peer reviewed literature written since the year 2000 had suggested that there may be in excess of 9 000 wildlife ranches in South Africa, covering an area >200 000 km^2 and harbouring between 16 and 20 million wild animals. Localised research studies and research focussing on specific aspects of wildlife ranching have provided important clues as to the scale of the sector, but a lack of assimilation of information at the national level (with a few exceptions aimed at specific segments of the industry) has meant that we have quite limited knowledge as to the true scale and scope of wildlife ranching across South Africa. This presents the following challenges:

- It is difficult to ascertain the circumstances under which the ecological, economic and social benefits from the industry are greatest;
- It is difficult to develop appropriate legislation to regulate the industry;
- It is difficult to develop best practice and incentives to promote the industry, especially in light of its potential to support South Africa's ability to meet international commitments to conservation targets;
- It is difficult for policy makers to include the industry in land use planning processes, which is particularly important given the imperative of land reform in South Africa and the fact that there will be a large-scale transfer of ownership of land during the coming years;
- It is difficult for government to support the sustainable development of the wildlife ranching industry as part of the green economy agenda in South Africa.

As a result of the lack of research into wildlife ranching and the important challenges this brings to the development of the sector, we initiated a study with the aim of making a national assessment of the scale of wildlife ranching in South Africa and attempted to answer the following questions:

1. What is the economic value of the wildlife ranching industry in South Africa?
2. What are the ecological and environmental impacts of the wildlife ranching industry in South Africa and what are their contributions to biodiversity conservation?
3. What are the social impacts of the wildlife ranching industry in South Africa?
4. What are the trends in the wildlife ranching industry?
5. What are the drivers and constraints, the risks and opportunities for the industry?
6. What are the necessary interventions required to maximize benefits and address problems associated with the industry and its development?

1.2 Methods

We used the following three approaches to answer these aforementioned questions:

1. Through a literature search we collected and collated information on the history and growth of wildlife ranching, the various land use practises conducted throughout the country, the size and scale of the sector, and its economic, social and conservation impacts.
2. We developed a structured survey questionnaire for wildlife ranchers that aimed to assess the impacts of their enterprises, from which we would derive current averages across the sector. Questionnaires asked about basic property variables (e.g. farm size, location, land use types) and requested information on herbivore species and abundance, carnivore presence, offtakes of animals through various consumptive activities, number of people employed, income generation and a variety of other economic, social and conservation factors.
3. We interviewed (to varying degrees of detail) key stakeholders including national and provincial government personnel, interest groups and industry associations (e.g. WRSA, SAHGCA, CHASA, WTA) to gather information, impressions and opinions on factors such as trends in land use, pros and cons associated with wildlife ranching and drivers and constraints affecting the industry.

1.3 Results

1.3.1 The current scale of wildlife ranching

Using data provided by provincial nature conservation departments, we estimated that there were 6,734 properties with exemption permits and 2,245 open farms (wildlife ranches without exemption permits) in South Africa during 2014. Approximately 75% of wildlife ranchers had exemption permits (Table 1). The area over which wildlife ranches occurred was 170,419 km^2.

1.3.2 Wildlife ranches included in our surveys

We conducted surveys with 251 wildlife ranchers, covering an area of 13,775 km^2. These included 134 properties conducting ecotourism, 112 conducting intensive breeding, 158 conducting live sales, 122 conducting trophy hunting, 115 conducting biltong hunting, and 65 conducting culling for game meat. Most ranchers conducted more than one type of land-use activity.

1.3.3 The scale of land-use types on surveyed wildlife ranches

Ecotourism: On properties that conducted ecotourism, the median number of overnight guests per year was 400, while the median length of stay was 2 nights.

Intensive breeding: Thirty-eight percent (38%) of properties bred high value wildlife species (n=96), comprising a total of 14 different species (mean number of species = 1.95 ± 1.16; range 1-5). Twenty-three percent (23%) of properties bred colour variants in camps (n=58), with a total of 15 varieties (mean number of varieties = 2.26 ± 1.41; range: 1-7). A further 24 properties kept colour variants under extensive conditions.

On properties that conducted some form of intensive breeding, the percentage of land under camps (percentage intensification) was 10.9%, and the median camp size was 50 ha (mean = 111 ha). There were 12 ranches that were completely subdivided into camps. The overall percentage of intensification on all ranches was 6.0%.

Live sales: Sixty-three percent (63%) of properties conducted live sales during 2014, and sold a total of 30 species (mean number of species sold per property = 3.5 ± 3.8 (median = 2: range 1 – 23). The total number of animals sold live in South Africa during 2014 was estimated to be 225,200.

Trophy hunting: On properties that conducted trophy hunting, the median number of clients per ranch was 20 per year, while the median length of stay was 5 nights. In total, 37 wildlife species were trophy hunted, with a median of 6.5 species hunted per ranch. The total number of animals trophy hunted in South Africa during 2014 was estimated to be 130,186, while the carcass mass of animals that would have been available for consumption was 11.52 million kg (11,520 tonnes).

Biltong hunting: On properties that conducted biltong hunting, the median number of clients per ranch was 40 per year, while the median length of stay was 3 nights. In total, 24 wildlife species were hunted for biltong, with a median of 5 species hunted per ranch. The total number of animals hunted for biltong in South Africa during 2014 was estimated to be 277,027, while the carcass mass of animals that would have been available to biltong hunters was 18.93 million kg (18,930 tonnes).

Culling for game meat: On properties that conducted culling, a total of 21 species were shot per year, with a median of 2 species per ranch. The total numbers of animals culled for game meat in South Africa during 2014 was estimated to be 176,969, while the carcass mass of animals that would have been available for consumption was 9.70 million kg (9,700 tonnes).

1.3.4 The economic contribution of wildlife ranching

Ecotourism: This was not assessed

Live sales (including the revenue generated by intensive breeding): The median revenue generated by live sales on surveyed properties was R202/ha, while the total revenue generated by live sales on all wildlife ranches across South Africa was estimated to be R4.328 billion. This value included private sales which equated to R2.453 billion.

Trophy hunting: The median amount spent by trophy hunters for the animals hunted on wildlife ranches was R234/ha, while the total revenue generated from these animals on all wildlife ranches across South Africa was estimated to be R1.96 billion.

Biltong hunting: The median amount spent by biltong hunters for the animals hunted on wildlife ranches was R81/ha, while the total revenue generated from these animals on all wildlife ranches across South Africa was estimated to be R0.65 billion.

Culling for game meat: The median values of game meat extracted from trophy hunted and culled animals were R37/ha and R42/ha respectively, while the total value of meat extracted from all wildlife ranches across South Africa was estimated to be R261.8 million from trophy hunted animals and R349.7 million from culled animals.

1.3.5 The social contribution of wildlife ranching

Game meat production: The total mass of game meat that was produced on wildlife ranches during 2014 through trophy hunting and culling was 21.22 million kg (21,220 tonnes) (excluding the meat obtained through biltong hunting).

Employment: The median number of permanent employees per hectare on surveyed wildlife ranches was 0.0038/ha, and the total estimated number of jobs created by the wildlife ranching sector was 65,172. The median salary per person per month was R3,441 (mean = R3,743 ± R1,836).

These estimates are only for people employed directly on wildlife ranches, and exclude people employed by industries reliant on the wildlife ranching sector but who are not employed by the ranchers themselves. Such industries include wildlife translocators, fencing businesses, and taxidermists. Temporary workers are also not included.

1.3.6 The ecological contribution of wildlife ranching

Herbivore species richness and abundance: The mean number of herbivore species occurring on wildlife ranches was 15.0 ± 5.4. The most common species were Common Duiker (*Sylvicapra grimmia*), Kudu (*Tragelaphus strepsiceros*), Impala (*Aepyceros melampus*) and Steenbok (*Raphicerus campestris*), all of which occurred on >80% of properties, while the least common species were Oribi (*Ourebia ourebi*), Suni (*Neotragus moschatus*)and Lichtenstein's Hartebeest (*Alcelaphus lichtensteinii*), all of which occurred on <5% of properties. Giraffes (*Giraffa camelopardalis*) occurred on 56% of properties, White Rhinos (*Ceratotherium simum*) 24%, African Elephants (*Loxodonta africana*) 13%, and Black Rhinos (*Diceros bicornis*) 8%.

The most abundant species were Impala (comprising 24.1% of all animal counts), Kudu (11.8%) and Springbok (*Antidorcas marsupialis*) (11.6%). The least abundant species were Black Rhinos (0.07%), and Grey Rhebok (*Pelea capreolus*) (0.07%). Giraffes made up 1.33% of animal counts, Elephants 0.40% and White Rhinos 0.28%. The species with the highest biomasses were Kudu (comprising 12.8% of total biomass), Eland (*Taurotragus oryx*) (10.9%), African Buffalo (*Syncerus caffer*) (9.9%) and Blue Wildebeest (*Connochaetes taurinus*) (9.4%). Although African Elephants only comprised 0.40% of herbivore numbers, they made up 8.2% of the total herbivore biomass.

The total number of herbivores on all wildlife ranches across South Africa was estimated to be 5.987 million animals. This number excluded small cryptic species, namely grysbok spp., Klipspringer (*Oreotragus oreotragus*), Oribi and Suni, as well as Warthogs (*Phacochoerus africanus*) and Bushpigs (*Potamochoerus larvatus*). It is noted that this estimate is considerably lower than stated in previous reports, some of which indicate numbers as high as 20 million animals. We believe the discrepancy is mainly due to different methods of calculation.

Carnivore species occurrence: The most common species/species groups were jackals (occurring on 97% of properties), mongooses (96%), Caracal (*Caracal caracal*) (94%) and genets (90%). Leopards (*Panthera pardus*) and Brown Hyaenas (*Parahyaena brunnea*) occurred on 62% and 50% of properties respectively, while Cheetahs (*Acinonyx jubatus*), Spotted Hyaenas (*Crocuta crocuta*) and African Lions (*Panthera leo*) occurred on <20% of properties. Wild Dogs (*Lycaon pictus*) were least common, occurring on only ~4% of farms.

Table 1. Overview of all major findings of this study (note all values are estimates and details of methods used to obtain them are provided in the main body of the report).

General statistics	Number of exempt wildlife ranches in South Africa	6 734
	Total number of wildlife ranches in South Africa (including exempt and open ranches)	8 979
	Area of all wildlife ranches in South Africa (km^2)	170,419
	Total number of herbivores on all wildlife ranches	5.987 million
Intensive breeding	% of area under intensive breeding	6.0
Live sales	Number of animals sold in South Africa	225,500
	Total revenue generated (turnover) from live sales (includes private sales and auctions)	R4.328 billion
Trophy hunting	Number of animals hunted in South Africa	130,186
	Total revenue generated (turnover) from animals trophy hunted	R1.956 billion
Biltong hunting	Number of animals hunted in South Africa	277,027
	Total revenue generated (turnover) from animals hunted for biltong	R0.651 billion
Game meat production	Number of animals culled in South Africa	176,969
	Total carcass mass from trophy hunting, biltong hunting and culling (tonnes)	40,150
	Total carcass mass available for sale (excludes meat from biltong hunting) (tonnes)	12,943
	Total value of game meat produced (excludes meat from biltong hunting)	R0.612 billion
Jobs and salaries	Total number of jobs created by wildlife ranching sector	65,172
Salaries	Median salary of employees	R3,441

2 THE HISTORY OF WILDLIFE RANCHING IN SOUTH AFRICA

At the beginning of the 20th century, many wildlife populations in southern Africa were depleted as a result of disease epidemics and over-exploitation by humans (Bond *et al.*, 2004). In an attempt to reverse this, colonial governments centralised control of wildlife and tried to protect it by banning all consumptive utilisation at both commercial and subsistence levels. Although these changes were intended as conservation measures, they had the opposite effect on private land because farmers had no incentive to protect wildlife. Instead of contributing to income, wildlife became a burden to landowners by competing with domestic livestock and harbouring diseases, and the outcome was either neglect of wild species or deliberate eradication. In addition, livestock farming was actively encouraged through government subsidies and massive state investment in infrastructure, disease control and research, rendering wildlife even less desirable (Bond *et al.*, 2004). Many veterinarians and government agriculturalists, who were the most influential field scientists at the time, were opposed to wildlife conservation on private land because they believed wildlife was unproductive and spread disease (Carruthers, 2008), and there was a general lack of recognition of the potential for using wildlife sustainably and productively (Mossman & Mossman, 1976). While these prevailing attitudes did not encourage farmers to allow wildlife to remain on their land to mix with livestock, some farmers with large properties did keep wildlife, and it was often the case that these farms maintained higher land value than farms without wildlife (Mossman & Mossman, 1976; Carruthers, 2008).

During the 1950s there was growing recognition among international ecologists that productivity of wildlife could be quite high, that it might provide an alternative source of meat to domestic livestock, and that exterminating all wild animals to make way for domestic livestock was unnecessary and not the most efficient use of land, especially in marginal areas (Mossman & Mossman, 1976). This way of thinking was not initially mirrored by research in southern Africa, however, which continued to focus on improving domestic livestock breeds or cropping systems. In South Africa, a handful of landowners developed business models that were based around wildlife use, but they were hindered by authorities who actively prevented production and trade in wildlife, and by financial institutions, such as the Land Bank, that did not recognize wildlife as economic assets (Snijders, 2012). Wildlife was considered uncontrollable and a financial risk, and this made it impossible for farmers to secure loans and subsidies to fund wildlife activities.

The first regional research into the benefits of wildlife on private land was conducted in Southern Rhodesia (now Zimbabwe) by Dasmann and Mossman in 1959 (Mossman & Mossman, 1976; Carruthers, 2008). The findings of this work contradicted the conventional wisdom of the time and showed that wildlife could be ranched like cattle, could coexist with domestic livestock without negative consequences and held genuine potential for meat production. The scientific and cultural thinking started to change after this and the utilisation of wildlife was encouraged, transforming agricultural policy (Carruthers, 2008).

In South Africa, once it was recognised that harvesting wildlife for commercial purposes could be sustainable, there was still some initial resistance to using private land in this way. Instead, commercial consumptive use of wildlife was encouraged on state land in the 1960s, including flagship reserves like the Kruger National Park (KNP) (Carruthers, 2008). Despite the lack of government assistance, wildlife ranching had been growing on private land during this time, driven by the farmers themselves, and in 1964 there were between 2000-3000 farms in the former Transvaal using one or two game species as a source of income, although the primary sources of income for these farms were still cattle, maize and tobacco (Mossman & Mossman, 1976). This early growth of the private wildlife industry was due to ranch owners wanting a place to go to enjoy wildlife rather than any intent to benefit commercially (Bothma & Von Bach, 2010).

The Department of Agriculture and Fisheries (now the Department of Agriculture, Forestry and Fisheries, or DAFF) bowed to pressure in 1974 and set up a committee to formulate official game farming policy (Carruthers, 2008). The report, which was not completed until 1980, recognized intensive wildlife ranching as an official branch of farming, but at the time, this still did not confer ownership of wildlife to landowners, and wildlife ranchers did not enjoy the same rights as stock farmers. Wildlife had always been classified as *res nullius*, meaning that it did not belong to anybody, including the owner of the land on which it occurred, unless it was brought under physical control, such as by killing an animal during a hunt (Bothma & Von Bach, 2010; Snijders, 2012). In 1991, however, the South African government promulgated The Game Theft Act (No. 105 of 1991), which gave legal ownership of wildlife to landowners who obtained a Certificate of Adequate Enclosure (CAE) (Snijders, 2012). This meant that an animal that escaped onto a neighbouring property could be reclaimed, as long as sufficient proof of ownership could be provided (Bothma & Von Bach, 2010), and this lowered the risk for wildlife ranchers who wanted to own expensive species such as Sable (*Hippotragus niger*) or rhinos. In this case, the wildlife to be owned was defined as "game", which included all species kept or held for commercial or hunting purposes, including the meat, skin, carcass or any portion of the carcass of that game. A CAE could be applied for after erecting a suitable game fence around a property, the dimensions and quality of which were determined by each province according to the species to be enclosed.

The CAE also exempted landowners from many conservation regulations, and gave them the right to capture and keep most species without having to apply for separate permits, to hunt at any time of the year and to market, sell or donate animal commodities at will (Snijders, 2012). The Game Theft Act gave financial value to wildlife, which became a legally protected asset that could result in bank loans, credit, and novel tradable and insurable commodities. As a result, wildlife species prices increased and wildlife utilisation on private land surged. Legal ownership of wildlife does not, however, mean that wildlife ranchers are allowed to do whatever they please with animals, because they still need to conform to regulations for certain activities, such as hunting or translocation, and this had led some in the sector to believe that they were still not the true owners of their wildlife.

With the growing knowledge that wildlife ranching was ecologically and financially sustainable, and in some instances more so than regular agriculture, and with growing financial incentives, wildlife ranching has grown tremendously over the last 25 years.

Other socio-political, economic and ecological motivations that have arisen since the switch to a democratic government in 1994 have also contributed towards the growth of the sector. One motivation was that profit margins for traditional farming practices declined due to decreasing agricultural subsidies and the emergence of large-scale, feedlot-centred production systems Occurrence of intensive breeding of high value species on surveyed ranches (van Zyl *et al.*, 2001). De-regulation of the agricultural sector by the World Trade Organisation (WTO), as well as the agricultural sector's loss of political leverage in parliament, have played an important role in promoting the switch from stock farming to wildlife ranching. Economic incentives were the predominant factors causing many farmers to switch from pastoralism to wildlife ranching. For instance, the increase in wages for agricultural workers, lead landowners to look for ways to reduce the size of their labour force. Wildlife ranching provided an avenue to do so, as it was regarded as potentially less labour intensive than traditional stock farming. A further economic incentive was that increased stock theft, especially of small domestic stock, was making stock farming economically less viable, while there was greater potential for foreign exchange earnings from trophy hunting and tourism than stock farming. An ecological reason for switching to wildlife ranching was that game species caused less degradation to the rangeland in comparison with traditional livestock.

3 RATIONALE FOR THE STUDY

Despite the large scale of the wildlife ranching sector and its continuing growth, there is still much that we do not know about the sector (Langholz & Kerley, 2006; Bothma & von Bach, H.J.S., 2010; Lindsey, Romañach & Davies-Mostert, 2009; Lindsey *et al.*, 2013), including basic information such as exactly how many wildlife ranchers there are in total, how much land they occupy, and how many animals they own.

In terms of economics, work has been done comparing the economic and financial viability of wildlife versus livestock ranching (Cumming, 1995; Barnes & De Jager, 1995; Cloete, Taljaard & Grove, 2007), income generation from the trophy and biltong hunting sector (Van Der Merwe & Saayman, 2008; Saayman, Van der Merwe & Rossouw, 2011; Rossouw, Saayman & Van Der Merwe, 2011a; Saayman *et al.*, 2011; Van Der Merwe *et al.*, 2014), profitability of game ranching (ABSA, 2003; Cloete, Van Der Merwe & Saayman, 2015), and the contribution of ecotourism to the economy of the Eastern Cape (Sims-Castley, 2002; Smith & Wilson, 2002; Sims-Castley, Kerley & Geach, 2004; Langholz & Kerley, 2006; Muir, Skowno & Kerley, 2011). However, little is known about the overall contribution private wildlife ranches make to the economy or which types of enterprise are more financially viable. Although there have been useful studies conducted at the provincial level (e.g. van der Waal & Dekker, 2000; Reilly, Sutherland & Harley, 2003), there have been no comprehensive, structured, national analyses, and there is little information available on the social contribution of wildlife ranching or the general conservation value of ranch land (Bond *et al.*, 2004a; Langholz & Kerley, 2006). Furthermore, there has been insufficient monitoring of the ecological impacts of game ranching or of land use trends within the industry and, as a result, a dearth of information with which to guide policy (Lindsey *et al.*, 2009b). This has resulted in inadequate regulation and some negative impacts on conservation. Examples of the latter include exotic species being translocated into areas where they never historically occurred (extra-limital introductions), manipulation of species genetics to create hybrid species and elevate the frequencies of colour variants, and the start of ethically questionable hunting practices such as 'canned' hunting and 'put and take' hunting (Hamman, Vrahimis & Blom, 2003; Lindsey *et al.*, 2006). In some cases, lack of knowledge of the workings of wildlife ranching has resulted in inappropriate legislation with potential to stifle the industry without achieving desired outcomes.

South Africa inherited skewed land ownership from the past government and the transfer of land from white to black farmers is a political imperative (Lindsey *et al.*, 2013b). Lack of data, the fact that most of the beneficiaries of wildlife-based land uses are white landowners, and a perception that wildlife ranching threatens food security because it displaces traditional forms of agricultural production, have meant that wildlife ranching is not always fully supported by the government (Duffy, 2000; Lindsey *et al.*, 2013). Without intervention to raise awareness among politicians of the potential benefits of wildlife-based land uses there is a risk that land reform will cause a reversion to livestock in marginal areas that are best suited for wildlife. South Africa's future hinges on developing land use options that are socially just, economically viable, and ecologically appropriate (Langholz & Kerley, 2006), and there is a need for research into the scale and impacts of wildlife ranching in southern Africa to guide land use planning and land reform.

Over the last four years the South African Government has recognised that the national economy needs to adopt resource-efficient production practices and progressively restructure away from energy intensive industries towards new green industries, which are financially viable and internationally competitive in the long run. The South African wildlife ranching industry has been flagged as a potentially strong sector of 'green economy' development, but a detailed assessment of the social, economic and conservation value of the wildlife ranching industry has not yet been conducted. In the absence of industry-wide data, it is difficult to:

- Ascertain the circumstances under which the ecological, economic and social benefits from the industry are greatest;
- Develop appropriate legislation to regulate the industry;
- Develop best practice and incentives to promote the industry as a means of helping South Africa achieve commitments to international conservation targets;
- For policy makers to include the industry in land use planning processes, which is particularly important given the imperative of land reform in South Africa and the fact that there will be a large-scale transfer of ownership of land during the coming years;
- For government to support the sustainable development of the wildlife ranching industry as part of the green economy agenda in South Africa.

The purpose of this study was therefore to answer the following questions:

1. What is the economic value of the wildlife ranching industry in South Africa?
2. What are the ecological and environmental impacts of the wildlife ranching industry in South Africa and what are their contributions to biodiversity conservation?
3. What are the social impacts of the wildlife ranching industry in South Africa?
4. What are the trends in scale of and types of land use within the wildlife ranching industry?
5. What are the drivers and constraints, the risks and opportunities for the industry?
6. What are the necessary interventions required to maximize benefits and address problems associated with the industry and its development?

4 THE DEFINITION OF WILDLIFE RANCHING AND KEY COMPONENTS WITHIN THE WILDLIFE RANCHING SECTOR USED IN THIS REPORT

4.1 Wildlife ranching definition

The criteria we used to decide whether or not to include a wildlife establishment in our study were:

1. They had to be privately owned (which could mean owned by an individual, company or consortium). We excluded any state owned areas; and
2. They had to derive commercial benefit from wildlife. The extent of commercialisation was not important (i.e. they did not have to be profitable), and we included a range of possibilities from full-time profit-making wildlife ranchers at one end of the spectrum, to part-time, mixed farming ranchers possibly making a loss from wildlife at the other.

The terms “wildlife ranching” and “game farming” both refer to the management of wildlife on private land for commercial purposes. They are often used interchangeably, although game farming generally (and subjectively) refers to smaller properties (<5,000 ha) where some form of constant management is necessary, while wildlife ranching generally refers to larger properties (>5,000ha) where management interventions are less necessary and frequent (and may be considered extensive).

In addition to properties that would generally be referred to as ranches or farms, we also included private game/nature reserves, as long as they fulfilled the two criteria above. We also included enterprises that used non-consumptive activities such as ecotourism to generate revenue (some properties were used exclusively for ecotourism), and did not confine our analyses to the consumptive use of wildlife. For the sake of simplicity and consistency, we use the term “wildlife ranching” throughout this report to refer to all these categories of wildlife operation.

4.2 The key components within the wildlife ranching sector

The wildlife ranching sector is supported by four main “pillars” (following Van der Merwe, Saayman & Krugell, 2004):

1. Ecotourism;
2. Live sales and breeding of high value species and colour variants;
3. Trophy and biltong hunting; and
4. Processed game products.

Ecotourism may be defined as "responsible travel to natural areas that conserves the environment and improves the well-being of local people." In the context of this report, ecotourism involves non-consumptive use of wildlife, such as photographic tourism, bird-watching, hiking and horseback riding, and ideally develops awareness about the local environment and culture and results in minimal impact on the environment. In South Africa, ecotourists generally seek out natural environments and wildlife for a genuine “wilderness experience” (Sims-Castley, 2002), so the eco-tourism industry is reliant upon a comparatively intact environment.

Breeding of high value game species generally takes place in intensive or semi-extensive environments. The three main species supporting this sector over the last 30 years have been Sable, Roan (*Hippotragus equinus*) and disease free African Buffalo, while more recently the industry has expanded to include colour variants of plains game species including Blesbok (*Damaliscus pygargus phillipsi*), Gemsbok, Impala, Springbok, and Blue Wildebeest. Due to the high individual value of the

animals, breeding is often conducted under conditions that reduce the risks of depredation, generally in fenced camps or enclosures of varying size. Live wildlife species may be bought from auctions, including boma, catalogue and internet auctions, or directly from wildlife ranchers, conservation authorities and wildlife capture businesses (Bothma, du Toit & van Rooyen, 2010a).

Hunting in South Africa can be broadly divided into three categories: trophy hunting, biltong hunting and wingshooting (bird hunting). Trophy hunting can be defined as the selective hunting of individual non-domesticated animals (primarily mammals), picked for specific traits such as large horns, tusks or body size, and performed by paying clients using a rifle or bow in the presence of a professional hunter (Lindsey *et al.*, 2007; Van der Merwe, Saayman & Rossouw, 2014). The primary products obtained from this activity are skins, horns and tusks, and these are often retained by the clients to be displayed as mounted trophies. When the species hunted is an ungulate, the meat from the carcass is normally considered to be a secondary product and left by the client for local consumption.

Biltong hunting is defined as the hunting of non-domesticated animals, performed as a cultural activity by local hunters, normally using a rifle or bow, with the purpose of obtaining meat (Van der Merwe *et al.*, 2014). This meat may be processed into biltong or sausage, and is consumed either by the hunter and his/her family or friends, or sold to local butcheries. Wingshooting is the hunting of birds, normally wildfowl and game birds, performed as a cultural activity by local hunters using a shotgun, but is not dealt with in this report because it is normally conducted on non-wildlife agricultural land (Andre van der Westhuizen, South African Wingshooters Association, personal communication).

Processed game products include meat and skins, so there is some overlap with hunting. In the context of this report, we only consider meat products because skins were very rarely mentioned by surveyed ranchers, and do not appear to be a common by-product of animals shot (aside from trophy animals, in which case the skin is taken by the hunting client and not sold separately by the landowner). Although game meat is often referred to as venison, Hoffman *et al.* (2005) suggest that the two terms should be differentiated because venison generally refers to meat originating from farmed animals, such as is the case with deer in New Zealand and Europe, while game meat in South Africa originates from wild, free-roaming animals. In this report we use the term game meat for meat taken from wild ungulate species (e.g. Springbok, Kudu, Eland, Blesbok, wildebeest species, zebra species, etc.), and differentiate this from Ostrich and crocodile meat and from 'bushmeat' which typically refers to meat obtained from wildlife through illegal hunting, or poaching (Lindsey *et al.*, 2013a).

4.3 Exemption permits and certificates of adequate enclosure

"Exemption Permits", "Certificates of Adequate Enclosure" (CAE), "Certificate of Sufficient Enclosure" (CSE) and "Game Farm Permits" are all types of permit issued by provincial nature conservation authorities to landowners (mostly private landowners on free-hold properties) to convey certain rights to these landowners over the use of wildlife. The only real difference between these permits is the terminology used by different provinces; otherwise they are virtually interchangeable. North West Province, Limpopo, Mpumalanga and Gauteng use exemption permits; the Western Cape, Eastern Cape and Free State use CAEs; the Northern Cape (which previously used CAEs as well) use Game Farm Permits; and KwaZulu Natal uses Certificates of Sufficient Enclosure. In general, any landowner to whom such a permit has been issued may, subject to conditions specified in the permit, do the following on the land for which the permit has been issued:

- Hunt any number of the species of wild animal authorised on the permit at any time of year;

- Capture any wild animals of the species authorised in the permit within time periods designated by provincial nature conservation authorities and the Wildlife Translocation Association; and
- Sell or trade in any wild animals of the species authorised in the permit.

These permits do not cover species occurring on the List of Threatened or Protected Species (TOPS) or species considered to be dangerous game (African Elephants, rhinos, African Buffalos, African Lions, Leopards, Hippos).

Provincial nature conservation authorities will issue exemption permits or certificates of adequate enclosure if the landowner can demonstrate that the property is adequately fenced for the species to be included in the permit. This requires that perimeter fencing meets certain specifications set out by provincial regulations, dependent on the species to be included in the permit. Having a valid permit conveys certain ownership rights over the animals under the Game Theft Act of 1991 (*Game Theft Act*, 1991).

To simplify terminology in this report, the terms “exemption”, “exempted” or “exempt” are used to incorporate farms with any of the four types of permit mentioned above. Regulations for these exemption permits are provided for in Provincial Ordinances.

Landowners without exemption permits are also allowed to make use of wildlife for commercial gain, including consumptive use, but they are required to obtain separate hunting or capture permits for every such activity and are not allowed to hunt throughout the year. A lack of exemption also prevents a landowner from claiming damages from anyone hunting or removing wildlife from their properties without permission because they are not covered by the Game Theft Act of 1991. This report uses the term “open farm” to describe commercial wildlife ranches that do not have an exemption permit.

Although regulations may be implemented differently in different provinces, the exemption period is usually three years, and during this time farmers can utilise wildlife all year. At the end of the three years, the rancher can renew the exemption permit and carry on as before, or if the permit expires, the ranch reverts to being an open farm. Having an exemption permit, does not, however, necessarily mean that a wildlife rancher will utilise game commercially, nor does it mean that the farmer is free to translocate species wherever he pleases. The latter issue is constrained by the conditions of the exemption permit and may require further permits from nature conservation departments for certain restricted species, especially for inter-provincial translocations.

5 METHODS

Details of specific data collection and analysis methods are described in the corresponding sections below. What follows here are the general methods used to obtain the data that we present in the later sections.

5.1 Collection and collation of existing data

Existing data on the wildlife ranching industry was collected and collated from a variety of published sources including: the scientific and popular literature; the Department of Environmental Affairs (DEA); the Department of Agriculture, Forestry and Fisheries (DAFF) (including the Directorate of Veterinary Public Health (DVPH)); provincial nature conservation departments; national and provincial wildlife industry associations (e.g. Wildlife Ranching South Africa (WRSA), National Association of Conservancies (NAC), Professional Hunting Association of South Africa (PHASA), South African Hunters and Game Conservation Association (SAHGCA), agricultural unions, etc.); international databases such as CITES; and existing GIS databases.

5.2 Questionnaire survey of landowners

We developed two variations of a structured questionnaire survey to interview commercial wildlife ranchers in South Africa. The purpose of these questionnaires was to estimate the economic, social and biodiversity contributions of wildlife ranching from the perspective of the individual rancher, and to use the data collected to make comparisons between land use types. To qualify as a participant in this survey, the landowner needed to derive some form of revenue from wildlife, whether it was as a primary or secondary source of income. The amount of income was not a deciding factor, nor was the main land use on the property. Part-time wildlife ranchers were, therefore, included as long as the wildlife was used for some kind of income generation. Mixed farmers were also included, i.e. those with both wildlife and livestock, or wildlife and crops, or all three, regardless of whether wildlife was a primary or secondary land use type. All types of wildlife utilisation were considered, including non-consumptive ecotourism (such as photographic safaris, birding, hiking, horseback riding, etc.), breeding of wildlife species (including intensive breeding using camp systems or semi-extensive breeding), live sales (either privately or via auctions), or consumptive utilisation which encompassed trophy and biltong hunting, and culling for game meat production. We did not ask questions specifically about 'canned' hunting, and the only rancher that indicated that he bred African Lions, quickly emphasised that they were for live sales and that he had no involvement with hunting them.

Because we wanted to obtain economic, social and biodiversity information from each survey participant, the main questionnaire was lengthy, and comprised 81 questions, some with multiple components (see Annexure I). The average duration of the questionnaire was 40-60 minutes, with some interviews lasting in excess of two-hours. Because some questions were specific to land use types, such as hunting or breeding, ranchers with more varied enterprise models were required to answer more questions. This was off-putting to some potential participants because of the time requirements, and in order to reduce the rate at which ranchers refused to participate, a shorter questionnaire survey was subsequently created and was offered as an alternative if the landowner was unwilling to give up sufficient time to complete the long survey. The shorter survey comprised 15 questions and took approximately 15 minutes to complete, however, it could only be used to answer the more basic questions, and excluded economic aspects and questions aimed at assessing an index of biodiversity.

In total, 205 long surveys and 46 short surveys were conducted (Figure 1). The first 125 long surveys were obtained through face-to-face interviews, and were collected by two survey officers assigned

to separate regions of South Africa (one in Limpopo Province, and one in the Western, Eastern and Northern Cape provinces). When this proved to be too time consuming (for reasons described below), the survey collection technique was switched to telephonic interviews, and the remainder of the long surveys and all the short surveys were done via the telephone.

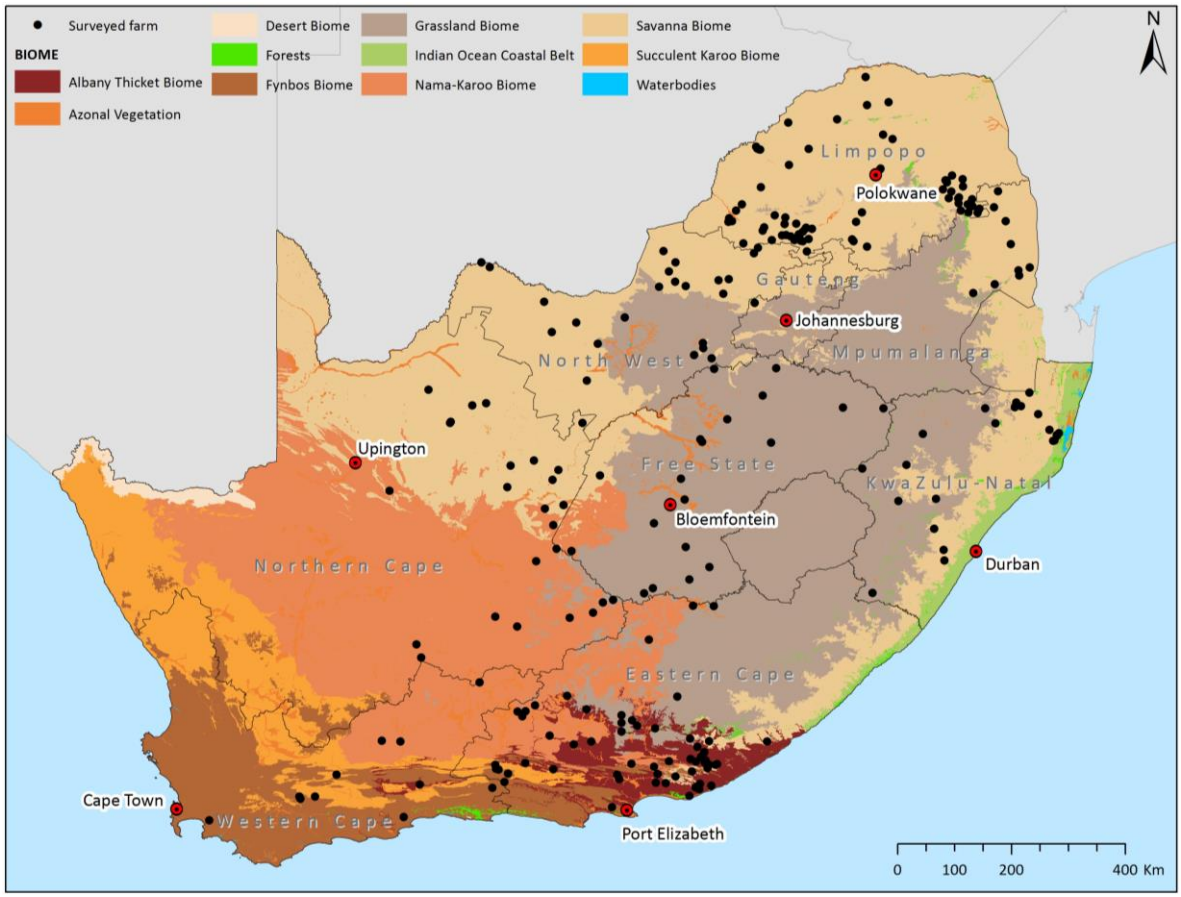

Figure 1. Distribution of surveyed wildlife ranches across South Africa (n=251).

With regards to the process of selecting wildlife ranchers for the study, we were able to obtain up-to-date contact lists for only three provinces (North West, Free State and KwaZulu-Natal), but not for the remaining six provinces. Although provincial nature conservation authorities have contact list databases for all farming properties with exemption permits or certificates of adequate enclosure (see glossary or section 4.3 for an explanation of these terms), which is a requirement when applying for such a permit, the provincial authorities are not allowed to release private information (including contact details) without the consent of the landowner (due to the Protection of Personal Information Act of 2013). Similarly, private organisations, such as WRSA and SAHGCA, who have large membership lists of wildlife ranchers, are constrained by the same laws and were not able to provide us with this information.

As a result of this lack of contact information up-front, we were only able to select wildlife ranchers on a random basis for three provinces mentioned above, and for the rest we depended on convenience sampling. We acknowledge the potential bias that this creates, but it was unavoidable. The following alternative methods were used to obtain contact details for the remaining six provinces:

- Internet searches were conducted using a combination of the following terms: “game farm”, “wildlife ranch”, “game lodge”, “private game reserve”, “private nature reserve”, “hunting lodge”, “game breeders”, “game auctions”, “wildlife translocation”.
- Advertisements relating to wildlife ranching activities (such as ecotourism, hunting and game breeding) were gleaned from magazines such as “WRSA”, “Game and Hunt” and various travel magazines.
- Survey officers attended wildlife rancher meetings and study groups to introduce the project and request the participation of attendees.
- During the course of travelling between farms, survey officers obtained contact information on an ad hoc basis from signboards and advertisements along the road, as well as from information offices in towns.
- During questionnaire interviews, survey officers asked the participants to provide contact details of other wildlife ranchers they knew in the area.
- A contact information data-capture sheet for wildlife ranchers was placed at the EWT stand at Grain SA's NAMPO Harvest Day in May 2014.
- WRSA provided contact details of the chairpersons of their regional offices (although not of individual wildlife ranchers) and we made contact with some of these.
- Various EWT programmes have databases of farmers in a number of provinces, including the Eastern Cape, KwaZulu-Natal and Limpopo/Mpumalanga on the western boundary of KNP, some of which are wildlife ranchers.
- Short articles were placed in newsletters of WRSA and SAHGCA, as well as in the magazine *Wild & Jag* to request wildlife ranchers to get in touch if they were willing to participate (this method yielded no responses whatsoever).
- A request was sent to the Honorary Rangers Association of North West Province for assistance to obtain contact information.

In addition to the difficulties in obtaining the contact details of ranchers, we also faced the constraints of convincing ranchers to agree to participate and to find convenient times to conduct interviews. While many ranchers contacted were willing to answer questions about their farming operations, some were not willing. In addition to the time commitment required to answer the questions, which was off-putting to some, others were unwilling to answer questions because they were considered too personal or sensitive. This was understandable given that, in most cases, the person conducting the interview was unknown to the farmer. None of the personal information provided by landowners in the questionnaires is presented here.

With regards to the response rates, we attempted to contact 526 wildlife ranchers/landowners/ managers, from which we obtained 251 successful surveys (Figure 2). Thirty-five (35) ranchers were unwilling to participate for various reasons, while 57 initially agreed to participate (either over the phone or via email) but then did not respond again with further attempts to request participation. Twenty-five (25) people were no longer practising wildlife ranching (either because they had sold their farms or had switched to another form of agriculture), while six did not use wildlife commercially, although they did have wildlife on their properties. The final 152 people did not answer their phones after two attempts.

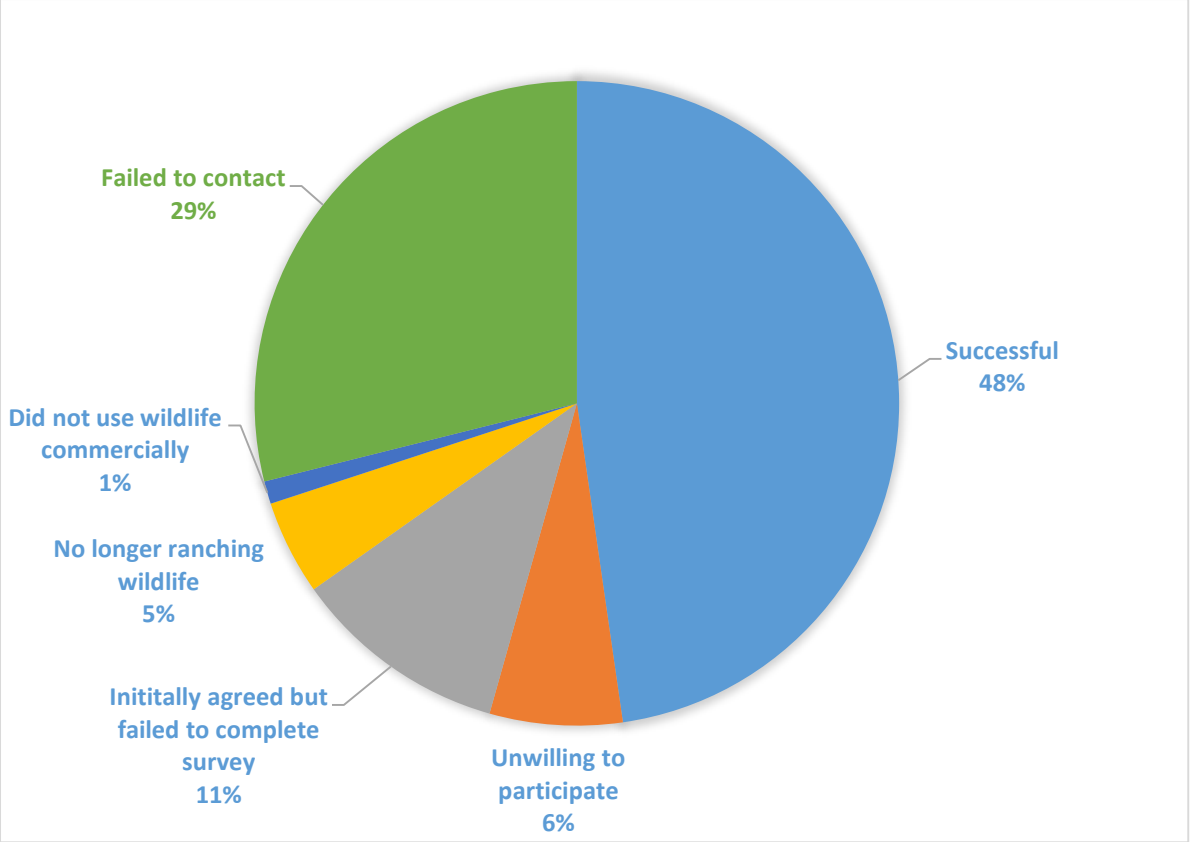

Figure 2. Response rates of wildlife ranchers requested to participate in survey (n=526).

5.3 Selected surveys of key stakeholders

Individuals from key stakeholder groups were interviewed to gather information, impressions and opinions on factors such as trends in land use, pros and cons associated with wildlife ranching, drivers and constraints affecting the industry, and initiatives in place to enhance the benefits associated with wildlife ranching. These interviews varied from basic requests for information to more detailed and structured discussions that were focussed on the field of expertise of the interviewee. These key stakeholders and the types of information we requested from them were as follows:

1. National DEA: We asked about DEA's mandate over wildlife ranching in South Africa, the various forms of regulation including TOPS and translocation, the exemption permit system, ownership of wildlife, the issue of national vs. provincial legislation, permitting systems, extra-limital species and intensive breeding;
2. Provincial DEA: We requested information on numbers of exempt properties, areas covered by these properties and any further information they could provide about wildlife ranching in their provinces;
3. DAFF: From the Directorate of Veterinary Public Health we asked about their mandate over wildlife ranching in South Africa, veterinary legislation surrounding wildlife as it pertains to the private industry including translocation regulations, issues surrounding wildlife disease;
4. Representatives of the meat industry, including game meat: We asked about the current state and scale of game meat production, the potential for increasing the contribution of game meat to food security, legislation surrounding game meat production and how it restricts developing a consumer market;

5. WRSA: We asked about the scale and trends of the wildlife ranching sector, general constraints arising from legislation, potential ways forward;
6. PHASA: We asked about their mandate in South Africa, membership, trophy hunting statistics, job creation by the trophy hunting industry, where trophy hunting is conducted, the position of the industry on colour variants, regulations and constraints on the sector, potential impacts of stricter international regulations, the potential for involvement of previously disadvantaged communities, as well as ways forward.
7. Biltong hunting organisations (SAHGCA and CHASA): We interviewed 17 chairpersons of local hunting organisations belonging to these associations to ask about the kind of hunting they conduct, where they hunt, how many times a year, how many animals they hunt, what they do with the meat and how much they spend;
8. Wildlife Translocation Association (WTA): We interviewed 19 wildlife translocation members of the WTA to obtain data on numbers of animals translocated, numbers of employees, annual turnover, their impressions and opinions of legislation surrounding wildlife translocation, how it impacts the sector and potential ways to improve the industry;

6 THE CURRENT STATE OF THE WILDLIFE RANCHING SECTOR

6.1 The extent and scope of the wildlife ranching sector

6.1.1 Spatial and temporal patterns and trends in the extent and type of wildlife ranching

6.1.1.1 *The growth of the wildlife ranching sector*

There have been no definitive studies on the growth of the wildlife ranching sector in South Africa, and we still do not have a clear idea of the true extent of wildlife ranching in the country (Bothma & Von Bach, 2010). Before exemption permits were issued, there was little contact between game producers and conservation departments and few records were kept about the extent of wildlife production (Mossman & Mossman, 1976). Once farmers could obtain exemption permits, permit records became a possible source of information, but only for farms with such permits; open ranches were still difficult to quantify.

Despite this lack of detailed information, there are some statistics available from which the growth of wildlife ranching in South Africa has been documented. Du Toit (2007) estimated that there were as few as four fenced game ranches specializing in game in the former North-Western Transvaal in 1965 (now part of Limpopo and North West Provinces), although there were between 2,000-3,000 farms using one or two game species as a secondary source of income (Mossman & Mossman, 1976). There were similarly low numbers of specialized game ranchers in other provinces at this time. By 1980 there were thought to be 399 farms in South Africa that were used entirely for wildlife, covering an area of 6,100 km^2, and by 1987, this had increased to 1,760 farms, covering 62,000 km^2 (Carruthers, 2008) (Figure 3), although it is not known how many of these farms had exemptions. In the year 2000, there were thought to be between 7,000 and 9,000 wildlife ranches (of which 5,061 had exemptions), covering a total area of 160,000 km^2 (Ebedes, 2002; Van der Merwe *et al.*, 2004; Bothma & Von Bach, 2010), and by 2005, the total area (all game ranches, with and without exemptions) used by wildlife ranching was estimated to be 205,000 km^2 (including 6,330 farms with exemptions) (National Agricultural Marketing Council, 2006), representing 16.8% of South Africa's total land area of ~1,221,000 km^2. It should be noted that this 2006 report presented no citations or methods for how this estimate of area was calculated, and no indication of how many of these farms were used entirely for wildlife, and how many were mixed farms.

If these figures were correct, the number of exempted wildlife ranches grew by an average of 7.4% per year during the time period 1987 to 2005, while the area used for wildlife ranching grew by an average of 6.9% per year. These farms were unevenly spread across the provinces, with more than 80% occurring in Limpopo, the Northern Cape and the Eastern Cape in the year 2000 (Van der Merwe & Saayman, 2003). More recent figures for exempt farms have not been published. For an in depth discussion of the history of wildlife ranching in South Africa, see Carruthers (2008).

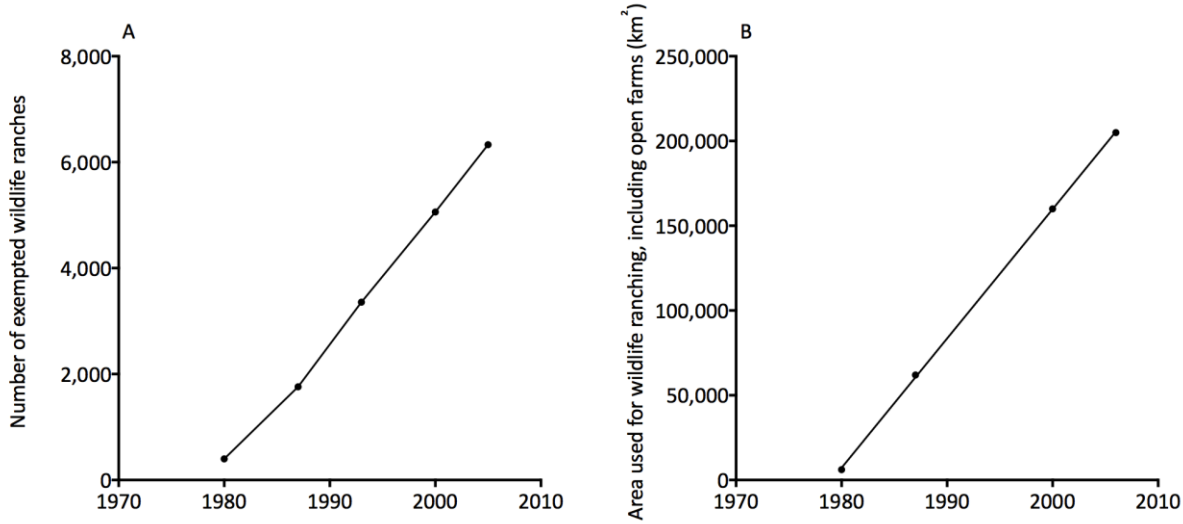

Figure 3. The growth of the wildlife ranching industry in South Africa as reported in the literature: A) number of exempt farms; A) total area of wildlife ranches (including both exempt and open farms). Data sources: Van der Merwe *et al.*, 2004; NAMC, 2006; Carruthers, 2008.

In recent years, access to personal information, including contact details of landowners, has become strictly controlled due to the Protection of Personal Information Act (POPI). Although this protects an individual's right to privacy, it has created a major obstacle in terms of conducting large scale studies like the current one. While provincial nature conservation departments hold information on wildlife ranchers with exemption permits, and other representative organisations such as WRSA, SAHGCA and farmers unions do the same, they are bound by confidentiality clauses and may not release information without the permission of the landowners. To illustrate how things have changed over the last decade, a study conducted in 2001 that investigated the extent of wildlife ranching in Gauteng was able to obtain a list of all properties with exemption permits in the province from the provincial department of nature conservation, and was able to approach the South African Game Ranchers Association for information on their members (Reilly *et al.*, 2003). In 2002, a study on the value of game farm tourism in North West Province was able to obtain contact information from the provincial database of exempted farms (Van der Merwe & Saayman, 2003). Today this is not possible. As a result, current information is more fragmented than in the past, and is often anecdotal or self-referential (Snijders, 2012).

6.1.2 Current number of exempt and open wildlife ranches

6.1.2.1 *Number of exempt and open wildlife ranches*

There is no national database for wildlife ranches, exempted or open, so statistics on the numbers of farms and their areas must be obtained separately from each province. This might change in the next few years if the Preservation and Development of Agricultural Land Framework Bill, which is currently under review, is promulgated. This Bill will provide for a National Agricultural Land Register, the objective of which will be to store geo-referenced data and information for the development, protection, sustainable use and management of natural agricultural resources and agricultural land. This will be an electronic-based register of all agricultural land that will track the use, protection, alteration and loss of agricultural land in the Republic, and will make it possible to extract information from a central place.

Provincial nature conservation departments issue exemption permits to landowners who can show they have adequately fenced their properties for the species they wish to keep, and we approached all nine provinces with requests to provide numbers and areas of exempt properties using their permit records. The quality of provincial records was quite variable, and it is not clear how many have accurate records. In some provinces, permits are held by Districts or Service Centres, rather than centrally, which makes it even harder to obtain data. For example, Limpopo Province, which has approximately half of the exempt farms in the country, was only able to provide data on numbers and areas of exempt farms for three of its five District Municipalities, which meant that the number of properties with exemption permits for the entire province had to be estimated by extrapolation from the data provided. A clear recommendation to be drawn from this aspect of the project is that exemption permit records need to be converted to an electronic format (where that has not yet happened), and these need to be held centrally, at least within each province, if not nationally.

Even in those provinces that keep good records, information is rarely accurate or up-to-date because the numbers of active permits are constantly changing due to newly registered exemption permits or ranchers allowing their permits to lapse (which could be due to them selling their farm, switching to another land use type, or simply failing to renew the permit - in which case all wildlife based activities would require separate permits). As exemption permits last for three years, it is also likely that some of the properties with valid permits are no longer used for wildlife ranching. Given these factors that make it impossible to get accurate figures, the numbers and areas of exempt farms estimated below should be treated as approximations.

Based on information provided by provincial nature conservation departments, the estimated number of properties in South Africa with exemption permits is 6,734 (Table 2). It is important to note here that this does not necessarily equate to the same number of wildlife ranches, because it is possible that a single wildlife ranch comprises more than one property and holds more than one exemption permit (Peter Oberem, WRSA, personal communication). This possibility makes it even more difficult to estimate the total number of wildlife ranches in South Africa and underscores the need for a centralised, electronic database for wildlife ranching related permits. Many provinces keep exemption permit records as paper copies, which are impossible to keep track of accurately.

The number of open farms (i.e. those practising wildlife ranching without exemption permits) cannot be estimated from any existing databases and, to the best of our knowledge, there are no records in the literature documenting national statistics on numbers of farmers or ranchers who use wildlife as part of their agricultural practises. Annual agricultural statistics released by DAFF do not include any information on the commercial (or non-commercial) use of wildlife (e.g. DAFF, 2012; DAFF, 2013). The only information that we could find was collected incidentally during agricultural surveys of commercial farmers by the market research company Marketing Surveys & Statistical Analysis, Pty Ltd (MSSA), who do annual agricultural surveys across South Africa, but who have not yet included specific questions on wildlife ranching (Schalk van Vuuren, MSSA, personal communication). The results of these surveys do not shed any light on the extent of open farms. Consequently, if a landowner does not have an exemption permit for his wildlife, there are no official records on his farming practices, unless he is a member of an organisation like WRSA or SAHGCA; but even then, records are fragmented between different organisations and are not held centrally. This situation should change if the Preservation and Development of Agricultural Land Framework Bill (as described above) is promulgated because the Bill will require all farmers to declare what they use their land for.

Table 2. Comparative statistics for numbers and areas of wildlife ranches by province. Provincial statistics were provided by nature conservation departments and are subject to frequent changes because of the dynamic nature of permitting processes.

	Provincial statistics					Surveyed farm statistics			
Province	Number of exempt farms in 2000[1]	Number of exempt farms in 2014	Estimated area of exempt farms in 2014 (ha)	Mean farm size (ha)	Median farm size (ha)	Number sampled (number exempt[27])	Total area of surveyed farms (ha)	Mean area of surveyed farms (ha)	Median area of surveyed farms (ha)
Limpopo	2,482	3,366[2]	5,499,519[2]	1,634[3]	1,040[3]	75 (69)	303,616	4,048	1,600
Mpumalanga	205	647[4]	866,482[5]	1,339[6]	735[6]	11 (5)	34,496	3,136	2,400
North West	340	727[7]	1,219,000[8]	1,677[9]	800[9]	23 (20)	126,696	5,509	1,000
Free State	180	380[10]	431,300[11]	1,137[12]	700[12]	21 (14)	31,767	1,513	1,310
Gauteng	72	95[13]	95,000[14]	1,000[15]	Unknown	1 (1)	5,600	-	-
KwaZulu-Natal	90	125[16]	431,000[17]	3,475[18]	1,400[18]	22 (15)	66,987	3,045	1,394
Eastern Cape	624	559[19]	739,300[19]	1,322[20]	Unknown	60 (38)	347,554	5,793	3,515
Western Cape	82	197[21]	626,000[22]	3,180[23]	1,330[23]	12 (8)	87,984	7,332	3,700
Northern Cape	986	638[24]	2,873,769[25]	4,504[25]	2,459[25]	26 (21)	372,803	11,650[28]	6,862
Total	5,061	6,734	12,781,370	1,898	1,000[26]	251 (191)	1,377,503	5,360	2,100

[1] Eloff 2002; [2] Estimate based on data provided by LEDET (and based on incomplete information: 3 out of 5 District Municipalities provided numbers of exemptions, covering 73% of the total area of the province); [3] Based on a sample of 1,745 exempt farms for which information was provided by LEDET; [4] Data provided by MTPA; [5] Extrapolation based on a sample of 588 exempt farms for which farm size was provided by MTPA; [6] Based on known farm sizes for 588 exempt properties; [7] Data provided by NWPG; [8] Extrapolated figure based on known farm sizes for 702 exempt properties; [9] Based on known farm sizes for 702 exempt properties; [10] Data provided by FSDETEA; [11] Extrapolated figure based on known farm sizes for 354 exempt properties; [12] Based on known farm sizes for 354 exempt properties; [13] Data provided by GDARD; [14] Total area estimated by GDARD (no breakdown available); [15] Based on total estimated area of exempt farms in Gauteng; [16] Figures provided by Karel Landman (WRSA KZN); [17] Extrapolated figure based on known farm sizes for 83 exempt properties; [18] Based on known farm sizes for 83 exempt properties; [19] Data provided by ECPTA; [20] Based on total estimated area of exempt farms in Eastern Cape (no breakdown available); [21] Data provided by Cape Nature [22] Extrapolated figure based on data for 167 properties provided by Cape Nature; [23]Based on data for 167 properties provided by Cape Nature; [24] Data provided by NCDENC [25] Figures from DENC provided as individual farm sizes; [26] Based on amalgamated data from all provinces (n=4,277); [27] Exemption status was indicated by ranchers during surveys; [28]Mean estimate based on 32 properties because one farm comprised 6 properties, and one farm comprised 2.

During the current questionnaire survey, 191 out of 251 participating landowners (76.1%) indicated that they had an exemption permit. However, landowners from North West Province were selected from an old exemption permit database and were, therefore, biased towards landowners with exemptions. When participants from North West Province were excluded, 171 out of 228 landowners (75%) had an exemption permit (Table 3). These 228 participants from eight provinces were selected without any prior knowledge of their exemption status, and we assumed that they were representative of wildlife ranchers across the country.

Table 3. Numbers and areas of exempt, open and all wildlife ranches in South Africa.

Percentage of wildlife ranches with exemption permits based on rancher survey responses (%)		75
Approximate number of exempt wildlife ranches based on data provided by Provincial Nature Conservation Departments		6,734
Approximate area under exempt wildlife ranches based on data provided by Provincial Nature Conservation Departments (km^2)		127,814
Estimated number of open wildlife ranches (calculated using number of exempt properties and percentage of wildlife ranchers with exemptions)		2,245
Estimated area under open wildlife ranches (calculated using estimate of number of open ranches and mean area of exempt ranches) (km^2)		42,605
Estimated total number of wildlife ranches		8,979
Estimated total area of wildlife ranches	**km^2**	**170,419**
	ha	**17,041,900**

By comparison, approximately 50% of farms that stocked game in 1984 had exemption permits (Behr & Groenewald, 1990), while in the late 1990s, 83% of respondents to a wildlife ranch survey had exemption permits (van der Waal & Dekker, 2000). The large increase during the period between these two studies is generally attributed to the promulgation of the Game Theft Act in 1991, which provided significant incentives to having an exemption permit (see section 4.3), and it is unsurprising that the majority of wildlife ranchers who use wildlife commercially obtain them.

If it is assumed that 75% of all wildlife ranchers have exemption permits and that there are currently 6,734 exempt ranches in South Africa, then there are approximately 2,245 open wildlife ranches in the country, making a grand total of 8,979 wildlife ranches (Table 3). To estimate the total area under wildlife ranching in South Africa, including both exempt and open farms, we assumed that the area under exempt properties (127,814 km^2) comprised 75% of all land under wildlife, which gives a total area of 170,419 km^2 (Table 3). Given a total land area of 1,221,000 km^2 for South Africa, the area covered by commercial wildlife ranchers comprises 14.0% of the country, which is 2.2 times greater than the area covered by South African state protected areas (78,100 km^2, or 6.4% of the country's surface area; the latter areas include National Parks, Provincial Nature Reserves, Mountain Catchment Areas, Forest Area Protected Areas, Local Nature Reserves, World Heritage Sites and National Botanical Gardens; SANBI, 2011).

This current estimated area of 170,419 km^2 is less than indicated by a report by the National Agricultural Marketing Council (2006), which stated that there were about 9,000 wildlife ranches in South Africa, covering an area of 205,000 km^2. That report, which is widely cited in grey literature articles discussing the scale of wildlife ranching in South Africa, does not provide background or citations for how these figures were derived, so it is not possible to assess the reasons for the disparity with our current estimate. Evidence from auction sales (see section 6.1.4.1) and trophy hunting income for the entire country (see section 6.1.5.1), as

well as much anecdotal evidence from the wildlife ranching industry itself, strongly suggests that wildlife ranching is growing rather than declining, so the difference between our estimate and the 2006 estimate (NAMC, 2006) is not likely to be due to a contraction in area of wildlife ranches. Rather, it may represent inaccuracies in the data provided by the provinces to either or both studies.

Our estimate is slightly higher than the area estimated for the year 2000, when the area estimated was 160,000 km^2 (Ebedes, 2002). It should be noted that the current estimate is for ranches that use wildlife commercially, and does not include farms that may have unutilised free-roaming wildlife populations. The number of such ranches is probably unknowable, and the extent of wildlife on these properties will be highly variable.

The proportion of ranches with exemptions varied slightly between land use categories, ranging from 79% for ranches conducting biltong hunting to 92% for ranches conducting live sales (Figure 4). Given that most ranchers conduct more than one land use, it is hard to determine whether any categories of land use are more or less likely to have exemption permits. However, the more land uses practiced on a property, the more likely a rancher would be to have an exemption permit (Figure 5). Given the advantages of having an exemption, such as being able to hunt all year and not requiring new permits every time an animal is hunted or translocated, ranchers conducting multiple activities will save themselves a lot of time by obtaining an exemption permit.

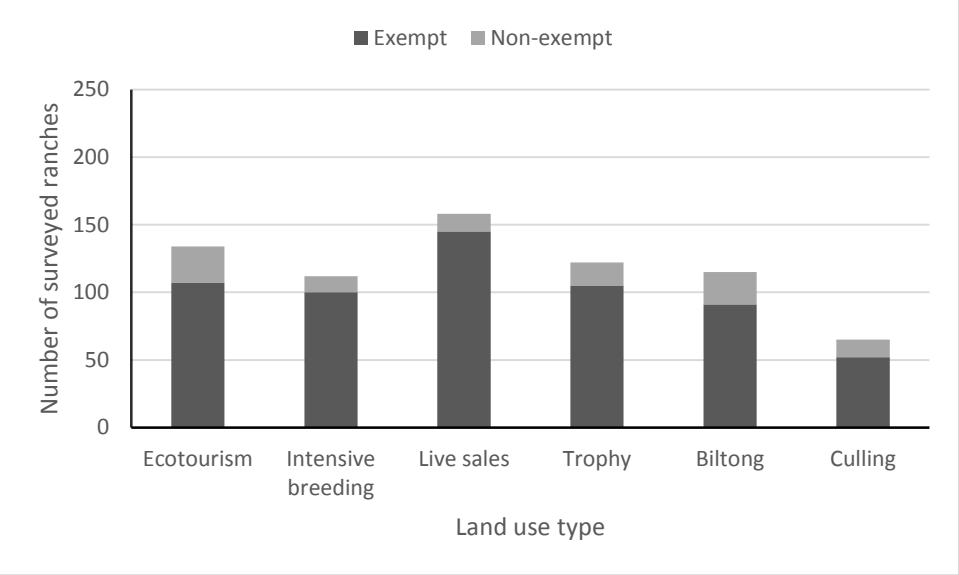

Figure 4. Exemption permits of surveyed wildlife ranches according to land use types (n=251).

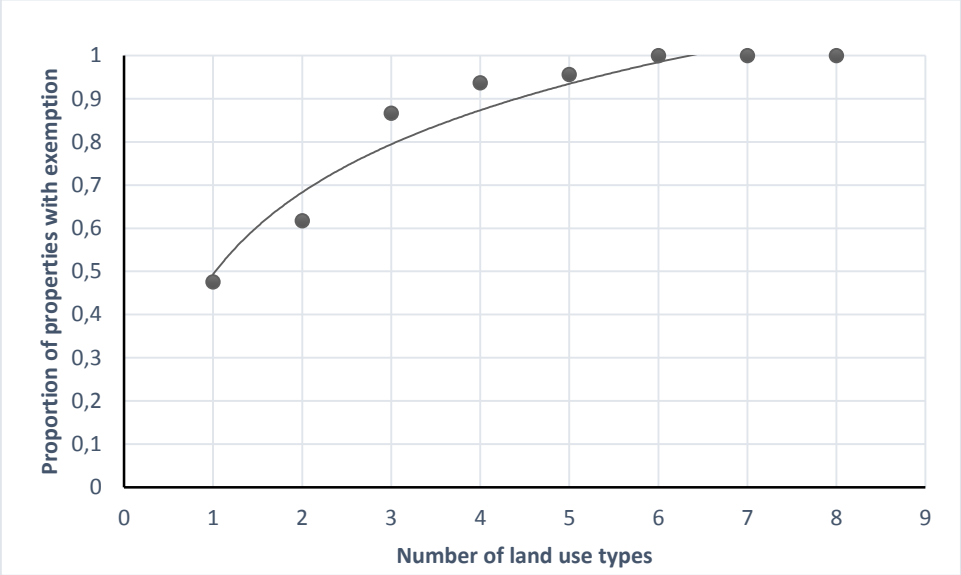

Figure 5. Percentage of ranches with exemption permits relative to the number of land uses per ranch (n=251). Land uses include ecotourism, intensive breeding, live sales, trophy hunting, biltong hunting, culling for game meat, crocodile farming, ostrich farming and taxidermy.

6.1.2.2 *Distribution of wildlife ranch sizes: provincial farm data versus surveyed farms*

Comparing the frequency distributions of wildlife ranch areas for provincial data (n=4,277 exempt properties out of an estimated 6,734) and our surveyed ranches (n=251) shows that we under-sampled small ranches (<1,000 ha) and over-sampled large ranches (>3,000 ha) (Figure 6). This is also apparent from Table 2, which shows that the mean ranch sizes of surveyed ranches were larger than the mean ranch sizes of provincial ranches (with the latter being based on exemption permit data). Although the majority of our surveyed ranches were not selected with any foreknowledge of their area, we stress here that the following results are likely to be disproportionately influenced by the ranching practices of large landowners.

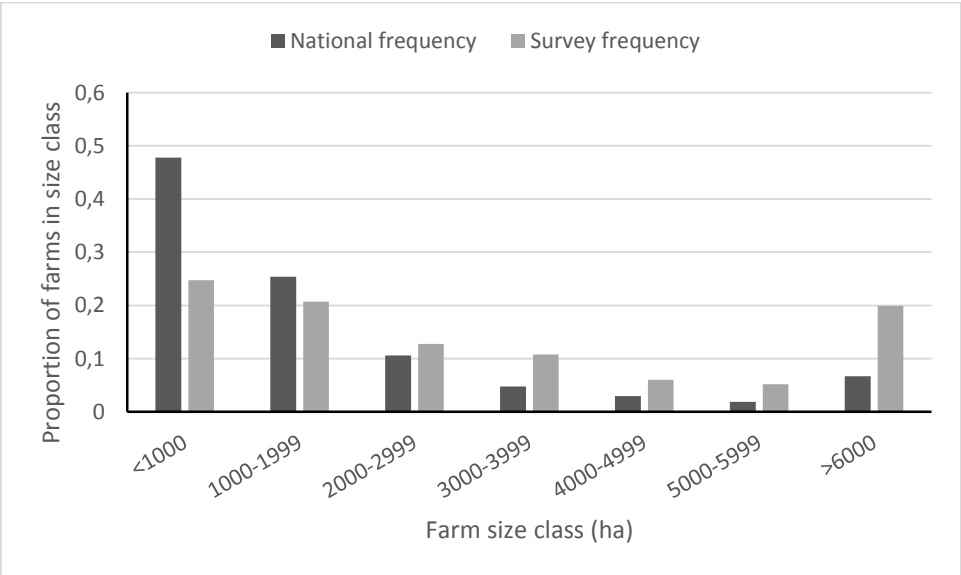

Figure 6. Frequency distributions of all wildlife ranches in South Africa from provincial data relative to surveyed wildlife ranches. The national frequency is estimated from a sample of 4,277 exempt property sizes provided by provincial nature conservation departments.

6.1.3 Ecotourism on private land

6.1.3.1 *Ecotourism on private land in the literature*

Very little is known about the extent and growth of ecotourism on private land, and the scale of ecotourism on wildlife ranches has never been assessed at a national level. In 1998, 35.5% of 118 wildlife ranchers surveyed in the Northern Province (now Limpopo and North West) indicated that they derived an income from ecotourism, which extrapolated to a total of 809 ranchers conducting ecotourism in the province (van der Waal & Dekker, 2000). Such estimates have not been made for other provinces.

The most comprehensive assessment of the contribution of ecotourism to privately owned properties in South Africa has been a series of studies conducted by the Nelson Mandela Metropolitan University examining the Indalo association of Private Game Reserves (PGRs) in the Eastern Cape (Sims-Castley, 2002; Smith & Wilson, 2002; Sims-Castley *et al.*, 2004; Langholz & Kerley, 2006; Muir *et al.*, 2011). These studies looked at economics and job creation, but did not assess the scale of ecotourism across the province.

6.1.3.2 *Ecotourism on surveyed wildlife ranches*

One hundred and thirty-four (134) of the 251 (53%) ranches surveyed conducted ecotourism (Table 4). These ranches covered an area of 910,960 ha, which was 66% of the total area surveyed (1 389 403 ha). One hundred and seven (107) of the 134 (80%) ranches conducting ecotourism had exemption permits.

Table 4. Surveyed wildlife ranches conducting ecotourism (total area and median). N=number of surveyed ranches per province conducting ecotourism; % = % of surveyed properties in province conducting ecotourism.

Province	Ecotourism			
	N	%	Total area (ha)	Median area (ha)
Limpopo	38	51	206,086	1,650
Mpumalanga	9	82	32,504	3,800
North West	8	35	14,880	1,200
Free State	5	24	5,400	640
Gauteng	1	100	5,600	NA
KwaZulu-Natal	15	68	56,032	2,500
Eastern Cape	32	53	190,681	3,500
Western Cape	8	67	73,804	3,700
Northern Cape	18	69	325,973	11,000
Total	134	53	910,960	3,100

6.1.3.3 *Number of ecotourists hosted on surveyed wildlife ranches*

Out of the 134 properties conducting ecotourism, 76 provided figures for numbers of ecotourism clients hosted per year (Table 5). The median number per ranch was 400 (mean 1,578), while the average length of stay was 2.8 days (median 2 days).

Table 5. Ecotourism clients on wildlife ranches

	Ecotourism
Number of ranches providing responses	76
Mean number of clients per year	1,578
Median number of clients per year	400
Mean length of stay of clients (bed nights)	2.8
Median length of stay of clients (bed nights)	2

6.1.4 Breeding and live sales on private land

6.1.4.1 *Breeding and live sales in the literature*

The first official live wildlife auction in SA was held in Limpopo Province in 1975, when 128 animals were sold (Bothma *et al.*, 2010a). The number of animals sold annually increased almost every year to reach a peak of 21 101 animals in 2004, then declined until 2009, then increased again to 23,963 animals in 2013 and ~29,281 in 2014 (Figure 7) (Cloete, Van Der Merwe & Saayman, 2015; Flippie Cloete, North West University, personal communication). Since 2004, there has been an increase in the number of high value animals sold at live auctions. In 1991, 68% of wild animals sold on auction came from state conservation authorities because there were few private wildlife ranchers with sufficient wildlife stocks to sell animals on auction. By 2005, however, 77% of wild animals sold on auction came from private wildlife ranchers (Bothma *et al.*, 2010a), so the contribution from private land has increased substantially.

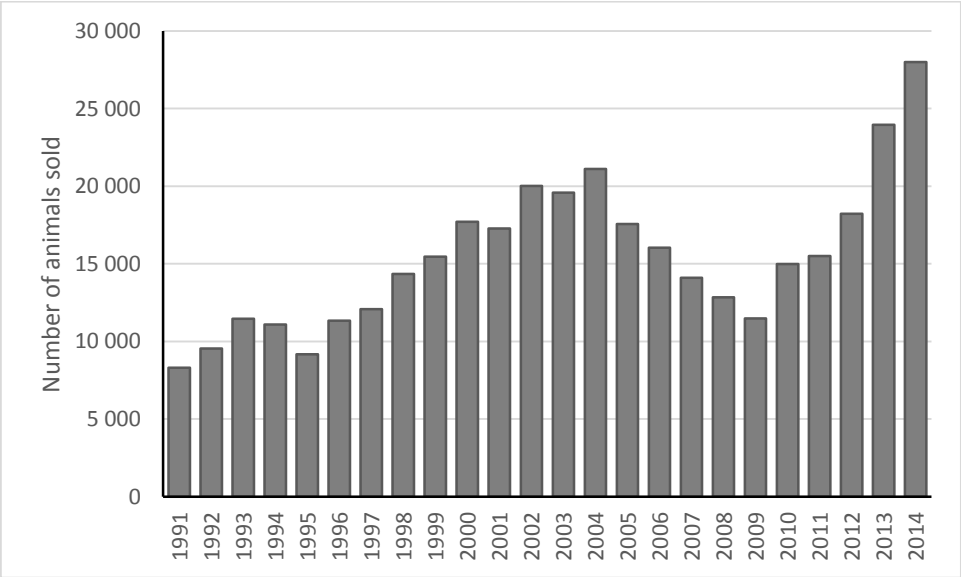

Figure 7. Numbers of animals sold live at wildlife auctions in South Africa between 1991 and 2014. Data source: (Bothma *et al.*, 2010a; Cloete *et al.*, 2015; F. Cloete, pers. comm.)

Much of the recent growth of the live sales sector is due to deliberate breeding of wildlife under intensive or semi-extensive conditions where breeding conditions are enhanced, for the purpose of selling animals. This is somewhat different to the passive breeding under extensive conditions whereby animals are generally left alone and only removed for management purposes. This passive breeding would have supplied the early wildlife auctions with animals,

but as the wildlife ranching sector grew, deliberate breeding under enhanced conditions is presumed to have increased.

The figures presented above represent only those animals sold at auction, which are thought to be a small percentage of animals sold live in South Africa (Bothma & Von Bach, 2010; Cloete *et al.*, 2015). There is a lack of reliable and up to date information (Cloete *et al.* 2015), and the number of animals sold privately has never been accurately estimated. Cloete *et al.* (2015) reported a range of possible numbers of animals sold privately during 2014: 130,000 (as reported on the WTA website (www.wtass.org/Default.aspx); and 167,440 (as reported by Dry, 2013). These numbers are 4.5 to 6 times larger than those traded on formal auctions, and may themselves be underestimates because the WTA does not represent all wildlife translocators. Although most large scale wildlife translocators are members of the WTA, it is not compulsory for professional game capturers to join the association, and as a result there are an unknown number of small private operators who are not members. This has two important implications: 1) the capture data of the non-members are not included in the national statistics provided by WTA, which undervalues the contribution of the sector and makes it hard to obtain accurate estimates of numbers of animals translocated within the country; and 2) these non-members are harder to monitor and regulate because they are not bound by rules or the code of conduct of the WTA. This is not say that all non-members of WTA do not abide by the legislation surrounding wildlife translocation, but it does make it hard to make sure they do. This adds to the uncertainty of how many live animals are traded within the wildlife ranching sector.

6.1.4.2 *Wildlife breeding on surveyed wildlife ranches*

During the survey, ranchers were asked if they conducted intensive breeding and live sales of wildlife. Intensive breeding generally involves high value species (e.g. African Buffalo, Sable, Roan and colour variants, amongst others) that are held in small- to medium-sized fenced camps or enclosures, where they are generally protected from predators and provided with most of (or all of) their food, water and veterinary requirements. As a result, these populations are not self-sustaining. The degree of protection from predators and supplemental feeding is highly variable, however, so it is not possible to precisely define the management practices of ranchers who breed wildlife intensively.

Regardless, the purpose of intensive breeding is to produce 'superior' animals for live game sales or trophy hunting, and breeding conditions may be manipulated to select animals for desirable traits, such as long horns. When asked if they conducted intensive breeding, some ranches preferred the term "semi-extensive" breeding, perhaps because the term intensive has negative connotations. This highlights the problem with terminology and the need for more precise definitions.

The act of selling live wildlife does not necessarily mean that a rancher breeds wildlife intensively, however, as many ranches capture and trade wildlife from extensive systems. This is generally done for management purposes, but has the advantage of generating revenue for the rancher.

One hundred and twelve (112) of the ranchers (45%) surveyed indicated that they conducted intensive or semi-extensive breeding (Table 6 and Figure 6), of which 89% had exemption permits.

Table 6. The distribution of breeding and live game sales activities among surveyed wildlife ranches. Percentages refer to the number conducting each activity/number of surveyed ranches in each province.

Province	Intensive breeding			Live game sales			Both
	N	%	Area (ha)	N	%	Area (ha)	N
Limpopo	38	51	155,718	59	79	247,856	38
Mpumalanga	2	18	1,992	2	18	4,380	1
North West	18	78	25,261	18	78	123,591[1]	16
Free State	8	38	6,082	12	57	12,592	8
Gauteng	0	0	0	0	0	0	0
KwaZulu-Natal	4	18	9,437	15	68	61,707	4
Eastern Cape	23	38	174,097	30	50	210,579	20
Western Cape	2	17	59,015	4	33	65,655	2
Northern Cape	17	65	319,743	18	69	327,123	16
Total	112	45	751,345	158	63	1,053,483	105

[1]This includes one particularly large property in North West province that conducted live game sales but that did not conduct intensive breeding

Ranchers were asked which species they bred intensively in camps. We separated species out into two major groups: 1) colour variants, and 2) non-colour variants. The second group mostly comprised species we refer to as high value species (after Cloete *et al.* 2015) (some of which are considered threatened on the IUCN Red List), although it also includes a few lower value plains game species and small antelope species that are bred for the hunting industry or reintroductions.

Ninety-six (96) ranches bred high value wildlife species, comprising a total of 14 different species (including a grouping of small antelopes) (Table 7). The mean number of high value species found on ranches conducting intensive breeding was 1.95 (range: 1-5).

Twenty-three percent (23%) of ranches bred colour variants in camps (n=58), with a total of 15 varieties (Table 8). Note that a total of 82 ranchers kept colour variants, but 24 kept them extensively. The mean number of colour variant varieties per ranch (among ranches that stocked them) was 2.3 (range: 1-7). Fifty-four (54) ranchers bred high value species without colour variants, 16 bred colour variants without other high value species, and 42 bred both high value species and colour variants (Figure 8).

Table 7. Occurrence of intensive breeding of high value species on surveyed ranches

		Number and % of breeding properties
Percentage of all properties breeding intensively (n=251)		45%
Percentage of all properties breeding high value species (n=251)		38%
Percentage of breeding properties breeding high value species (n=112)		86%
Number of properties with the following high value species:		
	Sable	54
	African Buffalo	47
	Nyala	29
	Roan	17
	Eland	10
	Bontebok	5
	Bushbuck	4
	Small antelope species[1]	3
	Tsessebe	2
	White Rhino	2
	Cheetah	2
	Waterbuck	1
	Lion	1
	Pygmy Hippopotamus	1

[1]This group includes duiker spp., grysbok spp., Steenbok and Oribi

Table 8. Occurrence of intensive breeding of colour variants on surveyed ranches

		Number and % of breeding properties
Percentage of all properties breeding intensively (n=251)		45%
Percentage of all properties breeding colour variants (n=251)		23%
Percentage of breeding properties breeding colour variants (n=112)		52%
Number of properties with the following colour variants:		
	Black impala	38
	Golden wildebeest	31
	Black springbok	24
	White blesbok	19
	Copper springbok	17
	Yellow blesbok	13
	Golden gemsbok	12
	White springbok	11
	Saddle-back blesbok	5
	Copper blesbok	4
	Saddle-back impala	2
	Black-nose impala	2
	Red gemsbok	2
	White lion	2
	Cream Eland	1

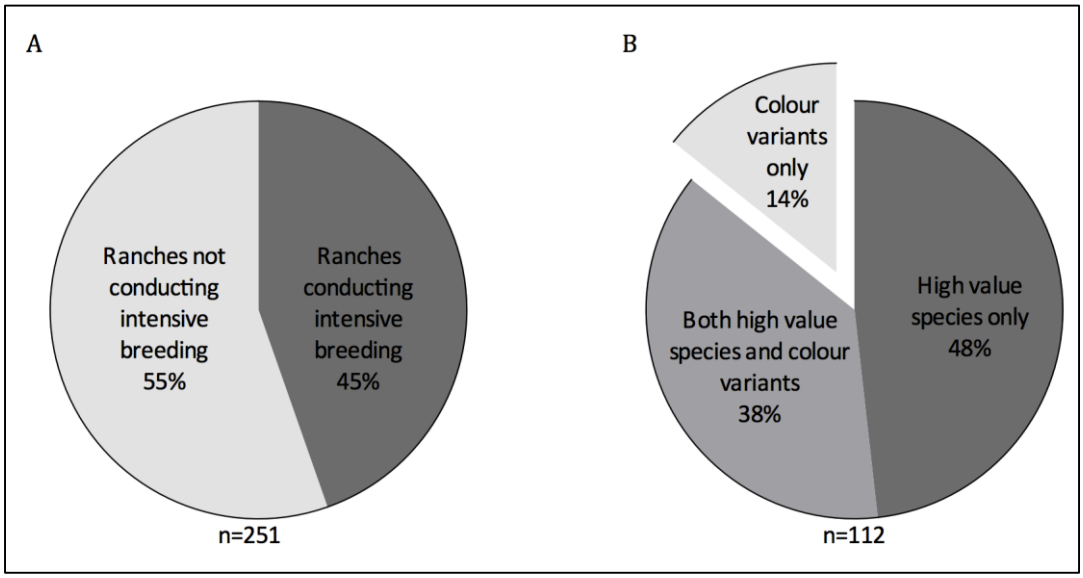

Figure 8. A) Percentage breakdown of all surveyed ranches conducting intensive breeding vs. ranches not conducting intensive breeding; B) Ranches conducting intensive breeding: percentage breakdown according to whether they breed high value species only (e.g. African Buffalo, Sable, Roan, etc.), colour variants only, or both high value species and colour variants. Note this excludes ranches keeping high value species and colour variants extensively.

6.1.4.3 *Level of intensification*

Although intensive breeding is generally conducted in fenced camps, there is no set definition of what constitutes a camp in terms of size. Rather than set an area definition, we simply accepted the response of a rancher regarding whether intensive breeding was a land use and whether they used breeding camps. In general, if a rancher managed a property for a certain species (e.g. Sable) but did not do so using fenced-off areas, he indicated this by stating that the management was extensive.

Out of 112 ranches indicating that they conducted intensive breeding, 95 provided estimates for the number and size of camps on their properties (Table 9). The total area of camps on these 95 ranches was 77,426 ha out of a total farm area of 710,411 ha, which equates to 10.9% of the land areas of ranches that conduct some form of intensive breeding. We refer to this as the percentage intensification of a property. The number of individual camps was 696, with a mean camp size ~111 ha. Note that a property could have multiple camps, and we used the total area of all camps on an individual property to calculate the level of intensification. Twelve ranches were completely subdivided into camps, with no extensive section, while a further four comprised >50% camps.

To estimate the total percentage intensification for all wildlife ranches in South Africa, it was not possible to extrapolate directly using the overall 10.9% because there was a trend of increased intensification on smaller ranches, which meant that using an average across all farm sizes would be invalid. To account for this trend across farm sizes we used the following method of extrapolation (see Appendix 1 in section 12.1 for full explanation): First we grouped our surveyed intensive breeding ranches into 1,000 ha size classes (all ranches >6,000 ha were placed in one class), then calculated median values for the percentage of intensification for each farm size class. These median values provided a way to predict the level of intensification for ranches not covered by our survey.

Table 9. Levels of intensive breeding on surveyed and all ranches: areas under camps and percentage intensification

Number of surveyed ranches providing responses	95
Total area of surveyed ranches providing responses (ha)	710,411
Total area of camps on surveyed ranches providing responses (ha)	77,426
% intensification on surveyed ranches conducting intensive breeding	10.9%
Extrapolated area of camps on all wildlife ranches in South Africa (ha)[1]	1,022,785
Overall % intensification of all ranches in South Africa, including those properties that do not conduct intensive breeding (based on total wildlife ranching area of 17 041 900 ha)	6.0%

[1]These estimates accounted for the increased percentage intensification on smaller ranches – see text and Appendix 1 (Section 12.1) for details.

We then used the frequency distribution of all wildlife ranch sizes in South Africa (see Figure 6) to assign a total estimated area of ranches to each ranch size class, and then multiplied these areas by the median percentage of intensification calculated for each size class. The outcomes of these products, which equalled the total percentage intensification per ranch size class, were then summed to provide a total estimate for South Africa, weighted according to ranch size.

The total area of wildlife ranches under camps in South Africa (i.e. properties fragmented into sub-cadastral portions) was estimated to be 1,022,785 ha, which represented 6.0% of the total area. This is an area half the size of KNP. The impacts of this could be quite significant if intensification affects biodiversity, but this remains to be tested.

6.1.4.4 *Live wildlife sales on surveyed ranches*

One hundred and fifty-eight (158) of the surveyed ranchers (63%) indicated that they conducted live sales (Table 6), with 105 of these also conducting intensive breeding. All except seven of the 112 breeders conducted live sales, which is logical given that the purpose of breeding is to sell animals; the ranchers that bred game but did not sell live were generally building their stock and had not yet entered the live sale sector. Fifty-three (53) ranchers conducted live sales, but did not breed game under intensive conditions in camps. Ninety-two percent (92%, n=158) of ranchers conducting live sales had exemption permits. This very high rate of current exemptions is also logical given that the permits allow ranchers to sell game at any time, as long as they adhere to the translocation regulations.

Eighty-seven (87) of the 158 surveyed ranches who sold live wildlife provided offtake densities. The total number of species sold live on all surveyed ranches was 30, while the mean number of species sold per property during 2014 was 3.5 ± 3.8 (median = 2: range 1 – 23) (Table 10). The total number of animals sold live on these 87 properties was 10,602, which equates to an overall mean of 0.02 animals per hectare.

Because the number of animals sold on auction during 2014 is an accurately known quantity (29,281 animals: F. Cloete, pers. comm.), we only estimated the number of animals sold privately. As with percentage intensification, there was a trend of increased offtake densities on smaller ranches, suggesting that an overall mean would not be the most representative measure to use to extrapolate for the whole country. We accounted for this as described in Appendix 1 (section 12.1), and based on an extrapolation from 76 ranches, we estimated that a total of 196,180 animals were sold privately during 2014 (Table 10). Adding animals sold on auction to this provides an overall estimate of ~225,500 animals sold live on wildlife ranches in South Africa during 2014.

Table 10. Average numbers of animals sold privately on wildlife ranches conducting live sales.

	Live sales
Number of ranches providing responses	76
Area covered by ranches of these respondents (ha)	398,216
Total number of species sold across all surveyed ranches	30
Mean number of species sold per ranch[1]	3.5
Median number of species sold per ranch	2
Range in number of species sold per ranch	1 – 23
Total number of animals sold privately on surveyed ranches providing data (including colour variants)	8,150
Mean number of animals sold privately per ranch	107
Median number of animals sold privately per ranch	42
Range in number of animals sold per ranch	2 – 1,273
Mean number of animals sold per ha[1]	0.02
Extrapolated number of animals sold privately on all wildlife ranches in South Africa[2]	196,180
Total estimated number of animals sold privately and on auctions in South Africa	~225,500

[1]This is the overall mean, which does not account for the fact that smaller ranches tend to sell more animals per ha than larger ranches; [2]These estimates accounted for the increased live offtake densities per ha on smaller ranches.

This number is higher than the estimates provided by the WTA, whose website (www.wtass.org/Default.aspx) currently states that about 130,000 animals are translocated per year. As the WTA is a voluntary association and does not include all wildlife translocators in the country, their estimate can be interpreted as an absolute minimum number. Our estimate is also higher than that of Dry (2013), who stated that 167,440 animals were translocated in 2010 by 44 game capture companies. We note that statistics provided to us directly from the WTA show that a total of 49,539 animals were translocated in 2010 by 13 active members who provided data for that year. Dry (2013) does not state how he derived his higher figure, but a quick calculation suggests that he multiplied the figure of 49,539 (as provided by the WTA) by the ratio of total WTA members divided by the number of members who provided statistics (i.e. 49,539 × (44/13)). Regardless of the method used, these numbers were relevant for 2010, so the four-year gap could easily account for the differences between estimates. Given the fact that there are many wildlife translocators not registered with the WTA, and the time lag between estimates, we do not see much of a discrepancy between our estimates and those made previously. Whatever the reasons, the number of animals translocated in South Africa during 2014 almost reached one-quarter of a million if the animals sold on auction are also counted.

6.1.4.5 *The contribution of the wildlife translocation industry to live sales of wildlife*

The clear need for wildlife ranchers to move species for business or management purposes (as documented by the previous sections) is met by the wildlife translocation industry, which has developed into a major offshoot of the wildlife industry. Moving large animals on mass generally requires expensive specialised equipment that many ranchers cannot afford, as well as expertise in catching and moving animals that are the realm of veterinarians or people with years of specialised experience. Additionally, the capture of large or dangerous species normally requires the use of controlled veterinary drugs that may only be used legally by veterinarians, and this often precludes ranchers from catching and moving animals themselves. As a result, the need for specialist capturing skills has grown, and these skills have been developed by the wildlife translocation industry.

The WTA is a voluntary organisation of professional game capturers that comprised 51 active and 4 associate members during 2014. We interviewed 18 active members (35%) during late 2014 and early 2015 to obtain information on the following:

1. The number of animals they translocated during 2014;
2. The proportion of animals sold privately versus the proportion sold on auction;
3. The number of people they employ (see section 6.3.2);
4. The average wages of employees and the total contribution to salaries (see section 6.3.2);
5. Annual turnover (see section 6.2.4.2);
6. The constraints faced by the industry and opinions of possible solutions (see section 7.2.2.2).

During 2014, the 18 members translocated a total of ~72,000 animals (mean = 4,028; range: 163 – 11,400) (Table 11). The translocators who moved the fewest animals tended to work primarily with high values species (e.g. African Buffalo, Nyala (*Tragelaphus angasii*), Sable, Roan) or mega-herbivores, and indicated that they often conducted individual darting rather than mass capture. Given that we sampled 35% of active members of the WTA without knowing the scale of their operations before contacting them, we think that our sample should be representative of the remaining active members. Our estimate for the number of animals translocated by all active members of the WTA during 2014 was, therefore, ~205,440 animals (Table 11). This is likely to underestimate the total number of animals moved by translocators in South Africa because not all wildlife translocators are members of the WTA. We were unable to assess the additional contribution of these non-WTA members. In comparison to our earlier estimate of numbers of animals translocated within South Africa, which was 225,500 animals (based on ranchers survey responses – see Table 10), we suggest a potential range of 205,500 – 225,500 animals translocated in South Africa during 2014.

Table 11. Wildlife Translocation statistics from active members of the WTA.

Number of respondents	18
Number of animals translocated during 2014	72,000
Mean number of animals translocated per operator	4 028
Range in number of animals translocated per operator	163 – 11,400
Extrapolated number of animals translocated for all 51 active WTA members during 2014	205,440
Overall range in the number of animals translocated, based on estimates from rancher surveys and WTA surveys	205,500 – 225,500

6.1.4.6 *Live sales of wildlife: private versus auction sales*

We asked ranchers and translocators whether they sold wildlife privately or on auction. Fifty-six percent (56%, n=103) of ranchers indicated that they sold wildlife through private arrangements only (which included selling to wildlife translocators or traders), while only 7% percent indicated that they sold exclusively at auctions (Table 12). These latter ranches all did intensive breeding of high value species, and more than half of them also bred colour variants. This is logical because auctions provide the best platform to obtain high prices for high value species. The remaining 37% of ranchers stated that they sold wildlife both at auction and privately, but many of these indicated that the majority of their sales were done

privately. If we subjectively assume that 75% of sales made by these ranchers are done privately, then the overall estimate for wildlife traded privately by wildlife ranches is 84%.

Of the wildlife translocators interviewed, 22% (n=18) sold game privately only, while 78% used both auctions and private deals. Based on numbers provided by respondents, 91% of the animals translocated were sold privately.

Available data indicate that ~29,000 animals were sold on auction during 2014 (F. Cloete, pers. comm.). Using our two estimates for percentages of animals sold privately (84% and 91% for ranchers and translocators respectively), the extrapolated range of total animals sold in South Africa is 181,000 – 322,000 animals in total. Our estimate from ranching surveys falls almost in the middle of this range.

Table 12. Percentages of animals sold privately and on auction.

	Surveyed wildlife ranchers (n=251)	Surveyed wildlife translocators (n=18)
Percentage selling privately only	56%	22%
Percentage selling at auctions only	7%	0
Percentage selling both privately and on auction	37%	78%
Estimated percentage of all animals sold privately	84%	91%

It appears that a large number of wildlife translocation events are untraceable, which is potentially problematic because it is not possible to monitor and regulate large segments of the industry. We would like to stress that we do not think this challenge applies to most translocators who are members of the WTA, which appears to be a transparent organisation with strict guidelines and a code of conduct. It is in the best interests of the WTA and its members to abide by the rules set down by legislation, and one way to improve the wildlife translocation system in South Africa would be to incentivize non-WTA members to become members (see section 9.6).

One of the advantages of selling wildlife privately is that the seller knows what price he will get, whether he sells directly to a wildlife trader/translocator, or makes his own deal with another farmer and then gets a translocator to move the animals (for which he would pay for the services of the translocator). While auctions may offer the prospect of higher prices, they are more of a gamble. Some translocators also have a preference for private sales because it costs more to move animals for auctions (Jan van Vuuren, WTA, personal communication). Animals going to auction first have to be transported to the site of the auction, then to the site of the buyer; so they have to be moved twice. Arranging sellers and buyers in advance is more economical because animals only have to be moved once, and very often it is possible to move animals between farms that are close together (in the case of auctions, the destination property is unknown). An additional, non-economic advantage of private sales between nearby farmers is that the animals are transported over shorter distances, suffer less stress as a result, and do not sit in pens as they would at auctions. Mortality rates have been documented to drop when translocators stop taking animals to auctions (e.g. from 1.4% to 0.4%; J. van Vuuren, pers. comm.).

6.1.5 Trophy and biltong hunting on private land

6.1.5.1 *Insights from the literature*

The market for trophy hunting has grown tremendously in South Africa over the last 20 years, partly due to the growth of the private wildlife ranching sector (Bond *et al.*, 2004; Van der Merwe, Saayman & Krugell, 2004; Lindsey, Roulet & Romanach, 2007; Van der Merwe *et al.*,

2014), which has expanded the area over which hunting can occur and the numbers and variety of game available; and partly due to the decline in the availability of trophy hunting in other countries as a result of various factors including the closure of hunting (e.g. Kenya), the reduction of wildlife populations in West Africa, and political instability (e.g. Central African Republic (CAR), Sudan and Democratic Republic of Congo (DRC)) (Bond *et al.*, 2004; Lindsey *et al.*, 2007). Recent closures of trophy hunting opportunities in Botswana and uncertainties surrounding policies in Zambia will likely increase the regional market share for South Africa, while the current shifts towards intensive breeding of high value game species may also attract more foreign hunters. Such breeding also overcomes the previous disadvantage that the South African hunting industry had relative to competitor nations through the lack or relative shortage of 'big game' species. The weak Rand also adds to the attraction of South Africa as a hunting destination. The shift towards intensive breeding may be a double-edged sword if the price of trophies goes too high (in which case South Africa could lose foreign hunters to Namibia) or if the price of plains game moves out of reach of local biltong hunters.

Trophy hunting occurs in 23 sub-Saharan African countries, but South Africa has the most operators, most visiting foreign hunters, largest number of animals shot and highest revenue generated (Lindsey *et al.*, 2007). The numbers of foreign hunters coming to South Africa have generally increased over time, as have the numbers of animals hunted (Figure 9) (PHASA/DEA data 2013). As almost all trophy hunting is conducted on private land, much of this growth can be attributed to the wildlife ranching sector.

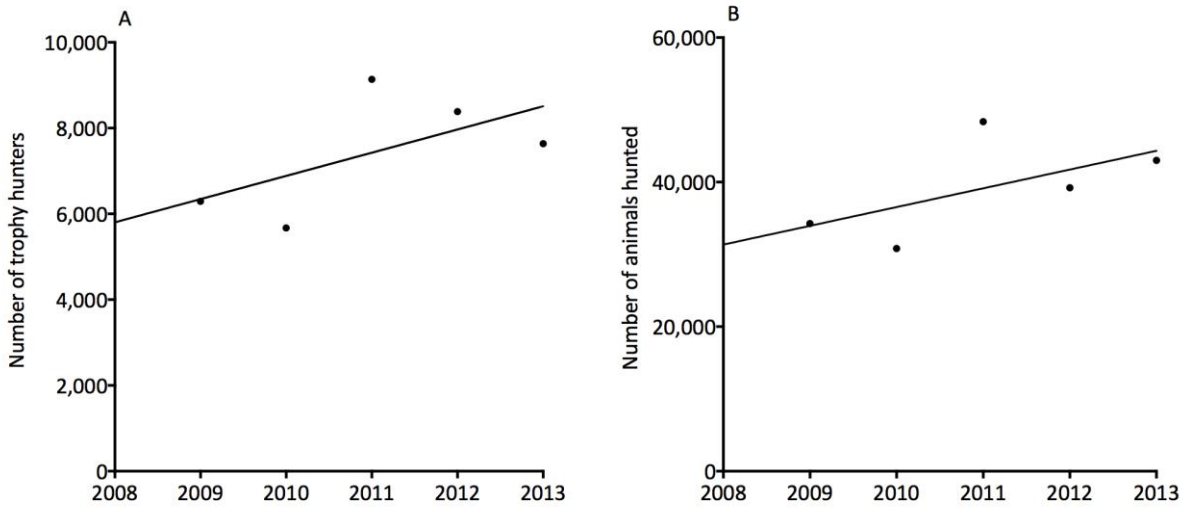

Figure 9. Trophy hunting in South Africa: A) Number of trophy hunters; B) Numbers of indigenous animals hunted. Data compiled annually by DEA and provided by Magdel Boshoff (Deputy Director for TOPS policy development, DEA).

For biltong hunting, a series of reports by North-West University have documented the growth of the sector over the last decade (Van Der Merwe & Saayman, 2008; Saayman *et al.*, 2011; Van Der Merwe *et al.*, 2014). According to these reports, there may be as many as 200,000 biltong hunters in South Africa, and based on an average of 9 animals hunted per hunter per year (determined from a survey of 671 biltong hunters in 2013), these hunters may hunt in excess of 1.8 million animals per year (Van der Merwe *et al.*, 2014). Below we discuss some of the assumptions made in these reports (see section 6.2.5.1).

6.1.5.2 *The scale of trophy and biltong hunting on surveyed wildlife ranches*

One hundred and twenty-two (122) of the 251 ranches surveyed conducted trophy hunting (49%), while 115 conducted biltong hunting (46%) (Table 13). Of these, 74 ranches conducted both forms of hunting, while the remainder (n=89) conducted only one. Overall, 163 ranches conducted at least one form of hunting (65%). Trophy hunting ranches covered an area of 797,013 ha, while biltong hunting ranches covered an area of 567,002 ha, which were respectively 58% and 41% of the total area (1,377,503 ha) of all ranches surveyed; 85% of trophy hunting ranches and 79% of biltong hunting ranches had exemption permits.

Table 13. Surveyed wildlife ranches conducting trophy and biltong hunting (N=number of surveyed ranches per province conducting hunting type; % = % of surveyed properties in province conducting hunting type).

Province	Trophy hunting			Biltong hunting			Both		
	N	%	Area (ha)	N	%	Area (ha)	N	%	Area (ha)
Limpopo	37	49	174,085	39	52	138,047	27	36	108,922
Mpumalanga	3	27	6,380	2	18	6,200	1	9	2,400
North West	10	43	115,359	14	61	21,166	7	30	15,629
Free State	9	43	14,190	10	48	14,700	7	33	10,690
Gauteng	0	0	0	0	0	0	0	0	0
KwaZulu-Natal	15	68	51,735	9	41	37,980	9	41	37,980
Eastern Cape	33	55	199,929	18	30	108,310	10	17	47,340
Western Cape	1	8	5,000	6	50	22,264	1	8	5,000
Northern Cape	14	54	230,335	17	65	218,335	12	46	208,323
Total	122	49	797,013	115	46	567,002	74	29	436,284

6.1.5.3 *Number of trophy hunters hosted on surveyed wildlife ranches*

Out of the 122 properties conducting trophy hunting, 57 provided figures for numbers of trophy hunting clients hosted per year (Table 14). The median number of trophy hunting clients per ranch was 20 (mean 32), but we did not attempt to extrapolate the total number of trophy hunting clients for the country because of the likelihood of double counting. A number of the survey participants indicated that some of their clients hunt on other ranches as well when necessary. The mean length of stay was 4.8 days.

Table 14. Trophy hunting clients on wildlife ranches.

	Trophy hunting
Number of ranches providing responses	57
Mean number of trophy hunting clients per year	32
Median number of trophy hunting clients per year	20
Mean length of stay of trophy clients (bed nights)	4.8
Median length of stay of trophy clients (bed nights)	5

6.1.5.4 *Trophy hunting offtakes on surveyed ranches*

Out of the 122 properties conducting trophy hunting, 74 provided data on trophy offtakes (Table 15). Hunters on these ranches (which covered an area of 510,724 ha) shot a total of 37 wildlife species (Figure 10), with a median of 6.5 species per ranch. The total number of animals hunted was 5,704, which equates to an overall mean of 0.011 animals hunted per

hectare. Again, as with percentage intensification and live sales, there was a trend of increased trophy offtake densities on smaller ranches, which we accounted for as described in Appendix 1 (section 12.1).

Table 15. Number of animals hunted for trophies on wildlife ranches.

	Trophy hunting
Number of ranches providing responses	74
Area covered by ranches of these respondents (ha)	510,724
Total number of species trophy hunted across all ranches	37
Median number of species trophy hunted per ranch	6.5
Range in number of species trophy hunted per ranch	1 – 23
Total number of animals trophy hunted on surveyed ranches providing data	5,704
Mean number of animals trophy hunted per ha[1]	0.011
Extrapolated number of animals trophy hunted on all wildlife ranches in South Africa[2]	130,186

[1]This is the overall mean, which does not account for the fact that smaller ranches tend to hunt more animals per ha than larger ranches; [2]These estimates accounted for the increased offtake densities per ha on smaller ranches.

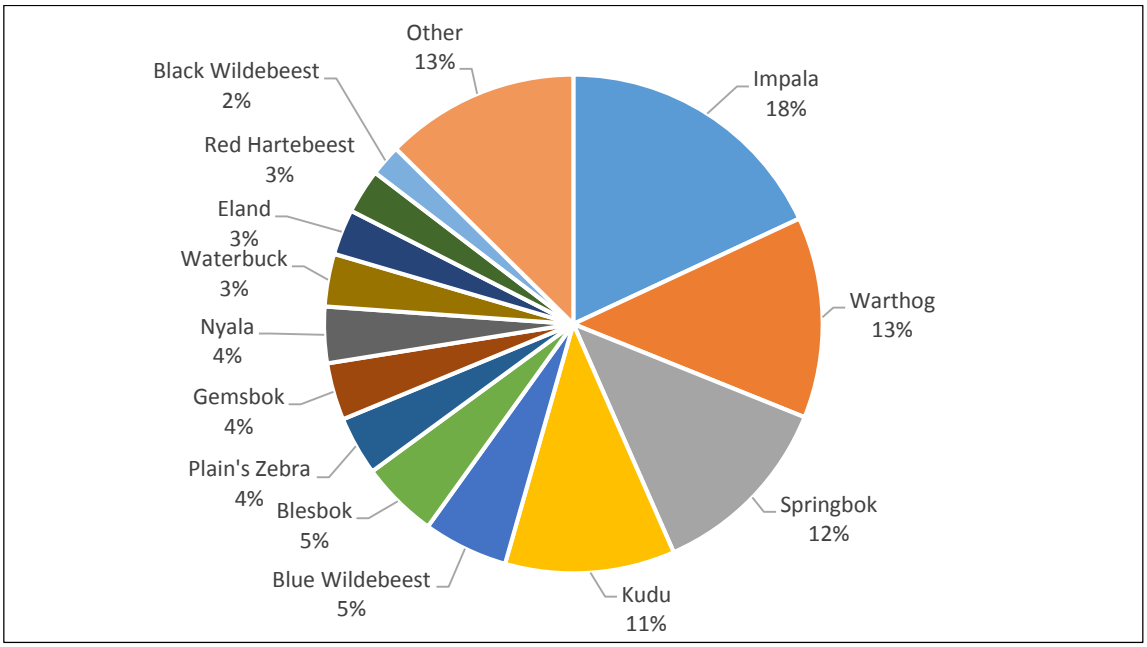

Figure 10. Trophy hunting species proportions on surveyed wildlife ranches. Other species included: Bushbuck, African Buffalo, Mountain Reedbuck, Common Duiker, Sable, Steenbok, Giraffe, Mountain Zebra, Common Reedbuck, Lechwe, Roan, Bush Pig, Tsessebe, Botebok, Elephant, White Rhino, Ostrich, Red Duiker & Leopard

Using the extrapolation method described in Appendix 1 (see section 12.1), and based on the data provided by wildlife ranches in our survey, the total number of animals trophy hunted on private land in South Africa during 2014 was ~130,186 (Table 15). This estimate is approximately three times higher than the trophy hunting numbers compiled by the DEA in their annual statistics, which show that the number of animals hunted across the entire country averaged 43 532 animals per year over three years between 2011 and 2013 (48,365 in 2011, 39,214 in 2012 and 43,017 in 2013 (data provided by Magdel Boshoff, Deputy Director for TOPS policy development, DEA). These DEA numbers were based on permit data compiled by each province (which are submitted to the provinces by individual professional hunters (PHs)) and submitted to the DEA every year for national compilation. The DEA

statistics include some species that were not covered by our survey (such as small and medium sized carnivores, primates and porcupines), which makes the discrepancy even larger.

There are a number of potential explanations for the discrepancy, including bias in our data collection (which we tried to account for), under-reporting of trophy hunts by PHs, poor record keeping by provinces, or a combination of all of these. Additionally, the statistics collected by DEA do not include animals trophy hunted by local (South African) hunters. While the majority of South African hunters conduct biltong hunting, some do conduct trophy hunting as well, but statistics on such figures are not available for comparison. Furthermore, not all animals hunted by trophy hunting clients are taken as trophies, but if such animals were included as trophy animals by the survey participants (we did not ask participants to differentiate), they would have inflated the figures.

6.1.5.5 *Number of biltong hunters hosted on surveyed wildlife ranches*

Out of the 115 properties conducting biltong hunting, 57 provided figures for numbers of biltong hunting clients hosted per year (Table 16). The median number of biltong hunting clients per ranch was 40 (mean 77), while the average length of stay was 2.9 days.

Table 16. Biltong hunting clients.

	Biltong hunting
Number of ranches providing responses	57
Mean number of biltong hunting clients per year	77
Median number of biltong hunting clients per year	40
Mean length of stay of clients (bed nights)	2.9
Median length of stay of clients (bed nights)	3

6.1.5.6 *Biltong hunting offtakes on surveyed ranches*

Out of the 115 properties conducting biltong hunting, 74 provided data on offtakes (Table 17). Hunters on these ranches (which covered an area of 431,426 ha) shot a total of 24 different wildlife species (Figure 11), with a median of 5 species per ranch. The total number of animals hunted was 9,942, which equates to an overall mean of 0.023 animals hunted per hectare. There was a trend of increased biltong offtake densities on smaller ranches which we adjusted for as described in Appendix 1 (section 12.1). The total number of animals hunted for biltong on private land in South Africa during 2014 was estimated to be ~277,027 (Table 17).

Table 17. Number of animals hunted for biltong on wildlife ranches.

	Biltong hunting
Number of ranches providing responses	74
Area covered by ranches of these respondents (ha)	431,426
Total number of species hunted for biltong across all ranches	24
Median number of species hunted for biltong per ranch	5
Range in number of species hunted for biltong per ranch	1 – 17
Total number of animals hunted for biltong on surveyed ranches providing data	9,942
Mean number of animals hunted for biltong per ha[1]	0.023
Extrapolated number of animals hunted for biltong on all wildlife ranches in South Africa[2]	277,027

[1]This is the overall mean, which does not account for the fact that smaller ranches tend to hunt more animals per ha than larger ranches; [2]These estimates accounted for the increased offtake densities per ha on smaller ranches.

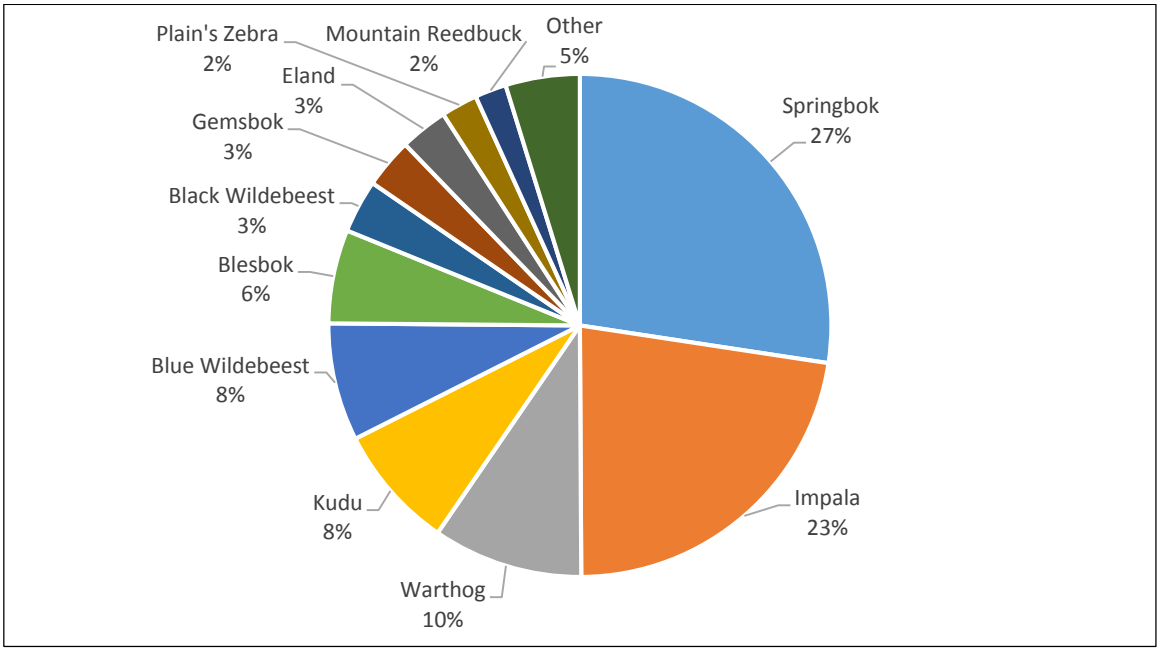

Figure 11. Biltong hunting species proportions on surveyed wildlife ranches. Other species included: Red Hartebeest, Waterbuck, Common Reedbuck, Giraffe, Nyala, Tsessebe, Lechwe, Ostrich, Common Duiker, Bushbuck, Bush Pig, Steenbok.

6.1.6 Processed game products

6.1.6.1 *Insights on game meat production from the literature*

There are two markets for game meat produced on wildlife ranches in South Africa: export and domestic. Game meat was first exported from South Africa sometime around 1972 (Conroy & Gaigher, 1982), and by 1974, an estimated 1,900 carcasses were exported, mostly from the then Cape Province and the Free State (Mossman & Mossman, 1976). Autonomous provincial structures at the time precluded the central collation of statistics for the South African game industry (Conroy & Gaigher, 1982), and there was little contact between game producers and conservation departments (Mossman & Mossman, 1976), so few estimates of game meat production on private land were available. Conroy & Gaigher (1982) used export data from Namibia as an approximation for South Africa, which estimated that 47,022 game animals (Springbok, Kudu and Gemsbok) were shot for export in 1980. In 1989, retail marketing of game meat remained poorly organised (Behr & Groenewald, 1990), with exports being handled by only two firms. Between 1984 and 1986, an average of 851 tonnes was certified for export by the Directorate of Veterinary Services, although the actual quantities exported were unknown. A report by the National Agricultural Marketing Council (2006) stated that 450 tonnes of wild meat were exported annually from South Africa during the early 2000s, but the source of this information was not provided.

Cropping of game meat for export from South Africa is done in strict accordance with the guidelines of the Veterinary Procedural Notices (VPN), which are issued by the Department of Agriculture Forestry and Fisheries (DAFF), and in conjunction with the legislation of countries that import the meat (primarily the European Union) (Van der Merwe, Jooste & Hoffman, 2011). As a result, export records for game meat are more readily available than domestic records (Van der Merwe *et al.*, 2011), allowing estimates of quantities of game meat exported.

In contrast to exported meat, the quality of game meat hunted for the local market has never been controlled and no regulations or guidelines currently apply to game carcasses sold domestically (Van der Merwe *et al.*, 2011). The resulting lack of recorded meat inspection data means that the quality of game meat intended for the local market is unknown. Although it is well known that fresh unapproved game meat (not inspected and approved with an abattoir stamp) is available at butcheries and some of the bigger retail outlets during the hunting season (Van der Merwe *et al.*, 2013), the quantities involved are not accurately known. Little information about the historical consumption of game meat is available for South Africa, although a report by the National Agricultural Marketing Council (2006) stated that 1,350 tonnes were consumed domestically per year during the early 2000s. Neither the source of these data nor the methods used to estimate the figure were provided.

Van der Merwe (2013) stated that the 2009 annual report of the South African Meat Industry Company (SAMIC) (which we were not able to obtain a copy of) indicated that uncontrolled game meat contributes to more than 20% of the total fresh red meat consumption in South Africa during the 5-month hunting season (which is generally between May and September). Dry (2013) suggests this figure might be 10%. If these percentages are correct, we can estimate the amount of game meat sold using red meat production figures.

During 2013, between 756,150 and 983,000 tonnes of beef were produced in South Africa, and a further 308,450 – 439,000 tonnes of pork, lamb and goat meat was produced as well (Rudi van der Westhuizen, SAMIC, personal communication.; Danie Jordaan, University of Pretoria, personal communication). If it is true that 10-20% of the total fresh red meat consumption in South Africa during the 5-month wildlife hunting season is derived from uncontrolled game meat, then the range of possible masses of game meat being consumed in South Africa is 44,360 – 118,500 tonnes.

Although there has been a lot of interest in the production of game meat in South Africa over the last 50 years, it has not received the same amount of research attention and government support as domestic meat production. While a lot of work has been done on the qualities of game meat over this period (examples include Von la Chevallerie, 1972; Viljoen, 1999; Bartoň *et al.*, 2014; and a string of papers by the Hoffman laboratory at Stellenbosch University over the last 20 years: e.g. Hoffman *et al.*, 2004; Hoffman *et al.*, 2005; Hoffman & Wiklund, 2006; Hoffman *et al.*, 2009), there remains a dearth of information on how much is produced in South Africa, what the local demand is, and whether it might contribute towards future food security. This was emphasized by Hoffman *et al.* (2004), who stated that it was virtually impossible to obtain reliable data on the South African game meat retail industry. To compound these problems, there have also been few quality standards in place for game meat in South Africa, which has allowed the legal selling of game meat of inferior quality (Hoffman *et al.*, 2004) and, more recently, the substitution and mislabelling of game meat products has occurred in the formal consumer market (D'Amato *et al.*, 2013; Cawthorn, Steinman & Hoffman, 2013). This has been damaging to small-scale game meat producers because large-scale sellers of game meat, such as supermarkets, are now cautious of where they source their meat, and many now only use larger wholesalers who can guarantee the source and quality of the meat (see section 6.3.1.1 for further discussion on food security).

Ranched and hunted game meat in South Africa is mostly distributed in the form of dressed carcasses to supermarkets and butcheries by wholesalers or hunters (D'Amato *et al.*, 2013), although some of it is first processed into biltong and various forms of sausage. According to the South African Meat Safety Act (DAFF, 2004), meat from wild animals sold for human consumption must be accompanied by a permit, it must be processed by an accredited abattoir and approved upon regulated inspection, otherwise it cannot be sold (McCrindle *et al.*, 2013). However, livestock and game may be slaughtered for "own consumption", which broadly applies to biltong and trophy hunters, so many of these regulations do not apply to

them. Both biltong and trophy hunters purportedly sell excess meat illegally to butcheries, but this is extremely hard to monitor or quantify.

6.1.6.2 *Sources of game meat production on surveyed wildlife ranches*

Game meat is produced from three different activities on wildlife ranches; namely trophy hunting, biltong hunting and culling. Although the main purpose of trophy hunting is the trophy, game meat is a by-product of the activity (unless the species hunted was a carnivore or primate). This meat remains the property of the landowner, unless he has an arrangement with the hunting operator or a meat producer, in which case the landowner may still generate revenue from the meat. When the landowner keeps the meat, it may be used for personal consumption, added to the menus of lodges or guest houses on the ranch, given to employees as rations (or sold to them at a low price), or sold domestically (either as whole carcasses, select cuts, or in processed forms such as biltong and droëwors; all of which may be processed on site or at a local butchery). Whichever way the meat derived from trophies is used, it has value either as a generator of additional revenue or as a source of protein for staff. Meat produced in this way is often of poorer quality than meat produced from biltong hunting or culling because trophy hunted animals are shot through the body to avoid damage to the head (which would spoil the trophy). This has a tendency to spoil some of the meat around the wound. Van der Merwe (2012) reported that the average meat loss from a trophy hunted carcass was 16%, while head shots taken by biltong hunters and culling specialists generally aim for the head or neck, and result in no meat loss.

Meat obtained from biltong hunting is, for obvious reasons, almost always taken by the hunting client. On most biltong hunting ranches there are, at the very least, facilities to hang and slaughter hunted animals to allow the hunter to package his meat before taking it home or to a butchery for further processing. Although some ranches have full butchery facilities, this is not the norm because the capital costs of building a butchery are very high. Cloete *et al.* (2015) stated that a basic slaughter facility and cold room would cost a minimum of R240,000 on a small ranch, and as much as R750,000 on a large ranch. They defined a small ranch as one with a capacity to hold up to 150 Large Stock Units (LSU) equivalents and a large ranch as one with a capacity to hold up to 1,000 LSU equivalents. Although the authors did not indicate their reasons, we assume they used LSU equivalents as the unit of measure rather than area to take into account the fact that ecological carrying capacity differs between biomes, which will impact density of wildlife species per unit area.

Culling generally produces game meat more efficiently than either trophy or biltong hunting because marksmen shoot as many animals as possible (within quota limits) in a short space of time, and do not need to be as selective of which animals they aim for. This shortens time requirements of personnel and therefore reduces costs. Slaughtering is also more efficient because trained staff can process multiple animals at once.

6.1.6.3 *Basic culling data for surveyed ranches*

Out of the 65 properties conducting culling, 36 (55%) provided data on culling offtakes (Table 18). The total number of animals culled was 5,637 over an area of 243,490 ha, spanning 21 species (median = 2 species). There was a trend of increased culling offtake densities (animals/ha) on smaller ranches which was accounted for as described in Appendix 1 (section 12.1). The final estimate for the numbers of animals culled for game meat in South Africa during 2014 was ~176,969 (Table 18).

Table 18. Number of animals culled on wildlife ranches.

	Culling
Number of ranches providing responses	36
Area covered by ranches of these respondents (ha)	243,490
Total number of species culled across all ranches	21
Median number of species culled per ranch	2
Range in number of species culled per ranch	1 – 15
Total number of animals culled on surveyed ranches providing data	5,637
Mean number of animals culled per ha[1]	0.023
Extrapolated number of animals culled on all wildlife ranches in South Africa[2]	176,969

[1]This is the overall mean, which does not account for the fact that smaller ranches tend to hunt more animals per ha than larger ranches; [2]These estimates accounted for the increased offtake densities per ha on smaller ranches.

6.1.6.4 *Game meat offtakes from trophy hunting, biltong hunting and culling on surveyed ranches*

Game meat offtakes from trophy hunting, biltong hunting and culling were estimated using the same datasets presented in Table 15, Table 17 and Table 18. Estimating carcass mass offtakes requires the use of dressing percentages for each species, which are the proportions of dressed weight divided by the full body weight. The dressed weight is the mass of an animal after it has been partially butchered to have the skin, head, legs below the knee joints, rumen, intestines, heart and lungs removed. We obtained these proportions from Bothma *et al.* (2010b).

Because carcass mass differs between species, we first estimated the mass of meat obtained from each species hunted or culled on a ranch, then summed the mass from each species to obtain a ranch total. Total carcass masses per species were calculated using three separate equations for trophy hunting, biltong hunting and culling, with body masses and dressing percentages being obtained from Bothma *et al.* (2010b):

$$\text{Mass of meat obtained from trophy hunting species A} = \text{Number of animals trophy hunted} \times \text{Mean adult male body mass of species A} \times \text{Dressing percentage of species A}$$

$$\text{Mass of meat obtained from biltong hunting species B} = \text{Number of animals biltong hunted} \times \text{Mean adult body mass (both sexes) of species B} \times \text{Dressing percentage of species B}$$

$$\text{Mass of meat obtained from culling species C} = \text{Number of animals culled} \times \text{Mean adult body mass (both sexes) of species C} \times \text{Dressing percentage of species C} \times 0.75$$

In the equation for mass of meat obtained from culling, the total was multiplied by 0.75 to take into account the inclusion of juvenile animals. A total of 510,058 kg of game meat was produced through trophy hunting, 614,422 kg from biltong hunting, and 303,743 kg from culling (Table 19). The mean carcass mass offtakes per hectare were 1.0 kg, 1.42 kg and

1.25 kg respectively. As found with all other measures of offtakes, there was a trend of increased offtake densities on smaller ranches, and we adjusted for these as in Appendix 1 (section 12.1). The extrapolated carcass mass offtakes for all wildlife ranches in the country were: trophy hunting, 11.52 million kg; biltong hunting, 18.93 million kg; culling, 9.70 million kg (Table 19). This gave a grand total of 40.15 million kg of game meat from all three categories of offtake. This is consistent with the lower estimate of game meat consumption described above (assuming 10% of red meat consumption during the hunting season comprises game meat).

Table 19. Game meat offtakes from surveyed wildlife ranches.

	Trophy	Biltong	Culling
Number of ranches providing responses	74	74	36
Area covered by ranches of these respondents (ha)	510,724	431,426	243,490
Total number of animals hunted or culled on surveyed ranches	5,704	9,942	5,637
Total biomass of animal carcasses from hunting or culling on surveyed ranches (kg)	510,058	614,422	303,743
Mean carcass mass offtakes per hectare (kg)	1.00	1.42	1.25
Total extrapolated carcass biomass from hunting and culling on wildlife ranches in South Africa (millions of kg)[1]	11.52	18.93	9.70

[1]These estimates accounted for the increased offtake densities per ha on smaller ranches.

6.1.6.5 *Uses of game meat from trophies and culled animals on surveyed ranches*

While biltong hunters remove the game meat from the animals they hunt, meat from trophy hunting and culling is predominantly used by landowners. During the surveys, wildlife ranchers were asked what they did with game meat produced from both trophy hunting and culling, with the responses being assigned to one of the categories mentioned above. Ranchers were also asked to estimate the proportion of carcasses used in each category.

Sixty-one percent (61%, n=71) of this meat was sold domestically (through various sources such as rancher owned butcheries, local butcheries, or other meat producers), while nearly 18% was given to farm workers as rations (Figure 12). Nine percent (9%) of game meat went to personal consumption by ranchers (which included giving meat to friends and relatives) and 9% was used in guest houses and lodges owned by ranchers. Two participants indicated that the meat from trophies was taken by the professional hunting operator conducting the hunting (which equated to <1%), but they did not say what kind of payment arrangement they had for the meat. Only one rancher indicated that he had an arrangement with a meat exporter, but this was currently not taking place because of the export ban resulting from the foot and mouth disease outbreak of 2011 (see section 6.3.1.1).

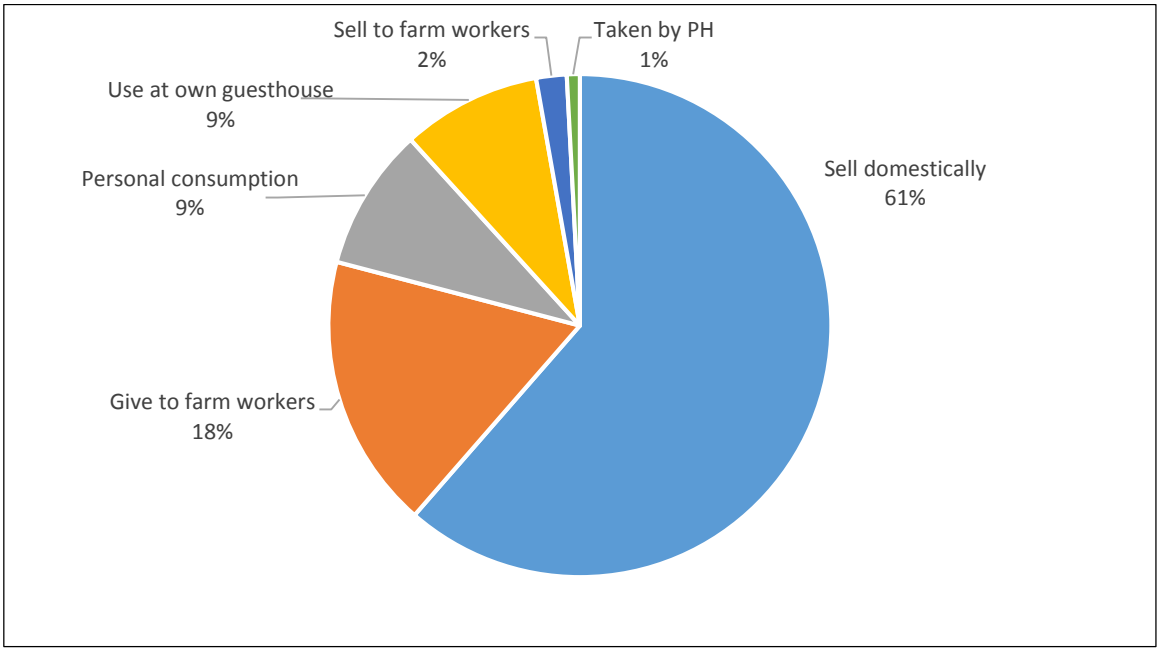

Figure 12. The different uses of game meat (obtained from trophy hunting and culling) on surveyed wildlife ranches (total carcass mass = 813,802 kg)

6.1.7 The extent to which livestock ranching coexists with wildlife ranching

6.1.7.1 *Insights on mixed farming from the literature*

We refer to mixed farms as those landowners whose commercial enterprises comprise a mix of wildlife, domestic livestock and crops. Mixed farms can run wildlife and livestock at the same time (either overlapping on the same land or separated but on the same property), wildlife and crops, or all three together.

Throughout most of the twentieth century, most farmers who stocked wildlife in South Africa did not use it as their primary source of income, so wildlife and domestic livestock often coexisted on these properties. There is little documented information, however, regarding the extent to which this occurred. In 1984, an attempt was made to determine the scale of commercial use of game in South Africa (Behr & Groenewald 1990). The authors obtained the names and contact details of 2,207 farmers who were known to stock game, and mailed a survey questionnaire to all of them. It is not clear where these contact details were obtained, but they likely came from the then Department of Agriculture (now DAFF). A total of 1,529 responses were returned, of which 752 (49%) indicated that the farmer derived some income from game. Presumably the remaining 51% of farmers kept game for non-commercial purposes. Of the 752 farmers who used game commercially, 81% derived <10% of their total income from game (i.e. most of their income came from other agricultural practices such as domestic livestock), 7% derived >50% of their income from game, and only 2% were full time game farmers.

Since 1984, and particularly after 1991 when the Game Theft Act was promulgated, wildlife ranching has expanded, both in terms of numbers of practitioners and the proportion of income derived from game. Van der Waal & Dekker (2000) state that the number of mixed livestock/game ranches was on the decline during the 1990s, with many farmers switching over to game only.

6.1.7.2 *Mixed farming on surveyed wildlife ranches*

Mixed farms comprised 45.8% of wildlife ranching properties surveyed (115/251) (Figure 13). Of these, 101 (40.2%) kept livestock and wildlife, three (1.2%) grew commercial crops alongside wildlife, and 11 (4.4%) kept livestock and grew crops alongside wildlife. One-hundred and thirty-six (136, 54.2%) wildlife ranchers kept wildlife exclusively. Landowners who grew crops such as lucerne or maize for the purpose of supplemental feeding of their own wildlife or livestock, and who did not sell the crops for commercial gain were not counted as mixed farmers (unless they kept livestock as well). There were 53 such landowners (21%), and the areas over which they grew such crops were generally small in relation to their properties.

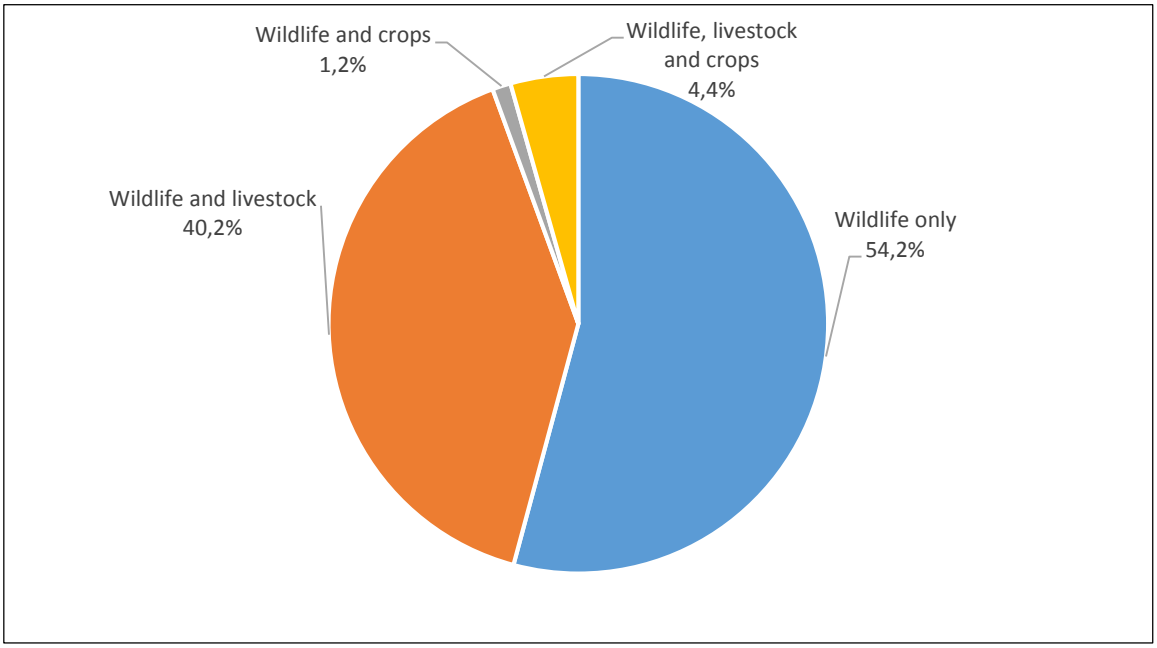

Figure 13. Percentage of mixed farmers in survey (n=251).

6.2 The economic scale of the wildlife ranching sector and its components, and how profits are reinvested

6.2.1 The economics of wildlife ranching: overview

There have been no definitive studies on the full economic benefits that can be derived from wildlife ranching in South Africa (Bothma & Von Bach, 2010). Thirty years ago, as described previously, only about half of South African farmers who stocked wildlife derived any income from it, and 80% of those that did, only made about 10% of their income from wildlife (Behr & Groenewald, 1990). The main sources of revenue at the time were from game meat production (practiced on 36% of farms), biltong hunting (29% of farms), live game sales (13% of farms), trophy hunting (12% of farms), and wildlife viewing (9% of farms) (Behr & Groenewald, 1990). Trophy hunting provided the highest average income out of these categories (with a mean of R43,000/property/year), while game meat production and biltong hunting provided R7,000/property/year and R11,000/property/ year on average respectively. Wildlife viewing provided the lowest average income (R4,200/property/year). These averages did not account for farm size, which is important because the properties were highly variable in size, so it is not possible to estimate income per hectare. No national estimate of financial turnover was made. Nearly half the farmers surveyed indicated a desire to expand their wildlife ranching practices, but an interesting conclusion of the study, that has turned out to

be incorrect, was that wildlife ranching in South Africa was unlikely to develop into a major agricultural concern.

Since the 1984 survey, economic studies of the wildlife ranching sector have primarily been conducted at the provincial level (e.g. Cloete *et al.*, 2007; Saayman *et al.*, 2011) or have focused on specific parts of the industry, such as hunting (Van Der Merwe & Saayman, 2008; Van Der Merwe *et al.*, 2013; Van Der Merwe *et al.*, 2014) and ecotourism (Sims-Castley, 2002; Sims-Castley *et al.*, 2004; Muir *et al.*, 2011). There is little published research on live sales other than popular articles written for magazines (e.g. Cloete, 2014). The only attempt at a national economic analysis, which estimated that game farm tourism generated >R874 million in the year 2000 (Van der Merwe & Saayman, 2003), was based on a review of the available literature, and was probably a significant underestimate (as was conceded by the authors) because a number of unknown variables were not included. For example, hunting was found to be the biggest income earner for game farms, generating R568 million, but this estimate was based mainly on trophy hunting, while it is now known that biltong hunting also makes a large contribution (Van der Merwe *et al.*, 2014). Subsequent studies conducted by the same authors have shown that biltong hunting now contributes ~90% of the total income generated by the hunting industry (Van Der Merwe *et al.*, 2014). More recent assessments of revenues generated by the entire wildlife ranching sector have not been reported in the peer reviewed literature, but rough estimates based on the summed contributions of the four "pillars" of the sector suggest that it generates an annual turnover of >R10 billion (Gert Dry, WRSA, personal communication).

A report on the profitability of wildlife ranching (ABSA, 2003), which analysed the hypothetical income and expenditure of ecotourism and harvesting surplus animals (with the latter including hunting, culling for game meat and selling live animals at auction), found that a large game ranch conducting ecotourism could generate an income between R9 and R12 million per year from accommodation, although they did not specify what area a large ranch would cover (except that it would have the economic carrying capacity of 1,000 LSU). A similar sized (large) ranch could generate between R2 million and R3.5 million per annum from lodging and hunting during the hunting season. Two important findings of the report were that larger wildlife ranches were more likely to make a profit than small ranches, due to economies of scale, but also that wildlife ranching in dry areas was more profitable than cattle farms of similar size, for two main reasons: 1) cattle farming is more labour intensive than wildlife ranching; 2) wild animals are more expensive than livestock, and so generate more revenue per animal. The report, however, provided no methods for how the estimates were made, no data to back up the results, and gave no citations for where information was obtained.

6.2.2 Financial and economic assessment

Our main objective for financial and economic assessment was to estimate the total annual revenue generated by the wildlife ranching sector (also termed turnover or gross income). The wildlife ranching sector contains a number of quite different economic activities ranging from non-consumptive ecotourism to consumptive trophy and biltong hunting, and may be conducted on large extensive areas or in smaller intensive camps. It also includes mixed farming, where landowners make commercial use of both wildlife and livestock. It is a complex mix of land use types and, in order to comprehensively measure the financial and economic impacts of all possible enterprise types, individual modelling exercises would be required for each land use, and each would need to be based on a specific survey. Given that our study had limited time and resources, we were only able to conduct a general survey, and ask questions about gross turnovers.

We faced two major limiting factors in doing this: 1) the willingness of the participants to take sufficient time to answer detailed questions about income and expenditure (and noting that

our questionnaire was very long anyway); and 2) the willingness of participants to divulge confidential financial information. As a result, we focussed our attention on income generated by ranching offtakes. Although we asked ranchers about income derived from guest accommodation, much of the data collected turned out to be unusable for the purposes to which we intended it. As a result, we excluded income from accommodation from our analyses.

6.2.3 The economic scale of ecotourism on wildlife ranches

6.2.3.1 *The financial turnover of ecotourism on private land in the literature*

The revenue generated by ecotourism on wildlife ranches has never been assessed on a national level, although some provincial studies have been conducted. In 1998, 35.5% of 118 wildlife ranchers surveyed in the then Northern Province (now Limpopo and North West) indicated that they derived an income from ecotourism (van der Waal & Dekker, 2000). Their median annual gross income was R21,000, which extrapolated to a total turnover of R17 million for the province based on an estimated 809 ranchers conducting ecotourism. Bothma & von Bach (2010) reported that ecotourism contributed R40 million to the gross income of the wildlife ranching industry in South Africa in the year 2000, representing only 4.7% of total wildlife ranching income.

During 2000/2001, questionnaires distributed to ~34 wildlife ranchers and 50 tourists in North West Province showed that the average group size of ecotourists to wildlife ranches was three people, and that the average spending per person was R1 064 over three days (Van der Merwe & Saayman, 2003). The authors estimated that if 100,000 tourists visited wildlife ranches in a year, the total revenue generated would be R106 million, although it is not clear where the estimate of 100,000 tourists came from.

The most comprehensive assessment of the revenue generated by ecotourism on privately owned properties in South Africa has been a series of studies conducted by the Nelson Mandela Metropolitan University on the Indalo association of PGRs in the Eastern Cape (Sims-Castley, 2002; Smith & Wilson, 2002; Sims-Castley *et al.*, 2004; Sims-Castley *et al.*, 2005; Langholz & Kerley, 2006; Muir *et al.*, 2011). These studies showed that, despite the relatively small number of ecotourism-based game farms in the Eastern Cape, their combined earning power, coupled with multiplier effects and other documented benefits of ecotourism (i.e. job creation, equitable wealth distribution, community upliftment, sustainable land use and biodiversity conservation), probably had a significant economic impact on the region (Sims-Castley *et al.*, 2004; Sims-Castley *et al.*, 2005). In 2004, total gross incomes were estimated to average R1,985/ha/year, suggesting that PGRs may contribute in excess of R87 million to the economy of the region per annum (Sims-Castley *et al.*, 2004). In 2010, total gross incomes were estimated to average R2,009/ha/year for nine reserves (Muir *et al.*, 2011). The two most important income generating activities of the PGRs were game viewing and accommodation provision, accounting for 87% of income from all wildlife based land uses (Muir *et al.*, 2011).

These Indalo member PGRs are probably not very representative of the average ecotourism based wildlife ranch in the Eastern Cape (or the rest of the country), however, because they all involved very large initial investments to get them up and running. For example, in 2004 the initial capital outlay for the PGRs varied between R10 million and R60 million (Sims-Castley *et al.*, 2004), and by 2010, the average cost of setting up a PGR in the EC had increased to R84 million (Muir *et al.*, 2011). Wildlife ranchers that do not have this kind of money available to set up a PGR will probably not obtain these kinds of incomes from ecotourism, although they will still get better returns for ecotourism than for other land use activities such as hunting and game sales (Smith & Wilson, 2002). In comparison to other agricultural land uses in the Eastern Cape, these authors found that ecotourism generated superior revenue. Sims-Castley (2002) provided an example of a landowner changing his

principal land use from commercial livestock farming to that of ecotourism, and showed that the change resulted in incomes quadrupling from almost R100/ha/year to over R400/ha/year.

There are two main ways that ecotourists spend money on wildlife ranches, namely accommodation and wildlife viewing. The series of surveys on socio-economic development of PGRs in the Eastern Cape (described above) found that these two attributes accounted for 87% of gross income (Muir *et al.*, 2011). Wildlife viewing, authentic wildlife experiences (which often means the necessary inclusion of the Big 5) and natural scenery and landscape, were regarded as the most important drawcards in attracting visitors (Muir *et al.*, 2011), while quality of service and accommodation were also found to be important. Although day visitor trips played a role in visitor income, there was a perception that they were not financially beneficial because they did not make use of accommodation. Instead, they increased vehicle traffic and added extra pressure to the carrying capacity of the reserves. In 2010, the average revenue per hectare for all Indalo members was R2,009 per hectare, and was decreasing in real terms (Muir *et al.*, 2011).

6.2.4 The economic scale of breeding and selling wildlife on private ranches

6.2.4.1 *The financial turnover of intensive breeding and live sales on private land in the literature*

The first official live wildlife auction in South Africa in 1975 generated a financial turnover of R20 362 (Bothma *et al.*, 2010a). Since then, the annual turnover has increased massively, with R9 million being generated in 1991, R87 million in 2001, R1.03 billion in 2013, and ~R1.875 billion in 2014 (Bothma *et al.*, 2010a; Cloete *et al.*, 2015)(F. Cloete, pers. comm.) (Figure 14). This trend is continuing in 2015, with almost 100 wildlife auctions scheduled (P. Oberem, pers. comm.). Taking into account annual inflation rates since 1991 (obtained from Statistics SA website: http://www.statssa.gov.za/?page_id=1854&PPN=P0141), the R9 million turnover in 1991 would be worth R40.9 million in 2014. The increase from the inflation adjusted R40.9 million in 1991 to R1.875 billion in 2014 represents an average annual increase of ~18.0% over the last 23 years. There have been two particularly rapid increases in turnover over this period, however, one from 1995 to 2002, after which there was a four year downturn, and a second from 2009 to the present day, with this second representing an average annual increase of 35.8% over five years (Cloete *et al.*, 2015) (Figure 14). The former period of growth was primarily driven by demand for game animals in order to stock farms that were transformed from livestock to wildlife ranching, while the latter growth was primarily driven by the breeding of high value species and colour variants (Cloete *et al.*, 2015).

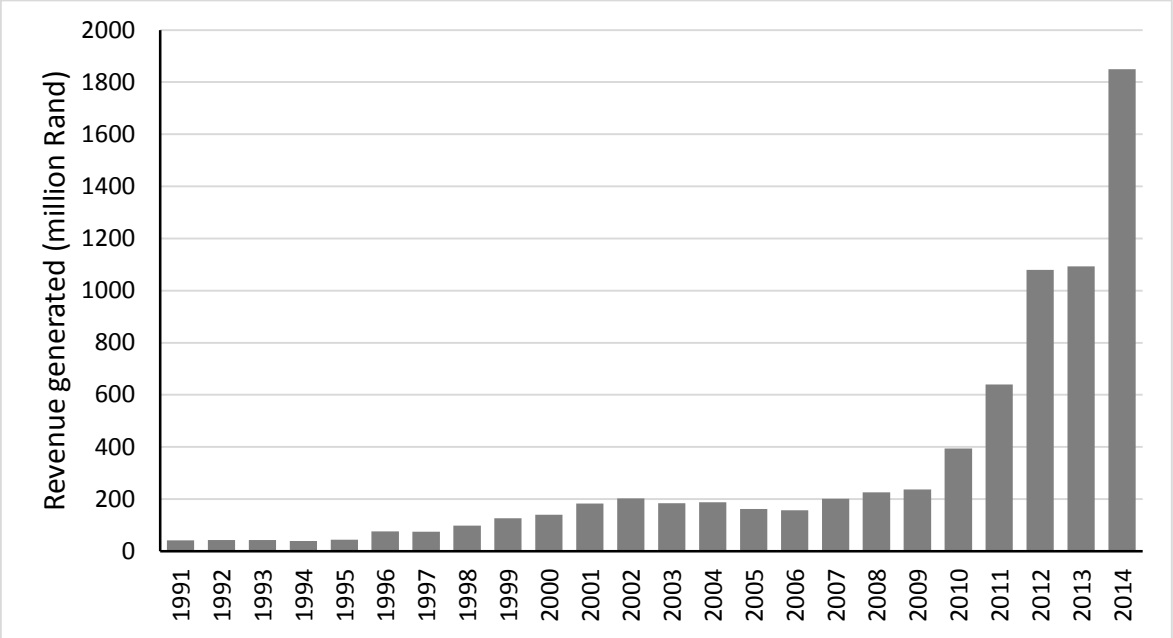

Figure 14. Annual revenue, adjusted for inflation, generated from live wildlife sales at auctions. (Data sources: Bothma *et al.*, 2010a; Cloete *et al.*, 2015; F. Cloete, pers. comm.)

Although the number of animals sold on auctions started declining after 2004, the total turnover continued to increase (except for a dip in 2005 and 2006). This was because more and more high value species, such as Sable, Roan, African Buffalo and rhino species were entering the market (Bothma *et al.*, 2010a; Cloete *et al.*, 2015). In 2006, the high value species sold on auctions contributed only 3.5% of the numbers of animals sold but generated 51.8% of the total turnover, while the five most common species (Impala, Blesbok, Blue Wildebeest, Kudu and Springbok) contributed 59.7% of the numbers of animals sold but generated only 12.2% of the total turnover (Bothma *et al.*, 2010a). The number of animals sold on auctions started increasing again in 2010, and together with increasing numbers of high value species being sold, and increasing prices of these species, these factors have driven a rapid increase in annual turnover.

With regards to the prices of plains game species since 1991, there was an increase in real terms (based on inflation adjusted, live wildlife auction prices) from the early to mid-1990s, due to strong demand for stocking new wildlife ranches, but this was followed by stagnating or decreasing prices during the late 1990s and early 2000s when new land for wildlife production became increasingly scarce (Cloete, 2014; Nowers, 2013). Other factors also played a role in preventing price increases, including pressure from the hunting industry, increased competition within South Africa, and the global economic slowdown that started in 2008 (Cloete, 2014). As a result, marketing animals through the formal live wildlife auction system was not particularly profitable, there was a decline in the demand for plains game, and numbers of animals sold decreased (Nowers, 2013; Cloete *et al.*, 2015). Wildlife ranchers experienced a price squeeze during this period because their costs were increasing while their income was not, and this led to a move towards more intensive breeding of high value species as well as colour variants (Cloete, 2014). Prices of these high value species continued increasing in real terms while plains game prices were declining (Nowers, 2013), and some very high prices have been paid over the last two years (e.g. in April 2012, an African Buffalo cow and heifer sold for R20 million, and in early 2014, a bull sold for R40 million). During 2012, prices of colour variants increased between 11% (golden wildebeest) and 499% (golden gemsbok) and their proportional representation in total turnover (16%) was much higher than their proportional representation in total numbers sold (6%) (Nowers, 2013). Overall, the high

value species accounted for 80% of sales in 2012 (Thomas, 2013). As the revenue generated by live sales of high value species increased, there was a concurrent development of infrastructure for game capture across the country (which had previously been confined mostly to Limpopo), and this made it easier to market live wildlife nationally (Cloete *et al.*, 2015). This combination of factors has now also contributed to an increase in auction prices for plains game that are more in demand again due to accessibility (Cloete, 2014).

In the year 2000, live game sales and the breeding of high value species were thought to be the second largest generator of revenue for game farm tourism after trophy and biltong hunting (Van der Merwe & Saayman, 2003), with live game sales generating R180 million from both auctions and private sales (Eloff, 2002). Information relating to the economic value of breeding and live sales is limited to the statistics from formal live game auctions (Cloete *et al.*, 2015). While game auctions generated R1.875 billion, it is thought that private sales may have generated 3-4 times that amount (F. Cloete, pers. comm.), although this is not reported in the peer reviewed literature. If this is the case, then the live game sale industry could be worth >R5 billion.

6.2.4.2 *Revenue generated by live game sales on wildlife ranches in South Africa (private sales only)*

To estimate the revenue generated by live sales of wildlife on surveyed ranches, we used the same dataset as used in section 6.1.4.4 (Table 10), except that we confined our estimate to private sales only, and excluded auction data because national auction statistics are well recorded elsewhere. We multiplied the number of each species sold on a property by their live sale price, and then summed the outcomes for all species to obtain ranch totals. Live game prices for 2014 were provided by a wildlife translocator (J. van Vuuren, pers. comm.), but it should be noted that there is some variability among translocators that is not accounted for in these estimates. In cases where ranchers indicated they sold colour variants, we used prices provided to us by the ranchers when possible. The total revenue generated from privately conducted live sales on surveyed ranches was R157.8 million (over an area of 382,919 ha), giving an average income of R412/ha (Table 20). To extrapolate the total income for the country, we corrected for the fact that small ranches had a larger income per hectare than large ranches, as described in Appendix 1 (section 12.1). The median revenue generated was R202/ha, while the overall revenue generated by live sales on wildlife ranches in South Africa was ~R2.453 billion (Table 20). If the auction figures mentioned above are added to this, the total revenue generated by live sales on wildlife ranches in South Africa from both auctions and live sales during 2014 was ~R4.328 billion.

Table 20. Revenue generated from live sales on wildlife ranches (excluding auctions).

	Live sales
Number of ranches providing responses	74
Area covered by ranches of these respondents (ha)	382,919
Total income generated from animals sold live from surveyed ranches (millions)	R157.8
Mean revenue generated by live sales per ha[1]	R412
Median revenue generated by live sales per ha	R202
Estimated total revenue generated by privately conducted live sales on all private land in South Africa (billions) (excludes auction sales)[2]	R2.453

[1]This is the overall mean, which does not account for the fact that smaller ranches generate more revenue per ha than larger ranches; [2]These estimates accounted for the increased offtake densities on smaller ranches.

It should be noted that there was a large amount of variability in the revenue generated per hectare between ranches, which resulted from the different management practices of the participants. Some landowners only removed plains game from extensive properties for ecological management purposes, and this resulted in low incomes per hectare. Other

landowners conducted intensive breeding of high value species and, thus, generated high revenues on small areas.

Comparisons between the results from auctions and private sales indicate that auctions generated 43% of the total live sales revenue but only contributed 13% of animals sold. This is unlikely to be due to differences in prices within species (e.g. a buffalo will fetch a similar price whether on auction or sold privately), but rather due to the fact that auctions generally only deal with high value species, while private sales deal with both high value species as well as large numbers of plains game species of relatively low value.

6.2.4.3 *Revenue generated by wildlife translocators*

We obtained data on annual turnovers from 13 of our surveyed wildlife translocators, who between them generated R250 million during 2014 (Table 21). If we assume that these operations were representative of all active WTA members, the total revenue generated in 2014 was R980.7 million. This gross income is about one-quarter of our estimate for gross income received by ranchers for their live sales (Table 20), and we think this difference can be explained by the fact that wildlife translocators often act as the middle-man in the transaction between two ranchers trading animals, and in these cases get paid to translocate animals rather than trading them. This is particularly relevant when ranchers use translocators to transport high value species and colour variants to auctions, which is a large segment of the income generated by ranchers. We note, however, that many translocators prefer to act as game traders when possible because that is more profitable for them.

Table 21. Revenue generated by wildlife translocators.

Total turnover (gross income) of 13 translocation organisations	R250.0 million
Estimated total revenue generated by all 51 active members of the WTA	R980.7 million

6.2.5 The economic scale of trophy and biltong hunting on wildlife ranches

6.2.5.1 *Insights from the literature*

Revenue generated by trophy hunting in South Africa broke the R1 billion mark in 2013, when it was estimated that foreign hunters spent R1.072 billion (PHASA press release December 2014 http://www.phasa.co.za/what-is-in-the-news/phasa-press-release/item/570-revenue-from-hunting-tourists-breaks-r1-billion-mark.html). Of this, R758 million was revenue was spent on species fees, the majority of which would have gone to the landowners of the ranches on which the animals were hunted. The remaining R314 million was generated by daily rates paid to hunting outfitters. This estimate does not include traditional tourism spending that goes hand in hand with the hunting expenses or other hunting expenses such as permits and licensing fees; in total, these other expenses may add >50% to the total revenue generated. The revenue generated in 2013 was an increase of 32% from the previous year, which was accounted for partly due to a strengthening of the USD against the ZAR, partly due to an increase in daily rates, and partly due to an increase in the number of animals hunted.

For biltong hunting, a series of reports by North-West University has documented the growth of the sector over the last decade, with the most recent estimated revenue being R6.3 billion in 2013 (Van Der Merwe *et al.*, 2014). Approximately R3 billion of this revenue came from the money spent on the game species hunted, which would have mostly gone to wildlife ranchers (Saayman *et al.*, 2011), while the rest came from things like accommodation and food (some of which would have been paid to ranchers). By comparison, the total revenue in 2007 was

R4.4 billion. These estimates were based on questionnaires completed by 671 biltong hunters, who spent an average of R31,473 over the course of one year, and assumed that there were 200,000 biltong hunters in South Africa, each of which spent this average amount (Van Der Merwe *et al.*, 2014). This assumption was not explained by the authors, and the only reference we were able to find was in an online hunting article (http://www.africahunting.com/threads/history-and-status-quo-of-recreational-hunting-in-south-africa.15017/) that indicates the number 200,000 was based on the sale of hunting permits. A second assumption in the calculation was that the hunters sampled were truly representative of an average biltong hunter in South Africa. The sampling method used relied on biltong hunters voluntarily completing an online questionnaire, which can lead to voluntary response bias where those who completed the survey were different from those who did not complete the survey. Online surveys are more likely to be completed by keen active hunters than people who hunt less actively, so the figures may be overestimated.

6.2.5.2 *Types of revenue generated by trophy and biltong hunters on surveyed ranches*

Direct expenditure by hunters varies according to the type of hunting activities conducted (Table 22, following Van der Merwe *et al.* (2014)). During our survey, we attempted to obtain information from ranches about income generated from animal offtakes.

Table 22. Types of expenses incurred by trophy and biltong hunters on wildlife ranches

Type of expenditure	Money paid to landowner?	
	Trophy hunting	**Biltong hunting**
Animals hunted	Yes	Yes
Daily fees - May include: PH fees (trophy only), fees for guides, trackers, skinners, transport & butchering facilities	Sometimes: Depends on whether landowner is also hunting operator	Sometimes: Often includes accommodation fees
Licenses and permits	No	No
Accommodation	Yes	Yes
	These costs may be included in a package that includes daily fees	These costs are often included in daily fees
Food and beverages	Yes	Sometimes
Butchery facilities and meat processing	No	Yes: included in daily fee
Transport	Included in daily fee	No
Trophy handling fees	Sometimes: depends on whether landowner has facilities	No
Fuel	Included in daily fee	No
Ammunition	No	No
Other hunting equipment	No	No
Clothes	No	No
Other miscellaneous (e.g. toiletries, tobacco, etc.)	No	No

6.2.5.3 *Revenue generated by trophy hunting on wildlife ranches*

To estimate the amount spent by trophy hunters on the animals they hunted for each surveyed property, we multiplied the number of each species hunted (using the same data from 74 properties in section 6.1.5.4) by the average trophy prices for those species during

2014, and then summed all the species totals. Trophy prices for each species were estimated using national data provided by DEA for 2013 adjusted for inflation (assumed to be 6%: value taken from average 2014 inflation rate provided by Statistics SA (http://www.statssa.gov.za/publications/P0141/CPIHistory.pdf)). Trophy values were provided in USD currency, so we converted them to ZAR by multiplying by the average exchange rate during 2014 (USD1 = R10.8) as estimated using the website OANDA (http://www.oanda.com/currency/average). These prices were similar to the mean species trophy costs taken from the websites of 13 trophy hunting farms selected by typing in the term "trophy hunting prices South Africa" to a web browser, so we considered them reliable.

From these 74 properties, the total revenue generated from species fees alone was estimated to be R92.43 million on a total area of 510,724 ha. This equates to an average revenue of R181/ha (Table 23). However, as with numbers of animals hunted per hectare, there was a relationship between ranch size and income per hectare: ranches <1,000 ha generated an average of R539/ha, while ranches >6,000 ha generated an average of R102/ha. In estimating the total revenue generated by trophy hunting on private land across South Africa, we accounted for these differences in income per hectare using the method described in Appendix 1 (12.1). The total revenue generated from trophy hunting fees on private land in South Africa during 2014 was ~R1.956 billion (Table 23). In comparison, the annual statistics compiled by the DEA indicate that the revenue generated from the animals trophy hunted during 2013 was R737 million. Some of the difference in revenue estimates may be due to the fact that our Rand value is from 2014, which is one year later than the DEA statistics, so we would expect it to be higher. However, there is also a big difference in the number of animals trophy hunted between our figures and the average annual figures of DEA.

These income estimates only include the money paid by hunting clients for the animals shot, and do not include any other costs.

6.2.5.4 *Revenue generated by biltong hunting on surveyed ranches*

To estimate the amount spent by biltong hunters on the animals they hunted for each surveyed property, we performed the same analysis as done for trophy hunting above, using the same data set for biltong hunting ranches in section 6.1.5.6. Average animal prices for each species were estimated from price lists of 17 biltong hunting properties (some of which were provided by the Rand Hunters Association, and some taken from websites while searching using the term "biltong hunting prices South Africa"), adjusted for 6% inflation if the website indicated 2013 prices rather than 2014.

The total revenue generated from species fees alone on 74 properties was estimated to be R21.64 million on a total area of 431,426 ha. This equates to an average revenue of R50/ha (Table 23), but again there was a relationship between ranch size and income per hectare: ranches <1,000 ha generated an average of R147/ha, while ranches >6,000 ha generated an average of R24/ha. To estimate the total revenue generated by biltong hunting on private land across South Africa, we accounted for these differences in income per hectare using the method described in Appendix 1 (section 12.1) and found that the total revenue generated from biltong hunting fees on private land in South Africa during 2014 was ~R651.13 million (Table 23).

In comparison, van der Merwe *et al.* (2014) estimated that the amount spent by biltong hunters on game animals during 2013 was R3 billion. This is a major discrepancy, and while there could be bias in our sampling methods that would account for some of this difference, the two assumptions of the van der Merwe *et al.* (2014) paper (see section 6.2.5.1) may have led to them over-estimating revenue.

Table 23. Revenue generated from animals fees for trophy and biltong hunting on wildlife ranches.

	Trophy hunting	Biltong hunting
Number of ranches providing responses	74	74
Area covered by ranches of these respondents (ha)	510,724	431,426
Total income generated from animals hunted on surveyed ranches (millions)	R92.4	R21.6
Overall mean amount spent by hunters on animals per ha[1]	R181	R50
Median amount spent by hunters on animals per ha	R234	R81
Estimated total revenue generated by trophy hunting fees on all private land in South Africa (billions)[2]	R1.956	R0.651

[1]This is the overall mean, which does not account for the fact that smaller ranches generate more revenue per ha than larger ranches; [2]These estimates accounted for the increased offtake densities on smaller ranches.

6.2.6 The economic scale of processed game products on wildlife ranches

6.2.6.1 *Game meat production in the literature*

Reliable data on the South African game meat retail industry is scant (Hoffman *et al.*, 2004), and there is little published information on financial turnovers from either the export or domestic industry. Baard (1984, cited by Carruthers, 2008) reported that the South African game meat export trade increased in value from R4 million in 1977 to R9.7 million in 1980, before dropping to R5.5 million in 1982 due to a decline in the price of South African derived game meat.

In 1984, game meat production was conducted on 36% of farms stocking wildlife (out of a sample of 1,529 farms stocking game throughout South Africa), which was a higher proportion of ranches than any other activity, including hunting and live game sales (Behr & Groenewald, 1990). The revenue generated by game meat production was not estimated, however. In 2000, game meat production generated the lowest income of the four "pillars" of wildlife ranching (Van der Merwe & Saayman, 2003), with a gross income estimated at R20 million (Eloff, 2002). A report by the National Agricultural Marketing Council (2006) stated that the value of wild meat exported annually from South Africa during the early 2000s was R15 million, while the value of wild meat consumed domestically was R27 million.

Because the quality of game meat supplied to the domestic market is not yet regulated, the status of game meat intended for the local market and the quantities of meat involved are unknown, which makes it difficult to estimate the turnover generated by this segment of the market (Van der Merwe *et al.*, 2011; Van der Merwe *et al.*, 2013). Uncontrolled game meat reportedly contributes more than 20% of the total fresh red meat consumption in South Africa during the hunting season (Van der Merwe *et al.*, 2013), but how much this is worth has not been estimated.

Game meat production in South Africa is run on a free-market basis, which creates business opportunities for private wildlife ranchers with capacity to sell meat (Hoffman *et al.*, 2004). When compared with beef, game meat has a lower total fat content (Hoffman *et al.*, 2004) and is lower in total saturated fatty acids (Viljoen 1999), making it an appealing choice for health conscious consumers. Game meat is also considered more "organic" than many domestic livestock products because it is generally free of antibiotics and hormones (D'Amato *et al.*, 2013), although it is often perceived to be tougher and less juicy than beef, possibly because its lower fat content makes it less succulent (Hoffman *et al.*, 2005). Despite the health advantages, it is not easy to make a profit from selling game meat because the species concerned are more difficult and costly to harvest, are not farmed at high densities, and have to be culled in the field, all of which increase the effort and costs required to harvest the

meat (Hoffman *et al.*, 2004). In comparison, domestic livestock are accustomed to human contact, can easily be herded (and therefore protected from depredation), are farmed at higher densities with supplementary food, and can be delivered to abattoirs for mass slaughter. Numbers of game animals that can be harvested per hectare are, therefore, lower than domestic animals, so the volume of meat a single wildlife rancher can supply is often insufficient to interest wholesalers (Conroy & Gaigher, 1982).

6.2.6.2 *Value of game meat produced on surveyed ranches*

To estimate the value of game meat produced on surveyed properties, we used the offtake data presented in Table 15, Table 17 and Table 18 (from trophy hunting, biltong hunting and culling respectively) in combination with game meat prices provided by ranchers during the surveys. As with all the previous offtake densities, there was a relationship between ranch size and income generated from game meat per hectare: for trophy meat, <1,000 ha ranches generated a median of R60/ha, while ranches >6,000 ha generated a median of R7/ha; for culling, ranches <1,000 ha generated a median of R207/ha, while ranches >6 000 ha generated a median of R20/ha; Using the extrapolation method described in Appendix 1 (section 12.1), we found that the total value of game meat obtained from trophy hunting was R 261.8 million, while that from culling was ~R 349.7 million (Table 24). Note that these estimates are not presented as turnover because much of the meat produced was not sold (see section 6.1.6.5).

Table 24. Value of game meat production on wildlife ranches.

	Meat from Trophy hunting	Meat from biltong hunting	Meat from culling
Number of ranches providing responses	74	74	36
Area covered by ranches of these respondents (ha)	510,724	431,426	243,490
Total number of animals culled or hunted on surveyed ranches	5,704	9,942	5,637
Total biomass of meat from culled animals on these ranches (kg)[1]	510,058	614,422	303,743
Total value of game meat produced on surveyed ranches (millions)	R16.9	No estimate[2]	R12.7
Mean value of game meat per ha[3]	R33		R52
Median value of game meat per ha	R37		R42
Estimated total value of game meat production from culling and trophy hunting on all private land in South Africa (millions)[4]	R261.8		R349.7

[1]These estimates were based on average body masses of species and using dressing percentages provided by Bothma, van Rooyen & du Toit (2010); [2] Wildlife ranchers do not sell the meat generated from biltong hunting (it is kept by the hunter); [3] This is the overall mean, which does not account for the fact that smaller ranches generate more revenue per ha than larger ranches; [4]These estimates accounted for the increased offtake densities on smaller ranches.

6.3 The social contribution of the wildlife ranching sector

6.3.1 The extent to which wildlife ranching contributes to food security

6.3.1.1 *Food security in South Africa and the potential contribution of game meat produced by wildlife ranchers*

The United Nations Development Program (UNDP) defines food security as the condition when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (United Nations Development Programme, 2012). Food insecurity debilitates society by increasing mortality, disease and disability and by decreasing human development. According to the Human Development Index, South Africa scores higher than most sub-Saharan countries, but lags behind North America, Europe, most of South America and Asia and even some African States such as Gabon, Botswana and Namibia (United Nations Development Programme, 2012). During the period 2000-2010, 8.7% of children under the age of five years in South Africa were underweight, 23.9% were stunted due chronic dietary inadequacy, and 4.7% experienced wasting from poor nutrition (United Nations Development Programme, 2012). A recent report by the Departments of Social Development (DSD) and DAFF suggested that only 20% of South African households are food secure, while >50% experienced some degree of hunger (DAFF, 2013b).

Two important factors that impact food security in South Africa are: 1) the ability of the country to meet the dietary energy and nutritional requirements of all its citizens; and 2) the ability of individual citizens and households to access the food that is available. With regards to the first factor, the extent to which a country has the means to make sufficient food available to its people, irrespective of whether the food is domestically produced or imported, is referred to as national food sovereignty. South Africa is food sovereign because, although it is a net importer of cereals and meat, it is able to pay for its food imports without the need for international aid (DSD/DAFF 2013). These imports come at a high price, however, and in 2014, poultry meat imports cost South Africa ~R4.1 billion (DAFF, 2015).

According to the South African Meat Industry Company (SAMIC), South Africa slaughtered 756,146 tonnes of beef during 2014 (R. van der Westhuizen, pers. comm.), which would have earned beef farmers ~R25 billion (DAFF, 2015). Also slaughtered during 2014 were 100,574 tonnes of lamb/mutton and 207 882 tonnes of pork. However, South Africa imported 13,000 tonnes of beef, 6,000 tonnes of lamb/mutton, 30,000 tonnes of pork and 215,000 tonnes of chicken during 2014.

So although South Africa produces a large amount of animal protein for consumption every year, there is a shortfall. This is partly due to the fact that the human population has doubled from 25 million to >50 million over the last 30 years (DAFF, 2013c), while the numbers of livestock have remained the same or declined. Cattle numbers have fluctuated around 13-14 million head during this period, while sheep numbers have dropped from nearly 30 million head to 22 million (DAFF, 2013c). There has also been an overall loss of high agricultural potential land to non-agricultural activities such as mining and housing developments, and since 1994 the overall area under food production has declined by 30% (DAFF, 2013b). It appears that the demand for meat may have outstripped the country's ability to produce it, and with the growing human population, this situation is likely to get worse.

One possible solution to this problem would be for South Africans to eat more game meat. McCrindle *et al.* (2013) suggest that, if game meat resources (including the offal) were used sustainably, thousands of tonnes of game meat could be produced on an annual basis to fulfil the growing protein requirements of the domestic consumer market. Moreover, with game meat production being run on a free-market basis, there are considerable business

opportunities for private wildlife ranchers to take advantage of the good qualities of game meat, namely its relatively low fat content and "organic" (antibiotic and hormone free) status (Hoffman *et al.*, 2004).

An important questions is then, how feasible is this? Things are not as simple as just culling more wild ungulates. It is not easy to make a profit from selling game meat because harvesting wildlife requires considerable effort (Hoffman *et al.*, 2004). Animals run wild, are farmed at relatively low densities, and have to be culled in the field. In comparison, domestic livestock can be herded, are farmed at higher densities with supplementary food, and can be delivered to abattoirs where standardized slaughtering and carcass handling procedures can be followed. Thus the volume of meat a single wildlife rancher can supply is often insufficient to interest wholesalers. Add to this the fact that the value of wildlife is increasing alongside the expanding live game sale sector, and you have a situation developing where wildlife ranchers are becoming less willing to sell their animals cheaply for meat because they can get better prices on live sales.

To compound these problems, there are regulatory issues that need to be resolved in terms of processing of game meat. At present, the Meat Safety Act (DAFF, 2004) regulates the local meat industry, including game meat, and requires the delivery of live animals to abattoirs. This is not feasible with wild animals, and means that game species designated for the local market cannot easily be processed at approved slaughter facilities. A draft game meat scheme aimed at making local production more practical and cost effective, which had been in the pipeline for nearly 10 years, was scrapped by DAFF during 2014, leaving many potential small-scale producers of game meat out of the legal market (but see below for a plan to counter this by WRSA).

At present, most game meat products sold in butcheries are derived from animals shot by trophy or biltong hunters who are not required to follow any hygiene standards, and if the animals are not shot, bled and cooled correctly, the meat produced may be of inferior quality (Hoffman *et al.*, 2004). As much as 95% of game meat entering the market is illegal (Maretha van der Merwe, City Council of Tswane, personal communication; Tertius Bergh, Private Consultant for the meat industry, personal communication) because there are no regulations available for butcheries that process game meat in this way, and according to the Foodstuffs, Cosmetics and Disinfectants Act (DAFF, 1972), it is not permitted to sell anything that is not traceable and has not been inspected. But this is a grey area in terms of legalities, because it is legal to take an animal with a skin on into a butchery, provided the butchery includes a separate room where the skin can be removed, and this allows biltong and trophy hunters to circumvent legislation (M. van der Merwe, pers. comm.). There is no formal monitoring system for how much game meat enters the domestic market because it is illegal, and any estimate provided previously is really only a very rough estimate made using untested assumptions (T. Bergh, pers. comm.).

This situation, along with the recent incidences of products being mislabelled or substituted with other meat types (Cawthorn *et al.*, 2013; D'Amato *et al.*, 2013), has resulted in large-scale sellers becoming cautious of where they get their supplies. Although there are approved wholesale producers of game meat in South Africa capable of processing up to 2,000 tonnes per year, these businesses are geared towards the export market and only sell <10% of their meat locally (Hoffman *et al.*, 2004). For these wholesalers to sell in Europe, they have to comply with stringent international hygiene standards that are expensive to initiate and maintain, so they are not able to produce game meat at locally competitive prices (Charl de Villiers, Game Marketing Division, Mosstrich, pers. com.).

In February 2011, a foot and mouth disease (FMD) outbreak in KwaZulu-Natal, led the international community to close all exports of game meat from South Africa until the problem was resolved (Charl de Villiers, Game Marketing Division, Mosstrich, pers. com.). The

World Organisation for Animal Health (OIE) recognised that South Africa was free of FMD in February 2014, but the European Union (EU), who were the largest importers of meat from South Africa before the ban, have stricter rules, and have not yet (at least up until recently) allowed the import of South African game meat into Europe (Sikhumbuzo Mbizeni, DAFF, personal communication). This has had a major impact on the potential for generating revenue from game meat exports, which in turn has increased the costs of importing meat. Estimates of potential income generated from game meat exports suggest that for every one kilogram of game meat that could be exported, South Africa could pay for the import of three kilograms of beef because of the high value of export quality game meat (Uys, 2015 – quoting Peter Oberem, WRSA).

In terms of the potential quantity of legal domestic game meat production in South Africa, this is determined by the number of abattoirs registered to process game meat. The Meat Safety Act (DAFF, 2004) prescribes the classification of abattoirs according to the number of slaughter units that can be slaughtered per day (DAFF, 2012b). These, along with approximate numbers of each category of abattoir (which are not known precisely) are as follows:

- High throughput abattoir: unlimited slaughter units (n = 4 export abattoirs)
- Low throughput abattoir: 3 – 20 slaughter units (n = 9 – 15 abattoirs)
- Rural abattoir: 1 – 2 slaughter units (n = 6 – 12 abattoirs)

A slaughter unit of 1 bovine unit (or 6 sheep) is equivalent to 1 medium game animal (Eland, Kudu, Blue Wildebeest) and 6 small game animals (Impala, Blesbok, Springbok). See DAFF website: http://www.daff.gov.za/daffweb3/Branches/Agricultural-Production-Health-Food-Safety/Veterinary-Public-Health/Veterinary-Public-Health. The legitimacy of the registration of these abattoirs is technically questionable however: how can an abattoir be approved when there are no regulations in the Meat Safety Act (DAFF, 2004) to allow for them? (T. Bergh, pers. comm.).

In terms of domestic game meat production potential, if we assume the higher numbers of abattoirs are correct (15 low throughput and 12 rural abattoirs), these abattoirs can process a maximum of 300 units (low throughput) and 24 units (rural) per day, which equates to an annual maximum total of 118,260 slaughter units if they run 7 days a week. This is equivalent to 709,560 Impala per year, or ~21,300 tonnes of meat (assuming an Impala carcass weighs 30 kg). By comparison, nearly 11 million head of livestock (cattle, sheep and pigs) were slaughtered during 2014 (R. van der Westhuizen, pers. comm.). If game meat production is to be increased in the future, a significant increase in the number of registered game meat abattoirs would be needed.

Overall then, although there is strong potential for game meat to satisfy some of the dietary needs of South Africans that are currently being filled by imports (or to cover the costs of these imports through game meat exports), there are a number of obstacles that need to be overcome before this can happen more effectively.

There is room for optimism, however. WRSA has recently developed an international standard guiding the production of game meat, and this has been registered by the International Standards Certification (ITC), which is a globally accredited certification body headquartered in Australia (P. Oberem, pers. comm.). According to a 2015 fact sheet produced by WRSA, the standard is in compliance with South African legislation; in fact, the standard exceeds national requirements because it is in compliance with the specifications of three benchmarks laid down by the International Organisation for Standardisation (ISO), including environmental, food safety and quality standards. WRSA's standard is, therefore, higher than the minimum standard set by the Meat Safety Act (DAFF, 2004), which means that the government has poor grounds to refuse it (T. Bergh, pers. comm.).

The standard is a positive step forward because the bigger retailers, who want to put game meat in their shops, want a standard that is beyond reproach. They need to reassure the consumers that the meat is safe (because of the many diseases that can be transferred to humans). A standard provides a guarantee to the retailers. Another advantage of the standard is that it will benefit wildlife ranchers wishing to produce game meat because they will now have access to legal and practical guidelines. One disadvantage of the new standard is that it will be expensive to implement. Participating ranches will have to be audited to make sure they are doing things properly, and the extra costs will have to be absorbed by the supplier, not the retailer (T. Bergh, pers. comm.). There may be some ranchers who will be unwilling to pay for it.

With regards to the second factor that impacts food security in South Africa (i.e. the ability of individual citizens and households to access the food that is available), even if South Africa does find a way to produce larger quantities of game meat in future, this will not ensure that all members of society have access to it, especially those who are already undernourished as a result of poverty. Game meat generally fetches high prices because it is considered a luxury product (Hoffman *et al.*, 2004), despite the fact that game carcasses from private wildlife ranches are not subject to any regulation (Conroy & Gaigher, 1982), so it is unclear how much game meat will be a viable source of inexpensive protein. As the ability to buy any product is directly influenced by price, much game meat will remain inaccessible to some segments of the population while this situation persists. Indeed, rural communities appear to gain few direct benefits from hunting or harvesting game, as game meat is currently marketed to affluent consumers (McCrindle et al. 2013). That being said, the expensive cuts make up <30% of the carcass (those being the hind quarters, rib-eye, back muscle, fillets, and top side), with the rest being cheaper cuts including bone meat, liver and kidneys (T. Bergh, pers. comm.). This issue could be further alleviated by the expanded use of less expensive edible by products of game such as the head, feet and offal (McCrindle *et al.*, 2013).

So there could be two segments to a market for game meat (P. Oberem, pers. comm.). There is the lower end market with cheaper cuts and people looking for lower prices, and then there is the high end, speciality market, where people are looking for delicacy. There is a huge opportunity from the point of view of processing or beneficiation (that is adding value through processing) for things like carpaccio, pâté, droëwors, etc. There might be a bit of a clash in that some people will want cheaper food and will take the cheaper off cuts, but a rancher can still make droëwors and biltong and sell it for higher prices. There are further possibilities of using certain sections and cuts in canned meat that would have a better shelf life. This meat would be reasonably priced and could be used locally or exported, particularly to other African countries, where there is a huge demand.

6.3.1.2 *Current game meat production on wildlife ranches*

Section 6.1.6 of this report shows that wildlife ranchers across South Africa produced 23,700 tonnes of game meat from a combination of trophy hunting and culling during 2014. If 61% of this was sold domestically (section 6.1.6.5), then approximately 14,450 tonnes of game meat could have been processed through these abattoirs. A further 15,700 tonnes of game meat were obtained via biltong hunting, although this was not available for sale because it was removed by the hunters.

6.3.2 The extent and quality of employment generated by the wildlife ranching sector.

6.3.2.1 *Employment in agriculture and wildlife ranching in the literature*

There has been a lack of clarity with regards the numbers of people working as paid agricultural employees in South Africa, as well as the wages they receive, and this is partly

due to fact that statistics on farm labour are spread among different censuses (Liebenberg & Kirsten, 2013). According to Statistics South Africa (2007), between 1993 and 2007 there was a 31% decline in the number of farm units across South Africa from 57,980 to 39,982, and a concurrent 27% decline in the number of paid farm employees from 1,093,265 to 796,806 (Stats SA 2007). Liebenberg *et al.* (2013), however, quoting the Quarterly Labour Force Survey (QLFS), indicated that in 2009, there were still 50,332 farmers, but that this dropped to 34,905 by 2012, a drop of 15,427 (31%) in three years. Whichever statistics are correct, they highlight the same trend: there has been a large drop in numbers of farms across South Africa, and a concurrent drop in the number of people employed. It is not apparent, however, if this decline in number of farming units corresponds with a decline in the actual area under agriculture or if the average size of farms has increased (e.g. by the development of larger scale farming practises).

Liebenberg (2013) reported that 672,000 people were employed in the formal agricultural industry in the first two quarters of 2013, using statistics taken from labour surveys that included crops, horticulture, game and livestock, but excluded informal agriculture workers. Based on the numbers of farms and farm labourers provided by these reports, the average number of employees per farm can be estimated to be between 19 and 20, although this is not a very useful statistic without an estimate for numbers employed per unit area. The only statistics we could find on the total area of land in South Africa under commercial agriculture were from 1991 (DAFF, 2013c), which show that 86,186 000 ha (861,860 km^2) were used for commercial farming. If this area remains the same today, the number of people employed per hectare in the agricultural sector is 0.008 (or one farm employee every 128 ha).

Information on how these jobs are distributed among the different farming sectors, including wildlife ranching, is not well reported on. Van der Waal & Dekker (2000) estimated that wildlife ranches in the then Northern Province (now Limpopo and North West) in the late 1990s employed an average of 5.95 permanent staff with full time game related tasks. This equated to 13,700 full time jobs on game ranches in the province after extrapolation from the total number of ranches. In 2000, van der Merwe & Saayman (2003) estimated that the 7,000 exempted game ranches across South Africa employed 63,000 people, which equates to nine employees per ranch or 0.004 employees per hectare (one ranch employee for every 254 ha) based on a total estimated area of 16,000,000 ha. Bond *et al.* (2004), however, reported the total number of people employed by the commercial wildlife sector as being approximately 45,000, which is considerably fewer than the previous estimates. They did, however, state that, in semi-arid rangelands, wildlife can make more money and create more jobs than livestock.

By comparison, Cloete *et al.* (2015) state that the successful management of a semi-extensive game ranching operation requires, on average, one farm worker for every 750 ha. This labour-to-land ratio estimate, which is considerably lower than the rough calculation made above, was calculated using the results of structured interviews with wildlife ranchers during 2014. Based on this, a small ranch (150 LSU game equivalents) would require between two and four general farm workers to be efficient. In addition to general farm labour, most small ranches require the services of domestic workers (cleaners), chefs and, depending on the business model, a skinner and tracker.

During a survey of Namibian farmers conducting both livestock farming and wildlife-based land uses (either consumptive or non-consumptive), Lindsey *et al.* (2011; 2013) showed that the rate of employment was positively related to income from wildlife-based land uses (particularly ecotourism), but negatively related to income from livestock. In other words, employment rates were higher on commercial ranches that practised some degree of ecotourism than those that just practised livestock production. The overall average rate of employment on all ranches in that study was 0.22 workers per km^2, which equates to 0.0022 workers per hectare, and is about ½ to ¼ the rough estimates calculated above for South

Africa. This is not surprising given that Namibia is much drier and less productive than South Africa.

Smith & Wilson (2002) suggested that the impetus behind the growing game industry of the 1990s and early 2000s could be attributed to a number of socio-political, economic and ecological motivations, one of which was a concern of landowners that changed labour legislation would lead to increased wages for workers on farms. This made landowners regard wildlife ranching as an alternative to stock farming because it was considered to be potentially less labour intensive than traditional stock farming. Although the lower number of employees per wildlife ranch compared with the national farming average appears to support this hypothesis, additional factors need to be considered.

Comparing the above estimates for numbers of jobs created by the wildlife ranching sector with the overall farming sector is probably misleading for two reasons. First, the overall employment statistics are for the entire country, while the wildlife ranching figures represent the northern parts of South Africa only. These areas are not equal in rainfall and soil types and are not, therefore, directly comparable. Also, the employment estimates were not presented according to farm area, and if wildlife ranches in the northern parts of South Africa are smaller (or larger) on average than the other farms, the result is also not comparable.

For a comparison between employment figures of wildlife ranching and other farming practices, Sims-Castley *et al.* (2004) determined that when livestock farms in the Eastern Cape were converted to PGRs, they experienced an increase in employment of 3.5 times, and an average wage increase of 5.7 times. A later study of the same association of PGRs by Langholz & Kerley (2006) and then by Muir *et al.* (2011) estimated an even greater increase in jobs equal to 4.5 times that of previous livestock farming. The latter study estimated that, in 2010, entry level unskilled workers on PGRs earned R1,950/month, compared to R1,200/month earned by agricultural farm employees (Muir *et al.*, 2011). It is very important to note that the jobs created by these PGR were primarily ecotourism based (including hospitality), which require a higher level of training, and are, therefore, predisposed to higher salaries. It does not necessarily follow that all wildlife based jobs in the wildlife industry are so well paid.

6.3.2.2 *Levels of employment on surveyed wildlife ranches*

During the surveys we asked ranchers how many people they employed on their ranches, and we asked them to differentiate between the following categories:

1. Permanent vs. temporary employees;
2. Wildlife vs. non-wildlife employees;
3. Skilled vs. unskilled employees.

Obtaining consistent responses for these categories proved a difficult task for three reasons. First, some respondents answered as if employees working in lodges and guest houses (i.e. hospitality) were not wildlife employees. Although this is true to a point, for the purposes of this study we considered these employees as falling under wildlife because guest accommodation is generally only present on a farm because of the access to the wildlife (whether it is for ecotourism or hunting purposes). Second, on many ranches (especially mixed farms), employees do not have specialised job descriptions, and many cross-over between livestock and wildlife as the ranch owner sees fit. Third, it is very hard to define what constitutes a “skilled” employee. Some ranchers considered drivers to be skilled, while others only considered people in management positions to be skilled. As a result, we did not attempt to differentiate between skilled and unskilled employees in our analyses. In addition, when analysing the employment data below, we did not include the farm owners as employees, although they did sometimes count themselves as part of the staff.

From the 251 surveys, we obtained usable data on numbers of employees from 239 respondents, while 172 ranchers provided suitable monthly or annual wage information. The total number of people employed permanently on the 239 ranches was 4,521 with these ranches covering an area of 1,208,071 ha (Table 25). The mean labour-to-land ratio was 0.0037 permanent employees per hectare (or one permanent employee per 267 hectares). The number of people employed on a temporary basis was 500, giving a mean labour-to-land ratio of 0.0004 people per hectare (or one temporary employee per 2,500 hectares).

Table 25. Employment statistics for permanent staff based on 239 surveyed wildlife ranches.

Number of permanent employees	4,521
Area covered by 239 ranches (ha)	1,208,071
Overall mean number of permanent employees per hectare	0.0037
Median number of permanent employees per hectare	0.0040
Extrapolated number of permanent employees on wildlife ranches in South Africa[1]	65,172
Median salary per person per month	R3,441
Mean salary per person per month	R3,743 ± 1,836

[1]This estimate accounted for the higher densities of employees on smaller ranches using the extrapolation method of Appendix 1.

With regards permanent employees, there was a trend for smaller properties to employ more people per hectare (Figure 15), and in order to estimate the total number of people employed permanently by the wildlife ranching sector we took this trend into account (see Appendix 1, section 12.1). We removed seven outliers from the dataset because they had extremely high numbers of employees per hectare. All seven were for properties below 120 ha. From our extrapolation, we estimated that the wildlife ranching sector in South Africa employed ~65,172 people on a permanent basis.

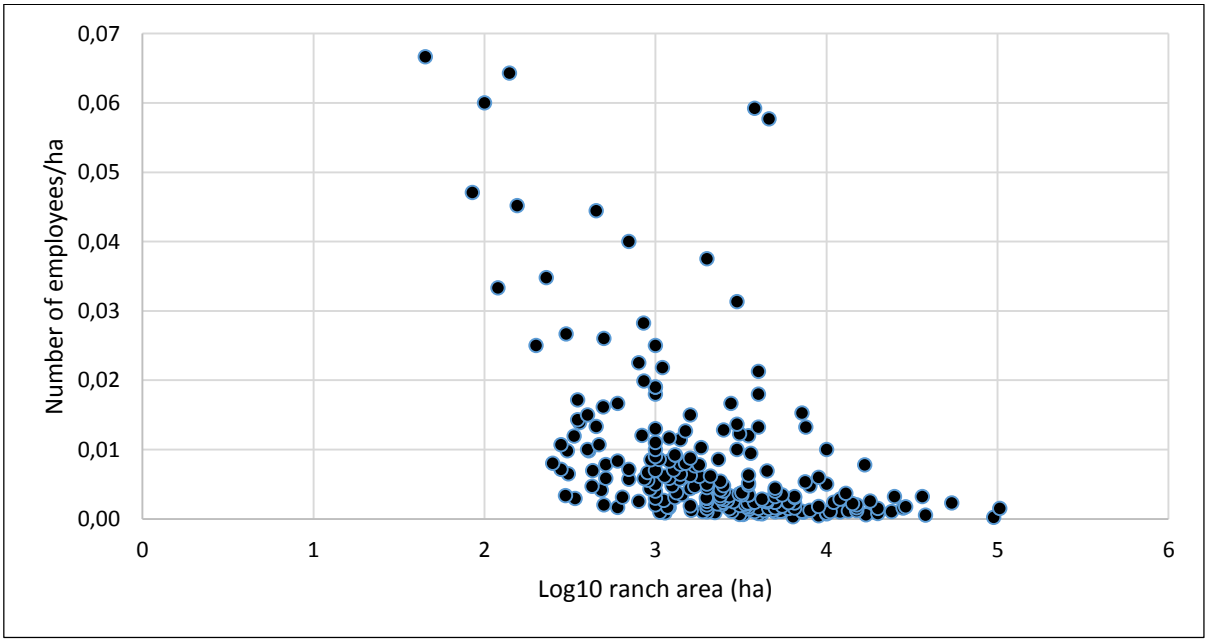

Figure 15. Log10 ranch size vs. number of employees/ha

It is important to note that this figure only included people employed directly on ranchers, and excluded those employed indirectly as a result of related activities that are not based or

conducted on the ranches themselves. Examples of indirect jobs include those created by taxidermy, trophy hunting operations (in cases employees work for the hunting operator rather than the rancher), wildlife translocation, fence construction and professional anti-poaching services. The number of jobs available in these sectors, which have arisen as a result of the wildlife ranching industry, may be quite substantial.

There are additionally a number of temporary employment opportunities created on wildlife ranches, such as clearing alien invasive plant species, whereby ranchers bring in teams of workers for a specific period. The majority of ranches did not employ temporary workers, so it was not possible to estimate the total numbers of temporary staff on wildlife ranches across South Africa using the same method as for permanent employees (because the median number of temporary employees per ranch was zero). However, a simple extrapolation using the mean number of temporary employees per hectare suggests a national total of ~7,050 people employed on wildlife ranches on a temporary basis. A complicating factor with estimating numbers of such temporary employees is that they may work on multiple ranches throughout the year, so there is a risk of double-counting. We did not attempt to account for this here.

Based on the results of work done on ecotourism properties in the Eastern Cape ((Sims-Castley *et al.*, 2004; Langholz & Kerley, 2006; Muir *et al.*, 2011), we made the *a priori* prediction that ranches conducting ecotourism would employ more people than ranches not conducting ecotourism. A Mann-Whitney U-test provided no evidence of a difference between the number of employees per hectare on ranches conducting ecotourism and the number on ranches without ecotourism (Mann-Whitney U = 6206, P = 0.959) (Figure 16). This result could have been influenced by the fact that many of our respondents practiced multiple land uses.

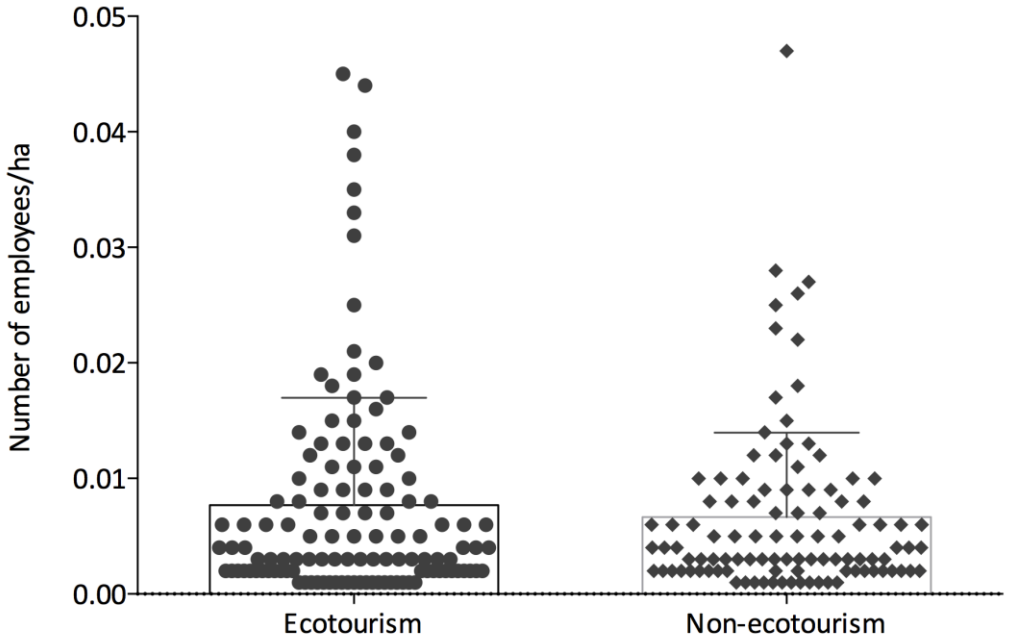

Figure 16. Number of employees per hectare on ranches conducting ecotourism vs ranches not conducting ecotourism (n=239)

6.3.2.3 *Wages on wildlife ranches*

During the surveys we asked ranchers what their monthly or annual wage bill was, from which we estimated a mean monthly wage per employee. Ideally we would have obtained a

detailed breakdown of wages for employees doing different jobs on each property, and identify wage differences (such as between staff working in lodges and staff working as trackers and skinners on trophy hunting operations), or differences between skilled and unskilled staff. This proved difficult, however, partly due to time constraints during the survey process, and partly because many ranch employees do not have specialised job descriptions and are difficult to squeeze into one category. Also, as mentioned above, it is hard to define what constitutes a "skilled" employee. As a result, we simply obtained an overall wage bill per month or per year.

From the 251 surveys, we obtained usable data on wage information from 172 respondents. The median salary per person per month was R3,441 (mean = R3,743 ± R1,836) (Table 25).

6.3.2.4 *How do the salaries differ between land use types?*

With regards to the salaries of different land-use types, we assumed *a priori* that employees on ranches conducting ecotourism would earn larger salaries than employee on ranches not conducting ecotourism (based on the previous work in the Eastern Cape (Sims-Castley *et al.*, 2004; Langholz & Kerley, 2006; Muir *et al.*, 2011)). This was confirmed with a Mann-Whitney U-test, which indicated that the salaries of employees on ranches conducting ecotourism were higher (median = R3,857/month) than on ranches without ecotourism (median = R2,764/month) (Mann-Whitney U = 2375, $P < 0.001$) (Figure 17). It should be noted that many of the ranches conducting ecotourism also conduct other forms of land-use, and if it were possible to separate out the land-uses more clearly, a larger difference in salary might be observed.

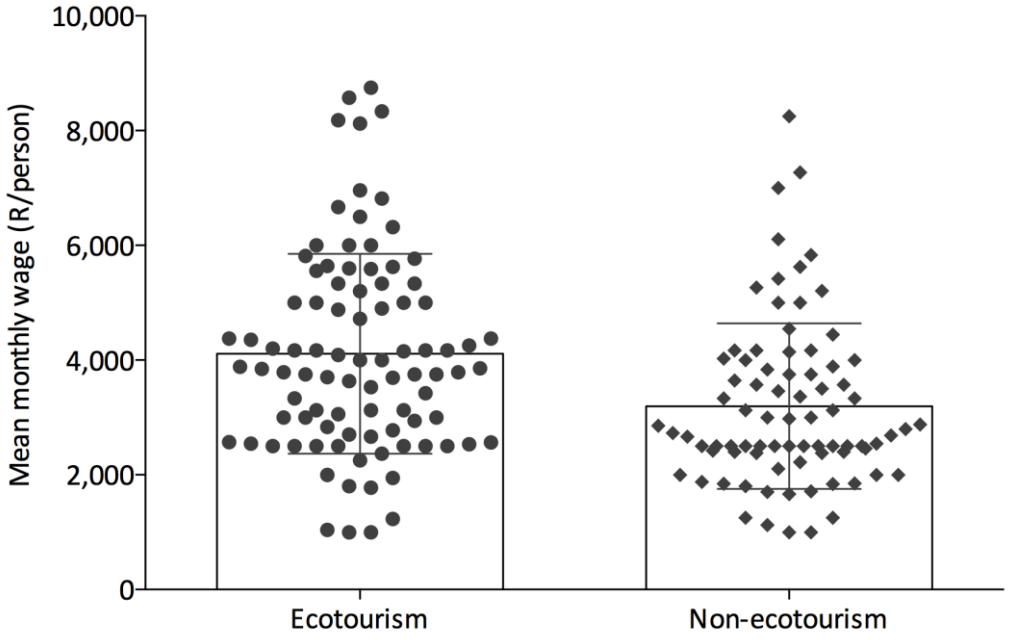

Figure 17. Salary comparisons between ranches conducting ecotourism and ranches not conducting ecotourism (n=172)

6.4 The ecological impacts and characteristics of the wildlife sector

6.4.1 Wild and free: a foundation framework for measuring which subpopulations are eligible for Red List assessments[1]

The IUCN Red List states that the criteria for deciding the threatened status of a species should only be applied to "wild subpopulations inside the natural range of the taxon" (IUCN Standards and Petitions Subcommittee, 2014). However, the definition of what constitutes a wild population remains unclear. Wildness varies along a spectrum from captive-bred to completely free-roaming. In between, subpopulations may have varying degrees of wildness depending on management intensity, which may render the subpopulation unviable in both the short and long term without continual intervention (Redford *et al.*, 2011; IUCN Standards and Petitions Subcommittee, 2014). As such, decision-makers need a measurable framework for wildness that can incorporate both short-term impacts on subpopulation survival (for example, food and water provision) and long-term impacts on population resilience (for example, disease resistance and dispersal), thereby reflecting functioning ecological and evolutionary processes.

The foundation for such a framework originated when Redford et al. (2011) asked what it means to successfully conserve a vertebrate species and defined five wildness nodes: Captive Managed; Intensively Managed; Lightly Managed; Conservation Dependent and Self-sustaining. However, these nodes lack empirical and quantifiable thresholds to be able to practically measure differences between subpopulations. Ultimately the framework should allow practitioners to measure the wildness of a subpopulation of a particular species on a particular property by evaluating a core set of management variables. This is driven by the need to evaluate how the private wildlife sector contributes to conservation, specifically in conducting Red List assessments, as there has been much rhetoric surrounding the debate but little empirical justification.

To lay the foundation for such a framework, two expert workshops were convened by the South African National Biodiversity Institute, Pretoria National Botanical Gardens (10th of December 2014 and 24th February 2015). The workshops laid the foundation for a practical framework to measure wildness by identifying six attributes relating to ecological and evolutionary processes with measurable thresholds to distinguish between five wildness nodes. The framework was piloted by using the dataset provided by the current wildlife ranching study. A subsample of properties containing the relevant species were analysed by manually reviewing the information and assigning scores for each attribute based on the thresholds. Preliminary results emphasise the important species-specific impacts of the private sector on wildness. While Roan and Sable Antelope are generally captive or intensively managed in the private sector, Mountain Zebra (*Equus zebra*) and Tsessebe (*Damaliscus lunatus*) can generally be considered wild and free-roaming, and thus possess conservation value. This may correlate with the commercial value of the species, where more lucrative species are ranched more intensively. High value game species are mostly penalised on space (most often maintained in small fenced areas) and exposure to natural ecological fluctuations.

This framework represents a rapid prototype for identifying potentially wild subpopulations scaled by the area requirements and social dynamics of the species. The true test of this framework will be in its application. Feedback between practice and theory needs to be implemented such that the framework presented here is refined to the point where it is

[1] This section was prepared by Matthew Child (Endangered Wildlife Trust) and forms part of a larger initiative to understand the contribution of wildlife populations to national biodiversity targets that is being led by the South African National Biodiversity Institute.

practical, intuitive and reflects evolutionary and ecological functioning for the relevant species. Key future work includes:

1. Publishing the preliminary results (paper currently in preparation).
2. Calibrating the threshold values through field surveys.
3. Measuring the wildness status of subpopulation on formally protected areas as a baseline.
4. Generating an exhaustive list of management actions permissible in each wildness node, relating to the thresholds.
5. Receiving buy-in from all stakeholders to generate constructive dialogue and cooperation.

Ultimately, we hope this framework provides a foundation to institute more quantitative and explicit sub-criteria that will help to reduce assessor bias and inconsistency in Red List assessments (Hayward *et al.*, 2015), and provide a strong ideological justification for what it means to successfully conserve a species rather than simply staving off extinction.

6.4.2 The abundance, distribution and population trends of wildlife species (with particular focus on ungulates, mega-herbivores and predators) on wildlife ranches.

6.4.2.1 *Insights from the literature*

The abundance of wildlife species on private land has never been accurately known at a national level. Conroy & Gaigher (1982) stated that, at least up until the early 1980s, there were no reliable data on game numbers on private land from official agricultural censuses, and they suggested that any estimates that had been made up to that point should be regarded with some reservation. The term “game” here is loosely referring to ungulate species (hoofed mammals including antelope species, hippos, pigs, zebras and rhinos), as well as African Elephants. It excludes small herbivores that are not generally used sustainably, such as lagomorphs and rodents, and it excludes carnivores. Wildlife ranches have never been categorized or counted separately from other types of agriculture (Snijders, 2012), and there are no national statistics available for wildlife numbers as there are for domestic livestock or agricultural crops.

Despite this, it has been estimated that there were 575,000 head of game on private land in 1966 (du Toit, 2007), and that this grew to 1.7 million by the year 2000 (Van der Merwe *et al.*, 2004). If the population growth rate had been constant during this period, the annual rate would have been 3.3%, but given the pattern of accelerated growth of land used for wildlife ranching during the 1990s, it is likely that wildlife population growth also accelerated during this period.

To the best of our knowledge, there have been no national estimates of game numbers on private land over the last 15 years that are based on observed counts, while the only attempt at quantification has been an extrapolation based on substituting assumed decreases in livestock numbers/biomass with assumed, but unsubstantiated game populations (du Toit, 2007). In this case, an assumed decrease in livestock numbers since 1990 (based on an uncorroborated drop in cattle numbers from 12.2 million head to 8 million head between 1990 and 2007 (we say uncorroborated because DAFF statistics do not show such a drop in cattle numbers, although they do show a drop in sheep numbers by 10 million head (DAFF, 2012a)) was converted to a biomass estimate (LSU), and it was assumed that this loss of biomass was replaced by the equivalent biomass of game species. According to du Toit (2007), the above mentioned decrease in livestock biomass equated to 18.6 million head of

game in 2007. While it is logical that a decrease in biomass of livestock might be replaced by wildlife species over time, we consider it unlikely to have happened by 2007. Such an increase in wildlife numbers would have required a large source of animals, and given that there were estimated to be 1.7 million head of game on private land in the year 2000 (this figure was itself also unsubstantiated), this would have required a net annual population growth rate of 18.6% over seven years. Du Toit's (2007) calculation of wildlife numbers may be an overestimate, and yet appears to be the source of all subsequent statements made in the grey literature regarding the size of the wildlife population on private land in South Africa.

6.4.2.2 *Estimating wildlife species abundance on surveyed ranches*

In the context of this report, we use the term "wildlife" to mean non-domesticated wild animals only, and exclude plants because we have not assessed the impact of wildlife ranching on the latter. As part of the questionnaire for ranchers, we asked about the kinds of wild animal species occurring on their properties, as well as numbers (when these were known), but we did not ask for a complete inventory. Instead, we asked questions about species with the aim of answering two main questions: 1) how much biodiversity does each property have; 2) how many animals are available to be used (consumptive or non-consumptive). The species we asked about were ones we expected the average participating rancher to be able to identify in order to provide reliable results (i.e. landowners would know whether or not they occurred on their properties).

6.4.2.3 *Herbivore species richness*

To assess the occurrence and abundance of wild species on ranches we asked the questions shown in Table 26. We obtained herbivore species occurrence data from 249 of the 251 participant ranchers. To prevent respondents from forgetting any species, we prompted them with a full list (n=39) of indigenous species, which were identified using distribution maps in Skinner & Chimimba (2005). In addition to these species, we also asked ranchers if they had any non-indigenous herbivore species, such as Lechwe, deer species, and wild boar; all of which are known to occur in some areas of South Africa.

Table 26. Questions asked to assess species occurrence and abundance on wildlife ranches.

Species group	Question asked	How were these data used?
Group 1: Large herbivores (All members of the mammalian order Artiodactyla (antelopes, Giraffe, Hippopotamus and pigs); all members of the order Perissodactyla (zebras and rhinos), and the African Elephant.	1) Which species occur on your property? A full list was provided. 2) Estimate the approximate population sizes where possible. As most wildlife ranchers conduct regular counts of their larger wildlife species, we assume their estimates are reasonably accurate. We did not request numbers for the small antelope species, namely duikers, grysboks, Steenbok, Suni, Klipspringer and Oribi, or for Warthogs and Bushpigs because these are difficult to count accurately.	1) Total contribution of wildlife ranching to national wildlife numbers 2) Biodiversity indicator 3) Indicator of extra-limital species occurrence 4) Stocking rate 5) Actual and potential financial and economic contribution 6) Potential contribution to food security 7) Contribution to the IUCN Red List
Group 2: Carnivores (All terrestrial members of the mammalian order Carnivora)	1) Which species occur on your property? A full list was provided and ranchers were asked if the species were resident, occasionally sighted, never sighted or if they didn't know. We differentiated between all cat,	1) Total contribution of wildlife ranching to national carnivore numbers 2) Biodiversity indicator

	dog and hyaena species (although we did not distinguish between the two jackal species), but clumped the smaller size categories into the following groups: mongooses, genets, civets, otters and weasel/ polecat. 2) Estimate the approximate population sizes of lions and cheetahs. These two species are generally easily recognised and only occur on private land if deliberately introduced, while most other carnivores occur naturally and are rarely counted.	

The mean number of herbivore species occurring on wildlife ranches was 15.0 ± 5.4 (range 0 - 27) (Table 27). Three properties had no herbivore species, two of which were crocodile ranches, and the other was an ostrich farm. The property with 27 species was a large private game reserve. There was a strong positive correlation between property size and herbivore species richness (Spearman $r_s = 0.44$, $p<0.001$) (Figure 18).

Table 27. Occurrence of herbivores on surveyed wildlife ranches.

Total number of possible indigenous herbivore species included in survey	39
Mean number of species per property	15.0
Standard deviation in number of species per property	5.4
Minimum number of recorded herbivore species	0
Maximum number of recorded herbivore species	27

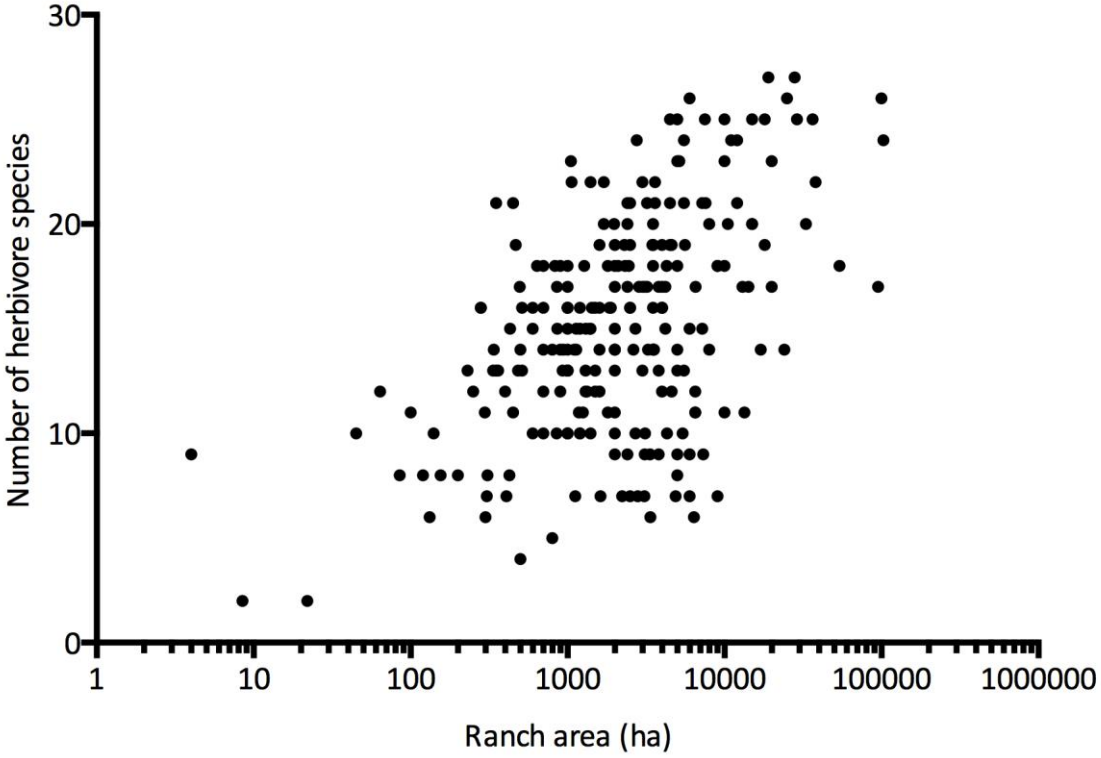

Figure 18. Relationship between property size and herbivore species richness on private land. Note log scale on X–axis. Spearman correlation: r_s = 0.44, p<0.001.

The most common herbivore species on surveyed ranches were Common Duiker, Kudu, Impala and Steenbok, all of which occurred on >80% of properties (Figure 19). The least common herbivore species were Oribi, Suni and Lichtenstein's Hartebeest, all of which occurred on <5% of properties. Out of the mega-herbivores, Giraffes were most common at 56% occurrence, followed by White Rhinos at 24%, then African Elephants at 13%, and finally Black Rhinos at 8%.

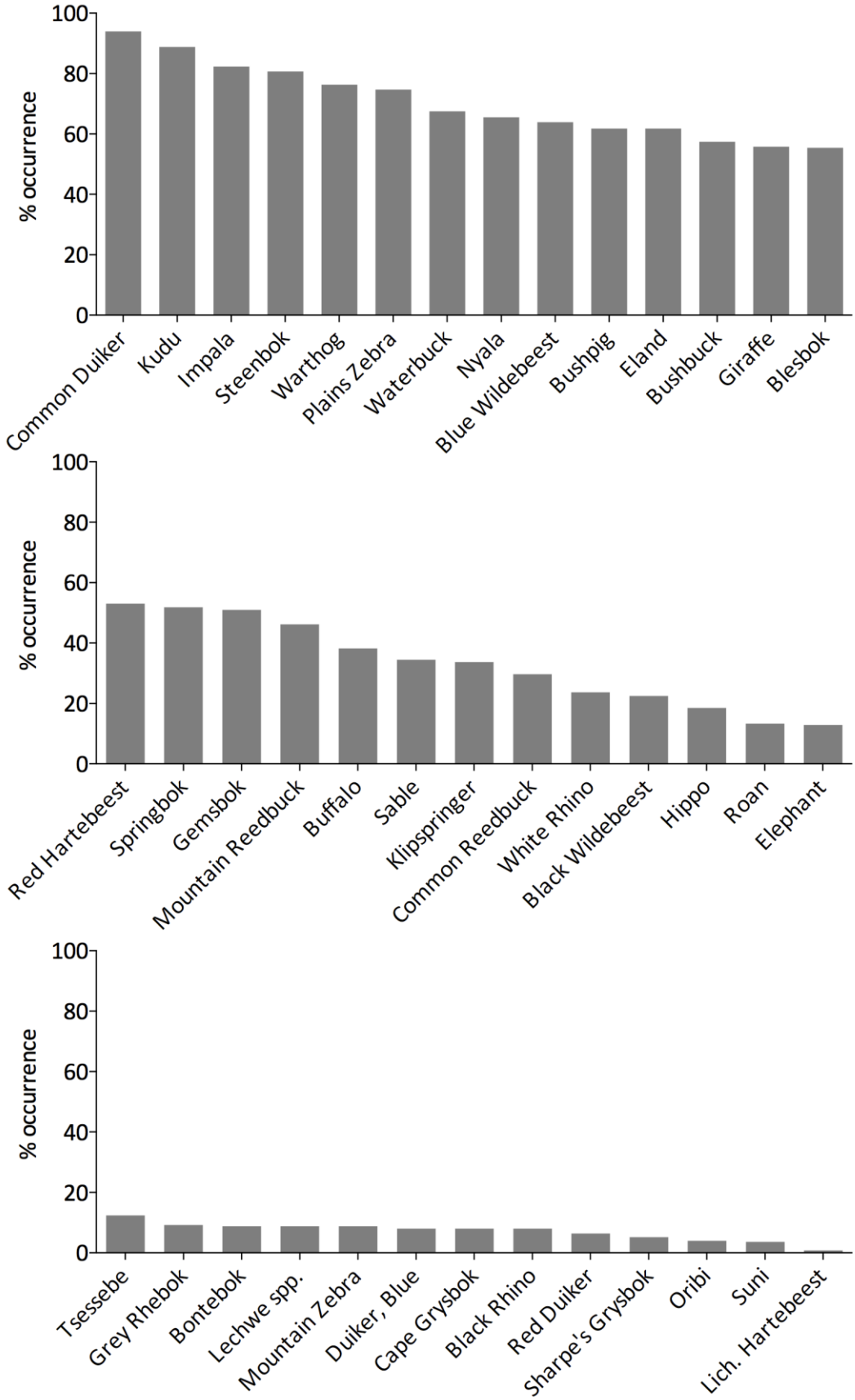

Figure 19. Percentage occurrence of all herbivore species on wildlife ranches. The total number of animals represented by these percentages on surveyed ranches was 306,135

6.4.2.4 *Herbivore species abundance of surveyed ranches*

We obtained herbivore species counts from 224 of the participant ranchers and used these to estimate the total number of herbivores on private land in South Africa. There are a number of challenges with these types of data that affect the accuracy of our estimates, as outlined below:

- Although 90% of participants indicated that they count their wildlife regularly, there are some species that are extremely difficult to count accurately. We did not ask for estimates for the small, often cryptic, species such as the three duiker species, two grysbok species, Klipspringer, Oribi, Steenbok or Suni; we also did not ask for estimates for Bushpigs and Warthogs. All these species, except for common duiker and Steenbok, which are both common on ranches, were excluded from our analyses of wildlife numbers. For Common Duiker and Steenbok, we used estimates of densities from Skinner & Chimimba (2005) and extrapolated according to property size. This method assumes equal densities on all properties, which will not be the case, but we reasoned that because these species are not managed, and are not frequently hunted or captured for live sale, this would be a reasonable way to include them;
- Other species that are difficult to count include Bushbuck (*Tragelaphus* scriptus) and Nyala (which occur in thick bush), Kudu and Common Reedbuck (*Redunca arundinum*) (which are often transient on properties), Mountain Reedbuck (*Redunca fulvorufula*) and Grey Rhebok (which occur in mountainous terrain), and Hippopotami. For these larger species, where participants were able to estimate numbers, we included them because landowners often have a rough idea of what they have. Where landowners did not have counts, we excluded them and corrected for area accordingly;

The most abundant large herbivore species on surveyed ranches was the Impala, which comprised 24.1% of all animals counted, followed by Kudu (11.8%) and Springbok (11.6%) (Figure 20). The least abundant species were Black Rhinos (0.07%), Grey Rhebok (0.07%) and Hippos (0.23%). Giraffes made up 1.33%, Elephants 0.40% and White Rhinos 0.28%. The species most represented in terms of biomass were Kudu (12.8%), Eland (10.9%), African Buffalo (9.9%) and Blue Wildebeest (9.4%). Although African Elephants only comprised 0.40% of herbivore numbers, they made up 8.2% of the total herbivore biomass.

6.4.2.5 *Herbivore species abundance of all wildlife ranches*

There was a trend for small ranches to stock animals at higher densities than large ranches, so to estimate the total number of herbivores on all wildlife ranches in South Africa, we had to correct for this using the method described in the Appendix 1 (section 12.1). Based on the numbers of animals given to us by surveyed wildlife ranchers, we estimated there to be ~5.987 million herbivores on all wildlife ranches across South Africa (excluding species as described above) (Table 28). We also estimated approximate 95% Confidence Intervals (CI) for this estimate using the equation for CIs of a sample median:

$$\frac{n}{2} \pm \frac{1.96\sqrt{n}}{2}$$

where n=number of ranches of each size class. The density of animals corresponding to the lower and upper CIs, as calculated with the above equation, were then used in place of the median as described in Appendix 1 (section 12.1). The lower and upper 95% CIs were 4.446 million and 7.295 million animals respectively (Table 28).

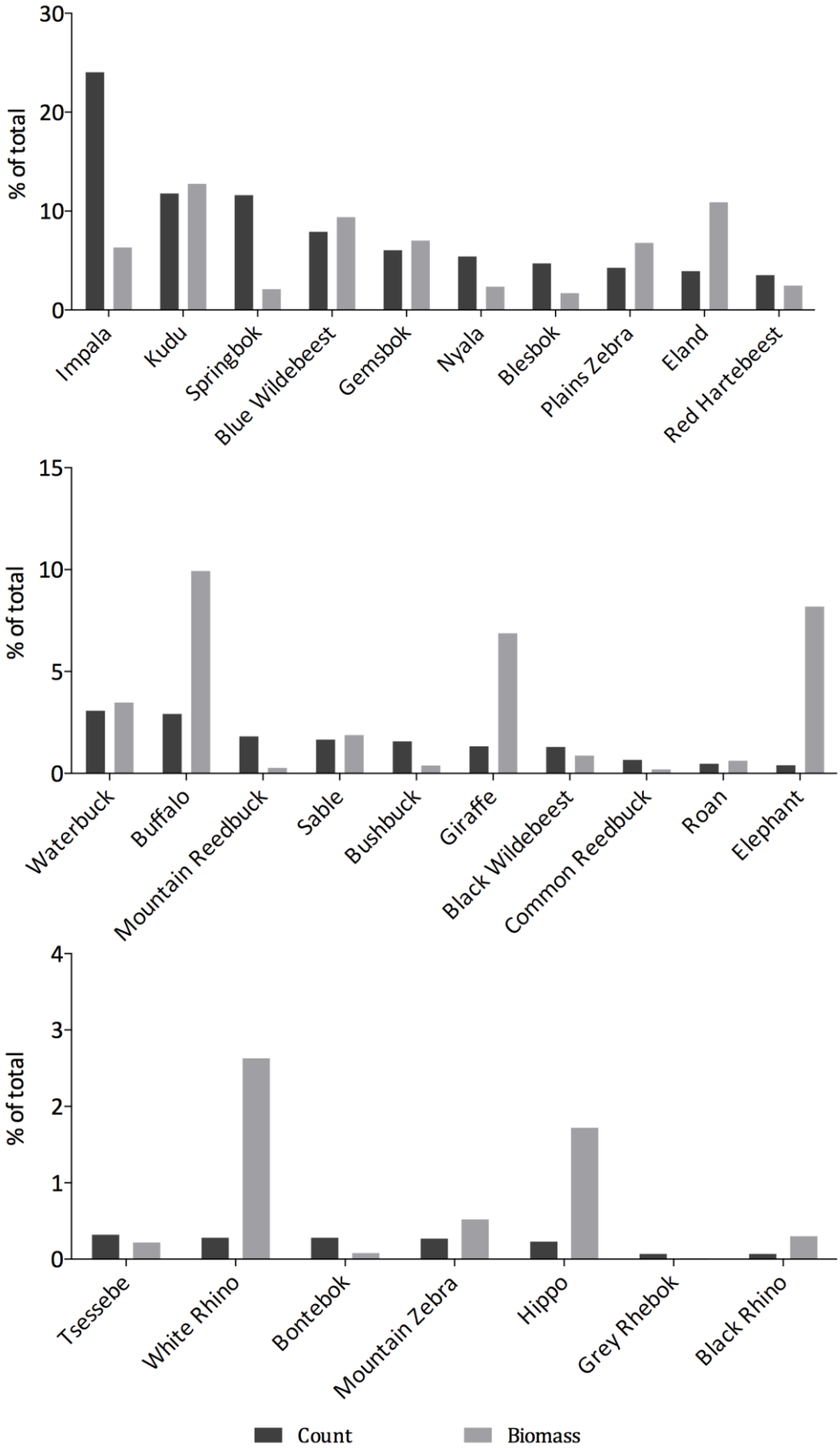

Figure 20. Large herbivore species abundance (black bars) and biomass (grey bars) on surveyed ranches, both represented as a % of total. The total number of animals represented was 306,135, while the total biomass was 55.6 million kg. Note different scales on Y-axis

Table 28. Total estimated numbers of herbivores in South Africa. These estimates exclude wild pig species and most small cryptic antelope species (Common Duiker and Steenbok were included).

	Estimate	95% CI
Total estimated number of herbivores on commercial wildlife ranches, including PGRs in South Africa (millions)	5.987	4.446 – 7.295

We acknowledge that this estimate is considerably lower than has often been quoted in the grey literature recently. As mentioned above, du Toit (2007) suggested that there may have been 18.6 million head of game on private land in 2007, which would mean an even higher number by 2015 given that eight years have passed since that report was released. This discrepancy may be the result of the different methods used to estimate game numbers, with the report by du Toit (2007) assuming a replacement of domestic herbivore biomass with biomass from wild herbivores (but with no direct counts used at all), and the current study extrapolating from estimated counts provided by 224 private wildlife ranchers. Further evaluation of the estimates will be necessary to determine herbivore numbers more accurately.

Whilst our estimate of numbers of wild herbivores is considerably lower than the estimate of 18.6 million commonly cited in the grey literature (du Toit, 2007), it still represents a huge increase in numbers of wildlife species that have resulted from the growth of the wildlife ranching sector. As discussed in section 6.4.2.1, in 1966 there were estimated to be 575,000 head of game on private land in South Africa (du Toit, 2007), so our current estimate represents a ten-fold increase.

This increase is generally ascribed to two factors: 1) the allocation of landowner user rights (including consumptive use) and ownership rights over wildlife (with ownership being made possible by the Game Theft Act of 1991); and 2) the realisation that multispecies wildlife systems could be more economically viable than livestock in many marginal areas (Cumming, 1995; Bond *et al.*, 2004; Bothma & Von Bach, 2010; Lindsey *et al.*, 2013b). The second factor, namely economic viability, can only be achieved when the first factor is in place, as evidenced by trends in wildlife populations of two countries with very different legislation regarding the consumptive use of wildlife.

In Namibia, a country that allows freehold landowners to consumptively use wildlife for commercial gain, surveys of commercial farmers showed a 70% increase in game numbers between 1972 and 1992, with a concurrent 84% increase in wildlife biomass (Barnes & De Jager, 1995). This trend has been mirrored in community conservancies throughout Namibia since their inception in 1996, many of which have consumptive use entrenched in their constitutions (NACSO, 2013).

By comparison, Kenya, which banned the consumptive use of wildlife in 1977, has experienced a precipitous decline in wildlife populations, both on private land and state protected areas, with this decrease possibly being as high as 70% (Norton-Griffiths, 2000, 2007; Ogutu *et al.*, 2011). Norton-Griffiths (2000) ascribed this “fundamental institutional failure” to the lack of property rights and use rights of landowners over wildlife, and stated that the resulting market failure reflected the absence of financial incentives for landowners to conserve their wildlife resource.

By allowing consumptive user rights as well as ownership rights to wildlife, South Africa has followed a similar path to Namibia, and has demonstrated an even greater growth in wildlife populations (at least in terms of herbivores). This growth should also be viewed in light of the declines of wildlife populations in many other African countries, which have been attributed

to factors including recurrent droughts, expansion of large-scale cultivation and other land-use changes, growing human settlements, illicit hunting, and livestock incursions into protected areas (Ogutu *et al.*, 2011). The fact that South Africa has managed to increase its wildlife populations while so many other African countries have not is a significant accomplishment (although this is tempered by issues that may be detrimental to biodiversity conservation, such as increased intensification (discussed in section 6.1.4.3), the introduction of non-indigenous and extra-limital species (section 6.4.5), and the intensive breeding of high value species and colour variants (sections 6.1.4.2 and 6.4.6)).

6.4.2.6 *Carnivore species occurrence*

We obtained carnivore species occurrence data from 205 respondents who answered the long version of the questionnaire survey. To prevent respondents from forgetting any species, we prompted them with a full list (n=20) of indigenous carnivore species/ groups, which were identified using distribution maps in Skinner & Chimimba (2005). We differentiated between all felid, canid (although we did not distinguish between the two jackal species) and hyaena species, but clumped carnivores within the smaller size categories (i.e. mongooses, genets, civets, otters and weasel/polecat) to avoid erroneous answers arising from misidentification. Respondents were asked whether the species was resident, occasionally sighted, never sighted or if they did not know anything about their occurrence on the property.

Reported carnivore occurrence was calibrated against distribution maps generated during the development of the 2004 Red List of Mammals (Friedmann & Daly, 2004) to investigate the relationship between predator diversity and several management practices. To do this, we determined the total number of carnivores/carnivore groups that should be present on each property (according to the 2004 maps), and calculated the proportion of total carnivores that were reported as present, as follows:

$$\% \text{ of carnivores present} = \frac{\text{Number of species/groups reported present (resident or transient}}{\text{Number of species/groups expected}}$$

The % of species present could only be calculated for a sub-sample of 193 farms, as it was not possible to calculate the expected occurrence for 12 farms that did not have detailed location data. We also excluded Lions from this analysis as they were only likely to be present as a result of active management/reintroduction.

Four species/species groups were extremely widespread, reported as present (resident or transient) on >80% of properties (Figure 21). These included jackals (97% of farms), mongooses (96%), Caracal (94%) and genets (90%). Apart from Leopards and Brown Hyaenas, which were fairly ubiquitous (62% and 50% of farms, respectively), large carnivores were the least frequently reported as present: Cheetahs, Spotted Hyaenas and Lions were only reported present on <20% of properties. Wild Dogs were the species least likely to be reported present, being resident on only ~4% of properties.

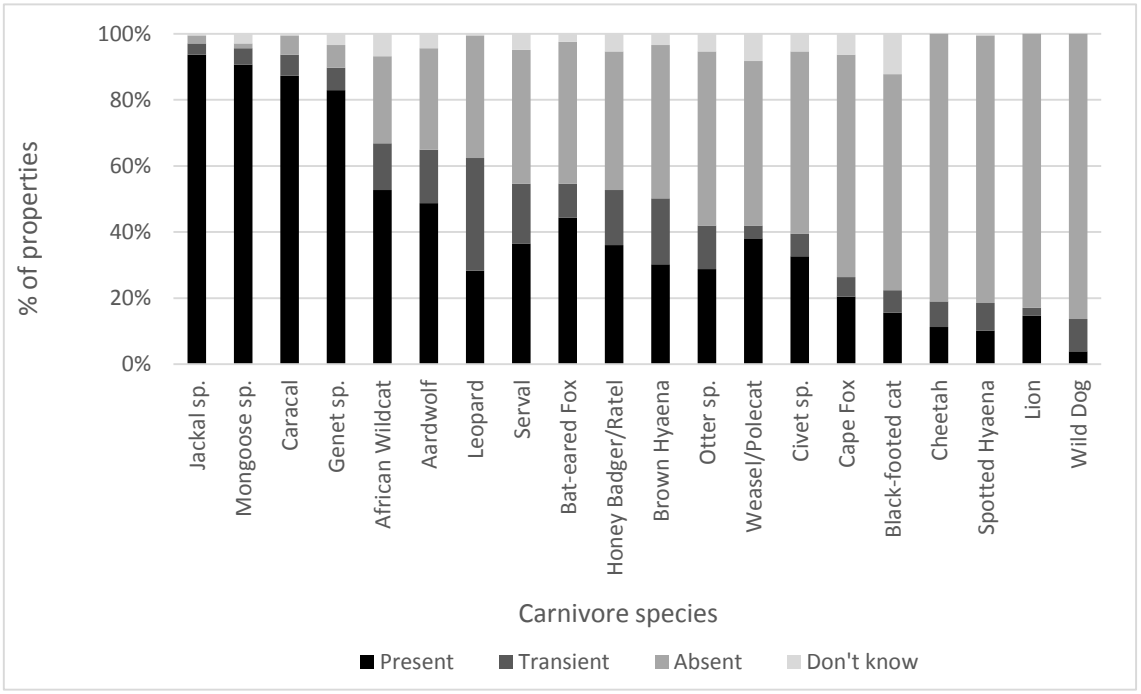

Figure 21. Distribution of carnivores across surveyed farms (n=205).

When we calibrated reported presence against expected presence we found that four species/species groups (Serval, jackals, mongooses and Caracal) were consistently present (occurring on 100% of properties) within their distribution ranges (Figure 22). Although Spotted Hyaenas and Leopards were reported as present on ~75% of farms where they were expected, other large carnivores tended to be comparatively less well-represented, with Wild Dogs reported present on only 48% of farms within their distribution range. Black-footed Cats, weasel/polecats, Cape Foxes and otters were all reported present on fewer than 50% of the properties within their ranges. This is likely due to their cryptic nature (e.g. Black-footed Cats and weasels/polecats) and their habitat specificity (e.g. otters), which makes broad range maps unsuitable for predicting occurrence with any precision.

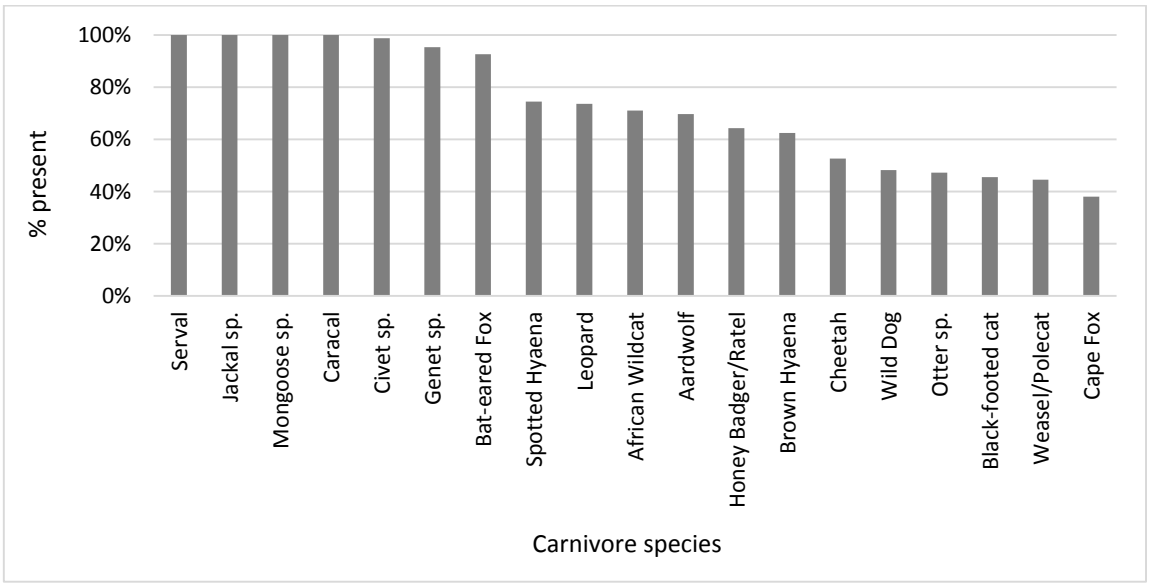

Figure 22. The proportion of farms reporting the presence of carnivore species/species groups within their natural distribution ranges.

The % of carnivores present was strongly positively correlated to property size (r_s = 0.51, p << 0.0001) (Figure 23). Given that larger properties have a correspondingly greater chance of harbouring more carnivores, this relationship was as predicted.

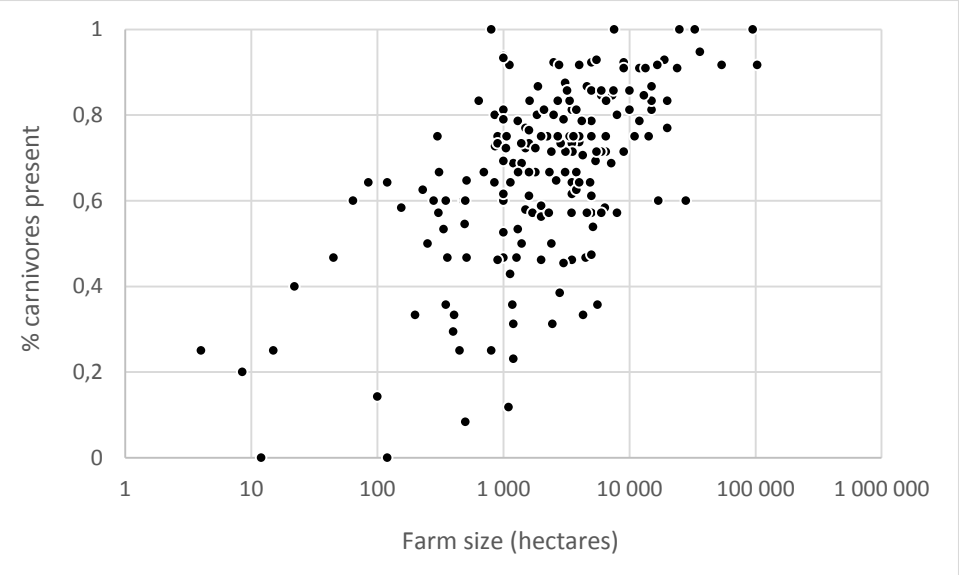

Figure 23. The relationship between farm size and the % of carnivores present (r_s = 0.51, p << 0.0001).

6.4.3 Assessing potential herbivore stocking capacity versus actual stocking densities on surveyed ranches

6.4.3.1 *Definitions of stocking capacity and stocking density*

Assessing the types of species and numbers of animals that can be carried on a wildlife ranch is critically important for good management practice and has implications not only for ranch income generation but also biodiversity conservation. The "ecological capacity" is the population density that is likely to exist in large unmanaged natural areas, and unchecked populations tend to fluctuate around this value (van Rooyen, 2010). The "stocking density" is the density at which wildlife populations are kept through the management practices of landowners (number of animals per unit area), and is adjusted according to the management aims. Management practices that stock animals at higher densities than the ecological capacity allows (i.e. overstocking) may lead to environmental degradation with negative consequences all round. Determining the ecological capacity of any given area is a difficult task, however, because it is a nebulous issue with many potential factors influencing the number of animals that can be kept per unit area (van Rooyen, 2010). The quantity and quality of food available are probably the most important factors needed for estimating ecological capacity, but these factors vary widely with soil type and rainfall, both of which change continuously across regions of South Africa, as evidenced by the wide variety of vegetation types occurring. Rainfall also varies between years, so ecological capacity changes over time and is likely to change with global climate change. Additionally, with the wide range of feeding guilds occurring across different large herbivore species in South Africa, which include grazers, browsers and mixed feeders (not to mention the fact that species feed on different parts of plants), deciding the correct stocking density for a property is not a simple task.

6.4.3.2 *Method of assessing stocking capacity versus stocking density*

As we had stocking densities for all the surveyed wildlife ranches providing herbivore numbers, we attempted to determine whether landowners were stocking herbivores within the ecological capacity of their region. To do this we obtained estimates of potential stocking densities from 38 sites in northern South Africa, all obtained from vegetation surveys carried out by ecologists (Mike Peel, Agricultural Research Council, personal communication). We only used these estimates for comparisons between actual and potential stocking densities, and do not present them further because they were not our data. There were two caveats with the potential stocking densities: 1) they were based on surveys of grasses and thus only represented stocking densities for grazers; 2) they should only be used as rough guides because there are many cases where wildlife ranchers overstock to a level that is three times higher than the recommended levels with no apparent side effects (M. Peel, pers. comm.). The best way to interpret this is to say that the further you move away from the guideline (i.e. the more a landowner overstocks), the greater the risk of loss of range (and animal) condition, especially during drought periods.

The stocking rate information provided to us was plotted in a GIS. Kriging was used to interpolate stocking rate values to create a raster grid of stocking rates in ArcGIS 10.2. Interpolated stocking rate values were then extracted to the point locations for centroids of surveyed farms. Because we only had potential stocking densities from the north of the country, we could only test actual stocking densities for a subset of our data.

From the data provided by surveyed ranchers we estimated the total biomass of each grazing species using the equation below. Average body masses of each species as well as whether or not a species was a grazer was determined using Bothma *et al.* (2010b). Four mixed feeder species were included as grazers, namely Eland, African Elephant, Impala and Springbok. The total mass for each species was multiplied by 0.75 to take into account the inclusion of juvenile animals.

Total biomass per species (kg)	=	Number of animals	×	Mean adult body mass (both sexes)	×	0.75

6.4.3.3 *Results: actual stocking density vs. potential stocking density*

We compared actual stocking densities of grazers with potential stocking densities on 85 properties. Thirty-two percent (32%) (n=27) of properties tested were found to be over the recommended stocking density, but only 5% of the total (n=4) had more than twice the recommended biomass of grazers. While these latter properties are at greater risk of loss in range condition if drought conditions arise, they are not necessarily overstocked at present. Overall, there was little evidence of overstocking on the wildlife ranches surveyed.

6.4.4 The extent of predator control measures on surveyed ranches

Respondents to both the long and short versions of our survey answered questions about their approach to managing predators on their properties. Figure 24 provides a detailed breakdown of the different predator control methods practiced by respondents. Less than half of the respondents (103, 41%) stated that they did not practice any active form of predator control. The remainder controlled predators through both non-lethal (i.e. live capture/translocation and contraception) and lethal methods (i.e. selectively shooting known individuals, culling or using non-selective methods such as poisoning). Selectively shooting known animals was the most frequent form of predator control, practiced by 31% of respondents.

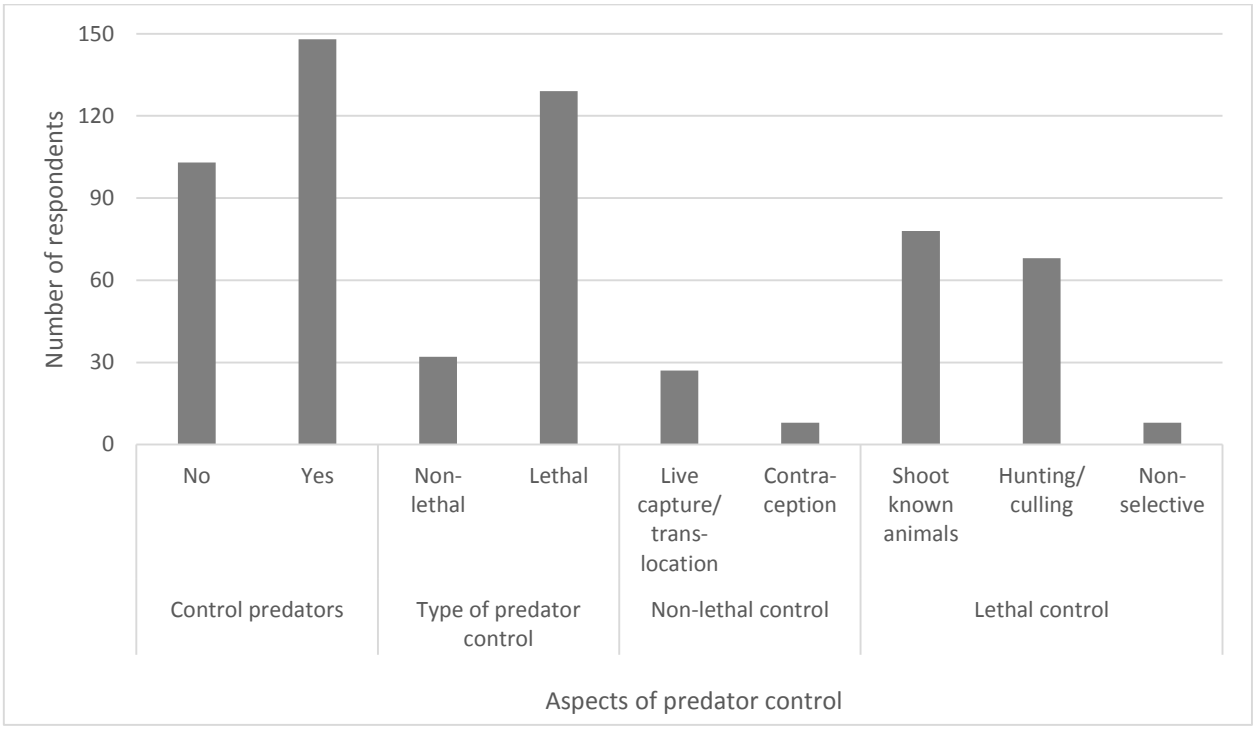

Figure 24. The number of survey respondents undertaking various predator control measures on their properties (n=251)

Two-hundred and forty-six (246) respondents provided information about the specific predators (or predator groups) they controlled. Jackals and Caracals were the subject of most of the lethal predator control activities, with 119 and 82 respondents practicing lethal control of these species, respectively. Indeed, lethal control was the only form of control used for jackals (Figure 25). Live capture and translocation were the most common methods used for species such as African Lions and Cheetah, which are highly valued for ecotourism, and which are the subject of coordinated national management plans (Lindsey *et al.*, 2009a; Miller *et al.*, 2013).

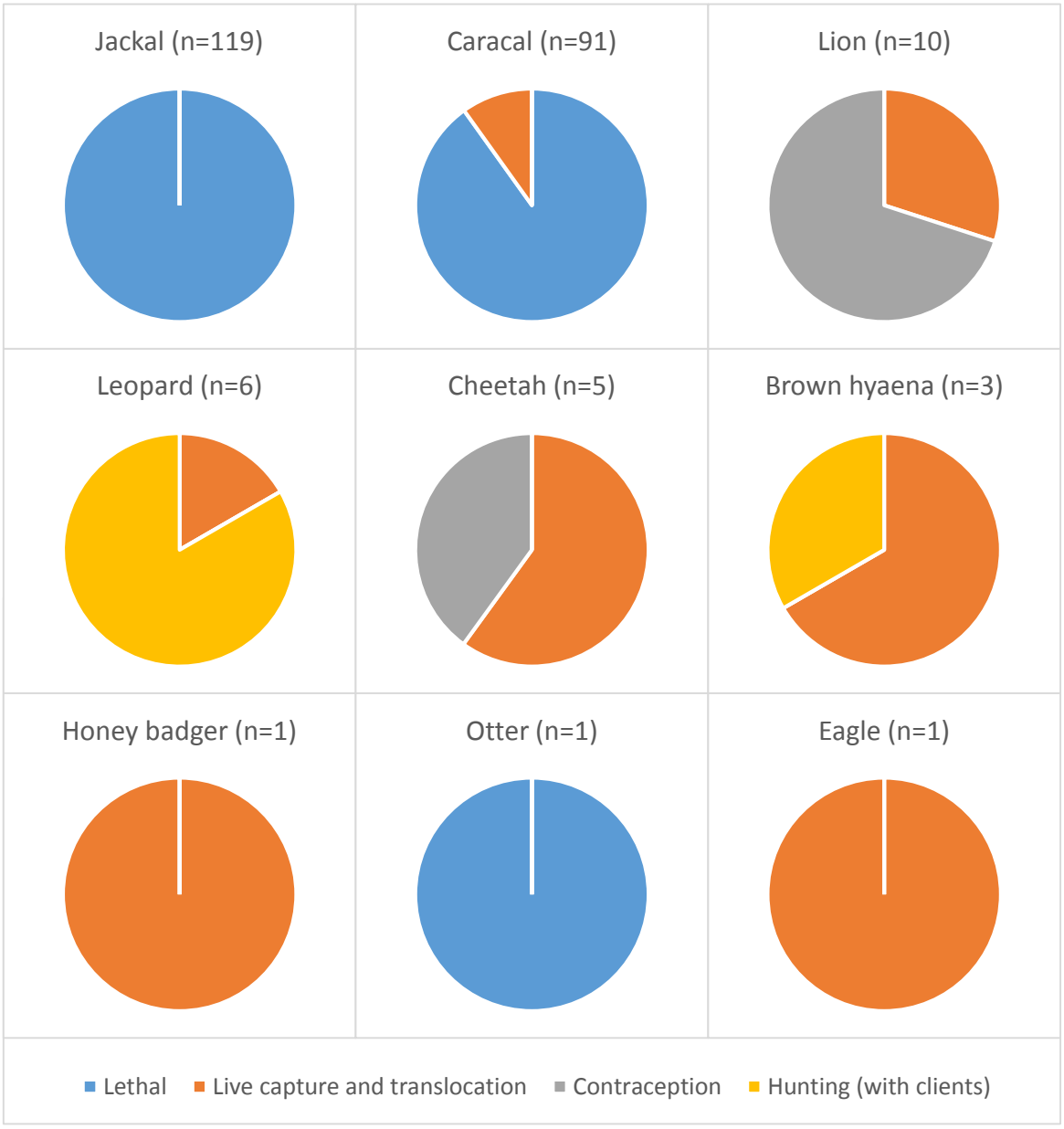

Figure 25. The proportion of respondents practicing various predator control methods for each predator species/species group.

6.4.5 The prevalence and impacts of non-indigenous and extra-limital species on wildlife ranches.

6.4.5.1 *Non-indigenous and extra-limital species in the literature*

South Africa is a signatory of the Convention on Biological Diversity, and is obliged to control the introduction of non-native species (Castley, Boshoff & Kerley, 2001), with the term non-native here meaning either non-indigenous (alien to South Africa) or extra-limital (indigenous to South Africa, but occurring outside of the natural range distribution). With the growth of wildlife ranching into areas that were previously depleted of wildlife, ranchers have relied on reintroductions of many large mammals to restock their properties, and this has coincided with introductions of non-native species, which are thought to increase the attractiveness of a property to tourists and hunters. Castley *et al.* (2001) assessed the incidence of introduced large mammal species on 30 large wildlife ranches in semi-arid areas of South Africa, and found that all 30 included introduced species that were either non-indigenous or extra-limital species. These introduced species represented between 10 and 57% of all species on these ranches. Furthermore, eight of these ranches had introduced colour morphs (white and black springbok, white blesbok), while 24 ranches carried species capable of hybridization.

The introduction of non-native species increases diversity of species, which enhances viewing opportunities for tourists and increases species for hunters, but it was predicted that the artificially increased diversity may jeopardise future success in the industry if tourists became more conservation savvy (Castley *et al.*, 2001). Some exotic species (e.g. Barbary Sheep *Ammotragus lervia*) have a high capacity to adapt to local conditions and become invasive. Species that can hybridize with native species may impact genetic integrity and long term survival of local populations, and may negatively impact their commercial market value. Introduced non-native species can affect native populations by causing changes in relative abundance of different species, modification of functional relationships, resource competition, competitive exclusion, niche displacement and hybridization (Castley *et al.*, 2001).

PGRs in the Eastern Cape face pressure to compromise strict conservation objectives in the following ways: 1) through unnaturally high stocking rates of species; 2) through introduction of non-native (exotic or extra-limital) species; 3) by creating false savanna landscapes from the native thicket vegetation (Sims-Castley *et al.*, 2005). Ecotourism potential can be boosted by introducing extra-limital species with the purpose of increasing visibility and diversity of wildlife species. PGR owners feel pressured to introduce non-native species that tourists expect to see, with examples in the EC being Giraffes and White Rhinos

The topic of extra-limital species is a controversial one. Wildlife ranchers, who are typically able to generate more revenue with greater diversity of herbivore species, cannot understand why they should not introduce species onto their properties if those species are native to South Africa. The basis of their argument generally revolves around two issues. First, there are no natural, truly wild areas left in South Africa, which means that every area, including national and provincial parks are managed. As a result, ranchers should be allowed to manage their properties as long as they are not harming the environment. Second, vegetation types are moving and changing, partly due to climate change, so it is not valid to hold to old distribution ranges for any species: if a species is able to adapt to, and survive in an environment, there should be no reason to stop ranchers from introducing them. Moreover, the South African wildlife ranching and hunting industries are of the opinion that impacts of non-indigenous and extra-limital species are limited (Spear & Chown, 2009a).

On the other hand, many conservation biologists generally believe that species should not be moved outside of their natural distribution ranges, even if those species are indigenous to the country. Species distribution ranges are not dictated by political boundaries, so just because a

species occurs within South Africa, does not mean that it should be allowed to be introduced anywhere in the country. There are a number of theoretical reasons for this position. Threats to indigenous biodiversity of introducing non-indigenous and extra-limital species include hybridisation with native species, competition, homogenisation of native biota, introduction of foreign parasites and pathogens, and alteration of ecosystem functioning (Spear & Chown, 2009a). However, little information exists on the extent to which plausible conservation concerns are being realised.

One of the most commonly cited examples of competition leading to the demise of a native herbivore species in South Africa is the introduction of Nyala into areas where they did not occur historically, leading to widespread reductions in Bushbuck populations. There is limited documented evidence in the literature to validate this, however, which is also the case for other extra-limital herbivore introductions and their potential impacts on biodiversity (Spear & Chown, 2009a, 2009b). Few studies have clearly documented the impacts of ungulate introductions in South Africa, and several of those identified did not provide strong evidence for the impact concerned (Spear & Chown, 2009b).

Homogenising of native species assemblages is the gradual replacement of native biotas by locally expanding non-native species that diminishes faunal distinctions between regions (Olden *et al.*, 2004). Mckinney (2005) showed evidence in plants and fish that species introduced from less distant sources have a greater homogenising effect on community composition than species introduced from more distant sources. This implies that introducing extra-limital species could have a greater homogenising effect on local fauna than introducing non-indigenous species.

6.4.5.2 *Non-indigenous and extra-limital species on surveyed wildlife ranches*

We defined non-indigenous species as those not occurring naturally and historically within South Africa. Whether or not a species was indigenous was determined using historical distributions extracted from Skinner & Chimimba (2005). Forty (40) out of 249 (16%) ranchers who provided herbivore species data indicated that they had non-indigenous species occurring on their properties, namely Fallow deer (*Dama dama*; n=24 ranches), Lechwe (*Kobus leche*; n=22 ranches), Scimitar-Horned Oryx (*Oryx dammah*; n=3 ranches), Barbary Sheep (*Ammotragus lervia*; n=2 ranches), Axis Deer (*Axis axis*; n=1 ranch), and Red Deer (*Cervus elaphus*; n=1 ranch).

We defined extra-limital species as species indigenous to South Africa that occur outside their natural historical distribution range. To determine whether a species occurring on a surveyed property was extra-limital, we used mammal distribution maps produced by the DEA for the following species: Blesbok, Bontebok, Black Wildebeest (*Connochaetes gnou*), Blue Wildebeest, African Buffalo, Cape Mountain Zebra (*Equus zebra zebra*), Hartmann's Mountain Zebra (*E. z. hartmannae*), Eland, Gemsbok, Giraffe, Impala, Kudu, Nyala, Plain's Zebra (*Equus quagga*), Roan, Sable, Springbok, Tsessebe, Waterbuck (*Kobus ellipsiprymnus*) and White Rhino.

Two-hundred and eighteen (218) out of 249 (88%) ranches had at least one extra-limital species according to the DEA distribution maps. The mean number of extra-limital species per ranch was 3.9 ± 3.5 (median: 3; range: 0-14). Twenty-six herbivore species were found to be extra-limital to some degree, with the species most commonly occurring out of range being Nyala (n=126), Blesbok (n=116), Impala (n=99), Waterbuck (n=82), Plain's Zebra (n=80), Gemsbok (n=64), Giraffe (n=60), Sable (n=60) and Blue Wildebeest (n=51).

6.4.6 The ecological risk of breeding colour variants.

6.4.6.1 *A definition of colour variants*

The term “colour variant” (or “colour morph”) is used to describe a wild animal expressing a rare colour phenotype. Common examples include the golden wildebeest (a variant of the Blue Wildebeest), black impala, black springbok, white springbok and white blesbok, amongst others. Some species have more than one colour variation. Colour variants are not separate species, subspecies or hybrids; nor are they the result of deliberate genetic modifications by humans. They are naturally occurring phenomena that probably result from genetic mutations occurring in wild populations (Cindy Harper, University of Pretoria, personal communication; Bettine Jansen van Vuuren, University of Johannesburg, personal communication). A colour variant can be viewed as an opportunity to adapt to change, and as such is important for evolution (C. Harper, pers. comm.).

Unusual coat colour variations are thought to be the result of expression of recessive traits, although this requires confirmation because the molecular basis for coat colour has not been studied in wild herbivore species; there are no genomes available for wild species, so we know very little about their genetics in general (C. Harper, pers. comm.). Although colour variants are not a new phenomenon (golden wildebeest were recorded in the Limpopo River basin near the Tuli Block in the 1920s, where they were known as “Vos” wildebeest (York 2015), and white springbok were recorded historically in the Eastern Cape Province (Skead *et al.*, 2007), the number of times they physically manifest is very low, probably because they are recessive and because coat colour does not derive from a single gene (in domestic species that have been studied, colour is an expression of different genes that work together, B. Jansen van Vuuren, pers. comm.). There is also a common perception that colour variants may be more prone to predation because they stand out, but this is untested due to their rarity in large wilderness areas. If colour variants are ever released into extensive areas with large predators, it would be useful to monitor their survival, including whether predators preferentially select them.

6.4.6.2 *The ecological risks of breeding colour variants*

Colour variants have become considerably more common on private land over the last decade, as evidenced by the increasing numbers of animals sold live on auction or privately; a cursory scan of any hunting or wildlife ranching magazines highlights this. Cloete (2014) suggests that the reasons for this increased prevalence is financial: economic pressures have forced some wildlife ranchers to transition to game farming practices and focus more on breeding high value species or colour variants. During the early 1990s, when agricultural land was being converted to wildlife ranching, there was a large demand for plains game to stock properties and the value of game increased. When the availability of new land for conversion to wildlife ranching dropped during the late 1990s, the demand for plains game declined, and the increasing price trend flattened off or declined. This was exacerbated during the 2000s due to economic pressures on the hunting industry (caused by factors such as harsh exchange rates, increasing marketing costs, increasing competition and the global economic slowdown), which resulted in stagnation of live auction prices of game species. Wildlife ranchers whose main incomes were generated by the use of plains game experienced decreased profits because their costs were increasing but their income was not. To remain financially sustainable, some of these ranchers shifted their focus to intensive breeding, and this increased the demand for high value species, including colour variants. Game breeders are placing them in intensive breeding camps for selective breeding, and protecting them from predation and disease.

The resulting increase in prevalence of colour variants has raised a number of concerns surrounding biodiversity conservation (e.g. Chardonnet & Mallon, 2015; PHASA, 2015), and these are discussed here.

1. Colour variants are considered by some to be a direct threat to biodiversity by risking the survival of indigenous taxa through genetic pollution (or mixing). The term genetic pollution is generally used to describe gene flow from domestic, non-native, invasive or genetically modified (GM) animals to a wild indigenous population. Genetic pollution is a value laden term, however, that implies either that hybrids are less fit than their parents, which need not be the case, or that there is an inherent value in "pure" gene pools, so the term “genetic mixing” may be better.

   Given that colour variants are almost exclusively confined to private land and that the number of individuals is relatively low in comparison to the number of standard coloured animals of the same species, it is unlikely that the release of colour variants would have any major impact on the overall population because the genes for unusual colour would be quickly diluted by the main population, even if all colour variants were released into the wild at the same time (B. Jansen van Vuuren, Pers. comm.). This is based on the assumption that the colour phenotypes are determined by recessive genes, which remains to be confirmed.

2. The management practices for colour variants are a direct threat to biodiversity because they result in the persecution of predators and because the animals are bred intensively with little regard to the environment.

3. Selective breeding of colour variants is based on human preferences for phenotypic traits, rather than natural selection and, therefore, distorts the natural processes of evolution. It weakens resilience and reduces adaptive capacity to environmental changes, such as health hazards, ecosystem transformation, or climate change, and elevates risk of zoonotic disease outbreaks. Animals that are kept in fenced camps are isolated from predators and, over multiple generations, are likely to lose their ability to react appropriately to predators. If these animals are treated for parasites and other diseases and are provided with veterinary care, they may lose their natural immunity. Additionally, they are mostly provided with supplemental food because their camps are small and have insufficient forage, meaning that some animals may survive drought periods when they would not have under natural conditions. These three factors all increase the chances of inherently weaker individuals surviving and reproducing and passing on genes that would not normally survive, ultimately undermining the “survival of the fittest” paradigm.

4. Selective breeding of colour variants may homogenize taxa at national or regional scale. Biotic homogenization describes the gradual replacement of native biotas by locally expanding non-natives, and diminishes floral and faunal distinctions among regions (Olden *et al.*, 2004). Colour variants are native species expressing a recessive colour gene, and as such are unlikely to homogenize local taxa.

5. If genes for colour variants are linked to any detrimental genetic traits, artificially increasing the number of animals with these genes will increase the prevalence of the negative traits. There is no evidence yet that there are any negative characteristics linked with colour genes in wildlife species, but this could be due to a general lack of knowledge about the genetics of these species in general (there are no genomes available for game species), or about colour variants (C. Harper, pers. comm.). The different colour horse breeds, such as chestnut, black, painted, and palamino, are all normal healthy horses. Colour genes are not usually linked to other functions in the body, so a change in colour can happen to allow an animal to adapt to changes in the environment without knocking out important things, such as liver function. There is, however, an example of a negative

trait linked to coat colour in horses: Lavender foal syndrome, whereby foals are born with a lavender coloured coat and are unable to stand up. This syndrome is thought to be the result of a recessive gene, but it is a lethal mutation and the foal does not survive. So, while it is possible that the genes for colour variants may be linked with negative traits, there is currently no evidence that this is the case. If there are, such animals would probably not survive to reproduce. More research is needed, however.

The biggest danger at the moment of the ongoing selective breeding of colour variants is not the colour variants themselves, but rather the inbreeding factor to try and get more and more of the colour (C. Harper, pers. comm.). If breeders are not being careful in their selection, and they are inbreeding, this will bring out a lot of the deleterious genes as well. They are creating homozygosity, and potentially fixing negative traits. Breeders need to rotate stock regularly to avoid inbreeding, but this is not always happening, because the easiest and quickest way to get more colours is to breed fathers and daughters. In the first generation they will probably not have any problems, but that also depends on the quality of the initial stock. If the initial stock come from outbred stock, and if they are good quality animals, things will likely be fine to start with. But if a breeder buys poor quality animals (and this could happen because these animals are very expensive, so the breeder may not be able to afford the best quality, or that many), such as small animals, low fertility, skew horns, or immune problems, inbred traits might become fixed more quickly.

One issue that is hampering our knowledge is that farmers use their own names for varieties, which makes it difficult to distinguish them for genetics purposes (C. Harper, pers. comm.). For example, the same colour variant can be referred to by different names, so you don't know if they are referring to the same variant (such as black or midnight impala). Or an animal could be referred to as white, which could mean various things. E.g. white could be a dilution (or cream in colour), with some melanin features remaining, with some darker pigment in it, and will be more a yellow colour (it is not an albino). So there is some confusion with naming, which is problematic when trying to identify mutations that cause colour differences. There is a need to standardise the naming of colours, which will make it easier to test for genetics of colour variants.

6.4.6.3 *The extent of colour variant breeding on surveyed ranches*

This was presented in section 6.1.4.2.

7 THE DRIVERS AND CONSTRAINTS AFFECTING THE WILDLIFE RANCHING SECTOR

7.1 Global factors and externalities that affect the wildlife ranching sector

7.1.1 Global patterns in hunting

7.1.1.1 *Prospects for future of the hunting industry*

The trophy hunting industry in Africa grew rapidly during the 1980s, 1990s and early 2000s (Lindsey *et al.*, 2007b). However, since then, the picture has been more mixed. South Africa has seen continued growth due to expansion of the wildlife ranching industry and due to the increasing array of species (and colour variants) available for hunting. In addition, there has been significant growth in Namibia with the successful community conservancy programme (based largely on revenue generated from hunting) has resulted in large increases in the land available for hunting (Jones & Weaver, 2008). In some other countries there has been a decline in the size of areas used for trophy hunting. For example, the Zimbabwean hunting industry was severely affected by the land reform programme, which resulted in the conversion of many game ranches to subsistence agriculture (Toit, 2004). Hunting has been severely disrupted in Chad and CAR due to political unrest, and a number of hunting blocks in countries such as Zambia and Tanzania have become unviable due to high levels of poaching and human encroachment (Lindsey *et al.*, 2012). Botswana banned all trophy hunting on state land in 2013, further reducing the land available to the sport.

The hunting industry has potential to be affected by changes in the levels of hunter participation in key markets. There appear to be mixed messages concerning hunter participation in the US, Africa's largest market for hunting safaris, some commentators noting a decline (Enck, Decker & Brown, 2000) and a more recent study suggestion an increase (USFW, 2011). In recent years there appears to have been a broadening of the market for hunting safaris, with increasing participation of hunters from non-traditional markets, such as Russia and even China.

The future of the trophy hunting industry is not clear. In several African countries, growing human populations and growing anthropogenic pressures on hunting areas are likely to impact negatively on the hunting industry over time. Countries such as South Africa and Namibia with the resources to manage wildlife effectively are likely to benefit from the decline in hunting opportunities elsewhere. This could conceivably have resulted in increasing demand for hunts in those two countries and thus increasing revenues. However, the hunting industry in both countries will have to contend with the issue of land reform which has potential for substantial impacts, negative or positive depending on the way the process is handled. Furthermore, the trophy hunting industry in those countries and elsewhere in Africa is seriously threatened by negative global perceptions.

7.1.1.2 *Constraints to the hunting industry*

The primary constraint to the hunting industry in Africa in general, including South Africa is the increasing global anti-hunting sentiment and publicity. The recent incident involving the illegal hunting of 'Cecil' the lion in Zimbabwe created a massive global furore and reflected growing outrage among the global public over the concept of killing charismatic African mammals for sport.

Growth in protectionist perspectives over wildlife is due to increasing global empathy for wildlife, but also due to a greater disconnect between people and nature, particularly among urban residents of the developed world. An increasing number of animal welfare

organisations have emerged, many of which adopt a strong anti-hunting philosophy and lobby actively for hunting bans and trophy import restrictions.

The hunting industry has arguably done little to discourage negative attitudes towards their industry. The 'canned' lion hunting industry for example, and the lack of distinction between it and trophy hunting in general among the general public, makes it increasingly difficult for many people to accept hunting as a legitimate land use and tool in conservation (Lindsey et al., 2012). Other questionable practices such as 'put and take' hunting, the hunting of exotic animals and of colour variants, and hunting along the boundaries of protected areas contribute further to the industry's negative public image. The hunting industry has been slow to adapt to the rise of social media, and the distribution of images of hunters posing with hunted animals have done great harm to the public image of hunting. These negative public images have been enhanced by a number of celebrities who have been outspoken about their distaste for trophy hunting.

In a number of cases, hunting has been demonstrated to confer negative impacts on some species, and notably carnivores such as lions (Loveridge *et al.*, 2007). In addition, in some cases there have been steep declines in wildlife populations in hunting blocks due to poaching (contributed to in some cases by inadequate contributions of hunting operators) (Lindsey *et al.*, 2014). These findings, coupled with public pressure, have motivated several countries (including key markets for African trophy hunting safaris) to implement restrictions on the import of hunting trophies. For example, the import of African Elephant trophies from Zimbabwe to the US was banned in 2014, and the US and EU are considering further restrictions on the import of lion trophies (Nelson, Lindsey & Balme, 2013). While South Africa has not yet been too affected by such steps, the potential for such restrictions is definitely there, particularly given the strength of the global revulsion of canned lion hunting. Additional constraints to the hunting industry have come in the form of bans by airlines on the carriage of hunting trophies. Both national governments and airlines are responsive to public pressure and so future scandals and negative publicity involving hunting will likely have the effect of imposing further restrictions on the industry.

7.1.2 Climate change and its potential effects on the wildlife ranching sector[2]

7.1.2.1 *Introduction*

Climate change is the response of an increase in atmospheric concentrations of greenhouses gases (GHG; including carbon dioxide, nitrous oxide) (Bryan, Gbetibouo & Ringler, 2009). This results in a rise in average surface temperature on the planet as the GHG "trap" heat within the earth and in the long term, this causes the alteration of earths climatic patterns. While carbon has naturally existed in the earth's atmosphere (e.g. through volcanic eruptions and veld fires), anthropogenic habits (including the excessive burning of fossil fuels) have exacerbated these levels which are now at unprecedented levels (Patz *et al.*, 2000). This has led to gradual climatic changes globally.

7.1.2.2 *Climate change in South Africa*

With climate change becoming more widely discussed, its affects are already being observed (Griffin 2012). In the past five decades mean annual temperatures in South Africa have increased by 1.5 times the observed global average of 0.65°C (Ziervogel *et al.*, 2014). Climate change is expected to have varying effects on different regions of the country; although the general pattern indicates increased aridity in the west and wetter conditions in the eastern part of the country (Magadza, 1994). Coastal regions in South Africa are expected to get hotter and by 2050 it is expected that temperatures will increase by 1-2°C while the interior

[2] This section was prepared by Samantha Page (EWT)

of the country will increase by as much as 4°C (Figure 26; Figure 27; Griffin 2012). By 2100, temperatures are expected to increase between 3 and 4°C while interior regions increase between 6 and 7°C (Griffin 2012). Sea-levels surrounding African coastlines are expected to rise ~25 cm by 2050 (Hulme *et al.*, 2001). Average temperatures for Saharan and semi-arid regions of southern Africa are expected to increase by ~1.5°C by 2050 (Hulme *et al.*, 2001).

As air temperatures increase, evaporation rates will rise (Archer et al. 2012). This will result in a decrease of annual rainfall, increasing the incidence of drought across most of the country (Archer et al. 2010). Generally, the far western regions of South Africa are expected to become drier due to a precipitation drop of 10-20 % (de Wit & Stankiewicz, 2011). The eastern and interior regions of the country are also expected to become drier due to a < 10% drop in precipitation (de Wit & Stankiewicz, 2011).

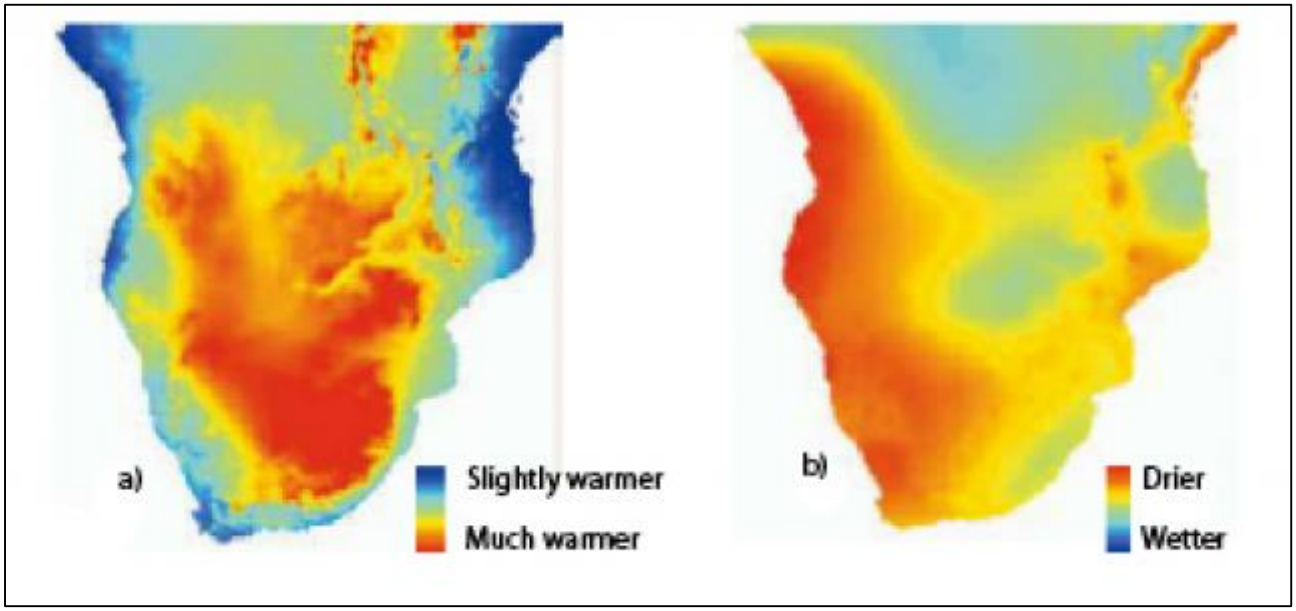

Figure 26. Projected climate change in southern Africa in (A) temperature and (B) precipitation for 2050 (Myers *et al.* 2011).

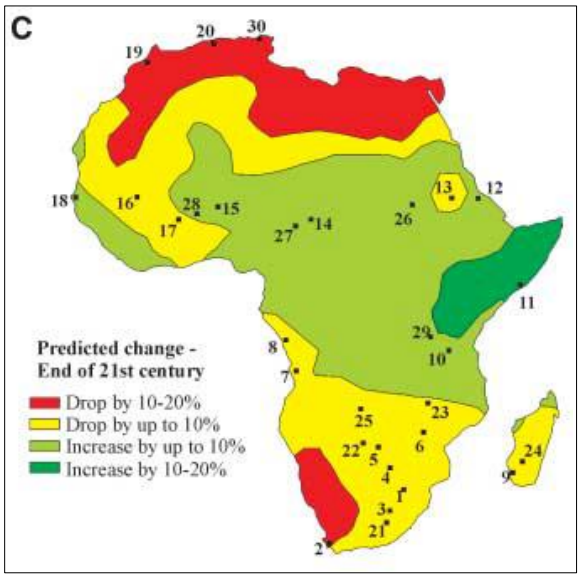

Figure 27. Simplified map of Africa showing expected change in precipitation by the end of the 21st century (de Wit & Stankiewicz, 2011).

7.1.2.3 *Species level impacts*

In the 21st century climate change will become a significant driver of global biodiversity loss (Erasmus *et al.*, 2002). It is estimated that ~4% of African mammal species are expected to be severely threatened by climate change (Thuiller *et al.*, 2006). Climate change will inevitably affect species abundance, distribution and behaviour (Erasmus *et al.*, 2002; Dixon, Smith & Guill, 2003; Thuiller *et al.*, 2006). Species are expected to adapt to changes in climate in a manner that will reflect on their dependence on certain climatic requirements or suitable habitats which will ultimately shift (Thuiller *et al.*, 2006).

In a study by Erasmus et al. (2002) predicting the vulnerability of 179 animal taxa to climate change revealed that 17% of those species are expected to expand their ranges, 78 % of studies species will show a range contraction (of between 4 and 98 %), 3 % showed no response and 2 % will possibly go extinct (including the Golden Mole, *Chrysospalax trevelyani* and the Armoured lizard, *Cordylus macrophallus*).

It is generally expected that there will be a latitudinal trend in species richness (Erasmus *et al.*, 2002; Thuiller *et al.*, 2006). There will be a decrease in species richness in the western regions of South Africa resulting from species loss and migration and an increase in richness in the east (Erasmus *et al.*, 2002; Thuiller *et al.*, 2006). This is due to the west-east temperature and precipitation gradient, causing an eastward species shift to wetter and cooler regions (Thuiller *et al.*, 2006). Some species are predicted to expand their range but most will contract due to limited habitat suitability (Erasmus *et al.*, 2002). Species loss may be exacerbated as anthropogenic land use change may prevent the eastward range shift of many species due to the unavailability of suitable habitat patches (Erasmus *et al.*, 2002). This could ultimately increase the number of species lost to climate change.

The severity to which species respond to climate change will vary according to species. More adaptable species or those that are able to move to regions of more suitable conditions may not experience negative population effects while those that are more sensitive may. For instance, vulnerability assessments predict declines in Nyala as they are not a species which can easily adapt to climate-induced habitat change (Dixon *et al.*, 2003). In regions of the country where rainfall is limited, large-bodied animals such as African Elephant, Hippopotamus and large bovids are likely to be threatened (Dixon *et al.*, 2003). This is due to their metabolic biomass and high dependence on water (Dixon *et al.*, 2003).

The KNP (Limpopo Province) has a high water-dependent assemblage of mammals which are sensitive to a lack of rainfall during the dry season (Thuiller *et al.*, 2006). This is expected to be exacerbated during in the future due to less rainfall and hotter conditions (Thuiller *et al.*, 2006). This could result in the KNP losing many species (Erasmus *et al.*, 2002). Under one modelling scenario it is expected that KNP will lose 11 (of their total 87 species) and gain 16 species through immigration due to species distribution shifts (Thuiller *et al.*, 2006). It is expected that Addo Elephant National Park (Eastern Cape) will lose up to 10 species (from their current total of 48 species), but gain six species (Thuiller *et al.*, 2006).

Another aspect which is important to note is how climate change could affect the spread of disease among species (Patz *et al.*, 2000; Thuiller *et al.*, 2006). Rainfall conditions influence an animals susceptibility to outbreaks of diseases like anthrax (Thuiller *et al.*, 2006). For instance, an unusually humid dry season in the KNP after 1990, resulted in an anthrax outbreak which caused massive declines in buffalo (*Syncerus caffer*) and kudu (*Tragelaphus strepsiceros)*. Climatic variations also have the ability to influence the life cycles of ticks and other parasites. For example, in 1998 southern KNP experienced a warmer than usual winter which allowed tick (*Boophilus decoloratus*) larva to peak twice in the region; once in summer (November – December) and again in winter (June-July) (Thuiller *et al.*, 2006). This essentially meant the ticks were able to undergo two life cycles in one year, increasing the likelihood of tick-borne

diseases; a phenomenon that will occur more frequently should these circumstances be experienced again.

It is assumed that predators will not be as severely affected by climate change as herbivores (Thuiller *et al.*, 2006). This is due to their ability to supplement water availability with prey fluids and are thus less dependent on water sources (Thuiller *et al.*, 2006). Therefore it is expected that carnivores will rather shift their distribution to follow their prey, rather than shifting to adapt to climatic changes (Thuiller *et al.*, 2006).

7.1.2.4 *Effects of climate change on wildlife ranching*

As the wildlife ranching industry is an important sector contributing to the South African economy, it is vital to understand how certain drivers may influence the industry. Understanding these changes and making predictions will allow those potentially affected to adapt with the change rather than losing all stock or game due to changes in climatic conditions. Climate change will affect the industry in various ways, including: increase in running costs, changes in species assemblages and changes in farm conditions (including climate, water availability and vegetation).

Hotter humid conditions, as mentioned earlier, can result in an increase in parasite and tick borne diseases (Thuiller *et al.*, 2006). This increases costs for wildlife ranchers who will need to dip and treat their game more frequently should this to prevent loss of animals to diseases.

Generally, a shift in suitable habitat and climatic conditions will result in farms having to be selective over which species they can stock and may mean that gradual adjustments to species assemblages may need to take place. In hot and arid regions, it would be impractical to stock large herds of water dependent species such as Waterbuck. Competitive interactions between other grazers and Waterbucks during drier periods may negatively affect the latter (Thuiller *et al.*, 2006). With limited natural water sources available, ranchers would ultimately need to invest in artificial water sources to provide species as they would be unable to naturally migrate in search of water.

Harsher conditions, especially in the interior regions of the country may limit stocking capacities of farms due to limited natural food and water availability. Drier conditions will also decrease the quality of food available which may result in malnutrition of many species (Dixon *et al.*, 2003). According is Dixon et al. (2003), further climatic changes will be detrimental to the production of livestock in South Africa; which is already suffering due to current seasonal variability. This is due to the decrease rangeland carrying capacity (Dixon *et al.*, 2003). However, as climate change will benefit some countries like Tanzania, it will likely improve productivity as there will be increased precipitation and temperature (Dixon *et al.*, 2003).

7.2 National and provincial trends, issues and policies that affect the wildlife ranching sector

7.2.1 Veterinary disease control policies and the problems faced by the wildlife ranching industry

7.2.1.1 *The mandate of veterinary disease control*

Veterinary disease control policies for wildlife ranches in South Africa are managed by the Directorate of Veterinary Public Health (DVPH), which falls under DAFF, and their mandate is controlled by the Animals Diseases Act of 1984 (DAFF, 1984). The DVPH work mainly on policies that control four important veterinary diseases, all of which are relevant to African Buffalo.

These diseases are: 1) Foot and mouth Disease (FMD), which is a designated disease endemic to KNP and areas on its boundary, so the movement of animals in this area is strictly controlled; 2) Corridor disease (also designated), which occurs around the KNP and neighbouring areas, northern KZN (HluHluwe & Ndumo are designated areas where these animals can be kept); 3) Brucellosis (controlled by the veterinary department but not designated), which occurs in KNP and some areas of KZN (common in cattle but not common in wildlife); and 4) Tuberculosis (TB) (controlled by the veterinary department but not designated), which is endemic in some populations in KNP and iMfolozi in KZN. Further information about these diseases (and others) and their control may be obtained from the DAFF website:

http://www.daff.gov.za/daffweb3/Branches/Agricultural-Production-Health-Food-Safety/Animal-Health/disease-control.

The following discussion is based on interviews with three veterinarians with extensive knowledge and experience working in or with the wildlife ranching sector. These experts were: Dr Sikhumbuzo Mbizeni (Deputy Director, Directorate of Veterinary Public Health), Dr Peter Oberem (President of WRSA and a veterinarian), and Dr Richard Burroughs (Director of the Centre for Veterinary Wildlife Studies).

7.2.1.2 *Veterinary regulations are applied unequally to wildlife ranchers and livestock farmers*

One of the main issues for wildlife ranchers involving veterinary controls is that the wildlife and stock industries experience different levels of regulation. There is a general consensus, even amongst wildlife ranchers, that veterinary controls and restrictions are necessary in the wildlife ranching sector to prevent the outbreak of disease or the translocation of diseases from endemic areas to sites outside the natural occurrence of these diseases. It is also necessary to prevent the spread of disease from wildlife to domestic livestock because of the far-reaching financial implications of outbreaks in the latter. However, the unequal control of diseases between livestock farmers and wildlife ranchers puts the latter at a disadvantage and allows for situations where livestock can pass on diseases to wildlife, even when wildlife ranchers have followed all the necessary regulations.

For example, African Buffalo translocations are very strictly controlled for the four main diseases described above. Animals may not be moved out of the disease zones around the KNP, and any animals outside these zones have to be tested before any translocation can be made. With cattle on the other hand, disease testing is a voluntary scheme, and farmers may not be forced to test their animals. If farmers test their animals and the animals are found to be positive, then DVPH can control their movement, but the farmer has to volunteer his animals for testing. To move cattle, farmers only have to get a permit from the stock theft unit (which is part of South African Police Service (SAPS), which relates to theft issues rather than disease issues, unless they are in an area with a confirmed outbreak of one of the diseases, in which case the DPVH controls and prevent movements until such time as the area is declared disease free). The DVPH is looking at ways to have testing in domestic animals made compulsory, but capacity is a problem. Game ranchers are trying to convince state veterinary services to utilize private veterinarians for some of this work in order to alleviate the capacity constraints at DAFF.

7.2.1.3 *Insufficient knowledge surrounding disease transmission in wildlife species*

A second important veterinary problem in wildlife is the lack of knowledge surrounding which species can get the different diseases and which are risks as carriers. Although it is often known which species are susceptible to certain diseases, in many cases it is not known which are carriers. For example, Impala may be symptomatic for FMD, but it is not known if they are carriers, and so we do not know if they pose a threat to other wildlife or cattle when they are translocated without being tested. A second example is the rabies virus in Kudu; we do not know what their role is in maintaining the disease in wildlife populations. As a general rule,

ecologists and veterinarians used to think that wild species, being well adapted to their environments, were less susceptible disease; we are now learning that this is not the case, especially when ranchers start intensifying production. We are also learning that some diseases thought not to occur in wildlife species, actually do occur. So there is a great need for research.

For example, in the case of TB, wildlife veterinarians have mostly been concerned with African Buffalo, but there is growing concern with other species such as Kudu. While the movements of African Buffalo are controlled (animals are tested before being moved and only allowed to move if TB free), movements of other species, such as Kudu are not. These other species are not tested, and yet may be carriers; if they are in fact carrying TB, they can infect other species, including African Buffalo, in the areas where they are moved to. Such accidental infections of species that were thought to be isolated, can have devastating financial impacts on wildlife ranchers. Another example is brucellosis, which can infect many species, including humans. African Buffalo are strictly controlled, but other species are not, and a rancher may move wildebeest species around without checking them for the disease. It is unknown whether wildebeest carry brucellosis, but it is suspected that they might.

There is, therefore, a potential biosecurity risk every time species are moved without being tested for disease and with no movement controls in place; wildlife ranchers are going to have to become more biosecurity conscious.

A similar biosecurity risk applies to the control of ticks and tick borne diseases. The Animal Diseases Act requires that animals must be treated for external parasites before being moved, but this rarely happens. For example, there was a case of the brown ear tick being moved out of its natural distribution range (possibly from KZN or the bushveld) and introduced into Free State. This could have had serious implications. Alternatively, if a tick-borne disease such as corridor disease is carried into an area where it is has not been previously recorded, it can be introduced into the brown ear tick population, which could then spread it to the other disease free animals.

A further potential problem could arise with the import of animals from other countries because we simply do not know what diseases we need to test for (e.g. should we test for ebola?).

7.2.1.4 *Veterinary aspects around colour variants*

With regards to potential veterinary problems with the growing numbers of colour variants, there are no veterinary health issues known so far.

7.2.1.5 *Insufficient capacity among state veterinarians*

A different kind of problem with the veterinary control of wildlife diseases that is encountered by the wildlife ranching sector is the lack of capacity in the state veterinary departments. There are few state veterinarians, which means that when wildlife ranchers need veterinary procedures carried out that legally require the presence of government employees, ranchers often have to wait a long time to get attended to. For example, only state veterinarians are legally allowed to collect blood from African Buffalo for testing, and this results in a backlog of requests from ranchers trying to move their animals. This could be alleviated if private veterinarians were allowed to carry out these procedures, and WRSA are working with the state veterinary services to see if this might be possible in future.

7.2.1.6 *Game meat*

The production and sale of game meat is a further area of wildlife ranching that falls under the mandate of the state veterinary department, and the outbreak of certain diseases can have major impacts on marketing products, particularly with regards to export. The impacts of international bans on meat exports that have arisen due to outbreaks of diseases such as FMD and avian flu have been discussed in section 6.3.1.1.

Meat production from domestic livestock and issues of meat hygiene are covered under Veterinary Procedural Notices (VPNs), which can be downloaded from the DAFF website at: http://www.daff.gov.za/daffweb3/Branches/Agricultural-Production-Health-Food-Safety/Animal-Health/importexport/vpnson. The purpose of VPNs is to prescribe the procedures that must be followed by processors who wish to import European Community (EC) approved meat from countries outside South Africa, for the purpose of processing such imported meat into meat products in South Africa, with a view of exporting the processed products to the EC market. These VPNs do not cover game meat for domestic sale.

7.2.2 Constraints on the wildlife translocation industry

During interviews with 18 wildlife translocators, we asked them to describe any regulatory problems faced and to provide suggestions for ways to resolve them. We paid particular attention to the constraints of this section of the wildlife ranching industry because the movement of animals between farms and between provinces is an important part of the wildlife ranching industry, and was a subject that had arisen repeatedly during our preparations for this study.

7.2.2.1 *The length of the capture season*

There is a lack of consensus around whether the capture season, which lasts for eight months between March and October, should be extended. The main advantages of being able to capture all year would be that translocators would not have to cram all their work into an eight month period, and that they would be able to employ all their staff year round. The main disadvantage of capturing all year would be the potential negative welfare issues for animals captured during the peak of summer.

During interviews with translocators, we asked them their opinions on whether the capture season should be extended. Fourteen out of 18 indicated they were satisfied with the current rules, mainly because they were concerned that capturing during the peak summer months would lead to increased stress and mortality of animals. There were also concerns that less qualified and more unscrupulous members of the translocation fraternity would take advantage of the situation without due care and consideration to the animals. There was a general consensus, however, that certain species could be translocated outside the capture season as long as their breeding seasons were taken into account. Such species were those that do not have a fixed breeding season.

The following discussion is based on an interview with Dr Leith Meyer, a Lecturer in Veterinary Science, at the Faculty of Veterinary Science, University of Pretoria, who is an expert in the field of the impacts of immobilising drugs and stress on wildlife species during the game capture process.

There has been much speculation about the impacts of temperature on physiology and survival of animals during game capture, with the general consensus being that you should not catch when it is very hot, because this may cause hyperthermia (Meyer *et al.*, 2008). There are two aspects to this idea that need to be considered: one is the effect of the drugs used, and the other is the effect of the capture process itself.

The primary cause of hyperthermia is stress: stress induced hyperthermia that is compounded by exercise (chasing the animals during capture) (Meyer *et al.*, 2008). When you chase an animal, it gets stressed, and this causes an increase in body temperature, and the metabolic/ muscle activity makes it worse. The ambient temperatures do not really have a major impact on causing hyperthermia, so it does not matter what time of year you catch animals: if you can catch on a cold winter morning, animals may still develop hyperthermia if they are stressed; if you catch on a hot day but do not stress the animals too much, they do not

develop hyperthermia. Where ambient temperatures become important, however, is where you place the animals after they have been chased, captured and stressed. In these situations, animals need to be placed somewhere where they can offload the heat they have gained: if a hot animal is placed in a hot crate, this is a problem, but if you put the same animal in a shaded spot with a breeze, it can offload the heat.

This implies that the translocation period could be extended into summer for certain species, as long as captures are done in a manner that minimises stress and exertion, and their breeding periods are taken into consideration. Animals should not be moved when they are early pregnant, heavily pregnant or if they have un-weaned lambs. So the translocation period, for seasonal breeders, could be extended into February, but probably not November or December. Species that breed all year may have fewer problems when moved in summer than seasonal species (e.g. rhinos and carnivores), but the proviso must be that capture is only done in well ventilated vehicles, and these vehicles must be provided with shade when parked. Capture operations should also be done properly, with limited stress to the animals.

The time of day of capture also appears to be important with regards to hyperthermia. The general assumption is that you do not capture in the middle of the day because the heat is worst, but if you look at the circadian temperature patterns of many species, their normal body temperatures are highest in the early evening (around 18h00), not the middle of the day (and lowest in the early morning). This means that catching in the late afternoon when it has cooled may not be the best time.

The downside to catching during the current capture season is that you are often catching animals when they are not in good body condition, because food availability is poor in winter, so animals do not have lots of body reserves. If animals are transported at night, there is a risk of hypothermia (especially if they have low body fat). Water availability may also be low in winter, so animals may be poorly hydrated. The length of the wildlife capture season could be opened up as a topic for discussion between the relevant stakeholders.

As an aside, there is anecdotal evidence suggesting that unfit animals are more vulnerable to dying of capture myopathy during the capture process, but this is a field that requires further research. Capture myopathy is a poorly understood disease complex that is associated with the capturing and handling of wild animals and generally leads to the death of any animal that develops it. Some pathologists think that animals that develop capture myopathy are not necessarily those that are in poor condition, but rather those that are over fed – they get fed concentrate, they are in great condition, and are perhaps a little overweight. Although this is anecdotal, it has potential implications for the intensive breeding industry and animals kept in camps.

7.2.2.2 *Regulatory and permitting issues*

Many wildlife ranchers and translocators are not happy with Threatened or Protected Species (TOPS) regulations. The general opinion is that the maps used by DEA to define the geographic distribution of species are outdated and too restrictive on their ability to move animals around. The permitting system around TOPS listed species is cumbersome and makes it burdensome to translocate some species, even when they are not threatened. The most frequently quoted example is that of the Black Wildebeest. This is a species that was once threatened with extinction, but was successfully conserved mainly thanks of the intervention of private wildlife ranchers. Now, thanks to TOPS regulations, these same ranchers have lost the incentive to look after the species because it has become a financial impediment rather than benefit. For example, it is financially more viable to hunt Black Wildebeest than to breed them because obtaining permits to translocate them has become so difficult (permits are expensive and are processed slowly), and ranches lose money when trying to do so. Rather than enhancing the conservation of this species, TOPS regulations have impeded its

conservation. Fewer Black Wildebeest have been translocated in the last two years than in previous years (J. van Vuuren, pers. comm.).

Another example is the Hartmann's Mountain Zebra, which is only allowed in certain areas of South Africa. Farms that fall within the natural distribution of this species have become saturated, which means there are no new buyers. As a result the live price is coming down and ranchers are starting to shoot them to replace them with species that can make more money.

Many ranchers and translocators also think that translocation legislation should be separated according to whether animals are on government protected areas or private wildlife ranching land. The premise is that it is the responsibility of the government to manage wildlife for conservation purposes, but private landowners should have the right to manage for business purposes because they need to be financially viable. However, under current legislation, there are already provisions for regulating translocations on state and private land separately, even though they fall under one piece of legislation (DEA, 2004), and there is a clear distinction in DEA legislation between protected areas and privately owned extensive systems (Magdel Boshoff, Deputy Director for TOPS policy development, DEA, pers. com.). A translocator may not translocate a specimen to a protected area that is outside its natural distribution range, but this prohibition does not apply to wildlife ranches. For example, a Bontebok may not be moved from the Western Cape to the KNP, but it may be moved from the Western Cape to a private wildlife ranch in Limpopo, as long as it is not against its provincial policy and as long as the province considers the risks (such as hybridization with Blesbok, disease transference, habitat type, etc.).

The updated norms and standards for translocating wildlife that are currently being debated, and which were out for comment early in 2015, may placate translocators and ranchers to some extent. These norms and standards make provision for moving species out of their natural distribution ranges (set by the DEA maps mentioned above), as long as the translocations are onto private land, and as long as they abide by provincial legislation. One of the prerequisites is that the habitat is suitable and that the risks of introducing an extra-limital species are taken into account. But this legislation will allow for wildlife ranchers to keep species outside of their natural distribution ranges under specified circumstances.

7.2.3 Taxation laws and subsidies.

A brief synopsis of the current tax legislation relevant to wildlife ranchers is provided by Cloete *et al.* (2015). Basically, there are no tax concessions for wildlife ranchers other than the fact that new stock born on the ranch does not need to be reported to the South African Revenue Service (SARS) until it is sold. Wildlife ranchers do not get a diesel rebate like standard agricultural businesses, which is a disadvantage. Net current income (i.e. profits) is taxable at the corporate tax rate. There are currently no subsidies for wildlife ranchers, but neither are there for livestock farmers.

7.2.4 Land reform

Landownership in South Africa remains an unresolved and emotive subject (Sebola & Tsheola, 2014). Although there are strong differences of opinion with regards to how land restitution and redistribution should be conducted, there is a general consensus that these issues need to be dealt with in a way that is fair and equitable for all parties.

The South African government has made agrarian reform and rural development one of its key policy priorities (Jacobs, 2012). The Department of Rural Development and Land Reform (DRDLR) has produced a Green Paper on Land Reform (DRDLR, 2011) and a series of policy statements, including their most recent strategic plan on rural development (DRDLR, 2015).

According to the Green Paper (DRDLR, 2011), there are three principles underpinning land reform:

1. De-racialising the rural economy;
2. Democratic and equitable land allocation and use across race, gender and class; and
3. A sustained production discipline for food security.

Given that the wildlife ranching sector encompasses 14% of the land area of South Africa and 20% of the agricultural land area, it is critical that the sector plays an active role in the land reform process. WRSA, which is the biggest player in the industry in the country, is working with the DRDLR to find solutions that are fair to all parties and which are good for South Africa as a whole (P. Oberem, pers. comm.). The first two principles highlighted by the Green Paper (DRDLR, 2011) and outlined above, are primarily political issues that we will not discuss here, but the third principle, namely sustained production discipline for food security, is something we have dealt with in an earlier section (section 6.3.1), and is an issue that the wildlife ranching sector can make a clear positive contribution towards.

The Green Paper (DRDLR, 2011) also introduced eight challenges and weaknesses faced by land reform. These were:

1. The land acquisition strategy of willing-buyer / willing-seller (this model produced a distorted land market and, according to Sebola & Tsheola, 2014, has failed to deliver redistributive justice);
2. A fragmented beneficiary support system (the recipients of land claims were ill-equipped to utilise the land effectively);
3. Beneficiary selection for land redistribution;
4. Land administration / governance, especially in communal areas;
5. Meeting the 30% redistribution target by 2014;
6. Declining agricultural contribution to the GDP;
7. Unrelenting increase in rural unemployment; and,
8. A problematic restitution model and its support system (communal property institutions and management)

Some of these are political issues that we do not discuss within this report, but points 2, 4, 6, and 7 are issues that have direct relevance to the wildlife ranching sector. Points 2 and 4, namely a fragmented beneficiary support system and land administration/governance issues are not dealt with by this report, but are important issues being taken up by some segments of the wildlife ranching community (P. Oberem, pers. comm.). Point 6, the declining agricultural contribution to the GDP is discussed in section 6.2 of this report, while point 7, the unrelenting increase in rural unemployment, is dealt with in section 6.3.2. In general, it is fair to say that the wildlife ranching industry plays a significant role in addressing the challenges identified by the Green Paper on land reform, and has the potential to make an even greater contribution in the future. What follows is a case study outlining the potential for wildlife ranching and land reform to work together in a positive way.

7.2.5 Case study: Nambiti Private Game Reserve[3]

7.2.5.1 *Introduction*

Nambiti Private Game Reserve is a 9,859 hectare "Big-5"reserve situated in the northern region of the Tugela basin near to Ladysmith in KwaZulu-Natal, South Africa (Figure 28). The reserve was established in 2000 on old cattle and maize farms that were combined to form a property extending over 8,000 hectares. Following this more farms were purchased, bringing the reserve to its current extent. Subsequently, the reserve was subject to a successful land claim and is now owned by the Senzo'kuhle Nkos'uNodada Communal Trust.

Operations at Nambiti Private Game Reserve are multi-faceted, combining 10 luxury game lodges catering to local and international tourists, limited hunting, live capture and sale of game and more recently, the production of venison from a recently constructed abattoir and butchery. Nambiti Private Game Reserve has been proclaimed as a nature reserve, through the KZN Biodiversity Stewardship Programme, in terms of Section 23 of the National Environmental Management: Protected Areas Act (No.57 of 2003). The reserve provides an interesting case study and model for the wildlife ranching sector as it combines clear biodiversity conservation imperatives, strong financial and economic imperatives, all within the context of a community/private sector partnership.

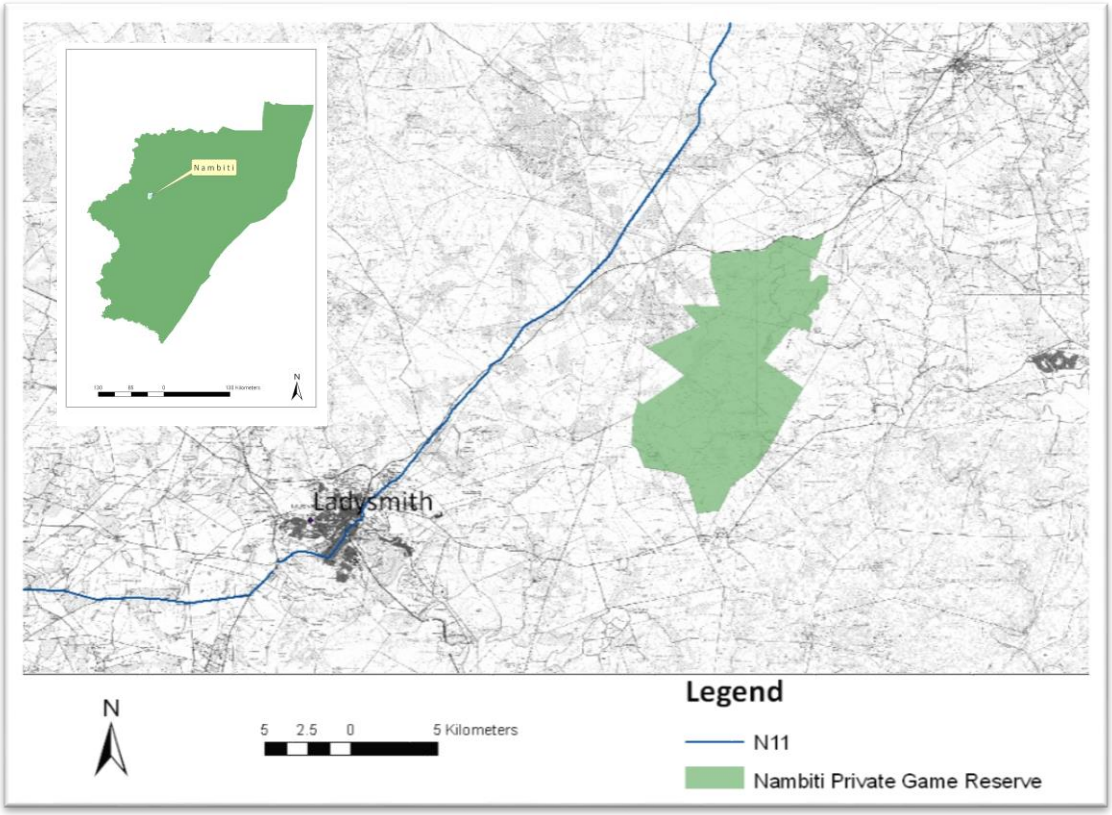

Figure 28. Regional location of Nambiti Private Game Reserve.

7.2.5.2 *Background to the formation of Nambiti*

Nambiti Private Game Reserve has an interesting history in that it was formed by a group of businessmen through the purchase of a number of farms and re-introduction of game.

[3] This section was prepared by Greg Martindale (Conservation Outcomes).

Subsequently, the reserve was successfully land claimed and a successful partnership was formed between the land claimants and the previous landowners.

7.2.5.3 *History of the development of the reserve*

In the late 1990s Rob Le Sueur, the founder of Nambiti Private Game Reserve, together with his business partners, began purchasing properties to establish the reserve. The properties had historically been used for extensive livestock production as well as limited crop production, primarily maize. The reserve was established in 2000, internal farm fences and alien vegetation were removed and game was re-introduced. Three further farms were then purchased. In addition to a variety of plains game that were re-introduced onto the reserve over the years, the following important re-introductions took place:

- White rhino – introduced in 2000. Nine births have been recorded to date as well as two deaths from poaching and one from injuries that arose from fighting. All adult White Rhino on the reserve have been dehorned.
- African Elephant – introduced in 2002 as a founder population of 11 animals.
- African Lions – the founder population of four lions were introduced in 2006 from Karongwe Private Game Reserve and Phinda Private Game Reserve.
- African Buffalo – 15 disease free bulls and a breeding herd of 11 cows were introduced in 2007 and 2010.
- Black Rhino – introduced in late 2013 as part of the Black Rhino Range Expansion Programme.

Following the establishment of the reserve, 20 lodge sites were identified and surveyed. Only 10 lodges have been developed but this has led to a relatively high density of tourism use within a reserve that is less than 10,000 hectares.

Engagement with the KZN Biodiversity Stewardship Programme began in late 2009 and the site was assessed in 2010. It qualified to be proclaimed as a nature reserve, the highest level of protection available in the stewardship programme and negotiations began on this basis. Concerns that were raised at the time related to the presence of both black and blue wildebeest with the potential danger of hybridisation and the presence of several extra-limital species that would not naturally have occurred in the region. It was agreed that the Black Wildebeest would be removed over time as would those extra-limital species that should not occur within the reserve. The documentation necessary to have Nambiti proclaimed a nature reserve was completed in late 2013 and the reserve has been declared a nature reserve in terms of Section 23 of the Protected Areas Act.

7.2.5.4 *Current property ownership*

The Senzo'kuhle Nkos'uNodada Communal Trust (IT101/2009/PMB) is a legal entity that represents the 136 successful land claimants from the Elandslaagte Community. The land was transferred to the community in June 2009 and is not under any tribal authority, all decisions are taken by the Trustees.

The individual lodge sites within Nambiti Private Game Reserve have been surveyed and sub-divided out of the remaining property. As a result the lodge sites are owned by a variety of companies and individuals who have a lease arrangement with the reserve's management company, which entitles them to traversing rights across the remainder of the property. The community owns a 50-bed lodge and the Department of Rural Development and Land Reform has purchased another site for them that can accommodate up to 30 beds but this site has not yet been developed.

7.2.5.5 *Management structure*

A management lease has been established between the Senzo'kuhle Nkos'uNodada Communal Trust and Nambiti Private Game Reserve (Pty) Ltd. (formerly registered as Four Arrows Investments (Pty) Ltd.) that was entered into in April 2009. The lease is a 35-year lease with an option to renew for a further 35 years. It recognises Nambiti Private Game Reserve (Pty) Ltd. as being responsible for the management of the reserve. Nambiti Private Game Reserve (Pty) Ltd. is 30% owned by the Senzo'kuhle Nkos'uNodada Communal Trust and 70% owned by Top Form Trading (Pty) Ltd. Top Form Trading is 100% owned by the lodge owners of the reserve. Nambiti Private Game Reserve (Pty) Ltd. has six directors, two of whom are from the communal trust and four of whom are from Top Form trading. As lodge owners, the Senzo'kuhle Nkos'uNodada Communal Trust is also a shareholder in Top Form Trading. Nambiti Private Game Reserve (Pty) Ltd. owns a management company that employs all of the reserve management staff named Zargoline. Zargoline is a non-profit company. The reserve's management structure is represented graphically in Figure 29.

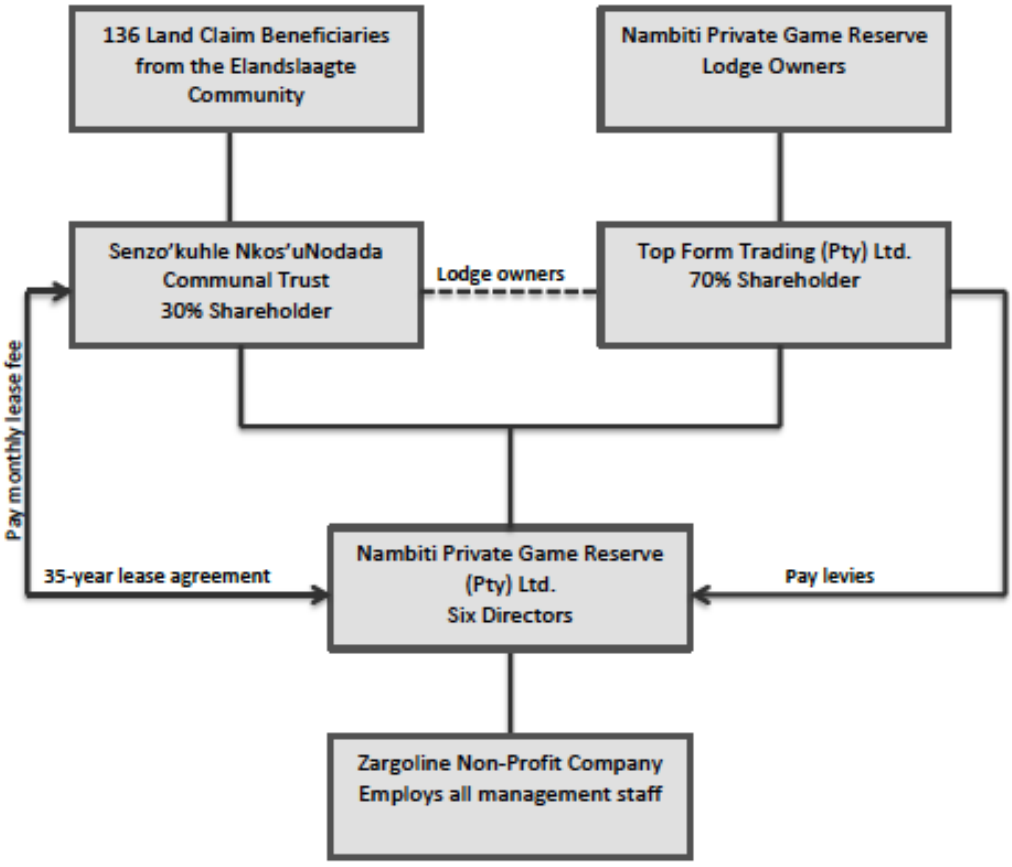

Figure 29. Graphic representation of the Nambiti Private Game Reserve management arrangements and structure.

7.2.5.6 *Community benefits of the reserve*

The Senzo'kuhle Nkos'uNodada Communal Trust and its beneficiaries benefit from Nambiti Private Game Reserve in a number of ways, including:

- Through payment of the lease fee by Nambiti Private Game Reserve (Pty) Ltd.
- Ownership and operation of Spingbok Lodge and another undeveloped lodge site.

- Sharing in the profits earned by the operation of the reserve – i.e. hunting, live offtakes and sale of venison.
- Preferential employment within the reserve.

7.2.5.7 *Lease arrangements*

At the time that the 35-year lease was established for Nambiti Private Game Reserve, the monthly lease fee was set at R78,000 for the first year and was to be increased by 5% or based on CPI, whichever was the lower, each year. The current lease fee is set at R105,000 per month. An accountant, appointed by the Senzo'kuhle Nkos'uNodada Communal Trust, manages this money and twice yearly it is distributed into the individual bank accounts of each of the 136 land claim beneficiaries. This amounts to a twice-yearly payment to each beneficiary of approximately R4,632. It is significant that the money is paid to each individual rather than to a single bank account as it ensures that each beneficiary receives an equitable share of the lease fee.

7.2.5.8 *Lodge ownership*

Lodges within Nambiti Private Game Reserve vary in size and the number of beds that they are entitled to provide. The levies that they pay are also determined by their size and the number of beds that they can provide with a levy fee of approximately R15,000 per month being charged for every 10-12 beds.

Springbok Lodge, which is owned by the Senzo'kuhle Nkos'uNodada Communal Trust, is the largest lodge in the reserve being allowed to provide between 50 and 60 beds. In terms of the arrangements that have been established for the operation and management of the lodge, an agreement is in place in which the previous lodge owners will continue to manage the lodge on behalf of the community for a 10-year period. The intention of this arrangement is that during this time the current lodge managers will provide mentorship and training to community members who will ultimately take over the management and operation of the lodge. The lodge, which is currently profitable, provides another source of revenue and employment for the 136 land claim beneficiaries.

7.2.5.9 *Profit share of operations of the reserve*

Profits that are made through the operation of the reserve include revenue generated through hunting, live offtakes and the sale of venison. As a 30% shareholder in Nambiti Private Game Reserve (Pty) Ltd., the Senzo'kuhle Nkos'uNodada Communal Trust is entitled to 30% of the profits generated by the operation of the reserve. However, as the owner of a second lodge site that is as yet to be developed, the communal trust is also obligated to pay the levies for the site. As the site is a 30-36 bed site, this equates to a monthly levy fee of approximately R45,000. The cost of this levy would have to be borne through the operation of Spingbok Lodge, which is currently not a financially viable option. Accordingly, an agreement has been reached with Nambiti Private Game Reserve (Pty) Ltd., in which the levy fee has been waived in return for which the communal trust receives no share in the profits of the operation of the reserve. As the profit share of the communal trust would amount to less than R45 000 per month this is a gain for the community that will enable them to focus on the operations of Springbok Lodge until such time as they are able to develop their second lodge site. In a further effort to offset this loss of income, a payment of an additional R100,000 is made at the end of each year to the communal trust.

7.2.5.10 *Preferential employment within the reserve*

Through resolutions of the directors of Nambiti Private Game Reserve (Pty) Ltd., a policy has emerged in which first preference is always given to beneficiaries of the land claim when employment opportunities arise within the reserve. Lodge owners are encouraged to seek

employees from within the community and if there are no community members who qualify for positions, options for the provision of training are explored. Although this is a fair and equitable process, that ensures preferential employment for the land claim beneficiaries, it has created challenges with other community members living around the reserve. In addition to the land claim beneficiaries, there are a number of other communities living in the vicinity of the reserve. As a result, at times, the preferential employment policy has created problems, as other community members, who also seek employment, feel ostracised by this arrangement.

7.2.5.11 *Biodiversity significance*

Nambiti Private Game Reserve is of significant biodiversity and ecological value, which led to it qualifying to be proclaimed as a nature reserve in terms of the KZN Biodiversity Stewardship Programme. Because of this it contributes to several important targets for biodiversity conservation in KwaZulu-Natal and South Africa.

7.2.5.12 *Contribution towards biodiversity and protected area targets*

The reserve falls on an ecotone between two vegetation zones: Tugela Thornveld in the south and east and Northern KwaZulu-Natal Moist Grasslands in the north and west (Figure 30).

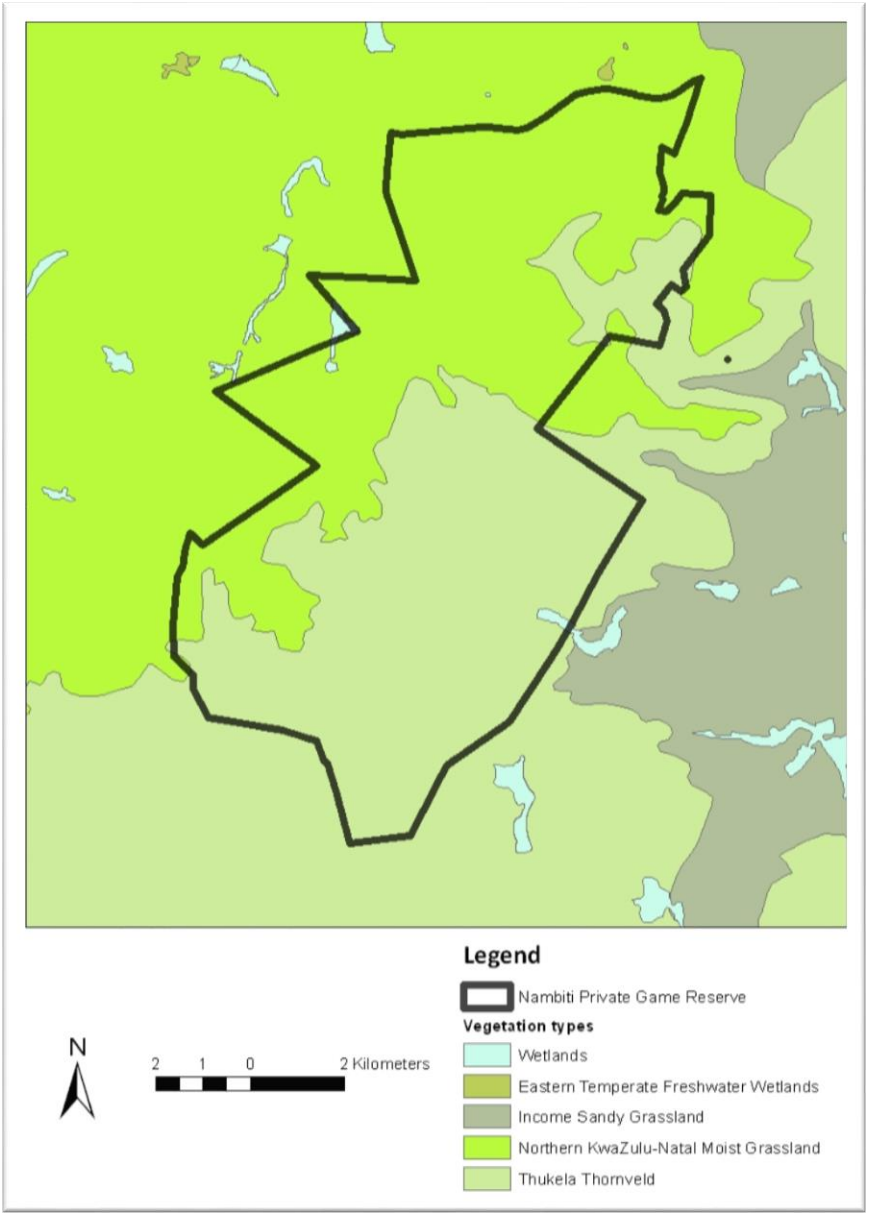

Figure 30. Vegetation types within Nambiti Private Game Reserve.

The valleys and gorges show intrusion of Valley Bushveld. These vegetation types are all currently heavily under-represented in the protected area system and are subject to a number of pressures from agriculture, urbanisation and mining. Accordingly, the protection of the reserve makes a significant provincial and national contribution towards the achievement of protected area targets. There are a significant number of KZN endemic and threatened plant and faunal species at the site.

7.2.5.13 *Role of the KZN Biodiversity Stewardship Programme*

The KZN Biodiversity Stewardship Programme is the primary mechanism for protected area expansion in the province. The programme seeks to support landowners in their conservation efforts through the proclamation of their land, if it qualifies to be proclaimed, and through formal legal agreements between the landowners and conservation authorities. Various incentives are provided to landowners as part of the programme, the most important of which is the provision of ecological expertise and advice to assist in the effective management of the reserve. The purpose of the declaration of Nambiti Private Game Reserve, as outlined in its proclamation documents are:

- To protect ecologically viable areas representative of South Africa's biological diversity and its natural landscapes in a system of protected areas.
- To protect South Africa's threatened or rare species e.g.: Black Rhino, Grey Crowned Crane, Blue Crane, Bald Ibis, Southern Ground Hornbill, Cape Vulture, Lappet-faced Vulture, White-backed Vulture, African Rock Python, Cheetah.
- To create or augment destinations for nature-based tourism. It is used extensively through its ten lodges for ecotourism in the area.
- To manage the interrelationship between the natural environment, human settlement and economic development. The land is owned by a community trust and will ensure sustainable economic return through effective biophysical management of the nature reserve.
- To generally, contribute to human, social, cultural, spiritual and economic development. The area has economic, anthropogenic and intrinsic value to the landowners, lodge shareholders and visitors to the area.

7.2.5.14 *The Black Rhino Range Expansion Project*

The Black Rhino Range Expansion Project is a partnership between WWF-SA and Ezemvelo KZN Wildlife that seeks to increase the numbers and growth rate of Black Rhino through the creation of new populations of rhinos in partnership with landowners. In KwaZulu-Natal, in order to qualify to receive Black Rhino, a property must be a proclaimed nature reserve, managed for the purposes of biodiversity conservation. Nambiti Private Game Reserve was reviewed and qualified for the reintroduction of Black Rhino and a number of Black Rhino were reintroduced onto the reserve in late 2013.

7.2.5.15 *Ecological management of the reserve*

As part of the KZN Biodiversity Stewardship Programme, extensive rangeland condition assessments of Nambiti Private Game Reserve have been conducted. The findings of these assessments indicated that the reserve was heavily over-stocked, which is a particular concern with regard to the conservation of Black Rhino and the need to provide sufficient habitat and forage to the newly introduced animals. In response to this, reserve management instituted a programme to reduce wildlife numbers to within carrying capacity limits through live capture and sale and through the production of game meat from the reserve. It was largely within this context that a decision was made to construct and begin the operation of an abattoir and butchery within the reserve.

7.2.5.16 *Nambiti business operations*

Nambiti Private Game Reserve’s primary business is nature-based tourism, catering to the luxury domestic and foreign markets. In addition, limited hunting, live capture and sale of game, and production of venison are activities that generate income and cover operational expenses.

7.2.5.17 *Operational management*

Nambiti Private Game Reserve employs 54 people in the operational management of the reserve. These people are employed in the following positions:

Position	Number of employees
General Manager	1
Assistant Manager	2
Anti-poaching Unit Manager	1
Rhino Monitor	1
Field Rangers	10
Road maintenance staff	6
Fencing staff	6
Wood cutting staff (for sale of firewood to lodges and removal of invasive species, particularly eucalyptus and wattle)	5
Gate Guards	6
Mechanic	1
Assistant Mechanic	1
Garden maintenance staff	6
Butchery Manager	1
Butchery Assistants	4
Office administrative staff	3
TOTAL	**54**

The number of staff employed in the operational management of the reserve does not include those staff employed individually by the lodges. It should also be borne in mind that the staff are generally not employed at a minimum agricultural labourer wage, meaning that the staff earn considerably more than staff who would have been employed if the properties were still used for livestock production. Nineteen staff were employed at the time that the farms were purchased to create Nambiti Private Game Reserve and this included domestic workers in the houses on the farms (Le Sueur, pers. comm.). This contrasts significantly with the number of staff currently employed in operational management alone, in general, at considerably higher wages.

7.2.5.18 *Tourism*

The game lodges within Nambiti Private Game Reserve, in general, cater to the luxury market. Most lodges include catering although there are some self-catered options. Six of the lodges are 5-star rated, one is 4-star rated, one is an AA Superior Rated Lodge and two are Superior Recommended. Rates in the lodges range from R1,150 per adult per night through to over R5,400 per adult per night, depending on the particular lodge and whether it is peak or off-peak season. The lodges have managed to fill a niche that caters to both a local and foreign tourism market, as more than half of all guests are South African. This would contrast with other luxury wildlife destinations, which are predominantly visited by foreign guests. Nonetheless, the lodges form an important source of foreign income generation for South Africa, as there are significant numbers of foreign visitors.

The lease fee paid by the lodges to Nambiti Private Game Reserve (Pty) Ltd. forms the primary source of income for the operation and management of the reserve.

The lodges employ people in a number of positions, including:

- Lodge managers
- Guides
- Chefs
- Front of house staff
- Waitrons
- Housekeeping
- Garden maintenance.

The lodges employ an average of over 10 staff, meaning that the total number of staff employed at the lodges is over 100 people. It should be borne in mind that the salaries of these staff are considerably higher than those paid in the agricultural sector, even for unskilled staff, as tourism minimum wages are considerably higher than agricultural minimum wages. The lodges thus form a significant source of employment and economic development in the region, which is of considerable significance to the region's local economy and should be viewed in the context of the high levels of unemployment and limited economic opportunities amongst the communities living in the reserve's surrounds. The details of each lodge and its operations are summarised in the Table 29.

7.2.5.19 *Game meat production*

It is logistically challenging to conduct the harvesting activities necessary to reduce animal numbers to within the reserve's carrying capacity and process carcasses through the reserve's abattoir and butchery within the context of the operations of 10 game lodges. Each game lodge is entitled to a minimum of two game viewing vehicles and in the case of larger lodges such as Springbok Lodge, there can be significantly more game viewing vehicles than two per lodge. As a result, during game drives all areas of the reserve are occupied and observed by game viewing vehicles and their passengers. Furthermore, as nature-based tourism is the primary economic activity and revenue generator of the reserve, it is imperative that the culling activities required when harvesting wildlife do not alter the behaviour of the animals in such a way that it negatively influences the visitor experience. Accordingly, culling activities and the harvesting of game are carefully controlled and managed to ensure that no negative impacts arise.

Most culling of wildlife for processing through the abattoir and butchery occurs between the morning and evening game drives conducted from the game lodges. In some instances night shooting takes place but this is generally only when large volumes of animals are being processed at one time. Suppressed weapons are used during all shooting in order to have the least possible impact on the wildlife and tourists within the reserve. As a result, in over three years of operation, no discernible negative changes in behaviour have been observed in any of the wildlife in the reserve. Most animals remain at ease within the presence of vehicles, do not see them as a threat and their behaviour appears to be unaffected by the culling operations. A summary of what has been processed through the abattoir and butchery over the last two years is provided in Table 30.

Table 29. Details of lodges and their operation at Nambiti Private Game Reserve

Lodge	Springbok Lodge	Cheetah Ridge	Idwala Lodge	Nambiti Plains Game Lodge	Lions Valley Lodge	Ndaka Lodge	Esiwini Lodge	Nambiti Hills Game Lodge	Umzolozolo Lodge	Elephant Rock Lodge
Catered suites	30 beds	20 beds	N/Ã	14 beds	20 beds	16 beds	10 beds	18 beds	10 beds	10 beds
Self-catering	N/A	10 beds	12 beds	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Approximate lease fee										
Rates	R1,645 – R2,245	R1,450 -	N/A	R2,050 – R2,650	R2,880	R1,150 – R1,400	R5,450	R2,195 – R4,030	R2,600 – R2,900	R1,725 – R2,215
Occupancy	-	-	100%	65-75%	-	-	15%	-	85%	80%
Percentage of foreign guests	-	-	0%	40%	-	-	>90%	-	40%	40%
Staff	**-**	**-**	**5**	**15**	**-**	**-**	**9**	**-**	**17**	**13**
• Guides	-	-	1	2	-	-	1	-	2	1
• Massage therapist	-	-	0	0	-	-	0	-	1	
• Managers	-	-	1	1	-	-	0	-	3	2
• Reservations	-	-	0	1	-	-	0	-	1	
• Chefs	-	-	0	5	-	-	2	-	3	2
• Barman	-	-	0	0	-	-	0	-	1	0
• Front of house	-	-	0	3	-	-	2	-	0	1
• Waitrons	-	-	0	0	-	-	0	-	0	2
• Housekeeping	-	-	2	3	-	-	3	-	5	3
• Garden	-	-	1	0	-	-	1	-	1	2

Table 30. Game meat processed through abattoir.

Species	2013	2014
Blue wildebeest	117	77
Impala	25	16
Kudu	24	22
Eland	4	7
Warthog	15	15
Zebra	4	11
Hartebeest	1	0
TOTAL	**190**	**148**

The operation of the abattoir and butchery has generated the following income over the last two years:

- 2013 – R900,000.
- 2014 – R840,000

Decisions on whether to conduct live capture activities or to harvest animals for meat production are driven by the value of the animal live or as produced meat at the particular time that animal population management is conducted. For example, with fluctuations in prices of zebra at live sales, it may be more financially sensible to harvest and process them than to sell them live, as zebra skins can fetch up to R 8,000. Venison produced from the abattoir is sold commercially from the butchery and is generally supplied to all lodges. In addition, various cuts of meat and processed meat such as boerewors is sold at an affordable price to the local communities surrounding the reserve. This therefore forms an affordable source of locally available meat for the community.

7.2.5.20 *Live sales*

In recent years, live sale of game has focussed on reducing numbers to within carrying capacity at Nambiti Private Game Reserve. The abattoir and butchery have limited throughput capacity, which has meant that efforts to reduce game numbers have had to include live sales. A summary of what was sold this year and last year is provided in Table 31.

Table 31. Live game sales offtakes.

Species	2014	2015
Blue wildebeest	311	384
Impala		189
Kudu	63	51
Eland	31	33
Zebra	50	49
Giraffe	6	
Blesbuck		100
TOTAL	**461**	**806**

Considerably more animals were sold in 2015 than in 2014 because of extreme drought conditions within the reserve and the urgent need to reduce game numbers to within carrying capacity limits. Live game sales have generated the following income over the last two years:

- 2014 – R861,213.
- 2015 – R1,526,688.

7.2.5.21 *Hunting*

Limited trophy hunting takes place on properties adjacent to Nambiti Private Game Reserve, which are owned by surrounding communities but leased and managed by the Trust and the reserve. Hunting forms one of the management options for animal population management and is an important source of additional revenue for the reserve. Hunting focuses on plains game species and is undertaken in a highly controlled fashion with a strong focus on the ethics of hunting. Through trophy hunting, the reserve has generated the following income over the past two years:

- 2013 – R400,000.
- 2014 – R390,000.

7.2.5.22 *Conclusion*

Nambiti Private Game Reserve is a successful wildlife ranching venture with significant biodiversity values that focuses on nature-based tourism, supplemented with limited hunting, live capture of game and the production of venison. It provides an interesting model of cooperation between a local community and the private sector and is a significant regional employer. The role that the reserve plays in the regional economy should not be underestimated, Ladysmith, the nearest local town, benefits from the reserve's economic activities and its employment of people. The reserve employs a far greater number of people than would be the case if the land were still used for conventional agriculture and, in general, at far higher salaries than minimum agricultural wages. The role that the reserve plays from a biodiversity conservation and socio-economic perspective can be summarised as follows:

- Contribution to biodiversity and protected area expansion targets through proclamation as a nature reserve, the protection of habitat that is under-represented in the protected area system and protection of a number of rare and threatened species.
- Employment of 54 people in reserve operation and management and a further … in the reserve's lodges, giving a total of …
- Income turnover of approximately R460 000 per month or R5.5 million per year through the operation of the reserve. This does not include income generated by the 10 individual lodges.
- Sustainable production of game meat for commercial sale, including the provision of an important local source of affordable meat to the communities living around the reserve.

Nambiti Private Game Reserve demonstrates the value and sustainability of a well-run wildlife ranching venture that integrates biodiversity conservation with significant socio-economic value. The benefits of the reserve include job creation, economic development and improved food security in an area with substantial poor rural communities that suffer from high levels of unemployment and limited economic opportunities.

7.2.6 Key risks to the sector posed by poaching and human-wildlife conflict

7.2.6.1 *Poaching for meat and trophies*

Poaching poses a serious threat to the wildlife ranching industry in South Africa, as it does to wildlife conservation in the country as a whole. The three most serious poaching issues at present are the rhino poaching crisis, the African Elephant poaching crisis and poaching for the bushmeat trade. Since 2008, South Africa has suffered severe rhino poaching due to an apparent upsurge in demand for rhino horn in the Far East (Biggs *et al.*, 2013). This poaching has necessitated a dramatic increase in expenditure on security (Lindsey & Taylor, 2012). Such expenditures has potential to make the keeping of rhinos unaffordable for many landowners and pose a risk that the land available for rhino will decline. Elephant poaching has resurfaced as a major threat in Africa (Wittemyer *et al.*, 2014), though has not yet affected South Africa to a great extent. If/when that threat does spread to South Africa, wildlife ranchers with African Elephants will be affected in a similar way to those with rhinos.

Poaching wildlife for bushmeat is one of the most serious threats to wildlife in many parts of Africa (Lindsey *et al.*, 2013a; Ripple *et al.*, 2015). There has been limited research into the scale of the issue in South Africa and the extent to which it affects the wildlife ranching industry has not been quantified. However, the issue appears to pose a particular problem for wildlife ranchers in parts of Kwa-Zulu Natal (Grey-Ross, Downs & Kirkman, 2010). There is an urgent need to understand the extent and the impact of bushmeat poaching in other parts of the country. Bushmeat poaching has impacted the wildlife ranching industry in Zambia so severely that landowners are shifting to alternative land uses (Lindsey *et al.*, 2013a). Similarly, in Zimbabwe, some conservancies have been severely depleted by poaching for meat (du Toit, 2007).

7.2.6.2 *Human wildlife conflict*

Human wildlife conflict (HWC) has potential to affect wildlife ranching in a number of ways, including *inter alia*:

7.2.6.3 *Undermining neighbour relations and imposing costs on others*

In cases where wildlife ranchers have reintroduced or protected conflict-prone species such as African Elephants, African Lions, Leopards, hyaenas and Wild Dogs there is potential for those species to impact negatively on the livelihoods of neighbouring communities or landowners. Such negative impacts can significantly undermine neighbour relations. While fences can significantly reduce HWC by preventing animals from leaving wildlife ranches, they are not perfect and predators in particular frequently escape. Such conflict, if allowed to proceed without being addressed, has scope to damage neighbour relations and could conceivably even reduce political support for wildlife ranching, were it to occur on a large scale. Consequently, addressing HWC where it occurs is essential.

7.2.6.4 *Persecution of predators and other conflict-prone species*

In some instances, the rise of wildlife ranching has reduced conflict between landowners and predators because of the removal of livestock across large areas. However, in other cases, conflict has actually increased with the development of wildlife ranching because landowners rely on the utilisation of predators' natural prey for their livelihoods. Research suggests that conflict tends to be highest on ranches where the breeding of expensive and wildlife rare species is practiced, where landowners utilise a high proportion of the annual sustainable yield of ungulates, where landowners practice mixed livestock/wildlife ranching and where ranchers are older (Lindsey, Toit & Mills, 2005; Thorn *et al.*, 2012). Where high value ungulates are bred, landowners frequently construct predator-

proof fencing (thus reducing available habitat for large carnivores) and are often highly intolerant of predators. Lethal control of predators is widespread on South African wildlife ranches in places, resulting in significant levels of mortality of several species including vulnerable Cheetahs and endangered Wild Dogs (Lindsey, Toit & Mills, 2004; Marnewick *et al.*, 2007).

The persecution of predators is most ecologically damaging when conducted using poison, which results in major collateral damage in the form of the mortality of non-target species and notably vultures (Ogada, Keesing & Virani, 2012). The persecution of predators by landowners can have serious impacts on the affected species. For example, both Cheetahs and Wild Dogs are severely affected by persecution on ranch lands (Lindsey et al., 2004; Marnewick et al., 2007). Such persecution significantly undermines the conservation value of wildlife ranching where it happens.

Large carnivores also play a key role in regulating terrestrial ecosystems (Estes *et al.*, 2011) and removing these species can cause effects that cascade through the lower trophic levels (Terborgh *et al.*, 2002; Ripple & Beschta, 2004; Estes *et al.*, 2011). Where large carnivores have been removed from the system, a boom in the mesocarnivore populations has been observed in a phenomenon called mesocarnivore release. This increase in mesocarnivores causes changes in predation patterns that affect prey populations (Berger, Gese & Berger, 2008) and habitats (Estes *et al.*, 2011). This can lead to increased predation on livestock or small game species. In North West Province where the large carnivore guild is heavily disrupted, landowners report double the proportion of stock holdings lost to predation when comparted to the Waterberg where the large carnivore guild is largely intact (Thorn *et al.*, 2012). Additionally, 61% of reported predation incidents were attributed to jackals in North West Province compared to 28% in the Waterberg (Thorn *et al.*, 2012). Thus the removal of large carnivores from a system can have serious ecological and economic consequences for the landowners.

Conflict appears to be lower where ranchers have combined to pool land to form conservancies, where ecotourism is the primary land use (Lindsey *et al.*, 2005; Thorn *et al.*, 2012). In such circumstances, large predators have often been reintroduced and wildlife-based land uses on private land make a significant contribution to their conservation (Hunter *et al.*, 2007).

8 KEY TOOLS TO MAXIMIZE THE ECONOMIC, SOCIAL AND CONSERVATION VALUE OF WILDLIFE RANCHING

8.1 Current strategies to increase the conservation contribution of wildlife ranching, their prevalence and impacts – including conservancies and stewardship programmes.

8.1.1 Conservancies

8.1.1.1 *The definition of a conservancy*

There is some variability in the definition of a conservancy as pertaining to private land. The conservancy concept covers a range of scenarios, from a situation where a collection of ranches/farms in a given area cooperate on some level to manage natural resources under the banner of a common identity, to a fully integrated model where adjacent properties are pooled to form a single management unit. In conservancies, the habitat does not necessarily have to be threatened (although it often is), and the landowners may derive no commercial benefit from the natural resources. An example of this is the Endangered Wildlife Trust's Riverine Rabbit Conservancy and Stewardship Project (www.ewt.org.za/DCP/stewardship.html), where the point of the conservancy is to protect the habitat of this highly threatened species. In some cases, such as on the commercial farmlands of Namibia, properties within the conservancy may be interspersed with land that is not part of the conservancy (Lindsey *et al.*, 2013b).

A slightly stricter definition is provided by Krug (2001), who states that a private conservancy consists of a group of commercial farms where neighbouring (or nearby) landowners have pooled natural and financial resources for the purpose of conserving and sustainably utilising wildlife. These farms may be wildlife ranches, livestock farms, or mixed wildlife-cattle ranches. Members of the conservancy may practise normal farming activities alongside biodiversity conservation, which itself may be commercial. The wildlife is managed to a greater or lesser degree jointly through a committee (i.e. co-managed), and is based on a constitution, the form of which may differ among conservancies. Any benefits derived from the wildlife may be shared between conservancy members according to the constitution. Examples of this kind of conservancy are found among the commercial conservancies of Namibia. These areas may lack internal wildlife fencing, but may retain livestock fencing so that the landowners are able to keep control of their cattle (Lindsey *et al.*, 2009b).

A narrow definition of a conservancy is provided by Lindsey *et al.* (2009b), who stated that a conservancy is a wildlife area comprising multiple ranches with all internal fencing and livestock removed, but retaining an external perimeter fence. Examples of this are found in the conservancies developed in the south-eastern Lowveld region of Zimbabwe.

What follows are descriptions of four models of conservancies in southern Africa, with the information presented having been obtained from the literature and from interviews with Raoul du Toit (Lowveld Rhino Trust) and Laurie Marker (Cheetah Conservation Fund), both of whom have extensive experience with the development and management of conservancies in Zimbabwe and Namibia, respectively.

8.1.2 Zimbabwe Lowveld private conservancies

8.1.2.1 *Introduction: the Savé Valley Conservancy*

A detailed description of the history and development of the Savé Valley Conservancy (SVC), the first of five conservancies established in Zimbabwe during the 1990s, can be found in Lindsey *et al.* (2008). In brief, the area that became the SVC (situated in the south-eastern Lowveld region) comprised individual cattle ranches for decades leading up to 1990. There had been growing recognition, however, that in such dry and marginal areas, the sustainable use of wildlife might outperform pure livestock ranching (Mossman & Mossman, 1976; Cumming, 1995), and during the early 1980s, an increasing number of landowners in the Zimbabwean Lowveld started experimenting with wildlife as a land-use. A custodianship scheme was developed between the government of Zimbabwe and these landowners, whereby 20 Black Rhinoceroses were introduced onto SVC, and this led to further initiatives, facilitated by technical and funding support from the Beit Trust via WWF, to increase the area available to these rhinos. After considerable effort was made to convince the landowners of the potential viability of a conservancy, SVC developed from these beginnings, partly to create larger areas for this population of rhinos and partly stimulated by a severe drought which had devastating effects on livestock and livestock ranching. In 1991 a constitution was signed by 18 landowners whereby they would manage wildlife resources cooperatively but maintain ownership rights over their land. By the time the SVC was fully operational, it comprised 21 properties and covered an area of ~3,440 km^2.

8.1.2.2 *Funding for the development of the Savé Valley Conservancy*

The creation of the conservancy required the construction of a double perimeter fence around the entire perimeter (as a veterinary precaution against FMD), which was a very costly exercise given that the perimeter was 350 km long. The fence was funded by the Beit Trust with the primary goal of conserving the rhinos, but with the proviso that the rest of the costs of setting up the conservancy were paid for by the landowners. These costs, which were mainly incurred by the necessary removal of all cattle (another veterinary requirement) and the introduction of wildlife species (in total, 3,675 animals from 13 wildlife species, including 553 elephants, were introduced), were also considerable and had to match the funds provided by the Beit Trust. Under the constitution of the conservancy, landowners had to contribute funding on a pro-rata basis according to the size of each property in order to cover these costs. The capital investment requirements for developing the SVC were, therefore, very high, and were only made possible by the external contribution of the Beit Trust.

8.1.2.3 *Other conservancies in Zimbabwe*

Several other large conservancies developed in Zimbabwe, including the Gwayi River (920 km2), Bubiana (1,387 km2), Bubye Valley (3,440 km2), Chiredzi River (1,080 km2), Midlands and more recently, the Nuanetsi Conservancy.

8.1.2.4 *Regulation of the Zimbabwean conservancies*

There has never been a regulatory body for conservancies in Zimbabwe. At the time when the conservancies were being developed, the Wildlife Producers Association was concerned that the conservancies would create political challenges, so there was no push for any regulation. As a result, there was no national policy, which meant that there was never really any real political acceptance for the conservancy model. In addition, their development coincided with increasing political tension over the issue of imbalanced land ownership.

8.1.2.5 *Barriers to developing the conservancies in Zimbabwe*

1) Veterinary issues: African Buffalo were considered very important for both trophy hunting and ecotourism, as well as the ecology of the area, but at the time, Zimbabwe was exporting beef to European Union and beef farmers were concerned about the spread of foot and mouth disease (FMD), which would have major detrimental impacts on their ability to export meat to Europe. So there was a lot of opposition to introducing African buffalo initially (from both the cattle producers and the veterinary authorities), and they had to be shown that wildlife on this scale was a more productive option for the country.
2) The political situation in Zimbabwe and the policies of land reform were starting to have an impact on farming around the time when the conservancies were being developed. There was a realisation from the outset among the main architects of the conservancies that there needed to be a lot of community outreach and engagement for any chance of success. However plans for such interventions were rapidly over-taken by the 'fast-track' land seizure programme in April 2000. Some steps were taken in that direction, though to a relatively limited degree and arguably at too slow a pace. Thereafter, large swathes of several conservancies were settled by subsistence farmers or taken over by politically connected elites. In some cases, such as Chiredzi River and Bubiana conservancies these changes resulted in the virtual end to wildlife as a land use, and in all cases, there was heavy poaching for bushmeat following the seizures and the removal and/or disruption of anti-poaching efforts (Lindsey *et al.*, 2011).
3) Conservancy management and governance: the leadership and chairmanship of conservancies was critical. The conservancies with the strongest leadership fared best during the land seizures due to their improved relative ability to negotiate with government and to retain cohesive management structures.

8.1.2.6 *Ecological benefits of developing conservancies*

The large scale of the Zimbabwean conservancies allowed for the effective conservation of a wider diversity of species than would be possible in smaller land units (Lindsey *et al.*, 2008). This large scale can enhance the resilience of the area to ecological shocks such as droughts by enabling herbivores to make use of patchy primary production resulting from sporadic rainfall, and by enabling the re-establishment of functional predator–prey relationships. Larger areas are more able to support viable populations of wildlife than isolated game ranches, and can host larger populations that are more resilient to stochastic events and are less likely to require augmentation or further reintroductions, and do not require management intervention to prevent inbreeding. The Zimbabwean conservancies now host wildlife of significant national and international value. For example, the conservancies current host Cheetahs, hundreds of African Lions and Wild Dogs, several hundred Black Rhinos and thousands of African Elephants (Rosemary Groom, African Wildlife Conservation Fund, personal communication).

8.1.2.7 *Financial benefits of developing conservancies*

Before the negative intervention of the Zimbabwean government's land reform policies, the conservancies of Zimbabwe were succeeding financially. The large size of conservancies permitted the reintroduction of large, charismatic species, which were key revenue drivers for tourism, and also brought into play the economy of scale that reduced management costs for each landowner (Lindsey *et al.*, 2008).

Unpublished research conducted by the economists Anna Spenceley and Jon Barnes, investigated the contribution of rhinos to wildlife based land-use, and whether they were economic assets or liabilities. They confirmed that SVC had achieved self-sustaining rhino conservation projects, and

that rhinos were paying their way. This meant that tourism was strong enough in SVC to allow for a reduction in donor funding; the ranchers had obtained economic viability through conversion to wildlife production.

8.1.2.8 *Social benefits*

The conservancies generate significant numbers of jobs and in future, when political and economic stability return to Zimbabwe, the scope for a greatly elevated tourism industry as a result of the conservancies is significant. Negotiations are underway regarding the integration of communities into the ownership and management of the conservancies. If this process can be achieved in a way that retains the existing expertise and investment, then the Zimbabwean conservancies, in spite of the multitude of challenges faced during the last few years, have potential to form sustainable and extremely effective examples of wildlife-based land uses.

8.1.2.9 *The main revenue drivers*

Prior to the onset of the political instability in Zimbabwe (pre-2000), SVC had a mix of properties conducting different land uses: some properties within the conservancies were doing trophy hunting while others were converting totally to ecotourism (they were getting out of hunting). It appeared that non-consumptive practices were more profitable once ranchers were established and registered with tourist agencies. Economic forecasts for converting cattle ranches to wildlife ranches that had been made before developing the conservancies were fully on track (Price Waterhouse, 1994). It is likely that most (if not all) of the land owners in the conservancies would have moved over to ecotourism because of the economic incentives. That being said, trophy hunting provided an essential entry point for ranchers into wildlife-based land uses during the beginning phases when wildlife populations were low and the infrastructure needed for ecotourism had not yet been developed.

8.1.2.10 *Meat production on the conservancies*

When the conservancies were started, there were accusations from the political level that the development of conservancies would undermine food security in Zimbabwe. This, however, did not take into account the fact that high income generating farming activities earn more money than meat production, particularly in marginal areas, and that this money can be used to buy in food for the country when necessary. For example, the number one earner in Zimbabwean agriculture at the time was tobacco. You cannot eat tobacco, but you can use the money generated from tobacco sales to buy things for the country. This principle can be applied to wildlife tourism and the considerable money that can be generated from the multiple consumptive and non-consumptive uses to which it can be put.

With regards to meat production, direct comparisons for African range lands had shown that cattle generated more meat than wildlife, but the overall opportunities generated by wildlife (which included ecotourism and trophy hunting in addition to meat production) were greater than from cattle (Cumming, 1995). Yet there is significant meat production potential, and more could be done in this regard, although disease issues would need to be dealt with.

8.1.2.11 *Negative impacts of conservancies*

There were few downsides to the development of the Lowveld conservancies. But issues that did arise were:

1) One cause of minor friction between landowners resulted from the different needs of consumptive and non-consumptive land uses. Trophy hunting and ecotourism can clash if

not managed properly, particularly when there has been restocking of wildlife. Landowners who have spent money on animals may not like it if hunters shoot those same animals.

2) The number of elephants brought in at the start may have been too many, and there was an imbalance in reproductive herds with too many cows and calves, which led to very high rates of population increase. Apart from the risk of habitat destruction, there were also risks of human wildlife conflict (HWC) due to the high densities of humans on the boundaries of the conservancies.
3) Following disruption of the conservancies during the land seizures there was widespread destruction of the perimeter fences. As a result of these changes, there has been widespread and severe human-wildlife conflict around some of the conservancies. Repairing the fences has not been possible due to the lack of security surrounding tenure of the conservancies and in some cases due to the withholding of hunting permits by government, which imparted severe financial challenges for the land owners.

8.1.2.12 *The long-term success of Zimbabwean conservancies*

Chiredzi River and Bubiana conservancies have become largely defunct as a result of the settlement of large numbers of subsistence farmers in them and resultant displacement and destruction of wildlife and wildlife habitats. SVC remains under significant political pressure and Gwayi River Conservancy is struggling with high levels of poaching, lack of wildlife management capacity and lack of investment following the removal of the original owners. We do not discuss this further here, other than to say that there is no evidence that the failures were due to anything other than politics of land reform and the huge pressures that were imposed on the conservancies through this process.

8.1.3 Namibian commercial conservancies

8.1.3.1 *Introduction: commercial conservancies in Namibia*

Namibia has two types of conservancy: commercial and community. We first deal with the commercial conservancies, which comprise freehold agricultural land, and are defined by the Conservancies Association of Namibia (CANAM) (http://www.canam.iway.na/index.htm) as legally protected areas comprising groups of bona fide land-occupiers practicing co-operative management based on:

1) A sustainable utilisation strategy;
2) Promoting conservation of natural resources and wildlife;
3) Striving to re-instate the original biodiversity with the basic goal of sharing resources amongst all members.

The first commercial conservancy in Namibia (Ngarangombe Conservancy) was established in 1991, and there are now 22 in Namibia. These conservancies are all situated in commercial farming areas and all comprise voluntary associations that came into existence through the concern and dedication of the landowners. Conservancies are on open land with no fencing, even around the perimeter.

8.1.3.2 *Regulation of commercial conservancies in Namibia*

There is no government regulation of commercial conservancies in Namibia; the only promulgated legislation on conservancies pertains to community conservancies. Instead, members of commercial conservancies adopt constitutions (neighbour agreements), which are different for every conservancy; so they regulate themselves. To initiate a commercial conservancy, willing farmers apply to the government for a permit that allows them to conduct trophy hunting anywhere within

the conservancy area. All landowner members of the conservancy then have rights to hunt anywhere within the conservancy, including other landowner properties.

Offtakes of game are not governed by government either, unless the species is protected by law (protected game species include Red Hartebeest and Eland, as well as species like Lions and Elephants), in which case the trophy hunter has to obtain permits. There is, however, ordinance under review at present and there is a hope that the new legislation to be promulgated in the near future will make provision for the formal registration of the existing conservancies, situated on commercial farmland.

8.1.3.3 *Land use types on commercial conservancies*

Many conservancy members are mixed farmers with integrated systems (Laurie Maker, pers. comm.). They keep livestock alongside wildlife, and they manage their livestock through internal cattle fencing that allows the wildlife to move freely. Farmers keep livestock because they like them and because it allows for a mixed grazing system. Livestock also plays an important role in the economy of Namibia. If there is a drought, farmers can reduce livestock stocking densities and manage wildlife better. In general, conservancy members are more conservation oriented than finance oriented; they like to see their wildlife, but are not governed by the potential financial gain that could be obtained from it. Many farmers sell cattle but utilise wildlife for food, including food for farm workers.

Many conservancy members also include some form of tourism land use on their properties. This can be hunting, ecotourism or both. They may separate activities to different times of year, or they may have neighbours doing one activity while they do another. An ecotourism operator may allow a neighbour to hunt on his property, and get paid part of the hunting package and also get the meat. There are many bed and breakfast establishments, and other guesthouses scattered around, even just on cattle farms, which have lots of wildlife anyway and attract tourists.

8.1.3.4 *Advantages of forming commercial conservancies*

The philosophy around commercial conservancies is currently more focussed on ecology and ecosystem health rather than money; so the ecology and health of wildlife is considered more important. There are no game fences, even on the peripheries, so animals are able to move around unimpeded; in the arid Namibian environment this is very important in preventing food shortages during dry periods. The ecological advantages described in section 8.1.2.6 apply equally here for the large open areas of commercial conservancies.

Commercial conservancies are not really economic units at the moment. In comparison, individual game farmers are more set on generating income from game, but they are not as well equipped to manage large areas for conservation as conservancies.

Trophy hunting was taking place on the land before conservancies started anyway, and the landowner members of the conservancies keep livestock as a source of income, but the game brings in additional money. Conservancy agreements allow the sharing of trophy hunting fees if clients are brought onto a neighbour's land.

In terms of financial comparisons between conservancies and single owner wildlife ranches, Barnes and de Jager (1995) showed that commercial conservancies required a lower initial capital investment per hectare than wildlife ranches and generated higher financial rates of return and higher economic rates of return than wildlife ranches.

8.1.3.5 *Barriers to forming a conservancy*

The only barrier to developing well-functioning commercial conservancies in Namibia is (sometimes) the people making up the conservancy. Neighbours who do not follow the guidelines of the constitution can make it difficult to run a conservancy well. For example, if one farmer is overhunting or does not have a conservation philosophy, it becomes problematic for the other members. Although this is not common, there have been cases where conservancies have fenced farmers out when they are not cooperating.

8.1.4 Namibian community conservancies

8.1.4.1 *Introduction: community conservancies in Namibia*

Community conservancies in Namibia are legally entrenched natural resource management projects managed under the guidance of a formal, national level Community Based Natural Resource Management (CBNRM) programme (NACSO, 2013). The aim of community conservation is to manage natural resources sustainably and generate returns for rural people. The first community conservancy was established in Namibia in 1998, and by 2013, there were 79 registered across the country, covering 20% of Namibia and half the communal land of the country.

8.1.4.2 *Regulation of community conservancies*

Unlike private commercial conservancies, community conservancies in Namibia are regulated by the government. The Nature Conservation Amendment Act of 1996 devolved wildlife use and the management of related tourism and hunting activities to communal area residents through the establishment of conservancies (NACSO, 2013). Communities are able to register their conservancies with the Ministry of Environment and Tourism (MET) once they have obtained approved boundaries of the area to be used, developed a legal constitution providing for the sustainable use of game, and defined a committee to represent the members. Conservancies must operate according to a wildlife management plan and a plan for the equitable distribution of returns to members, which includes all adult residents within the conservancy.

8.1.4.3 *Land use types*

Due to the variety of charismatic species of wildlife that can be seen on many community conservancies, ecotourism is prominent, and joint-venture tourism lodges have been extensively developed in conjunction with private sector operators (NACSO, 2013). These joint-ventures generate significant community conservation returns at a national level, although there are many conservancies without tourism activities. Joint-venture lodges are particularly important in providing employment and household income, and create a variety of in-kind benefits to employees, such as food and housing, access to transport, medical assistance, education materials, equipment and bursaries.

Trophy hunting concessions in communal areas are also very important, with many conservancies getting their start through this activity. Without trophy hunting, some conservancies would not have been viable and probably would not have been established; trophy hunting is able to generate cash and in-kind benefits shortly after the registration of a conservancy, while joint-venture tourism lodges generally take longer due to more complex agreements and high development costs. Trophy hunting also continues to provide critical finance to cover the costs of conservation activities. Additionally, hunting is often possible in areas with little or no tourism potential due to their remote location or lack of scenic beauty. Importantly, trophy hunting also produces meat from hunted animals, which is a direct return to the communities ranked highly by conservancy members.

Other activities include own-use harvesting of wildlife, which supplies meat for traditional authorities and individual households, and shoot-and-sell harvesting, which allows the harvesting of meat from surplus wildlife stocks for sale to butcheries (NACSO, 2013). Live capture operations are also starting to develop where wildlife populations have built up substantially.

In addition to these activities that are commonly practised on wildlife ranches, conservancies are also making use of sustainable harvesting of flora for timber and non-timber products, including bioprospecting, as well as fish, which are either harvested as a source of food or used in sport angling.

8.1.4.4 *Ecological and financial benefits of community conservancies*

Community conservancies have been credited with supporting the recovery of wildlife populations and have led to widespread environmental restoration. For example, Namibia's Elephant population has grown from 7,500 to 20,000 since 1995, while the free-roaming Lion population has expanded outside national parks (NACSO, 2013).

In terms of financial benefits, community conservancies contributed N$3.9 billion to Namibia's net national income between 1991 and 2013, and generated N$72 million in returns for local communities during 2013 alone (NACSO, 2013). Currently, joint-venture tourism generates 43% of total cash income and in-kind benefits across all conservancies, while trophy hunting generates 31% and meat from trophy hunting 9%. Community conservancies have also facilitated the creation of 6,472 jobs.

8.1.4.5 *Challenges for community conservancies*

Two of the biggest perceived threats to community conservancies are the rise in international wildlife crime that has resulted in widespread poaching of species like Elephants and rhinos, and the resulting pressure on the controlled legal use of wildlife populations. If the consumptive use of wildlife is curtailed by the international community because of a reaction to wildlife crime, the community conservancies would face significant losses in revenue.

Other challenges include: weak governance and mismanagement of funds, human-wildlife conflict (HWC), ensuring that wildlife harvesting is well controlled and sustainable.

8.1.5 Conservancies in South Africa

8.1.5.1 *The conservancy model in South Africa*

The South African conservancy model is quite different to those described above for Zimbabwe and Namibia, and there is very little published information on the extent to which conservancies are developed for commercial purposes, or on how effective they are for securing ecological benefits. The National Association of Conservancies and Stewardship South Africa (NACSSA) define a conservancy as a registered voluntary association between land users/owners who cooperatively wish to manage their natural resources in an environmentally sustainable manner without necessarily changing the land use of their properties (http://www.nacsa.org.za/index.html).

In 2011, there were over 600 proclaimed conservancies in South Africa, and they were becoming increasingly popular as management instruments on private land (Downsborough, Shackleton & Knight, 2011). There are currently six associations representing rural, urban, informal settlement and industrial conservancies covering up to three million hectares. The majority of these conservancies

are not game reserves or groupings of wildlife ranches (as seen in commercial conservancies in Namibia) (Downsborough *et al.*, 2011), and most obtain little to no commercial benefits from the wildlife they protect. They have no formal regulations governing their management, which is left to the constituent members, and they have no legally binding agreements, although they are required to register with provincial nature conservation authorities. There are few guidelines to direct their establishment and members must develop their own constitution, which includes a mission statement and a broad outline of proposed management activities. The voluntary nature of conservancies in South Africa and a lack of scientifically defensible guidelines means they fail to meet the expectations of many conservation professionals with regards to the benefits they bring to conservation (Downsborough *et al.*, 2011).

8.1.5.2 *The occurrence of conservancies amongst surveyed wildlife ranches*

Forty-six out of 205 (22%) surveyed wildlife ranchers indicated that their properties were part of a conservancy. Sixteen of the respondents whose properties were not part of a conservancy indicated that they would like to be part of one or would consider it under the right circumstances, but most of these were not in a position to join or create a conservancy, either because there were no other viable neighbours with whom they could work, or no interest from their neighbours.

Out of the 46 ranches that were part of conservancies, 45 had perimeter fencing while only one did not. Thirty-eight (38) of the fenced properties had game fencing (either bonox or stranded wire), of which 24 were electrified, while 8 had cattle fencing, which is known to be quite porous to wildlife. Overall, most properties that were part of conservancies were not actually open to other surrounding ranches because they were enclosed by game fencing.

8.1.6 Case study: Zululand Rhino Reserve

8.1.6.1 *The history and development of Zululand Rhino reserve*

The models used by private commercial conservancies described for Zimbabwe and Namibia above do not, as a general rule, apply to conservancies in South Africa. There are, however, private game reserves in South Africa that fit the models for Zimbabwe or Namibia, even though they do not call themselves conservancies. One such example is the Zululand Rhino Reserve (ZRR), and below is an account of the history and development of this game reserve, as described by the founder of the reserve, Clive Vivier.

ZRR, which was established in 2005, is an endangered species, big five game reserve rather than a conservancy, comprising 17 individually owned properties and covering a total area of 23,800 ha. These landowners have a common environmental management plan that is run by a management team, who control the running of the reserve. The management team manages alien plants, monitors the grazing, manages the burning programme, manages animal off-takes (in conjunction with the directors), and is responsible for security. Each property owner, however, retains control of his/her own farm, and is required to conduct maintenance on his own roads, water reticulation, water points, house and lodge. Landowners also remove alien vegetation, control soil erosion, conduct veld management and conduct burning (with advice provided by the reserve management).

The initial aim of ZRR was to preserve some pristine wilderness of KZN. The land was a block comprising mostly cattle farms with some game, but had until recently been mostly pristine; as a result it could be easily rehabilitated. ZRR started with one 1,000 ha property, from where they joined with two neighbours to get up to 3,000 ha. After determining viable boundaries for a conservancy, other landowners were approached to agree to a basic constitution to form a

conservancy, which was quite simple to set up because it involved limited management requirements.

Around 2005, Ezemvelo KZN Wildlife was looking for partners in the Black Rhino range expansion programme, but they required potential properties to have a minimum of 20,000 ha to receive animals. In order to qualify as a Black Rhino range expansion programme partner, the founders of ZRR decided to approach the other conservancy members to work together to form a reserve, which required the removal of all internal fences. Before removing the fences, all the game species were counted on each property in order to provide equity for landowners; landowners obtained shares according to the number of game they already had.

Arranging all this, however, and putting together a better constitution required a lot of meetings, and the founders made a point of not trying to force the landowners into a pre-arranged plan. Instead, all the landowners were included in the process of drawing up the constitution, and this transparency and inclusiveness was a vital part of the success. At the outset, landowners were allowed to practice whatever land uses they chose; some were conducting hunting, while others were doing non-consumptive activities. The only proviso was that their activities must not negatively impact others. Respecting the needs of every landowner, and making sure they were not forced to give up their rights to their property was a very important part of the process.

To make the management of the reserve more efficient, responsibility for security was devolved to central management and a manager and administrator were hired. Over time, the manager became responsible for ecological decisions, although the landowners remained responsible for carrying these decisions out. This ensured that activities such as burning and erosion control were coordinated. Game offtakes were allocated according to how many animals landowners had put into the reserve, but all landowners had a say in the decision processes.

The perimeter fence, which became necessary to allow “Big Five” species to be introduced onto ZRR, was funded by the landowners themselves. Costs were kept down because everyone had perimeter fencing anyway, but where there was a need to put up more fencing or where it needed improving (such as to make it predator proof), a fencing levy was introduced. Landowners paid on a per hectare basis, even those in the middle of the reserve.

8.1.6.2 *Positive outcomes of developing ZRR*

In the year 2000, farm values were R1,500/ha; in 2015 the land is valued at R25,000/ha. This means that total reserve area of 23,000 ha is now worth over half a billion Rand.

By developing the game reserve, the quality of life of the employees living within the area was improved. The original land area (such as 23 cattle farms of 1,000 ha each) would have employed a maximum of about 50-70 people; ZRR now employs nearly 400 people. So there has been massive job creation. Many of the jobs are relatively high paying (game rangers, hospitality staff etc.), and salaries are higher than they were before development of the reserve. The reserve also works with local communities: they have built two creches, have a soccer team, and try to employ solely from our neighbouring communities.

The turnovers of the properties are estimated to have increased between 10-20 fold. Whereas before farms were turning over a few hundred or few thousand cattle, now they are bringing in 5,000 tourists and turning over R20 million. It has developed a huge economic engine for the region. Occupancy rates of some of the established lodges are running at 90%.

In terms of conservation benefits, ZRR now has the Big Five, and a full complement of native predators, including the recently reintroduced Wild Dog. Even though these carnivores cost the reserve a lot of money because they kill large numbers of game, the landowners have accepted these costs because of the desire to conserve biodiversity and because the Wild Dogs are a draw card for ecotourists.

The development of the farms has been an evolutionary process. Many landowners started with cattle and a few game, then moved on to doing some hunting. After finding that wildlife pays well, they introduced more game and increased the amount of hunting. With more hunters came the need for better accommodation, which then led to the development of ecotourism. Once non-hunting tourists started coming all year round, and this was found to pay better than hunting, all hunting ended. This process took about eight years, with hunting terminated in ZRR altogether in 2014. In some cases, landowners who wanted to continue hunting were bought out because it was not considered viable to having hunting and ecotourism on the same reserve; having hunters shooting at animals at the same time that ecotourists are out game viewing is a potential cause of conflict, especially when the ecotourism side of the reserve generates the most revenue.

8.1.6.3 *Barriers to forming the reserve*

People and personalities were the big challenge to the development of ZRR. It is understandable that landowners who have occupied their farms for 50 years want to keep control of them. It took 17 meetings to get all people to buy in. A second challenge occurred during the changeover period when people were switching from cattle to game, because there was an initial drop in turnover; hunting filled the financial gap to some degree at this point, while some landowners had to live off saving from cattle savings for a while during the lean period.

8.1.7 Biodiversity Stewardship in South Africa[4]

Section 24 of the Bill of Rights within the Constitution sets in place the environmental rights clause. This clause guarantees 'everyone the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.'

South Africa has much valuable biodiversity outside of protected areas, but this is disappearing at an alarming rate. It has been recognised that in order to effectively conserve South Africa's biodiversity, conservation efforts must focus outside of formerly protected reserves, considering 80% of the country's most scarce and threatened habitats are privately owned. It is clearly not possible for government to purchase all the land identified as high priority in terms of habitat or threatened ecosystems to add it to our system of state-owned protected areas. This requires a new approach to conservation extension and a shift away from reactive extension (i.e. responding to problems and enforcing regulations and permitting procedures) to proactive extension (i.e. engaging with a landowner before a problem is created) where stewardship is encouraged. Biodiversity Stewardship provides a new cost-effective way for government to carry out its existing conservation mandate, by getting landowners to commit to conserving and managing the biodiversity on their own land. The new biodiversity stewardship approach provides a small number of simple, legally-aligned options nationwide and ensures that landowners benefit from participation. These tools offer various types of incentives to offset any potential costs incurred by landowners associated with conservation commitments. The Biodiversity Stewardship concept is a tool for achieving these conservation goals,

[4] This section was prepared by Dr. Ian Little, The Endangered Wildlife Trust

where positive, proactive partnerships and cooperative management are the key ingredient of natural resource management, and custodianship and responsibility for natural assets is maintained in private / communal ownership.

The Biodiversity Stewardship South Africa (BSSA) programme was an initiative of the national DEA in partnership with key conservation organisations. The BSSA programme was conceptualised by a coalition of non-governmental organisations during an exploratory workshop in 2005. The EWT then approached DEA's Directorate: Biodiversity Conservation with a proposal to develop the stewardship concept further. A Memorandum of Agreement was signed by the two parties and the EWT started Phase 1 of the programme in August 2006.

The BSSA is an umbrella programme that provides a powerful new tool to assist national and provincial government in fulfilling its mandate to conserve biodiversity outside of state-owned protected areas, in terms of the National Environmental Management: Protected Areas (Act 57 of 2003) and Biodiversity (Act 10 of 2004) Acts. The programme helps to implement provincial conservation plans through a consistent, national, landscape-scale approach to stewardship. It also assists government in meeting the targets set out by the National Spatial Biodiversity Assessment and the National Biodiversity Framework (NBF). The BSSA's goals are aligned with those of DEA's National Protected Areas Expansion Strategy and Community-Based Natural Resource Management (CBNRM) programme.

Biodiversity stewardship thus plays a central role in the implementation of the National Protected Area Expansion Strategy (NPAES) and the achievement of South Africa's protected area targets. It can also play a critical role in securing threatened ecosystems, in most of which establishment of large traditional state-owned protected areas is no longer feasible. Biodiversity stewardship provides a cost-effective mechanism for government to carry out its conservation mandate and achieve biodiversity and protected area targets.

Biodiversity Stewardship provides a number of advantages over other existing programmes for habitat protection. These other options include conservancies, private nature reserves, natural heritage sites and biosphere reserves but none of these offer site security, management obligations or an auditing process. Further, all of these existing options were based on landowner willingness alone and offered no long-term conservation security in the form of mutually beneficial collaborative partnerships which the Biodiversity Stewardship programme so effectively offers.

8.1.7.1 *What is Biodiversity Stewardship?*

Stewardship refers to the wise use, management and protection of that which has been entrusted to you. Within the context of conservation, Biodiversity Stewardship means wisely using natural resources that you have been entrusted with on your property, outside of the formal protected areas network, to ensure that natural systems, biodiversity and the ecosystem services they provide are maintained and enhanced for present and future generations. The programme allows for the formal proclamation of protected areas within a number of specific categories from Nature Reserve as the most secured option followed by Protected Environment, Biodiversity Agreement and Conservation Area. Nature Reserves include compulsory signing of the agreement and associated management plan into the property title deeds and agreements should be for 99years, these sites need to qualify based on their biodiversity value and usually have extensive limitations on agricultural practices. Following this are Protected Environments which usually include a 30 year agreement and voluntary title deed inclusion. This category is designed to maintain biodiversity conservation while at the same time allowing continued agricultural production based on a negotiated management plan which favours both outcomes. The two lower categories are

essentially entry level categories. These categories are uniform across the provinces but have been modified to fit provincial targets and strategies.

8.1.7.2 *The goal of Biodiversity Stewardship*

The primary goal of biodiversity stewardship is to secure biodiversity features of both immediate and long-term value through voluntary agreements with private and communal landowners/users. In many cases the rationale for encouraging conservation on private land is to conserve biodiversity in threatened ecosystems, where habitat loss is an ever-present threat. Habitat loss can often be most effectively tackled by spending effort on securing these sites.

8.1.7.3 *The Vision of Biodiversity Stewardship*

- To ensure that private and communally-owned areas with high biodiversity value in the province receive secure conservation status and are linked to a network of other conservation areas in the landscape.
- To ensure that landowners/users who commit their property to a stewardship option, will enjoy tangible benefits for their conservation actions.
- To expand biodiversity conservation outside of formally protected areas by encouraging commitment to, and implementation of, good biodiversity management practice, on private and communally-owned land.

8.1.7.4 *Principles of Biodiversity Stewardship*

- Landowner-focused extension – Biodiversity stewardship agreements between landowners and conservation authorities must be backed up with resources to ensure that there is extension capacity within those authorities to inform, help and support landowners who enter agreements on an ongoing basis.
- Acknowledging people's needs – Extension work can only be effective if it is based on an understanding of the attitudes and motivations of those who own, live and work on the land, striving to meet their needs while practising better conservation management.
- Focus on biodiversity priorities – Resources, time and energy must be focused on areas already identified as priorities, drawing on spatial information available from DEA, the South African National Biodiversity Institute (SANBI) and the provincial conservation authorities.
- Biodiversity as the bottom line – Decisions on conservation investment should be defensible and based on the biodiversity value of the land, not on ownership, political affiliation or economic status.
- Site security – In order to maximise use of the state's resources and guarantee ongoing conservation, the legal status of land with high biodiversity value must be secured through biodiversity stewardship agreements between landowners and conservation authorities.
- Building co-operation – Co-operation across property boundaries is often necessary in landscape-scale conservation management, e.g. in controlling fires, alien invasive species and flooding rivers. Partnerships need to be built between conservation agencies, the state, NGOs, private landowners and communities, based on mutual trust.

8.1.7.5 *The key advantages*

- It provides a cost effective conservation mechanism for expanding protection over important biodiversity areas in production landscapes, in many cases without taking land out of agricultural production;

- It contributes to national targets for protecting threatened ecosystems, expanding protected areas, maintaining the diversity and integrity of natural systems and landscapes, and the provision of vital ecosystem goods and services;
- It provides political, social, economic and environmental benefits.

8.1.7.6 *In summary, stewardship can provide*

- Expertise on the legal framework for private conservation within South African legislation.
- Site security through two of the stewardship options including Contract Nature Reserves & Biodiversity Agreements.
- Professional support team of conservation extension expertise.
- Competent land management interventions (e.g. fire management).
- Lobbying force for a suite of incentives.
- Spatial planning at 1:50 000 scale to identify broad conservation priority areas.

8.1.7.7 *Stewardship achievements thus far*

Biodiversity Stewardship has allowed for extensive expansion of priority protected areas in South Africa, especially in the Western Cape, KwaZulu-Natal and Mpumalanga Provinces, followed by the Eastern Cape, North West and others. The largest tracts of contiguous formal protected areas are within the "Protected Environment" category and the grasslands (which were previously very poorly conserved) have received considerable attention from the stewardship programme (in collaboration with NGOs such as the Endangered Wildlife Trust, WWF South Africa and BirdLife South Africa). Looking at the grassland biome as an example, the gains since 2006 have increased formal protection from 2.04 per cent (Carbutt *et al.*, 2011) to 2.38 per cent, which is still well below acceptable limits. However, given the good systems in place and the large number of sites in the declaration process, the area under formal protection will increase further to at least 2.65 per cent in the foreseeable future (Carbutt & Martindale, 2014). This however still falls short of the IUCN target of 10% formal protection by 2014, and at a local (national) scale, far short of the 12% target (or an additional ± 42,500 km2) by 2028 set as part of South Africa's NPAES (SANBI and DEA 2008). This is also still well below the Aichi Biodiversity Target 11, namely 17 per cent protection of all terrestrial ecosystems by 2020, set in 2010 during the 10th Conference of the Parties to the Convention on Biological Diversity in Nagoya, Japan (CBD, 2012).

8.1.7.8 *Stewardship and wildlife ranching*

Biodiversity Stewardship focusses on private and communal landowners and of course priority biodiversity areas. Many of these were previously private nature reserves and game ranches which supported significant biodiversity value. Stewardship has proved to be an effective tool for the formal proclamation and long-term security of these properties. While many of these properties would have maintained their biodiversity integrity without Biodiversity Stewardship the programme offers various incentives to support the landowner including management advice, permit assistance (especially with regards to animal actions and translocations) and some (but limited) fiscal incentives. However, should a landowner wish their land to be formally proclaimed as a Nature Reserve this will come with limitations such as not being permitted to keep out of range species, hybrids, genetic colour variants, etc. For some ranchers this is seen as a disincentive of the programme but it is in line with the principles of national and provincial (where applicable) conservation priorities.

In light of land reform however Biodiversity Stewardship has proved to be a very beneficial tool where properties have been awarded to community ownership through land claims a number of these have maintained productivity and biodiversity integrity through the establishment and application of detailed management plans and contractual agreements (often with the former owner staying on and paying a rental fee to the community providing the recipient community with a sustainable income).

9 RECOMMENDATIONS

9.1 Provincial nature conservation departments need to create centralised, electronic permitting systems to monitor and manage all permitting requirements

It was clear from our interactions with many of the provincial nature conservation departments that extracting data on exemption permits was not an easy task for them. As a result, the acquisition of accurate information on basic things like the number of current exemption permits and the area over which exempt properties occur was very difficult. If the provincial departments that are supposed to store and manage the data are not able to access it effectively, it is impossible to assess the true extent of wildlife ranching in South Africa. This makes it difficult to determine the accuracy of some statements made by stakeholders in the industry. This is important because planning the future of the wildlife ranching industry, which is already a major contributor to the economy, job creation and biodiversity conservation, and which has the potential to make further contributions in these areas, is dependent on accurate information.

Given the lack of funding and resulting understaffing that provinces are all exposed to, they urgently need an electronic format system that people can access instantaneously without having to refer to an outdated paper system. It goes without saying that such an electronic system needs to be secure, and that anybody with access to the information must have a high level of security clearance. These systems should be properly designed, secure databases (not excel spreadsheets) that automatically place permits in correct categories and update details instantaneously when data are added. Such systems could be created to send automatic warning messages to relevant department staff or the permit holders themselves and provide reminders if and when permit are due for renewal (e.g. in the case of exemption permits).

All types of permits required by the wildlife industry (whether private or state) should be on the same system and linked to each other to make the process of applying for various permits instantaneous. An example is provided below. A critical factor needed to make such a system effective would be to have well trained staff who are familiar with the system and able to keep it functioning effectively. Given the scale of the wildlife ranching sector, such a system would need to be very well designed and highly robust because it would experience very high levels of activity. IT staff would also need to be permanently available to deal with any problems arising.

Apart from being more efficient, electronic systems would also be more accurate and less prone to human error. Three substantial advantages would arise as a result of an effective electronic system:

1) Provincial nature conservation staff responsible for permits would be able to work more efficiently and more accurately. There would be fewer pressures on their time and they would be freed up to deal with other important tasks. The whole permitting process is currently very time consuming for departments, so such a system would be highly beneficial for over-burdened staff;
2) Wildlife ranchers, translocators and other relevant stakeholders would have an efficient system in which to submit their permitting requests and would be able to obtain their permits (if granted – see details below) instantaneously. This would make the entire wildlife ranching sector significantly more efficient; time would be saved, costs would be reduced, and everyone would benefit;
3) Access to the information for regular analysis by research institutions or government agencies would be quick and easy, although this would necessarily be subject to comprehensive security checks of the people requesting data. It would allow for efficient monitoring of the sector, and quick access to data that could be used for detailed economic, social and ecological assessments. These datasets would be up-to-date, accurate and

complete, and this would be highly beneficial to both the sector and the government in making the wildlife ranching industry competitive in the global economy. Additionally, and very importantly, it would also provide a means of oversight, whereby it would be possible to monitor conservation impacts and ethical practices of wildlife ranching.

One of the most common complaints made by wildlife ranchers and translocators during the current study was that the permitting process was burdensome, slow, inefficient and sometimes an impenetrable barrier to wildlife ranching processes.

Although the African Buffalo is a special case due to specific veterinary requirements for disease control, it can be used as an example of the problem with the current permitting system. You cannot obtain a movement permit for African Buffalo until you have a veterinary permit. Once you have this veterinary permit, you then have to obtain import and export permits from the provinces where the animals are going to and where they are coming from respectively. In many cases the rancher or translocator has to go to the permit office in person to apply for the permit. So the rancher has to first go to the permit office in the province he is exporting from to make application. The permit is not granted immediately, so he has to return on another day to get the permit (which may not be ready, creating the need to return a third time). Once the export permit is issued, the rancher then has to travel to the permit office in the province where the animals are being moved to in order to obtain an import permit. This may take two or more visits. So it is a very time consuming process, and at the end of it, if it takes long enough, the original veterinary permit may have expired, which would invalidate all subsequently obtained permits. This is a huge source of frustration to ranchers and translocators, but could be resolved by the implementation of an electronic permitting system.

The system could be easily regulated by ensuring that wildlife ranchers are only able to obtain permits for which nature conservation agencies have already granted them the right to do so (i.e. when they fulfil all the necessary requirements for exemption to conduct certain activities). These permissions would be covered by their exemption permits, and the electronic system would know all this information. E.g. If a rancher did not have the necessary permission to keep African Buffalo on his property, if he or a wildlife translocator applied for a permit to move this species into his property, the electronic permitting system would automatically reject the application. On the other hand, if a rancher wishes to translocate an African Buffalo to another ranch in another province, and both properties have all the necessary permits to keep the species, the electronic system would recognise this and issue a permit immediately. All the time wasting efforts would thus be avoided.

Very sensitive data, such as that of the location of privately owned rhinos could be kept off the database and managed by an independent entity, but that is not the focus of this report.

9.2 The need to ground-truth the impacts of wildlife ranching management practises on biodiversity

There are conflicting views between the wildlife ranching and conservation industries regarding the magnitude of the biodiversity impact of wildlife ranching practises. On the one hand, wildlife ranchers, who are in many cases nature lovers as well as business people, claim that their ranching practices are a net gain for biodiversity. While they do not provide the means to conserve biodiversity to the same extent as national parks, they do create habitats and ecosystems that are closer to what would be considered natural than is generally found on land where more standard agricultural practises are conducted (e.g. livestock or crops). So, although most wildlife ranches do not have the full suite of large mammals necessary to create what ecologists would consider a functional ecosystem (i.e. they do not have all species of large carnivore and mega-herbivore that would shape the environment under more natural circumstances), they do allow for an increase in many of the smaller wild species that contribute to biodiversity conservation (including birds and

invertebrates) that would not be found on livestock and crop farms. Furthermore, they make the case that it is unreasonable to expect them to manage their properties in the same way as state conservation areas because they simply do not have the same funds as the government with which to do this, and so are dependent on generating revenue themselves.

On the other hand, the degree to which wildlife ranches put up fences to secure their animals, and the increasing level of intensification that appears to be taking place due to the growth of the breeding of high value species and colour variants, must be having a detrimental impact on biodiversity. The fences prevent the movement of medium to large species and, therefore, impact on the effects of natural selection that would normally regulate which animals live and die. The fences also prevent the movement of some predators, which unnaturally affects which animals survive predation events (not to mention the fact that many jackals and Caracals are killed by wildlife ranches because of the threats they pose to their animals: see section 6.4.4). The natural processes that should be taking place are thus heavily impacted.

Although we developed an index to assess the impacts of management practises on carnivore diversity, we were not able to conduct any fieldwork to allow us to test the degree to which wildlife ranching contributes to the conservation of biodiversity. Given the fast growth of the industry, and the claims made by opposing factions in the argument, there is a need to conduct fieldwork to measure the true levels of biodiversity of wildlife ranches, and compare the outcomes with biodiversity in areas with other forms of land use.

9.3 Consensus on extra-limital and non-indigenous species

Another area of contention between wildlife ranchers and conservation biologists is whether or not ranchers should be allowed to keep extra-limital and non-indigenous species on their properties. Ranchers argue that such species help generate greater income and should be allowed because there are no truly natural areas left; all areas are now managed to some extent and vegetation types are shifting. Conservation biologists argue that translocating non-native species into new areas create a number of risks to biodiversity, and that until we fully understand how serious those risks are, we need to adopt a precautionary approach and keep species within the ranges that they are known to have occurred in historically. The jury is out on this subject, so we recommend continued discussion and debate.

9.4 Game meat regulations and the production of game meat

Domestic game meat production is currently hampered by the lack of legislation pertaining specifically to wildlife within the Meat Safety Act (2004). WRSA have moved this situation forward by the development of an international standard, which has been registered by the International Standards Certification (ITC) (see section 6.3.1.1). This is a very positive step, but it would be advantageous to the wildlife ranching industry, and meat consumers in South Africa, for DAFF to continue with the process they started years ago and finalise legislation that covers game meat production under the Meat Safety Act (DAFF, 2004). The development of the game meat industry will help with food security and will also create more skilled jobs for people who train as meat inspectors etc.

For game meat production to be increased, there will also be a need for a significant increase in the number of registered game meat abattoirs in order to handle the potential increased load of game meat coming in from wildlife ranches.

9.5 Defining terminology

During interviews with wildlife ranchers, it became apparent that there are certain terms commonly used within the sector that are not used consistently and are hard to define accurately. It would be helpful if more specific definitions could be developed for some of these terms, perhaps by small workshops, but this would require the involvement of academic conservation biologists for the theory, government nature conservation personnel to represent the stakeholders who implement legislation, and wildlife ranchers who are the people directly affected by decisions. The terminology that we identified as being imprecisely defined included:

1. Intensive breeding. We defined this as the confinement of wild species in small to medium sized camps or enclosures, where they are fenced in, protected from predators and provided with most of, or all their food, water and veterinary requirements (see glossary). Populations are thus not self-sustaining in the short term. How we define intensive breeding will impact whether individuals of a species are counted towards the IUCN Red List of Threatened Species, which in turn has an impact on TOPS regulations.
2. Breeding camps. This is closely tied to intensive breeding. Exactly what constitutes a breeding camp in terms of area is not defined. Part of the difficulty is the fact that an area that might be too small for a large species of antelope to sustain itself, might be large enough for a small antelope species.
3. Wild populations. Defining what wild means is complex and is thoroughly described in section 6.4.1. Finding an objective way to assess the wildness of a population will assist with determining the conservation status for the IUCN Red List.
4. Names of colour variants. Currently, many ranchers use their own names to define their colour variants (e.g. black and midnight impala). This results in the same colour variant being referred to by different names, which makes it difficult to distinguish varieties for genetics purposes.

9.6 Organisation of wildlife capture and translocation operators

Although most large scale wildlife translocators are members of the WTA, it is not compulsory for professional game capturers to join the association, and as a result there are an unknown number of small private operators who are not members. This has two important implications: 1) The capture data of the non-members are not included in the national statistics provided by WTA, which undervalues the contribution of the sector and makes it hard to obtain accurate estimates of numbers of animals translocated within the country; and 2) Non-members are harder to monitor and regulate because they are not bound by rules or the code of conduct of the WTA, although they are supposed to abide by legislation just as WTA members are. This is not say that all non-members of WTA do not abide by the legislation surrounding wildlife translocation, but it does make it hard to make sure they do. This adds to the uncertainty of how many live animals are traded within the wildlife ranching sector, the conditions in which they are kept during translocation, and the degree to which translocators abide by veterinary and conservation regulations designed to prevent problems with disease transmission or negative impacts on ecological processes.

Regulation of translocation organisations would be most effective if they were all members of the WTA, but the constitution of South Africa does not allow this to be enforced. One way to encourage membership would be through the creation of incentives, which could be developed by both provincial nature conservation departments and organisation such as the WTA (although it would not necessarily have to be the WTA). This is something that would need to be discussed between all relevant stakeholders, possibly through a workshopping process, but one example could be as follows.

To apply for membership of an accredited national association (which has a code of conduct, ethics, rules and regulations etc.), translocators would need to be a registered in their province. This would require approval of all necessary equipment and an assessment of the qualifications within the organisation, but would result in a certification by nature conservation that indicates a minimal level of legitimacy. Once membership of the accredited organisation was obtained, the translocation organisation could set minimum standards for maintaining membership, which could involve submitting regular capture statistics. Provincial certification and membership of an accredited organisation could bring the advantage of reduced permitting requirements if the industry conducted some self-regulation. Non-membership would mean having to obtain permits for every translocation operation.

We do not intend to be prescriptive here, because these are issues that would need to be worked out by the relevant stakeholders, but some form of scheme to encourage translocators to join an accredited organisation would benefit all. Stricter regulation of the industry would then be possible because under such a national scheme, if a translocator contravened the rules, there would be consequences.

9.7 The length of the game capture season

Opinion is divided about the whether the length of the capture season should be extended. We are not qualified to make a recommendation with regards to this issue, but there is evidence to suggest that capturing animals in summer is not as much of a welfare issue as once thought, as long as species specific considerations are taken into account with regards to breeding, and as long as capture operations are managed correctly (see section 7.2.2.1). We, therefore, recommend the opening or continuation of discussions between nature conservation, veterinarians and wildlife translocators to discuss the possibility.

9.8 There needs to be more consistency between the legislation for wildlife and livestock and an increase in capacity in state veterinary departments

Currently there are different regulations being applied to livestock and wildlife (see section 7.2.1.2). This puts wildlife ranchers at a disadvantage because their animals are at risk of exposure to disease from untested livestock and because they are subject to the slow processes of veterinary testing and permitting that livestock farmers are not. While the legislation surrounding disease control in wildlife is necessary, there needs to be some examination of how this same legislation can also be applied to domestic livestock farmers.

In terms of lack of capacity among state veterinarians, there is currently no allowance for private veterinarians to do things like collect blood from African Buffalo for disease testing (and the results of tests for controlled diseases can only go to state veterinarians). It might be possible, however, to allow the South African Veterinary Association (SAVA), in collaboration with the South African Veterinary Council, to set up a registration process that would allow private veterinarians to do this work. These veterinarians would have to pass specific exams and would need to be subject to regular ethical review to ensure they were sticking to the rules (because they might be tempted to allow diseased animals through or not report diseases properly if they are working for wildlife ranchers). Such a system would lighten the workload of state veterinarians and speed up the disease testing process, which would be beneficial to wildlife ranchers.

9.9 There is a lack of knowledge surrounding the occurrence and transmission of diseases in wildlife species

The lack of knowledge surrounding this issue, which is discussed in section 7.2.1.3, means that there are potential biosecurity hazards waiting to happen. There is, therefore, a great need for research into veterinary diseases. There is also a lack of understanding amongst wildlife ranchers (and possibly translocators) about the biosecurity risks of moving animals without permits, without testing for disease and without the required treatment of animals for external parasites. This needs to be addressed.

9.10 The concurrent national and provincial competence for nature conservation regulations (the so-called 9+1 issue) is the cause of much disagreement and needs some form of resolution.

Schedule 5 of the South African constitution says that nature conservation is a concurrent national and provincial competence, which means that both national and provincial government have the authority to make and implement legislation about biodiversity. The National DEA does not have jurisdiction over provinces. This is a major source of discontent amongst wildlife ranchers and wildlife translocators because of the impacts this system has on their ability to obtain translocation permits. Ranchers and translocators want national legislation to simplify the process of getting permits, but this cannot be achieved without a change in the constitution, which is an unlikely prospect. Some provinces are, however, aligning legislation with NEMBA and TOPS regulations and it would be beneficial if all provinces followed suit. An improved permitting system, as described in section 9.1 above, would go a long way to alleviating the difficulties created by this problem.

9.11 Should wildlife ranching remain the mandate of DEA or move under DAFF?

This is a highly debated issue in the wildlife ranching industry and is something that would have to be discussed at a high political level. Many ranchers and wildlife translocators want less regulation, and do not want to be directed by the same rules as are applied to state protected areas. As such, many feel (especially those that practice techniques that are more akin to farming than ranching, such as intensive breeding) that they would be better managed by DAFF. DAFF is more aligned with agribusiness, which would suit the purposes of many ranchers, while DEA is more aligned with biodiversity conservation. With the increasing intensification of wildlife ranching, more and more so-called wild animals are being moved in the direction of domestication. Arguably, the more intensively managed animals are, the less conservation value they have.

A valid concern of the wildlife ranching industry is that, from a perception point of view, if the industry is not seen to be part of agriculture and not producing food, it could be a distinct political disadvantage. The falling apart of the game meat scheme (see section 6.3.1.1) was particularly disappointing because the wildlife industry continues to have no way to measure how much meat they can produce – so it looks like they are not producing. In August 2013, DAFF and the Department of Social Development (DSD) put out a food security and nutrition policy in which they identified risks to the management of food security. This document stated that its policy would include the protection of prime agricultural land, and limitations on its alienation for other activities, including mining, game farming, and property development. This highlights that some segments in the government view wildlife ranching as a threat to food security, and this could have negative consequences for the sector.

However, a major concern we have from the perspective of which government department has control of wildlife ranching, is whether DAFF will pay sufficient attention to conservation concerns. This appears unlikely because they are more likely to concentrate on the utilisation of the natural

resources, such as the generation of revenue from increased intensification. For example, it is unclear if DAFF would worry about the hunting of too many rhinos, and whether or not that hunting was detrimental to the conservation of rhinos. It is also unclear if they would work to prevent hybridisation or inbreeding. Although the wildlife ranching industry states that it does not want hybridisation to take place, will they be able to prevent it if they are allowed to have any species they choose on their properties (which is what many ranchers want because of the potential to increase revenue)? The potential deregulation and free-for-all that could ensue could have impacts on state protected areas because state areas source some of their specimens from private game farmers and auctions. It will also impact on South Africa's commitments as a signatory to the Convention on Biological Diversity. An additional downside with the option of wildlife ranching moving under DAFF is the lack of capacity in the department.

An alternative approach that has been suggested by WRSA is that wildlife ranching could stay under DEA, but with DEA developing a separate branch under which wildlife ranching would fall (i.e. there would be one branch for conservation and one for wildlife ranching). The practicalities of this are uncertain, and it is something that would need to be discussed at a high political level.

9.12 The creation of larger areas for conservation through joining of wildlife ranches

South African policies allowing landowners to split up the landscape through fencing may have serious consequences for biodiversity conservation. The benefits of creating larger conservation areas through the joining of privately owned wildlife ranches, which include financial, social and conservation benefits, have been described in section 8. The only way to effectively encourage landowners to drop fences rather than put more up is through incentives; increased regulation is likely to have the opposite effect, as was seen historically when the previous government adopted a preservationist approach that restricted activities of farmers (see section 2). The current South African government should try to create incentives for landowners to work together and join properties rather than split up the landscape further with fences.

There are a couple of obstacles to this, however. First, the government's own policy of providing exemption permits on the basis of a landowner demonstrating that he has 'adequately enclosed' his property actively encourages ranchers to construct fences. Without an adequate fence, the rancher cannot obtain the exemption permit, which may be quite limiting to the activities he wishes to conduct, and so he is practically forced into putting up a fence. Second, given the large profits that are currently being made from intensive game breeding programmes, it will be difficult to convince some ranchers to participate in more extensive practices.

One way to incentivise ranchers to create more extensive areas is to follow the example of the Price-Waterhouse (1994) study for the Zimbabwe Lowveld conservancies and demonstrate to ranchers in South Africa that the financial benefits of creating large extensive areas can be substantial. Extensive wildlife ranches are unlikely to match the profits currently being made by intensive breeding of high value species or colour variants, but if a stage is reached when the profitability of intensive breeding drops away, there will be a need for the development of ranching practices that are more viable in the long term. In order to do this, more research will be needed into the economics of wildlife ranching, particularly extensive ranching.

We do recognise, however, that there are areas in South Africa where these principles of removing fences and creating more extensive area have been applied, although they are not generally referred to as conservancies. One example that we have discussed is the Zululand Rhino Reserve (section 8.1.6), where neighbouring landowners have joined properties together successfully, with clear economic, social and ecology benefits. Other examples include the Associated Private Nature Reserves (APNR) which border the KNP.

9.13 Development of community based wildlife land-uses in South Africa

We have clearly shown in this report (as have others before us) that the sustainable use of wildlife can be widely beneficial. Wildlife ranches, conservancies and private game reserves are all able to generate large amounts of revenue from wildlife, while at the same time creating a large number of jobs and conserving biodiversity (this last factor being dependent on the management practices adopted). The Nambiti Private Game Reserve (section 7.2.5) and Namibian community conservancy examples (section 8.1.4) demonstrate the possibilities for rural communities to make use of similar opportunities in areas where land is not privately owned, and this is something that South Africa needs to pursue urgently. If similar initiatives can be rolled out more widely across South Africa, particularly in areas where land claims are being used ineffectively, there could be widespread benefits through economic income, job creation, meat production and biodiversity conservation.

10 PERSONAL COMMUNICATIONS

Dr Tertius Bergh, Private Consultant for the meat industry

Dr Flippie Cloete, Senior Lecturer, Department of Agricultural Economics, North West University

Dr Gert Dry, Past President, Wildlife Ranching South Africa

Dr Rosemary Groom, African Wildlife Conservation Fund

Dr Cindy Harper, Veterinary Genetics Laboratory, University of Pretoria

Dr Bettine Jansen van Vuuren, Professor, University of Johannesburg

Mr Danie Jordaan, Lecturer, Department of Agriculture, University of Pretoria

Dr Sikhumbuzo Mbizeni, Deputy Director, Directorate of Veterinary Public Health

Dr Peter Oberem, President, Wildlife Ranching South Africa

Dr Mike Peel, Agricultural Research Council

Dr Maretha van der Merwe, City council of Tswane, Environmental Health

Mr Andre van der Westhuizen, Chief Executive, South African Wingshooters Association

Mr Rudi van der Westhuizen, CEO, SAMIC

Mr Jan van Vuuren, President, Wildlife Translocation Association

Mr Schalk van Vuuren, Research Director, Marketing Surveys & Statistical Analysis CC.

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12 APPENDICES

12.1 Appendix 1. Methods for extrapolating survey results to the entire wildlife ranching sector.

During surveys we collected data on a variety of wildlife ranching activities that were later found to vary with ranch size (Table A 1).

Table A 1. Types of data collected during surveys that were found to vary with ranch size.

Topic	Types of data collected
Intensive breeding	1) Numbers and areas of breeding camps for intensive breeding
Animal numbers	2) Numbers of each herbivore species per property
Live sales	3) Numbers of animals taken off live (differentiated into species)
	4) Gross income received for these animals (based on live species prices)
Trophy hunting	5) Numbers of animals trophy hunted (differentiated into species)
	6) Gross income received from animal fees (based on trophy prices)
	7) Carcass biomass available for consumption
	8) Value of carcasses (based on rancher responses)
Biltong hunting	9) Numbers of animals hunted for biltong (differentiated into species)
	10) Gross income received from animal fees (based on species prices)
	11) Carcass biomass available for consumption
Culling	12) Numbers of animals culled (differentiated into species)
	13) Carcass biomass available for consumption
	14) Value of carcasses (based on rancher responses)

We wanted to use these data to estimate levels of intensification, total numbers of animals, hunting offtakes, meat production and gross income for the entire South African wildlife ranching industry, and so originally intended to calculate averages (means) from the surveys and extrapolate by simply multiplying up for the entire area under wildlife ranching. However, during preliminary analyses of the data we found that, in many cases, small properties tended to have higher levels of intensification, higher offtake densities per hectare and higher income generated per hectare than large properties, which suggested that that an overall mean offtakes (which would be strongly skewed by the small farms) might not be the most representative measure to use to extrapolate for the whole country.

To account for the variation in offtake densities relative to property size, we assigned ranches within our survey sample to one of six size classes (<1,000 ha; 1,000 – 1,999; 2,000 – 2,999; 3,000 – 3,999; 4,000 – 4,999; 5,000 – 5,999; and >6,000 ha), then calculated median values for the unit of interest (i.e. levels of intensification, total numbers of animals, hunting offtake densities, meat production per hectare or gross income per hectare) for each farm size class.

These median values provided a way to predict the level of intensification, numbers of animals, offtakes per hectare and gross income per hectare for any ranch for which we did not have such data (i.e. for the remaining wildlife ranches in South Africa not covered by our survey), and from this we were able to provide an estimate of the totals for all ranches, taking into account the effect of ranch size. To do this, we used an approximate frequency distribution of all wildlife ranch sizes in South Africa (which was based on data from a sample of 4,277 exempt farm sizes provided by

provincial nature conservation departments – see Figure 6 in the main document) to assign a total estimated area of ranches to each size class, and then multiplied these areas by their respective levels of intensification/offtake/gross income, calculated using the medians. The outcomes of these products, which equalled the total intensification/offtake/gross income per ranch size class, were then summed to provide an estimate of each product, weighted according to ranch size.