Oryx gazella – Gemsbok


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Regional Red List status (2016)	Least Concern
National Red List status (2004)	Least Concern
Reasons for change	No change
Global Red List status (2016)	Least Concern
TOPS listing (NEMBA)	None
CITES listing	None
Endemic	No

The Gemsbok (*Oryx gazella*) is extremely well-adapted, both behaviourally and physiologically to harsh, arid conditions and can survive and reproduce successfully in areas with no permanent sources of water.

Taxonomy

Oryx gazella (Linnaeus 1758)

ANIMALIA - CHORDATA - MAMMALIA - CETARTIODACTYLA - BOVIDAE - *Oryx* - *gazella*

Synonyms: *Oryx gazella* (Linnaeus 1758) spp. *gazella*

Common names: Gemsbok (English, Afrikaans), Gemsbuck, Oryx (English), Inkukhama, iKukhama (Ndebele), None (Sepedi), Kukama (Setswana), Inyamatane (Swati), Mhala (Tsonga), Noni (Venda), Inkukhama (Xhosa)

Taxonomic status: Species

Taxonomic notes: Previously regarded as a single species, Gemsbok (*O. gazella*) and Beisa Oryx (*O. beisa*), from East Africa, are now considered distinct species based on taxonomic results revealing high (40%) genetic divergence between haplotypes (Osmers et al. 2012), morphology and geographic distribution (Grubb 2005). Osmers et al. (2012) do, however, recommend further molecular investigations into the genetics of the species to confirm their results. Currently, no subspecies have been identified within the assessment region.

Assessment Rationale

Listed as Least Concern as Gemsbok are numerous and widespread across the arid and semi-arid regions within the assessment region, and population numbers have increased over three generations (1992–2015) on formally protected areas, often by over 100%. The future of this species in South Africa is regarded as secure, as they continue to occur in large numbers, are resilient to aridity, and survive successfully without permanent sources of drinking water when free-ranging. The Kgalagadi Transfrontier Park contains the largest subpopulation of Gemsbok, with an estimated size of between 6,615 and 14,606 individuals (2012–2013 counts), depending on season. Overall, approximately 9,570 individuals currently exist on other formally protected areas and, due to their high economic value (particularly within the hunting industry), there are around 37,610 individuals present on private land. Thus, overall, there are at least 55,376 individuals in South Africa. No direct conservation interventions are currently required and this species should continue to be a key component in the wildlife economy. The development of a translocation and metapopulation strategy is encouraged to sustain the genetic resilience of the population and to prevent extensive introduction outside its natural range.

Regional population effects: Within the assessment region, migration does take place within the Kgalagadi Transfrontier Park, which is only fenced along its western and southern boundaries, allowing the unrestricted movement of animals between South Africa and southern and central Botswana. Variability in the localised environmental conditions experienced in these areas largely determines the nature and direction of movement across these international borders. Although the Gemsbok subpopulation in Mapungubwe National Park is small, there may be some movement into and out of Botswana. The remaining population is, however, typically restricted to private ranches and reserves, provincial and national protected areas. A degree of genetic dispersal occurs through the translocation of individuals between these protected areas via game sales. No rescue effects are necessary.

Distribution

Historically, Gemsbok occurred extensively in the arid and semi-arid savannah territories of the Kalahari and Karoo regions of southern Africa. They ranged expansively in Namibia aside from the Zambezi Region (previously known as the Caprivi Strip) and surroundings, throughout the arid and semi-arid regions of Botswana, extending marginally into western Zimbabwe and southwest Angola (East 1999). During the 19th and 20th centuries, anthropogenic modification and fragmentation of their habitat resulted in a significant reduction in their range. More recently, however, widespread reintroductions have occurred onto both private and formally protected reserves. Currently, their distribution is widespread, although patchy, across the southwest of southern Africa.

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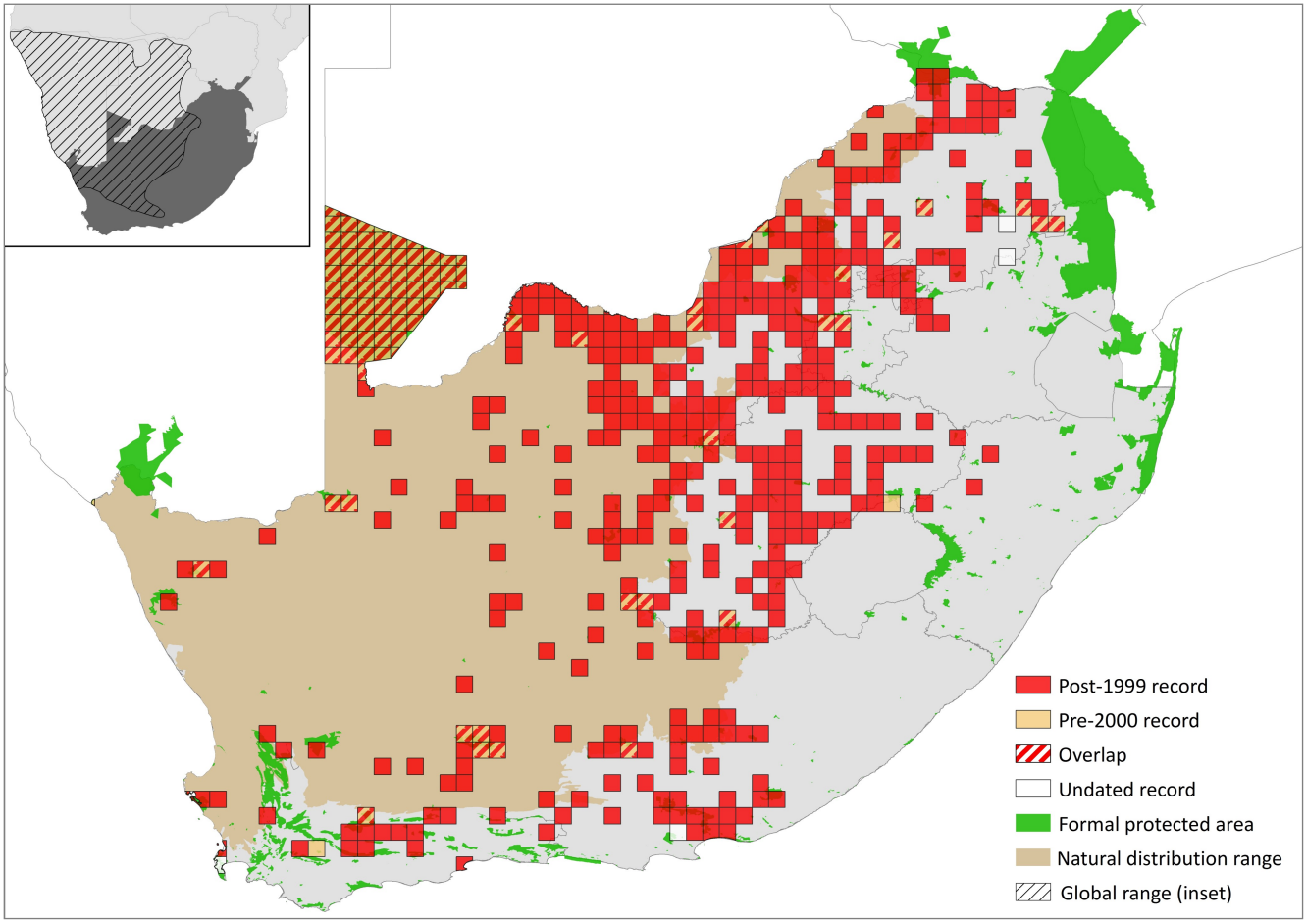

Figure 1. Distribution records for Gemsbok (*Oryx gazella*) within the assessment region

Table 1. Countries of occurrence within southern Africa

Country	Presence	Origin
Botswana	Extant	Native
Lesotho	Absent	-
Mozambique	Absent	-
Namibia	Extant	Native
South Africa		
Eastern Cape	Extant	Native & introduced
Free State	Extant	Native & introduced
Gauteng	Extant	Introduced
KwaZulu-Natal	Extant	Introduced
Limpopo	Extant	Native & introduced
Mpumalanga	Extant	Introduced
North West	Extant	Native & introduced
Northern Cape	Extant	Native
Western Cape	Extant	Native & introduced
Swaziland	Absent	-
Zimbabwe	Extant	Native & introduced

A healthy population occurs in the Iona National Park of Angola (B.A. Bennett. pers. comm. 2015), a traditional stronghold for the species (East 1999). Gemsbok have also been introduced onto private game ranches in Zimbabwe (East 1999).

Within the assessment region, Gemsbok historically ranged across the arid regions of the Northern Cape, through Namaqualand, and extended partially into the Karoo (Western Cape), Eastern Cape and Free State; the most eastern limit of their range being the confluence of the Orange and Vaal Rivers and small areas of the North West Province. There may be free-roaming herds in North West (outside fenced areas) but they may also be escapees (Power 2014). Gemsbok were historically permitted in Gauteng and are now mainly held on exemption farms, but no further imports are allowed (C. Whittington-Jones pers. comm. 2016). Their populations have recently increased within their historic range as a result of reintroductions onto many formally protected and private properties (Skinner & Chimimba 2005; Power 2014). Additionally, as a consequence of their commercial value, they have now been introduced onto a number of privately owned game ranches situated outside of their natural distribution, such as the eastern parts of Limpopo Province (Knight 1999).

Population

Gemsbok are widespread and common across the dry regions of southern Africa. Naturally, Gemsbok population distribution and birth rates are known to vary with annual rainfall (Mills & Retief 1984). In 2008, the IUCN Antelope Specialist Group estimated the total Gemsbok population to be 373,000 individuals in southern Africa. The generation length of Gemsbok has been estimated as 7.8 years (Pacifici et al. 2013), which yields a 23.6 year three-generation window. Within the assessment region, the population is thriving and subpopulations are stable or

Table 2. Summary of population size estimates for Gemsbok (*Oryx gazella*) on protected areas and wildlife ranches in South Africa

Province	Inside natural distribution range	Formally protected		Privately protected		Total	
		No of sites	Subpopulation total (2012–2015)	No of sites	Subpopulation total (2012–2015)	No of sites	Subpopulation total (2013–2015)
Eastern Cape	Partially	6	669	27	1,485	33	2,154
Free State	Partially	6	1,402	229	8,039	235	9,441
KwaZulu-Natal	No	0	0	3	105	3	105
Limpopo	Partially	6	685	1	149	7	834
Mpumalanga	No	0	0	2	5	2	5
North West	Partially	8	2,121	415	17,440	423	19,561
Northern Cape	Yes	5	9,942	6	9,795	11	19,737
Western Cape	Partially	2	2,947	9	592	11	3,539
Total		33	17,766	692	37,610	725	55,376

increasing on protected areas, conservancies and private game ranches. For example, over three generations on Camdeboo National Park, Eastern Cape Province (1992–2015), the subpopulation has increased from 15 to 92 individuals; from 180 to 1,855 individuals (930% overall growth) in Karoo National Park; and from 15 (in 2003) to 240 (2015) individuals in Mountain Zebra National Park (A. Gaylard unpubl. data). Similar increases on protected areas have occurred in the Northern Cape over three generations (M. Smit unpubl. data): at Rolfontein Nature Reserve the subpopulation has increased by 363% (from 87 to 403 individuals); by 40% (119 to 167 individuals) in Goegap Nature Reserve; and from 19 individuals in 2002 to 97 in 2013 at Doornkloof Nature Reserve. The subpopulations on both Augrabies Falls National Park (336 individuals; 2012 count) and Mokala National Park (1,544 individuals; 2016 count) are also stable or increasing (C. Bissett unpubl. data). The largest subpopulation exists in Kgalagadi Transfrontier Park, where the subpopulation is estimated to be between 6,615–9,777 individuals (2013 count) in the dry season, and 10,044–14,606 individuals (2012 count) in the wet season (Ferreira et al. 2013). Thus, on formally protected areas alone, there are well over 10,000 mature individuals in the assessment region. We assume trends are similar on private lands. For example, in the North West Province, while there are an estimated 2,121 individuals on formally protected areas, there are *c.* 17,440 on private lands (2013 estimates). Overall, we estimate a total population size of at least 55,376 individuals across the country (Table 2). There are no major threats to this species and its numbers on private lands are increasing. Most of the national population is fragmented except the largest subpopulation in the Kgalagadi Transfrontier Park.

Current population trend: Stable

Continuing decline in mature individuals: There is no observed decline. Within protected areas the population is increasing.

Number of mature individuals in population: Approximately 55,376 individuals.

Number of mature individuals in largest subpopulation: Between 6,615 and 14,606 individuals in the Kgalagadi Transfrontier Park (based on 2013 census data).

Number of subpopulations: At least 33 on formally protected areas.

Severely fragmented: Yes, aside from the Kgalagadi Transfrontier Park, the dispersal of Gemsbok is largely limited by fences, and is thus dependent on translocation for dispersal. The Kgalagadi Transfrontier Park is only fenced along its western and southern boundaries, allowing the unrestricted movement of animals between the assessment region and southern and central Botswana. Some movement of animals may also occur between the Mapungubwe National Park and Botswana.

Habitats and Ecology

This species is exceedingly well-adapted to arid conditions, occurring in semi-arid and arid grass, shrub and woodland savannahs of the Kalahari, Karoo and adjacent regions of southern Africa. In addition, this species makes use of sandy and stone plains, alkaline pans and river valleys, and will ascend mountains to frequent salt licks and springs. In the Kgalagadi Transfrontier Park, Gemsbok show a preference for sandy dune areas of red Kalahari soils sparsely carpeted in short annual grasses (Eloff 1959).

Gemsbok are predominantly grazers, but occasionally supplement their diets with browse material, (Cerling et al. 2003), water-rich fruits and underground tubers strewn throughout dune regions (Dieckmann 1980; Knight 1991; Verlinden & Masogo 1997), particularly during adverse conditions (Williamson 1987; Knight 1995a). They also eat underground tubers, Gemsbok Cucumbers (*Acanthosicyos naudinianus*) and Tsamma Melons (*Citrullus lunatus*), which have high water concentrations (Knight 1991; Dieckmann 1980). They may use Tsamma Melons even when surface water is available, suggesting that these additional resources contain other valuable supplementary nutrients (Knight 1995a). When surface water is readily available their diet consists of large quantities of fibre-rich roughage, however, where water is less available they become increasingly more selective. In the Kgalagadi Transfrontier Park, Knight (1991) found the diet of Gemsbok to consist of a high biomass of low quality dune grasses such as *Eragrostis lehmanniana* and *Stipagrostis* spp. Their narrow muzzle aids in the selection of taller grasses. Depending on ambient temperature, they typically require between 2.4 and 3.9 litres of water per day (Knight 1995a), and will drink water regularly when available. However, they are able obtain the bulk of their required water intake from grasses and alternative forage

resources and, thus, are not dependent on permanent sources of drinking water for survival (Knight 1991, 1995a). Gemsbok conserve body water through selective brain cooling (Maloney et al. 2002; Strauss et al. 2016), seasonal changes in activity pattern (M. Boyers pers. comm. 2016) and microclimate selection (M. Boyers pers. comm. 2016; W. Strauss unpubl. data). With a keen sense of smell, Gemsbok have been observed with their noses to the ground, locating underground roots and tubers that they dig up using their front hooves (Williamson 1987).

It is expected that, along with physiological and behavioural adaptations, the use of these moisture-rich resources enable Gemsbok to survive and reproduce successfully without the need for large-scale migrations seen by other large herbivore species in arid regions (for example, Blue Wildebeest, *Connochaetes taurinus*). During an extreme drought period in the 1980s, populations of Blue Wildebeest, Red Hartebeest (*Alcelaphus buselaphus*), Eland (*Tragelaphus oryx*) and Giraffe (*Giraffa camelopardalis*) experienced substantial population declines in the Kalahari, while resident Gemsbok populations were much less affected (Spinage & Matlhare 1992; Knight 1995b; Thouless 1998).

Typically, Gemsbok will forage during the early mornings and late afternoons, sometimes continuing deep into the night (Knight 1991; C. Relton pers. obs. 2013), when plants contain more moisture. The hottest parts of the day are usually spent ruminating and resting, often under shaded tree islands of *Vachellia* (previously *Acacia*) *erioloba* (C. Relton pers. obs. 2013). Knight (1991) noted that Gemsbok also consumed pods of *V. erioloba* to supplement their diets. Considered non-migratory ungulates, Gemsbok do not reveal seasonal trends in their movements (Williamson 1987), but move nomadically in pursuit of spatially and temporally variable resources (C. Relton unpubl. data). Exhibiting nomadic movements, Gemsbok home ranges vary significantly depending on the area and resources available. Males are territorial and have stable territories. In Namaqualand, Dieckmann (1980) reported that the territories of males ranged from 4.2–9.8 km^2, while in the Kgalagadi Transfrontier Park they increased to an average of 26 km^2. Knight (1991) found the home ranges of females in the Kgalagadi Transfrontier Park to average 1,430 km^2.

Gemsbok are gregarious, occurring in unstable mixed or nursery herds of usually between 3–30 individuals, or as solitary males. Herds of up to 300 animals have been documented following rainfall events in the Namib Desert (Skinner & Chimimba 2005). Similar to other arid-adapted species experiencing unpredictable environmental conditions, they are opportunistic breeders, and, as young are often present all year round, there appears to be no definite breeding season (Eloff 1959). However, Skinner et al. (1974) noted a peak calving season in August and September in the North West Province. A gestation period of 264 days was recorded by Brand (1963). Long gestation periods are common in arid and semi-arid herbivore species (compared to seasonal breeders in temperate and tropical areas) (Skinner & Van Jaarsveld 1987).

Ecosystem and cultural services: As an iconic species of southern Africa's arid regions, the Gemsbok is a valuable flagship species, and may attract public support for the conservation of South Africa's dry, threatened savannah regions, which are particularly vulnerable to the effects of climate change. They are a valuable prey species to large predators, particularly African Lion (*Panthera leo*) and Spotted Hyaena (*Crocuta crocuta*), in South Africa's arid and semi-arid regions (Périquet et al. 2015). They are economically valuable to the hunting industry of South Africa for venison, skins and trophies.

Use and Trade

This is a popular species in the live animal trade industry at game auctions, and has a subsistence value as venison and for national recreational biltong, meat and trophy hunters. The Gemsbok is considered a high value – high return animal in the captive breeding, game ranch and hunting industries of South Africa (Bothma 2005), and has substantial international value as a trophy animal. Hunting and subsistence use does not, however, have a damaging effect on the stability of Gemsbok populations. This is largely a result of its recent large-scale introduction and reintroduction onto private lands.

Patterson and Khosa (2005) reported that Gemsbok generate 8.7% of hunting income for South Africa, and was described as one of the most hunted species in both Namibia (Lindsey et al. 2007) and South Africa (Patterson & Khosa 2005). A minimum ranch size of 1,200 ha is recommended for private Gemsbok owners, and the smallest viable population should include at least three males and seven females (Osmers 2012).

Threats

Currently, there are no major threats to the survival of this species within the assessment region. During the 19th and

Table 3. Use and trade summary for the Gemsbok (*Oryx gazella*)

Category	Applicable?	Rationale	Proportion of total harvest	Trend
Subsistence use	Yes	Venison, skins and live animal trade in game auctions.	Minority	Stable
Commercial use	Yes	Venison, trophies and live sales.	Majority	Increasing
Harvest from wild population	Yes	Venison	Minority	Stable
Harvest from ranched population	Yes	Venison, skins, trophies and live sales.	Majority	Increasing, due to their increasing commercial value.
Harvest from captive population	Yes	Captive breeding for trophies. In some cases breeding for particular colour variants takes place, such as Golden Gemsbok.	Minority	Increasing, due to their increasing commercial value.

Table 4. Possible net effects of wildlife ranching on the Gemsbok (*Oryx gazella*) and subsequent management recommendations

Net effect	Positive
Data quality	Inferred
Rationale	Private landowners have increased the numbers of this species into areas outside of its natural distribution, and the species is considered economically valuable to South Africa's hunting and game ranch industries.
Management recommendation	Maintain viable genetic diversity of the species by ensuring that the founding population size is large, and by adding genetic material and individuals from an extensive source population periodically.

20th centuries, the population declined significantly as a direct result of habitat loss due to the expansion of urban and agricultural practices in southern Africa. Since then large scale reintroductions and introductions of Gemsbok have occurred both onto private game ranches, and protected areas. Namibia for example, holds the majority of its Gemsbok on private game ranches, and East (1999) noted that the population increased from approximately 55,000 in 1972 to over 164,000 in 1992. By 2006, the Gemsbok population in Namibia was estimated at more than 388,000 (Mendelsohn 2006). Gemsbok have a number of physiological and behavioural adaptations which allow for its successful survival in fragmented, arid environments, even during harsh drought conditions. Their independence from permanent sources of drinking water, are facilitated through their utilisation of water-rich fruit, and underground roots and tubers, microclimate selection, seasonal changes in activity patterns and selective brain cooling. Livestock farming, particularly in the Kalahari, is a minor threat to this species, as a result of expanding competition with livestock and the subsequent habitat loss and degradation from overgrazing and bush encroachment (Verlinden & Masogo 1997; Verlinden 1998; Bergström & Skarpe 1999; Wallgren et al. 2009). Research suggests that, in the region of Kgalagadi, the majority of the most suitable grazing environments is utilised for livestock grazing rather than wildlife (Verlinden 1998; Darkoh 2003).

Although some illegal poaching of this species exists, mostly in Botswana, it is not considered to be a threat for Gemsbok within the assessment region.

Finally, arid southern African savannahs are particularly vulnerable to climate change, and are expected to become hotter and drier with increasingly unpredictable rainfall (Hulme et al. 2001; Hannah et al. 2002; Meadows 2006). Amplified temperatures in association with a decline in the frequency of rainfall could radically constrict key habitats, thus threatening the habitat availability and forage resources of this species.

Current habitat trend: Stable (Driver et al. 2012). However, habitat quality may be locally declining as a result of expanding livestock farming and climate change.

Conservation

This species is economically important to southern Africa's wildlife industry, is a valuable trophy species on game farms, and a sustainable source of protein for local communities. Because of this, it is in great demand among game ranchers, and has been extensively introduced into areas outside of its natural distribution. Gemsbok subpopulations have increased substantially across northern South Africa, due to translocations of Namibian animals onto private game farms.

Table 5. Threats to the Gemsbok (*Oryx gazella*) ranked in order of severity with corresponding evidence (based on IUCN threat categories, with regional context)

Rank	Threat description	Evidence in the	Data quality	Scale of	Current trend
1	*2.3.2 Small-holder Grazing, Ranching or Farming*: habitat loss and degradation resulting from overgrazing. Current stresses *1.2 Ecosystem Degradation*, *2.3.2 Competition* and *2.3.5 Inbreeding*: ecosystem degradation and fragmentation with associated increase in competition for resources and decrease in genetic diversity in small subpopulations.	Verlinden et al. 1998	Indirect	Regional	Increasing
		Verlinden & Masogo 1997	Indirect	Regional	
		Bergström & Skarpe 1999	Indirect	Regional	
		Wallgren et al. 2009	Indirect	Regional	
		Darkoh 2003	Indirect	Regional	
		Osmers 2012	Indirect	National	
2	*11.2 Droughts*: climate change – increased temperatures, more frequent & severe droughts and exacerbated fluctuations in rainfall.	Hulme et al. 2001	Simulation	National	Increasing
		Meadows 2006	Simulation	National	
		Hannah et al. 2002	Simulation	National	
3	*8.2.1 Problematic Native Species/Diseases*: vulnerability to pathogens, parasites and disease through translocations into new areas outside of their natural range.	-	Anecdotal	-	Increasing with the expansion of introduced range.

Table 6. Conservation interventions for the Gemsbok (*Oryx gazella*) ranked in order of effectiveness with corresponding evidence (based on IUCN action categories, with regional context)

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	*2.3 Habitat & Natural Process Restoration*: maintenance of forage and water resources, particularly grassland savannahs from overgrazing, degradation and bush encroachment.	-	Anecdotal	-	-	-
2	*1.1 Site/Area Protection*: expansion of transfrontier and protected areas to create corridors for natural movements in response to spatial and temporal variability in rainfall and resources.	-	Anecdotal	-	-	-
3	*5.3 Private Sector Standards & Codes*: sustaining genetic diversity through a metapopulation plan.	-	Anecdotal	-	-	-
4	*6.5 Livelihoods, Economics & Other Incentives*: increased provision of cheap venison to local communities to reduce poaching and habitat degradation.	-	Anecdotal	-	-	-

Gemsbok also occur within a number of formally protected areas within the assessment region, where they are important to South Africa's ecotourism industry. These include the Kgalagadi Transfrontier Park (which contains South Africa's largest subpopulation), Karoo National Park, Mokala National Park, Augrabies Falls National Park, Molopo Nature Reserve and Madikwe Game Reserve, among others. Population numbers within these reserves are thought to be stable or increasing, and numbers are additionally increasing within the private sector.

No specific conservation interventions are currently required for this species, and wildlife ranching is considered beneficial for Gemsbok conservation in South Africa, and has effectively increased the extent and abundance of this species. Yet, ranch managers should consider the importance of maintaining genetic diversity in isolated subpopulations of Gemsbok, especially on game farms running breeding programmes that select for particular traits (Osmers 2012) or colour variants, such as the Golden Gemsbok. Genetic variability plays a vital role in continued reproductive success and fitness, which becomes principally important during adverse environmental conditions. Since arid savannahs are particularly vulnerable to enhanced aridity under current climate change predictions, it is vital that managers prevent genetic degradation of populations from inbreeding (see **Recommendations for land managers and practitioners**). Finally, due to its status in the game industry and attractiveness for trophy and venison hunters, it is important to ensure that habitats and water sources are maintained, particularly on small, private properties, where natural movements are restricted by fences. Population trends and genetic diversity should be monitored to prevent inbreeding and the loss of genetic material.

Recommendations for land managers and practitioners:

- Continued development of Gemsbok as a keystone species within the sustainable, wildlife-based rural economy, by incentivising landowners to supply cheap, low-carbon protein to local communities, thus ensuring that the benefits of this species are shared.
- Osmers (2012) suggested private ranch owners should maintain subpopulation viability and genetic diversity by:
  - Knowing the origin of founder population animals, and establishing when and from where additional genetic material should be inserted into the population.
  - Starting with a founder population as large as possible to ensure the effective population is sustainable, and threats of inbreeding are kept to a minimum.
  - Periodically supplementing the population with genetic material from an alternate, large source population.
  - Add individuals to the population from other large, well-managed source populations every few years in order to enrich genetic diversity, and compensate for alleles lost through mutation or trait selection.
- Monitor phenotypic data such as horn length and carcass weight.

Research priorities:

- Assessing the vulnerability of Gemsbok to climate change. Considering that the climate of the Northern Cape Province, a stronghold of the Gemsbok, is predicted to become unlike anything currently experienced in South Africa (hotter and drier with increased variability in rainfall), the arid-adapted Gemsbok is an ideal model animal in which to investigate behavioural plasticity – including conservation physiology – in the face of anthropogenic climate change. Studies over the medium-term (*c*. 5 years) relating individual variability in physiological parameters to reproductive output and success (fecundity) could provide valuable insights into the extent to which ungulates are able to cope with the effects of anthropogenic climate change.
- Quantifying the contribution of Gemsbok to the wildlife economy and in creating sustainable social-ecological systems in South Africa.

Encouraged citizen actions:

- Landowners should create conservancies for this species and engage local stakeholders to create sustainable, wildlife-based rural economies.
- Report sightings on virtual museum platforms (for example, iSpot and MammalMAP), especially outside protected areas.

Data Sources and Quality

Table 7. Information and interpretation qualifiers for the Gemsbok (*Oryx gazella*) assessment

Data sources	Field study (unpublished)
Data quality (max)	Estimated
Data quality (min)	Estimated
Uncertainty resolution	Best estimate
Risk tolerance	Evidentiary

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Details of the methods used to make this assessment can be found in *Mammal Red List 2016: Introduction and Methodology.*