

3. Status of leopard in South Africa

a. Distribution of leopard within South Africa

Based on maximum entropy models, Swanepoel, *et al.*, (2013) estimated that approximately 20% (248,770 km²) of South Africa is suitable for leopard (Fig. 1). Suitable habitat is fragmented into four general regions: one stretching along the southeast coast, one occurring in the interior of KwaZulu-Natal, one encompassing the Kruger National Park and interior of Limpopo, and one in the northern region where the Kgalagadi Transfrontier National Park is located (Fig. 1). Approximately 32% of the suitable leopard habitat is situated in protected areas.

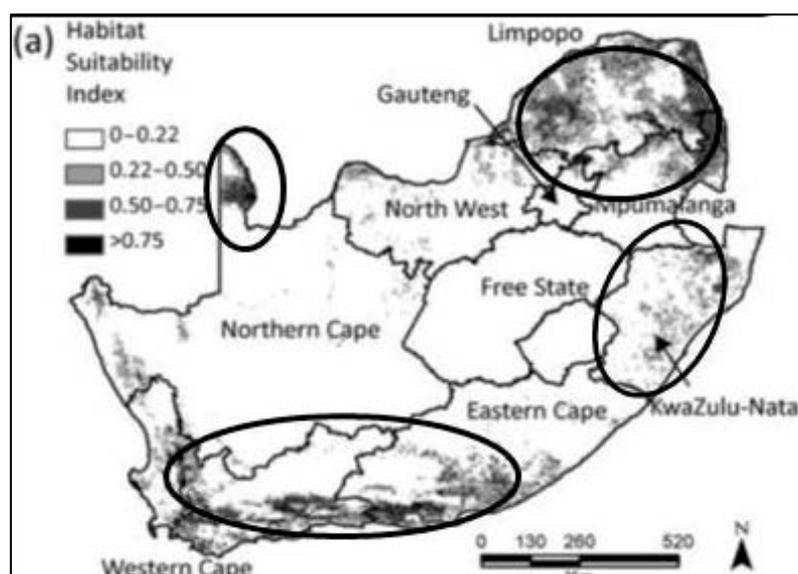


Figure 1: Suitable leopard habitat in South Africa predicted from a model containing the full set of environmental variables (land cover; NDVI, grazing capacity, elevation, surface ruggedness, distance to nearest river, human density, distance to roads, distance to villages, cattle density, and small ruminant density). (Copied from Swanepoel, *et al.*, 2013).

b. Leopard abundance in South Africa

Leopards are generally considered uncommon in South Africa, however estimates of the size of the national population vary widely from 2,185 to 23,400 leopards (Martin & De Meulenaer, 1988; Friedmann & Traylor-Holzer, 2005; Swanepoel, *et al.*, 2014b). None of these estimates are based on rigorous population counts at regional scales, and their confidence intervals are so wide as to make them meaningless (e.g. 2,813-11,632 leopards estimated by Swanepoel, *et al.*, 2014b).

Estimated leopard population densities at sites surveyed in Mpumalanga, KwaZulu-Natal, Limpopo and North West Province vary from 0.2 ± 0.0 leopards/100 km² (Khamab, North West Province), to as high as 12.2 ± 2.4 leopards/100 km² (Sabi Sands, Mpumalanga) (Mann, *et al.*, 2017). A separate study in the Maputaland Conservation Unit in KwaZulu-Natal estimated leopard density to range between 1.6 ± 0.62 /100 km² in the smallest protected area (Ndumo) to 8.4 ± 1.03 /100 km² in the largest (western shores, St Lucia) (Ramesh, *et al.*, 2017). A density of 10.7 leopard/100 km² (Chase Grey, *et al.*, 2013) was

recorded in the montane habitat of the western Soutpansberg, though this is likely to be an overestimate since the survey area in this study was smaller than the expected home range size of a single male leopard. Leopard densities across the Eastern and Western Cape have been estimated between 0.95 leopard/100 km² and 1.11 leopard/100 km².

c. Leopard population trends in South Africa

Data generated from the South African Leopard Monitoring Project suggest an 8% decline in the national population per year, and significant declines in leopard density have been observed in five out of 18 sites surveyed in 2017 (Mann, *et al.*, 2017). Some stable populations (e.g. Somkhanda and Manyoni) appear to be well below their potential capacities, while other sites such as Barberton and Songimvelo in Mpumalanga, Ophate in KwaZulu-Natal and Dinokeng in Gauteng appear to no longer have functioning leopard populations (Mann, *et al.*, 2017).

Up to the end of 2016, leopard densities at most monitoring sites in KwaZulu-Natal were relatively stable, with the exception of Hluhluwe-iMfolozi Park and St Lucia Eastern Shores, which both showed significant declines from 2015 to 2016, and Phinda Game Reserve, where the population noticeably increased from 2014 to 2016 (Mann, *et al.*, 2017). Leopard density at Hluhluwe-iMfolozi Game Reserve has declined by >70% in five years, from 13 leopards/100 km² in 2011 to 3 leopards/100 km² in 2016 (Mann, *et al.*, 2017). Results from the 2017 surveys showed strong declines in leopard density also at Ithala, Tembe and uMkhuze Game Reserves.

Leopard densities at some monitoring sites in Limpopo appear stable, with annual fluctuations within the standard deviation of previous estimates (Mann, *et al.*, 2017). The notable exceptions to this are Zingela and Makalali Game Reserves, where marked declines in leopard density were recorded from 2016 to 2017 (Mann, *et al.*, 2017). A separate study showed a 44% decline in leopard densities in the Soutpansberg Mountains from 2012 (6.55 leopard/100 km²) to 2016 (3.65 leopard/100 km²) (Williams, *et al.*, 2017).

The leopard populations in the Kruger National Park and surrounding private nature reserves, as well as Loskop Dam Nature Reserve in Mpumalanga, remain stable (Mann, *et al.*, 2017). Though density estimate in Timbavati Game Reserve declined markedly in 2016 to 7.3 ± 1.3 leopards/100 km² from the ~ 10.5 leopards/100 km² recorded between 2013 and 2015, and has remained at this level since (Mann, *et al.*, 2017).

The leopard population in Kwande Nature Reserve in the Eastern Cape appears to be stable, while leopard densities in the Gamkaberg, Rooiberg and Swartberg areas of the Little Karoo, Western Cape, increased from 0.6 ± 0.1 leopards/100 km² in 2012 to 1.1 ± 0.2 in 2017 (Mann, *et al.*, 2017).

Leopard population trends elsewhere in South Africa are unknown.

d. Threats

At present, the illegal killing of leopards for skins and other body parts for traditional ceremonies and medicines is believed to be the major threat facing leopard within South Africa, and more widely across southern Africa (Hunter, *et al.*, 2013). Leopard skins are used in ceremonial wear by a number of cultural and religious groups in KwaZulu-Natal and Swaziland, most notably the Nazareth Baptist 'Shembe' Church. Mark-resight surveys undertaken at religious gatherings of the 'Shembe' church suggest that there are

approximately between 13,000 and 18,000 illegal leopard skins in circulation among church members.

Other threats to leopard in South Africa include excessive off-takes (legal and illegal) of putative damage causing animals (DCAs) (Balme, *et al.*, 2009, St John, *et al.*, 2011, Thorn, *et al.*, 2013, Swanepoel, *et al.*, 2014b; Williams, *et al.*, 2017), the unethical radio-collaring of leopards for research and tourism (Balme, *et al.*, 2014), and habitat loss and fragmentation due to the development of urban areas, mines and agriculture (Di Minin, *et al.*, 2013, Swanepoel, *et al.*, 2013, McManus, *et al.*, 2015; Williams, *et al.*, 2017). In the Western Cape, the loss of wilderness areas is resulting in reduced habitat for leopard prey such as hyrax and small antelopes, increasing the likelihood of leopards relying on livestock for food (Martins & Martins, 2006).

e. Illegal off-take

It is estimated that as many as 1500 - 2500 leopards are illegally harvested annually to meet the demand for skins by the Nazareth Baptist 'Shembe' Church; The illegal killing of putative DCAs is typically indiscriminate, the scale of which is currently unknown since illegal off-take of leopards is poorly monitored, if at all.

f. Data quality

Until recently, reliable published information on leopard population sizes and trends at a national scale was poor to non-existent. Detailed estimates of abundance are available for only a very small fraction of the species' range (e.g. Balme, *et al.* 2010, Chapman & Balme, 2010, Chase-Grey, *et al.*, 2013, Maputla, *et al.*, 2013; Ramesh, *et al.*, 2017; Williams, *et al.*, 2017). However, in 2013, the provinces of KwaZulu-Natal and Limpopo established leopard monitoring programmes wherein systematic camera-trap surveys were conducted in order to reliably track leopard population trends. The South African Leopard Monitoring Project was recently established through the expansion of these monitoring initiatives to five additional provinces, namely the Eastern Cape, Gauteng, Mpumalanga, North West and the Western Cape (Mann, *et al.*, 2017).

4. Adaptive management framework

a. Management tools/plans

Some provinces in South Africa have adopted management plans that address particular aspects of leopard management (e.g. the Eastern and Western Cape have guidelines for the management of DCAs, while KwaZulu-Natal (Balme, *et al.*, 2010b) and Mpumalanga have specific plans that guide the allocation of hunting quotas). A need for a national management plan that provides standardized guidelines to provinces for the management of the species, particularly in relation to trophy hunting, was identified. To this end, norms and standards for the trophy hunting of leopard in South Africa are currently under development, the general approach of which is to: 1) distribute hunting effort evenly across leopard range in South Africa; 2) limit hunting to male leopards of at least seven years of age; and 3) ensure the mandatory submission of hunt return data and trophy photographs following all leopard hunts (both successful and unsuccessful, including DCA leopards killed). An online application and submission system for the management of trophy hunting has been developed and roll out to the provinces is imminent.

Data from the South African Leopard Monitoring Project are being used to inform the adaptive management of leopard in South Africa, and in particular trophy hunting. The adaptive management framework has been designed to test the impact of leopard hunting within hunting zones, so that quotas can be adjusted annually based on trend data. Hunting will be restricted to leopard hunting zones where scientifically robust data on leopard density trends indicate overall stable (or increasing) populations.

b. Legislative tools

The leopard is listed as vulnerable in terms of section 56 of the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) and is regulated in accordance with the Threatened or Protected Species Regulations. Various provincial ordinances and acts provide additional legislative protection. Permits are therefore required to undertake a variety of activities in relation to leopard, e.g. hunting, keeping, selling and other forms of direct use. Permits are issued upon a written application, and each application is handled on its merits in accordance with environmental legislation and policies.

A non-detriment finding (NDF) for leopard, a fundamental requirement for the export of the species in accordance with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), was approved by the Scientific Authority of South Africa and published for public input in December 2015. Since then, the government of South Africa has made concerted efforts to implement measures recommended in the NDF.

c. Harvest restrictions

Until recently though, there were no restrictions on the age, sex or size of leopards that could be killed (Balme, *et al.*, 2012). The norms and standards for the trophy hunting of leopard will however codify a policy adopted in 2015 to limit hunting to male leopards of at least seven years of age.

d. Compliance and enforcement

The number of leopard trophies hunted in South Africa each year is regulated and individuals require a permit to remove a putative DCA. Trophy hunting and legal DCA control is formally managed at the provincial level, and an improvement in compliance is anticipated once the norms and standards for the trophy hunting of leopard are formally gazetted.

Harvest of leopard is however mostly illegal (e.g. illegal retaliatory killing, off-take for skins, incidental snaring) and some of the provinces seems unable to effectively address this.

e. Management of damage causing animals (DCAs)

It has been suggested that the removal of DCAs or the illegal off-take of leopards significantly exceeds off-take from trophy hunting (St John, *et al.*, 2011, Thorn, *et al.*, 2013). However, according to permits issued, a minimum of 46 leopards were killed as DCAs in seven provinces between 2012 and 2016. In some provinces, progress has been made in reducing the number of leopards killed as DCAs. For example, in the Cederberg area of the Western Cape, the recorded removals of problem leopards have declined significantly in recent years, from 7-8.6 per year during 1950 - 2003, to 0.8 per year from 2004 - 2006 (Martins & Martins, 2006). Similarly, the numbers of problem leopards killed in northern KwaZulu-Natal declined significantly after 2005 (Balme, *et al.*, 2009). In the case of the Western Cape, reduced off-take appears to have been due to educational efforts by leopard researchers and the development of alternative livestock protection techniques (Martins & Martins, 2006), whereas in northern KwaZulu-Natal it was probably due to the

implementation of a revised protocol for issuing problem leopard permits (Balme, *et al.*, 2009). An increase in the number of DCA applications in Limpopo has been observed in association with the number of game ranches breeding high-value species, and with the use of predator-proof fencing (Pitman, *et al.*, 2016). Leopards were recorded as the most common putative problem animal (68%) in Limpopo between 2003 and 2012, followed by elephant (20%), lion (4%), brown hyena (3%), black-backed jackal (2%), caracal (2%), cheetah (0.5%) and spotted hyena (0.5%) (Pitman, *et al.*, 2016).

Details of leopards killed as DCAs will in future be captured in the online application and submission system that has been developed for the management of leopard trophy hunting, thereby improving monitoring of DCA off-take.

f. Sustainable off-take quotas

The system of allocating leopard hunting quotas in South Africa has been completely overhauled since the South African Leopard Monitoring Project recorded declines in some leopard populations in KwaZulu-Natal and Limpopo. Recent research also suggested that hunting quotas in Limpopo, which accounted for >60% of leopards trophies hunted in South Africa, were unsustainable, particularly if the removal of putative DCAs was taken into account (Pitman, *et al.*, 2015). Anecdotal information from North West similarly suggested that quotas were too high (Power, 2014). A further concern was the clumping of trophy hunts, leading to increased pressure on specific populations.

Leopard hunting quotas are now adjusted annually based on population trend data generated by the South African Leopard Monitoring Project. Hunting will be excluded from any areas where leopard populations are in decline, and hunting will not be allowed in areas where scientifically robust data on leopard population trends are absent. Hunting zones eligible for a quota are thus those where scientifically robust population trend data indicate increasing or stable leopard populations (i.e. no statistically significant difference in observed leopard density over time). In 2016 and 2017, the leopard hunting quota was set at zero to allow time for the recovery of declining populations and improved management of trophy hunting, while for 2018, the Scientific Authority recommended a quota of seven male leopards of ≥ 7 years of age (five in Limpopo and two in KwaZulu-Natal) (Fig 2.). Research has shown that since fewer males are required to maintain the same levels of reproduction, leopards are resilient to disturbance if the prime reproductive female life-stage remains intact (Crookes, *et al.*, 1998, Gaona, *et al.*, 1998), while population models show that hunting of leopard can be sustainable when only male leopard 7 years and older are hunted (Packer, *et al.*, 2011).

Leopard Hunting Zones 2018

Limpopo:

KwaZulu-Natal:

- Surveillance site
- Catchment
- Leopard Hunting Zone (LHZ)
- LHZ eligible for quota

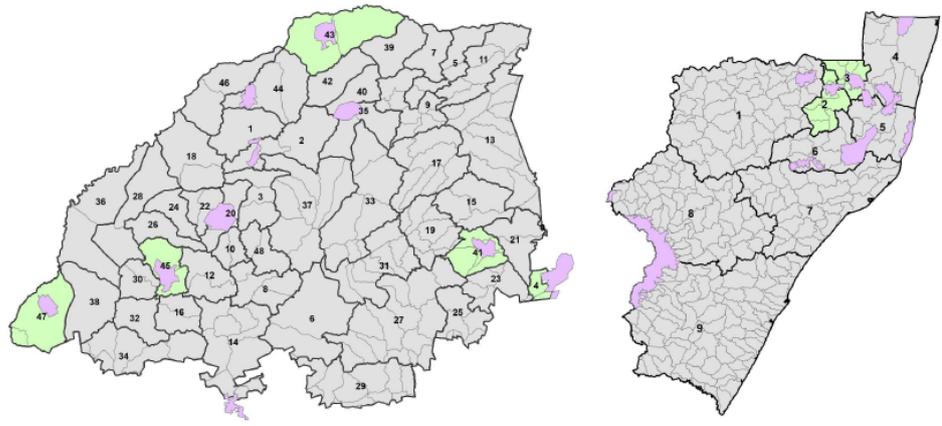


Figure 2: Eligible leopard hunting zones recommended for 2018.

5. Monitoring methods

The South African Leopard Monitoring Project provides for a standardised, rigorous framework employing systematic camera-trap surveys for the monitoring of leopard population trends throughout South Africa. In 2017, camera-trap surveys coupled with spatial capture-recapture sampling were completed at 24 sites, which included a mix of state- and province-run protected areas, private conservancies, commercial game ranches and community reserves. The total area covered by camera-trap stations amounted to 4,784 km² and the sampling effort comprised 33,605 camera-trap days. Best practice guidelines for leopard monitoring are currently being developed to encourage the private sector to participate in the project.

An online reporting system for trophy hunting applications and hunt return data (including leopards killed as DCAs) has also been developed and roll out to the provinces is imminent. Hunt return data will be used to determine catch-per-unit-effort and harvest composition as indices of relative abundance.

6. Utilization and monitoring of the export quota

In accordance with Resolution Conf. 10.14 (Rev. CoP16), South Africa is allowed to export 150 leopards annually as hunting trophies and skins for personal use, though between 2005 and 2016 only 73 leopards were exported annually, mostly as hunting trophies (Fig. 3) (CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK).

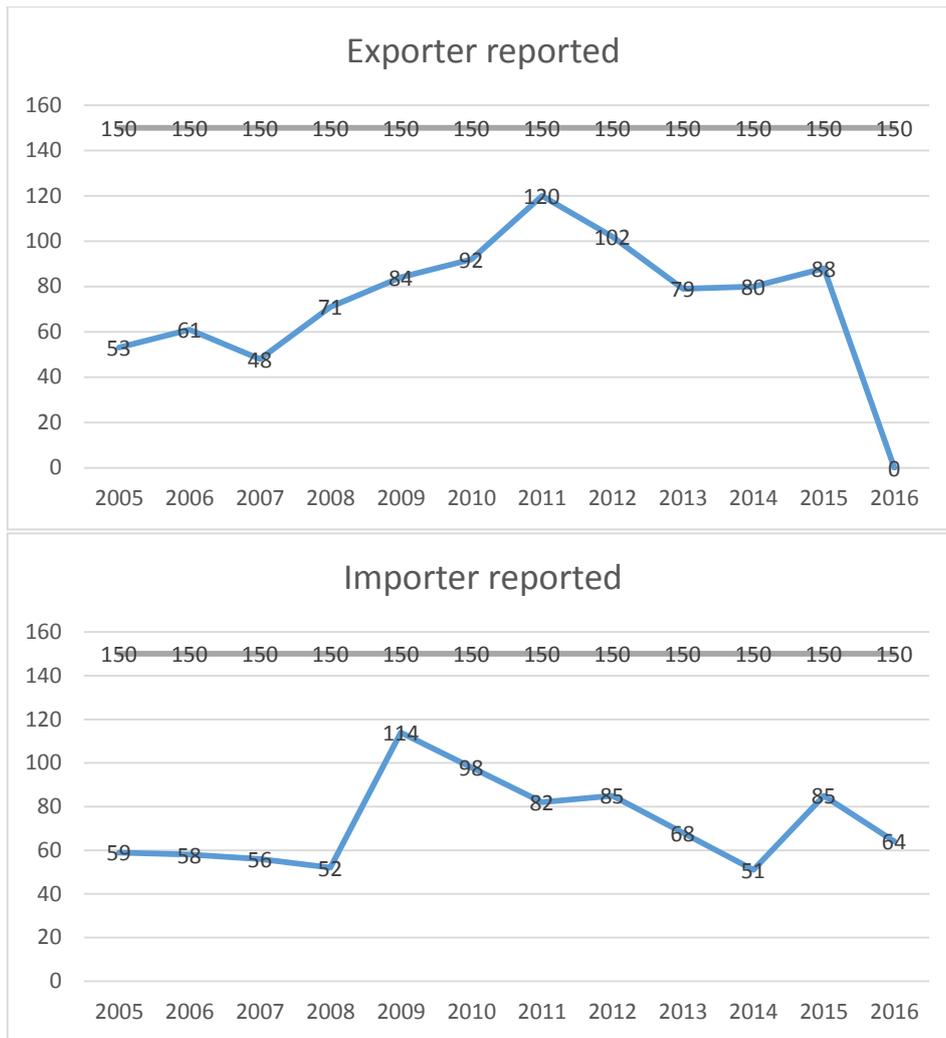


Figure 3: South Africa's utilization of the export quota for leopard hunting trophies and skins for personal use (150), as reported between 2005 and 2016 (CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK).

7. Conservation incentives and benefits

In South Africa, privately-owned land is extremely important for the conservation of leopards, and carnivores in general (Friedmann, *et al.*, 2002; Lindsey, Du Toit & Mills, 2004). However, management of carnivore conflict through translocation and killing of DCAs are limiting carnivore persistence on private land (Lindsey, *et al.*, 2004).

Trophy hunting, when well-managed, can be an important tool for the conservation of species and habitats through the provision of financial incentives, especially when revenues are invested back into conservation and when benefits are shared equitably with local communities (e.g. Lindsey, *et al.*, 2007; Dickson, *et al.*, 2009; UNEP-WCMC, 2013; IUCN, 2016), and it has similarly been argued that trophy hunting can foster tolerance towards leopards. Questionnaire surveys have suggested that the attitudes of landowners to leopards is better than for other predator species which cannot be hunted, such as cheetah and wild dogs, and that game ranchers are more tolerant of leopards than livestock farmers

(Lindsey, *et al.* 2005), however, in northern KwaZulu-Natal, landowners who hunted the most leopards also removed (legally and illegally) the highest numbers of putative DCAs (Balme, *et al.*, 2009). Similar patterns have been observed more widely (Peebles, *et al.*, 2013; Treves & Bruskotter, 2014). In Limpopo Pitman, *et al.* (2016) demonstrated that the proportional increase in problem animal control of nuisance wildlife such as leopard has far outweighed the proportional increase in game ranching trends towards more intensive practices, suggesting that intolerance is growing. However, the recent shift in South Africa's game ranching industry to high-value species and colour variants has likely decreased tolerance towards leopards (and other carnivores) and increased levels of retaliatory killing (Thorn, *et al.*, 2013; Pitman, *et al.*, 2016). More research is required to understand the complex relationship between trophy hunting and tolerance of landowners towards leopards. Although available leopard habitat has likely increased in parallel with the growth of the commercial wildlife industry (Thorn, *et al.*, 2011), it is unlikely that trophy hunting of leopards directly incentivizes the private sector to conserve leopard habitat.

It is hoped that the adaptive management framework recently adopted in South Africa, through which trophy hunting is limited to areas with stable (or increasing) leopard populations as demonstrated by scientifically robust data on leopard population trends, will encourage collaborative landowner participation in the South African Leopard Monitoring Project, and ultimately incentivize management practices that contribute towards the conservation of leopards.

8. Livelihood/ socio-economic benefits and impacts

In South Africa the promulgation of the Game Theft Act (No. 105 of 1991, as amended in Acts 18 of 1996 and 62 of 2000), which grants conditional ownership of wildlife to private landowners who obtain a Certificate of Adequate Enclosure (CAE), consolidated the foundations of an economically viable wildlife industry (Carruthers, 2008). The right of ownership of wildlife, combined with a growing understanding that wildlife ranching was ecologically and financially sustainable, along with significantly reduced subsidies for conventional agriculture and increasing financial incentives for commercial wildlife ranching, has led to a tremendous increase in land under wildlife and game numbers over the past 30 years, and the establishment of a formal wildlife sector in South Africa.

Southern Africa has a particularly well-established sport hunting industry that generates substantial revenues. Lindsey, *et al.* (2007) estimated the annual revenues generated by trophy hunting in sub-Saharan Africa to be approximately USD200 million, with USD100 million of those accrued by South Africa. Trophy hunters in South Africa were reported to spend an average of USD20,136 per hunter for the 2015/2016 hunting season, in total USD131 million for the approximately 7600 international hunters hosted by South Africa in that year (TREES, 2017). In addition to direct financial values, the Professional Hunters' Association of South Africa (PHASA) estimates that thousands of jobs are created by professional hunting in South Africa, including hunting outfitters, professional hunters and other jobs created by international hunting tourists. Moreover, >60 000 bed nights were booked by international hunting tourists in 2014, amounting to approximately USD9 million (Sinovas, *et al.*, 2016).

The total estimated financial value of leopard trophy exports from SADC (the Southern African Development Community) over the period 2005 - 2014 was USD9 964 702 (USD1520/leopard trophy) (Sinovas *et al.*, 2016). Approximately 14% of these trophies originated in South Africa (USD1 395 058). Leopard is also the most valuable trophy exported from SADC, followed by elephant (USD1303) and hippopotamus (USD759) (Sinovas, *et al.*, 2016).

9. Research projects underway

Research from South Africa, for the period 1982 - 2012, accounted for a significant proportion of the peer-reviewed literature on leopards; more than double that of any other range state. However, unlike leopard research conducted elsewhere, South African studies focused primarily on ecological themes, rather than conservation and management (Balme, *et al.*, 2013). Current research projects within South Africa include:

- *Panthera*: Furs for Life – combatting the illegal trade in leopard skins for cultural regalia through education, policy and the provision of faux leopard furs.
- *Panthera*: The origins of leopard skins entering Shembe markets.
- *Landmark Leopard and Predator Foundation*: ecology of leopards, remedial action for injured leopards, and conflict management with livestock owners.
- *Primate and Predator Project*: conducting research into the status of leopards outside of protected areas and in the Soutpansberg Mountains, Limpopo Province.
- *North West Leopard Project*: investigating the ecology of leopards in the province through camera trapping and GPS collars, with a view to enable province-wide management (e.g. setting quotas, conflict management and translocation appraisal).
- *Cape Leopard Trust*: continuing work on leopards in the greater Western Cape, and to venture into Northern Cape. Farmer education and ecological research.
- *Mpumalanga Tourism and Parks Agency*: Ingwe Leopard Project: Greater Lydenburg area; Kruger National Park western boundary carnivore monitoring, including the neighbouring rural areas; spatial ecology, habitat utilisation, population demographics and conservation of leopards in the Loskop Dam Nature Reserve

10. Conclusion and recommendations

Leopards are generally considered uncommon in South Africa, however estimates of the size of the national population vary so widely as to make them meaningless. Estimated leopard densities in South Africa range from 0.2 ± 0.0 leopards/100 km² to 12.2 ± 2.4 leopards/100 km². South Africa's leopard population is apparently declining by 8% per year and significant declines in leopard density have been observed in some areas. Some stable populations appear to be well below their potential capacities, while other areas with prime leopard habitat seem to no longer have functioning leopard populations. At present, the illegal killing of leopards for skins and other body parts for traditional ceremonies and

medicines is believed to be the major threat facing leopard within South Africa. Addressing the illegal skin trade remains a compliance and enforcement challenge. In some provinces, progress has been made in reducing the number of leopards killed as DCAs, though the recent shift in South Africa's game ranching industry to high-value species and colour variants has likely decreased tolerance towards leopards and increased levels of retaliatory killing.

Both national and provincial legislation provides for the protection and conservation of leopard in South Africa. Since the publication of a non-detriment finding (NDF) on leopard in December 2015, the government of South Africa has made concerted efforts to implement measures recommended in the NDF in order to improve the management of the species:

- a) The South African Leopard Monitoring Project has been established, providing for a standardised, rigorous framework using systematic camera-trap surveys for the monitoring of leopard population trends throughout South Africa.
- b) An adaptive approach for the management of trophy hunting has been adopted, and population trend data generated by the South African Leopard Monitoring Project are being used to inform leopard hunting quotas on an annual basis. Hunting will be restricted to leopard hunting zones where scientifically robust data on leopard density trends indicate overall stable (or increasing) populations.
- c) Norms and standards for the trophy hunting of leopard in South Africa are currently under development, the general approach of which is to: 1) distribute hunting effort evenly across leopard range in South Africa; 2) limit hunting to male leopards of at least seven years of age; and 3) ensure the mandatory submission of hunt return data and trophy photographs following all leopard hunts (both successful and unsuccessful).
- d) An online application and submission system for the management of trophy hunting has been developed and roll out to the provinces is imminent. Hunt return data will be used to determine catch-per-unit-effort and harvest composition as indices of relative abundance, while the data capture for leopards killed as DCAs will improve monitoring of DCA off-take.

Between 2005 and 2016, South Africa did not fully utilize its export quota of 150 leopard hunting trophies and skins for personal use, having exported on average 73 per year, mostly as trophies. It is therefore unnecessary to consider an increase in the export quota. On the other hand, a reduction in the export quota would limit the flexibility that is crucial for the adaptive management approach adopted by South Africa for the allocation of leopard hunting quotas. Considering that the leopard is the most valuable hunting trophy exported from SADC, it is hoped that this adaptive management approach will encourage collaborative landowner participation in the South African Leopard Monitoring Project, and ultimately incentivize management practices that contribute towards leopard conservation.

It is therefore recommended that South Africa's export quota for leopard hunting trophies and skins for personal use (Resolution Conf. 10.14 (Rev. CoP16)), as originally informed by a Population and Habitat Viability Analysis (PHVA), be retained at 150.

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