



**HUMANE SOCIETY
INTERNATIONAL**

African Leopard

(*Panthera pardus*)



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This factsheet is part of a series highlighting species vulnerability to trophy hunting and lethal offtake.

IMPACTS OF TROPHY HUNTING

- Offtakes are not biologically sustainable
- Depressed reproduction rates
- Increased rates of infanticide
- Increased inbreeding

POPULATION

Although there is no reliable estimate on the number of leopards in Africa, scientists believe that leopard populations have declined considerably.¹ The IUCN Red List assessment estimates that leopard populations have experienced similar declines to lion populations (which have decreased by 42% in the last three generations) as they face similar threats.¹ Leopards may have experienced even greater declines due to a large proportion of their range falling outside protected areas. Scientists also infer leopard population declines greater than

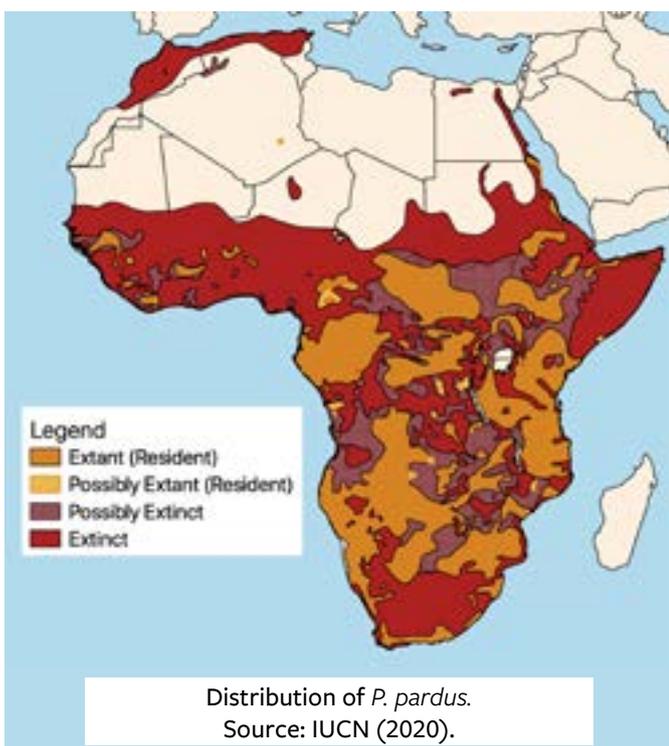
QUICK FACTS:

Population Size:	Unknown, decreasing
Range:	48-67% of historic range lost
IUCN Red List:	Vulnerable (2020)
CITES:	Appendix I (since 1975)
International Trade:	7,155 leopard trophies traded internationally from 2009-2018
Threats:	Habitat fragmentation, reduced prey base, conflict with livestock and game farming, excessive killing for ceremonial use of skins and poorly managed trophy hunting.

50% across East and West Africa.¹

The IUCN Red List status of the leopard throughout its range has changed from Least Concern in 2002 to Near Threatened in 2008 to Vulnerable in 2016, which was maintained in 2020, highlighting the steady deterioration of the conservation status of this species. Species are classified as Vulnerable if they face a high risk of extinction in the wild in the *immediate* future.

The status of leopard populations varies across regions. North African leopards potentially qualify as Critically Endangered due to extremely small population size and probable extirpation from Morocco and Algeria.¹ Populations in Sub-Saharan Africa are declining and predicted to continue decline due to rapid human population growth and habitat



loss.¹ Leopard populations within Angola, Zambia, Mozambique, Zimbabwe and South Africa also appear to be decreasing.¹

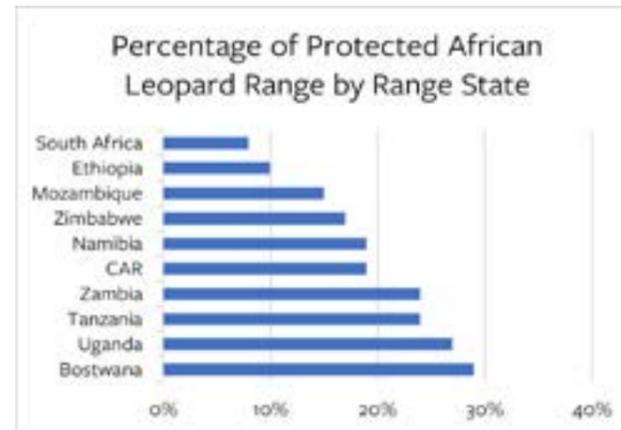
RANGE

The African leopard has lost 48-67% of its historic range (since 1750),² including regional losses of 93.9-99% in North Africa, 86-95% in West Africa, 45-66% in Central Africa, 40-60% in East Africa, and 28-51% in Southern Africa.³

Only 17% of the leopard's extant range in Africa is protected.² The percent of extant range that is protected in countries that allow leopard trophy hunting includes: 29% in Botswana, 27% in Uganda, 24% in United Republic of Tanzania, 24% in Zambia, 19% in Central African Republic, 19% in Namibia, 17% in Zimbabwe, 15% in Mozambique, 10% in Ethiopia, and 8% in South Africa.⁴ Such small percentages of protected ranges leave leopards vulnerable to numerous threats, including trophy hunting.

LIFE HISTORY AND REPRODUCTION

Leopard population growth is slow due to long lifespans, low reproductive rates, long intervals between births, and long periods of cub dependency. The maximum lifespan in females in the wild is 19 years and they continue to give birth up to 16 years old.⁵ Therefore, even the oldest females are important for population growth. The average age of first birth is 3-4 years, depending on the population.^{5,6} Most litters comprise 1-3 cubs that gain independence around 19 months,^{5,7} but can range from 9-35 months.⁷ Females care for only one litter at a time and average interbirth interval is around 25 months,^{5,7} with a range from 11-39 months.⁷ This is important because long intervals between small litters means that few offspring are produced and population growth requires a long time; indicating that populations are slow to recover from over-exploitation. In addition, only 37% of cubs survive to independence.⁵ Females provide sole care to offspring. Cubs who are orphaned while still dependent have even lower survival rates, especially if they are young at the time of their mother's disappearance.⁷ Therefore it is important that mothers remain alive throughout the cub dependency period to ensure survival. Individual females can have up to 11 litters, although



less than half survive to independence.⁵ The average lifetime reproductive success for females, that is the number of offspring a female will contribute to the population over her lifetime, is 4.1.⁵ This illustrates the importance of the survival of each litter. Reproduction can also be slowed due to prey declines, which is a major threat to leopards. During times of prey scarcity mothers will prolong cub dependence which decreases lifetime reproductive success.^{5,7}

One of the most important predictors of cub survival in leopards is infanticide.⁵ Infanticide occurs when an adult male takes over the territory of another male⁸ and kills the dependent cubs in order to increase mating opportunities with resident females (see *Social Structure* section). In the Sabi Sand Game Reserve in South Africa, infanticide by male leopards accounted for 49% of all cub mortality (where the cause of death was known), indicating that leopards have one of the highest rates of infanticide among mammalian carnivores.⁸ In addition, it may take mothers nearly 3 times longer to replace litters lost to infanticide than litters that survive to independence.⁹

Multiple reproductive parameters have been linked to anthropogenic, or human-caused, mortality. Following the implementation of stricter off-take restrictions (both for farmers and trophy hunters), first birth for female leopards occurred at a younger age, mothers spent more time with dependent cubs, mothers produced more litters, and mating success rate was higher.⁹ In addition, the average minimum territorial tenure time for males was longer,⁹ which would allow for increased cub survival due to fewer male takeovers and opportunities for infanticide. In addition, survival rates were higher for juveniles and subadults which contributes to long-term population growth.⁹ These

are multiple direct measures of reproduction and population growth that are stunted due to high off-take from trophy hunting.

SOCIAL STRUCTURE

Leopards are solitary but exhibit kin-related territory structure where both sexes maintain and defend their own territories.^{8,10} Females stay near their birth territories and share with related females, while males disperse from where they were born to establish new territories.^{8,10,11} In populations under high hunting pressure, subadult males disperse shorter distances and establish territories near their birth habitat.^{11,12} In addition, trophy hunting can encourage earlier natal dispersal.¹¹

Although leopards are solitary, they exhibit complex territory structures that are sensitive to disruption. After the death of an adult male, including by anthropogenic factors such as trophy hunting, other males will move into the previously occupied territory. The number of male takeovers predicts the rate of infanticide and only male leopards commit infanticide.⁸ Males in the early stages of their territorial tenure are most often responsible for committing infanticide.⁸ Both natural and human-caused mortality may contribute to the rate of infanticide by shortening territorial tenure in males. In populations with low rates of human disturbance, naturally occurring infanticide does not appear to negatively affect population size.⁸ However, high rates of human off-take can artificially increase rates of male takeovers and infanticide to an unsustainable level which negatively affects population growth. For example, following reduced human-caused mortality from trophy hunting and lethal management, male territories were more stable, leopard mortality decreased, cub survival increased, reproductive output increased, and population growth rate increased.⁹ High rates of human off-take disrupt complex territorial structure and can increase mortality caused by conflict between leopards and infanticide.⁹ Artificially high levels of male takeovers, due to trophy hunting, promote lower cub survival rates, delay age at first parturition, reduce conception rates, and lower annual litter production.¹³ Given that cub survival is the most important measure of female lifetime reproductive success,⁵ infanticide due to male takeovers has long-term negative effects on population growth. During male takeovers, adult females may also be killed while trying to protect

their cubs.⁸ Therefore, maintaining social stability to prevent male takeover is critical for cub survival and reproductive rates. Management strategies must consider the negative effects of human-caused mortality on social stability, especially given the high rates of infanticide in leopards.

Male-biased dispersal in leopards, where males leave their natal range to establish new territories and females stay, decreases the chances of inbreeding, or mating with a close relative, due to physical separation of related individuals. This is important because inbreeding results in reduced genetic diversity which can have many negative effects on survival and reproduction. However, long-term anthropogenic mortality in leopard populations can disrupt dispersal,^{9,11,12} thereby increasing levels of inbreeding.¹² In the recovering leopard population at Phinda-uMkhuze Complex (PMC) in South Africa, more than 50% of all leopard deaths between 2002 and 2012 were due to human-related causes, primarily persecution by farmers and trophy hunting.⁹ In this population, where anthropogenic mortality was high, there was evidence of reduced dispersal and increased inbreeding.¹² In comparison, the leopard population at the Sabi Sand Game Reserve in South Africa, which is at carrying capacity and has experienced low levels of anthropogenic mortality (<2% between 1975 and 2015), exhibited normal dispersal patterns and no evidence of inbreeding.¹²

HABITAT AND ECOLOGY

Leopards are carnivores that need an abundance of prey in order to survive. They are solitary hunters and typically consume small to medium prey (10-40 kg in weight).¹⁴ Their preferred species include impala, bushbuck, and common duiker.^{14,15} Although leopards are considered generalists because they eat a wide variety of prey, individuals will also specialize on specific prey species or sizes.¹⁵ Males are more likely than females to specialize due to their larger body size allowing them the ability to catch a wider variety of prey.¹⁵ These male specialists are especially vulnerable to prey declines of their preferred prey, as they are less capable of shifting to other prey species or sizes based on availability.¹⁵ Therefore, it is important to consider that prey declines may disproportionately affect some adult males, the same demographic targeted by trophy hunters.

Although leopards can be found in a wide variety of habitats, habitat use is largely driven by prey availability^{16,17} and negatively correlated with human presence and disturbance.^{2,16,18} Leopard population density also closely follows prey species.^{19,20} Large prey declines have occurred throughout the leopard's range, including 52% in East Africa, and 85% in West Africa.²¹ The latest IUCN report estimates >50% decline in leopard populations across East and West Africa due to these reductions in prey.¹ Bushmeat trade of medium and large herbivores has also contributed to a decline of leopard prey.¹

DIRECT ANTHROPOGENIC THREATS

The greatest human-caused, or anthropogenic, threat is likely conflict with livestock and game farming communities.¹ Yet, a large percentage of leopards killed in these conflicts are not reported or accounted for,¹ which means that accurate estimates of illegal offtake are not used when determining hunting quotas. Leopards have been taken at unsustainable rates both legally and illegally, including persecution from livestock farmers, trophy hunters, and poachers.¹ Livestock and game farmers kill leopards due to both real and perceived threats to their livelihoods.¹ In Limpopo Province, South Africa, leopards accounted for 68% of permit applications for killing nuisance wildlife.²² Leopards are also killed, legally and illegally, for their skins to be used in traditional ceremonies.¹

Without proper management and recording of offtake due to conflict with livestock owners, it is impossible to ensure that other sources of offtake, such as trophy hunting, are sustainable. This is especially true for leopards given that their population size is also unknown. Most countries do not have adequate data on wildlife conflict and therefore do not consider these sources of mortality when establishing offtake quotas. For example, one study found that less than 50% of leopards killed due to human-wildlife conflict were reported.²³ While leopard populations have consistently declined, legal offtake rates have remained high.²⁴ Global gross imports of leopard trophies totaled 7,155 from 2009 to 2018, or 715 per year on average.²⁵

Scientific studies have documented leopard hunt-

ing quotas that are higher than what is biologically sustainable. A study in Tanzania's Selous Game Reserve, found that some hunting blocks have quotas up to seven times the sustainable rate.²⁶ There is also evidence of unsustainable levels of trophy hunting of leopards in Mozambique,²⁷ South Africa,^{9,28} Zimbabwe,²⁹ and Zambia.³⁰ Due to concerns over population declines, South Africa suspended trophy hunting of leopards for two years in 2016 and 2017.^{1,31} Trophy hunting can have an additive effect with other threats, so factors such as habitat quality, prey declines, population demographics, and illegal offtake need to be taken into consideration when determining sustainable hunting levels.²⁸ This is especially true for infanticidal species, such as leopards. A study in Mozambique found that although offtake initially appeared to be sustainable, when taken in consideration with the age of leopards legally taken and sex of leopards illegally taken, trophy hunting offtake was biologically unsustainable.²⁷

Numerous scientific studies over the past decade have demonstrated that poorly managed trophy hunting has led to negative impacts on leopard populations. There has been a history of mismanagement and over-exploitation.¹³ The latest IUCN assessment lists poorly managed trophy hunting as a major threat to leopard survival that has increased in recent years.¹ Poorly regulated trophy hunting has contributed to population declines,⁹ low reproductive output,⁹ low genetic diversity,¹² decreased abundance,^{12,16} and mortality rates double those of leopards in protected habitats.¹³ As previously mentioned, only 17% of the leopard's extant range in Africa is protected² which means leopards are vulnerable to high rates of offtake in the majority of their range. Trophy hunting also disrupts social stability⁹ and natural dispersal in leopards.^{11,12} In addition to immediate effects, there may also be delayed effects of trophy hunting on leopard spatial and population dynamics.^{10,32}

Hunters are most likely to take adult male leopards as trophies,^{13,33} which destabilizes the social structure and depresses reproduction rates⁹ (see *Social Structure*). However, female leopards are also killed for trophies. In one study, 87% of professional hunters surveyed, who have hunted in Botswana, South Africa, Namibia, Tanzania, Zambia, or Zimbabwe, responded that they were willing to hunt an adult female leopard.³³ Data suggest that trophy hunters are equally likely to encoun-

ter a male or female leopard¹³ and that hunters have difficulty determining the sex and age of individuals.^{13,33,34} Since males can mate with multiple females, females are the limiting factor in reproduction and hold higher reproductive value. In addition, females taken as trophies are likely to leave dependent cubs orphaned. To limit these negative effects, several countries (Mozambique,³⁵ Namibia,³⁶ South Africa,³⁷ Tanzania³⁸) have followed scientific recommendations^{32,34} to implement regulations so that only males aged seven and older can be hunted. Despite these regulations, offtake of females and young leopards is common.^{34,40}

Finally, the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) have approved annual quotas for twelve countries for export of leopard hunting trophies and skins for personal use. Despite the significant decline of leopard population size over the past 22 years, the annual CITES export quota total has increased five-fold, from 460 in 1983 to 2,648 in 2007-2019.⁴¹ These CITES quotas are outdated and based on population estimates derived from poor methodology that relied solely on habitat availability and excluded important factors such as prey abundance and anthropogenic mortality.^{41,13}

MANAGEMENT IMPLICATIONS

African leopard populations are decreasing¹ and there are not enough population data available to make science-based management decisions. There are no robust range-wide population estimates for mature individuals and limited reliable data on regional and national population sizes and demographics.¹ In order to protect leopard populations from further declines, there must be sufficient data on population size, demographics, and the number of individuals lost to all threats. For most populations, this information is severely lacking, meaning that no level of offtake, even if legal, should be considered biologically sustainable.

CITES quotas are not based in modern science but on a poorly designed study that is over 30 years old.⁴² The population estimates from this study incorrectly modeled population size as a function of habitat without considering prey abundance or anthropogenic mortality, which led to gross overestimates of leopard abundance.^{13,41} It is important to consider these factors, as it is known that leop-

ard populations are driven by prey^{16,17,19,20} and that high rates of human-caused mortality occur in ideal leopard habitat.²⁸ These overestimates remain a problem as offtake quotas have historically been set too high, and given the lack of robust abundance data, managers have been slow to reduce them.⁴¹ In addition, these quotas do not consider biological implications of trophy hunting, such as increased infanticide, inbreeding, and depressed reproduction rates.

Human-leopard conflict is also serious threat that must be addressed. Non-lethal measures to prevent livestock-conflict should be implemented in place of problem animal removal. Better husbandry practices are more successful than lethal offtake at preventing livestock loss and increasing human tolerance of leopards.⁹ A study in South Africa found that even after reducing offtake from trophy hunting and lethal removal, poaching decreased due to improved tolerance as a result of successful preventive measures.⁹

Leopard populations are facing many ongoing threats, such as habitat loss, prey declines, persecution, and poorly managed trophy hunting. Leopards have low reproductive rates, slow population growth, and replacement of individuals takes a long time, which makes them susceptible to population declines. These factors, in addition to prey loss, contribute to low density leopard populations, which makes it difficult to distribute trophy hunting pressure so that offtake is sustainable. Mismanagement of trophy hunting, where quotas are set too high, restrictions on leopard age and sex are not set or followed, and offtake is too highly concentrated, has led to population declines. Yet, trophy hunting of adult males, the preferred targets, still negatively impacts leopard populations. Trophy hunting can artificially increase the rate of male turnover leading to shortened territorial tenure, unnaturally high rates of infanticide, and depressed growth rates. Disruption of male dispersal from trophy hunting has led to increased inbreeding which can negatively affect survival and reproduction. Offtake of females and young leopards occurs, even though this can result in population crashes. However, hunting quotas are often set too high and do not take these important biological factors into consideration. Without proper monitoring and management, especially with unknown population sizes, the compounding effects of trophy hunting will continue to threaten leopard survival.

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