



**BOTSWANA DEPARTMENT OF WILDLIFE & NATIONAL PARKS**

**REVIEW OF THE LEOPARD (*Panthera pardus*) EXPORT QUOTA FOR  
BOTSWANA, ESTABLISHED PER RESOLUTION CONF. 10.14 (REV.  
COP16) AND NON-DETRIMENT DETERMINATIONS, IN  
ACCORDANCE WITH CITES DECISION 18.165**

**GABORONE, BOTSWANA – MAY 2020**

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## **1 INTRODUCTION**

Leopards are members of both photographic tourism’s “big seven” and hunting’s “big five,” with considerable potential for sustainably generating income in rural areas, but they can also inflict serious losses on livestock farmers, especially those with low and insecure incomes and small livestock numbers.

Balancing the assets and liabilities from the presence of leopard populations requires them to be carefully managed.

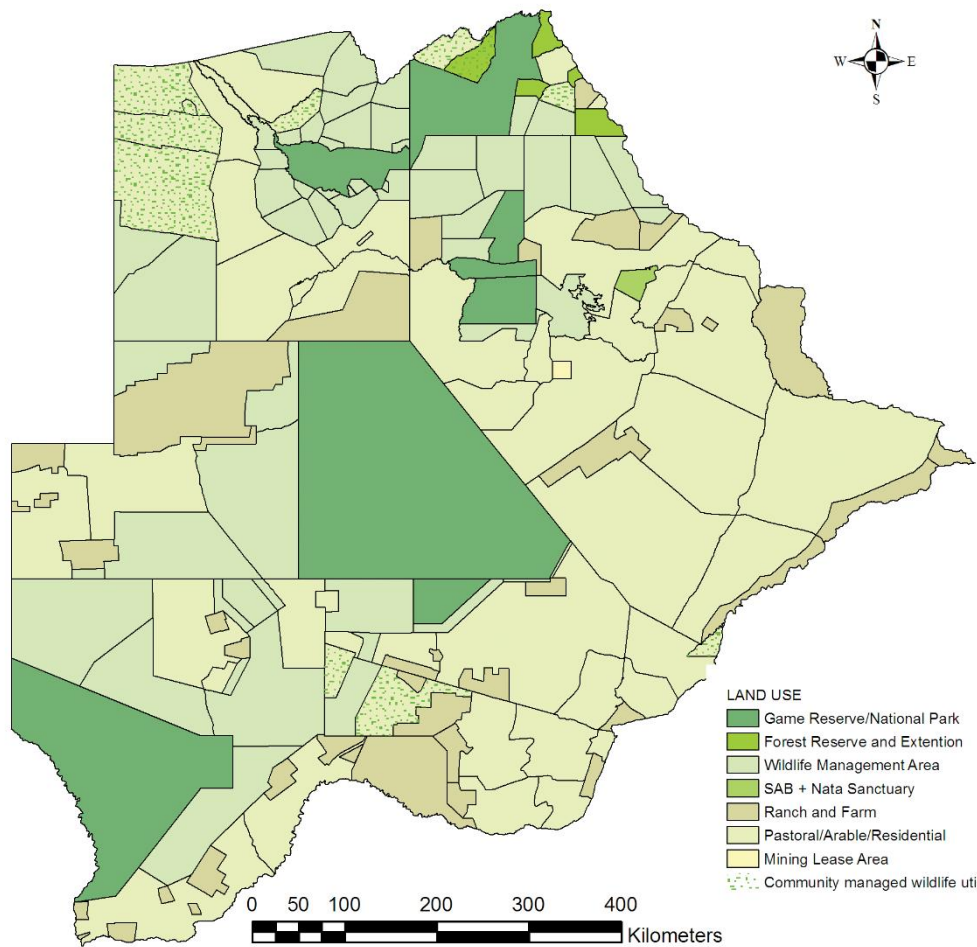
## **2 CONSERVATION STATUS OF LEOPARD IN BOTSWANA**

The leopard as a species is classified as globally Vulnerable (Stein et al 2020), with the African subspecies *P. pardus pardus* also being vulnerable; mainly due to habitat loss, conflict killing and depletion of their prey base. These continental impacts are ultimately due to rapid growth in human and livestock populations (<https://www.iucnredlist.org/species/15954/163991139#population>). Botswana is the exception to this rule; while her human population has increased, the number of livestock has shown the opposite trend to the rest of the continent with a decline from 3.512 million head in 2004 to 2.532 million head in 2017 (Botswana Annual Agricultural Census Report 2013, 2015). This decline in livestock will have led to a decrease in human-predator conflict connected to livestock depredation by large carnivores. The area of leopard habitat in Botswana (see below) has remained approximately constant with no large-scale changes in land use that are likely to have affected the number of leopards in Botswana.

## **3 BOTSWANA’S LEOPARD POPULATION AND ITS DISTRIBUTION**

### **3.1 LEOPARD HABITAT**

Botswana manages approximately 38% of her surface area as wildlife estate (Figure 1). This includes National Parks (NPs) and Game Reserves referred to collectively as Protected Areas (115,819 square km), Wildlife Management Areas (WMAs) (143,070 square km), and Forest Reserves (4,207 square km). Land use over most of the remainder is extensive subsistence pastoralism and subsistence crop farming on communal land. There is arable cropping in the east and south, irrigated vegetable farming along river courses, and commercial livestock and game ranching on privately owned or leased land. Land outside the protected areas may be declared to be a Controlled Hunting Area (CHAs).



**FIGURE 1: DESIGNATED LAND USES IN BOTSWANA**

Botswana’s human population density is low overall (approx. 2.25 million people in 600,370 square km) with most of the population concentrated on the south and east, leaving the central and northern parts thinly populated (2.6/square km).

Leopards are highly adaptable and widely distributed and can persist in areas where other large carnivores have been extirpated, including the outskirts and suburbs of towns. Botswana’s largely rural economy and sparse population leave most of its land area as suitable habitat for leopard. All of the Protected Areas, WMAs and livestock areas support leopards at various densities. Over a large portion of the south east of the country where agriculture is the most intensive and has the longest history, leopards are classed as “possibly extinct” (Jacobson et al 2016; Stein et al 2020), but that may reflect a lack of systematic surveys rather than the real absence of leopards.

The veterinary cordon fences that separate Protected Areas and WMAs from communal and agricultural land, and the livestock fences that control the movements of livestock are permeable to predators, allowing almost unhindered connectivity between leopard populations in different areas and land uses.

### 3.2 LEOPARD DENSITIES AND NUMBERS

Compared to most of the rest of *P.P. pardus*’ range, Botswana has a useful body of data on leopard densities. Data on population trends are limited and can be supplemented by proxy measures of historical density (see below).

With the exception of the agricultural areas in the south east where leopard densities are probably very low, the available data are sufficiently representative of the major habitats and land use designations for the national leopard population to be estimated by extrapolation from surveyed areas (Figure 2).

Current estimates of leopard density are based on spoor counts, camera trapping, and citizen science photographic surveys. Results have been stratified according to land use (Figure 2).

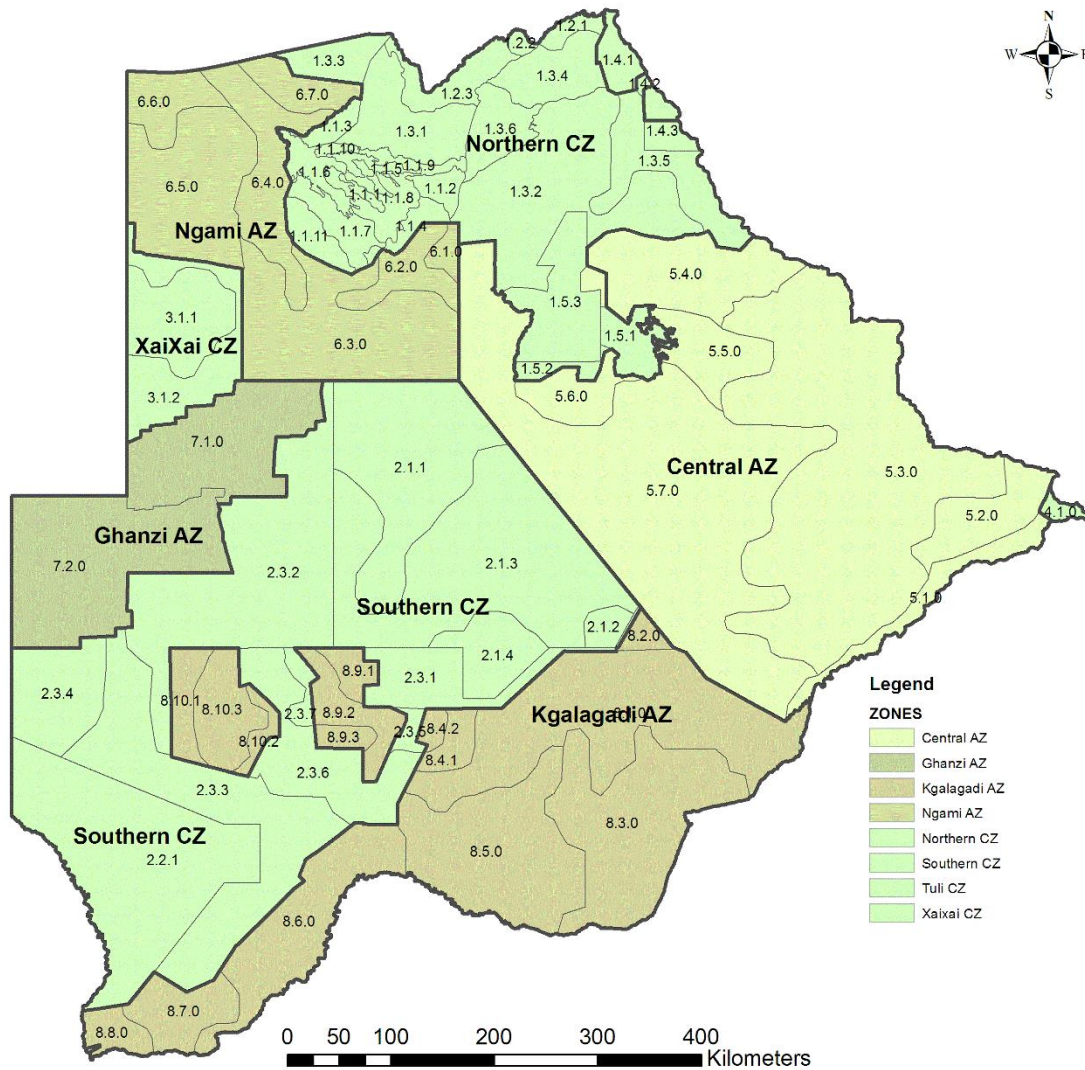


FIGURE 2: STRATIFICATION OF BOTSWANA LAND USE AREAS FOR CALCULATIONS OF LEOPARD POPULATIONS

**TABLE 1: ESTIMATES OF LEOPARD NUMBERS FOR STRATIFIED LAND USES IN BOTSWANA. *Minimum and maximum of estimates in parentheses.***

<b>Zone</b>	<b>Stratum</b>	<b>Population</b>
Northern CZ	1.1.1	15 (7 - 22)
Northern CZ	1.1.2	23 (15 - 37)
Northern CZ	1.1.3	21 (13 - 34)
Northern CZ	1.1.4	113 (86 - 126)
Northern CZ	1.1.5	9 (6 - 15)
Northern CZ	1.1.6	7 (5 - 12)
Northern CZ	1.1.7	49 (31 - 79)
Northern CZ	1.1.8	120 (60 - 180)
Northern CZ	1.1.9	38 (19 - 57)
Northern CZ	1.1.10	14 (7 - 22)
Northern CZ	1.1.11	39 (24 - 62)
Northern CZ	1.2.1	1 (0 - 3)
Northern CZ	1.2.2	1 (0 - 1)
Northern CZ	1.2.3	55 (28 - 83)
Northern CZ	1.3.1	96 (7 - 186)
Northern CZ	1.3.2	353 (176 - 529)
Northern CZ	1.3.3	52 (26 - 78)
Northern CZ	1.3.4	85 (42 - 127)
Northern CZ	1.3.5	117 (58 - 175)
Northern CZ	1.3.6	75 (41 - 131)
Northern CZ	1.4.1	13 (4 - 23)
Northern CZ	1.4.2	1 (0 - 2)
Northern CZ	1.4.3	13 (4 - 22)
Northern CZ	1.5.1	1 (0 - 3)
Northern CZ	1.5.2	1 (0 - 1)
Northern CZ	1.5.3	3 (0 - 7)
Southern CZ	2.1.1	116 (66 - 225)
Southern CZ	2.1.2	0 (0 - 0)
Southern CZ	2.1.3	89 (0 - 178)
Southern CZ	2.1.4	18 (12 - 29)
Southern CZ	2.2.1	629 (419 - 865)
Southern CZ	2.3.1	13 (5 - 47)
Southern CZ	2.3.2	123 (52 - 170)
Southern CZ	2.3.3	252 (81 - 368)
Southern CZ	2.3.4	39 (14 - 59)
Southern CZ	2.3.5	1 (0 - 3)
Southern CZ	2.3.6	96 (10 - 150)
Southern CZ	2.3.7	11 (1 - 17)
Xaixai CZ	3.1.1	52 (25 - 113)
Xaixai CZ	3.1.2	33 (19 - 48)

<b>Zone</b>	<b>Stratum</b>	<b>Population</b>
Tuli CZ	4.1.0	51 (38 - 65)
Central Agric	5.1.0	326 (239 - 413)
Central Agric	5.2.0	18 (0 - 31)
Central Agric	5.3.0	23 (0 - 39)
Central Agric	5.4.0	37 (0 - 62)
Central Agric	5.5.0	0 (0 - 0)
Central Agric	5.6.0	0 (0 - 0)
Central Agric	5.7.0	164 (0 - 275)
Ngami Agric	6.1.0	2 (0 - 4)
Ngami Agric	6.2.0	7 (0 - 14)
Ngami Agric	6.3.0	33 (0 - 66)
Ngami Agric	6.4.0	15 (0 - 30)
Ngami Agric	6.5.0	140 (57 - 266)
Ngami Agric	6.6.0	26 (12 - 47)
Ngami Agric	6.7.0	6 (0 - 12)
Ghanzi Agric	7.1.0	149 (74 - 223)
Ghanzi Agric	7.2.0	212 (106 - 319)
Kgalagadi Agric	8.1.0	79 (0 - 133)
Kgalagadi Agric	8.2.0	3 (0 - 5)
Kgalagadi Agric	8.3.0	14 (0 - 24)
Kgalagadi Agric	8.4.1	6 (0 - 10)
Kgalagadi Agric	8.4.2	2 (0 - 4)
Kgalagadi Agric	8.5.0	54 (0 - 90)
Kgalagadi Agric	8.6.0	37 (0 - 61)
Kgalagadi Agric	8.7.0	15 (0 - 25)
Kgalagadi Agric	8.8.0	7 (0 - 11)
Kgalagadi Agric	8.9.1	17 (1 - 36)
Kgalagadi Agric	8.9.2	40 (2 - 86)
Kgalagadi Agric	8.9.3	12 (1 - 25)
Kgalagadi Agric	8.10.1	1 (0 - 4)
Kgalagadi Agric	8.10.2	1 (0 - 1)
Kgalagadi Agric	8.10.3	8 (0 - 29)
<b>TOTAL</b>		<b>4,295 (1893 - 6700)</b>

WMAs were intended to act as buffers between Protected Areas and agriculture land; protecting human livelihoods from animals leaving Parks and Reserves, and protecting wildlife populations in Protected Areas from conflict killings and harvest. Where WMAs have been used non-consumptively for photographic tourism, wildlife densities have risen to the same high levels as in the Protected Areas; leopard densities in photographic tourism areas (Rafiq et al 2019; Rich et al 2019) are probably at the maximum that prey populations can support. These saturated populations are expected to be sources of dispersing leopards that move into population sinks in livestock areas (both communal and privately owned) where conflict killings reduce leopard density, shifting the human-wildlife conflict interface out to the boundaries of the non-consumptive WMAs. There are no data for the scale of these source–

sink dynamics, but livestock-predator conflict is independent of distance from a Protected Area, which suggests that conflict is with resident leopards. This in turn suggests that limited offtakes (for whatever reason) of leopards in WMAs and livestock areas will not compromise core populations in Protected Areas or non-consumptive WMAs.

### 3.3 HISTORICAL TRENDS

In 2004 there were estimated to be 5,617 leopards in Botswana (Central Statistics Office 2005), and this has been the basis for calculating export quotas in subsequent years. The basis for the estimate included numerous assumptions in the absence of field data, most notably extrapolation of leopard densities from good habitat to areas now known to support only low densities, leading to an over-estimate of national leopard numbers.

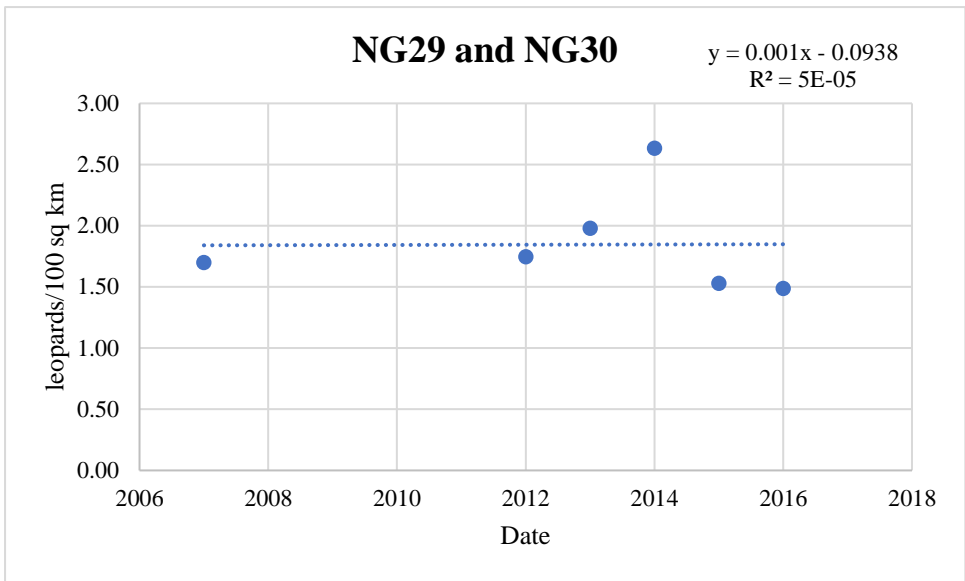
Historical estimates of leopard abundance, stratified by area, are available from 2004 (Central Statistical Office 2005) (Table 2), and comparison with current estimates show that current estimates of leopard populations are lower. This does not reflect downward trends in leopard populations; it is a result of improved area coverage in a wider range of habitats, requiring less extrapolation for areas lacking data (see also 3.4 below).

**TABLE 2: ESTIMATES OF LEOPARD NUMBERS IN BOTSWANA IN 2004 AND 2020**

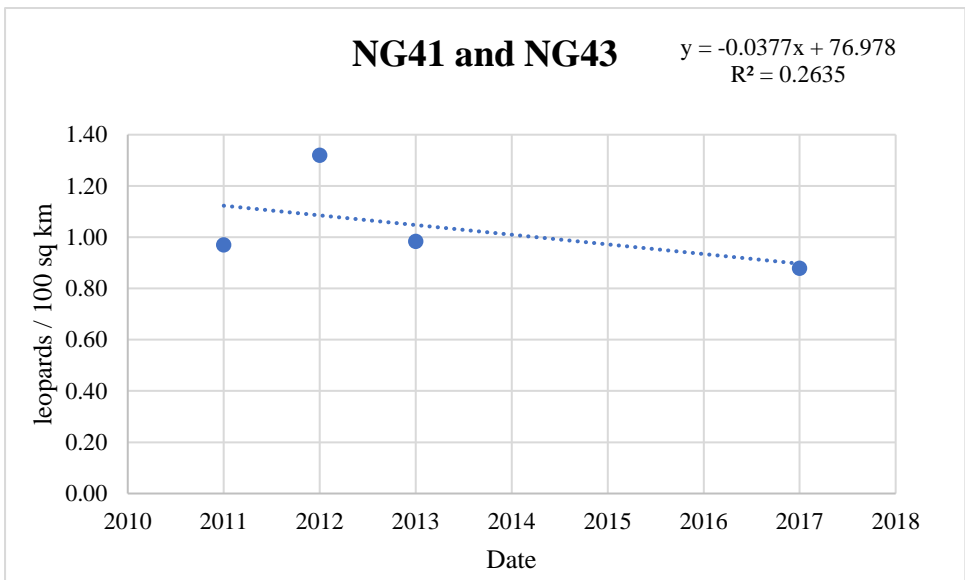
<b>Zone</b>	<b>Estimate 2004</b>	<b>Estimate 2020</b>
Northern Conservation Zone	1,998	1,369
Southern Conservation Zone	1,955	1,473
Northern Agricultural Zone	840	797
Southern Agricultural Zone	823	656
<b>Botswana</b>	<b>5,617</b>	<b>4,295</b>

Actual trend data are available for two sites in the Northern Conservation Zone. There was no significant density trend in Stratum 1.1.7 (NG29 and NG30 Okavango Delta) from 2007 to 2016 (Figure 3), and no significant density trend in Stratum 1.3.2 (NG41 and NG43) from 2011 to 2017 (Figure 4). These results are consistent with the lack of trend in proxy measures of leopard abundance (see Figure 3.4 below).





**FIGURE 3: LEOPARD POPULATION TREND FROM 2007 TO 2016 IN STRATUM 1.1.7 OF THE NORTHERN CONSERVATION ZONE. DENSITIES CALCULATED FROM TRACK SURVEYS.**



**FIGURE 4: LEOPARD POPULATION TREND FROM 2011 TO 2017 IN STRATUM 1.3.2 OF THE NORTHERN CONSERVATION ZONE. DENSITIES CALCULATED FROM TRACK SURVEYS**

### 3.4 PROXY MEASURES OF LEOPARD ABUNDANCE

#### 3.4.1 Leopard Attacks on Livestock

Botswana Department of Wildlife and National Parks (DWNP) records show a stable number of reported incidents of leopard attacks on livestock between 2015 and 2019 (Figure 5) and of leopards killed as problem animals (Figure 6). Decreasing livestock numbers (see 2 above) would be expected to lead to decreasing conflict if leopard numbers are stable and decreasing conflict if leopard numbers are decreasing. Stable conflict with decreasing livestock numbers implies increasing leopard numbers.

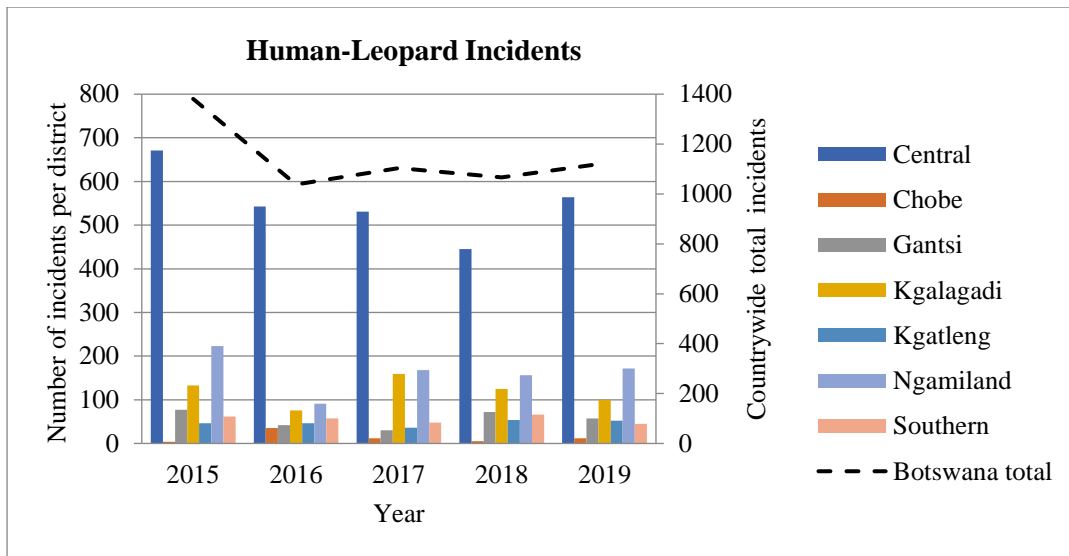


FIGURE 5: LEOPARD ATTACKS ON LIVESTOCK PER ANNUM, FROM DWNP RECORDS

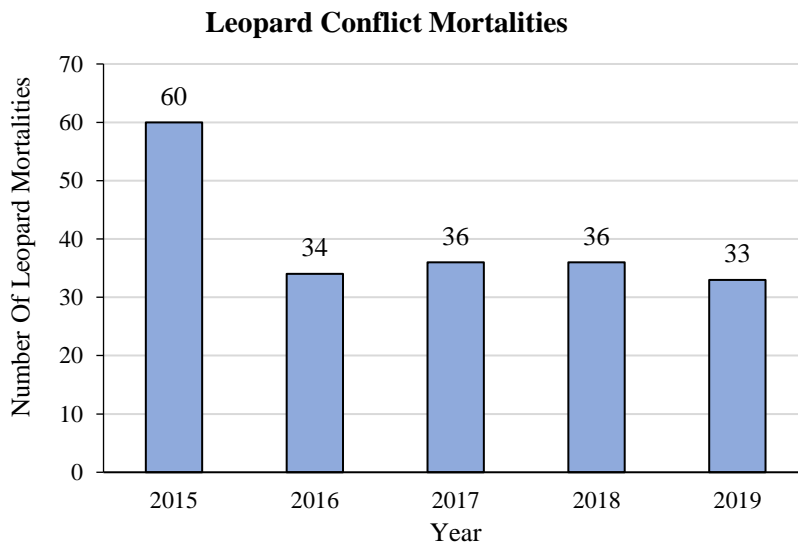


FIGURE 6: NUMBERS OF LEOPARDS KILLED AS PROBLEM ANIMALS PER ANNUM, FROM DWNP RECORDS

### 3.4.2 Trophy Quality

Prior to the moratorium on hunting in 2014 data on trophy quality as measured by skull size were reported by operators to the Botswana Wildlife Producers Association. Leopard skull size was stable with time in most areas and actually increased with time in material from Ghanzi. Since females and young leopards have smaller skulls this indicates stable age structures and sex ratios in hunted populations, even when they are also subject to conflict killings in livestock areas. Stable age structures and sex ratios are a robust indicator of sustainable offtake.

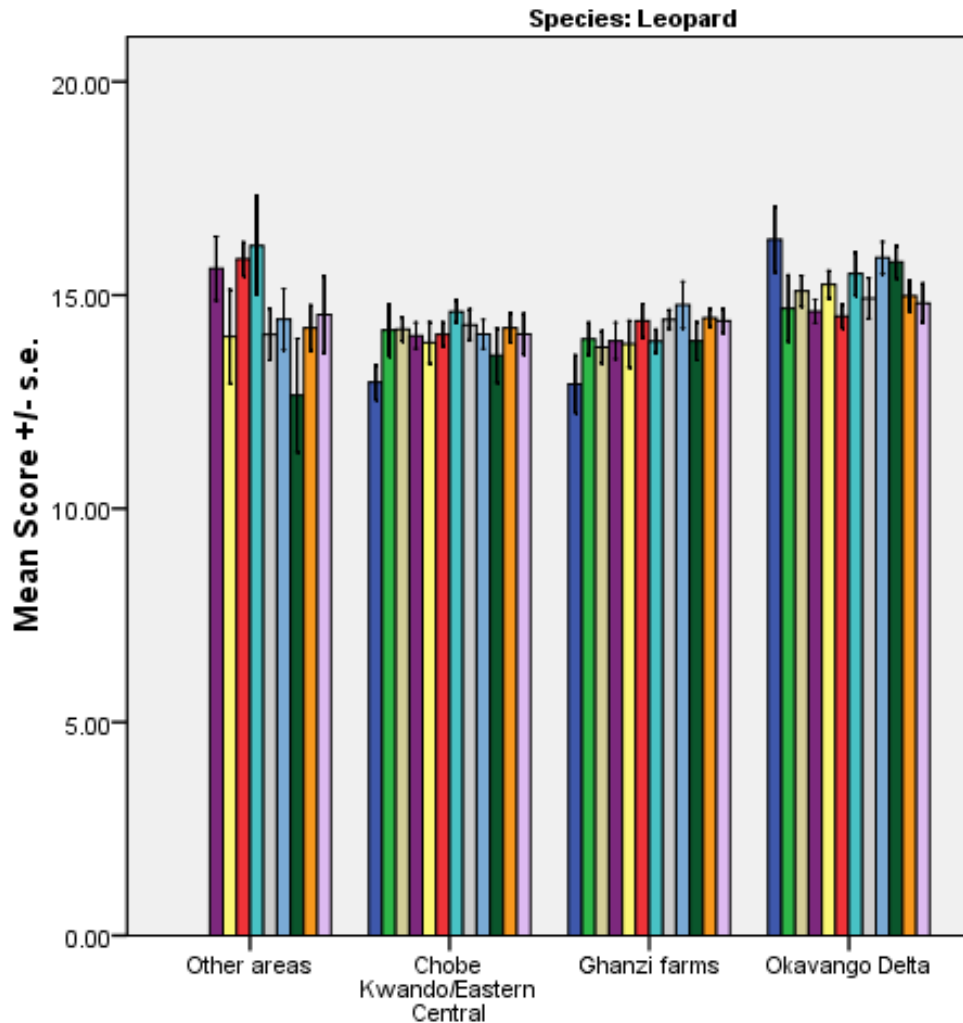


FIGURE 7: SKULL SIZES (LENGTH + WIDTH) OF LEOPARDS TAKEN AS TROPHIES BETWEEN 1997 AND 2007 (BWPA DATA)

### 3.4.3 Anthropogenic Leopard Mortalities in Botswana

Problem animal killings reported to DWNP have been stable at between 33 and 36 per annum since 2016, having decreased from 60 in 2015 (Figure 4). There is no estimate for the number of unreported problem animal killings. Poaching for skins is limited; fewer than five skins per year are intercepted by DWNP. Neither of these causes of mortality are at a scale that is expected to affect leopard populations.

## 4 THE LEOPARD'S LEGAL STATUS AND PROTECTIONS IN BOTSWANA

The leopard is classified as a partially protected game animal under the Wildlife Conservation and National Parks Act of 1992, Schedule 7 and may be killed or captured only with a licence issued under the same Act. Under Wildlife Conservation and National Parks Act of 1992 leopards may be killed without a permit/licence in defence of human life or livestock. Leopards killed under these circumstances must be reported to DWNP, and usually the skin is surrendered to the department. Any other take-off leopards are restricted by quotas specific to designated areas.

## **5 MANAGING HUNTING OFFTAKE**

All hunting quotas for any game species and under all permit and licensing systems are specific to designated areas. The size of quotas depends on the local species population and its dynamics, not on the national population and is adjusted according to census results.

### **5.1 SECONDARY EFFECTS OF HUNTING: POSSIBLE MORTALITY CASCADES AND THEIR PREVENTION**

In dense leopard populations infanticide is the leading cause of juvenile mortality (Balme and Hunter 2013) and replacement of a territorial male as a consequence of hunting may lead to a pulse of cub killing by his replacement (Balme et. al 2010) (a similar situation is found in lions and is managed by setting minimum ages for trophies). In Botswana, leopard densities as high as those where infanticide occurs are limited to the photographic tourism areas, where no hunting will take place. Repeated removal of territorial males from a restricted area may reduce emigration of young males, which may lead to localised inbreeding (Naude et al 2020). In Botswana this can easily be prevented by not repeatedly assigning leopard licenses to the same area. Age restrictions on hunted animals also ameliorate the effects of infanticide; if males are harvested at the age of 7 years or older, the effects of infanticide and population disruption are significantly decreased (Balme et al. 2012).

### **5.2 HISTORICAL LEOPARD QUOTAS**

Between 2005 and 2014 (when the hunting moratorium was instituted) the quota was set at 130 per annum on the basis of a 2% offtake from a national leopard population of 5,600 (DWNP from results compiled by the Botswana Carnivore Forum). The population estimate is from 2004 (Central Statistics office 2005), and there has not been a national census of leopards since then. A national census was planned for 2020 but has been postponed due to the COVID-19 pandemic.

### **5.3 POTENTIAL REVENUE GENERATION FROM LEOPARDS**

#### **5.3.1 Non-Consumptive**

Leopards are one of photographic tourism's "big seven" but offering them as photographic subjects requires high densities of leopards that are habituated to close approach by tourists in vehicles. This is not possible in Botswana outside the prime photographic areas of the Okavango, Chobe and Linyanti.

#### **5.3.2 Consumptive**

Leopards are one of hunting's "big five", and substantially enhance the value of hunting packages. Hunting (combined with other wildlife offtakes under Botswana's diverse wildlife laws) has a proven track record in generating income for rural communities (Arntzen 2003). Tolerance for leopards in livestock areas is improved, and their persecution as problem animals is reduced, if they have a tangible value as hunting trophies.

## **6 REQUEST FOR QUOTA**

Botswana supports a stable population of 4,295 leopards which suffers limited mortality from problem animal control and illegal killing. The leopard population sustainably supported trophy hunting offtakes when the annual quota was set at 130, and there is no reason to expect that there has been a subsequent decline in leopard numbers and no evidence of such a decline. Consequently, we submit a request that the quota be maintained at 130 per annum.

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## **8 ACKNOWLEDGEMENTS AND NOTES ON DATA RIGHTS**

Data for leopard numbers and densities were compiled by the Botswana Carnivore Forum and its members. For further information regarding data please contact the respective members from which data was collected as outlined in the leopard density excel sheet. This data is provided in confidence and should not be published or disseminated outside of this report without prior written consent from data owners.