WILDLIFE STATISTICS 2004

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Preface

Wildlife comprises all fauna (animal life) and flora (plant life) that are found in the wild. However, the term 'wildlife' is used in this statistical Report, to refer to that part of fauna that is found in the wild in Botswana and that comprises mammals and birds. Due to data limitations, the only population statistics provided on birds is on ostriches, although information is given on bird species that are protected and on those that may be legally hunted. Furthermore, statistics provided on mammals cover species of both herbivores and carnivores of various sizes.

Additional information is provided on populations of the main six predators of Botswana and on Problem Animal Control (PAC) efforts. Predator populations are not accurately estimated in aerial surveys, hence the need for estimates based on other surveys. PAC efforts aim at the minimization of wildlife-human conflicts in order to ensure that the pursuit of human survival does not endanger the sustainability of wildlife populations.

Information is provided on the percentage contribution of selected wildlife species to total animal biomass (measured in livestock units, LUs). The distribution of animal biomass is also presented in LU/km^2 units. LU/km^2 shows the pressure on sustainability of vegetation (for herbivores), other animals (carnivores) and water resources imposed by the indicated animal species. This measure is important for decision making regarding the sustainability of both the animals and the resources on which the animals depend.

Finally, data at both district and national levels on the number of game hunting licenses and size of hunting quotas for applicable species is also provided in this Report. Since the value of involving local communities in environmental sustainability efforts is of paramount importance, some information is given on the participation of local Community Based Organizations (CBOs) in wildlife management.

This is the maiden issue of the Wildlife Statistics Report produced by the Environment Statistics Unit (ESU). Officers of the Department of Wildlife and National Parks (DWNP) have supported this work by providing required data; and literature and reading through the draft of the Report as well as providing invaluable suggestions. Therefore, CSO acknowledges, with gratitude, the contributions of DWNP officers, particularly those of the head and staff of the Research Division and the head of the Management and Utilisation Division, and the staff of the Licensing and Utilisation Unit, Anti-Poaching Unit, Problem Animal Control Unit and the Community Development Unit.

It gives me great pleasure to present this first issue of the Wildlife Statistics Report to our stakeholders.

Thank you.

A. Majelantle
Government Statistician
January 2005

II. TABLE OF CONTENTS

			Page
I		**Preface**	**ii**
II		**Table of Contents**	**iii**
III		**List of Tables**	**v**
IV		**List of Figures**	**ix**
V		**List of Maps**	**ix**
VI		**List of Abbreviations**	**x**
VII		**Summary of Observations**	**xi**
1.0		**Introduction**	**1**
	1.1	Wildlife Background	1
	1.2	Challenges to the Sustainable Management of Botswana's Wildlife	1
	1.3	Wildlife and the economy	7
	1.4	Protection of Vulnerable Species	8
	1.5	Threatened and Rare Mammal and Bird Species	9
2.0		**Wildlife Population Estimates**	**11**
	2.1	Introduction	11
	2.2	Stratification of the Country for Aerial Surveys	11
	2.3	Shortcomings of Wildlife Aerial Surveys	11
	2.4	Challenges Associated with Counting Selected Species of Wildlife by Aerial Surveys	12
	2.5	Wildlife Population Estimates of Selected Species at the National Level	19
	2.6	Wildlife Population Estimates of Selected Species in Administrative Districts	25
	2.7	Wildlife Population Estimates of Selected in National Parks and Game Reserves	33

3.0		**Predator Populations**	**46**
	3.1	Brown Hyeana	49
	3.2	Cheetah	49
	3.3	Wild dog	50
	3.4	Leopard	50
	3.5	Lion	51
	3.6	Spotted Hyeana	52
4.0		**Animal (Wildlife and Domestic) Biomass Data**	**53**
	4.1	Introduction	53
	4.2	Contributions of Selected Species to Total Animal Biomass in Botswana	55
	4.3	Contributions of Selected Species to Total Animal Biomass in Ngamiland District	56
	4.4	Contributions of Selected Species to Total Animal Biomass in Kgalagadi District	58
	4.5	Contributions of Selected Species to Total Animal Biomass in Ghanzi District	59
	4.6	Contributions of Selected Species to Total Animal Biomass in Chobe District	60
5.0		**Problem Animals**	**62**
	5.1	Problem Animals Policy	62
	5.2	Problem-Animal Incidents Involving Species Attracting Monetary Compensation	63
	5.3	Overall Problem Animal Incidents	64
	5.4	Problem-Animal Incidents at the district level	64
	5.5	Wildlife Mortality Destruction Due To Control Efforts	65
6.0		**Wildlife Hunting Quotas and Offtake**	**71**
	6.1	Game Hunting Licences	71
	6.2	Land Holder's Privileges	75
	6.3	Game Animals Offtake Quotas	76
	6.4	Ostrich Offtake	99

IV. LIST OF TABLES

Table Number	Table Title	Page
1.0	**Introduction**	
Table 1.1	Species That Have Been Most Affected By Poaching (1999 – 2003	4
Table 1.2	Increasing revenue (in thousand Pula) at community level from auctions or Joint	7
Table 1.3	Protected Game animals in Botswana	8
Table 1.4	Partially Protected Game Animals in Botswana	9
Table 1.5	Globally Threatened Animals and Birds that Occur in Botswana	9
Table 1.6	Rare Fauna Species in Botswana	10
2.0	**Wildlife Population Estimates**	
Table 2.1	Population Estimates from the 2003 Aerial Survey by corresponding 95% Confidence Interval Limits and respective Percentage Deviation of the Confidence Limits From the Estimates for Selected Wildlife Species.	13
Table 2.2	Botswana Wildlife Population Estimates	20
Table 2.3	Densities of Selected Wildlife Species in Botswana (Numbers/km^2)	21
Table 2.4	Change in the Proportion* of Selected Wildlife Species that are in Protected Areas	24
Table 2.5	Estimated Population of Selected Wildlife Species in Chobe District -	25
Table 2.6	Densities of Selected Wildlife Species in Chobe District (Animals/km^2)	26
Table 2.7	Estimated Population of Selected Wildlife Species in Ghanzi District	27
Table 2.8	Densities of Selected wildlife species in Ghanzi District (Animals/km^2)	28
Table 2.9	Estimated Population of Selected Wildlife Species in Kgalagadi District	29
Table 2.10	Densities of Selected wildlife species in Kgalagadi District (Animals/km^2)	29
Table 2.11	Estimated Population of Selected Wildlife Species in Ngamiland District	31
Table 2.12	Densities of Selected wildlife species in Ngamiland District (Animals/km^2)	32

Table 2.13	Some of the Game Reserves/Ranches/ Parks, National Parks, and Nature Reserves of Botswana	33
Table 2.14	Estimated Population of Selected Wildlife Species in Chobe National Park	36
Table 2.15	Densities of Selected wildlife species in Chobe National Park (Animals/km^2)	37
Table 2.16	Estimated Population of Selected Wildlife Species in Moremi Game Reserve	38
Table 2.17	Densities of Selected wildlife species in Moremi Game Reserve (Animals/km^2)	39
Table 2.18	Estimated Population of Selected Wildlife Species in Central Kgalagadi Game Reserve (CKGR)	40
Table 2.19	Densities of Selected wildlife species in Central Kgalagadi Game Reserve (Animals/km^2)	40
Table 2.20	Estimated Population of Selected Wildlife Species in Gemsbok NP	41
Table 2.21	Densities of Selected wildlife species in Gemsbok NP (Animals/km2)	41
Table 2.22	Nxai Pans NP Wildlife Population Estimates	42
Table 2.23	Densities of Selected Wildlife Species in Nxai Pans NP (Animals/km^2)	43
Table 2.24	Estimated Population of Selected Wildlife Species in Makgadikgadi GR	43
Table 2.25	Densities of Selected Wildlife Species in Makgadikgadi GR (Animals/km^2)	44
Table 2.26	Combined Population Estimates for Nxai PanNP and Makgadikgadi Pan GR	44
Table 2.27	Table 2.27 Estimated Population of Selected Wildlife Species in Khutse Game Reserve	45
Table 2.28	Densities of Selected wildlife species in Khutse Game Reserve (Animals/km^2)	45

3.0 Predator Populations

Table 3.1	Legislation and Status of the Main Species of Predators in Botswana.	48
Table 3.2	Brown hyeana Population Estimates	49
Table 3.3	Cheetah Population Estimates	50
Table 3.4	Wild dog Population Estimates	50
Table 3.5	Leopard Population Estimates	51

Table 3.6	Lion Population Estimates	51
Table 3.7	Tentative estimate of Total Botswana population size of spotted hyeana.	52
4.0	**Animal (Wildlife and Domestic) Biomass Data**	
Table 4.1	Weights Used in Animal Biomass Calculations	54
Table 4.2	Percentage Contribution to Total Animal Biomass of Selected Species in Botswana	55
Table 4.3	Percentage Contribution by Wildlife and Domestic Animals to Total Animal Biomass in Botswana	56
Table 4.4	Percentage Contribution of Selected Species to Total Animal Biomass in Ngamiland District	57
Table 4.5	Percentage Contribution to Total Animal Biomass of Wildlife and Domestic Animals in Ngamiland District	57
Table 4.6	Percentage Contribution to Total Animal Biomass of Selected Species in Kgalagadi District	58
Table 4.7	Percentage Contribution to Total Animal Biomass of Wildlife and Domestic Animals in Kgalagadi District	58
Table 4.8	Percentage Contribution to Total Animal Biomass of Selected Species in Ghanzi District	59
Table 4.9	Percentage Contribution to Total Animal Biomass of Wildlife and Domestic Animals in Ghanzi Dist	60
Table 4.10	Percentage Contribution to Total Animal Biomass of Selected Species in Chobe District	61
Table 4.11	Percentage Contribution to Total Animal Biomass of Wildlife and Domestic Animals in Chobe District	61
5.0	**Problem Animals**	
Table 5.1	Incidents Involving Species Attracting Monetary Compensation (1999 -2003)	63
Table 5.2	Problem Animal Control Incidents Summary by Species (Jan-Dec 2003, Numbers)	67
Table 5.3	Problem Animal Control Incidents Summary by Species (Jan-Dec 2003, Percentages)	68
Table 5.4	Problem Animal Incidents by District and Species (2003)	69

Table 5.5	Wildlife Mortality Number Due To Problem Animal Control By Year 1999-2003	70
6.0	**Wildlife Hunting Quotas and Licences**	
Table: 6.1	Species that May be Hunted Using a Bird Licence, and the Allowed Numbers and Period	72
Table: 6.2	Species that May be Hunted Using a Single Game Licence and the Maximum Numbers Allowed and Perio	73
Table: 6.3	Species that May be Hunted Using a Small Game Licence and the Maximum Numbers All	74
Table 6.4	Number of Game Licences by Category (1997 – 2004)	74
Table 6.5	Maximum number of Animals Which May be killed by virtue of Landholder's Privileges during any One Period.	75
Table 6.6	Number of Persons and Companies with Land Holder's Privileges (1997 – 2004)	76
Table 6.7	Types of Hunting Quotas Granted in Various Districts (1997 – 2004)	79
Table 6.8	Chobe District Total Wildlife Hunting Quotas	80
Table 6.9	Chobe District Community Managed Areas Hunting Quotas	81
Table 6.10	Chobe District Concession Areas Wildlife Hunting Quotas	82
Table 6.11	Total Central District All Wildlife Hunting Quotas	83
Table 6.12	Central District Community Managed Areas Hunting Quotas	84
Table 6.13	Central District Concession Areas Wildlife Hunting Quotas	85
Table 6.14	Central District Citizen Wildlife Hunting Quotas	86
Table 6.15	Total Ghanzi District All Wildlife Hunting Quotas	86
Table 6.16	Ghanzi District Community Managed Areas Hunting Quotas	87
Table 6.18	Kgalagadi District All Wildlife Hunting Quotas	87
Table 6.18	Kgalagadi District Community Managed Areas Hunting Quotas	88
Table 6.19	Kgalagadi District Citizen Wildlife Hunting Quotas	88
Table 6.20	Kweneng District All Wildlife Hunting Quotas	89
Table 6.21	Kweneng District Community Managed Areas Hunting Quotas	89
Table 6.22	Kweneng District Citizen Wildlife Hunting Quotas	89
Table 6.23	Total Ngamiland District All Wildlife Hunting Quotas	90
Table 6.24	Ngamiland District Community Managed Areas Hunting Quotas	91
Table 6.25	Ngamiland District Concession Areas Wildlife Hunting Quotas	92

Table 6.26	Ngamiland District Citizen Wildlife Hunting Quotas	93
Table 6.27	Southern District All Wildlife Hunting Quotas	94
Table 6.28	Southern District Community Managed Areas Hunting Quotas	94
Table 6.29	Botswana All Wildlife Hunting Quotas	95
Table 6.30	Botswana All Community Managed Areas Hunting Quotas	96
Table 6.31	Botswana All Wildlife Concession Areas Wildlife Hunting Quotas	97
Table 6.32	Botswana All Citizen Wildlife Hunting Quotas	98
Table 6.33	Ostrich Adults, Chicks And Eggs Capture Quota (2004)	99
Table 6.34	Proportional contribution to National Ostrich Adults, Chicks And Eggs Capture Quota (2004) by Districts	100

V. LIST OF FIGURES

		Page
Figure 5.1	Incidents Arising From Species Attracting Monetary Compensation over the period 1999 - 2003	64
Figure 6.1	Percentage Contribution of Districts to 2004 National Quotas for Ostrich Eggs, Chicks and Adults	100

VI. LIST OF MAPS

		Page
Map 1.1	Map of Botswana by Administrative District	5
Map 2.1	Publicly owned Game Reserves, National Parks and Wildlife Management Areas	35
Map 3.1	Conservation Zones	47

III. LIST OF ABBREVIATIONS

CBNRM	Community Based Natural Resource Management
CBO	Community Based Organisation
CHA	Controlled Hunting Area
CITES	Convention on International Trade in Endengered Species of Wild Fauna and Flora
CKGR	Central Kgalagadi Game Reserve
DWNP	Department of Wildlife and National Parks
FMD	Foot and Mouth Disease
GR	Game Reserve
KCS	Kalahari Conservation Society
NP	National Park
PAC	Problem Animal Control
VCF	Veterinary Cordon Fences
WMA	Wildlife Management Area

VII SUMMARY OF OBSERVATIONS

Government's Commitment to the Sustainable Utilisation of the Wildlife Resource

Botswana possesses an enviable wealth of wildlife resources and its commitment to ensuring the sustainability of this precious natural heritage is illustrated in various ways, including the reservation of 39 percent of Botswana's total land area to, among other things, ensuring the sustainability of the country's wildlife resources. The Department of Wildlife and National Parks (DWNP) monitors success achieved in this direction through various means, including for example, annual aerial wildlife surveys.

Wildlife Populations

On average, the population estimates of some of the wildlife species (e.g. elephants and hartebeest) followed an increasing trend over the period 1994 – 2003 while those of others (e.g. duiker, gemsbok, giraffe, impala, kudu and steenbok) followed a declining trend over the same period, at the national level.

The protection granted to elephants under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), to which Botswana is a party, has contributed to the estimated rising population levels (Table 2.2) of the species. The increase in the population and density of elephants has produced various concerns, the most serious of which is the negative impact that such population density levels have on flora and fauna diversity in a given ecosystem, and consequently on the conservation of biodiversity.

Table 2.4 shows that in Botswana, with the exception of eland, the biggest proportion of all the other wildlife species are found in unprotected areas. Among other thing, the occurrence of larger proportions of wildlife populations in unprotected than are observed in protected areas underscores the importance of involving communities in wildlife management in order to minimize wildlife-human conflicts and thereby ensure the sustainability of this valuable resource.

Predators

Botswana's main predator species are composed of brown hyeana, cheetah, wild dog, leopards, lions and spotted hyeana. Since aerial surveys do not provide reliable estimates of the populations of predators (see Section 2.3), reasonable estimates are sourced from specialized ground-count surveys or indices of abundance data derived from various observational techniques. The brown hyeana population, which contributes between 56 and 69 percent of the estimated world population of the specie, is estimated at 4,338 and widely distributed through out the country. Botswana's current Cheetah population is estimated to be 1,768 animals, which represents 12 percent of the world cheetah population. Wild dogs are endangered species globally and are estimated at 1, 658. Lions and leopards cause the most livestock damage of all predator species and their

populations are estimated at 3,061 and 5,617; respectively. Spotted hyeana are estimated at 2,829.

Animal biomass

In 2003, total animal (wild and domesticated) biomass was estimated at 2,537,172 livestock units (LUs), while the estimate for LU/km^2 of land area was 4.39 for Botswana as a whole (see Table 4.3). On individual specie basis, the biggest contributions to total animal biomass are from cattle (69 percent) and elephants (12 percent). The estimated contribution of domestic animals as a group to total animal biomass was 80 percent in 1994 and 79 percent in 2003 at the national level. The contribution by domestic animals to total animal biomass was more than that of wildlife in Kgalagadi and Ghanzi districts, while the reverse is true for Ngamiland and Chobe districts. The gap between the two groups, with regard to contributions to total biomass, has been steadily narrowing over the 1996 - 2003 period in Ngamiland district but widening in Chobe district.

Problem Animal Control (PAC)

The Government of Botswana realizes that conflict between humans and wildlife is a threat to the populations of problem animals as they are killed to protect human beings and their livelihoods. The Government endeavours to mitigate these conflicts by encouraging the maintenance and restoration of the co-existence of the two, ensuring adequate compensation is given in a timely manner (for selected species) to people who have suffered loss of property due to the activities of wild animals; and through preventive and reactive damage control methods.

Table 5.1 and Figure 5.1 show that lions, leopards and elephants, in that order, were responsible for most of the problem animal incidents in the country over the period 1999 - 2003. Together, the three species were responsible for 96.2 percent of all problem animal incidents that were reported. Incidents of problem animals are more common during the hot and rainy months of November to April than they are during the relatively cooler and dry months of May to October (Tables 5.2 and 5.3).

The Central district, which has the biggest geographical area in the country, in addition to having the most wildlife, people and livestock populations compared to other districts experienced 55.3 percent of all the reported problem-animal incidents in 2003 (Table5.4). In addition, the district had the highest proportion of problem-animal incidents caused by porcupines (88.9 percent) and caracal (73.3 percent) in 2003.

It can be observed from Table 5.5 that over the period 1997 - 2000, the species that incurred the highest mortality numbers due to Problem Animal Control Efforts (PAC) were lions (37.1 percent) and leopards (33.7 percent). Cheetahs' proportion of animals killed due to PAC efforts was among the highest three over the period 1997 – 2000 and ranged from 10 percent to 32 percent. However, the proportion dropped to less than 3 percent in later years. No rhino was killed over the period 1997 – 2000 due to PAC efforts.

Game Hunting Licences and Quotas

The hunting and/or capturing of wildlife is controlled by Government in line with Wildlife Conservation (Hunting and Lincencing) Regulations and through hunting quotas that are set every year. Game licenses are of four kinds namely, bird licence, single game licence, small game licence and special game licence. There are three types of quotas; namely, Community Managed Areas (CMA) Wildlife Hunting Quotas (planned around protected areas and allocated to existing settlements found in those areas), Concession Areas Wildlife Hunting Quotas (which refer to CHAs that are leased to Safari Hunting Companies or concessionaires) and Citizen Wildlife Hunting Quotas (allocated only to citizens of Botswana). Ngamiland and Central districts were the only ones that were allocated all the three types of hunting quotas (Table 6.7).

At the national level, total wildlife offtake quotas for 2004 are lower than their 1997 levels for all species with the exception of elephants, baboons, jackal black bird, crocodile and eland. The species whose 2004 quotas are at least 70 percent lower than their 1997 levels are: springbok (94 percent), lechwe (91 percent), duiker (90 percent), steenbok (85 percent), gemsbok (84 percent), kudu (83 percent), warthog (77 percent), spotted hyeana (76 percent) and impala (70 percent). No offtake quotas were allocated to lions, reedbuck, sable and sitatunga during the years 2002, 2003 and 2004, because the populations of these species were considered to be declining.

The 2004 elephant offtake quota is 141 percent of its 1997 level. This large increase is justified by the specie's high population growth rate and the corresponding negative impact that the rate has on both the regeneration and survival of plants and survival of other animals within their range.

1.0 INTRODUCTION

1.1 Wildlife Background

It is correctly asserted in Visions of Change by Msimang (2000) that since time immemorial humanity has lived close to nature. He writes that humanity had knowledge of plants, including their chemical properties and values to society and understood animals well enough to formulate interpretations to their behaviours. Furthermore, he maintains, this is still true in the lives of many traditional African communities to the extent that nature is a vehicle through which their community heritage is handed down from one generation to the next. As a result, it is not surprising that they have conserved their wildlife much better than other continents. Consequently, the African continent is a major attraction at global level to wildlife enthusiasts, because of the expansive diversity and population of wild animals that are available for viewing in their natural habitats.

Botswana is one of the leading countries in this area on the continent because it possesses an enviable wealth of wildlife resources. Botswana is committed to ensuring the sustainability of this precious natural heritage, a commitment that is illustrated in various ways including the designation of 18 percent of the country's land area as protected areas that are reserved for the conservation of biodiversity and, therefore, wildlife. In addition, a further 21 percent of the country's land area is designated as Wildlife Management Areas (WMAs), which are stretches of land designated primarily for the purpose of wildlife conservation, and more specifically to serve as buffer zones and migratory corridors and hence support the natural ecological functions of Game Reserves and National Parks (See Figure 2.1). Hence, a total of 39 percent of Botswana's total land area is reserved for, among other things, ensuring the sustainability of the country's wildlife resources.

The Department of Wildlife and National Parks (DWNP) has put in place wildlife monitoring programs whose objective is to track the population of various wildlife species throughout the country (see Map 1.1) in order to sustain the wildlife resource. One of the tools that DWNP uses to monitor wildlife populations is aerial surveys which are conducted annually. In addition to these efforts, Botswana has promulgated several national policies and legislation and certified various regional and international legislations/treaties that are aimed at regulating the utilization of wildlife resources in ways that ensure their sustainability.

However, despite these and other efforts, the sustainable management of Botswana's wildlife faces various challenges, some of which are given in Section 1.2.

1.2 Challenges to the Sustainable Management of Wildlife in Botswana

1.2.1 Increasing Human and Livestock Populations

With the increases in human populations that have taken place over the years, human settlements and developments associated with them (e.g. road construction, buildings -

homes and institutions - construction, and arable and livestock farming) have expanded into parts of the country that were previously sole wildlife habitats. In a study conducted by Perkins and Ringrose (1996) that covered Livestock-Wildlife linkages among other issues, it was reported that the aforementioned developments have encouraged the expansion of existing human settlements and development of additional ones; and necessitated the provision of boreholes. In turn, boreholes have supported the expansion of the livestock production sector in parts of the country which due to lack of surface water were undisturbed wildlife habitats only three decades back. The resulting competition for resources, particularly the land resource, has given rise to wildlife-human conflicts that have led to the legal destruction of some problem animals over the years (see Chapter 5).

In addition, the geographic expansion of the livestock sector has not only reduced the quantity of rangeland available for wildlife use (habitat loss), but the quality as well due to overstocking of livestock in some parts of the country and the management style of free-ranging livestock in communal rangelands. Perkins and Ringrose (1996) reported that the Kgalagadi grazing resource has probably become woodier through livestock induced bush encroachment. Thus livestock have contributed to a decline in populations of grazers[1] due to habitat losses. It has been further suggested that some of the changes in population sizes and distribution of some species are coincident with habitat loss and increasing isolation of protected areas due to the expansion of the livestock sector.

1.2.2 Veterinary Cordon Fences (VCFs)

The first VCF was constructed in 1896[2] for the purpose of halting the spread of rinderpest. More VCFs were constructed later due to frequent outbreaks of Foot and Mouth Disease (FMD) in order to control the spread of the disease. VCF were also constructed to control the spread of the tsetse fly and for the purpose of keeping cattle away from wildlife rangelands. Later, construction of VCFs became mandatory when the need to meet the FMD control requirements of the European Union beef export (Perkins and Ringrose, 1996) markets arose. The European Union is the chief buyer of Botswana's beef exports.

Although to a large extent VCFs achieved their goal of controlling the spread of animal diseases, their erection hindered migratory wildlife species from moving to dry season sources of water and food, by closing some of the wildlife's movement corridors. As a result, following the construction of some fences there was a significant rise in the mortality levels of some species (Kalikawe, 1997; Perkins and Ringrose, 1996). Despite levelling off later, some species continue to experience VCF-induced mortality. Such species include buffalo, zebra, giraffe, ostrich, gemsbok and kudu. During the severe 1982 - 1986 drought, high wildlife mortality was observed as a result of entanglement with the VCFs or failure to access indispensable wildlife water sources and grazing lands.

[1] Grazers are those animals that consume standing forage, e.g. edible grass, and are distinguishable from browsers which consume edible leaves and twigs from woody biomass.

[2] Campbell, A.; A History of Wildlife in Botswana to 1966 in *Proceedings of a National Conference on Conservation and Management of Wildlife in Botswana, 1997*

Furthermore, VCFs disrupt spatial linkages between sub-populations of the same species, which consequently affects their fertility. Therefore, despite their tremendous value to the livestock industry, VCFs have had a negative impact on populations of wild animals and remain a contributing force behind declining wildlife trends.

When combined with the expansion of the livestock sector as explained in Section 1.2.1, the two factors (VCFs and expansion of livestock sector) have contributed to high wildlife mortality over the last three decades. For example, over a period of 20 years (1975 – 1995), wilderbeest (*Connochaetes taurinus*) and hartebeest (*Alcephalus buselaphus*) experienced mortalities of over 90 percent while buffalo (*Syncerus caffer*) and zebra (*Equus burchelli*) declined drastically within the northern part of Botswana (Perkins and Ringrose, 1996).

1.2.3 Poaching

The expansion of human and livestock populations into parts of the country that were previously solely occupied by wildlife has increased vulnerability of wildlife to poaching. The negative impact of poaching cannot be overlooked in wildlife management, particularly because it can lead to the total extinction of a species, e.g., black rhino in Botswana (Othomile, 1997).

Poaching takes place around the country and particularly across national boarders for economically rewarding species like elephants. Poaching can be carried out either for subsistence or for commercial purposes. All DWNP staff are responsible for monitoring and controlling poaching. However, the department has an Anti-Poaching Unit (APU) that is mainly responsible for conducting wildlife-related law enforcement operations.

DWNP is particularly concerned about elephant poaching because the Governments as a signatory to the CITES[3] agreement must ensure that the permission given to it to trade in ivory does not encourage elephant poaching. Indeed as Table 1.1 shows, elephant poaching incidents are on the decline.

To maximize efficiency in anti-poaching efforts, the APU has detachments in Central, Chobe, Ngamiland and Ghanzi districts. The first three districts are all in the northern part of the country and have large elephant populations, hence their selection. Ghanzi district on the other hand has the Training Center for anti-poaching officers. The APU office in Ghanzi also caters for southern Botswana.

In addition, the Botswana Defence Force (BDF) participates in the anti-poaching work. It has deployed in critical areas that are known to be prone to cross-boarder poaching. BDF has therefore contributed significantly to Botswana's anti-poaching efforts.

Table 1.1 shows the number of poaching incidents by species from 1999 to 2003. The species that have been most affected by poaching in the last four years are elephants, kudus, gemsbok, springbok, impalas and eland. Most elephant poaching incidents

[3] Convention on International Trade in Endengered Species of Wild Fauna and Flora

occurred in Chobe district, but the threat is now under control. Most gemsbok poaching incidents are in the Kgalagadi district and in Central Kgalagadi Game Reserve (CKGR), which is in Ghanzi district. Most poaching in Ghanzi and Kgalagadi districts is for subsistence. Springbok and kudu poaching takes place all over the country and is also mainly for subsistence purposes. Impala populations are very high (see Table 2.2) so the observed poaching level of less than 10 annually is relatively low. It is observed from Table 1.1 that the frequency of poaching incidents is generally on the decline.

Table 1.1 Species That Have Been Most Affected by Poaching (1999 – 2003)

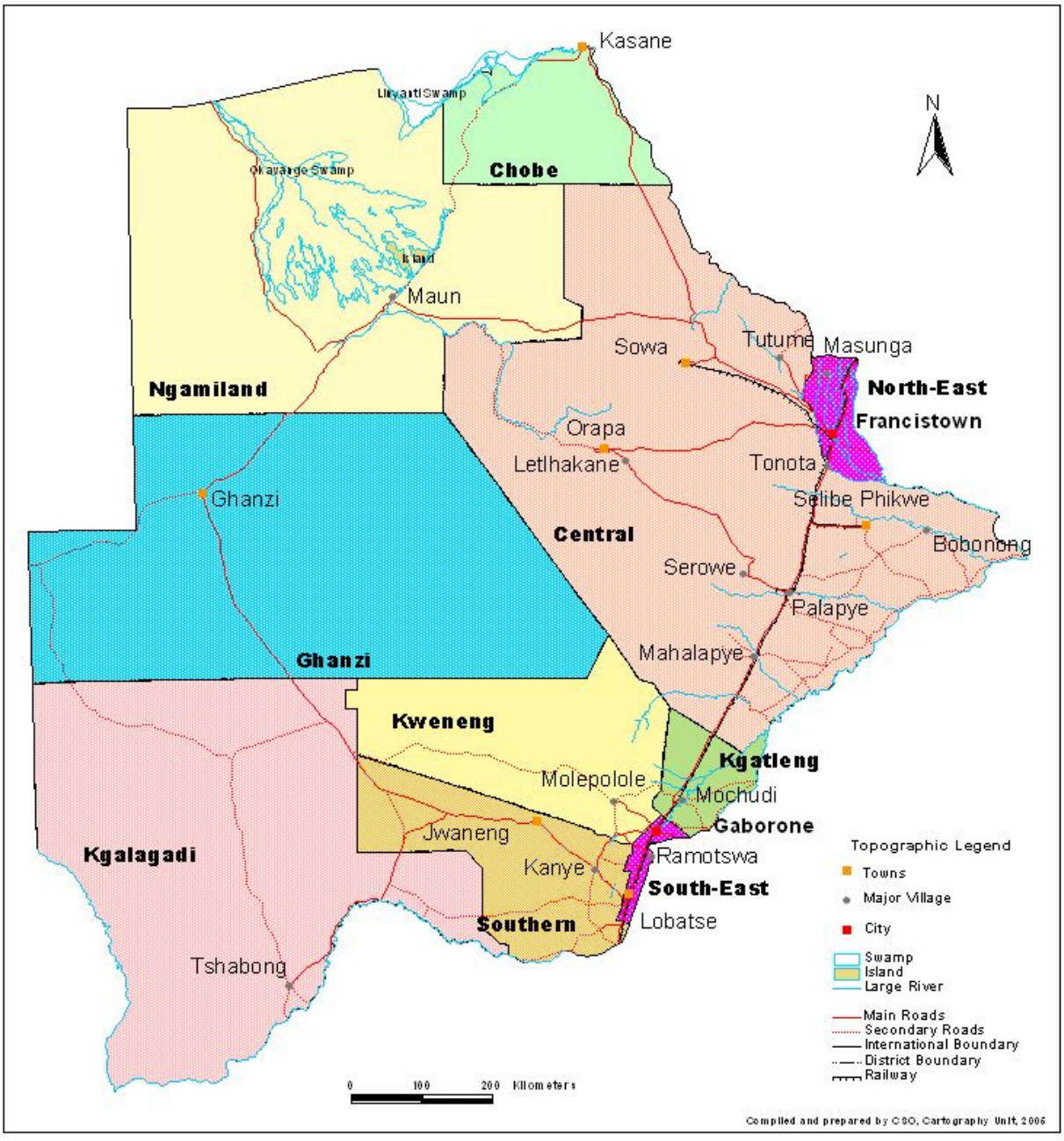
Species	1999	2000	2001	2002	2003	Total
Aardvark	-	-	-	2	1	3
Bat Eared Fox	-	-	-	4	-	4
Black Footed Cat	-	-	-	1	-	1
Buffalo		2	6	5	-	13
Caracal	-	-	-	3	-	3
Cheetah	-	-	-	2	4	6
Chobe bush buck	-	1	-	1	-	2
Duiker	-	-	-	7	-	7
Eland	10	10	5	3	2	30
Elephant	3	19	57	14	1	94
Francolin	-	-	1	-	-	1
Gemsbok	1	29	20	7	8	65
Giraffe	-	4	4	4	-	12
Guinea Fowl	-	6	9	3	-	18
Hartebeest	-	1	-	8	-	9
Hippo	-	-	-	-	-	0
Honey Badger	-	-	-	2	-	2
Hyeana	-	-	-	2	-	2
Impala	-	8	8	9	7	32
Jackal	-	3	-	2	4	9
Kudu	-	9	23	34	21	87
Lechwe	-	12	-	1	1	14
Leopard	2	2	1	-	6	11
Lion	-	-	3	4	-	7
Ostrich	1	5	8	4	1	19
Ostrich Shell		1		8	2	11
Pangolin	-	-	1	-	-	1
Python	-	6	3	6	-	15
Reedbuck	-	-	1	-	-	1
Rhinoceros	-	-	1	-	2	3
Spotted genet		1	2	1	-	4
Springbok	1	6	3	33	-	43
Spur-winged goose	-	-	-	2	-	2
Steenbok	-	1	5	4	-	10
Warthog	-	1	7	8	2	18
Wildcat	-	-	1	4	3	8
Wildbeest	-	2	1	3	1	7
Zebra	-	-	2	2	-	4

-: Zero

Source: Anti-Poaching Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Map 1.1

MAP OF BOTSWANA BY ADMINISTRATIVE DISTRICTS



1.2.4 Recurring Cycles of Drought

Rainfall is the driving force behind the availability of surface water and vegetation in rangelands; and, therefore, the carrying capacity (see Section 4.1) of land. Rainfall is, therefore, essential for good nutrition and wildlife reproduction rates that are conducive to sustainable population levels. It is also well known that large numbers of animals died during the drought of the early 1980s. However, as Tyson (1980) has shown, drought is endemic in Botswana and follows an 18-year cycle. Being part of the natural pattern, the decline in wildlife populations cannot be attributed solely to drought. This can be confirmed by considering the fact that the depletion in wildlife populations following the drought of the 1960s was lower than that which was observed following the drought of the 1980s.

1.2.5 Diseases

DWNP conducts disease surveillance operations throughout the country and mitigates disease outbreaks timeously. Therefore, although diseases have a potential of depleting wildlife populations, they have not had a significant impact on Botswana's wildlife populations. Feline immunodeficiency virus (FIV) has been reported in lions[4] by DWNP (Veterinary Unit) based on results from opportunistic sampling surveys of problem lions and by independent researchers working in northern Botswana especially those in the Okavango Delta. And of recent (September 2004), an outbreak of anthrax in the buffalo population of the Chobe National Park, was reported by DWNP, to have caused the death of several wildlife species including 60 elephants and 750 buffalos.

1.2.6 Abuse of the Hunting System

Licenses for legally hunting specific species of wildlife are given by DWNP. The licenses for the hunting of single game are of three kinds, namely; Citizen, Concession and Community-managed (see Section 6.3.1 for details). Citizen licenses are charged at a value well below the market rate and citizens who get them can transfer their licenses, at a profit, to another party. This practice has created a secondary market for hunting licenses that could result in over-hunting. Shooting from the back of vehicles is practiced widely, a practice the original citizen license holders are usually not in a position to carry out. Today, wildlife flees from approaching vehicles whether seen in protected or non-protected areas, which indicates past experiences of being shot at by vehicle occupants.

Some citizens also get Special Game licences (see Section 6.1.4) which are given free of charge. The licences have a species list, which the holders are supposed to tick as they hunt in order to provide feedback to DWNP on the animals hunted. However, some of the licence holders don't use the list. As a result it is not easy to monitor the number of animals hunted by specie and the holders can, therefore, hunt more than their licences allow. This gives the holders some game meat to spare for sell although the special game licences are meant for subsistence use only. In addition, they sometimes transfer them to non-holders who give them money.

[4] FIV is a feline version of the HIV-1, the entiologic agent responsible for AIDS.

These practices sometimes lead to more annual offtake than allocated and threatens the sustainable utilization of the wildlife resource.

1.3 Wildlife and the Economy

One of the Government of Botswana's goals is to diversify the country's economy in order to minimize its sole dependence on the minerals sector, particularly on diamond mining. The promotion of sustainable use of Botswana's rangelands and other natural resources is one of the avenues that can be used to attain this objective. The wildlife sector makes a significant contribution to this effort through its attraction of tourists into the country. The wildlife tourists mostly come into the country for trophy hunting; and wildlife photography and viewing. Unfortunately the contribution of wildlife-based tourism to Botswana's Gross Domestic Product (GDP) is not reported separately from that of the rest of the tourism industry (e.g. hotels) in the national accounts.

DWNP recognizes that people whose livelihoods are dependent on and are sustained by a given resource(s) are the people who are likely to make the best efforts, and be committed, to conserving the resource(s) and using it (them) sustainably. Hence, DWNP supports Community Based Organisations (CBOs) that are involved in wildlife management and utilization. The CBOs have a positive impact on the livelihoods of the families in these communities.

Out of the 83 CBOs involved in Community Based Natural Resources Management (CBNRM) in the country, only fourteen of the CBOs are wildlife based (Masilo-Rakgoasi, 2004). The CBOs receive a wildlife quota from government annually and utilize it, wholly or partially commercially, to generate revenues. These CBOs enter into joint venture agreements with private operators who pay an agreed fee for the quota that can be used for purposes of hunting or photographic safari rights. As Table 1.2 shows, monetary income generated in these 14 communities was estimated to be 8.45 million Pula in 2002.

Table 1.2 Increasing Revenue at Community Level from Auctions or Joint Venture Agreements (JVAs) between CBOs and Private Operators

	1993	1995	1997	1999	2001	2002
Number of CBOs in JVA or auction	1	2	3	5	9	14
JVA and auction income generated by CBOs (thousand Pula)	24	200	1,415	2,274	6,420	8,450

Source: National CBNRM Forum in Botswana, Proceedings of the Second (2002) and the Third (2004) CBNRM Conference in Botswana

In addition to the income that is shared by members of the communities, the wildlife sub-sector avails employment to rural-area dwellers through the CBOs or safari/tour companies. For example, according to Atlhopeng *et al* (1998), there are at least 50 Safari Company operators in Botswana providing about 40 percent of all employment in the

relatively undeveloped northern part of the country. Therefore, the importance of wildlife to the national economy cannot be overemphasized.

It is undisputable that the sustainable management of Botswana's wildlife can make a significant contribution to the realisation of the Government's goal of diversifying the economy and the Vision 2016 pillar of a prosperous, productive and innovative nation. Since measurement is essential for sustainable management of any resource, DWNP conducts aerial surveys in order to take the population count of wildlife species available in Botswana. Information from these surveys is used to estimate the population of the species in the whole country. The latter are presented in this Report in Chapter 2.

1.4 Protection of Vulnerable Species

All wild vertebrates in Botswana have been declared game animals, and hence no one can hunt or capture them without first obtaining a licence or permit. Additionally, at least 50 fauna species, presented in Table 1.3 have been declared protected game animals. In addition, the six species of animals given in Table 1.4 have been declared partially protected.

Table 1.3 Protected Game animals in Botswana

A. Mammals:	**B. Birds:**
Aardwolf (*Proteles cristalus*)	Kgori Bustard (*Ardeotis kori*)
Antbear (*Orycteropus afar*)	Stanley Bustard (*Neotis denhari*)
Blackfooted Cat (*Felis nigripes*)	All Buzzards (Familyu accipitridae)
Brown Hyena (*Hyeana brunnea*)	All Cranes (*Balearica* spp)
Cheetah (*Acinonyx jubatus*)	All Eagles (Family accipitridae)
Civet (*Viverra civetta*)	All Egrets (*Egretta* spp)
Giraffe (*Giraffa camelopardalis*)	All Falcons (Family falconidae)
Hippopotamus (*Hippopotamus amphibius*)	All Flamingos (*Phoenicoplterus* spp)
Honey Badger (*Mellivora capensis*)	Fish Owl (*Scotopelia peli*)
Klipspringer (*Oreotragus Oreotragus*)	All Goshawks (*Melierax spp*)
Mountain Reedbuck (*Redunca fulvorufula*)	Hammerkop (*Scopus umbretta*)
Night-ape (*Galago senegalensis*)	All Harriers (*Circus spp*)
Orib (*Ourebia ourebi*)	All Herons (Family ardeiadae)
Otter (*Aonyx capensis*)	All Ibises (Family jacanidae)
Pangolin (*Manis temmincki*)	All Jacanas (Family jacanidae)
Puku-Puku (*Kobus vardoni*)	All Kites (Family accipitridae)
Roan Antelope (*Hippotragus equinus*)	All Pelicans (*Pelecanus* spp)
Rock Dassie (*Procavia capensis*)	All Sparrowhawks (*Accipiter* spp)
Black Rhinoceros (*Diceros bicornis*)	All Storks (Family ciconiidae)
White Rhinoceros (*Ceratotherium Simum*)	Secretary Bird (*Sagittarius serpentarius*)
Serval (*Felis serval*)	Spoonbill (*Platalea alba*)
Sharpe's Steenbok (*Raphicerus sharpe*)	All Vultures (Family accipitridae)
Vaal Rhebuck (*Pelea capreolus*)	Yellow spotted Dassie (*Heterohyrax Brucei*)
Wild Dog (*Lycaon pictus*)	All Bitterns
Waterbuck (*Kobus ellipsiprymnus*)	**C. Reptiles**
Roan Antelope *(Hippotragus equinus)*	Python (*Python sebae*)
	Narina Trogon

Source: Wildlife Conservation and National Parks Act, 1992
Botswana Government Gazette, Bill Number 21, 1992

Protection status is bestowed on those wildlife species that are known to be in danger of, or vulnerable to extinction. The Government has secured their preservation through the Wildlife Conservation and National Parks Act of 1992 by declaring it illegal to hunt or capture protected or partially protected wildlife species except under and in accordance with the terms and conditions of a permit issued by the Director of DWNP. It is, however, permitted to kill the species in defense of human life or where such an animal has caused or is causing or threatens to cause damage to livestock, crops, water installation or fences anywhere outside a National Park or Game Reserve. Animals killed under the latter two conditions must be reported and the trophies delivered to the nearest Wildlife Officer or police station within seven days. The main difference between the two categories of protection of game animals (protected and partially protected) is in the magnitude of the sentence (magnitude of fine and length of imprisonment) that is imposed on an accused party after being proven guilty.

Table 1.4 Partially Protected Game Animals in Botswana

Leopard (*Panthera pardus*)	Chobe bushbuck (*Tragelathus scriptus*)
Lion (*Panthera leo*)	Sable antelope (*Hippotragus niger*)
Elephant (*Loxodonta africana*)	Eland (*Taurotragus oryx*)

Source: Wildlife Conservation and National Parks Act, 1992
Botswana Government Gazette, Bill Number 21, 1992

1.5 Threatened and Rare Mammal and Bird Species

Some of the animals and birds occurring in Botswana that are considered globally threatened are presented in Table 1.5. Botswana also has wildlife species that are considered rare; these are given in Table 1.6.

Table 1.5 Globally Threatened Animals and Birds that Occur in Botswana

Animals	**Birds**
African Elephant (*Loxodonta africana*)	Wattled crane, (*Grus carunculata)*
Nile crocodile (*Crocodylus niloticus)*	Cape vulture, (*Gyps coprotheres)*
Leopard (*Panthera leo*)	Peregrine falcon, (*Falco peregrinus)*
Puku (*Kobus vardon)*	Black-cheeked lovebird, (*Agapornis Nigrigenis)*
Oribi (*Ourebia ourebi)*	Slaty Egret, (*Egrettavinaceigula)*
Sable antelope (*Hippotragus niger)*	Lesser kestrel, (*Falco naumanni)*
Sitatunga (*Tragelaphus spekei)*	
Wild dog (*Lycaon pictus)*	
Black rhinoceros (*Diceros bicornis)*	
Square-lipped rhinoceros (*Ceratotherium smum)*	
Brown hyeana (*Hyeana brunnea)*	
Cheetah (*Acinonyx jubatus)*	

Sources: 1. Hannah, *et. al*., Botswana Biological Diversity Assesssment,1988
2. Botswana's Biodiversity Report, 1998.

All the species given in Tables 1.5 and 1.6 have protection status in Botswana with the exception of the Black-cheeked love bird (globally threatened); and the Nile crocodile and Sitatunga (both are listed under rare and globally threatened species).

Table 1.6 Rare Fauna Species in Botswana

Black rhinoceros (*Diceros bicornis)*	Otter, Clawless (*Aonyx capensis)*
Brown hyeana (*Hyeana Brunnea)*	Puku-puku (*Kobus vardon)*
Cape vulture (*Gyps coprotheres)*	Sable antelope (*Hippotragus niger)*
Cheetah (*Acinonyx jubatus)*	Sitatunga (*Tragelaphus spekei)*
Fishowl (*Scotopeliapeli)*	Waterbuck (*Kobus ellipsiprymnus)*
Klipspringer (*Oreotragus)*	Wattled crane (*Grus carunculata)*
Mountain reedbuck (*Redunca fulvorufula)*	White rhinoceros (*Ceratotherium simum)*
Nile crocodile (*Crocodylus niloticus)*	Yellow-spotted dassie (*Heterohyrax brucei)*
Oribi (*Ourebia ourebi)*	

Source: World Conservation Monitoring Center, Biodiversity Guide to Botswana, l991

2.0 WILDLIFE POPULATION ESTIMATES

2.1. Introduction

A reliable wildlife population estimate is mandatory for sustainable wildlife management. In Botswana, such estimates are made through wildlife aerial surveys conducted by counting selected species of wildlife from low-altitude flying planes. The surveys are conducted both in the wet and the dry seasons. The results of these counts are digitised and a computer program is used to estimate populations for the entire area/country.

The data presented here was collected during aerial surveys of animals in Botswana that were conducted during the dry season (July-October) of the years indicated in the respective tables. The data is presented at the national and administrative districts levels; and on protected areas (Game Reserves and National Parks). It is necessary to present data on administrative districts as well because a significant proportion of wildlife remains outside protected areas and hence wildlife population in protected areas is not representative of wildlife population in Botswana. The dry season data is used because as a result of vegetation cover, there is a higher possibility of missing out a greater number of animals during survey counts conducted in the wet season.

2.2 Stratification of the Country for Aerial Surveys

Before the survey starts each year, the country is subdivided into strata. The purpose of stratification in wildlife aerial surveys is to enhance the precision of the wildlife population estimates obtained and also to improve the efficiency of the surveys. Stratified systematic transect sampling (Griffiths, 1978) is used for the surveys.

If the aim of the survey is to obtain estimates for a single species (as was the case in the 1993 dry season survey), areas known from previous surveys to have high densities of the species in question are surveyed at higher intensities than those with lower densities. The 1993 survey was designed primarily to obtain improved precision for estimates of elephants and not for individual Controlled Hunting Areas (CHAs) or other areas.

Sometimes the survey is not aimed at a single species (e.g. the 1994 dry season survey). Therefore, strata are chosen on the basis of the dominant species in the relevant areas, in order to maximize the precision of the estimates of as many species as possible. Consequently, wildlife numbers counted from different parts of the country do not add up to the total for Botswana for some species because of two main reasons, namely: different stratification priorities for different parts of the country; and rounding errors which accumulate to cause differences in estimates.

2.3 Shortcomings of Wildlife Aerial Surveys

Estimates of wildlife populations derived from aerial surveys are based on counts, rather than censuses, of animals. These counts represent an unknown proportion of animals present at sample sites and, therefore have an intrinsic error margin. Additionally, aerial

wildlife population surveys have other inherent sources of error that have an impact on the population count, the most significant of which is visibility bias. This bias leads to miscounting of animals during aerial surveys and cannot be corrected for statistically because its magnitude is unknown. It leads to lower detection rate and can occur in various ways, including the following:

- Possibility of significant undercounting for wildlife species that move in large numbers even if only one group of the species is un-spotted during the survey (e.g. buffalo).
- Possibility of failure to see species whose natural colour blends well with local vegetation cover and hence creates an undercounting risk.
- Visibility loss due to poor weather conditions. Poor weather is sometimes a hindrance to surveying the complete sample area when it hinders visibility. This increases sampling errors.

The species most open to visibility bias are lions, leopards, reedbuck, hyenas and wild dogs. Because these species are very difficult to see and count accurately from the air, ground counts are done for some of them. For example, three lion-specific ground surveys have been done so far (1998, 1999 and 2000).

Another source of error is the migratory nature of wildlife, which creates the possibility of both over and under counting, especially for a large country like Botswana. If the survey takes more than a few days, wildlife can move hundreds of kilometers and end up being counted more than once or even missed out completely. In view of this fact, wildlife management decision-making process (e.g. offtake quotas) is based on trend analysis of national wildlife populations rather than individual district populations.

Furthermore, wildlife populations are scattered throughout a huge area that dictates a low sampling intensity when the aerial surveys are designed and conducted. Although this is a common feature of large wilderness areas, it must be noted that it results in large sampling errors. For illustration of the magnitude of such errors, see Table 2.1 that shows population estimates of selected wildlife species produced from the 2003 dry season aerial survey together with their 95 percent confidence intervals.

2.4 Challenges Associated with Counting Selected Species of Wildlife by Aerial Surveys

Generally, it should be noted that aerial surveys do not provide reliable estimates for predator species because of the nocturnal habits of such species that make it difficult to see them from the air. This causes undercounting as the surveys can only be effectively carried out in day time. Predators are also sparsely distributed which results in imprecise estimates. However, they do give an indication of their distribution in the country and their minimum numbers.

In using the data presented here, it is important to understand the possible sources of errors discussed in Section 2.1 and the challenges associated with counting specific species of wildlife. The latter are given in Sub-sections 2.4.1 – 2.4.32.

Table 2.1 Population Estimates from the 2003 Aerial Survey by corresponding 95 percent Confidence Interval Limits and respective Percentage Deviation of the Confidence Limits From the Estimates for Selected Wildlife Species.

Species	2003 Estimates	95 percent Confidence Interval		Percent Deviation of the Limits from the Estimate
		Lower Limit	Upper Limit	
Baboon	3,720	1,769	5,671	52
Buffalo	33,305	8,183	58,427	75
Crocodile	400	170	630	57
Duiker	9,786	7,940	11,631	19
Eland	31,598	19,643	43,553	38
Elephant	109,471	91,028	127,914	17
Gemsbok	101,522	86,968	116,076	14
Giraffe	9,463	7,550	11,375	20
Hartebeest	49,978	39,251	60,705	21
Hippo	1,466	605	2,326	59
Impala	67,040	53,892	80,189	20
Kudu	27,440	22,113	32,768	19
Lechwe	48,983	33,231	64,735	32
Ostrich	49,406	33,589	65,223	32
Reedbuck	67	5	143	112
Roan	188	48	329	75
Sable	2,877	1,588	4,166	45
Sitatunga	167	10	332	99
Springbok	35,811	19,440	52,182	46
Steenbok	36,368	31,137	41,600	14
Tsessebe	5,119	3,150	7,088	38
Warthog	4,154	2,725	5,583	34
Waterbuck	950	507	1,393	47
Wildbeest	45,858	31,987	59,729	30
Zebra	39,308	26,024	52,591	34

Source: Research Division, Department of Wildlife and National Parks, 2003 Aerial Census of Animals in Botswana

2.4.1 Baboon

Baboons are difficult to see from the air because of their habitat requirements. Population estimates derived from aerial surveys are likely to be underestimates. Their distribution is centered in the Okavango Delta although significant populations occur in Eastern Botswana as well.

2.4.2 Bat Eared Fox

They are considerably more difficult to see in the dry season than the wet season. Most of them are usually spotted in the Kgalagadi region, particularly in the Central Kgalagadi Game Reserve (CKGR).

2.4.3 Brown Hyeana

During aerial surveys, brown hyenas are usually seen in the Kgalagadi region, in the CKGR and Gemsbok National Park. They are predators and nocturnal creatures and hence their populations cannot be effectively estimated through daytime aerial surveys. Therefore, the population estimates of the specie that are presented in Chapter 3 are from other surveys.

2.4.4 Buffalo

Buffalo occur in protected areas, and particularly in Moremi Game Reserve. On a countrywide dry-season basis, they are found mainly around permanent water sources, particularly the Okavango Delta. They move in large herds of thousands and therefore resent a serious risk of undercounting even if just one herd is missed out.

2.4.5 Bushbuck

Because of their preference for dense vegetation, bushbuck are so difficult to see from the air that their counts are sometimes meaningless.

2.4.6 Cheetah

Cheetahs are mostly found in protected areas, and especially in the Moremi GR, Gemsbok NP and CKGR. They are predators and nocturnal creatures and hence their populations cannot be effectively estimated through daytime aerial surveys. Therefore, the population estimates of the specie that are presented in Chapter 3 are from other surveys.

2.4.7 Crocodile

They are seen in most of the large rivers, the Limpopo included and in the Okavango Delta. Because of their preference for aquatic habitats, they are probably undercounted in aerial surveys.

2.4.8 Duiker

Duikers are not easy to see from the air because of their small size and cryptic colouration. They are therefore best counted during the wet season because their colour shows better against the green vegetation background that is often seen during the wet season. They are seen throughout Botswana, with the highest densities around the CKGR, particularly in areas with bush encroachment and in lower densities in the Gemsbok National Park.

2.4.9 Eland

Eland are not easy to see from the air. However, most of them are usually seen in the CKGR and Gemsbok NP.

2.4.10 Elephants

Elephants are mostly found in the northern part of the country and move regularly across Botswana's borders with Namibia and Zimbabwe. Most elephants occur outside protected areas, and tend to concentrate near perennial water bodies during the dry season, e.g. along the rivers within their range and in the Okavango Delta. The Chobe National Park has the biggest concentration of them, especially along the Chobe river.

2.4.11 Gemsbok

The majority of the gemsbok are found in the Kgalagadi region of the country and mostly in protected areas (CKGR and Gemsbok National Park) although a significant concentration is also found in Ngamiland district.

2.4.12 Giraffe

Giraffes are difficult to see so the surveys probably underestimate their population size. The majority of giraffes are in northern Botswana. They are most numerous in unprotected areas, particularly the Okavango Delta region. The exception is that those in the Kgalagadi region mostly occur on the CKGR, a protected area.

2.4.13 Hartebeest

Hartebeest are widespread in the Kgalagadi ecosystem and quite a few are in the northern part of the country, mostly in the unprotected area of the Makgadikgadi Pans. They migrate significantly between seasons and hence, their distribution varies from season to season. For example, DWNP reported in the 1994 dry season Aerial Survey of animals in Botswana Report that during the 1994 dry season survey, the proportion of the Kgalagadi region hartebeest population found in protected areas was 20 percent in the wet season survey but the same proportion increased to almost 56 percent in the dry season.

2.4.14 Hippopotamus

Because of their aquatic habitats, the numbers seen are considerable underestimates of their real population counts. Most of them are in unprotected areas in the northern part of the country where perennial surface water is more available. Hence they are easily seen in the Okavango Delta and along the Okavango and Kwando, Linyati and Chobe river systems.

2.4.15 Impala

Impala occur in association with riverine vegetation and are therefore very widespread in northern Botswana particularly around the Okavango Delta area. They are also found in the eastern part of the country, and are easy to see from the air.

2.4.16 Jackal

They are found in low densities throughout Botswana. However their densities in the southern part of the country (Kgalagadi region) are higher than those of northern Botswana. They are nocturnal creatures, feeding in very small groups and blending easily with the environment, hence they are underestimated in aerial surveys.

2.4.17 Kudu

Kudus are widely distributed in the country. They prefer wooded habitats which makes it difficult to see them from the air, so they are probably underestimated in aerial surveys.

2.4.18 Lechwe

Lechwe are the most numerous animals in Botswana, after elephants. Most Lechwe are found in unprotected areas, particularly in the Okavango Delta around the Moremi Game Reserve. Some small populations are located in the Kwando, Linyati and Chobe river systems.

2.4.19 Lions

They occur mostly in protected areas and are most numerous in the Okavango Delta where the biomass of prey species is most abundant. Since they are predators and nocturnal creatures, their populations cannot be effectively estimated through daytime aerial surveys. Therefore, the population estimates of the specie that are presented in Chapter 3 are from other surveys.

2.4.20 Ostrich

They are widely distributed throughout the country, mostly in unprotected areas and the Kgalagadi region. Their males are easily spotted from the air because of their

preferences for open spaces. However, females are not equally attracted to open spaces so there is possibility of undercounting in aerial surveys.

2.4.21 Reedbuck

They live close to water and are restricted to the Okavango Delta and the rest of the northern perennial river systems. Hence, among protected areas they are only found in the Moremi Game Reserve. Some inexperienced observers sometimes confuse them for Lechwe, so their estimated population numbers could be below their actual levels.

2.4.22 Roan antelope

These species are not numerous in Botswana and are mostly found in the northern part of the country in unprotected areas. They tend to concentrate around available water during the dry season. They are on the edge of their range, and therefore their population is generally low.

2.4.23 Sable antelope (Sable)

Sable are mostly found in the northern part of the country. They are much sought after by trophy hunters but are not abundant. They tend to concentrate around available water during the dry season.

2.4.24 Sitatunga

Most of sitatunga occur outside protected areas, and especially along the Okavango River and in the Delta itself and along the Kwando-Linyati river system because the species require aquatic habitats. As a result, they are not easily seen from the air and population counts obtained from aerial surveys tend to be underestimates.

2.4.25 Spotted Hyeana

They are confined to northern Botswana, particularly in the Okavango Delta. They are predators and nocturnal creatures and hence their populations cannot be effectively estimated through daytime aerial surveys. Therefore, the population estimates of the specie that are presented in Chapter 3 are from other surveys.

2.4.26 Springbok

Most of them occur in the Kgalagadi region outside protected areas. In northern Botswana, they are found mainly around Nxai, Makgadikgadi pans and Lake Ngami. Their clumped distribution makes springbok a difficult species to obtain a precise estimate for.

2.4.27 Steenbok

The species are numerous and widely distributed in Botswana, avoiding only water-logged areas like the Delta. They are therefore mostly found in the relatively dry Kgalagadi ecosystem. They are very small-sized and are therefore unsuitable for counting from the air. The surveys nevertheless provide a rough idea of the distribution of the species and an estimate of the minimum number in an area.

2.4.28 Tsessebe

Tsessebe live in proximity with permanent water bodies, and are mainly found outside protected areas. They are particularly numerous in the Okavango Delta but are also common in the Moremi Game Reserve and Chobe National Park.

2.4.29 Warthhog

They are only numerous in the Okavango Delta Region. However, they occur in other areas in relatively small numbers, e.g., the northern part of the Kgalagadi region and the Tuli block. Aerial surveys underestimate warthog numbers because they are difficult to see from the air. The surveys nevertheless provide a rough idea of the distribution of the species and an estimate of the minimum number in an area.

2.4.30 Waterbuck

They are generally distributed throughout riparian habitats. They are not numerous in Botswana and occur mostly along the Limpopo river in the Tuli block and the other wetter areas of the north like the Okavango Delta region. They are usually undercounted in aerial surveys because their range is very limited, even in the dry season when vegetation cover is minimum.

2.4.31 Wild Dog

They occur in northern Botswana, particularly in the Okavango delta. A few are found in the CKGR. They are predators and nocturnal creatures and hence their populations cannot be effectively estimated through daytime aerial surveys. Therefore, the population estimates of the specie that are presented in Chapter 3 are from other surveys.

2.4.32 Wildebeest

Most of them are found in the Okavango Delta and Kgalagadi regions and around Makgadikgadi Pans. They are easy to see from the air. However, they move in large groups - of up to 20,000 sometimes, hence missing one group can result serious underestimates.

2.4.33 Zebra

The distribution of zebras is determined by accessibility to water hence they are distributed near perennial water bodies such as the Okavango Delta and the Chobe River systems in northern Botswana. Zebras are also found in private ranches in Ghanzi district. They are easy to see from the air.

2.5 Wildlife Population Estimates of Selected Species at the National Level

2.5.1 Trend of Wildlife Population Estimates at the National Level

The annual Aerial Censuses of Animals in Botswana carried out between 1993 and 2003 covered most of the country only over the period 1994 – 2003 because the 1993 survey was limited to northern Botswana. Therefore, comments on wildlife trends at national level are limited to the period 1994 – 2003, in other words, to a period spanning 9 years. The data from the 1989-1991 survey, which also covered the whole country, is also given in Table 2.2 but it is not used in the discussion because unlike the rest of the surveys that are conducted over a single season (dry or wet) it lasted two years.

Predator population estimates are presented separately in Chapter 3 because aerial surveys produce poor estimates of them and the DWNP uses additional methods to estimate their populations. Furthermore, the discussion on wildlife species population changes is general and does not get into the analysis of percentage changes because most of the confidence intervals of the estimates (given in the original Reports[5]) overlap for some years, which makes the observed differences statistically insignificant.

Due to the challenges of counting animal populations through aerial surveys that are highlighted in Sections 2.3 and 2.4, only the trends of species whose lower and upper limits for the 95 percent confidence intervals deviate less than 25 percent from the indicated population estimates are discussed. As can be seen from Table 2.1 (last column), the species that belong to that category are duiker, elephant, gemsbok, giraffe, hartebeest, impala, kudu and steenbok. Given the very broad confidence intervals of the other species, which overlap for most years, readers interested in analyzing their population trends are encouraged to see the officials of the Research Division of DWNP for assistance.

On the average, the population estimates of elephants and hartebeest followed an increasing trend over the period 1994 – 2003 while those of duiker, gemsbok, giraffe, impala, kudu and steenbok followed a declining trend over the same period, on the average. However, the population estimates of impala and kudu rose significantly in 2002 and showed only a comparatively slight decline in 2003, while those of steenbok picked up in 2001 and 2002 only to drop again in 2003.

[5] DWNP, Aerial Census of Animals in Botswana, Reports of indicated years

Table 2.2 Botswana Wildlife Population Estimates

Species	1989 – 1991*	1994	1996	1999	2001	2002	2003
Baboon	d.u.	10,291	10,683	9,710	5,591	4,291	3,720
Bat Eared Fox	d.u.	765	379	388	213	323	96
Buffalo	41,382	29,037	40,041	93,766	73,251	40,871	33,305
Crocodile	209	864	381	361	204	1,023	400
Duiker	20,589	28,107	17,920	8,991	6,093	11,173	9,786
Eland	19,724	15,339	21,987	15,163	29,607	24,957	31,598
Elephant	60,902	79,305	100,538	120,604	116,988	123,152	109,471
Gemsbok	91,710	138,338	135,047	127,143	112,488	106,865	101,522
Giraffe	11,706	14,049	14,134	14,698	12,056	10,290	9,463
Hartebeest	36,431	51,790	31,942	31,114	44,950	59,297	49,978
Hippopotamus	2,921	3,388	1,299	2,147	2,310	3,120	1,466
Impala	60,747	62,079	59,627	45,183	28,355	69,188	67,040
Jackal	d.u.	6,242	2,189	1,399	2,302	2,524	1,985
Kudu	20,411	34,470	25,759	19,514	18,203	40,997	27,440
Lechwe	69,785	69,613	77,876	78,330	56,318	70,183	48,983
Ostrich	62,359	58,297	37,541	32,488	75,546	77,226	49,406
Reedbuck	d.u.	2,276	1,244	709	128	695	67
Roan antelope	970	934	1,327	884	1,056	837	188
Sable antelope	3,424	4,682	3,379	2,052	3,394	2,254	2,877
Sitatunga	1,803	843	1,128	1,234	819	201	167
Springbok	128,468	107,101	73,833	51,792	42,990	41,204	35,811
Steenbok	36,296	72,235	41,204	33,282	38,809	57,972	36,368
Tsessebe	10,935	11,301	14,198	11,389	3,864	6,050	5,119
Warthog	7,829	11,962	10,918	5,300	5,304	12,525	4,154
Waterbuck	d.u.	1,805	967	428	628	2,051	950
Wildbeest	45,798	48,125	36,958	46,741	26,870	46,681	45,858
Zebra	47,310	48,011	39,817	55,406	34,818	38,780	39,308

* Unlike the usual aerial surveys that are conducted within one calendar year, this survey lasted two years.
d.u.: Data Unavailable
Source:DWNP, Aerial Census of Animals in Botswana, Reports of indicated years.

Table 2.3 Densities of Selected Wildlife Species in Botswana (Numbers/km^2)

Species	1994	1996	1999	2001	2002	2003
Baboon	0.018	0.025	0.023	0.010	0.007	0.006
Bat Eared Fox	0.001	0.001	0.001	-	0.001	-
Buffalo	0.050	0.093	0.220	0.127	0.071	0.058
Crocodile	0.001	0.001	0.001	-	0.002	0.001
Duiker	0.049	0.042	0.021	0.011	0.019	0.017
Eland	0.026	0.051	0.036	0.051	0.043	0.055
Elephant	0.137	0.233	0.283	0.202	0.213	0.189
Gemsbok	0.239	0.313	0.299	0.194	0.185	0.176
Giraffe	0.024	0.033	0.035	0.021	0.018	0.016
Hartebeest	0.089	0.074	0.073	0.078	0.102	0.086
Hippo	0.006	0.003	0.005	0.004	0.005	0.003
Impala	0.107	0.138	0.106	0.049	0.119	0.116
Jackal	0.011	0.005	0.003	0.004	0.004	0.003
Kudu	0.060	0.060	0.046	0.031	0.071	0.047
Lechwe	0.120	0.180	0.184	0.097	0.121	0.085
Ostrich	0.101	0.087	0.076	0.130	0.133	0.085
Reedbuck	0.004	0.003	0.002	-	0.001	-
Roan	0.002	0.003	0.002	0.002	0.001	-
Sable	0.008	0.008	0.005	0.006	0.004	0.005
Sitatunga	0.001	0.003	0.003	0.001	-	-
Springbok	0.185	0.171	0.122	0.074	0.071	0.062
Steenbok	0.125	0.095	0.078	0.067	0.100	0.063
Tsessebe	0.020	0.033	0.027	0.007	0.010	0.009
Warthog	0.021	0.025	0.012	0.009	0.022	0.007
Waterbuck	0.003	0.002	0.001	0.001	0.004	0.002
Wildbeest	0.083	0.086	0.110	0.046	0.081	0.079
Zebra	0.083	0.092	0.130	0.060	0.067	0.068

Source: DWNP, Aerial Census of Animals in Botswana, Reports of indicated years.

It should be noted that elephants are protected under CITES[6], to which Botswana is a party. The resulting controls over the number of elephants hunted per year have doubtlessly contributed to the estimated rising population levels (Table 2.2) of the species and their accompanying rising population densities (Table 2.3). The increase in the

[6] Convention on International Trade in Endangered Species of Wild Fauna and Flora, more commonly known as CITES, aims to protect certain plants and animals by regulating and monitoring their international trade to prevent it reaching unsustainable levels. The Convention entered into force in 1975, and Botswana became a Party in 1978. There are 166 parties to the Convention. The CITES Secretariat is administered by the United Nations Environment Programme (UNEP).

population and density of elephants has produced various concerns, the most serious of which is the negative impact that the well known elephant browsing habits that involve the trampling of vegetation, breaking off branches, stripping of barks from trees and pushing over whole trees; have on flora and fauna diversity in a given ecosystem and consequently on the conservation of biodiversity.

The negative impact that high levels of elephant populations and density have on biodiversity was aptly expressed by Owen-Smith (2003) in his address to a wildlife-related conference in Kasane when he said:

> "They (elephants) are blamed for having destroyed most of the lush riparian forest that once flanked the Chobe River, and for having transformed the *Acacia* trees in the adjoining woodland to standing skeletons amid a depauperate shrubland dominated by *Capparis tomentos* and *Croton megalobotrys*, two species that are not palatable to elephants. These vegetation changes threaten the persistence of other animal species, including especially the Chobe subspecies of bushbuck. … The concern of park managers is that a burgeoning elephant population will ultimately reduce habitat and species diversity and hence threaten the basic conservation objectives for protected areas."

Therefore, in the long run, large numbers of elephants cause reduction in habitat suitability due to changes in vegetation composition and loss of shade, and hence pose a serious threat to the survival of some other wild animals, e.g. bushbuck, roan antelopes, sable antelopes and tsessebe. Consequently, it is necessary to strike a balance between the conservation of elephants and the conservation of the other fauna and flora species on which high elephant densities have negative impacts.

2.5.2 Proportion of Wildlife Species that Were Observed in Protected and Unprotected Areas

It is observed from Table 2.4 that a large proportion of Botswana's wildlife occurs outside protected areas. With the exception of eland, the biggest proportion of all the other wildlife species that are presented in Table 2.4 were found in unprotected areas in both 1994 and 2003. Despite the shortcomings of wildlife population data collected from aerial surveys that are discussed in Sections 2.3 and 2.4, the information in Table 2.4 gives an indication of species (and hence areas corresponding with the location of the species) that may require additional protection status. The occurrence of large proportions of wildlife in unprotected areas that is observed from Table 2.4 underscores the importance of involving communities in wildlife management in order to ensure the sustainability of this valuable resource.

Furthermore, Table 2.4 shows that warthog, lechwe, buffalo, sable, impala, sitatunga wildebeest and hippopotamus species experienced the greatest absolute and percentage change in the proportion of total population of species that were observed in protected areas over the period 1994 – 2003. While the proportions of species observed in protected areas were higher in 2003 for sable and hippopotamus (88.1 and 68.7 percent)

than their 1994 levels, the observed changes indicated a decline of 50 percent or more for the proportions of the remaining six species. The greatest declines were observed for warthog, buffalo and lechwe for both absolute and percentage change in the proportion of total population of species that were observed in protected areas.

The surprising observation made from the data is that the increase in proportion of total population of species that were observed in protected areas was accompanied by a decrease in the estimated total population of species for both sable and hippopotamus over the same period. The shortcomings of the estimates notwithstanding (see Sections 2.3 and 2.4) these observations indicate that designating areas solely for wildlife conservation, although necessary, is not sufficient to guarantee sustainability of wildlife populations at the desired levels, and hence accentuates the value of a multi-faced strategic approach.

On the other hand, the opposite situation was observed for buffalos and impalas, where an upward trend in the species' population accompanied a decrease in the proportion of total population of the species that were observed in protected areas. Since the total population of the two species rose over the period, and the absolute population of the species decreased in protected areas but increased in unprotected areas. This observation can be attributed to the migration of the species from protected areas to unprotected areas.

There was an inverse relationship between changes in the proportion of the total population of eland, gemsbok, giraffe, reedbuck and roan that was seen in protected areas in 1994 and 2003 and the change in the population of the same species for the same period. For example, while eland shows a decrease in the proportion of protected wildlife, the total population of the species increased over the period.

Worthy of special mention are elephants whose absolute population in both areas increased together with increase in the protected proportion of the specie over the period.

Table 2.4 Change in the Proportion* of Selected Wildlife Species that are in Protected Areas

Species	1994 Wildlife Population			2003 Wildlife Population			1994 – 2003 Change In	
	Protected	Unprotected	Proportion* Protected	Protected	Unprotected	Proportion* Protected	Proportion* (Absolute)	Proportion* (Percentage)
Baboon	2,449	7,842	23.8	667	3,053	17.9	-5.9	-24.7
Buffalo	11,504	17,533	39.6	4,370	28,935	13.1	-26.5	-66.9
Duiker	4,012	24,095	14.3	722	9,064	7.4	-6.9	-48.3
Eland	9,580	5,759	62.5	17,754	13,844	56.2	-6.3	-10.0
Elephant	19,207	60,098	24.2	36,663	72,808	33.5	9.3	38.3
Gemsbok	81,093	57,245	58.6	60,539	40,983	59.6	1.0	1.7
Giraffe	3,946	10,103	28.1	2,987	6,476	31.6	3.5	12.4
Hartebeest	24,068	27,722	46.5	14,559	35,419	29.1	-17.3	-37.3
Hippopotamus	696	2,692	20.5	508	958	34.7	14.1	68.7
Impala	21,414	40,665	34.5	10,939	56,101	16.3	-18.2	-52.7
Kudu	7,338	27,132	21.3	4,680	22,760	17.1	-4.2	-19.9
Lechwe	29,774	39,839	42.8	7,044	41,939	14.4	-28.4	-66.4
Ostrich	14,195	44,102	24.3	8,402	41,004	17.0	-7.3	-30.2
Reedbuck	808	1,468	35.5	28	39	41.8	6.3	17.7
Roan antelope	256	678	27.4	68	120	36.2	8.8	32.0
Sable	1,015	3,667	21.7	1,173	1,704	40.8	19.1	88.1
Sitatunga	281	562	33.3	28	139	16.8	-16.6	-49.7
Springbok	25,040	82,061	23.4	7,549	28,262	21.1	-2.3	-9.8
Steenbok	15,456	56,779	21.4	8,119	28,249	22.3	0.9	4.3
Tsessebe	2,142	9,159	19.0	855	4,264	16.7	-2.3	-11.9
Warthog	4,697	7,265	39.3	401	3,753	9.7	-29.6	-75.4
Waterbuck	404	1,401	22.4	138	812	14.5	-7.9	-35.1
Wildbeest	13,804	34,321	28.7	6,036	39,822	13.2	-15.5	-54.1
Zebra	20,667	27,344	43.0	15,036	24,272	38.3	-4.8	-11.1

* Proportions and change in proportions of the population of species occurring in protected areas for selected wildlife species 1994 – 2003 are calculated by CSO

** Percentage change in total population of the selected species

Source: Raw data from Research Division, Department of Wildlife and National Parks. , Percentage computations by CSO

2.6 Wildlife Population Estimates of Selected Species in Administrative Districts

Analysis of district-based wildlife trends is limited to Chobe, Ghanzi, Kgalagadi and Ngamiland, the four districts that are fully covered in most surveys because they are the districts with the highest wildlife density. It is important to keep in mind that district-based wildlife data only gives an indication of the numbers and species mix for less mobile species like impala, tsessebe, sable antelope, lechwe, gemsbok and springbok. The other species move between districts a lot because there are no inter-district physical boundaries and therefore have to be treated as belonging to one system. Hence, observed decreases or increases in wildlife populations could simply be due to inter-district wildlife migrations.

2.6.1 Chobe District Wildlife Population

On the average, the population estimates of elephants, impala and gemsbok followed an upward trend over the period 1996 – 2003 in Chobe district (see Table 2.5). The increases in impala populations were restricted to the period 1996 – 2001, after which a decline was observed.

Table 2.5 Estimated Population of Selected Wildlife Species in Chobe District

Species	1996	1999	2001	2002	2003
Baboon	285	329	278	126	-
Buffalo	6,645	10,658	6,903	3,874	5,304
Eland	1,370	2,012	590	2,202	1,458
Elephant	39,331	39,836	39,376	53,862	46,144
Gemsbok	185	332	535	76	265
Giraffe	1,236	1,262	978	835	1,528
Hippopotamus	6	40	92	41	103
Impala	667	936	2,079	1,784	1,154
Kudu	280	434	155	260	314
Lechwe	205	62	252	154	355
Ostrich	478	532	606	535	492
Roan antelope	550	407	436	308	124
Sable	1,347	1,188	1,622	1,758	1,920
Steenbok	169	300	89	165	54
Tsessebe	369	964	232	239	553
Warthog	113	133	140	299	262
Wildbeest	1,079	602	192	266	109
Zebra	7,213	2,747	2,884	4,259	6,900

-: Zero

* Percentage change in selected wildlife species' population between 1996 and 2003

Source: Research Division, Department of Wildlife and National Parks. Magnitude of change calculated by CSO

On the other hand, the estimates for giraffes, kudus, and steenbok followed a downward trend over the same period. However, since the species are in the more mobile category, the declines could be due to inter-district migration of the species. The zero count for baboon in 2003 might be attributed to sighting problems associated with the species rather than complete absence of the species in the district.

The densities of wildlife species in Chobe district are given in Table 2.6.

Table 2.6 Densities of Selected Wildlife Species in Chobe District (Animals/km^2)

Species	1996	1999	2001	2002	2003
Baboon	0.014	0.016	0.013	0.006	-
Buffalo	0.319	0.507	0.329	0.182	0.250
Eland	0.066	0.096	0.028	0.103	0.069
Elephant	1.891	1.897	1.876	2.529	2.173
Gemsbok	0.009	0.016	0.025	0.004	0.012
Giraffe	0.059	0.060	0.047	0.039	0.072
Hippopotamus	-	0.002	0.004	0.002	0.005
Impala	0.032	0.045	0.099	0.084	0.054
Kudu	0.013	0.021	0.007	0.012	0.015
Lechwe	0.010	0.003	0.012	0.007	0.017
Ostrich	0.023	0.025	0.029	0.025	0.023
Roan antelope	0.026	0.019	0.021	0.014	0.006
Sable	0.065	0.057	0.077	0.083	0.090
Steenbok	0.008	0.014	0.004	0.008	0.003
Tsessebe	0.018	0.046	0.011	0.011	0.026
Warthog	0.005	0.006	0.007	0.014	0.012
Wildbeest	0.052	0.029	0.009	0.012	0.005
Zebra	0.347	0.131	0.137	0.200	0.325

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife

2.6.2 Ghanzi District Wildlife Population

It is observed from Table 2.7 that on the average, the population estimates of kudu and hartebeest in Ghanzi district followed an increasing trend over the period 1996 – 2003 while those of duiker, giraffe, gemsbok and steenbok followed a declining trend over the same period. Steenbok and duiker species recorded a decline at the national level as well. Hence their population declines cannot be fully attributed to inter-district migration, nor to survey limitations alone. Therefore due attention is required to ensure their sustainability.

The ostrich species estimates that show no population difference between the 1996 and 2003 estimates (Table 2.7) should be considered alongside the consistent upward trend that is observed between 1996 and 2002. Therefore, other things being equal, the 2003 observation can be attributed to sighting problems during the survey rather than population decline in the specie. Similarly, zero count for bat eared fox in 2003 can be attributed to the same cause rather than complete absence of the specie in the district.

The densities of wildlife species in Ghanzi district are given in Table 2.8.

Table 2.7 Estimated Population of Selected Wildlife Species in Ghanzi District

Species	1996	1999	2001	2002	2003
Bat Eared Fox	128	120	184	236	-
Duiker	7,374	2,275	3,576	2,862	3,368
Eland	9,385	6,906	7,778	8,664	9,347
Gemsbok	41,580	59,059	41,066	40,856	35,002
Giraffe	923	2,661	1,546	1,374	703
Hartebeest	6,828	11,750	8,859	12,275	8,141
Jackal	887	413	777	583	444
Kudu	10,066	8,066	7,416	15,564	8,173
Ostrich	6,797	9,432	10,341	10,947	6,797
Springbok	12,084	9,198	9,672	7,568	5,681
Steenbok	16,798	7,860	17,228	16,865	6,917
Warthog	567	279	1,389	2,375	938
Wildbeest	6,819	3,271	6,217	5,737	9,583
Zebra	121	314	844	706	813

-: Zero

Source: Research Division, Department of Wildlife. Magnitude of change calculated by CSO

Table 2.8 Densities of Selected wildlife species in Ghanzi District (Animals/km^2)

Species	1996	1999	2001	2002	2003
Duiker	0.06	0.02	0.03	0.03	0.03
Eland	0.08	0.06	0.07	0.08	0.08
Gemsbok	0.36	0.52	0.36	0.36	0.30
Giraffe	0.01	0.02	0.01	0.01	0.01
Hartebeest	0.06	0.10	0.08	0.11	0.07
Jackal	0.01	0.00	0.01	0.01	0.00
Kudu	0.09	0.07	0.07	0.14	0.07
Ostrich	0.06	0.08	0.09	0.10	0.06
Springbok	0.11	0.08	0.08	0.07	0.05
Steenbok	0.15	0.07	0.15	0.15	0.06
Warthog	0.01	0.00	0.01	0.02	0.01
Wildbeest	0.06	0.03	0.05	0.05	0.08
Zebra	0.00	0.00	0.01	0.01	0.01

-: Less than 0.001 up to zero
Source: Research Division, Department of Wildlife and National Parks

2.6.3 Kgalagadi District Wildlife Population

On the average, the population estimates of hartebeest, kudu and steenbok wildlife species of wildlife in Kgalagadi district followed an increasing trend over the period 1996 – 2003 (see Table 2.9) while those of duikers and gemsboks followed a declining trend in the same period. The populations of duikers recorded a more than 50 percent decline at the national level as well, hence the decline can not be reliably attributed to inter-district migration alone. Likewise, gemsboks are known to be among the less mobile species so their decline cannot be reliably attributed to inter-district migration alone either.

The densities of wildlife species in Kgalagadi district are given in Table 2.10.

Table 2.9 Estimated Population of Selected Wildlife Species in Kgalagadi District

Species	1996	1999	2001	2002	2003
Baboon	-	103	-	318	-
Bat Eared Fox	-	175	-	87	48
Brown hyeana	63	29	29	-	-
Duiker	4,543	2,693	900	3,571	1,724
Eland	8,913	4,067	11,557	6,229	16,619
Gemsbok	74,738	45,543	60,069	50,279	52,953
Hartebeest	20,694	14,355	30,545	31,760	32,103
Jackal	711	384	1,222	1,507	799
Kudu	2,012	1,766	2,582	2,776	2,447
Ostrich	10,421	10,125	12,249	14,203	12,751
Springbok	42,523	29,402	18,571	17,735	17,697
Steenbok	11,786	9,223	14,125	14,678	13,571
Warthog	59	55	224	2,252	146
Wildbeest	7,240	4,554	5,631	3,281	4,571

-: Zero
* Percentage change in selected wildlife species' population between 1996 and 2003
Source: Research Division, Department of Wildlife. Magnitude of change calculated by CSO

Table 2.10 Densities of Selected wildlife species in Kgalagadi District (Animals/km2)

Species	1996	1999	2001	2002	2003
Duiker	0.044	0.027	0.008	0.034	0.017
Eland	0.086	0.041	0.105	0.060	0.160
Gemsbok	0.720	0.459	0.546	0.486	0.510
Hartebeest	0.199	0.145	0.277	0.307	0.309
Jackal	0.007	0.004	0.011	0.015	0.008
Kudu	0.019	0.018	0.023	0.027	0.024
Ostrich	0.100	0.102	0.111	0.137	0.123
Springbok	0.410	0.297	0.169	0.171	0.171
Steenbok	0.114	0.093	0.128	0.142	0.131
Warthog	0.001	0.001	0.002	0.022	0.001
Wildbeest	0.07	0.046	0.051	0.032	0.044

-: Less than 0.001 up to zero
Source: Research Division, Department of Wildlife. Magnitude of change calculated by CSO

2.6.4 Ngamiland District Wildlife Population

Ngamiland district has the broadest diversity of wildlife species because of its advantage of encompassing the Okavango Delta, a permanent source of water where many species of wildlife tend to concentrate during prolonged dry seasons. Despite this advantage, most wildlife species in the district appear to have suffered a decline in population numbers over the period 1996 – 2003 (see Table 2.11). The levels of decline indicated by the estimates are not discussed because of the shortcomings associated with counting the species in aerial surveys. However, it should be noted that on average, declining trends were observed even for species whose confidence limits do not deviate more than 20 percent from the estimates such as duiker, elephant, gemsbok, giraffe, hartebeest, impala and steenbok.

Wildlife population counts from the 2003 survey were higher than those from the 1996 survey for only crocodiles and hippopotamus species. However, given the limitations associated with counting the species in aerial surveys because of their preference for aquatic habitats over dry ground, the results should be considered with caution.

The densities of wildlife species in Ngamiland district are given in Table 2.12.

Table 2.11 Estimated Population of Selected Wildlife Species in Ngamiland District

Species	1996	1999	2001	2002	2003
Baboon	10,148	9,278	4,615	3,322	3,037
BEF	197	93	29	-	24
Buffalo	33,396	83,108	62	36,985	17,697
Crocodile	381	332	204	958	384
Duiker	2,633	2,108	1,173	468	973
Eland	388	863	658	625	360
Elephant	59,716	79,594	67,808	65,438	57,381
Gemsbok	14,461	16,485	7,022	9,452	7,191
Giraffe	10,608	9,578	7,577	6,985	5,517
Hartebeest	1,076	515	90	1,025	414
Hippo	1,293	2,107	2,217	3,079	1,362
Impala	58,960	44,247	22,030	15,880	26,419
Jackal	457	215	75	-	13
Kudu	9,984	5,718	4,496	6,471	3,693
Lechwe	77,671	78,267	56,066	70,030	48,628
Lion	680	1,180	77	231	91
Ostrich	11,893	5,787	7,886	8,681	4,868
Reedbuck	1,244	709	128	695	67
Roan antelope	778	478	625	529	64
Sable	1,897	866	1,744	498	949
Sitatunga	1,128	1,234	819	201	167
Springbok	8,746	3,849	5,272	856	1,417
Steenbok	6,784	5,809	3,212	3,840	3,391
Tsessebe	13,829	10,425	3,208	5,812	4,560
Warthog	10,044	4,623	2,251	2,866	1,148
Waterbuck	796	428	558	574	590
Wildbeest	19,571	23,538	11,201	31	5,765
Zebra	24,268	26,119	23,772	19,734	17,447

-: Zero

Source: Research Division, Department of Wildlife and National Parks

Table 2.12 Densities of Selected wildlife species in Ngamiland District (Animals/km^2)

Species	1996	1999	2001	2002	2003
Baboon	0.090	0.090	0.045	0.033	0.028
Brown hyeana	-	0.001	-	-	-
Buffalo	0.296	0.804	0.616	0.362	0.164
Cheetah	-	0.001	-	-	-
Crocodile	0.003	0.003	0.002	0.009	0.004
Duiker	0.023	0.020	0.012	0.005	0.009
Eland	0.003	0.008	0.006	0.006	0.003
Elephant	0.528	0.770	0.667	0.641	0.530
Gemsbok	0.128	0.160	0.069	0.093	0.066
Giraffe	0.094	0.093	0.074	0.068	0.051
Hartebeest	0.010	0.005	0.001	0.010	0.004
Hippo	0.011	0.020	0.022	0.030	0.013
Horse	0.092	0.105	0.109	0.112	0.099
Impala	0.522	0.428	0.217	0.155	0.244
Jackal	0.004	0.002	0.001	-	-
Kudu	0.088	0.055	0.044	0.063	0.034
Lechwe	0.687	0.757	0.551	0.685	0.449
Lion	0.006	0.011	0.001	0.002	0.001
Ostrich	0.105	0.056	0.078	0.085	0.045
Reedbuck	0.011	0.007	0.001	0.007	0.001
Roan antelope	0.007	0.005	0.006	0.005	0.001
Sable	0.017	0.008	0.017	0.005	0.009
Sitatunga	0.010	0.012	0.008	0.002	0.002
Springbok	0.077	0.037	0.052	0.008	0.013
Spotted hyeana	0.002	0.001	-	-	-
Steenbok	0.060	0.056	0.032	0.038	0.031
Tsessebe	0.122	0.101	0.032	0.057	0.042
Warthog	0.089	0.045	0.022	0.028	0.011
Waterbuck	0.007	0.004	0.005	0.006	0.005
Wildbeest	0.173	0.228	0.110	-	0.053
Wild dog	0.003	-	-	0.138	-
Zebra	0.215	0.253	0.234	0.193	0.161

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife and National Parks

2.7 Wildlife Population Estimates of Selected Species in National Parks and Game Reserves

There are many Game Reserves (GRs), National Parks (NPs) and Game Parks (GPs) in Botswana, all of which are protected areas. The main purpose of the GRs and NPs is the conservation of the ecosystems they cover, and in some cases the conservation of the species contained therein. Figure 2.1 presents a map of Botswana showing the publicly owned Game Reserves and National Parks and the Wildlife Management Areas (WMAs), and Table 2.13 presents a list of publicly-owned and privately-owned NPs, GRs, and GPs of Botswana. However, in this Publication, only seven of these protected areas are discussed and they cover three NPs and four GRs that are publicly owned.

Table 2.13 Some of the Game Reserves/Ranches/ Parks, National Parks, and Nature Reserves of Botswana

Protected Areas	Size (km^2)	Ecosystems protected	Purpose of Protection
National Parks:			
1. Chobe National Park	10,589.00	Forests, riparian swamps, alluvial floodplain, mopane forest	Ecosystem conservation
2. Kgalagadi Transfrontier National Park	28,000.00 Botswana Side	Arid shrub savannah, Kalahari bush savannah, fossil rivers and pans	Ecosystem conservation, Peace Park between RSA and Botswana
3. Makgadikgadi and Nxai Pans National Park	7,400.00	Fossil lakebed, pan grassland, northern Kalahari tree and bush savannah	Ecosystem conservation
Game Reserves/Parks:			
4. Moremi Game Reserve	4,800.00	Okavango Delta, floodplain, northern Kalahari tree and bush savannah	Ecosystem conservation
5. Central Kalahari Game Reserve	52,800.00	Kalahari bush savannah, northern Kalahari tree and bush savannah	Ecosystem conservation
6. Khutse Game Reserve	2,500.00	Kalahari bush savannah, fossil rivers and pans	Ecosystem conservation
7. Mannyelanong Game Reserve	3.00	Rocky hill closed tree woodland	Ecosystem conservation and cape vulture breeding site
8. Maun Wildlife Educational Park	3.00	Ngamiland tree savannah	Urban environmental education
9. Gaborone Wildlife Educational Park	5.00	Mixed bushveld	Urban environmental education

(***…Continued next page***)

Table 2.13 Some of the Game Reserves/Ranches/ Parks, National Parks, and Nature Reserves of Botswana (…*Continued*)

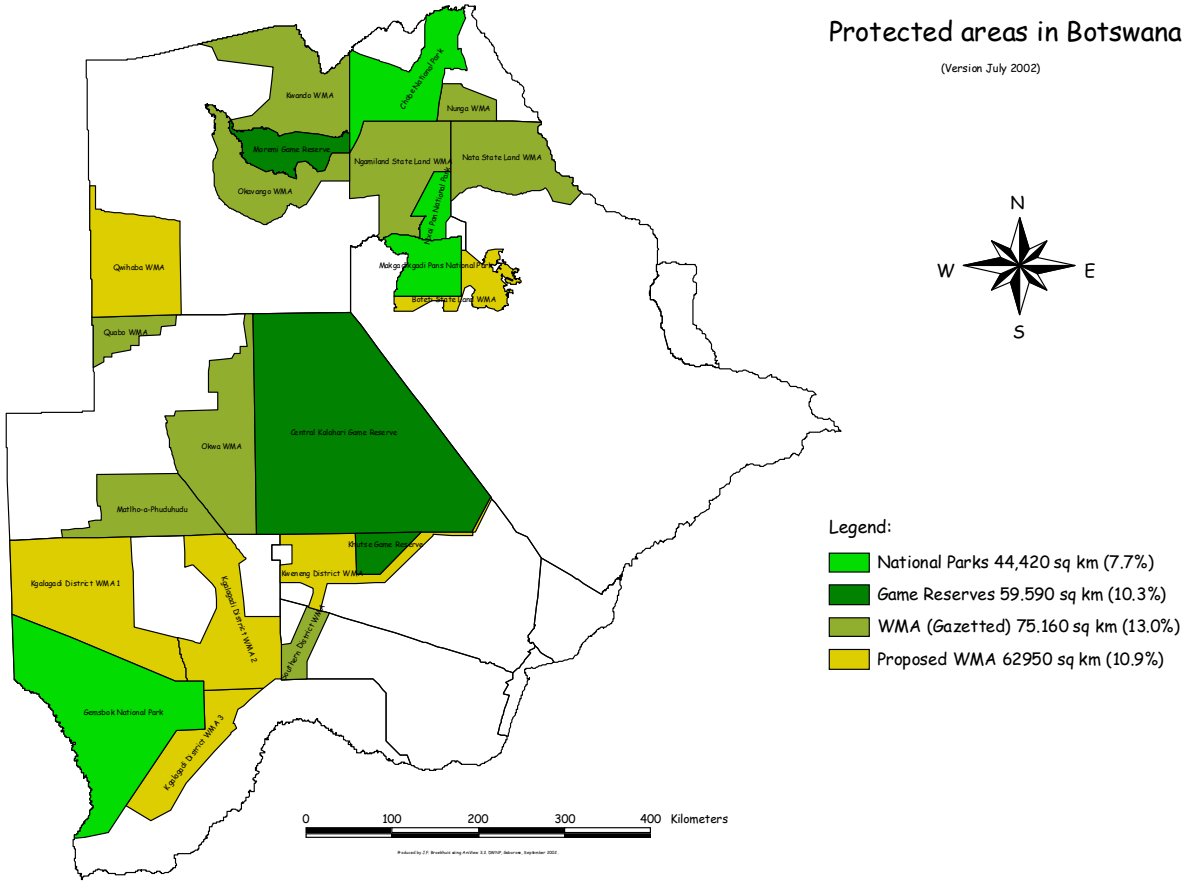
Protected Areas	Size (km^2)	Ecosystems protected	Purpose of Protection
10. Francistown Educational Park		Mixed bushveld	Environmental education, species management (rhino), under development
11. Nnywane Dam Game Reserve	n/a	Artificial wetland	Bird sanctuary
12. Mogobane Bird Sanctuary	n/a	Artificial wetland	Bird sanctuary
13. Bathoen Dam Bird Sanctuary	n/a	Artificial wetland	Bird sanctuary
Other Government Holdings:			
14. Ditopo Ranch	22.75	Mixed bushveld	Eland Domestication Project
15. Matlho-a-Phuduhudu Demonstration Game Ranch	n/a	Mixed bushveld	Demonstration game ranch
Private or Community Owned Nature Reserves:			
16. Le Roo Le Tau Community Area	n/a	Mixed bushveld	Community tourism initiative
17. Nata Sanctuary	230.00	Open pan/mopane woodland, 45 percent of the sanctuary is comprised of salt pans	Community project, bird sanctuary
18. Seboba Community Area	n/a	Riverine habitat	Community area operated under the Seboba Community Trust
19. Northern Tuli	450.00	Mixed bushveld, riparian woodland, mopane woodland	Game farms/tourism
20. Jwaneng Game Reserve	22.00	Kalahari bushveld savannah	Ecosystem conservation
21. Orapa Game Reserve	8.50	Mixed bushveld	Education
22. Mokolodi Nature Reserve	4.00	Mixed bushveld	Education
23. Khama Rhino Sanctuary	4.50	Mixed bushveld	Species management (white rhino)

n/a. Not available

Sources:

1. *Government of Botswana, National Report on Measures taken to Implement the Convention of Biological Diversity, 1998*
2. *The National Conservation Strategy Coordinating Agency, Southern African Biodiversity Support Program, Status of Biodiversity in Botswana, 2002*

Map 2.1 Publicly owned Game Reserves, National Parks and Wildlife Management Areas



2.7.1 Chobe National Park Wildlife Population

The populations and densities of selected wildlife species in Chobe NP are given in Tables 2.14 and 2.15, respectively. The major species (by population) in the Chobe NP are elephants, impalas, tsessebe, zebra and sable.

As in other parts of the country, the estimated population of elephants in Chobe NP over the period 1993 – 2003 generally followed an upward trend. Over the same period, the estimated population of impalas declined in 1996 but picked up in following years, only to decline again sharply in 2003. Tsessebe population generally followed a downward trend over the period with the exception of 1999, when it increased but started declining again in the following years of the same period. The estimated population of zebras had an upward trend over the years 1993 – 1996 that was followed by a reversed trend thereafter, with the exception of 2003. Sables on the other hand had an upward trend on the average.

Table 2.14 Estimated Population of Selected Wildlife Species in Chobe National Park

Species	1993	1994	1996	1999	2001	2002	2003
Baboon	-	14	286	331	217	-	-
Buffalo	31	736	5,319	4,903	1,788	252	3,773
Crocodile	-	7	-	11	-	-	-
Duiker	21	12	131	-	-	-	-
Eland	-	100	239	225	27	166	115
Elephant	13,565	11,682	25,532	22,053	33,219	31,598	30,348
Gemsbok	-	31	-	-0	14	-	55
Giraffe	364	1,107	666	850	692	540	999
Hippo	83	145	6	-	90	-	50
Impala	1,697	2,008	386	560	1,502	1,439	868
Kudu	-	497	114	260	123	156	205
Lechwe	52	138	172	63	245	0	362
Ostrich	291	43	344	416	173	300	369
Reedbuck	21	-	-	-	-	177	-
Roan	31	195	160	148	144	1,533	68
Sable	448	868	951	1,119	857	-	1,117
Steenbok	10	134	135	72	28	59	42
Tsessebe	1,322	270	253	960	43	103	77
Warthog	104	337	114	63	153	184	170
Waterbuck	10	12	172	-	-	-	27
Wildebeest	-	-	777	-	188	147	-
Zebra	479	1,762	2,490	1,504	1,359	338	2,121

-: Zero

Source: Department of wildlife and National Parks

Table 2.15 Densities of Selected wildlife species in Chobe National Park (Animals/km^2)

Species	1994	1996	1999	2001	2002	2003
Baboon	0.001	0.028	0.033	0.020	-	-
Buffalo	0.038	0.522	0.482	0.169	0.025	0.368
Duiker	0.001	0.013	-	-	-	-
Eland	0.010	0.023	0.022	0.003	0.016	0.011
Elephant	1.126	2.507	2.170	3.131	3.080	2.960
Gemsbok	0.003	-	-	0.001	-	0.005
Giraffe	0.017	0.065	0.084	0.065	0.053	0.097
Hippo	0.014	0.001	-	0.009	0.003	0.005
Impala	0.193	0.038	0.055	0.142	0.140	0.085
Kudu	0.048	0.011	0.026	0.012	0.015	0.020
Lechwe	0.013	0.017	0.006	0.023	0.015	0.035
Ostrich	0.004	0.034	0.041	0.016	0.029	0.036
Roan	0.019	0.016	0.015	0.014	0.017	0.007
Sable	0.084	0.093	0.110	0.081	0.149	0.109
Steenbok	0.013	0.013	0.007	0.003	0.006	0.004
Tsessebe	0.026	0.025	0.094	0.004	0.010	0.008
Warthog	0.032	0.011	0.006	0.014	0.018	0.017
Waterbuck	0.001	0.017	-	-	-	0.003
Wildebeest	-	0.076	-	0.018	0.014	-
Zebra	0.170	0.244	0.148	0.128	0.033	0.207

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife and National Parks.

2.7.2 Moremi Game Reserve

The populations and densities of selected wildlife species in Moremi GR are given in Tables 2.16 and 2.17, respectively. The major species (by population) in the GR are buffaloes, lechwe, impala, zebra and wildebeest.

The estimated populations of lechwe in the Moremi GR generally followed a downward trend, although their count picked up in 1994 and 2001. Similarly, the populations of impala, zebra, warthog and tsessebe declined over the period 1993 – 2003 with the exception of just a single year each (1999, 2001, 1994 and 1996; respectively), when increases were observed.

On the other hand, the estimated populations of wildebeest rose over the period, with the exception of 1996 and 2003. Buffalo populations in Moremi GR increased up to 1999 and declined thereafter.

Table 2.16 Estimated Population of Selected Wildlife Species in Moremi Game Reserve

Species	1993	1994	1996	1999	2001	2002	2003
Baboon	-	2,435	2,205	2,871	2,436	638	667
Buffalo	8,248	10,768	22,510	40,160	23,044	4,585	597
Crocodile	-	318	17	75	-	-	-
Elephant	7,261	7,525	7,758	5,442	6,048	9,562	5,862
Giraffe	1,309	1,334	1,691	1,370	1,777	1,233	958
Hippo	696	551	812	507	717	1,320	458
Impala	12,424	19,406	18,615	21,262	10,017	6,109	10,071
Kudu	-	710	1,028	563	430	392	458
Lechwe	18,906	29,636	11,752	10,978	17,513	4,759	6,682
Ostrich	114	184	232	131	86	174	125
Reedbuck	686	808	365	94	100	203	28
Roan	125	61	116	-	14	-	-
Sable	156	147	116	225	-	-	56
Sitatunga	114	281	83	56	143	-	28
Steenbok	52	-	17	-	43	15	-
Tsessebe	3,002	1,872	3,033	2,928	1,089	1,074	778
Warthog	2,867	4,001	1,542	854	616	218	208
Waterbuck	125	392	215	244	3,970	218	111
Wildbeast	1,618	2,288	1,310	4,429	-	6,109	236
Zebra	2,233	1,786	1,674	1,633	4,256	2,220	1,500

-: Zero

Source: Research Division, Department of Wildlife and National Parks. Magnitude of change calculated by CSO

Table 2.17 Densities of Selected wildlife species in Moremi Game Reserve (Animals/km^2)

Species	1994	1996	1999	2001	2002	2003
Baboon	0.494	0.612	0.797	0.491	0.177	0.185
BEF	-	6.247	-	-	-	-
Buffalo	2.186	-	11.146	4.642	1.273	0.166
Crocodile	-	0.005	0.021	-	-	-
Elephant	1.528	2.153	1.510	1.218	2.654	1.627
Giraffe	0.271	0.469	0.380	0.358	0.342	0.266
Hippo	0.112	0.225	0.141	0.144	0.366	0.127
Impala	3.939	5.166	5.901	2.018	1.695	2.795
Kudu	0.144	0.285	0.156	0.087	0.109	0.127
Lechwe	6.016	3.262	3.047	3.528	1.321	1.854
Ostrich	0.037	0.064	0.036	0.017	0.048	0.035
Reedbuck	0.164	0.101	0.023	0.020	0.056	0.008
Roan	0.012	0.032	-	0.003	-	-
Sable	0.030	0.032	0.062	-	-	0.015
Sitatunga	0.057	0.023	0.016	0.029	-	0.008
Steenbok	-	0.005	-	0.009	0.004	-
Tsessebe	0.380	0.842	0.812	0.219	0.298	0.216
Warthog	0.812	0.428	0.237	0.124	0.060	0.058
Waterbuck	0.079	0.060	0.068	0.092	0.060	0.031
Wildbeast	0.464	0.363	1.229	0.800	1.695	0.066
Zebra	0.363	0.465	0.453	0.857	0.616	0.416

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife and National Parks. Magnitude of change calculated by CSO

2.7.3 Central Kgalagadi Game Reserve (CKGR) Wildlife Populations

The populations and densities of selected wildlife species in Central Kgalagadi GR are given in Tables 2.18 and 2.19, respectively. The major species (by population) in the GR are gemsbok, eland, impala, hartebeest, steenbok and ostrich. Since the 1994 data in Table 2.18 lumps together wildlife counts for CKGR and Khutse GRs, commentary on time series data covers available data for the period 1996 – 2003 only.

Gemsbok is the most populous species in the CKGR. However, their population estimates from the aerial surveys have been declining since 1999. Eland, steenbok, springbok and kudu populations followed a declining trend on the average during the period 1996 – 2003. On the other hand, hartebeest and ostrich populations followed an upward trend over the same period although their estimates, based on the 2002 and 2003 surveys, showed a decline.

Table 2.18 Estimated Population of Selected Wildlife Species in Central Kgalagadi Game Reserve (CKGR)

Species	*1994	1996	1999	2001	2002	2003
Duiker	3,182	1,678	514	680	676	571
Eland	8,118	9,234	6,185	5,155	7,065	6,344
Gemsbok	44,740	32,713	55,067	35,463	34,801	29,609
Giraffe	1,115	893	2,661	1,416	1,253	703
Hartebeest	10,916	4,267	5,032	5,722	5,759	3,617
Kudu	4,525	6,253	5,014	2,096	4,609	2,941
Ostrich	9,734	3,505	4,614	5,920	4,986	3,807
Springbok	8,723	4,814	4,485	5,212	2,783	4,057
Steenbok	11,856	6,382	4,171	5,467	5,319	2,940
Wathog	359	263	-	368	988	23
Wildbeast	5,349	3,835	1,203	2,153	833	989

** Population estimates for CKGR and Khutse GRs were lumped together in 1994*

Source: Research Division, Department of Wildlife and National Parks. Magnitude of change calculated by CSO

Table 2.19 Densities of Selected wildlife species in Central Kgalagadi Game Reserve (Animals/km^2)

Species	1996	1999	2001	2002	2003
Duiker	0	0.01	0.013	0.013	0.011
Eland	-	-	0.099	0.135	0.121
Gemsbok	1	1	0.682	0.665	0.565
Giraffe	0.02	0	0.027	0.024	0.013
Hartbeest	-	0.10	0.11	0.110	0.069
Kudu	0.119	0.10	0.04	0.088	0.056
Ostrich	0.067	0.088	0.114	0.095	0.073
Springbok	0.092	0.09	0.1	0.053	0.077
Steenbok	0.122	0.08	0.105	0.102	0.056
Warthog	0.005	-	0.007	0.019	-
Wildbeast	0.073	0.023	-	0.016	0.019

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife and National Parks.

2.7.4 Gemsbok National Park

The populations and densities of selected wildlife species in Gemsbok NP are given in Tables 2.20 and 2.21, respectively. The major species on the basis of population size in the GR are gemsbok, hartebeest, eland, steenbok and ostrich. Since the 1994 data in Table 2.20 lumps together wildlife counts for Gemsbok and Mabuasehube NPs, and the data for 2003 was not available, commentary on time series data covers available data for the period 1996 – 2002 only.

Table 2.20 Estimated Population of Selected Wildlife Species in Gemsbok NP

Species	*1994	1996	1999	2001	2002
Duiker	765	491	715	248	891
Eland	1,362	8,877	3,980	3,230	4,364
Gemsbok	35,397	43,684	28,777	40,818	32,656
Hartebeest	13,026	6,589	7,283	9,602	17,882
Kudu	96	-	204	177	715
Ostrich	3,466	3,176	3,029	1,807	5,784
Springbok	15,584	2,326	4,234	, 602	2,459
Steenbok	3,466	3,210	2,173	5,634	4,697
Wathog	-	-	57	-	315
Wildbeast	4,446	554	3,011	177	1,814

* Estimated population is for Gemsbok and Mabuasehube NPs
Source: Department of Wildlife and National Parks

Table 2.21 Densities of Selected wildlife species in Gemsbok NP (Animals/km2)

Species	1996	1999	2001	2002
Duiker	0.019	0.030	0.008	0.034
Eland	0.347	0.169	0.104	0.165
Gemsbok	1.707	1.223	-	1.233
Hartebeest	0.257	0.310	1.301	0.675
Jackal	-	-	0.306	-
Kudu	-	0.009	0.006	0.027
Ostrich	0.124	0.129	0.058	0.218
Springbok	0.091	0.180	0.019	0.093
Steenbok	0.125	0.092	0.180	0.177
Warthog	-	0.002	-	0.012
Wildbeast	0.022	0.128	0.006	0.068

-: Less than 0.001 up to zero
Source: Research Division, Department of Wildlife and National Parks.

Generally, the trend of the estimated populations from aerial surveys for the major species of Gemsbok NP is upward for hartebeest and ostriches, downward for gemsbok and eland and erratic for steenbok.

2.7.5 Nxai Pan NP and Makgadikgadi Pans GR

The populations and densities of selected wildlife species in Nxai Pans NP and Makgadikgadi Pans GR are given in Tables 2.22 to 2.26. The major species on the basis of population size in the Nxai Pans NP are springbok, giraffe, gemsbok, and ostrich; and those for Makgadikgadi Pans GR are zebra, wildebeest, ostrich and gemsbok. Since the two protected areas are close together and the data for 2001 for the two areas are lumped together, an additional table containing data on wildlife counts for the combined Nxai Pans NP and Makgadikgadi Pans GR areas is given in Table 2.26.

Generally, over the period 1993 – 2003, the trend of major wildlife species' estimated populations in the two areas was erratic (Tables 2.22 and 2.24), even on a combined area basis Table 2.26. However, on a general basis, some general pattern can be traced for a few species. In the case of Nxai Pans NP, the trend of population estimates for springbok and ostrich was downward generally, except for the 1996 outlier estimate for the population of springbok . Regarding Makgadikgadi Pans GR, population estimates for gemsbok consistently declined until 1999 when the population estimate picked up and followed an upward trend thereafter.

Table 2.22 Nxai Pans NP Wildlife Population Estimates

Species	1993	1994	1996	1999	*2001	2002	2003
Duiker	15	22	-	-	-	-	-
Elephant	-	-	-	33	403	-	304
Gemsbok	107	44	173	167	1,482	353	0
Giraffe	214	44	173	167	206	257	111
Impala	-	-	-	-	296	-	-
Kudu	-	-	-	-	592	-	-
Ostrich	199	44	173	33	1,122	32	111
Springbok	5,389	733	3,083	1,205	4,668	-	663
Steenbok	122	-	-	33	477	160	28
Wildbeast	-	22	-	-	3,155	-	-
Zebra	-	-	-	-	15,640	-	332

**: Estimated population is for Nxai Pans NP and Makgadikgadi GR*
Source: Research Division, Department of Wildlife and National Parks.

Table 2.23 Densities of Selected Wildlife Species in Nxai Pans NP (Animals/km^2)

Species	1994	1996	1999	2001	2002	2003
Elephant	-	-	0.015	0.053	-	0.137
Gemsbok	0.020	0.078	0.075	0.194	0.159	-
Giraffe	0.020	0.078	0.075	0.027	0.115	0.050
Impala	-	-	-	0.039	-	-
Kudu	-	-	-	0.078	-	-
Ostrich	0.020	0.078	0.015	0.147	0.014	0.050
Springbok	0.329	1.386	0.542	0.611	-	0.298
Steenbok	-	-	0.015	0.062	0.072	0.012
Wildbeast	0.010	-	-	0.413	-	-
Zebra	-	-	-	2.046	-	0.149

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife and National Parks.

Table 2.24 Estimated Population of Selected Wildlife Species in Makgadikgadi GR

Species	1993	1994	1996	1999	2002	2003
Duiker	-	31	-	33	28	-
Elephant	-	-	-	-	337	149
Gemsbok	946	881	806	427	1,588	1,717
Giraffe	-	346	302	33	267	216
Hartebeest	-	126	-	131	295	95
Kudu	-	1,510	739	394	365	514
Ostrich	1,038	724	1,008	821	2,894	1,054
Springbok	31	-	-	-	14	162
Steenbok	122	-	-	755	42	324
Wildebeest	-	1,699	2,016	17,113	3,625	4,609
Zebra	-	18,119	9,541	28,019	9,976	11,083

-: Zero

Source: Research Division, Department of Wildlife and National Parks. Magnitude of change calculated by CSO

Table 2.25 Densities of Selected Wildlife Species in Makgadikgadi GR (Animals/km^2)

Species	1994	1996	1999	2002	2003
Diuker	0.008	-	0.010	0.005	-
Elephant	-	-	0.013	0.060	0.026
Gemsbok	0.218	0.198	0.086	0.282	0.305
Giraffe	0.086	0.074	0.007	0.047	0.038
Hartebeest	0.031	-	0.027	0.052	0.017
Kudu	0.374	0.181	0.080	0.065	0.091
Ostrich	0.179	0.247	0.166	0.514	0.187
Springbok	-	-	-	0.002	0.029
Steenbok	-	-	0.153	0.007	0.058
Wildbeast	0.420	0.494	3.456	0.643	0.818
Zebra	4.483	2.341	5.659	1.770	1.966

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife and National Parks.

For the combined Nxai Pans NP and Makgadikgadi Pans GR areas' population estimates (Table 2.26), wildebeest estimates were consistently on the increase over the 1993 – 2003 period, the 1999 outlier estimate aside; while those of gemsbok were on the decline on the average from 1993 – 1999 and increased thereafter.

Table 2.26 Combined Population Estimates for Nxai PanNP and Makgadikgadi Pan GR

Species	1993	1994	1996	1999	2001	2002	2003
Duiker	15	53	-	33	-	28	-
Elephant	-	-	-	99	403	337	453
Gemsbok	1,053	925	979	594	1,482	1,941	1,717
Giraffe	214	390	475	200	206	524	327
Hartebeest	-	126	-	131	-	295	95
Impala	-	-	-	-	296	-	-
Kudu	-	1,510	739	394	592	365	514
Ostrich	1,237	768	1,181	854	1,122	2,926	1,165
Springbok	5,420	733	3,083	1,205	4,668	14	825
Steenbok	244	-	-	788	477	202	352
Wildbeast	-	1,721	2,016	17,113	3,155	3,625	4,609
Zebra	-	18,119	9,541	28,019	15,640	9,976	11,415

-: Zero

Source: Research Division, Department of Wildlife and National Parks.

2.7.6 Khutse Game Reserve Numbers

The populations and densities of selected wildlife species in Khutse GR are given in Tables 2.27 and 2.28, respectively. The major species on the basis of population size in the GR are gemsbok, eland and steenbok. The population estimates of gemsbok over the 1996 – 2003 period were on the increase, generally, until 2002 when they started declining. The same estimates for eland followed an erratic trend before 2001 and a declining trend thereafter, while those for steenbok were erratic throughout the period.

Table 2.27 Estimated Population of Selected Wildlife Species in Khutse Game Reserve

Species	1996	1999	2001	2002	2003
Baboon	-	-	144	-	-
Duiker	79	27	-	-	-
Eland	686	107	4,615	2,908	943
Gemsbok	1,425	2,331	2,596	2,022	1,232
Giraffe	53	-	317	-	-
Hartebeest	-	-	202	138	131
Kudu	132	54		138	288
Ostrich	238	241	404	111	157
Springbok	-	-	-	-	314
Steenbok	317	161	865	166	367
Wildbeast	53	-	87	194	-

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife and National Parks. Magnitude of change calculated by CSO

Table 2.28 Densities of Selected wildlife species in Khutse Game Reserve (Animals/km^2)

Species	1996	1999	2001	2002	2003
Duiker	0.029	0.010	-	-	0.03
Eland	0.252	0.039	1.740	1.096	0.356
Gemsbok	0.524	0.857	0.978	0.762	0.464
Giraffe	0.019	-	0.120	-	0
Hartebeest	-	-	0.076	0.052	0.049
Kudu	0.049	0.020	-	0.052	0.109
Ostrich	0.087	0.089	0.152	0.042	0.059
Steenbok	0.117	0.059	0.326	0.063	0.138
Wildbeast	0.019	-	0.033	0.073	-

-: Less than 0.001 up to zero

Source: Research Division, Department of Wildlife and National Parks.

3.0 PREDATOR POPULATIONS

Predators are impressive animals to watch, even when seen in a still photograph or video screen. They are admired worldwide for their beauty and strength. In certain cultures, the skins of lions and leopards are symbolic of royalty while in other cultures, the practice of using body parts of predators as protection charms is not uncommon.

Furthermore, predators, especially lions, leopards and cheetahs are the kingpins of the photographic Safari Industry in the country. In addition, Botswana has a thriving wildlife hunting industry that is trophy driven. Predators are, therefore, a major component of the wildlife-based tourism industry of Botswana.

Unfortunately, there has been a concern since 2001 that predator species are becoming threatened (DWNP and Kalahari Conservation Society (KCS), 2002). Various reasons have been forwarded for this concern including the lack of reliable population data on the species, a situation that is suspected to lead to unsustainable hunting quotas in some areas; and mortality arising from (Problem Animal Control) PAC efforts. The latter is a direct result of increased conflict between people and predators due to the proliferation of human settlements and accompanying livestock farming activities in WMAs.

Predators are harmful to other animals, particularly livestock. In Botswana, predator species include lions, leopards, brown hyeana, spotted hyeana, cheetah and the wild dog. Lions and leopards are on record for causing the most damage of all predator species. The legislation and status of the main predators species of Botswana are summarized in Table 5.1.

Since aerial surveys do not provide reliable estimates of the populations of predators (see Section 2.3), reasonable estimates are sourced from specialized ground-count surveys or indices of abundance data derived from various observational techniques. There are indications that the abundance and distribution of the different predator species vary between and within different land use zones which are shown in Figure 3.1.

Map 3.1 Conservation Zones

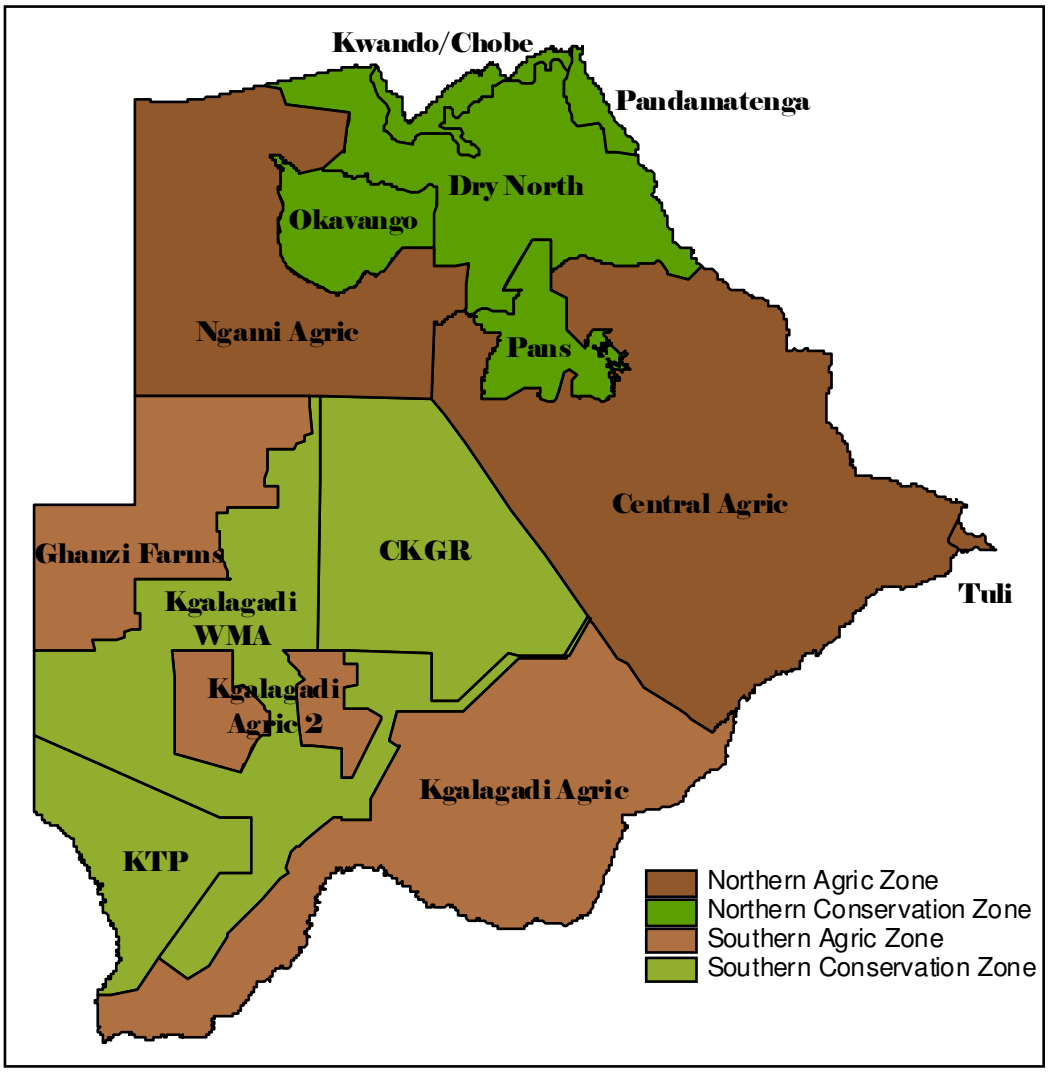


Table 3.1 Legislation and Status of the Main Species of Predators in Botswana.

Species	Legislation	Status	
		National	International
Brown Hyeana	Protected. May be hunted or captured only under and in accordance with the terms and conditions of a Director's permit.	Between 56 percent and 69 percent of the estimated world population occurs in Botswana (Mills and Hofer 1998). Population fluctuates appreciably and rapidly depending on food supply.	IUCN lists the brown hyeana as Lower Risk, Near Threatened (LR/nt). Close to qualifying for Vulnerable.
Cheetahs	Protected. May be hunted or captured only under and in accordance with the terms and conditions of a Director's permit.	Large estimated population of 1,768 cheetahs which comprise 12 percent of the world population (Marker 1998). Vulnerable subpopulations exist whose long-term survival depends on effectiveness of conservation management in the Agricultural zones.	IUCN lists the cheetah as Vulnerable (VU). The worldwide population estimate for cheetahs is less than 10 000 mature individuals. CITES Appendix 1
Wild dog	Protected. May be hunted or captured only under and in accordance with the terms and conditions of a Director's permit.	Vulnerable. Stringent conservation management in the Agricultural zones is necessary. Low level of conflict occurs, mainly with small stock farmers (Tjibae 2001).	IUCN lists the wild dog as Endangered (EN)
Leopards	Partially protected. May be hunted or captured only under and in accordance with the terms and conditions of a license or permit.	Viable and stable subpopulations occur in the Northern and Southern Conservation zones. They are also widely distributed in agricultural zones, but with lower density.	IUCN lists leopards as Vulnerable. CITES Appendix II: CITES export permits have been allocated to Botswana for 130 leopards for sport hunting per year. Between 60 and 80 of these leopards are utilized by sport hunting
Lions	Partially protected. May be hunted or captured only under and in accordance with the terms and conditions of a license or permit.	Two large viable subpopulations in the Conservation zones.	IUCN lists lions as Vulnerable. CITES Appendix II
Spotted hyeana	Classified as Game Animals in Botswana. May be hunted or captured by a non-citizen only under and in accordance with the terms and conditions of a license or permit and may be hunted by a citizen of Botswana outside a GR or NP without a license.	Between 3.6 percent and 4.1 percent of the estimated world population occurs in Botswana (Mills and Hofer 1998).	IUCN lists the spotted hyeana as Lower Risk, Conservation Dependent (LR/cd) and expect it to qualify for one of the threatened categories within a period of 5 years.

Estimates of the population and status of the six large predators of Botswana are as follows:

3.1 Brown hyeana (*Hyeana brunnea*)

Between 56 percent and 69 percent of the estimated world population of brown hyeana species occurs in Botswana (Mills and Hofer 1998). The brown hyeana is widely distributed throughout Botswana, particularly in the southern conservation zone and excluding the extreme north. There is a large stable subpopulation in the Southern Conservation Zone. The numbers and densities of brown hyeana are lower in the southern and northern Agricultural zones and also the southern parts of the Northern Conservation Zone. Status in Botswana: healthy stable population in southern Botswana.

Table 3.2 Brown hyeana Population Estimates

Zone	Percentage Area (km^2)	Estimate	Minimum Estimate	Maximum Estimate
Northern Conservation Zone	13.8	220	196	245
Southern Conservation Zone	27.9	3,296	2,871	3,720
Northern Agricultural Zone	34.7	405	135	675
Southern Agricultural Zone	23.5	416	139	694
Botswana	**100.0**	**4,338**	**3,341**	**5,334**

Source: Department of Wildlife and National Parks, Division of Research

3.2 Cheetah (*Acinonyx jubatus*)

Cheetahs are concentrated in small subpopulations in both conservation and agricultural conservation zones, with higher numbers occurring outside protected areas. The low density of cheetah in protected areas and Wildlife Management Areas has been attributed to competition with lions and hyeanas.

No formal research estimates have been undertaken and cheetah population estimates are limited to spoor surveys carried out in the Central Kalahari Game Reserve and Kgalagadi Transfrontier Park. Botswana's current Cheetah population is estimated to be 1,768. This figure represents 12 percent of the world population (Marker 1998). The largest population in Botswana is in the southern portion of the country. Population growth of cheetahs has been limited by constricting range and declining prey base, and is therefore vulnerable in Botswana. According to the Problem Animal Control records cheetahs cause a low level of conflict in the Agricultural zones.

Table 3.3 Cheetah Population Estimates

Zone	Percentage Area (km^2)	Estimate	Minimum Estimate	Maximum Estimate
Northern Conservation Zone	13.8	290	122	457
Southern Conservation Zone	27.9	618	479	757
Northern Agricultural Zone	34.7	368	155	580
Southern Agricultural Zone	23.5	493	208	777
Botswana	**100.0**	**1,768**	**965**	**2,571**

Source: DWNP and Kalahari Conservation Society, 2002. National Predator Strategy, Botswana.

3.3 Wilddog (*Lycaon pictus*)

This is an endangered species globally. In Botswana, there are two distinct subpopulations in the north and southern conservation zones. It is estimated that the population of wilddog in Botswana is about 1,658 (McNut, 2001). There are small, very vulnerable subpopulations in the Agricultural zones. However, only large conservation areas provide a secure habitat for wilddogs because these species are susceptible to habitat fragmentation since they range widely.

Table 3.4 Wilddog Population Estimates*

Zone	Percentage Area (km^2)	Estimate
Northern Conservation Zone	13.8	866
Southern Conservation Zone	27.9	621
Northern Agricultural Zone	34.7	102
Southern Agricultural Zone	23.5	69
Botswana	**100.0**	**1,658**

*Minimum and Maximum population estimates are not available at present

Source: DWNP and Kalahari Conservation Society, 2002. National Predator Strategy, Botswana

3.4 Leopard (*Panthera pardus*)

The population of leopards is healthy and widely distributed, albeit in low densities, throughout the country. However, the largest concentrations are in the Northern and Southern Conservation zones. The species are widely distributed but at a low density in Agricultural zones. Leopards are the least threatened predator species in Botswana because of their adaptability and wide distribution. They are estimated to have a density ranging between 1.9 – 3.0 leopards/ $100km^2$ in CKGR and of about 0.4 leopards/ $100km^2$ in the Kgalagadi Transfrontier Park (DWNP and KCS, 2002).

Table 3.5 Leopard Population Estimates

Zone	Percentage Area (km^2)	Estimate	Minimum Estimate	Maximum Estimate
Northern Conservation Zone	13.8	1,998	1,550	2,447
Southern Conservation Zone	27.9	1,955	1,564	2,346
Northern Agricultural Zone	34.7	840	652	1,029
Southern Agricultural Zone	23.5	823	638	1,008
Botswana	**100.0**	**5,617**	**4,404**	**6,830**

Source: DWNP and Kalahari Conservation Society, 2002. National Predator Strategy, Botswana

Leopards are one of the predator species killed most frequently as a result of problem animal control efforts (Table 5.5), because conflict between them and livestock owners is high. However, Woodroffe (2001) showed that the leopard species is not extinction prone, and remains the one large African predator species most likely to survive and maintain a presence outside protected areas.

3.5 Lion (*Panthera leo*)

There are two viable subpopulations of lions in the country, concentrated in the southern and northern conservation zones. There are, however, occasional sightings of vagrants in agricultural zones. In general the lion subpopulations in Botswana are large, stable and viable. However, some populations are locally threatened such as those in Makgadikgadi area while the Chobe/Kwando sub-population is locally disrupted. Conflict resolution and special measures will be a priority in areas where conflict occurring adjacent to conservation areas disrupts or threatens key lion populations, such as is the case with the Makgadikgadi sub-population.

Table 3.6 Lion Population Estimates

Zone	Percentage Area (km^2)	Estimate	Minimum Estimate	Maximum Estimate
Northern Conservation Zone	13.8	1,918	1,561	2,275
Southern Conservation Zone	27.9	1,133	889	1,378
Northern Agricultural Zone	34.7	10	-	20
Southern Agricultural Zone	23.5	-	-	-
Botswana	**100.0**	**3,061**	**2,450**	**3,673**

Source: Department of Wildlife and National Parks, Division of Research

Lions and leopards cause the most livestock damage of all predator species (Tjibae 2001, Table 5.1 and Figure 5.1). Therefore, conservation efforts aimed at the species outside protected areas are likely to succeed only if people see a benefit to tolerating predators

such as lions (Dinerstein *et al.* 1999 and Woodroffe 2001). The impact of lethal control on the subpopulations of lions in the Conservation zones varies from sustainable (Okavango and Kgalagadi Transfrontier Park) to high (Makgadikgadi).

3.6 Spotted hyeana (*Crocuta crocuta*)

There is a large and stable subpopulation in the Northern Conservation Zone and a smaller but stable subpopulation in the Southern Conservation Zone. The population of spotted hyeana is limited in distribution in the Agricultural zones. Their status in Botswana can be described as healthy and stable with no serious concern for becoming vulnerable.

The available Problem Animal Control records do not distinguish sufficiently between brown hyeana and spotted hyeana. Although hyeana form only a small proportion of the problem animal incidents reported at the national level (contributed about 7 percent if the incidents in 2003, see table 5.3), between 15 percent and 50 percent of the reported incidents involved spotted hyeana for the four districts of Ngamiland (Rutina 2001). The general approach to the conflict is to conserve spotted hyeanas in large conservation areas and allow the communities to remove any animals that stray beyond its borders and cause livestock losses.

Table 3.7 Tentative estimate of Total Botswana population size of Spotted Hyeana.

Zone	Percentage Area (km^2)	Estimate	Minimum Estimate	Maximum Estimate
Northern Conservation Zone	13.8	1,918	1,580	2,257
Southern Conservation Zone	27.9	601	476	726
Northern Agricultural Zone	34.7	154	0	307
Southern Agricultural Zone	23.5	156	0	312
Botswana	**100.0**	**2,829**	**2,056**	**3,603**

Source: DWNP and Kalahari Conservation Society, 2002. National Predator Strategy, Botswana

4.0 ANIMAL (WILD AND DOMESTIC) BIOMASS DATA

4.1 Introduction

Animal biomass is measured in livestock units (LUs). In Botswana, a LU is defined as an animal weighing about 450 kg. Holechek *et al* (1989) stated that on average the consumption of forage by range ruminants is about 2 percent of their body mass in dry matter when forage availability is unrestricted, while that of ruminants is about 50 percent higher. An animal with a biomass of 1 LU (weighing 450 kg) is expected to eat about 9 – 13.5 kg of dry matter forage per day depending on whether it is a ruminant or non-ruminant animal and on the quality of the forage available to it. Hence, the weight of an animal is positively correlated with the amount of forage it needs to consume to meet its daily food requirements. Forage demand by animals on a given piece of land depends on their total animal biomass and the length of time they will occupy the land. Therefore, the best way to measure the impact of wildlife and livestock populations on the sustainable use of rangelands[7] is by looking, not only at their total numbers, but also at their total animal biomass measured in livestock units (LUs).

Animal biomass estimates are useful in estimating the stocking rate for a given piece of land. Stocking rate at a given time in a defined geographical area is the amount of land allocated to each animal (or livestock) unit. However, it is measured in terms of the number of LUs per unit area of land, e.g., LU/km^2, and is thus positively correlated with total animal biomass. Stocking rate has more influence on vegetation than any other grazing factor (Holechek *et al*, 1989) because the quantity of vegetation consumed will change in the same direction with total animal biomass. In grassland ranges for example, switching from heavy to moderate or light grazing intensities can considerably increase herbage production. High stocking rates can, if they rise beyond a certain level, lead to overgrazing which has an impact on the composition of rangeland vegetation, and consequently animal (domestic and wild) productivity as well. In addition, animal mortality from poisonous plants is much higher on heavily grazed ranges because the nonpoisonous and palatable species are less available (Holechek *et al*, 1989). Therefore, high animal biomass and overstocking can lead to non-sustainability of both rangelands and the animals that depend on them.

Although rangeland productivity is determined by soil, topographic and climatic characteristics, grazing and browsing also have an influence on the productivity of the rangeland's plants. By enabling the measurement of stocking rates (in conjunction with other pertinent variables, e.g. forage production per hectare per year and carrying capacity[8]), animal biomass measurements facilitate efforts aimed at ensuring that rangelands are used in a sustainable manner.

[7] The term 'rangeland' refers to land that is uncultivated and capable of providing habitat for domestic and wild animals (Holechek *et al*, 1989).

[8] The term 'Carrying capacity' refers to the maximum stocking rate possible year after year that will not induce damage to vegetation or related resources.

The weights used in animal biomass calculations in Botswana are given in Table 4.1

Table 4.1 Weights Used in Animal Biomass Calculations

Species	Weight (kg)	Livestock Units (LU)
Wildlife		
Buffalo	450	1.000
Bushbuck	30	0.131
Crocodile	68	0.242
Duiker	15	0.078
Eland	340	0.810
Elephant	1725	2.740
Gemsbok	150	0.439
Giraffe	750	1.467
Hartebeest	125	0.383
Hippo	990	1.806
Impala	45	0.178
Klipspringer	15	0.078
Kudu	136	0.408
Lechwe	72	0.253
Reedbuck	40	0.163
Ostrich	68	0.242
Roan	220	0.585
Sable	185	0.513
Sitatunga	60	0.221
Springbok	26	0.118
Steenbok	10	0.058
Tsessebe	110	0.348
Warthog	45	0.178
Waterbuck	135	0.405
Wildbeest	165	0.471
Zebra	200	0.544
Domestic Animals		
Cattle	338	0.807
Donkey	100	0.324
Horse	200	0.544
Sheep/Goats	35	0.147

Source: Bonifica, 1992

Rangelands are the primary habitat of nearly all the land-dwelling wild animals. The expansions of human and animal (livestock/wildlife) populations have exerted ever-increasing demands on finite rangeland resources. Overstocking of both domestic and wild animals can precipitate rangeland degradation, which can be followed by localized desertification, especially in a semi-arid country like Botswana. Hence, overstocking

cannot be taken too seriously. In view of this, data on estimated total animal biomass in four selected districts and the country as a whole is presented in this chapter.

4.2 Contributions of Selected Species to Total Animal Biomass in Botswana

Cattle contributed the greatest proportion on animal biomass (about 68.5 percent) in both the 1994 and 2003 estimates (Table 4.2). Elephants ranked second after cattle in both years with contributions of 8.7 percent and 11.8 percent, respectively. The other animal species with contributions of more than 1.0 percent in at least one of the two years were sheep/goats, donkeys, gemsboks, buffaloes and horses. At the national level, only elephants and the 'sheep and goats' species of animals had more than one percentage point change in contributions to total animal biomass.

Table 4.2 Percentage Contribution to Total Animal Biomass of Selected Species in Botswana

Species	1994	2003	Change in Percentage Points
Buffalo	1.16	1.31	0.15
Cattle	68.53	69.10	0.57
Donkey	2.70	3.18	0.48
Duiker	0.09	0.03	-0.06
Eland	0.49	0.04	-0.45
Elephant	8.66	11.82	3.16
Gemsbok	2.42	1.76	-0.66
Giraffe	0.82	0.02	-0.80
Hartebeest	0.79	0.75	-0.04
Hippo	0.24	-	-0.24
Horse	0.96	1.24	0.28
Impala	0.44	0.47	0.03
Kudu	0.56	0.02	-0.54
Lechwe	0.70	0.49	-0.21
Ostrich	0.56	0.02	-0.54
Reedbuck	0.01	-	-0.01
Roan	0.02	-	-0.02
Sable	0.10	0.06	-0.04
Sheep/Goats	7.85	5.14	-2.71
Sitatunga	0.01	-	-0.01
Springbok	0.50	0.17	-0.33
Steenbok	0.17	0.08	-0.09
Tsessebe	0.16	0.07	-0.09
Warthog	0.08	-	-0.08
Waterbuck	0.03	0.02	-0.01
Wildbeest	0.90	0.85	-0.05
Zebra	1.04	0.84	-0.20

-: Contribution less than 0.01 percent or zero

Source: DWNP, 1994 and 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

The total animal biomass was estimated at 2,537,172 LU and the number of livestock units per square kilometer of land was 4.39 in 2003 for Botswana as a whole (see Table 4.3)

It can be seen from Table 4.3 that total animal biomass and LU/km^2 increased by 1.08 percent and 1.39 percent, respectively, over the 1994 – 2003 period. Although these are not big changes, the national total might have balanced out big localized increases in the estimates since animal biomass is not evenly distributed across the country. Such localised increases in biomass could have an adverse effect on the sustainable use of rangelands at the local level.

Table 4.3 Percentage Contribution by Wildlife and Domestic Animals to Total Animal Biomass in Botswana

Year	Domestic Animals	Wildlife	Total Biomass (LU)	LU/km^2
1994	80.04	19.96	2,510,100	4.33
2003	78.66	21.34	2,537,172	4.39
Percentage change*	-1.72	6.91	-0.12	1.08

* Percentage change in proportional contributions between 2003 and 1994 calculated by CSO
Source: DWNP, 1994 and 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

4.3 Contributions of Selected Species to Total Animal Biomass in Ngamiland District

Elephants contributed the greatest proportion (over 39 percent) of animal biomass in Ngamiland district over the period (see Table 4.4). However, their proportional contributions followed a declining trend, on the average, particularly because of the increase in cattle numbers, and therefore increase in the contribution of cattle to total animal biomass over the same period.

Consequently, it is observed from Table 4.5 that over the 1996 – 2003 period, the percentage contribution of wildlife to animal biomass followed a consistent decline (from 83 percent in 1996 to 58 percent in 2003), while that of domesticated animals was consistently on the increase (from 17 percent in 1996 to 42 percent in 2003). However, the trend of total animal biomass and biomass per unit area in LU/km^2 followed an erratic pattern.

Table 4.4 Percentage Contribution of Selected Species to Total Animal Biomass in Ngamiland District

Species	1996	1999	2001	2002	2003
Buffalo	9.45	16.34	15.21	8.19	4.59
Cattle	9.27	16.94	18.60	31.19	34.36
Donkey	2.13	1.34	0.96	1.56	1.78
Duiker	0.06	0.03	0.02	0.01	0.02
Eland	0.09	0.14	0.13	0.11	0.08
Elephant	46.31	42.89	45.06	39.68	40.82
Gemsbok	1.80	1.42	0.75	0.92	0.82
Giraffe	4.40	2.76	2.70	2.27	2.10
Hartebeest	0.12	0.04	0.01	0.09	0.04
Hippo	0.66	0.75	0.97	1.23	0.64
Horse	1.59	1.16	1.46	1.38	1.52
Impala	2.97	1.55	0.95	0.63	1.22
Kudu	1.15	0.46	0.44	0.58	0.39
Lechwe	5.56	3.89	3.44	3.92	3.19
Ostrich	0.81	0.28	0.46	0.46	0.31
Reedbuck	0.06	0.02	0.01	0.03	-
Roan	0.13	0.05	0.09	0.07	0.01
Sable	0.28	0.09	0.22	0.06	0.13
Sheep_Goats	3.88	3.74	3.45	3.09	4.18
Sitatunga	0.07	0.05	0.04	0.01	0.01
Springbok	0.29	0.09	0.15	0.02	0.04
Steenbok	0.11	0.07	0.05	0.05	0.05
Tsessebe	1.36	0.71	0.27	0.45	0.41
Warthog	0.51	0.16	0.10	0.11	0.05
Waterbuck	0.09	0.03	0.05	0.05	0.06
Wildbeest	2.61	2.18	1.28	1.47	0.70
Zebra	3.74	2.79	3.14	2.38	2.46

-: Contribution less than 0.01 percent up to zero

Source: DWNP, 1996, 1999 and 2001 - 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

Table 4.5 Percentage Contribution to Total Animal Biomass of Wildlife and Domestic Animals in Ngamiland District

Year	Domestic Animals	Wildlife	Total Biomass (LU)	LU/km^2
1996	16.87	83.13	353,347	3.13
1999	23.18	76.82	508,473	4.92
2001	24.47	75.53	412,321	4.05
2002	37.22	62.78	451,825	4.42
2003	41.84	58.16	385,147	3.56

Source: DWNP, 1996, 1999 and 2001 - 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

4.4 Contributions of Selected Species to Total Animal Biomass in Kgalagadi District

Cattle contributed the greatest proportion (had a minimum of 53.68 percent) in 1996 of estimated animal biomass in Kagalagadi district over the period 1996 – 2003. Gemsbok were the second biggest contributor to animal biomass and had a contribution ranging from 9.31 percent to 11.01 percent over the same period. The remaining animal species contributed less than 10 percent of animal biomass annually over the period 1996 – 2003.

Table 4.6 Percentage Contribution to Total Animal Biomass of Selected Species in Kgalagadi District

Species	1996	1999	2001	2002	2003
Cattle	53.68	67.68	65.91	65.81	60.83
Donkey	2.47	2.67	2.23	2.74	2.04
Duiker	0.21	0.11	0.03	0.12	0.06
Eland	4.23	1.77	3.80	2.13	6.37
Gemsbok	19.21	10.77	10.70	9.31	11.01
Hartebeest	4.64	2.96	4.75	5.13	5.82
Horse	2.00	2.07	1.31	1.84	1.27
Kudu	0.48	0.39	0.43	0.48	0.47
Ostrich	1.48	0.02	1.20	1.45	1.46
Sheep_Goats	5.69	6.94	7.30	8.94	8.24
Springbok	2.94	1.87	0.89	0.88	0.99
Steenbok	0.40	0.29	0.33	0.36	0.37
Warthog	0.01	0.01	0.02	0.17	0.01
Wildbeest	2.00	1.16	1.08	0.65	1.02

Source: DWNP, 1996, 1999 and 2001 - 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

Table 4.7 Percentage Contribution to Total Animal Biomass of Wildlife and Domestic Animals in Kgalagadi District

Year	Domestic Animals	Wildlife	Total Biomass (LU)	LU/km2
1996	63.84	36.16	170,773	1.65
1999	79.36	20.64	185,656	1.87
2001	76.75	23.25	246,500	2.24
2002	79.33	20.67	237,070	2.29
2003	72.38	27.62	211,158	2.03

Source: DWNP, 1996, 1999 and 2001 - 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

Table 4.7 shows that on the average, the percentage contribution of domestic animals to total animal biomass in Kgalagadi district was on the increase over the period 1996 – 2003 while that of wildlife was declining. The total animal biomass on the average

followed an increasing trend, which is an indication of increasing pressure on rangeland resources in the district. This observation is confirmed by the last column of Table 4.7, which shows an increasing trend, generally, in the number of livestock units per square kilometer of land in the district.

4.5 Contributions of Selected Species to Total Animal Biomass in Ghanzi District

It is observed from Table 4.8 that as in the Kgalagadi district, cattle contributed the greatest proportion (minimum of 68.04 percent) of estimated animal biomass in Ghanzi district over the period 1996 – 2003, and their contributions followed an increasing trend. Gemsboks were the second biggest contributors to animal biomass and had a contribution ranging from 6.14 percent to 12.28 percent over the same period with their contributions following a downward trend, on the average. The remaining animal species contributed less than 10 percent of animal biomass annually.

Table 4.8 Percentage Contribution to Total Animal Biomass of Selected Species in Ghanzi District

Species	1996	1999	2001	2002	2003
Cattle	68.04	68.94	73.13	75.15	76.58
Donkey	1.81	1.43	1.29	1.47	1.18
Duiker	0.29	0.08	0.11	0.08	0.11
Eland	3.87	2.65	2.42	2.40	3.23
Gemsbok	9.30	12.28	6.93	6.14	6.55
Giraffe	0.69	1.85	0.87	0.69	0.44
Hartebeest	1.33	2.13	1.30	1.61	1.33
Horse	3.19	2.79	2.92	2.11	2.11
Impala	-	-	0.03	-	0.04
Kudu	2.09	1.56	1.16	2.17	1.42
Ostrich	0.84	1.08	0.96	0.91	0.70
Sheep_Goats	3.38	3.64	6.58	5.43	3.66
Springbok	0.73	51.00	0.44	0.31	0.29
Steenbok	0.50	0.22	0.38	0.33	0.17
Warthog	0.05	0.02	0.10	0.14	0.07
Wildbeest	1.64	73.00	1.13	0.92	1.93
Zebra	0.03	0.08	0.18	0.13	0.19

-: Contribution less than 0.01 percent up to zero
Source: DWNP, 1996, 1999 and 2001 - 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

Table 4.9 shows that on the average, the percentage contribution of domestic animals to total animal biomass in Ghanzi district was on the increase over the period 1996 – 2003 while that of wildlife was declining. Total animal biomass on the average followed an increasing trend, which is an indication of rising demand for rangeland resources used by animals. This observation is confirmed by the last column of Table 4.9, which shows an increasing trend, generally, in the number of livestock units per square kilometer of land in the district.

Table 4.9 Percentage Contribution to Total Animal Biomass of Wildlife and Domestic Animals in Ghanzi District

Year	Domestic Animals	Wildlife	Total Biomass	Total Area	LU/km2
1996	76.42	23.58	196,377	115,175	1.71
1999	76.80	23.20	211,178	114,010	1.85
2001	83.92	16.08	260,048	114,062	2.28
2002	84.16	15.84	292,225	114,426	2.55
2003	83.53	16.47	234,476	115,152	2.04

Source: DWNP, 1996, 1999 and 2001 - 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

4.6 Contributions of Selected Species to Total Animal Biomass in Chobe District

It is observed from Tables 4.10 and 4.11 that this is the only district among the four analysed in this report in which the contribution of wildlife to total animal biomass increased, while the one of domestic animals decreased, over the period 1996 – 2003. On average, the district experienced a rise in elephant numbers over the period which resulted in more than 5 percentage points in the contribution of elephants to total biomass (Table 4.10). Hence, over the period, their contributions to total animal biomass ranged from 75.21 percent in 1999 to 84.77 percent in 2002. Unlike what has been observed for the other districts, the same contribution from cattle dropped over the period from 12.35 in 1999 to 5.78 percent in 2003.

As a result of the foregoing discussion, total animal biomass and LU/km^2 increased, on the average, over the period 1996 – 2003. The impact of these increases on the vegetation in Chobe has already been discussed in Section 2.5.1.2.

Table 4.10 Percentage Contribution to Total Animal Biomass of Selected Species in Chobe District

Species	1996	1999	2001	2002	2003
Buffalo	4.87	7.34	5.28	2.23	3.54
Cattle	8.66	12.35	7.52	8.66	5.78
Donkey	0.03	0.06	0.07	0.02	0.06
Eland	0.81	1.12	0.37	1.02	0.79
Elephant	78.96	75.21	82.57	84.77	84.30
Gemsbok	0.06	0.10	0.18	0.02	0.08
Giraffe	1.33	1.28	1.10	0.70	1.49
Hippo	0.01	0.05	0.13	0.04	0.12
Impala	0.09	0.11	0.28	0.18	0.14
Kudu	0.08	0.12	0.05	0.06	0.09
Lechwe	0.04	0.01	0.05	0.02	0.06
Ostrich	0.08	0.09	0.11	0.07	0.08
Roan	0.24	0.16	0.20	0.10	0.05
Sable	0.51	0.42	0.64	0.52	0.66
Sheep_Goats	0.19	0.09	0.08	0.04	0.06
Steenbok	0.01	0.01	-	0.01	-
Tsessebe	0.09	0.23	0.06	0.05	0.13
Warthog	0.01	0.02	0.02	0.03	0.03
Waterbuck	0.05	-	0.02	-	0.01
Wildbeest	0.37	0.20	0.07	0.07	0.03
Zebra	2.87	1.03	1.20	1.33	2.50

-: Contribution less than 0.01 percent up to zero

Source: DWNP, 1996, 1999 and 2001 - 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

Table 4.11 Percentage Contribution to Total Animal Biomass of Wildlife and Domestic Animals in Chobe District

Year	Domestic Animals	Wildlife	Total Biomass (LU)	LU/km2
1996	8.88	91.12	136,476	6.56
1999	12.50	87.50	145,136	6.91
2001	7.67	92.33	130,668	6.22
2002	8.72	91.28	174,101	8.17
2003	5.90	94.10	149,979	7.06

Source: DWNP, 1996, 1999 and 2001 - 2003 Aerial Census of Animals in Botswana (Dry Season) Reports

5.0 PROBLEM ANIMALS

Any animal that kills or threatens domestic livestock is regarded as a problem animal. Competition for living space and food between problem animals and human beings presents a challenge to sustainable utilization of all natural resources involved (rangelands, wildlife, and water resources). Conflict between the two groups has escalated with the expansion of the livestock sector into areas that were previously dominated by wildlife. The conflict is a threat to the populations of problem animals as they are killed to protect human beings and their livelihoods.

5.1 Problem Animals Policy

The Government endeavours to mitigate these conflicts by:

- Encouraging the maintenance and restoration of the co-existence of the two
- Ensuring adequate compensation is given in a timely manner to people who have suffered loss of property due to the activities of wild animals.

The Government recognizes the negative impact that problem animals have on the livelihoods of rural households in terms of property (livestock and crops) and sometimes even human life. Furthermore, it is mindful of the fact that conservation strategies are only effective if they are not implemented at the expense of local populations, otherwise they exacerbate the conflict. At present, monetary compensation by Government for damages to property caused by wildlife is limited to the species of animals listed in Table 5.1. The species were selected on the basis that it is difficult for people to defend themselves against them, and not because they are the only ones that pose a danger to people and/or their property. Compensation is also aimed at encouraging human communities to be tolerant towards problem animals and protecting endangered species e.g. rhinoceros.

Concerns raised about the compensation effort include the following:

- The communities argue that receiving due compensation is a slow process packed with cumbersome procedures. However, DWNP has initiated a new process that has brought about improvement in the timeliness of compensation payments.
- There has been concern in other quarters that the program might not be financially sustainable in the long run.

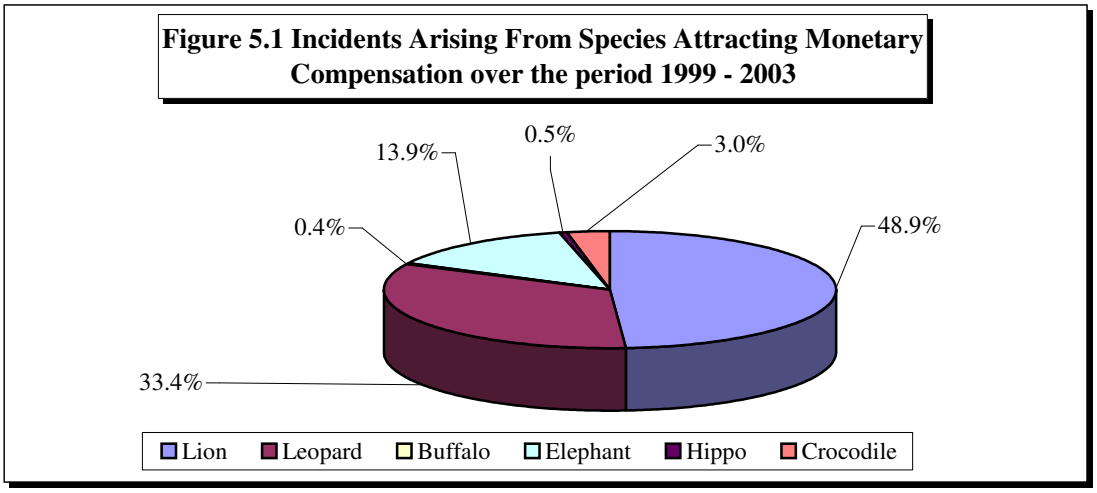
In addition to monetary compensation, the Government uses preventive and reactive damage control methods. Under preventive methods, it encourages farmers to practice proper husbandry methods, which can greatly reduce predation, such as kraaling livestock at night in predator-proof kraals. Under reactive methods, the Government's aim is to pass a deterrent message to problem predators and uses scaring techniques (thunder flashes) and capture and translocation. Killing of the animals identified as habitual offenders is only used as a last resort.

5.2 Problem-Animal Incidents Involving Species Attracting Monetary Compensation

We observe from Table 5.1 and Figure 5.1 that lions, leopards and elephants, in that order, were responsible for most of the problem animal incidents in the country over the period 1999 - 2003. Although the data indicates an increase of these incidents over time on the average, the interpretation should be applied with care. This is because it is possible that the upward trend indicated is a consequence of improved data capture methods that the DWNP has increasingly put in place in recent years.

Table 5.1 Incidents Involving Species Attracting Monetary Compensation (1999 - 2003)

Species	1999	2000	2001	2002	2003	Total incidents
Numbers						
Lion	554	860	1,271	1,089	3,343	7,117
Leopard	953	540	1,541	854	969	4,857
Buffalo	-	23	3	10	17	53
Elephant	180	180	167	334	1,157	2,018
Hippo	18	5	2	13	37	75
Crocodile	10	10	365	9	46	440
Rhino	-	-	-	-	-	-
Year Totals	**1,715**	**1,620**	**3,349**	**2,309**	**5,569**	**14,560**
Percentages						
Lion	32.3	53.1	38.0	47.2	60.0	48.9
Leopard	55.6	33.3	46.0	37.0	17.4	33.4
Elephant	10.5	11.1	5.0	14.5	20.8	13.9
Crocodile	0.6	0.6	10.9	0.4	0.8	3.0
Hippo	1.0	0.3	0.1	0.6	0.7	0.5
Buffalo	0.0	1.4	0.1	0.4	0.3	0.4
Rhino	-	-	-	-	-	-
Year Totals	**100.0**	**99.9**	**100.0**	**100.0**	**100.0**	**100.0**



5.3 Over-all Problem-Animal Incidents

We observe from Tables 5.2 and 5.3 that apart from the three species already mentioned (lion, leopard and elephants), the other species that were most frequently involved in problem animal incidents were hyenas, wild dogs and cheetah, all of which are predators. Since lions and leopards are carnivores, elephants are the only herbivores in the leading problem animals group in Botswana.

Tables 5.2 and 5.3 also show that incidents of problem animals are more common during the hot months of November to April than they are during the cooler months of May to October. It is possible that rains have an impact on the observed pattern because the hot months are also the months of highest rainfall when the animals can move over a wider range because their food is more readily available. The cooler months range from low rainfall to rainless – which, due to want of food, limits the moisture-sensitive species to ranges near water bodies and hence lowers their interaction frequency with human populations and their properties; and hence, the resulting frequency of conflicts.

5.4 Problem-Animal Incidents at the District Level

The district level information on problem animal incidents is presented in Table 5.4. It is observed that Central district residents experienced 55.3 percent of all the reported problem-animal incidents in 2003. This is not surprising because the district is the biggest (area-wise) in the country and as a result it also has more wildlife, people and livestock than the other districts. These factors tend to increase the chances of interaction between wildlife, livestock and people and hence have an upward impact on the frequency of problem animal incidents. Lions, leopards, elephants and hyenas, in that order, caused most of the incidents reported to have occurred in Central district in 2003. In addition, the district had the highest proportion of problem-animal incidents caused by porcupines (88.9 percent) and caracal (73.3 percent) in 2003.

The other districts in which at least 10 percent of the problem-animal incidents that took place in 2003 occurred are Ngamiland (18.1 percent) and Kweneng (11.8 percent). Ngamiland district has one of the highest wildlife densities in the country mainly because of the Okavango Delta and surrounding areas around which many wildlife species tend to concentrate, especially during the dry winter months due to availability of food and water. As in Central district, the leading wildlife offenders in Ngamiland district in 2003 were lions, leopards, and elephants, in that order. However on specie basis, the shares of the district in the total incidents caused by each of the three species were less than 25 percent, and therefore not as significant as the district's share in those caused by hippotamuses (97.3 percent) and crocodiles (83.7 percent) nationally (see Table 5.4, 'Percentages' part).

Lions, leopards and wild dogs, in that order, caused most of the problem-animal incidents in Kweneng district in 2003. While the first two animal species are leading problem animals in all districts where they are located, wild dogs are among the top three only in Kweneng and Ghanzi, with the two districts suffering the majority, at national level, of reported wilddog incidents (Kweneng, 62.3 percent and Ghanzi, 15.1 percent). In addition, Kweneng district had the highest proportion of problem-animal incidents caused by cheetahs (39.9 percent).

It is worth noting that although Southern district contributes only 2.2 percent of the total problem-animal incidents in the country, it experienced the highest proportion of problem-animal incidents caused by baboons (51.9 percent), steenboks (78.9 percent) and duikers (85.7 percent) in 2003 and 100 percent of all guinea fowl incidents that are reported. Furthermore, although Kgatleng district experienced the lowest share of all the problem-animal incidents (1.5 percent), it suffered most of the monkey-imposed incidents.

5.5 Wildlife Mortality Destruction Due To Problem Animal Control

It is observed from Table 5.5 that over the period 1997 - 2000, the species that incurred the highest mortality numbers due to Problem Animal Control Efforts (PAC) were lions (37.1 percent) and leopards (33.7 percent). The pattern was retained for individual years as well, with the exception of 1997, 2001 and 2003 due to high levels of other animals killed (cheetahs, 1997; and elephants, 2001 and 2003).

In 2001, elephants suffered the highest mortality numbers due to PAC efforts and their proportion of the total number of animals killed was 42 percent. However, it is observed from Table 5.5 that elephants comprised less than 5 percent of all animals killed due to PAC in the remaining years during the period, with the exception of 2003. Consequently, elephants contributed only 11 percent of the number of animals killed due to PAC efforts over the period 1997 – 2003.

Cheetahs' proportion of animals killed due to PAC efforts was among the highest three over the period 1997 – 2000 and ranged from 10 percent to 32 percent. However, the proportion dropped to less than 3 percent in later years.

The wild dogs' proportion of animals killed due to PAC efforts was less than 6 percent between 1997 – 1999 and less than 3 percent between 2000 – 2003. This averaged out to less than 3 percent share of animals killed due to PAC efforts for the whole period (1997 – 2003). The same proportion for hippos was less than 2 percent from 1997 until 2003 when it rose to 2.9 percent.

No rhino was killed over the period 1997 – 2000 due to PAC efforts

Table 5.2 Problem Animal Control Incidents Summary by Species (Jan-Dec 2003, Numbers)

Species	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Lion	209	201	230	155	217	295	294	223	522	268	233	496	3,343
Leopard	129	117	132	152	148	129	147	219	192	104	123	277	1,869
Elephant	33	78	162	133	137	96	109	95	79	82	38	115	1,157
Hyena	13	18	14	25	33	90	73	107	73	33	16	17	512
Wild dog	36	18	6	29	4	34	27	18	11	2	10	4	199
Cheetah	46	13	3	15	2	44	14	4	24	9	3	1	178
Kudu	14	41	45	25	9	9	5	2	2	18	-	4	174
Jackal	3	6	5	6	3	-	2	5	7	2	17	3	59
Croc	7	2	3	5	-	-	-	3	-	3	5	21	49
Python	6	-	10	5	-	-	3	2	-	-	4	7	37
Hippo	4	3	3	2	-	-	-	-	1	-	4	20	37
Baboon	2	4	-	4	1	2	-	6	3	1	2	2	27
Steenbok	4	6	7	1	-	-	-	-	-	-	-	1	19
Porcupine	-	2	9	3	3	1	-	-	-	-	-	-	18
Buffalo	2	2	-	1	-	-	-	-	-	2	7	3	17
Caracal	6	-	-	2	-	-	1	-	-	-	4	2	15
Duiker	1	3	6	3	-	-	-	-	-	-	-	1	14
Monkey	1	1	1	3	-	1	1	-	1	-	-	-	9
Guinea Fowl	1	1	3	2	-	-	-	-	-	-	-	-	7
Honey Burger	-	-	-	-	-	-	6	-	-	-	-	-	6
Spring Hare	-	1	-	1	-	-	3	-	-	-	-	-	5
Bush Pig	-	-	1	-	-	1	-	1	-	-	-	-	3
Genet	-	-	-	-	-	-	1	-	1	-	-	-	2
Eland	-	1	-	1	-	-	-	-	-	-	-	-	2
Spring Bok	-	-	-	-	-	-	1	-	-	-	-	-	1
Zebra	-	-	-	-	-	1	-	-	-	-	-	-	1
Total	**517**	**518**	**640**	**573**	**557**	**703**	**687**	**685**	**916**	**524**	**466**	**974**	**7,760**

-: No incidents

Source: Management and Utilisation Division, Department of Wildlife

Table 5.3 Problem Animal Control Incidents Summary by Species (Jan-Dec 2003, Percentages)

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Lion	40.43	38.80	35.94	27.05	38.96	41.96	42.79	32.55	56.99	51.15	50.00	50.92	43.08
Leopard	24.95	22.59	20.63	26.53	26.57	18.35	21.40	31.97	20.96	19.85	26.39	28.44	24.09
Elephant	6.38	15.06	25.31	23.21	24.60	13.66	15.87	13.87	8.62	15.65	8.15	11.81	14.91
Hyena	2.51	3.47	2.19	4.36	5.92	12.80	10.63	15.62	7.97	6.30	3.43	1.75	6.60
Wilddog	6.96	3.47	0.94	5.06	0.72	4.84	3.93	2.63	1.20	0.38	2.15	0.41	2.56
Cheetah	8.90	2.51	0.47	2.62	0.36	6.26	2.04	0.58	2.62	1.72	0.64	0.10	2.29
Kudu	2.71	7.92	7.03	4.36	1.62	1.28	0.73	0.29	0.22	3.44	-	0.41	2.24
Jackal	0.58	1.16	0.78	1.05	0.54	-	0.29	0.73	0.76	0.38	3.65	0.31	0.76
Croc	1.35	0.39	0.47	0.87	-	-	-	0.44	-	0.57	1.07	2.16	0.63
Python	1.16	-	1.56	0.87	-	-	0.44	0.29	-	-	0.86	0.72	0.48
Hippo	0.77	0.58	0.47	0.35	-	-	-	-	0.11	-	0.86	2.05	0.48
Baboon	0.39	0.77	-	0.70	0.18	0.28	-	0.88	0.33	0.19	0.43	0.21	0.35
Steenbk	0.77	1.16	1.09	0.17	-	-	-	-	-	-	-	0.10	0.24
Porcup	-	0.39	1.41	0.52	0.54	0.14	-	-	-	-	-	-	0.23
Buffalo	0.39	0.39	-	0.17	-	-	-	-	-	0.38	1.50	0.31	0.22
Caracal	1.16	-	-	0.35	-	-	0.15	-	-	-	0.86	0.21	0.19
Duiker	0.19	0.58	0.94	0.52	-	-	-	-	-	-	-	0.10	0.18
Monkey	0.19	0.19	0.16	0.52	-	0.14	0.15	-	0.11	-	-	-	0.12
G/Fowl	0.19	0.19	0.47	0.35	-	-	-	-	-	-	-	-	0.09
H/Burger	-	-	-	-	-	-	0.87	-	-	-	-	-	0.08
S/Hare	-	0.19	-	0.17	-	-	0.44	-	-	-	-	-	0.06
B/Pig	-	-	0.16	-	-	0.14	-	0.15	-	-	-	-	0.04
Genet	-	-	-	-	-	-	0.15	-	0.11	-	-	-	0.03
Eland	-	0.19	-	0.17	-	-	-	-	-	-	-	-	0.03
S/Bok	-	-	-	-	-	-	0.15	-	-	-	-	-	0.01
Zebra	-	-	-	-	-	0.14	-	-	-	-	-	-	0.01
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

-: Zero

Calculated from Table 5.2

Table 5.4 Problem Animal Incidents by District and Species (2003)

DISTRICT	MKY	LON	LEO	HYN	ELE	BUF	BAB	JAC	KUD	CRC	CHE	WILDD	ST/B	PTH	POR	DUI	CAR	GUIF	HIP	H/B	Comb	TOTAL
Numbers																						
Central	3	1,857	1,065	321	801	1	12	16	90	3	59	15	4	3	16	2	11	-	-	-	9	4,288
Ngamiland	-	771	287	8	246	6	-	1	4	41	-	5	-	1	1	-	-	-	36	-	1	1,408
Kgalagadi	-	92	66	46	-	-	-	12	11	-	20	21	-	-	-	-	2	-	-	-	-	270
Southern	1	-	28	12	-	-	14	8	26	-	20	4	15	18	1	-	-	7	-	-	2	168
Kweneng	-	379	242	80	-	-	-	-	18	-	71	124	-	3	-	-	-	-	-	-	-	917
Chobe	-	135	4	30	110	10	-	-	-	5	2	-	-	1	-	-	-	-	1	6	-	304
Kgatleng	5	-	37	11	-	-	1	22	25	-	5	-	-	11	-	-	-	-	-	-	-	117
Ghanzi	0	109	140	4	-	-	-	-	-	-	1	30	-	-	-	-	2	-	-	-	2	288
Total	**9**	**3,343**	**1,869**	**512**	**1,157**	**17**	**27**	**59**	**174**	**49**	**178**	**199**	**19**	**37**	**18**	**14**	**15**	**7**	**37**	**6**	14	7,760
Percentages																						
Central	33.3	55.5	57.0	62.7	69.2	5.9	44.4	27.1	51.7	6.1	33.1	7.5	21.1	8.1	88.9	14.3	73.3	-	-	-	64.3	55.3
Ngamiland	-	23.1	15.4	1.6	21.3	35.3	-	1.7	2.3	83.7	0.0	2.5	-	2.7	5.6	-	-	-	97.3	-	7.1	18.1
Kgalagadi	-	2.8	3.5	9.0	-	-	-	20.3	6.3	-	11.2	10.6	-	-	-	-	13.3	-	-	-	-	3.5
Southern	11.1	-	1.5	2.3	-	-	51.9	13.6	14.9	-	11.2	2.0	78.9	48.6	5.6	85.7	-	100.0	-	-	14.3	2.2
Kweneng	-	11.3	12.9	15.6	-	-	-	-	10.3	-	39.9	62.3	-	8.1	-	-	-	-	-	-	-	11.8
Chobe	-	4.0	0.2	5.9	9.5	58.8	-	-	-	10.2	1.1	-	-	2.7	-	-	-	-	2.7	100.0	-	3.9
Kgatleng	55.6	-	2.0	2.1	-	-	3.7	37.3	14.4	-	2.8	-	-	29.7	-	-	-	-	-	-	-	1.5
Ghanzi	-	3.3	7.5	0.8	-	-	-	-	-	-	0.6	15.1	-	-	-	-	13.3	-	-	-	14.3	3.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Key to abbreviations:

MKY: Monkey **HYN:**Hyeana **BAB: Baboon** **CRC:** Crocodile **ST/B:** Steenbok **DUI:** Duiker **HIP:** Hippopotamus

LON: Lion **ELE:** Elephant **JAC: Jackal** **CHE:** Cheetah **PTH:** Python **CAR:** Caracal **H/B:** Honey burger

LEO: Leopard **BUF:** Buffalo **KUD: Kudu** **WILDD:** Wild dog **POR:** Porcupine **GUIF:** Giunea fowl

Comb: Combined species represents the group of animals that recorded 5 or less incidents, summed over all districts, in 2003 (Springbok, Genet, Zebra, Eland, Bush pig and Springhare)

-: No incidents

Source: Management and Utilisation Division, Department of Wildlife and National Parks

Table 5.5 Wildlife Mortality Number Due To Problem Animal Control By Year 1999-2003

Species	1997	1998	1999	2000	2001	2002	2003	Total for 1997-2003
Numbers:								
Lion	21	58	107	78	26	17	30	337
Leopard	35	38	36	43	24	46	84	306
Hippo	1	-	1	-	-	1	5	8
Rhino	-	-	-	-	-	-	-	-
Elephant	3	1	8	3	42	3	42	102
Buffalo	-	-	-	-	7	14	2	23
Crocodile	-	-	-	-	1	3	2	6
Cheetah	30	17	18	30	-	1	4	100
Wilddog	4	7	7	4	-	2	2	26
Year Total Incidents	**94**	**121**	**177**	**158**	**100**	**87**	**171**	**908**
Percentages:								
Lion	22.3	47.9	60.5	49.4	26.0	19.5	17.5	37.1
Leopard	37.2	31.4	20.3	27.2	24.0	52.9	49.1	33.7
Hippo	1.1	-	0.6	-	-	1.1	2.9	0.9
Rhino	-	-	-	-	-	-	-	**-**
Elephant	3.2	0.8	4.5	1.9	42.0	3.4	24.6	11.2
Buffalo	-	-	-	-	7.0	16.1	1.2	2.5
Crocodile	-	-	-	-	1.0	3.4	1.2	0.7
Cheetah	31.9	14.0	10.2	19.0	-	1.1	2.3	11.0
Wilddog	4.3	5.8	4.0	2.5	-	2.3	1.2	2.9
Year Total Incidents	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Management and Utilisation Division, Department of Wildlife and National Parks

6.0 WILDLIFE HUNTING QUOTAS AND LICENCES

The hunting and/or capturing of wildlife is controlled by Government in line with Wildlife Conservation (Hunting and Lincencing) Regulations and through hunting quotas that are set every year. The relevant Regulations are briefly described in the following section.

6.1 Game Hunting Licences

In Botswana, game licenses are of four kinds namely, bird licence, single game licence, small game licence and special game licence. The descriptions given in the following paragraphs on the different types of game licences are derived from the Wildlife Conservation (Hunting and Licencing Regulations), 2001. Hunting licences are only issued after the payment of applicable fees.

6.1.1 Bird Licences

A bird licence entitles the holder to hunt any of the following game birds in areas, numbers and within the period specified in the licence. Bird licences held by Botswana citizens are valid for one year and those held by non-citizens are valid for one week, one month or one calendar year. Table 6.1 shows the species that may be hunted using a bird licence, and the allowed numbers and period.

6.1.2 Single Game Licence

A single game licence entitles the holder thereof to hunt one individual of the species specified in the hunting quota notice and endorsed on the licence, during the period specified in the hunting permit and within an area or areas specified in the licence. The species that may be hunted are given in Table 6.2. An individual may not hold single game licences in excess of the maximum numbers given in Table 6.2.

6.1.3 Small Game Licence

A small game licence entitles the holder thereof to hunt the species and maximum number of animals specified in Table 6.3. The licence is only issued to citizens of Botswana and is valid for the period specified therein. Only one small game licence may be held by an individual at any one time.

6.1.4 Special Game Licence

These are only issued to citizens of Botswana who depend principally on the hunting and gathering of veld produce for their food. It is issued specifically for subsistence purposes, so the holders are not permitted to sell their licences or meat of the animals killed in respect of their licences. The licence allows the holder to hunt any animals other than

protected game animals and is valid for one year. Unlike the other licences discussed in this section, it is issued free of charge. The licence specifies the maximum number of each species and kind which may be hunted and the period of validity of the licence. Holders of special game licences are not entitled to and cannot be issued with any other type of licence.

Table: 6.1 Species that May be Hunted Using a Bird Licence, and the Allowed Numbers and Period

Species	Number	Open Season
DUCKS		
Knobbilled duck, yellow billed duck, Whitefaced duck, Southern Porchard, Cape Shoveler, Cape teal and Redbilled teal only	Maximum of 10 per day in any combination	From the first day of April to the 30th September inclusive
GEESE		
Egyptian goose and Spurwinged goods only	Maximum of 2 per day in any combination	From the first day of April to the 30th September inclusive
SANDGROUSE		
Doublebanded sandgrouse, Burchell's Sandgrouse. Namaqua Sandgrouse, and Yellowthroated Sandgrouse only	Maximum of 5 per day in any combination	From the first of October to first of April inclusive.
DOVE		
Morning dove, Redeyed dove, Cape Turtle dove and Laughing dove only.	Maximum of 15 per day in any combination	Throughout the year
PIGEON		
Green pigeon only	Maximum of five per day	Through out the year
QUAIL		
Common Quail and Button Quail only	Maximum of 2 per day in any combination	Through out the year
GUINEA FOWL	Maximum of 5 per day in any combination	From the first day of April to the 30th September inclusive
FRANCOLIN		
Swainson's francolin, Redbillied, Natal Francolin and Orange river francolin only	Maximum of 10 per day in any combination	From the first day of April to the 30th September inclusive.

Source: Government of Botswana, Wildlife Conservation (Hunting and Licensing Regulations), 2001

Table: 6.2 Species that May be Hunted Using a Single Game Licence and the Maximum Numbers Allowed and Period

Species	Fees to be paid for each licence		Maximum number of single Game Licences to be held by one person in one season	
	Citizen Fee (Pula)	Non Citizen Fee (Pula)	Citizen Licence	Non Citizen Licence
Baboon (Tshwene)	50	200	1	1
Bat-eared fox (Mothose)	50	200	1	1
Black-backed jackal (Phokoje)	50	200	2	1
Buffalo (Nare)	1,500	5,000	1	1
Bushbuck(Serolobothoko)	500	1000	1	1
Caracal (Thwane)	100	500	1	1
Crocodile(Kwena)	300	1000	1	1
Duiker(Phuti)	100	300	2	1
Eland (Phofu)	700	2,500	1	1
Elephant (Tlou)	8000	20,000	1	1
Gemsbok(Kukama	700	2,500	1	1
Hartebeest (Kgama)	300	1,000	1	1
Impala(Phala)	150	500	2	1
Kudu(Tholo)	300	1,000	1	1
Ostrich(Ntshe)	300	1,000	1	1
Lion(Tau)	1,500	10,000	1	1
Lechwe(Letswee)	300	1,000	2	2
Leopard(Letotse)	1,500	10 000	1	1
Porcupine(Noko)	50	200	1	1
Reedbuck(Mhele)	500	1,500	1	1
Sable(Kwalato)	1,500	5,000	1	1
Srub hare(Mmutla)	15	50	1	1
Side-striped jackal(Sekgee phokoje	50	200	2	1
Silver fox (Lesie)	50	200	1	1
Sitatunga (Sebogata)	1,500	5,000	1	1
Spotted hyeana(Phiri yo moramaga)	100	300	1	1
Springbok(Tshephe	150	400	2	2
Springhare(Ntlole)	15	50	4	2
Steenbok (Phuduhudu)	100	300	2	1
Tessebe(Tsessebe)	500	3,000	1	1
Vervet Monkey (Kgabo	50	200	2	2
Warthog(Mathinthinyane	150	500	2	2
Wild eat (Tibe)	50	200	1	1
Wild pig (Kolobe ya naga	150	500	1	1
Wildebeest (Kgokong)	500	2,500	1	1
Zebra (Pitse ya naga)	1,000	5,000	1	1

Source: Government of Botswana, Wildlife Conservation (Hunting and Licensing Regulations), 2001

Table: 6.3 Species that May be Hunted Using a Small Game Licence and the Maximum Numbers Allowed

Species	Number
Caracal	2
Bat Eared Fox	5
Silver fox	10
Black backed jackal	50
Side striped jackal	30
Porcupine	3
Springhare	10

Source: Government of Botswana, Wildlife Conservation (Hunting and Licensing Regulations), 2001

Table 6.4 Number of Game Licences by Category (1997 – 2004)

Year	Birds	Single	Small	Special
1997	3,051	3,449	285	d.u.
1998	3,922	5,683	333	d.u.
1999	4,838	5,454	847	275
2000	6,426	5,414	484	502
2001	6,413	5,914	394	322
2002	9,384	2,189	65	d.u.
2003	1,921	1,688	d.u.	253
2004	d.u.	2,023	d.u.	183

d.u.: Data Unavailable

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

6.2 Land Holder's Privileges

A person or company that is entitled to landholder's privileges may, subject to relevant fees hunt or kill - without a licence or permit - any animals, other than protected and partially protected game animals, within the limits of the land in respect of which he/she is entitled to enjoy such privileges. However, he/she is not allowed to kill any animal listed in Table 6.5 in excess of the maximum number specified for the animal.

A person is entitled to landholder's privileges or to enjoy them if he is a citizen or resident of Botswana and:

- the person owns private land or at least one-quarter of undivided share of private land in Botswana; or is the employee of such a person; or is the spouse or child of the owner of the land or of his employee;
- the person occupies land that is not in a Game Reserve or National Park under an agreement of lease or of purchase granted to him other than for the purpose of hunting; or is the employee of such a person; or is the spouse or child of the occupier of the land or of his employee;
- the person has occupied private land for at least three months and has written permission from the owner of the land to enjoy landholder's privileges in respect of the land; or is the employee of, and has written permission from such a person to enjoy the privileges; or is the spouse or child of the occupier of the land or of his employee;
- the Minister responsible for wildlife has declared in writing that such a person shall be entitled to such privileges.

A company is entitled to landholder's privileges only if at least 51 percent of the company's beneficial shareholders are Batswana citizens or alternatively as a result of the declaration of the Minister.

Table 6.5 Maximum number of Animals Which May be killed by virtue of Landholder's Privileges during any One Period.

Animal	Maximum number permitted to be killed	Relevant Period
Zebra	10	One Year
Kudu	10	One Year
Gemsbok	10	One Year
Wilderbeest	10	One Year
Hartbeest	10	One Year
Ostrich	10	One Year
All other game animals	25 of each specie	One Year

Source: Government of Botswana, Wildlife Conservation and National Parks Act, 1992

Table 6.6 Number of Persons and Companies with Land Holder's Privileges (1997 – 2004)

Year	1997	1998	1999	2000	2001	2002
Land Holders*	53	54	67	142	141	145

*Persons and Companies
N/A: not available
Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife

6.3 Game Animals Offtake Quotas

The underlying principle in determining annual wildlife offtake is that the figures proposed should be based on wildlife population estimates, with the annual percentage increase in the population being the determining factor. The offtake quotas that are set by DWNP are based on wildlife population trend data collected from annual aerial surveys. This information is supplemented by ground counts, especially for gregarious and other species that are difficult to see from the air. This is in line with the suggestion made in Bonifica (1992) that since by nature aerial surveys tend to provide underestimates for most wildlife species, their offtake quotas should be based on trend data rather than the absolute annual estimates.

Furthermore, Botswana's annual offtake quota is adjusted depending on factors such as drought, existence or non-existence of illegal offtake, reproduction rates of species and several other factors that wildlife managers consider vital for the sustenance of specific populations. Other criteria considered include impact of the aerial survey methodology on the population count (particularly species whose size and colouration make their sighting difficult). The assigned quotas depend on whether the successive annual populations of a species are considered to be increasing (e.g. elephants), stable (e.g. Kudu) or declining (e.g. bushbuck). Offtake quotas are only assigned to species whose populations are considered to be stable or increasing. Game animals offtake quotas that are determined as described control only single game licences.

6.3.1 Utilisation of Quotas

For wildlife and natural resource management purposes, the Government has divided the country into Controlled Hunting Areas (CHAs). Annually, specific numbers of applicable species of animals are allocated for hunting to each CHA. That is what comprises the CHA's wildlife hunting quota. The quotas are of three categories which are described, in brief, immediately below:

6.3.1.1 Community Managed Areas (CMA) Wildlife Hunting Quotas.

Some CHAs are leased to Community Based Organisations (CBOs) and are therefore referred to as Community Wildlife Managed Areas (CMA) or Community Controlled Hunting Areas (CCHA). A CBO is a legal entity formed by a community to represent the community's interest and implement their management decisions. A community refers to a diverse group of people with varied socio-economic interests and capabilities sharing an interest in conservation and living within a legally defined geographic area.

CMAs are planned around protected areas (National Parks, Game Reserves and Sanctuaries) and are allocated to existing settlements found in those areas. Communities living in, or immediately adjacent to, these CHAs are able to lease them from the respective Land Authorities in order to improve their standard of living by using and managing the resources contained therein in such a way that local people benefit through increased incomes.

Annually, over the period March - April, CBOs apply to DWNP for the wildlife hunting quotas that they require. DWNP awards quotas according to the quotas set by the DWNP for the respective CMAs and the merit of each application. Every CMA hunting quota, for which licence and hunting permit applications are presented and appropriate fees paid, is granted the applicable number of single game licences and permits.

The beneficiary CBO can utilize the quota either wholly commercially, or partially commercially with a proportion of the quota being reserved for subsistence (*Pers. Comm.* Masilo Rakgoasi, DWNP). There are four principal ways of the commercial utilization of CMA wildlife hunting quotas:

Joint Venture Agreement (or Sub-Lease)
This is a CMA quota utilization method whereby the community sub-leases sections of their CHA and wildlife quota to a private sector company which operates more or less independently of the CBO. Sub-leasing their CHA requires less investment and risk taking than other methods of quota utilization, gives the community comparatively low individual benefits and offers the community minimum skills-transfer.

Joint Venture Partnership
In this category of CMA quota utilization the community works together with a private company in a joint enterprise, sharing its risks, responsibilities and benefits. It is characterized by increased decision making power for the community and development of local capacity but poses a higher risk for the community's earnings than does the Joint Venture Agreement category.

Auctioning
The community may also choose to auction their quota and sell it to the highest bidding company. This method of quota utilization is characterized by minimum risk to the

earnings of the community, minimum or no skills transfer and low individual cash earnings, among others.

Direct Marketing
The community utilizes their quota themselves (independently of private companies) and sells the resulting products directly to clients. The community retains all decision-making and management responsibilities. The option is best suitable for communities with the necessary skills for efficient quota utilization. It is characterized by very high business risk and insecure cash earnings for the community.

6.3.1.2 Concession Areas Wildlife Hunting Quotas

Concession areas refer to CHAs that are leased to Safari Hunting Companies or concessionaires. In order to select the later, Government advertises the CHAs available for leasing, and interested concessionaires bid for the CHAs. The concessionaires are required to present a management plan that shows how they intend to manage the applicable CHAs if they are leased to them. The plan has to specify the planned improvements and environmental and natural resource management intentions - for example, plans for the provision of water for animals and the measure that will ensure sustainable use of the environment in general.

After the bidding process the successful concessionaires are informed in writing. Using the information on the quotas allocated to each specie, they use the notice to apply for single game licenses and hunting permits that they must have before they utilize their quota. As is the case with CMAs quotas, every concession hunting quota for which a licence application is presented and fees paid is granted the applicable number of single game licences.

6.3.1.3 Citizen Wildlife Hunting Quotas

There are some CHAs that are not leased to the two categories of CHA leaseholders in any one year. The wildlife hunting quotas allocated to this group of CHAs are referred to as Citizen wildlife hunting quotas, which as the name implies, are allocated only to citizens of Botswana. In order to select the beneficiary citizens, Government advertises the CHAs and respective quotas that are available for each year and individual citizens apply for the quotas that are of interest to them. Since the number of applications always exceeds the number of animals in the quota, selection of the individual beneficiaries of the quota is by a raffle system. Raffling is conducted at the district level in every district where there is a citizen hunting quota. An individual who wins an animal pays for the respective hunting licence and permit in order to be free to hunt.

6.3.1.4 Types of Hunting Quotas allocated to Districts

The three types of hunting quotas are distributed in the districts as Table 6.7 shows. Kgatleng district was not allocated hunting quotas during the period 1997 – 2004 because the district decided not to hunt in order to allow wildlife populations to replenish themselves. For the same reason, Ghanzi and Southern districts were not allocated citizen quotas. On the other hand, Chobe district took a decision to lease all its CHAs that are allocated citizen hunting quotas to concessionaires, hence there are no citizen hunting quotas for Chobe over the period covered.

It is observed from Table 6.7 that only three districts have been allocated concession wildlife hunting quotas. There are several reasons for this, including:

- Scarcity of high value trophy species in the remaining districts which causes lack of interest on the part of concessionaires to operate in those district; and
- Land-use zoning that was adopted by the DWNP, whereby some parts of the country are not eligible for commercial wildlife usage.

Table 6.7 Types of Hunting Quotas Granted in Various Districts (1997 – 2004)

District	CMA*	Concession	Citizen
Chobe	✓	✓	x
Central	✓	✓	✓
Ghanzi	✓	x	x
Kgalagadi	✓	x	✓
Kweneng	✓	x	✓
Ngamiland	✓	✓	✓
Southern	✓	x	x
Kgatleng	x	x	x

CMA: Community Managed Hunting Areas

✓: Type of hunting quota was granted in the district

x: Type of hunting quota was not granted in the district

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

6.3.2 Observations on National Level Quotas (1997 – 2004)

At the national level, total wildlife offtake quotas for 2004 are lower than their 1997 levels for all species with the exception of elephants, baboons, jackal black bird, crocodile and eland. The species whose 2004 quotas are at least 70 percent lower than their 1997 levels are: Springbok (94 percent), Lechwe (91 percent), Duiker (90 percent), Steenbok (85 percent), Gemsbok (84 percent), Kudu (83 percent), Warthog (77 percent), Spotted Hyeana (76 percent) and Impala (70 percent). No offtake quotas were allocated to lions, reedbuck, sable and Sitatunga during the years 2002, 2003 and 2004, because the populations of these species were considered to be declining.

The 2004 elephant offtake quota is 141 percent of its 1997 level. This large increase is justified by the species population growth rate, which Taolo (1997) estimated at over 6 percent. The 2003 Aerial Survey of animals estimated their population at 109,471. Furthermore, during browsing they damage individual plants and suppress their regeneration, and negatively impact on vegetation composition and structure.

Table 6.8 Chobe District Total Wildlife Hunting Quotas

Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	15	15	30	30	30	30	30	30
Buffalo	15	15	16	16	16	16	16	16
Cat_wild	5	5	5	5	5	5	3	3
Crocodile	3	3	3	3	3	3	3	3
Duiker	25	25	25	25	25	28	22	22
Eland	3	3	4	6	6	10	5	5
Elephant	15	18	30	30	30	24	30	30
Gemsbok	-	-	-	-	-	2	1	1
Hare_Cap	10	10	10	10	10	10	10	10
Hare_scru	10	10	10	10	10	10	10	10
Hyaen_spotted	15	15	30	30	30	9	6	6
Impala	16	16	16	22	22	24	24	24
Jackal_blackB	5	5	5	5	5	5	5	5
Jackal_sideS	2	2	2	2	2	1	1	1
Kudu	15	15	15	18	18	18	8	8
Lechwe	2	2	2	2	2	2	2	2
Leopard	12	12	10	10	10	6	6	6
Lion	2	2	4	5	5	-	-	-
Monkey	5	5	5	5	5	5	5	5
Porcupine	5	5	5	5	5	5	5	5
Reedbuck	4	4	4	4	4	-	-	-
Sable	2	2	2	6	6	-	-	-
Steenbok	40	40	40	40	40	40	38	38
Tsessebe	2	2	2	6	6	2	2	5
Warthog	-	-	-	6	6	7	7	7
Wildebeest	-	-	-	5	5	3	3	3
Zebra	4	4	4	8	8	8	8	8

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.9 Chobe District Community Managed Areas Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	10	10	20	20	20	20	20	20
Buffalo	15	15	14	14	14	14	14	14
Crocodile	3	3	3	3	3	3	3	3
Duiker	25	25	25	25	25	25	22	22
Eland	3	3	3	3	3	4	3	3
Elephant	12	12	24	24	24	24	24	24
Hyaen_spotted	10	10	20	20	20	6	4	4
Impala	16	16	16	19	19	21	21	21
Kudu	10	10	10	13	13	13	6	6
Lechwe	2	2	2	2	2	2	2	2
Leopard	10	10	8	8	8	4	4	4
Lion	2	2	3	3	3	-	-	-
Reedbuck	4	4	4	4	4	-	-	-
Sable	2	2	2	4	4	-	-	-
Steenbok	25	25	25	25	25	25	24	24
Tsessebe	2	2	2	2	2	2	2	5
Warthog	-	-	-	4	4	5	5	5
Wildebeest	-	-	-	3	3	3	3	3
Zebra	4	4	4	6	6	6	6	6

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.10 Chobe District Concession Areas Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	5	5	10	10	10	10	10	10
Buffalo	-	-	2	2	2	2	2	2
Cat_wild	5	5	5	5	5	5	3	3
Duiker	-	-	-	-	-	3	-	-
Eland	-	-	1	3	3	6	2	2
Elephant	3	6	6	6	6	-	6	6
Gemsbok	-	-	-	-	-	2	1	1
Hare_Cap	10	10	10	10	10	10	10	10
Hare_scru	10	10	10	10	10	10	10	10
Hyaen_spotted	5	5	10	10	10	3	2	2
Impala	-	-	-	3	3	3	3	3
Jackal_blackB	5	5	5	5	5	5	5	5
Jackal_sideS	2	2	2	2	2	1	1	1
Kudu	5	5	5	5	5	5	2	2
Leopard	2	2	2	2	2	2	2	2
Lion	-	-	1	2	2	-	-	-
Monkey	5	5	5	5	5	5	5	5
Porcupine	5	5	5	5	5	5	5	5
Sable	-	-	-	2	2	-	-	-
Steenbok	15	15	15	15	15	15	14	14
Tsessebe	-	-	-	4	4	-	-	-
Warthog	-	-	-	2	2	2	2	2
Wildebeest	-	-	-	2	2	-	-	-
Zebra	-	-	-	2	2	2	2	2

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.11 Central District All Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	60	60	120	120	120	120	120	120
Buffalo	2	2	6	6	6	6	6	8
Cat_wild	20	20	20	20	20	20	11	11
Duiker	1,715	1,715	765	765	765	220	196	196
Eland	-	-	3	4	4	4	4	4
Elephant	9	18	18	18	18	18	18	24
Gemsbok	5	5	9	9	9	9	6	6
Hare_Cap	30	30	30	30	30	30	30	30
Hare_scru	30	30	30	30	30	30	30	30
Hartebeest	50	50	30	30	30	30	26	26
Hyaen_spotted	60	60	105	105	105	28	16	16
Impala	297	297	153	153	153	123	110	110
Jackal_blackB	20	20	20	20	20	20	20	20
Jackal_sideS	8	8	8	8	8	4	4	4
Kudu	265	265	180	180	180	99	48	48
Leopard	5	5	5	5	5	6	6	6
Lion	2	2	5	7	7	-	-	-
Monkey	20	20	20	15	15	15	15	15
Ostrich	130	130	115	115	115	94	93	93
Porcupine	15	15	15	15	15	15	15	15
Springbok	385	385	235	241	241	116	65	54
Steenbok	1,895	1,895	790	790	790	270	255	255
Wildebeest	-	-	-	7	7	7	7	7
Zebra	-	-	3	10	10	10	10	10

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.12 Central District Community Managed Areas Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	5	5	10	10	10	10	10	10
Cat_wild	5	5	5	5	5	5	2	2
Duiker	90	90	60	60	60	15	13	13
Hyaen_spotted	5	5	10	10	10	3	2	2
Jackal_blackB	5	5	5	5	5	5	5	5
Jackal_sideS	2	2	2	2	2	1	1	1
Kudu	10	10	10	10	10	10	5	5
Lion	-	-	1	1	1	-	-	-
Monkey	5	5	5	-	-	-	-	-
Ostrich	11	11	11	11	11	10	10	10
Springbok	140	140	60	60	60	20	8	6
Steenbok	20	20	20	20	20	20	19	19
Wildebeest	-	-	-	2	2	2	2	2
Zebra	-	-	-	2	2	2	2	2

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.13 Central District Concession Areas Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	15	15	30	30	30	30	30	30
Buffalo	2	2	6	6	6	6	6	8
Cat_wild	15	15	15	15	15	15	9	9
Duiker	175	175	75	75	75	45	39	39
Eland	-	-	3	4	4	4	4	4
Elephant	9	18	18	18	18	18	18	18
Gemsbok	5	5	9	9	9	9	6	6
Hare_Cap	30	30	30	30	30	30	30	30
Hare_scru	30	30	30	30	30	30	30	30
Hyaen_spotted	15	15	15	15	15	9	6	6
Impala	-	-	7	7	7	7	7	7
Jackal_blackB	15	15	15	15	15	15	15	15
Jackal_sideS	6	6	6	6	6	3	3	3
Kudu	30	30	20	20	20	20	9	9
Leopard	5	5	5	5	5	6	6	6
Lion	2	2	4	6	6	0	0	0
Monkey	15	15	15	15	15	15	15	15
Ostrich	10	10	15	15	15	15	15	15
Porcupine	15	15	15	15	15	15	15	15
Springbok	0	0	0	6	6	6	6	6
Steenbok	225	225	90	90	90	90	84	84
Wildebeest	-	-	-	3	3	3	3	3
Zebra	-	-	3	6	6	6	6	6

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.14 Central District Citizen Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	40	40	80	80	80	80	80	80
Duiker	1,450	1,450	630	630	630	160	144	144
Hartebeest	50	50	30	30	30	30	26	26
Hyaen_spotted	40	40	80	80	80	16	8	8
Impala	297	297	146	146	146	116	103	103
Kudu	225	225	150	150	150	69	34	34
Ostrich	109	109	89	89	89	69	68	68
Springbok	245	245	175	175	175	90	51	42
Steenbok	1,650	1,650	680	680	680	160	152	152
Wildebeest	-	-	-	2	2	2	2	2
Zebra	-	-	-	2	2	2	2	2

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.15 Ghanzi District All Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Duiker	300	300	275	275	275	60	52	52
Gemsbok	290	290	245	245	245	200	104	104
Jackal_blackB	-	-	-	-	-	36	34	34
Jackal_sideS	-	-	-	-	-	2	2	2
Kudu	55	55	55	55	55	35	17	17
Leopard	-	-	-	2	2	6	5	5
Lion	-	-	-	1	1	-	-	-
Ostrich	55	55	-	-	-	35	35	35
Springbok	85	85	85	85	77	50	31	24
Steenbok	770	770	320	320	320	160	150	150

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.16 Ghanzi District Community Managed Areas Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Duiker	300	300	275	275	275	60	52	52
Gemsbok	290	290	245	245	245	200	104	104
Hartebeest	-	-	-	-	-	20	16	16
Jackal_blackB	-	-	-	-	-	36	34	34
Jackal_sideS	-	-	-	-	-	2	2	2
Kudu	55	55	55	55	55	35	17	17
Leopard	-	-	-	2	2	6	5	5
Lion	-	-	-	1	1	-	-	-
Ostrich	55	55	-	-	-	35	35	35
Springbok	85	85	85	85	77	50	31	24
Steenbok	770	770	320	320	320	160	150	150

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.17 Kgalagadi District All Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Duiker	820	820	530	530	530	190	165	165
Gemsbok	615	615	480	480	475	250	132	132
Hartebeest	-	-	-	-	-	-	16	16
Hyaen_spotted	-	-	-	-	-	-	4	4
Jackal_blackB	-	-	-	-	-	-	15	15
Kudu	60	60	55	55	55	55	27	27
Leopard	4	4	4	8	8	8	8	8
Lion	-	-	-	8	8	-	-	-
Ostrich	297	243	243	243	243	210	161	161
Porcupine	-	-	-	-	-	15	15	15
Springbok	1,985	1,985	595	595	553	279	197	158
Steenbok	1,340	1,340	630	630	630	270	256	256
Wildebeest	-	-	-	-	-	-	8	8

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.18 Kgalagadi District Community Managed Areas Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Duiker	470	470	380	380	380	140	122	122
Eland	-	-	-	6	6	12	8	8
Gemsbok	590	590	470	470	470	240	126	126
Hartebeest	-	-	-	-	-	-	16	16
Hyaen_spotted	-	-	-	-	-	-	4	4
Jackal_blackB	-	-	-	-	-	-	15	15
Kudu	50	50	50	50	50	50	25	25
Leopard	4	4	4	8	8	8	8	8
Lion	-	-	-	8	8	-	-	-
Ostrich	276	222	222	222	222	189	141	141
Porcupine	-	-	-	-	-	15	15	15
Springbok	1,900	1,900	515	515	479	230	167	133
Steenbok	910	910	500	500	500	200	190	190
Wildebeest	-	-	-	-	-	-	8	8

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.19 Kgalagadi District Citizen Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Duiker	350	350	150	150	150	50	43	43
Gemsbok	25	25	10	10	5	10	6	6
Kudu	10	10	5	5	5	5	2	2
Ostrich	21	21	21	21	21	21	20	20
Springbok	85	85	80	80	74	49	30	25
Steenbok	430	430	130	130	130	70	66	66

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.20 Kweneng District All Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Duiker	450	450	260	260	260	90	77	77
Gemsbok	20	20	20	20	20	20	11	11
Kudu	50	50	30	30	30	30	15	15
Ostrich	25	25	25	25	25	25	24	24
Springbok	40	40	40	40	25	25	16	13
Steenbok	450	450	220	220	220	120	114	114

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.21 Kweneng District Community Managed Areas Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Duiker	200	200	160	160	160	60	52	52
Gemsbok	10	10	10	10	10	10	6	6
Kudu	20	20	20	20	20	20	10	10
Ostrich	12	12	12	12	12	12	12	12
Springbok	30	30	30	30	15	15	8	6
Steenbok	200	200	120	120	120	80	76	76

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.22 Kweneng District Citizen Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Duiker	250	250	100	100	100	30	25	25
Gemsbok	10	10	10	10	10	10	5	5
Kudu	30	30	10	10	10	10	5	5
Ostrich	13	13	13	13	13	13	12	12
Springbok	10	10	10	10	10	10	8	7
Steenbok	250	250	100	100	100	40	38	38

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.23 Ngamiland District All Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	140	190	270	280	280	265	265	265
Buffalo	146	146	116	140	140	133	138	136
Cat_wild	55	55	50	55	55	55	16	16
Crocodile	15	15	13	16	16	17	17	17
Duiker	2,735	2,185	1,130	1,195	1,095	295	261	261
Eland	34	34	26	29	29	30	29	29
Elephant	63	126	120	132	126	156	156	156
Gemsbok	117	117	74	75	75	65	38	38
Hare_Cap	110	110	100	110	110	110	110	110
Hare_scru	110	110	100	110	110	110	110	110
Hartebeest	130	130	55	55	50	45	40	40
Hyaen_spotted	135	135	270	280	280	62	30	30
Impala	2,402	2,402	1,093	1,176	1,176	946	860	668
Jackal_blackB	55	55	50	55	55	32	35	35
Jackal_sideS	22	22	20	22	22	15	10	10
Kudu	1,160	1,160	710	725	725	405	180	180
Lechwe	3,480	3,480	914	984	944	510	296	296
Leopard	62	62	65	73	73	38	31	31
Lion	13	13	14	31	31	-	-	-
Monkey	55	55	50	55	55	55	44	44
Ostrich	203	188	168	167	147	129	128	128
Porcupine	55	55	50	55	55	-	55	55
Reedbuck	179	179	144	147	147	-	-	-
Sable	16	16	14	17	17	-	-	-
Sitatunga	9	9	10	10	10	-	-	-
Springbok	100	100	75	85	85	70	41	36
Steenbok	3,465	3,465	1,500	1,540	1,540	660	622	622
Tsessebe	773	773	472	487	487	444	398	349
Warthog	1,093	1,093	662	683	683	245	245	245
Wildebeest	154	154	138	160	160	160	132	132
Zebra	98	98	95	108	108	106	100	100

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.24 Ngamiland District Community Managed Areas Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	40	45	80	80	80	80	80	80
Buffalo	50	50	40	40	40	43	40	38
Crocodile	4	4	4	5	5	7	7	7
Duiker	1,340	1,190	290	290	290	70	63	63
Eland	31	31	21	21	21	22	21	21
Elephant	30	60	60	66	66	78	78	78
Gemsbok	105	105	60	60	60	46	26	26
Hartebeest	125	125	50	50	50	40	36	36
Hyaen_spotted	35	35	80	80	80	24	11	11
Impala	514	514	275	274	274	234	219	219
Jackal_blackB	-	-	-	-	-	-	4	4
Jackal_sideS	-	-	-	-	-	-	2	2
Kudu	330	330	195	195	195	115	58	58
Lechwe	765	765	272	272	232	160	93	93
Leopard	17	17	21	23	23	16	9	9
Lion	-	-	-	8	8	-	-	-
Ostrich	96	81	64	64	64	52	50	50
Reedbuck	48	48	33	33	33	-	-	-
Sable	4	4	4	4	4	-	-	-
Sitatunga	1	1	1	1	1	-	-	-
Springbok	-	-	-	4	4	4	4	4
Steenbok	1885	1885	525	525	525	210	198	198
Tsessebe	152	152	113	113	113	115	104	99
Warthog	242	242	207	207	207	74	74	74
Wildebeest	30	30	30	35	35	36	29	29
Zebra	6	6	6	13	13	14	8	8

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.25 Ngamiland District Concession Areas Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	55	55	100	110	110	105	105	105
Buffalo	81	81	66	90	90	90	98	98
Cat_wild	55	55	50	55	55	55	16	16
Crocodile	10	10	8	10	10	10	10	10
Duiker	135	135	135	200	200	105	94	94
Eland	3	3	5	8	8	8	8	8
Elephant	33	66	60	66	60	66	66	66
Fox_batear	-	-	-	-	6	-	-	-
Gemsbok	2	2	4	5	5	9	6	6
Hare_Cap	110	110	100	110	110	110	110	110
Hare_scru	110	110	100	110	110	110	110	110
Hyaen_spotted	55	55	100	110	110	22	11	11
Impala	1,432	1,432	561	646	646	532	494	302
Jackal_blackB	55	55	50	55	55	32	31	31
Jackal_sideS	22	22	20	22	22	15	8	8
Kudu	275	275	185	200	200	130	58	58
Lechwe	2,650	2,650	577	647	647	350	203	203
Leopard	41	41	42	48	48	22	22	22
Lion	12	12	13	22	22	-	-	-
Monkey	55	55	50	55	55	55	44	44
Ostrich	17	17	18	19	19	19	22	22
Porcupine	55	55	50	55	55	-	55	55
Reedbuck	91	91	90	93	93	-	-	-
Sable	10	10	8	11	11	-	-	-
Sitatunga	7	7	8	8	8	-	-	-
Springbok	-	-	-	6	6	6	6	6
Steenbok	290	290	270	310	310	220	209	209
Tsessebe	551	551	314	329	329	314	281	233
Warthog	716	716	320	341	341	116	116	116
Wildebeest	96	96	84	101	101	101	83	83
Zebra	76	76	73	79	79	80	80	80

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.26 Ngamiland District Citizen Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	45	90	90	90	90	80	80	80
Buffalo	15	15	10	10	10	-	-	-
Crocodile	1	1	1	1	1	-	-	-
Duiker	1,260	860	705	705	605	120	104	104
Elephant	-	-	-	-	-	12	12	12
Gemsbok	10	10	10	10	10	10	6	6
Hartebeest	5	5	5	5	-	5	4	4
Hyaen_spotted	45	45	90	90	90	16	8	8
Impala	456	456	257	256	256	180	147	147
Kudu	555	555	330	330	330	160	64	64
Lechwe	65	65	65	65	65	-	-	-
Leopard	4	4	2	2	2	-	-	-
Lion	1	1	1	1	1	-	-	-
Ostrich	90	90	86	84	64	58	56	56
Reedbuck	40	40	21	21	21	-	-	-
Sable	2	2	2	2	2	-	-	-
Sitatunga	1	1	1	1	1	-	-	-
Springbok	100	100	75	75	75	60	31	26
Steenbok	1,290	1,290	705	705	705	230	215	215
Tsessebe	70	70	45	45	45	15	13	17
Warthog	135	135	135	135	135	55	55	55
Wildebeest	28	28	24	24	24	23	20	20
Zebra	16	16	16	16	16	12	12	12

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.27 Southern District All Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	-	-	-	-	-	10	10	10
Duiker	40	40	40	40	40	30	27	27
Gemsbok	-	-	-	-	10	10	8	8
Hartebeest	-	-	-	-	-	2	2	2
Hyaen_spotted	15	15	15	15	15	6	4	4
Jackal_blackB	-	-	-	-	-	5	5	5
Jackal_sideS	-	-	-	-	-	1	1	1
Kudu	-	-	-	-	-	10	5	5
Leopard	-	-	-	-	-	1	-	-
Ostrich	-	-	-	-	-	10	9	9
Springbok	400	400	300	300	300	120	69	54
Steenbok	80	80	80	80	80	70	58	58
Warthog	-	-	-	-	-	3	3	3

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.28 Southern District Community Managed Areas Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	-	-	-	-	-	10	10	10
Duiker	40	40	40	40	40	30	27	27
Gemsbok	-	-	-	-	10	10	8	8
Hartebeest	-	-	-	-	-	2	2	2
Hyaen_spotted	15	15	15	15	15	6	4	4
Jackal_blackB	-	-	-	-	-	5	5	5
Jackal_sideS	-	-	-	-	-	1	1	1
Kudu	-	-	-	-	-	10	5	5
Leopard	-	-	-	-	-	1	-	-
Ostrich	-	-	-	-	-	10	9	9
Springbok	400	400	300	300	300	120	69	54
Steenbok	80	80	80	80	80	70	58	58
Warthog	-	-	-	-	-	3	3	3

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.29 Botswana All Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	215	265	420	430	430	425	425	425
Buffalo	163	163	138	162	162	155	160	160
Cat_wild	80	80	75	80	80	80	30	30
Crocodile	18	18	16	19	19	20	20	20
Duiker	6,085	5,535	3,025	3,090	2,990	913	800	800
Eland	37	37	33	49	49	60	50	50
Elephant	87	162	168	180	174	198	204	210
Fox_batear	-	-	-	-	6	-	-	-
Gemsbok	1,047	1,047	828	829	834	556	300	300
Hare_Cap	150	150	140	150	150	150	150	150
Hare_scru	150	150	140	150	150	150	150	150
Hartebeest	180	180	85	85	80	97	100	100
Hyaen_spotted	225	225	420	430	430	105	60	60
Impala	2,715	2,715	1,262	1,351	1,351	1,093	994	802
Jackal_blackB	80	80	75	80	80	98	114	114
Jackal_sideS	32	32	30	32	32	23	18	18
Kudu	1,605	1,605	1,045	1,063	1,063	652	300	300
Lechwe	3,482	3,482	916	986	946	512	298	298
Leopard	83	83	84	98	98	65	56	56
Lion	17	17	23	52	52	-	-	-
Monkey	80	80	75	75	75	75	64	64
Ostrich	710	641	551	550	530	503	450	450
Porcupine	75	75	70	75	75	35	90	90
Reedbuck	183	183	148	151	151	-	-	-
Sable	18	18	16	23	23	-	-	-
Sitatunga	9	9	10	10	10	-	-	-
Springbok	2,995	2,995	1,330	1,346	1,281	660	419	339
Steenbok	8,040	8,040	3,580	3,620	3,620	1,590	1,493	1,493
Tsessebe	775	775	474	493	493	446	400	354
Warthog	1,093	1,093	662	689	689	255	255	255
Wildebeest	154	154	138	172	172	170	150	150
Zebra	102	102	102	126	126	124	118	118

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.30 Botswana All Community Managed Areas Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	55	60	110	110	110	120	120	120
Buffalo	65	65	54	54	54	57	54	52
Cat_wild	5	5	5	5	5	5	2	2
Crocodile	7	7	7	8	8	10	10	10
Duiker	2,465	2,315	1,230	1,230	1,230	400	351	351
Eland	34	34	24	30	30	38	32	32
Elephant	42	72	84	90	90	102	102	102
Gemsbok	995	995	785	785	795	506	270	270
Hartebeest	125	125	50	50	50	62	70	70
Hyaen_spotted	65	65	125	125	125	39	25	25
Impala	530	530	291	293	293	255	240	240
Jackal_blackB	5	5	5	5	5	46	63	63
Jackal_sideS	2	2	2	2	2	4	6	6
Kudu	475	475	340	343	343	253	126	126
Lechwe	767	767	274	274	234	162	95	95
Leopard	31	31	33	41	41	35	26	26
Lion	2	2	4	21	21	-	-	-
Monkey	5	5	5	-	-	-	-	-
Ostrich	450	381	309	309	309	308	257	257
Porcupine	-	-	-	-	-	15	15	15
Reedbuck	52	52	37	37	37	-	-	-
Sable	6	6	6	8	8	-	-	-
Sitatunga	1	1	1	1	1	-	-	-
Springbok	2,555	2,555	990	994	935	439	287	227
Steenbok	3,890	3,890	1,590	1,590	1,590	765	715	715
Tsessebe	154	154	115	115	115	117	106	104
Warthog	242	242	207	211	211	82	82	82
Wildebeest	30	30	30	40	40	41	42	42
Zebra	10	10	10	21	21	22	16	16

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.31 Botswana All Wildlife Concession Areas Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	70	70	130	140	140	145	145	145
Buffalo	83	83	72	96	96	98	106	108
Cat_wild	70	70	65	70	70	75	28	28
Crocodile	10	10	8	10	10	10	10	10
Duiker	295	295	185	250	250	153	133	133
Eland	3	3	8	14	14	18	14	14
Elephant	42	84	78	84	78	84	90	90
Gemsbok	7	7	11	12	12	20	13	13
Hare_Cap	140	140	130	140	140	150	150	150
Hare_scru	140	140	130	140	140	150	150	150
Hyaen_spotted	70	70	120	130	130	34	19	19
Impala	1,432	1,432	565	653	653	542	504	312
Jackal_blackB	70	70	65	70	70	52	51	51
Jackal_sideS	28	28	26	28	28	19	12	12
Kudu	305	305	205	220	220	155	69	69
Lechwe	2,650	2,650	577	647	647	350	203	203
Leopard	46	46	47	53	53	30	30	30
Lion	12	12	16	28	28	-	-	-
Monkey	70	70	65	70	70	75	64	64
Ostrich	27	27	28	29	29	34	37	37
Porcupine	70	70	65	70	70	20	75	75
Reedbuck	91	91	90	93	93	-	-	-
Sable	10	10	8	13	13	-	-	-
Sitatunga	7	7	8	8	8	-	-	-
Springbok	-	-	-	10	10	12	12	12
Steenbok	500	500	345	385	385	325	307	307
Tsessebe	551	551	314	333	333	314	281	233
Warthog	716	716	320	343	343	118	118	118
Wildebeest	96	96	84	105	105	104	86	86
Zebra	76	76	75	85	85	88	88	88

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.32 Botswana All Citizen Wildlife Hunting Quotas

Wildlife Species	1997	1998	1999	2000	2001	2002	2003	2004
Baboon	85	130	170	170	170	160	160	160
Buffalo	15	15	10	10	10	-	-	-
Crocodile	1	1	1	1	1	-	-	-
Duiker	3,310	2,910	1,585	1,585	1,485	360	316	316
Eland	-	-	-	4	4	4	4	4
Elephant	-	-	-	-	-	12	12	18
Gemsbok	45	45	30	30	25	30	17	17
Hartebeest	55	55	35	35	30	35	30	30
Hyaen_spotted	85	85	170	170	170	32	16	16
Impala	753	753	403	402	402	296	250	250
Kudu	820	820	495	495	495	244	105	105
Lechwe	65	65	65	65	65	-	-	-
Leopard	4	4	2	2	2	-	-	-
Lion	1	1	1	1	1	-	-	-
Ostrich	233	233	209	207	187	161	156	156
Reedbuck	40	40	21	21	21	-	-	-
Sable	2	2	2	2	2	-	-	-
Sitatunga	1	1	1	1	1	-	-	-
Springbok	440	440	340	340	334	209	120	100
Steenbok	3,620	3,620	1,615	1,615	1,615	500	471	471
Tsessebe	70	70	45	45	45	15	13	17
Warthog	135	135	135	135	135	55	55	55
Wildebeest	28	28	24	26	26	25	22	22
Zebra	16	16	16	18	18	14	14	14

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

6.4 Ostrich Offtake

Ostrich offtake quotas are allocated for 6 districts as shown in Table 6.33. With the exception of Southern district, quotas allocated remained constant in the three years 2002 – 2004. It is observed from Table 6.34 and Figure 6.1 that more than half of the offtake for ostrich eggs, chicks and adults are from Southern district while Kweneng contributes less than 1 percent of all the three categories of national ostrich offtake. Ngamiland, Kgalagadi and Central districts contribute over 10 percent and Ghanzi district contributes just over 5 percent to the allocated ostrich quotas (See Figure 6.1 also).

The inclusion of offtake quotas for chicks and eggs is not surprising in view of the increase in ostrich farming as a lucrative business over the past several years.

Table 6.33 Ostrich Adults, Chicks And Eggs Capture Quota (2004)

District	Adults	Chicks	Eggs
Ngamiland			
2002	235	1,520	1,785
2003	235	1,520	1,785
2004	235	1,520	1,785
Central			
2002	190	1,084	1,261
2003	190	1,084	1,261
2004	190	1,084	1,261
Southern			
2002	100	400	260
2003	894	5,351	5,815
2004	894	5,351	5,815
Ghanzi			
2002	85	495	585
2003	85	495	585
2004	85	495	585
Kgalagadi			
2002	184	1,430	1,549
2003	184	1,430	1,549
2004	184	1,430	1,549
Kweneng			
2002	0	22	25
2003	0	22	25
2004	0	22	25
Annual for Botswana			
2002	794	4,951	5,465
2003	1,588	9,902	11,020
2004	1,588	9,902	11,020

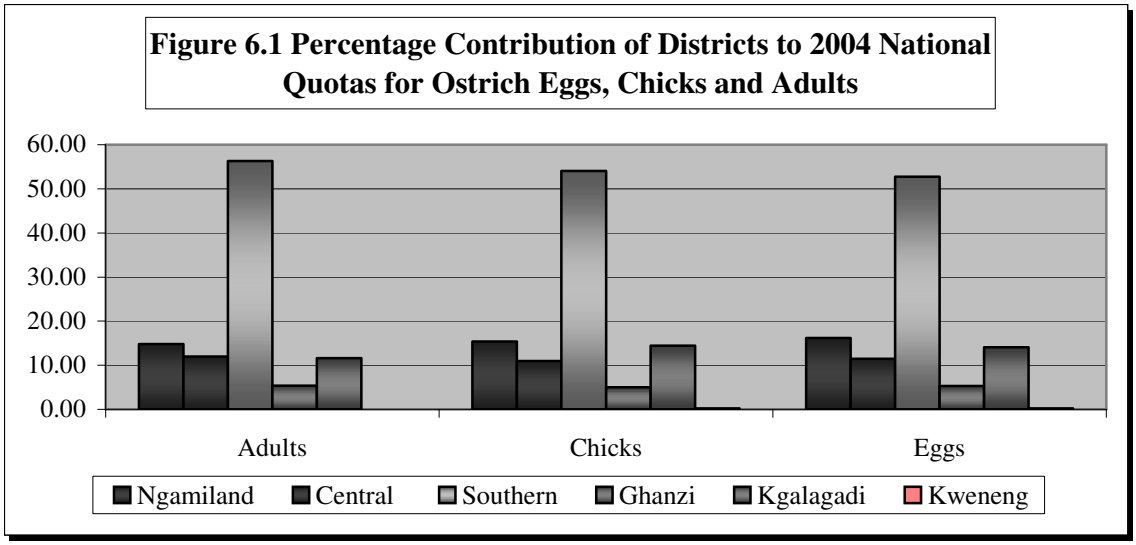
Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks

Table 6.34 Proportional contribution to National Ostrich Adults, Chicks And Eggs Capture Quota (2004) by Districts

District	Ngamiland	Central	Southern	Ghanzi	Kgalagadi	Kweneng	Total
Adults	14.80	11.96	56.30	5.35	11.59	-	100.00
Chicks	15.35	10.95	54.04	5.00	14.44	0.22	100.00
Eggs	16.20	11.44	52.77	5.31	14.06	0.23	100.00

-: Zero

Source: Licensing Unit, Management and Utilisation Division, Department of Wildlife and National Parks



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