**BEFORE THE SECRETARY OF THE INTERIOR**

# PETITION TO LIST THE AFRICAN LION (*Panthera leo leo*) AS ENDANGERED PURSUANT TO THE U.S. ENDANGERED SPECIES ACT

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**March 1, 2011**

IFAW

HUMANE SOCIETY INTERNATIONAL

THE HUMANE SOCIETY OF THE UNITED STATES

BORN FREE

DEFENDERS OF WILDLIFE

# Petition to List the African Lion as Endangered

Honorable Ken Salazar
Secretary of the Interior
1849 C Street, N.W.
Washington. D.C. 20240

**PETITIONERS**

The International Fund for Animal Welfare
1350 Connecticut Ave, NW, Suite 1220
Washington, DC 20036

The Humane Society of the United States and Humane Society International
2100 L Street, NW
Washington, DC 20037

The Born Free Foundation / Born Free USA
PO Box 32160
Washington, DC 20036

Defenders of Wildlife
1130 17th Street, NW
Washington, DC 20036

The Fund for Animals
200 West 57th Street
New York, NY 9011

**Date: March 1, 2011**

Jeffrey Flocken: The International Fund for Animal Welfare
Teresa Telecky: The Humane Society of the United States and Humane Society International
Adam Roberts: The Born Free Foundation/Born Free USA
Wm. Robert Irvin: Defenders of Wildlife
Michael Markarian: The Fund for Animals


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**Authors**: Jennifer Place, The International Fund for Animal Welfare; Jeffrey Flocken, The International Fund for Animal Welfare; Will Travers, The Born Free Foundation; Shelley

Waterland, The Born Free Foundation; Teresa Telecky, The Humane Society of the United States and Humane Society International; Caroline Kennedy, Defenders of Wildlife and Alejandra Goyenechea, Defenders of Wildlife.

**NOTICE OF PETITION**

Pursuant to Section 4(b) of the Endangered Species Act ("ESA"), 16 U.S.C. § 1533(b), Section 553(e) of the Administrative Procedure Act, 5 U.S.C. § 553(e), and 50 C.F.R. § 424.14(a), petitioners, The International Fund for Animal Welfare, The Humane Society of the United States and Humane Society International, The Born Free Foundation/Born Free USA, Defenders of Wildlife, and The Fund for Animals hereby Petition the Secretary of the Interior to list the African lion (*Panthera leo leo*) as Endangered.[1] 16 U.S.C. § 1532(6), (16) ("The term 'endangered species' means any species which is in danger of extinction throughout all or a significant portion of its range . . ."; "The term 'species' includes any subspecies of fish or wildlife . . .").

This Petition "presents substantial scientific [and] commercial information indicating that" the African lion subspecies is in danger of extinction throughout all or a significant portion of its range. *See* 50 C.F.R. § 424.14(b)(1) ("substantial information" is "that amount of information that would lead a reasonable person to believe that the measure proposed in the Petition may be warranted"). Therefore, the Secretary of the Interior must make an initial finding "that the petitioned action *may be* warranted." 16 U.S.C. §1533(b)(3)(A)(emphasis added) (The Secretary of the Interior must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the Petition"). Petitioners are confident that a status review of the subspecies, as required by 16 U.S.C. § 1533(b)(3)(B), will support a finding that listing the African lion as Endangered is warranted.

The African lion has suffered a major reduction in population size across the continent, and such decline is ongoing because threats to the subspecies continue unabated. The U.S. has the opportunity to assist in protecting the iconic African lion by listing the subspecies as Endangered. Listing of the entire subspecies as Endangered, would meaningfully contribute to African lion conservation. Such a Continent-wide listing would allow the U.S. to support all range countries in their efforts to protect lion habitat and eliminate threats to the subspecies. Further, because unsustainable take, and subsequent imports of lion derivatives into the U.S., contribute to endangerment throughout their range, importation of any African lion specimen deserves the level of scrutiny that an Endangered listing would provide, namely an analysis of whether the import would in fact enhance the propagation or survival of the subspecies or is for scientific purposes. The U.S. has the opportunity to assist in protecting the iconic African lion by listing the subspecies as Endangered.

[1] The Asiatic lion (*Panthera leo persica*) was listed as Endangered in 1970. 35 Fed. Reg. 8491 (June 2, 1970).

**EXECUTIVE SUMMARY**

This Petition demonstrates that the African lion (*Panthera leo leo*) meets the statutory criteria for an Endangered listing under the ESA.

The petitioners – The International Fund for Animal Welfare, The Humane Society of the United States and Humane Society International, The Born Free Foundation/Born Free USA, Defenders of Wildlife, and The Fund for Animals – submit this Petition to the Secretary of the Interior requesting formal protection for the African lion as Endangered under the ESA. The ESA considers a species (including subspecies) to be "Endangered" when it "is in danger of extinction throughout all or a significant portion of its range." 16 U.S.C. § 1532(6). The Act requires the Secretary to determine within 90 days of receiving the Petition whether the Petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C. § 1533(b)(3)(A). Such determination must be made solely on the basis of the "best scientific and commercial data available." 16 U.S.C. § 1533(b)(1)(A). Following a positive 90-day finding, the Secretary must, within one year of receipt of the Petition, complete a review of the status of the species and publish either a proposed listing rule or a determination that such listing is not warranted. 16 U.S.C. § 1533(b)(3)(B). Should a rule be proposed, the Secretary has an additional year to finalize regulations protecting the species. 16 U.S.C. § 1533(b)(6)(A).

When a foreign species is listed as Endangered, protection under the ESA occurs by, *inter alia*, prohibiting imports unless they enhance the propagation or survival of the species or are for scientific purposes. 16 U.S.C. § 1533(b)(1)(A). Furthermore, Section 8 of the ESA provides for "International Cooperation" in the conservation of foreign, listed species, and listing a foreign species heightens global awareness about the importance of conserving the species.

This Petition describes the natural history and biology of the African lion and the current status and distribution of the subspecies; it clearly shows that its population size and range are in alarming and precipitous decline. The Petition reviews the threats to the continued existence of the African lion, including retaliatory killing due to attacks on livestock, loss of habitat and prey, and disease. The Petition also demonstrates how Americans engaging in unsustainable trophy hunting and international trade of African lions and their parts are significantly and negatively impacting the conservation status of the African lion. It then explains how existing laws and regulations are inadequate to address the numerous and interacting threats to the African lion today. Lastly, the Petition demonstrates how an Endangered listing of the African lion under the ESA will result in significant benefits to the subspecies.

*Status and Distribution*

In 2008, the International Union for the Conservation of Nature (IUCN) classified the African lion as Vulnerable with a declining population trend, which means it is considered to be facing a high risk of extinction in the wild (Bauer, Nowell, & Packer, 2008). This classification is based on a suspected reduction in population of approximately 30 percent over the past two decades (Bauer, et al. 2008). However, African lion experts have now agreed that the population size is less than 40,000 with an estimated range of 23,000 to 39,000 (Bauer et al., 2008). The most quantitative estimate of the historic size of the African lion population resulted from a modeling exercise that predicted there were 75,800 African lions in 1980 (Bauer et al., 2008). Comparing

the 1980 estimate of 75,800 to the 2002 estimate of 39,000 African lions yields a suspected decline of 48.5 percent over 22 years. Additionally, since 2002, several studied African lion populations are known to have declined or disappeared altogether (Henschel, et al., 2010).

The African lion now occupies less than an estimated 4,500,000 $km^2$, which is only 22 percent of the subspecies' historic distribution (Bauer et al., 2008). The latest research suggests the African lion exists in 27 countries (Bauer et al., 2008; Henschel et al., 2010), down from 30 countries in 2008, just 3 years ago (Bauer et al., 2008), illustrating that the status of the African lion continues to deteriorate.

Populations of African lion that are both viable and exist in largely Protected Areas, occur in only about 5 percent of their currently occupied range and 1.1 percent of their historical continent-wide range. Thus, the African lion is endangered both across a significant portion (approximately 95 percent) of its current range and across a significant portion (approximately 99 percent) of its historical range.

*Threatened Destruction, Modification, Curtailment of Habitat or Range*

Loss of habitat and corresponding loss of prey are serious threats to the survival of the African lion (Ray, Hunter, & Zigouris, 2005). These threats are principally driven by human activity, including conversion of lion habitat for agriculture and grazing as well as human settlement (Ray et al., 2005). Human population growth has been specifically identified as the root cause of many problems associated with the conservation of African lions because of increasing human settlement in lion habitat and associated agriculture and livestock production (IUCN SSC Cat Specialist Group, 2006a). It is therefore of concern that the human population of sub-Saharan Africa, which was 518 million in 1990, is predicted to rise to 1.75 billion people by 2050 (UN DESA, 2009).

Other related threats to African lion habitat and prey include the bushmeat trade, civil unrest and desertification. The expanding human population has resulted in increased consumption of bushmeat which has severely reduced some lion prey species, causing conflict between African lions and humans competing for the same resources (Parliamentary Office of Science and Technology, 2005; IUCN SSC Cat Specialist Group, 2006b). Civil unrest within sub-Saharan Africa degrades otherwise suitable lion habitat through the overharvesting of wildlife and vegetation (Dudley, Ginsberg, Plumptre, Hart, & Campos, 2002). Lastly, land degradation through desertification is predicted to lead to the loss of two-thirds of arable land in Africa by 2025 (Bied-Charreton, 2008), which will further increase competition between humans and African lions.

*Overutilization for Commercial, Recreational, or Scientific Purposes*

The African lion is clearly over-utilized. The original analysis presented in this Petition shows that between 1999 and 2008, 21,914 African lion specimens (lions, dead or alive, and their parts and derivatives), reported as being from a wild source, representing a minimum of 7,445 lions, were traded internationally for all purposes. Of this trade, the U.S. imported 13,484 lion specimens reported as being from a wild source (62 percent of the total), which is the equivalent

of at least 4,021 lions (54 percent of the total). The most common purposes of this international trade were scientific, recreational and commercial.

Between 1999 and 2008, 7,090 lion specimens, reported as being from a wild source, were traded internationally for recreational trophy hunting purposes, representing a minimum of 5,663 lions. Most of these specimens were imported to the U.S.: 4,139 specimens (58 percent of the total), representing a minimum of 3,600 lions (64 percent of the total). Despite the significant and continuing population and range declines that this subspecies has suffered and continues to suffer, the number of lion trophies, reported as being from a wild source and traded for hunting trophy purposes, imported to the U.S., is increasing. Of these trophies, the number imported into the U.S. in 2008 was larger than any other year in the decade studied and more than twice the number in 1999.

From 1999 to 2008, 2,715 lion specimens, reported as being from a wild source, the equivalent of at least 1,043 lions, were traded internationally for commercial purposes (defined as "for the purpose of sale in the importing country.") Of this trade, the U.S. imported 1,700 lion specimens (63 percent of the total), the equivalent of at least 362 lions (35 percent of the total). The most common lion specimens traded for commercial purposes were claws, trophies, skins, live animals, skulls and bodies.

The aforementioned international trade figures include lion specimens reported as being from a wild source that were exported from South Africa. From 1999 to 2008, South Africa reported exporting a number of specimens equivalent to 2,862 wild source lions. Since the estimated number of wild lions in South Africa in 2002 ranged between 2,716 and 3,852 it seems highly unlikely that the aforementioned 2,862 South African lions involved were all wild source. Therefore, the South Africa trade data specifically must be treated with caution.

Twenty African range States exported lions and lion parts reported as being wild source between 1999 and 2008. A country-by-country examination of the number of African lions exported and reported as being from a wild source, and the status of the wild population in each country reveals that off-take was unsustainable in at least sixteen of these twenty range States. Specifically, the U.S. imported lion specimens from twelve range States where the reported data indicate that the off-take was unsustainable. Therefore, even setting aside the South African data, clearly the lion is overexploited for these purposes across sub-Saharan Africa.

In addition to the direct killing of the targeted individual, trophy hunting can have further population impacts. For example, when males that are part of a pride are killed, all the pride's cubs less than nine months of age will be killed by new dominant males (Whitman, Starfield, Quadling, & Packer, 2004). Listing the African lion as Endangered under the ESA would end imports of commercial and recreational lion trophies and all lion specimens into the U.S., unless they are found to enhance the survival or propagation of the species or are for scientific purposes. 16 U.S.C. §§ 1538(a)(1)(A), 1539(a)(1)(A). African lions are also killed for purposes that do not involve legal international trade. However, there are no comprehensive data on the levels or impact of these activities.

*Disease or Predation*

Diseases such as canine distemper virus (CDV), feline immunodeficiency virus and bovine tuberculosis are viewed by experts as a threat to the African lion (Roelke et al., 2009; Cleaveland et al., 2007). Human population growth and expansion is exposing African lions to new diseases to which they may have little or no immunity (IUCN SSC Cat Specialist Group, 2006b). For example, the CDV disease, normally associated with domesticated dogs, has affected lion populations (Cleaveland et al., 2007).

*Inadequacy of Existing Regulatory Mechanisms*

The African lion is listed on Appendix II of the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES), which means that export permits should not be granted unless the export is determined not to be detrimental to the survival of the species in the wild. Nonetheless, this Petition demonstrates that lion specimens are routinely exported from countries across their range where lion off-take is detrimental to the survival of the subspecies. This means that the U.S. regularly allows imports of lion specimens accompanied by export permits issued by countries where lion off-take is unsustainable. This is a clear indication that CITES, as currently implemented, is inadequate to protect the African lion from unsustainable international trade.

The country that imports the most wild source African lion specimens—the U.S.—has no meaningful protective measures for the subspecies, despite the evidence that imports are having a detrimental impact. An Endangered listing under the ESA would ensure that lion specimens could only be imported to the U.S. if the import enhances the survival or propagation of the species or is for scientific purposes.

Conservation of the African lion could be potentially affected by several other international and African regional agreements, as well U.S. laws, but none of these adequately protect the subspecies from ongoing and rapid decline in population and range. Moreover, few range States appear to have adequate national regulatory mechanisms, or effective measures to implement and enforce such mechanisms should they exist, to address these declines. In summary, the threats to lions in Africa are exacerbated by insufficient regulatory mechanisms throughout their range (IUCN SSC Cat Specialist Group, 2006a; IUCN SSC Cat Specialist Group, 2006b).

*Other Natural or Manmade Factors Affecting the Survival of the African Lion in the Wild*

The African lion is threatened by retaliatory killings, often associated with loss of prey, ritual killings, and compromised population viability due to increasingly small and isolated populations. Retaliatory killing, in particular, is a serious threat to the survival of the African lion (Chardonnet et al., 2010) and occurs in all major range States (Frank, Hemson, Kushnir, & Packer, 2006). When the African lion's prey is reduced by human or natural means, lions increasingly prey on domestic livestock (Chardonnet et al., 2010). Livestock predation is the main source of conflict between people and lions and can induce extreme human retaliation (Chardonnet et al., 2010). African lions are easily killed for retaliatory purposes by various

means, but they are particularly vulnerable to poisons because of their scavenging nature (Hoare & Williamson, 2001; Baldus, 2004).

*Conclusion*

This Petition demonstrates that the African lion meets the criteria for listing as Endangered under the ESA and therefore the subspecies should be listed. The best scientific and commercial data available demonstrate that the population and range of the African lion have significantly decreased, and continue to decrease, and that the African lion is in danger of extinction throughout "all or a significant portion of its range" 16 U.S.C. § 1532(6). The African lion faces serious threats due to over-exploitation by recreational trophy hunting and commercial trade, loss of habitat and prey species, retaliatory killings, disease and other human-caused and natural factors. The subspecies is not adequately protected by existing regulatory measures at national, regional or international levels. Listing the African lion as Endangered under the ESA would be a meaningful step toward reversing the decline of the subspecies by ensuring that the U.S. does not allow the importation of African lions or their parts unless it is to enhance the propagation or survival of the subspecies or is for scientific purposes, and by raising global awareness about the alarming and increasingly precarious status of the African lion.

## I. INTRODUCTION

Until very recently, conservation of the African lion (*Panthera leo leo*) was not identified as a matter of significant concern. The subspecies was considered abundant, healthy and wide-ranging. Most lion populations were not closely monitored and, as a consequence, wildlife management authorities have overlooked their steady decline in the last few decades. Therefore, adequate conservation measures to address the primary threats to the subspecies—retaliatory killings resulting from human-lion conflict, habitat and prey loss, disease, and unsustainable take for international trade in lion trophies and lion parts—are lacking. Scientists and managers now acknowledge that the African lion population's size and range have dramatically decreased. Over the past decade, scientists have begun to quantify lion population and range and to evaluate the causes of their decline. As detailed in this Petition, the results of these scientific endeavors are alarming. The U.S. has an important role to play in African lion conservation efforts, including granting the subspecies Endangered status under the ESA.

## II. STATUS AND DISTRIBUTION OF THE AFRICAN LION

### *A. Status*

The International Union for the Conservation of Nature (IUCN) classifies the African lion as Vulnerable, which means it is considered to be facing a high risk of extinction in the wild (Bauer et al., 2008). This classification is based on a suspected reduction in population of approximately 30 percent over the past two decades (Bauer et al., 2008). The population is continuing to decline (Bauer et al., 2008).

African lion experts have agreed that the population size is less than 40,000 with an estimated range of 23,000 to 39,000 (Bauer et al., 2008). This is based on the results of two independent assessments: Bauer and Van Der Merwe (2004) estimated the African lion population to be 23,000, with a range from 16,500 to 30,000; and Chardonnet (2002) who estimated the population to be about 39,000 with a range from 28,854 to 47,132. The two assessments used different methodologies and techniques which account for the divergent estimates. For example, Chardonnet (2002) used ecological boundaries when defining regions, whereas Bauer and Van Der Merwe (2004) used national borders. Additionally, it is important to note that there is no detailed knowledge of lion populations in some areas such as Ethiopia (Gebresenbet, Bauer, Hunter & Gebretensae, 2009) and the North Albertine Rift of Uganda and the Democratic Republic of the Congo (Treves, Plumptre, Hunter, & Ziwa, 2009).

Lion populations in West Africa are classified by the IUCN as Regionally Endangered, meaning lions in this particular region are considered to be facing a very high risk of extinction in the wild (Bauer & Nowell, 2004). The population size in this region has been estimated to number between 850 (Bauer & Van Der Merwe, 2004) and 1,163 mature individuals (Chardonnet, 2002). In Central Africa, population surveys carried out by Bauer and Van Der Merwe (2004) and Chardonnet (2002) indicate a range of between 950 and 2,815 individuals (IUCN SSC Cat Specialist Group, 2006b). A more recent study, conducted across West and Central Africa between 2006 and 2010, surveyed areas of known or probable lion range considered ecologically

important for African lion conservation known as Lion Conservation Units (LCUs) (Henschel et al., 2010). In this study, 12 of the 16 West African LCUs were surveyed, and only two showed evidence of the presence of lions. In Central Africa, 3 of the 11 identified LCUs were surveyed, and none of these suggested the presence of lions. The study authors state that as few as 1,000-2,850 lions may remain in this part of the continent (Henschel et al., 2010). There are an estimated 11,000 to 15,744 lions in East Africa (IUCN SSC Cat Specialist Group, 2006b) and 10,000 to 19,651 lions in Southern Africa (IUCN SSC Cat Specialist Group, 2006b), a substantial decrease from historic numbers.

It is widely agreed that there is a downward trend in the number of lions in Africa (Bauer et al., 2008). The most recent IUCN Red List analysis identifies the African lion population trend as 'decreasing' with a suspected population reduction of at least 30 percent over the last 20 years (Bauer et al., 2008).

It has been estimated that a million lions existed in Africa in pre-colonial times (Frank et al., 2006). The most quantitative estimate of the recent historic size of the African lion population, which was based on a modeling exercise, predicted that there were 75,800 African lions in 1980 (Ferreras & Cousins, 1996; Bauer et al., 2008). Comparing the 1980 estimate of 75,800 to the higher 2002 estimate of 39,000 lions (Chardonnet, 2002) yields a suspected decline of 48.5 percent over 22 years (Bauer, et al, 2008); whereas, comparing the 1980 estimate to the lower 2002 estimate of 23,000 (Bauer & Van Der Merwe, 2004), yields a suspected decline of 69.7 percent over 22 years. Since 2002, several studied lion populations are known to have declined or disappeared altogether (Henschel et al., 2010). In certain areas, the decline is faster and far greater than 30 percent. For example, in Queen Elizabeth National Park, Uganda, a 50 percent decline has been reported over 10 years (Dricuru, as cited in Treves et al., 2009).

In order for the African lion to have a high likelihood of persisting in the future, multiple robust populations must thrive across connected ecosystems. Based on a meta-analysis of 30 years of published minimum viable population (MVP) sizes in mammals, primarily large-bodied species that are IUCN listed (and including both the African and Asian lion), a population size as low as 2,200 individuals can be reasonably considered as viable (i.e., demographic continuity in the absence of immigration/emigration, translocation, etc.) (Traill, Bradshaw, & Brook, 2007). This statistical threshold represents a 95 percent probability for population persistence over at least 40 generations (*Table 2,* lower 95 percent confidence interval for the standardized mean MVP = 3,876 individuals, representing $n = 95$ mammal species).

Using the Traill et al. (2007) 2,200 viability threshold as a criterion for screening the African lion populations listed by Bauer, Chardonnet, & Nowell (2005), we find that the subspecies has no more than 5 population clusters, representing just 14 populations on the entire African Continent, could be reasonably deemed to be viable (i.e., estimated population size overlaps the viability estimate: (**Table 1**).

**Table 1**. Clusters of populations for African lion in which estimates of the regional population size encompass a viability threshold of 2,200 or more individuals.

| *Population* | *Number of lion populations* | *Country* | *Study* | *Minimum* [1] | *Mid-estimate* [1] | *Maximum* [1] |
|---|---|---|---|---|---|---|
| Serengeti ecosystem[2] | 4 | Tanzania | Chardonnet [3] | 3412 | 4437 | 5222 |
| | | | Bauer & Van Der Merwe [4] | 1823 | 2573 | 3323 |
| Selous and surrounds | 2 | Tanzania | Chardonnet | 3458 | 4940 | 6422 |
| | | | Bauer & Van Der Merwe | 3500 | 4500 | 4600 |
| Rungwa ecosystem | 1 | Tanzania | Chardonnet | 2352 | 3360 | 4368 |
| | | | Bauer & Van Der Merwe | - | - | - |
| | | | | | | |
| Okavango ecosystem[5] | 4 | Botswana | Chardonnet | 1782 | 2228 | 2674 |
| | | | Bauer & Van Der Merwe | 1440 | 2007 | 2808 |
| Kruger ecosystem[6] | 3 | South Africa, Zimbabwe, Mozambique | Chardonnet | 2463 | 2798 | 3132 |
| | | | Bauer & Van Der Merwe | 2306 | 2355 | 2404 |
| **TOTAL** | **14** | | Chardonnet | **13467** | **17763** | **21818** |
| | | | Bauer & Van Der Merwe | **9069** | **11435** | **13135** |
| **TOTAL (without Selous)** | **12** | | Chardonnet | **10009** | **12823** | **15396** |
| | | | Bauer & Van Der Merwe | **5569** | **6935** | **8535** |

1 Figures for lion population sizes derived from Tables 6.9, 7.2, 7.5, 7.6, 7.7, and 7.10 in Bauer et al. (2005). Mid-estimates for some lion numbers were the same (or not greatly different from) the minimum or maximum available from the literature, and thus cannot be considered as an average.
2 Includes near-contiguous areas of Manyara National Park, Ngorongoro Crater, Serengeti, and Tarangire National Park.
3 Chardonnet, 2002.
4 Bauer & Van Der Merwe, 2004
5 Includes near-contiguous areas of Okavango Delta, Kwando and Chobe National Park, Botswana, Kaudom, Nyae and Caprivi, Namibia.
6 Includes near-contiguous areas of Kruger National Park, South Africa, Gonarezhou National Park, Zimbabwe, and Limpopo National Park, Mozambique.

These five clusters of 14 populations represent only 10 percent of all 144 African lion populations identified by Chardonnet (2002). However, because the Selous and its environments are not under permanent protection, only four clusters and 12 populations (8.3 percent) of

African lion could be reasonably considered as *both* viable *and* inhabiting mostly Protected Areas (**Table 1**).

Based on the number of African lions that are simultaneously viable and inhabiting mostly Protected Areas, we find that only about one-third of all lions on the Continent could be considered secure under present conservation measures (**Table 2**). In other words, approximately two-thirds of all lions in Africa occur both in non-viable *and* unprotected populations.

**Table 2**. Percentage of African lions that occur in viable and mostly protected populations.

| *Study* | *Estimated number of viable* and *protected lions*[1] | *Continental population estimate* | *Estimated continental percentage of lions in viable populations* |
|---|---|---|---|
| Chardonnet | 10009-15396 | 29000-47000 | 33-35% |
| Bauer & Van Der Merwe | 5569-8535 | 16500-30000 | 28-34% |

[1] Range of low to high estimates for the four protected African ecosystems (Table 1) in which lion population size is greater than 2,200 individuals.

The five viable populations of the African lion that are itemized in (**Table 1**) occur in approximately 6.2 percent of their currently occupied range, and occur in slightly more than 1 percent of their historical range across the continent (**Table 3**).

Populations of the African lion that are both viable and inhabiting mostly Protected Areas (**Tables 1 and 3**) occur in only about 5 percent of their currently occupied range, and occur in only 1 percent of its historical, Continent-wide range (**Table 3**). Thus, the African lion is endangered both in a significant portion (approximately 95 percent) of its current range and across a significant portion (approximately 99 percent) of its historical range. Therefore, *Panthera leo leo* meets the definition of an endangered subspecies under the ESA.

**Table 3**. Approximate land areas (in $km^2$) occupied by five subpopulation clusters of the African lion.

| *Ecosystem* | *Approximate lion population range area ($km^2$)* [1] | *Percentage of current range* [2] *(4.5 million $km^2$)* | *Percentage of historical range* [1] *(20.5 million $km^2$)* |
|---|---|---|---|
| Serengeti ecosystem | 38,010 | | |
| Selous and surrounds | 55,000 | | |
| Rungwa ecosystem | 42,000 | | |
| Okavango ecosystem | 103,467 | | |
| Kruger ecosystem | 42,873 | | |
| **TOTAL (viable)** | **281,350** | 6.2% | 1.4% |
| | | | |
| **TOTAL (viable *and* protected)** | **226,350** | 5.0% | 1.1% |

[1] Chardonnet (2002).

[2] Current and historical range sizes from Bauer et al. (2008).

### *B. Distribution*

Historically, lions were found across Africa, Europe, the Middle East and Southwest Asia, occurring in all habitat types, except very dry deserts and very wet forests (IUCN SSC Cat Specialist Group, 2006b). Outside Africa, lions now exist only as a single relic population of the Asiatic lion (*Panthera leo persica*) in the Gir Forest in the State of Gujarat, India (Bauer et al., 2008).[2]

The African lion once lived throughout the African Continent, except for the interior of the Sahara Desert and dense coastal and central rainforests (Nowell & Jackson, 1996; Bauer et al., 2008). The African lion now occupies less than an estimated 4,500,000 $km^2$, having disappeared from 78 percent of its historic distribution (Bauer et al., 2008). Despite divergence in inventories of lion numbers, sources agree on a downward trend affecting both numbers and geographical range (Bauer et al., 2008).

The African lion survived in some areas of North Africa, such as the High Atlas Mountains, until the 1940s, but is now extinct in all of North Africa (Algeria, Egypt, Libya, Morocco, Tunisia and Western Sahara) (Frank et. al, 2006); Nowell & Jackson, 1996). The subspecies is also extinct in Congo, Djibouti, Eritrea, Gabon, Gambia, Lesotho, Mauritania and Sierra Leone, and its presence is uncertain in Burundi, Cote d'Ivoire, Democratic Republic of Congo, Ghana and Togo (Bauer et al., 2008; Henschel et al., 2010). The African lion was never present in Equatorial Guinea or Liberia (Chardonnet, 2002).

Based on a comparison between Bauer et al. (2008) and Henschel et al. (2010), the African lion now exists in 27 countries, 3 fewer than documented in 2008, illustrating that the status of the African lion continues to deteriorate. The subspecies is currently found in the following sub-Saharan African countries (Fig.1): Angola, Benin, Botswana, Burkina Faso, Cameroon, Central African Republic, Chad, Ethiopia, Guinea, Guinea-Bissau, Kenya, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Somalia, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe (Bauer et al., 2008; Henschel et al., 2010).

[2] The Asiatic Lion subspecies (*Panthera leo persica*) was listed as Endangered pursuant to the ESA in 1970. 35 Fed. Reg. 8491 (June 2, 1970).


**Figure 1. Current Geographic Range of Lion**

## III. NATURAL HISTORY AND BIOLOGY OF THE AFRICAN LION

Unless otherwise noted, accounts in Section 3, are from the American Society of Mammologists' detailed summary of the basic biology of *Panthera leo* (Haas, Hayssen, & Krausman, 2005)

### *A. Taxonomy*

The African lion belongs to the class Mammalia, order Carnivora, suborder Feliformia, family Felidae, species *Panthera leo* Linnaeus, 1758. There are two recognized subspecies of lion: African lion *P. l.* Linnaeus, 1758, and Asiatic lion *P. l. persica* Meyer, 1826.

### *B. Species Description*

The lion is the second largest species of Felidae, only slightly smaller than the tiger but nearly twice as large as the leopard. Basic characteristics include sharp, retractile claws, a short neck, a broad face with prominent whiskers, rounded ears and a muscular body. Lions are typically a tawny unicolor with black on the backs of the ears and white on the abdomen and inner legs. The males usually have a recognizable mane around the head, neck and chest; however, there can be regional variation in the color and development of the mane, from blond to black, and from thick to patchy or balding. Variations in lion body size and color can exist between and within lion populations in different geographic regions, as well as on a pride-by-pride basis.

Lions are sexually dimorphic, with males weighing about 20-27 percent more than females. Adult males, on average, weigh about 188 kg with the heaviest male on record weighing 272 kg. Females are smaller, weighing, on average, 126 kg. The male body length, not including the tail, ranges from 1.7 m to 2.5 m with a tail from 0.9 m to 1 m. Lions are the only species of cat with a tufted tail (Nowell and Jackson, 1996).

### *C. Reproduction and Mortality*

Lions have no fixed breeding season. Females give birth every 20 months if they raise their cubs to maturity, but the interval can be as few as 4-6 weeks if their litter is lost. Gestation lasts 110 days, litter size averages 1-4 cubs, and the sex ratio at birth is 1:1. Cubs' eyes open shortly after birth and they begin walking within 2 weeks. Cubs are weaned at eight months and are raised communally until they reach sexual maturity at around 2 years old. At about four years of age, females will have their first litter and males will become resident in a pride.

Lions live in groups called "prides", which are "fission-fusion" social units defined as a stable membership that can be divided into small groups throughout the range (Nowell & Jackson, 1996). Prides vary in size and structure but typically have 5-9 adult females, their dependent offspring, and a coalition of 2-6 immigrant males. Prides confer advantages to members including greater hunting success when compared to solitary lions, and cooperative protection of individuals in the pride and their cubs. Each pride has a territory of 20-500 $km^2$ depending on availability of prey. Use of space within the territory correlates with prey movement and

availability. While core areas are spaced some distance from other prides, average pride ranges typically overlap. Lean-season prey mass determines the home-range size of the pride. Lions show diverse patterns of behavior both between and within prides, including hunting and feeding methods and preferences. Lions are most active at night, and communicate through scent-marking and roaring. Nomadic lions are less common than lions in prides, with between one and five members changing freely within a nomadic group

Pride size is positively-related to reproductive success: large prides will out-compete smaller prides and, as a result, successful reproduction tends to be lowest in small prides with only 1 or 2 females (Kissui, Mosser, & Packer, 2009). Pride takeovers by male lions and subsequent infanticide of cubs sired by the ousted male lions greatly influences reproductive success. Male lions form coalitions of up to 7 individuals to takeover a pride, and after a successful takeover are usually in control for about two to three years before another younger, stronger coalition of males takes over the pride anew (Nowell & Jackson, 1996). Upon takeover, it is to the new males' reproductive advantage to kill all the suckling cubs in the pride as this will cause the nursing lionesses to come back into estrous within a few weeks, providing an opportunity for the new males to sire offspring. Pride takeovers often result in the defeated males being severely injured or killed. Similarly, lionesses defending their cubs from the victorious males are sometimes killed during the takeover as well (Nowell & Jackson, 1996).

Wild male lions live an average of 12 years and up to 16 years. The oldest known wild female lion lived to 17 years. Adult mortality is typically caused by humans, starvation, disease or attacks from other lions as full-grown lions have no natural predators. They can also be seriously injured or killed during hunting attempts on some of their larger prey such as buffalo, rhino, zebra, or wildebeest. Adult lion sex ratios skew heavily in favor of females – possibly due to high sub-adult male mortality rates. Among cubs, infanticide is a significant source of mortality which usually occurs when new males take over a pride. Infanticide accounts for 27 percent of cub mortality.

### *D. Hunting and Feeding*

Lions are generalist hunters, with foraging preferences and opportunities changing with season and with lion group size (Scheel, 1993). While females in a pride do the majority of the hunting, stronger males are often more aggressive during the actual feeding and can dominate the kill. Nomadic lions typically have large ranges following prey migrations, and are known to stalk prey, hunt and scavenge cooperatively. Varying by region and prey availability, prey species can be as small as rodents, and as large as medium-sized ungulates and young elephants (Nowell & Jackson, 1996). Prey species in Africa include wildebeest, buffalo, eland, elephant, giraffe, kudu, gazelle, topi, zebra, and warthog, among others. However, in places where there are fewer large antelope and other medium-to-large sized prey options, lions may eat more small prey such as gemsbok and even porcupine. They have also been known to kill cheetah cubs, and sometimes will take small prey such as rodents, tortoises, fish in shallow water, amphibians and occasionally grass, fruits and termites. Additionally, lions are opportunistic scavengers and will chase other predators away from their kill. On the other hand, scavengers in large numbers, such

as a pack of 20 to 40 spotted hyenas—a predator with similar and therefore competing prey preferences—can drive one or more lions away from a kill and steal his or her meal.

Females consume, on average, 8.7 kg/day in the dry season and 14 kg/day in the wet season when prey is more abundant). Males can consume twice as much as females, and cubs can consume one-third as much as adult females.

### *E. Habitat Requirements*

Lion population size typically correlates with the herbivore biomass – therefore prey numbers can limit the lion population density within an ecosystem (Hayward, O'Brien, & Kerley, 2007). The African lion can be found in all African habitat types with the exception of the interior of the Sahara Desert and deep rainforests (Bauer et al., 2008). Studies indicate, however, that they have a preference for open woodlands, thick bush, scrub and grass complexes. Additionally, they have been known to inhabit semi-deserts, forests, and mountains as high as 5,000 m (16,404 ft) elevation.

## IV. CRITERIA FOR LISTING THE AFRICAN LION AS ENDANGERED

The Supreme Court has described the ESA as "the most comprehensive legislation for the preservation of endangered species ever enacted by any nation" (Tennessee Valley Authority v. Hill, 437 U.S. 153, 180 (1978). In that landmark case, the Court stated that:

> [t]he plain intent of Congress in enacting this statute was to halt and reverse the trend towards species extinction, whatever the cost. This is reflected not only in the stated policies of the Act, but in literally every section of the statute (Tennessee Valley Authority v. Hill, 437 U.S. 153, 184 , 1978).

This Petition demonstrates that the African lion meets the statutory criteria for an Endangered listing under the ESA. As demonstrated in this Petition, the African lion is in danger of extinction throughout all or a significant portion of its range and, therefore warrants listing as an endangered subspecies. Accordingly, the Secretary of the Interior should act to halt and reverse the current trends towards extinction for the African lion by listing the subspecies as Endangered under the ESA.

The ESA requires the Secretary of the Interior to list a species, or subspecies, for protection if it is in danger of extinction in all or a significant portion of its range. According to the statute, a species may be threatened or endangered by any of the following five factors: The present or threatened destruction, modification, or curtailment of its habitat or range; Overutilization for commercial, recreational, scientific, or educational purposes; Disease or predation; Inadequacy of existing regulatory mechanisms; or, Other natural or manmade factors affecting its existence.

16 U.S.C. § 1533(a)(1)(A)-(E); 50 C.F.R. § 424.11(c)(1)-(5).

The ESA requires that all determinations relating to whether a species is affected by any of the five listing factors be made "solely on the basis of the best scientific and commercial data available to him after conducting a review of the status of the species." 16 U.S.C. § 1533(b)(1)(A). Further, determinations must "tak[e] into account those efforts, if any, being made by any State or foreign nation…to protect such species" by protection of habitat and food supply, or by any other conservation practice within any area under its jurisdiction. 16 U.S.C. § 1533(b)(1)(A).

### *A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range*

Loss of habitat and corresponding loss of prey are serious threats to the survival of the African lion (Ray et al., 2005). These threats are principally driven by human activity, including conversion of lion habitat for agriculture and grazing as well as human settlement (Ray et al., 2005). Apex predators require a large amount of space and resources, and competition with humans is inevitable as humans expand into previously unsettled, wild areas (Prugh et al., 2009). The African lion, a top predator in many African ecosystems, is no exception (Treves & Karanth, 2003).

Given that most African economies rely heavily upon natural resources and land (UNECA, 2010), expanding human populations are increasing pressure on natural resources and causing significant environmental change (UNEP, 2007.) Human population growth has been specifically identified as the root cause of many problems associated with the conservation of the African lion because of increasing human settlement in lion habitat and associated human activities such as agriculture and livestock production (IUCN SSC Cat Specialist, 2006a). It is therefore of concern that the human population of sub-Saharan Africa, which was 518 million in 1990, is predicted to rise to 1.75 billion people by 2050 (UN DESA, 2009).

Sub-Saharan Africa saw a 25 percent increase in the amount of land allocated to agriculture between 1970 and 2000 (Chardonnet et al., 2010). Transformation of wild habitats into areas suitable for livestock farming leads to environmental degradation and loss of plant and animal biodiversity (Chardonnet et al., 2010). As the need for suitable land for livestock grazing increases, the seasonal movement of livestock into wildlife conservation areas is becoming increasingly prevalent across sub-Saharan Africa (Chardonnet et al., 2010). Numbers of domestic livestock (450 million small ruminants and 200 million cattle) in sub-Saharan Africa are increasing steadily in response to expanding human populations (Chardonnet et al., 2010).

Development within the sub-Saharan African region continues to rely on exploitation of natural resources, including wildlife (Chardonnet et al., 2010). The exploitation of trees and mineral resources, and the construction of dams and irrigation schemes, contribute to destruction and degradation of lion habitats (IUCN SSC Cat Specialist Group, 2006b). For example, a proposed road through the middle of the Serengeti ecosystem is expected to have serious, negative impacts on the animals that live there, including African lion prey (Holdo, Fryxell, Sinclair, Dobson, & Holt, 2011).

The increasing human population size also results in the increasing consumption of bushmeat, a significant source of protein for human populations in many parts of sub-Saharan Africa. In addition to the increased subsistence consumption that parallels increased human population size, the commercialization of the bushmeat trade further threatens African wildlife. Human hunting of wild animals for meat means wild lions face declining prey (IUCN SSC Cat Specialist Group, 2006b). Stein (2001) identified many species that are negatively impacted by the bushmeat trade that are also preferred prey species for African lions (Funston, Mills, Biggs, & Richardson, 1998; Harrington & Myers, 2004; Nowell & Jackson, 1996; Scheel, 1993; Sinclair, Mduma, & Brasheres, 2003).

Additionally, although the African lion may not be the primary target for bushmeat poachers, it is a common practice for poachers to kill them anyway, and kill them first, to ensure easier hunting and less competition for the target bushmeat species (B. Joubert & D. Joubert, personal communication, June 15, 2010).

The threat from commercial poaching and the demand for bushmeat are intensifying due, partly, to civil unrest (Chardonnet et al., 2010). Civil unrest within sub-Saharan Africa degrades otherwise suitable lion habitat through the overharvesting of wildlife and vegetation by refugees and combatants (Dudley et al., 2002). During the past 40 years, over 30 wars and 200 *coups d'état* have taken place across sub-Saharan Africa (Chardonnet et al., 2010). Because of these many enduring and severe civil conflicts, an estimated 500 million modern weapons are now readily available (Chardonnet et al., 2010). This massive increase in available firepower has resulted in less traditional hunting methods, and more hunting with modern weapons, which has a devastating effect on wildlife populations (Chardonnet et al., 2010).

Land degradation through desertification is predicted to lead to the loss of two-thirds of arable land in Africa by 2025 (Bied-Charreton, 2008), which will further increase competition between humans and lions. Experts have predicted that the 'devastating impacts of climate change' will lead to serious biodiversity degradation and loss as a result of desertification, drought and land degradation (UNECA, 2008). Drought and desertification have already had significant negative effects on biodiversity in Africa (UNECA, 2008).

### *B. Overutilization for Commercial, Recreational, or Scientific Purposes*

The African lion is listed on Appendix II of CITES, by virtue of being a member of the family Felidae, which is listed on that Appendix. Species listed on Appendix II are those that are not necessarily threatened with extinction but may become so unless trade is closely controlled. Specimens must be accompanied by an export permit or a re-export certificate. Permits and certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, above all that trade will not be detrimental to the survival of the species in the wild (CITES, n.d.).

The 175 CITES Parties are required to file Annual Reports with the CITES Secretariat on the import and export of listed species. These reports are compiled into an electronic, searchable trade database by the United Nations Environment Programme, in cooperation with the World

Conservation Monitoring Centre (UNEP-WCMC), which is available to the public on the CITES website (www.cites.org). This database can be used to determine the level, of legal international trade as well as the types and sources of African lions and their parts that are involved. In the context of CITES, international trade is not limited to commercial trade,[3] but also includes international trade associated with breeding, circus or travelling exhibition, education, enforcement, trophy hunting, medicinal, personal use, reintroduction, scientific research, and for zoological exhibition. By examining purposes of trade, the CITES trade database can be used to evaluate the reasons behind the movement of African lions and their parts across international borders by humans. The database also includes the source of African lions and their parts in international trade, whether captive-bred,[4] captive-born,[5] illegal, pre-Convention,[6] ranch-raised, or wild. While the CITES trade database is the principal source of information on international trade in African lions and their parts, it does not contain information on domestic use of African lions or their parts for commercial, recreational, or scientific purposes; nor does it account for poaching and illegal trade, except where illicit international trade has resulted in a seizure.

The African lion is clearly over-utilized. The original analysis presented in this Petition shows that between 1999 and 2008, 28,197 African lion specimens (lions, dead or alive, and their parts and derivatives), the equivalent of at least 10,902 lions, were traded internationally for all purposes (Table A1). This figure was derived by adding the figures for four types of specimens that likely represent one lion each: bodies, skins, live, and trophies. Skulls and bones were not included in this calculation because after lions are hunted, their skin is usually removed, leaving the skull and other bones and body parts; in this analysis, the skin or trophy is used to represent a lion, not the skull or bones. The most commonly-traded items were scientific specimens (13,260), trophies (7,897), live lions (1,844), claws (1,291), skulls (1,214) and skins (1,025) (Table A1). Other lion parts in international trade include bones (127), hair (223), and teeth (802). Over this decade, the U.S. imported 16,021 lion specimens (57 percent of the total), which is the equivalent of at least 4,759 lions (44 percentage of the total). The most common purposes of international trade were for commercial, recreational hunting, and scientific purposes.

Of the aforementioned trade from all sources, 21,914 African lion specimens (lions, dead or alive, and their parts and derivatives), reported as being from a wild source, being the equivalent of at least 7,445 lions, were traded internationally for all purposes. Of this trade, the U.S. imported 13,484 lion specimens reported as being from a wild source (62 percent of the total), which is the equivalent of at least 4,021 lions (54 percent of the total). The most common purposes of this international trade were scientific, recreational and commercial.

The African lion is one of the most well-studied of the big cats. Thus, almost half the specimens in international trade (13,260 of 28,197, or 47 percent) were themselves categorized as specimens, which are often scientific specimens; indeed, the majority of these (12,711 of 13,260,

[3] In the context of CITES, "commercial" means that the purpose of trade, in the country of import, is to obtain economic benefit (whether in cash or otherwise), and is directed toward resale, exchange, provision of a service or any other form of economic use or benefit.
[4] "Offspring of second generation, F2, or subsequent generation, (F3, F4, etc.) are specimens produced in a controlled environment from parents that were also produced in a controlled environment" (CITES Resolution Conf. 10.16 (Rev.)).
[5] "First generation offspring, f1, are specimens produced in a controlled environment from parents at least one of which was conceived in or taken from the wild" (CITES Resolution Conf. 10.16 (Rev.)).
[6] In the context of CITES, "pre-Convention" means before the provisions of CITES applied to that specimen (CITES Resolution Conf. 13.6, http://www.cites.org/eng/res/13/13-06.shtml).

or about 96 percent) were traded for scientific purposes (Tables A2 and A3). However, the units of measurement used for these specimens are not standardized (measurements include ml., g., kg., and flasks) and, in most cases, the unit of measurement was not recorded at all. Thus, it is impossible to know from these data the impact of international trade in lion specimens for scientific purposes.

The most common purposes of international trade (other than for scientific purposes, as explained above) were for hunting trophy purposes (9,224 items) and for commercial purposes (3,102 items). The U.S. is the main importing country of lion items as both hunting trophies and for commercial purposes (52.5 percent and 59 percent, respectively).

### 1. Recreational Trophy Hunting

From 1999 through 2008, 9,224 lion specimens were traded internationally as hunting trophies. Specimens traded for the reported purpose of hunting trophy[7] included not only 'trophies', although these were the most common form in trade, but also fourteen other types of specimens including bodies, bones, skulls, skins, teeth, tails and even live animals (Table A4). The 9,224 lion specimens in trade represent a minimum of 7,565 lions (adding bodies (28), live (5), skins (421) and trophies (7,111)). The number of trophies traded internationally in 2008 (1,140) was larger than any other year in the decade studied and more than twice the number in 1999 (518). Most of the specimens traded internationally for trophy hunting purposes were imported to the U.S.: 4,846 specimens (53 percent of the total), representing a minimum of 4,175 lions (55 percent of the total) (Table A5). Other significant importing countries were Spain (958), France (564), and Germany (525). Most hunting trophies were exported from South Africa (4,202) and Tanzania (2,247), which together accounted for 70 percent of those in international trade over the decade. Mozambique (695), Zimbabwe (951), and Zambia (465) were also significant exporting countries (Table A6).

Of the aforementioned trade from all sources, 7,090 lion specimens, reported as being from a wild source, were traded internationally for recreational trophy hunting purposes, representing a minimum of 5,663 lions. Most of these specimens were imported to the U.S.: 4,139 specimens (58 percent of the total), representing a minimum of 3,600 lions (64 percent of the total). Despite the significant and continuing population and range declines that this subspecies has suffered and continues to suffer, the number of lion trophies, reported as being from a wild source and traded for hunting trophy purposes, imported to the U.S., is increasing. Of these trophies, the number imported into the U.S. in 2008 was larger than any other year in the decade studied and more than twice the number in 1999.

When considering the impact of trophy hunting on the African lion, one must consider how killing one lion can result in the death of other lions. Trophy hunters preferentially seek adult male lions. When an adult male lion, which is part of a pride, is killed by a trophy hunter, surviving males who form the pride's coalition may become vulnerable to takeover by other male coalitions – often resulting in injury or death to the defeated males. Replacement male(s) who take over the pride will usually kill all pride cubs less than nine months of age in the pride

[7] 'Hunting trophies' are for personal use not for sale in the importing country, unlike "commercial" trophies.

(Whitman et al., 2004). Similarly, lionesses defending their cubs from the victorious males are sometimes killed during the takeover (Packer, Pusey, & Eberly, 2001).

Whitman et al. (2004) used a model to determine that these additional impacts could be largely avoided by restricting trophy hunting to males at least 5-6 years of age because this allows younger males to reproduce. However, the method is only rigorously enforced in one area of one lion range State, the Niassa Reserve of Mozambique (Begg & Begg, 2010). Indeed, hunting organizations in Zambia, Zimbabwe, and Tanzania allow hunting of males as young as 2 years, which is the age at which male lions become mature (Packer et al., 2009). Females were, until recently, shot as trophies in Zimbabwe, a practice that experts consider to be "inherently harmful to a population" (Packer, Whitman, Loveridge, Jackson, & Funston, 2006, p. 7).

Recent analysis has shown that trophy hunting has likely contributed to the decline of lion populations in many areas (Packer et al., 2009). Consistent hunting intensity should yield consistent hunting off-take; therefore a decline in off-take indicates a decline in species population. Packer et al. (2009) found that, over the past 25 years, the steepest declines in the number of lions killed by hunters occurred in African countries with the highest hunting intensity. While Tanzania has the largest lion population of any country on the Continent, it also has the highest lion off-take through trophy hunting. Within Tanzania, hunting areas in the Selous Game Reserve with the highest lion off-take showed the steepest declines between 1996 and 2008, as did hunting regions outside of the Selous with the highest off-take (Packer et al., 2009). Across all of Tanzania, off-take has declined by 50 percent over the past 13 years despite increasing demand and hunting effort (Packer et al., 2009). This declining off-take cannot be attributed to habitat loss or to human-lion conflict (Packer et al., 2011). Instead the data strongly suggests that lion populations in the hunting areas declined as a direct consequence of over-hunting (Packer et al., 2011).

Packer et al. (2009) states that although trophy hunting of African lions:

> is often portrayed as an economic strategy for increasing support for carnivore conservation, local communities often seek extirpation of problem animals… Thus, sport hunting quotas may sometimes reflect pressures to control carnivores rather than to conserve them. Across Africa, countries with the highest intensity of lion off-take also had the highest number of livestock units per million hectares of arable land. (p. 3)

Packer et al. (2009) concludes that "Sport hunting is an inherently risky strategy for controlling predators as carnivore populations are difficult to monitor and some species show a propensity for infanticide that is exacerbated by removing adult males" (p.1).

### 2. Commercial trade

From 1999 to 2008, 3,102 lion specimens, the equivalent of at least 1,328 lions (adding trophies, skins, live and bodies), were traded internationally for commercial purposes (defined as "for the purpose of sale in the importing country") (Table A7). The most common lion specimens traded

for commercial purposes were claws (764), trophies (508), skins (442), live (320[8]), skulls (144) and bodies (58). Of this trade, the U.S. imported 1,846 lion specimens (59 percent of the total), the equivalent of at least 401 lions (30 percent of the total) (Table A8). Other significant importers were South Africa (282), and Germany (178). The main exporting countries for commercial purposes were Zimbabwe (914 items), South Africa (867) and Botswana (816) (Table A9); these three countries accounted for 83.7 percent of all specimens in such trade.

Of the aforementioned trade from all sources, 2,715 lion specimens, reported as being from a wild source, the equivalent of at least 1,043 lions, were traded internationally for commercial purposes (defined as "for the purpose of sale in the importing country.") Of this trade, the U.S. imported 1,700 lion specimens (63 percent of the total), the equivalent of at least 362 lions (35 percent of the total). The most common lion specimens traded for commercial purposes were claws, trophies, skins, live animals, skulls and bodies.

The figure of 1,328 lions traded for commercial purposes was derived by adding the number of specimens traded as trophies, skins, live animals and bodies. Looking more specifically at these four types of specimens in commercial trade, we found the following:

- Trophies of 508 lions were traded internationally for commercial purposes over the decade (Table A10). The U.S. imported most of these (241), accounting for 47 percent of those imported (Table A10). Most of these trophies were exported from South Africa (241) and Zimbabwe (229) which, together, accounted for 92.5 percent of all such exports (Table A11).
- The skins of 442 lions were traded internationally for commercial purposes over the decade (Table A7). Most were imported by South Africa (162) or the U.S. (123) which, together, accounted for 64.5 percent of such imports (Table A12). Most such skins were exported by Botswana (239) which comprised 54 percent of such exports (Table A13). Other significant exporting countries included Zimbabwe (94) and South Africa (66).
- Data on the international trade in live lions for commercial purposes indicate that 320 live lions were traded for such purposes during the decade (Table A7). Many countries imported and exported live lions in small quantities over the decade, but the largest importer was South Africa (78) (Table A14) and the largest exporters were Zimbabwe (52) and South Africa (47) (Table A15).
- Bodies of 58 lions were traded internationally for commercial purposes over the decade (Table A7). The U.S. imported most of these (18), accounting for 31 percent of those imported. Most of these bodies were exported from South Africa (20) and Zimbabwe (18) which, together, accounted for 66 percent of all such exports.

Appendix B contains examples of lion parts offered for sale on the internet. These range from USD 6,300 for a lion 'rug' to USD 22,400 for a mounted lion trophy, and from USD 700 for an African lion claw necklace, to USD 600 for a lion skull, and a complete set of African lion claws for USD 1,200. Other items offered for sale on the internet include skulls and bones.

[8] There is a discrepancy in the number of live lions traded for commercial purposes between the exporting countries which reported 320, and the importing countries which reported 321.

As with African lions killed for trophy hunting purposes, the additional impacts of the use of lions for commercial purposes must be considered. The most common lion items in international commercial trade (for sale in the importing country) are trophy mounts and skins. Judging by the offers of sale of trophy mounts and skins found on the internet (Appendix B), both males and females are used for these purposes. The killing of males or females for commercial trade in their parts has effects that will negatively impact wild populations.

### 3. Wild Source Versus Captive Source

According to the data, over the decade studied, 21,914 of the 28,197 lion specimens traded internationally originated in the wild (Table A16); this means that 77.7 percent of lion specimens in such trade originated in the wild. Of the 7,897 trophies so traded, 6,326 or 80 percent reported as being from a wild source. Similar trends occurred in the trade in claws (1,080 of 1,291), skulls (1,030 of 1,214) and skins (840 of 1,025). In contrast, of the 1,844 live lions traded over the decade, 179 or only 9.7 percent originated in the wild. The data indicate that at least 7,445 wild source lions were traded internationally between 1999 and 2008. This figure was derived by adding the figures for four types of specimens that likely represent one lion each: bodies (100), live (179), skins (840), and trophies (6,326).

The aforementioned international trade figures include lion specimens reported as being from a wild source that were exported from South Africa. From 1999 to 2008, South Africa reported exporting a number of specimens equivalent to 2,862 wild source lions. Since the estimated number of wild lions in South Africa in 2002 ranges between 2,716 and 3,852 it seems highly unlikely that the aforementioned 2,862 South African lions involved were all wild source. Therefore, the South Africa trade data specifically must be treated with caution.

Over the decade, 7,288 specimens from captive-bred lions were traded internationally (Table A17). Other than scientific specimens, trophies were the most abundant item from captive-bred lions (2,366); the number of trophies from captive-bred lions in international trade increased dramatically and steadily over the decade with the number in 2008 (710) being over 24 times than that in 1999 (29). The parts and products of at least 4,288 captive-bred lions were traded during the decade (derived by adding bodies (35), live (1,686), skins (201), and trophies (2,366))**.**

While many countries engage in international trade in captive-bred lion specimens, South Africa exports more than any other country (Table A18). Over the decade, South Africa exported 3,333 such specimens, or 46 percent of the total; such exports increased dramatically from only 32 specimens in 1999 to 921 specimens in 2008, an almost 29-fold increase.

In contrast to ‘wild’ and ‘captive-bred’ sources, few lion specimens were reported to have originated from other sources such as ‘F-1 captive-born’ (Table A19), ‘pre-Convention’ (Table A20), ‘ranch-raised’ (Table A21), or illegal (Table A22).

### 4. International Trade in African Lions and their Parts by Source Country

Twenty African range States exported lions and lion parts reported as being wild source between 1999 and 2008 (Table 4). A country-by-country examination of the number of African lions

exported and reported as being from a wild source, and the status of the wild population in each country reveals that off-take was unsustainable in at least sixteen of these twenty range States. Specifically, the U.S. imported lion specimens from twelve range States where the reported data indicate that the off-take was unsustainable. Therefore, even setting aside the South African data, clearly the lion is overexploited for these purposes across sub-Saharan Africa.

Table 4. Summary of numbers of wild source lions exported from range States, compared with estimated and average population in each State.

| Lion Range States | Population Size[9] | | | No. wild source lions estimated in inter-national trade, 1999-2008 | Avg. annual wild source trade as percent of Avg. pop. size[10] | Notes |
|---|---|---|---|---|---|---|
| | Chardonnet, 2002 | Bauer & Van Der Merwe, 2004 | Avg. Chardonnet and Bauer & Van Der Merwe | | | |
| Angola (AO) | 749 | 450 | 599 | 0 | 0 | ▪Angola is a lion range State but is not a CITES Party, so there is no trade information for this country. |
| Benin (BJ) | 325 | 65 | 195 | 25 | 1.3 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004)<br>▪ Sustainable off-take hardly possible due to small, isolated populations (Bauer, De Iongh, Princée, & Ngantou, 2003)<br>▪ U.S. imported specimens from this country, 1999-2008 |
| Botswana (BW) | 3207 | 2918 | 3063 | 422 | 1.4 | ▪ Trophy hunting did not take place in 2001-2004 and 2007-2008. However Botswana exported wild lion specimens for other purposes<br>▪ Trophy hunting likely contributed to population decline in 1980s and 1990s (Packer et al., 2009)<br>▪U.S. imported specimens from this country, 1999-2008 |
| Burkina Faso (BF) | 444 | 100 | 272 | 134 | 4.9 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004) |

[9] Sources: Three left columns from IUCN SSC Cat Specialist Group, 2006a (https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxhZnJpY2FubGlvbmNvYWxpdGlvbnxneDo3ODZkMGI3MThkYjMyYTE3, page 15) and IUCN SSC Cat Specialist Group, 2006b (https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxhZnJpY2FubGlvbmNvYWxpdGlvbnxneDo0NDliMTJhMjY1ODk3Y2Nh , page 14)

[10] Note that population data are at least 10 years old (from 2002).

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | ▪ Sustainable off-take hardly possible due to small, isolated populations (Bauer et al., 2003)<br>▪ U.S. imported specimens from this country, 1999-2008 |
| Burundi (BI) | Not listed | Not listed | 0 | 0 | 0 | ▪Presence uncertain: (Bauer et al., 2008): |
| Cameroon (CM) | 415 | 260 | 338 | 104 | 3.1 | ▪ Sustainable off-take hardly possible due to small, isolated populations (Bauer et al., 2003)<br>▪U.S. imported specimens from this country, 1999-2008 |
| CAR (CF) | 986 | 300 | 643 | 49 | < 1 | ▪ Sustainable off-take hardly possible due to small, isolated populations (Bauer et al., 2003)<br>▪ Trophy hunting likely contributed to population decline in 1980s and 1990s (Packer et al., 2009)<br>▪U.S. imported specimens from this country, 1999-2008 |
| Chad (TD) | 520 | 150 | 335 | 16 | < 1 | ▪ Sustainable off-take hardly possible due to small, isolated populations (Bauer et al., 2003) |
| Congo (CG) | 60 | 0 | 30 | 0 | 0 | ▪ Presence uncertain: (Bauer et al., 2008)<br>▪No known resident lion populations (Henschel et al., 2010) |
| Cote d'Ivoire (CI) | 100 | 30 | 65 | 1 | < 1 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004)<br>▪No resident lion populations found (Henschel et al., 2010)<br>▪ Sustainable off-take hardly possible due to small, isolated populations (Bauer et al., 2003)<br>▪ U.S. imported specimens from this country, 1999-2008 |
| DRC (CD) | 556 | 240 | 398 | 0 | 0 | |
| Ethiopia (ET) | 1477 | 1000 | 1239 | 16 | < 1 | ▪U.S. was the major importer of specimens from this country, 1999-2008 |
| Gabon (GA) | 20 | 0 | 10 | 3 | 3 | ▪(Bauer et al.,2008): possibly extinct<br>▪ Sustainable off-take hardly possible due to small, isolated populations (Bauer et al., 2003) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Ghana (GH) | 15 | 30 | 23 | 0 | 0 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004)<br>▪No resident lion population (Henschel et al., 2010) |
| Guinea (GN) | 27 | 200 | 114 | 0 | 0 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004) |
| Guinea Bissau (GW) | 10 | 30 | 20 | 0 | 0 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004) |
| Kenya (KE) | 2749 | 2280 | 2515 | 10 | < 1 | ▪U.S. imported specimens from this country, 1999-2008 |
| Malawi (NW) | 25 | n/a | 25 | 0 | 0 | |
| Mali (ML) | 21 | 50 | 36 | 0 | 0 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004) |
| Mozambique (MZ) | 955 | 400 | 678 | 206 | 3.0 | ▪U.S. imported specimens from this country, 1999-2008 |
| Namibia (NA) | 691 | 910 | 801 | 204 | 2.5 | ▪ Trophy hunting contributed to population decline in 1980s and 1990s (Packer et al., 2009)<br>▪U.S. imported specimens from this country, 1999-2008 |
| Niger (NE) | 47 | 70 | 58 | 2 | < 1 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004)<br>▪ Sustainable off-take hardly possible due to small, isolated populations (Bauer et al., 2003) |
| Nigeria (NG) | 85 | 200 | 142 | 0 | 0 | ▪West Africa population is Regionally Endangered (Bauer& Nowell, 2004) |
| Rwanda (RW) | 45 | 25 | 35 | 0 | 0 | |
| Senegal (SN) | 156 | 60 | 58 | 0 | 0 | ▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004) |
| Somalia (SO) | 217 | n/a | 217 | 0 | 0 | |
| South Africa (ZA) | 3852 | 2716 | 3284 | 2862 | 8.7 | ▪8.7% annual off-take cannot be sustainable<br>▪U.S. imported specimens from this country, 1999-2008 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sudan (SD) | 866[11] | n/a | 866 | 48 | < 1 | |
| Swaziland (SZ) | 27 | 15 | 21 | 7 | 3.3 | ▪ Lions were extirpated from Swaziland but have been reintroduced into fenced areas<br>▪ With a population of only 21 lions, the export of 3 lions per year cannot be sustainable<br>▪U.S. imported specimens from this country, 1999-2008 |
| Tanzania (TZ) | 14432 | 7073 | 10752 | 2186 | 2 | ▪ Trophy hunting likely contributed to population decline in 1980s and 1990s (Packer et al., 2009)<br>▪ Trophy hunting, as currently managed, is unsustainable (Packer et al., 2011)<br>▪U.S. imported specimens from this country, 1999-2008 |
| Togo (TG) | transient | 0 | 0 | 1 | > 100 | ▪Lion presence uncertain (Bauer et al., 2008)<br>▪West Africa population is Regionally Endangered (Bauer & Nowell, 2004)<br>▪ Sustainable off-take not possible due to small, isolated populations (Bauer et al., 2003) |
| Uganda (UG) | 618 | 575 | 596 | 0 | 0 | |
| Zambia (ZM) | 3199 | 1500 | 2349 | 520 | 2.2 | ▪ Trophy hunting likely contributed to population decline in 1980s and 1990s (Packer et al., 2009)<br>▪U.S. imported specimens from this country, 1999-2008 |
| Zimbabwe (ZW) | 1686 | 1037 | 1362 | 1214 | 8.9 | ▪ Lion hunting in Zimbabwe is unsustainable (Packer et al., 2006)<br>▪Trophy hunting likely contributed to population decline in 1980s and 1990s (Packer et al., 2009)<br>▪U.S. imported specimens from this country, 1999-2008 |

Below are summaries from data in Appendix A (Tables A23 through A92) including 24 source countries, listed alphabetically.

[11] IUCN SSC Cat Specialist Group (2006a) (W& C Africa) and (2006b) (E&S Africa) both contained tables of lion population sizes in the two regions covered. However, Sudan was included in both publications: in IUCN SSC Cat Specialist Group (2006a) under the Central Africa region, and in IUCN SSC Cat Specialist Group (2006b) under the East Africa region. In both IUCN documents, it is stated that the data in the original references (Chardonnet, 2002 and Bauer & Van Der Merwe, 2004), which were recorded by populations, were combined, as appropriate, to provide national estimates. However, since Sudan occurred in both documents and the population estimates therein were different, Chardonnet was examined and the sizes of populations in Sudan were added to obtain the value in Table X.

### a) Benin

Between 1999 and 2008, 47 lion specimens were exported from Benin (Table A23). This included 11 skins and 14 trophies as well as six live animals. The six live animals were from captive-bred sources but all remaining specimens were from wild sources. All exported specimens originated in Benin. This represents at least 25 wild lions. France was the main importer of trophies for personal or hunting trophy purposes, while the U.S. was the main importer of the skins and skin pieces for scientific purposes (Table A24). Bauer et al. (2003) stated that, considering the small populations and their isolation, sustainable off-take in West Africa and Central Africa was "hardly possible". Thus, it is of concern that 25 wild source lions were exported from Benin during the decade; this is 12.8 percent of the population (25 of 195). Annualized, these exports represent 1.3 percent of the population Table 4.

### b) Botswana

Botswana banned lion trophy hunting (Packer et al., 2009) in 2001-2004 and again in 2007 through the present (Davidson, Valeix, Loveridge, Madzikanda, & Macdonald, 2011), owing to concerns over the species' conservation status within the country, but commercial trade in lions and lion parts continues. Between 1999 and 2008, Botswana exported 5,633 lion specimens including 5,148 scientific specimens, 155 trophies, 274 skins, 31 live animals and two bodies. This represents the export of at least 462 lions (adding trophies, skins, live animals and bodies) (Table A25). 5,606 of 5,633 (99.5 percent) lion specimens exported from Botswana during the decade originated from a wild source (Table A26). This represents at least 435 wild source lions (adding bodies (2), live (4), skins (274), and trophies (155)). However, twelve of the wild source lion trophies exported originated in Mozambique and one in Zimbabwe; thus the total number of Botswana wild source lions exported during the decade was 422.The only other sources of lions exported were captive-bred (13) and captive-born (14) (Table A27). Of the 435 wild source lions or their parts exported, 249 were exported for commercial purposes most of which were skins (229) to South Africa (Table A28). The trophies and skins of 149 lions were exported as hunting trophies, most of which were trophies (104) exported to the U.S. (Table A29). The parts of an additional 35 lions were exported for personal purposes including 30 skins to South Africa (Table A30). A large number of specimens were exported from Botswana for scientific purposes (Table A31), particularly to the U.S.. Botswana exported 423 wild source lions 1999-2008 out of a population of 3,063, or 13.8 percent of the population (annualized, this is 1.4 percent of the population). Although Botswana placed a moratorium on lion trophy hunting from 2001 through 2004 (Packer et al., 2009), and no trophies were exported those years, export of trophies resumed thereafter, averaging 23 per year 2005-2008, as did the export of skins to South Africa for commercial purposes, averaging 17.6 per year 2004-2008.

Packer et al. (2009) discussed the historic over-utilization of lions in Southern Africa, stating that "…offtakes peaked, then fell sharply in the 1980's and 1990's in Botswana, CAR, Namibia, Tanzania, Zambia and Zimbabwe." This downward harvest trend "…most likely reflected declining population sizes: success rates (as measured by harvest/quota) have fallen" for lions (Packer et al., 2009, p. 2). This occurred even as demand for lion trophies has grown in the U.S. and has held stable in the European Union since the mid-90s. Packer et al. (2009) identified Botswana as one of the countries where trophy hunting is likely to have contributed to the decline in lion populations in the 1980s and 1990s.

### c) Burkina Faso

Between 1999 and 2008, 134 wild source lion trophies were exported from Burkina Faso for either hunting trophy or personal purposes (Tables A32 and A33). Analysis revealed lions were not exported from other sources or for other purposes, and all originated in Burkina Faso. This represents 134 wild lions. The largest importer was France (104 of 134 or 77.6 percent) although the U.S. also imported some of these. Bauer and colleagues stated that, considering the small populations and their isolation, sustainable off-take in West Africa and Central Africa was "hardly possible" (Bauer et al., 2003). Thus, it is of concern that 134 wild source lions were exported from Burkina Faso during the decade; this is 49 percent of the population (134 of 272). Annualized, these exports represent 4.9 percent of the population (Table 4).

### d) Cameroon

Between 1999 and 2008, 192 lion specimens were exported from Cameroon (Table A34). These included 1 live specimen from a captive-bred source exported to South Africa, wild source specimens and skin pieces exported for scientific purposes, and wild source trophies (103), skins (1), skulls (1), and teeth (1) exported as hunting trophies or for personal purposes. Trophies were exported mainly to France (53) but also the U.S. (15) and Spain (10). All exported specimens originated in Cameroon. This represents 104 wild lions. Bauer and colleagues stated that, considering the small populations and their isolation, sustainable off-take in West Africa and Central Africa was "hardly possible" (Bauer et al., 2003). The continued deterioration in lion numbers in Central Africa (Henschel et al., 2010) means that sustainable off-take are less likely now than in 2003. Thus, it is of concern that 104 wild source lions were exported from Cameroon during the decade; this is 31 percent of the population (104 of 338). Annualized, these exports represent 3.1 percent of the population (Table 4).

### e) Central African Republic

Between 1999 and 2008, 49 lion specimens, in the form of trophies only, were exported from Central African Republic (CAR) (Table A35). All of these were from wild sources, were traded as hunting trophies or for personal purposes, and originated in CAR. France was the main importer but the U.S. also imported some of these. This represents 49 wild lion specimens. Bauer et al. (2003) stated that, considering the small populations and their isolation, sustainable off-take in West Africa and Central Africa was "hardly possible". The alarming situation of lion populations in Central Africa (Henschel et al., 2010) means that sustainable off-takes are less likely now than in 2003. Packer et al. (2009) identified CAR as one of the countries where trophy hunting is likely to have contributed to the decline of lion populations in the 1980s and 1990s. Thus, it is of concern that 49 wild source lions were exported from CAR during the decade; this is 8 percent of the population (49 of 643). Annualized, these exports represent less than 1 percent of the population (Table 4).

### f) Chad

Between 1999 and 2008, Chad exported two trophies to Poland and thirteen to France, all from wild sources, for hunting trophy purposes. In addition, Chad exported one wild source skin to Poland for personal purposes. All originated in Chad. Thus, Chad exported sixteen wild source lions during the decade. Bauer et al. (2003) stated that, considering the small populations and their isolation, sustainable off-take in West Africa and Central Africa was “hardly possible”. The alarming situation of lions in Central Africa (Henschel et al., 2010) means that sustainable off-takes are less likely now than in 2003. Thus, it is of concern that 16 wild source lions were exported from Chad during the decade; this is 5 percent of the population (16 of 335). Annualized, these exports represent less than 1 percent of the population (Table 4).

### g) Congo

The lion is likely to be extinct in Congo (Henschel et al., 2010). Between 1999 and 2008, Congo exported two teeth to Norway from an illegal source for personal purposes.

### h) Côte d'Ivoire

Between 1999 and 2008, only one skin was exported from Côte d'Ivoire in 2001; it was from a wild source, originated in Côte d'Ivoire and was traded for commercial purposes to the U.S.. The one lion skin exported from Cote d’Ivoire to the U.S. for commercial purposes may have been the last lion in the country, since Henschel et al. (2010) did not find any lions in that country. Thus, it is of concern the U.S. legally imported a lion skin from Côte d'Ivoire a country that may no longer have lions.

### i) Ethiopia

Between 1999 and 2008, 399 lion specimens were exported from Ethiopia (Table A36). Most were specimens for scientific purposes. However, exports included 14 trophies for hunting trophy purposes, and two skins for personal purposes (Tables A37 and A38), all from wild source lions that originated in Ethiopia. This represents at least 16 wild lions which is two percent of the population (16 of 1,239). Annualized, these exports represent less than one percent of the population (Table 4). The U.S. was the major importer of lion trophies from Ethiopia.

### j) Gabon

From available evidence it seems likely that lions are extinct in Gabon (Henschel et al., 2010). Between 1999 and 2008, one skin and four trophies were exported from Gabon to France. Two trophies were pre-Convention and traded for personal purposes, two trophies were wild source and traded for hunting purposes, and one skin was wild source and traded for personal purposes. All were of Gabonese origin. This represents three wild source lions, 33 percent (3 of 10) of the population at the time. Annualized, these exports represent 3 percent of the population (Table 4). These legally exported specimens may have been Gabon’s last lions.

### k) Kenya

Trophy hunting was banned in Kenya in 1977 (Lindsey, Alexander, Frank, Mathieson, & Romanach, 2006), but commercial trade continues. Between 1999 and 2008, 2,108 lion specimens were exported from Kenya; most were scientific specimens (2,025 of 2,108 or 96 percent) (Table A39). Exports also included 3 bodies, 8 claws, 1 garment, 50 hair, 5 leather products, one live animal, two skin pieces, 8 skins, three teeth and two trophies. All specimens exported were from wild lions that originated in Kenya (Table A40) except for one skin exported to France in 2003 which was from a captive-bred lion, two claws and 35 specimens which were from an illegal source, and two leather products and three skins which were pre-Convention (Table A41). Thus, Kenya exported 10 wild lions or their parts during the decade (adding three bodies, one live animal, four skins, and two trophies). Two of the bodies were part of a travelling exhibition and one was exported to the U.S. for personal purposes; the one live lion was exported to Uganda for reintroduction purposes; the four skins were exported to the Netherlands (1) and the U.S. (3) for personal purposes; and the two trophies were exported to the U.S. (1) and the U.K. (1) for personal purposes (Table A42). Exports also included 110 specimens exported to the U.S. for commercial purposes in 2000. Ten wild source lions were exported from Kenya during the decade; this is less than one percent of the population (10 of 2,515). Annualized, these exports represent less than one percent of the population (Table 4).

### l) Liberia

Between 1999 and 2008, Liberia exported two live, wild source lions to South Africa in 2004 for commercial purposes. Liberia is not a lion range State (Bauer et al., 2008); however, the UNEP-WCMC database identifies Liberia as the origin of these lions.

### m) Mozambique

Between 1999 and 2008, Mozambique exported 953 lion specimens including teeth (697), trophies (162), skulls (46) and skins (44) (Table A43). None of the exported specimens originated in another country. Thus, this represents at least 206 lions (adding trophies and skins). Trends in the data include: the export of skins, skulls and teeth dropped off or ended after 2001 and now the principal export is trophies which numbered, on average, 18 in the past five years. All specimens exported from Mozambique were of wild source and for personal or hunting trophy purposes only. Most trophies were exported to South Africa (47), the U.S. (41) or Spain (41) (Table A44). Very few lion specimens were traded for personal purposes (Table A45), although 231 teeth were imported to the U.S. in 1999. Thus, it is of concern that 206 wild source lions were exported from Mozambique during the decade; this is 30 percent of the population (206 of 678). Annualized, these exports represent 3 percent of the population (Table 4). A more recent population estimate speculates that there are a greater number of lions in Mozambique than previously thought (Chardonnet et al., 2009).

### n) Namibia

Between 1999 and 2008, Namibia exported 1,013 lion specimens including 683 scientific specimens, trophies (168), skins (42), live animals (5) and bodies (2). This represents the export of at least 217 lions (adding trophies, skins, live animals and bodies) (Table A46). Of the 1,013

lion specimens exported from Namibia, 1,008 or 99.5 percent, were from wild sources. This represents the export of at least 212 wild lions (adding trophies (167), live (1), skins (42) and bodies (2)) (Table A47). However, of these, the one live lion originated in South Africa, two trophies came from Tanzania, two from Zimbabwe and three from South Africa. Thus the total number of wild source lions of Namibian origin exported during the decade was 204. Very few specimens from non-wild sources were exported from Namibia (Table A48). Of the 1,008 wild source lion specimens in trade, 305 or 30 percent, were traded for hunting trophy purposes (Table A47). These included 7 skins and 133 trophies. The U.S. was the main importer of lion specimens from Namibia for hunting trophy purposes (Table A49). Of the 1,008 wild source lion specimens, 78 or 7.7 percent, were for personal purposes (Table A50). These included two bodies, 29 skins, and 38 trophies. Wild source specimens were also traded for the additional purposes including: circus /travelling exhibition (1), commercial (72) and skins (5) (Table A51). Thus, it is of concern that 204 wild source lions were exported from Namibia during the decade; this is 25 percent of the population (204 of 801). Annualized, these exports represent 2.5 percent of the population (Table 4).

The number of trophies exported from Namibia grew from 10.4 per year on average between 1999 and 2003 to 23.2 per year on average between 2004 and 2008. Packer et al. (2009) discussed the historic over-utilization of lions in Southern Africa, stating that "…off-takes peaked then fell sharply in the 1980's and 1990's in Botswana, CAR, Namibia, Tanzania, Zambia and Zimbabwe". This downward harvest trend "most likely reflected declining population sizes: success rates (as measured by harvest/quota) have fallen" for lions (Packer et al., 2009, p. 2). This occurred even as demand for lion trophies has grown in the U.S. and has held stable in the European Union since the mid-1990s. Packer et al. (2009) identified Namibia as one of the countries where trophy hunting is likely to have contributed to the decline in lion populations in the 1980s and 1990s.

### o) Niger

Between 1999 and 2008, Niger exported eleven live lions: two wild source lions were exported to Nigeria for commercial purposes; two ranch-raised and three captive-bred lions were exported to Nigeria for zoo purposes; two captive-bred lions were exported to Togo for personal purposes; and two captive-bred lions were exported to Côte d'Ivoire for educational purposes. All exports originated in Niger. This means that at least two wild source lions were exported from Niger during the decade. Bauer et al. (2003) stated that, considering the small populations and their isolation, sustainable off-take in West Africa and Central Africa was "hardly possible". Thus, it is of concern that 2 wild source lions were exported from Niger during the decade; this is 3 percent of the population (2 of 59). Annualized, these exports represent less than 1 percent of the population (Table 4).

### p) Nigeria

From 1999 to 2008, Nigeria exported two lion teeth to the U.S., derived from an illegal source for personal purposes.

### q) Senegal

Between 1999 and 2008, Senegal exported six captive-bred live lions to South Africa for commercial purposes (three in 1999 and three in 2000), and two captive-bred live lions to Mauritania for zoological purposes (both in 2000). All originated in Senegal.

### r) South Africa

Between 1999 and 2008, South Africa exported the parts of at least 5,186 lions (comprising trophies (3,983), skins (630), live (514) and bodies (59)) (Table A52). Of these, 2,962 (about 57 percent) were reported to be from wild lions (adding trophies (2,413), skins (453), live (57) and bodies (39)) (Table A53). Unlike any other range State, South Africa also exported a large number of wild source lion specimens that did not originate in South Africa. During that same time period, 316 wild sourced lion trophies, 397 wild source skins and 3 wild source bodies were imported to South Africa (Table A54) but it is impossible to know from the data how many of these stayed in South Africa or were re-exported. However, it is possible to learn from the data that a minimum of 88 trophies and 12 skins that originated from wild sources in other range States were exported by South Africa during the decade. This means that the impact of international trade on the wild population of lions in South Africa should be determined based on the removal of 2,862 wild lions over the past decade (subtracting the wild imported lion trophies (88) and skins (12) from the wild exported lion parts (2,962)). However, it must be noted that South Africa also produces and exports parts of captive-bred lions, and also imports and then re-exports lion parts from other African range States, but those numbers are not included in these figures. Indeed, despite the presence of these captive-bred source lions, the average number of wild source lion trophies exported annually from South Africa appears to have nearly doubled from 168 in the first half of the decade (1999-2003) to 313 in the second half (2004-2008).

The source countries for the parts of wild lions imported into South Africa were Tanzania, Mozambique, Zimbabwe, Zambia, Botswana and Namibia. Thus, it is of concern that 2,862 wild source lions were exported from South Africa during the decade; this is 87 percent of the population (2,862 of 3,284). Annualized, these exports represent 8.7 percent of the population (Table 4). Since the estimated number of wild lions in South Africa in 2002 ranges between 2,716 and 3,852 it seems highly unlikely that the aforementioned 2,862 South African lions involved were all wild source. Therefore, the South Africa trade data specifically must be treated with caution. Furthermore, South Africa does not rigorously enforce a strict age minimum for trophies.

While the overall Continent-wide trade in wild source lion specimens wavered roughly between 300-600 specimens per year with no trend over the decade, the international trade in lion trophies of wild source from South Africa rose significantly, from 137 specimens in 1999 to 454 in 2008 (Table A53). No such trend was observed for skins or bodies. South Africa also imported wild source lion specimens over the decade (Table A54) including 202 claws, 92 live, 397 skins, 140 skulls, 466 teeth and 316 trophies.

Purposes of international trade in wild source lions from South Africa reveal that trade:

- For hunting trophy purposes were by far the largest in number of all the purpose categories and imports to the U.S. far exceeded numbers imported to other countries (Table A55).
- In live animals for circus and travelling exhibit purposes were relatively few but included one body exported to South Korea in 2008 and 15 lions exported to Zimbabwe in 2002 (Table A56).
- For commercial purposes included trophies, claws and skins but in low numbers compared to those for hunting trophy purposes (Table A57).
- For educational purposes included imports by China of 2 bodies in 2005, 3 skins in 2007, 52 specimens in 2007-2008, and 20 trophies in 2006-2008 (Table A58).
- For medical purposes included 88 specimens imported to Chile in 1999 (Table A59).
- For personal purposes included 23 trophies imported by China (Table A60).

Regarding the hunting of captive-bred lions, Packer et al. (2006) stated, "Captive-bred hunting undermines the conservation credibility of the hunting industry and does nothing to preserve lion habitat" (p. 9). Closer examination of the data revealed that the international trade in captive-bred source lions and lion parts from South Africa rose significantly over the course of the decade, from 56 specimens in 1999 to 969 in 2008 (Table A61). In particular, the number of bodies, bones, live animals and trophies from captive-bred lions rose dramatically over the period. In 2008 alone, the parts of at least 852 captive-bred lions (adding bodies (13), skins (14), trophies (707) and live animals (128)) were exported from South Africa.

Purposes of international trade in captive-bred lions from South Africa reveal that trade:

- For hunting trophy purposes were by far the largest in number of all the purpose categories and imports to the U.S. far exceeded numbers imported to other countries (Table A62).
- For commercial purposes included 25 live lions imported by Togo in 2004, 14 by Thailand 2006-2008, and 10 by Zimbabwe in 2008 (Table A63).
- For educational purposes included 10 live lions imported by China in 2003 and 2004 (Table A64).
- For personal purposes included 60 bones and 16 skin pieces imported to Vietnam (Table A65).
- For zoo purposes were relatively few in number and unremarkable in trend, with the exception of the importation by Thailand of 54 live lions in 2006-2008 (Table A66).

It should also be noted that South Africa imported 131 captive-bred source live lions during the decade for breeding purposes including: fifteen from Argentina (a non-range State), one each from Spain, Germany and France (non-range States), three from Indonesia (a non-range State), 33 from Swaziland, and 77 from Zimbabwe. South Africa also imported eight live wild source lions for breeding purposes including one from the United Arab Emirates (a non-range State) and seven from Swaziland. Another nine captive-born lions were imported from Swaziland for breeding purposes. South Africa also imported 69 captive-bred live lions during the decade for commercial purposes: twelve from Argentina (a non-range State), four from Belgium (a non-range State), twenty from Spain (a non-range State), seven from Italy (a non-range State), eight from Portugal (a non-range State), six from Senegal, eleven from Zimbabwe, and one from Germany (a non-range State). Fourteen captive-born live lions from Botswana were also

imported by South Africa for commercial purposes. Finally, South Africa imported 74 wild source live lions for commercial purposes: Four from Botswana, 16 from Spain; two from Liberia and 52 from Zimbabwe. It should be noted that these purposes are not for traveling exhibitions, such as circuses, or zoos. It is possible that these lions are being used for canned hunting purposes either as breeders or to be shot as trophies.

There is increasing concern that South African exports of lion bones are going to Asia for use in Traditional Chinese Medicine, both for its own perceived value and as a replacement for tiger parts; the illegal trade in tiger parts has had severe, negative impacts on wild tiger populations (Nowell & Ling, 2007). In this regard, it is of interest is that 60 of the 70 bones traded internationally from South Africa during the period were imported by Vietnam in 2008; there are no records of Vietnam importing bones prior to that year. These bones did not originate from wild lions ; they originated from captive-bred lions and were categorized as being traded for "personal" purposes (Table A65). It is not possible to draw conclusions about the impact of trade in these lion bones because the data are not precise enough to determine from how many lions those bones were derived.

### s) Sudan

Between 1999 and 2008, Sudan exported 2 leather products to United Arab Emirates for personal purposes, 22 live animals to United Arab Emirates (six for commercial purposes, four for zoo purposes and the remainder for personal purposes), six live animals to Saudi Arabia for personal purposes, 19 live animals to Syrian Arab Republic (eight for commercial purposes and the remainder for zoo purposes), and one trophy to Saudi Arabia for personal purposes (Table A67). All exported specimens originated in Sudan and were wild source. Thus, Sudan exported at least 48 wild source lions during the decade. Thus, it is of concern that 48 wild source lions were exported from Sudan during the decade; this is 6 percent of the population (48 of 866). Annualized, these exports represent less than 1 percent of the population (Table 4).

### t) Swaziland

Between 1999 and 2008 Swaziland exported 46 live lions to South Africa for breeding (42) and circus/travelling exhibition (4) purposes: seven were from wild sources (all for breeding purposes), 30 from captive-bred sources and nine from captive-born sources. In addition, one trophy from a wild source lion that originated in South Africa was exported to Greece for personal purposes. This means that at least seven wild lions of Swazi origin were exported during the decade. Thus, it is of concern that 7 wild source lions were exported from Swaziland during the decade; this is 33 percent of the population (7 of 21). Annualized, these exports represent 3 percent of the population (Table 4). Swaziland has such a small population of lions that even this number cannot be sustainable.

### u) Tanzania

Between 1999 and 2008, Tanzania exported 4,926 lions and lion parts. This included 2,083 trophies, one live animal, and 102 skins, representing a minimum of 2,186 lions (Table A68). In contrast to South Africa, virtually none of the specimens exported by Tanzania were from a

captive-bred source (the exception being one trophy imported by the U.S. in 2000). The only other source of specimens in trade was "illegal" and these were very few (Table A69). Tanzania did not export lions for breeding, circus, education, enforcement, medical, reintroduction, or zoo purposes. Tanzania exported very few lions or their parts for commercial purposes (Table A70). Setting aside scientific specimens from wild source lions (Table A71), virtually all of the lion specimens exported from Tanzania were for hunting trophy purposes (Table A72). Unlike South Africa, only four of the exported trophies originated in another country (all from South Africa). At least 2,131 wild lions were killed in Tanzania over the past decade for the international trade in hunting trophies (adding "trophies" (2,015) and "skins" (87) and subtracting the four imported trophies). An additional 67 items were exported for personal purposes, representing 62 wild lions (Table A73). Most wild source lion skins exported from Tanzania for hunting trophy purposes went to South Africa (44) and Germany (29) (Table A74). The U.S. is the largest importer of wild source hunting trophies exported from Tanzania, with 47 percent (956); other major importers were France (283), Spain (212), Mexico (122) and South Africa (109) (Table A75). Thus, it is of concern that 2,186 wild source lions were exported from the Tanzania during the decade; this is 20 percent of the population (2,186 of 10,753). Annualized, these exports represent 2 percent of the population (Table 4).

Lion off-take for trophy hunting in Tanzania is considered to be unsustainable. In trophy hunting areas the primary cause of declines in lion populations is trophy hunting (Packer et al., 2011). Packer et al. (2009) identified Tanzania as one of the countries where trophy hunting is likely to have contributed to the decline in lion populations in the 1980s and 1990s. The U.S. is by far the largest importer of hunting trophies from Tanzania.

### v) Togo

Between 1999 and 2008, Togo exported one wild source trophy to South Africa in 2001 for hunting trophy purposes, one skin from a ranch-raised lion to South Africa in 2001 for personal purposes, and one captive-bred live lion that originated in South Africa, to Libyan Arab Jamahiriya in 2002 for personal purposes. It is of concern that one wild source lion was legally exported from Togo in 2001 because there were no known resident lions as of 2002 (Bauer & Van Der Merwe, 2004). The presence of wild lions in Togo remains uncertain (Bauer et al., 2008).

### w) Zambia

Between 1999 and 2008, Zambia exported 567 lion specimens, the vast majority of which were trophies (498) (Table A76). This represents at least 530 lions (adding skins (29), live animals (3), and trophies (498)). All but nine specimens (three live animals plus six trophies) were from wild sources (Table A77). The parts of at least 521 wild source lions were traded during the decade (adding wild source trophies (492) and skins (29)) (Table A78). However, one of the trophies of wild source originated in South Africa; thus the total number of wild source lions of Zambian origin exported is 520. The main purpose of this trade was hunting trophies (470 of 567 specimens) and the U.S. was the main importer of these (262 of 470) (Table A79). Only 26 specimens were traded for other purposes including personal, commercial and scientific (Table A80). Thus, it is of concern that 520 wild source lions were exported from Zambia during the

decade; this is 22 percent of the population (520 of 2,350). Annualized, these exports represent over 2 percent of the population (Table 4).

Packer et al. (2009) discussed the historic over-utilization of lions in Southern Africa, stating that off-take peaked then fell sharply in the 1980's and 1990's in Botswana, CAR, Namibia, Tanzania, Zambia and Zimbabwe. This downward harvest trend "most likely reflects declining population sizes: success rates (as measured by harvest/quota) have fallen" for lions (Packer et al., 2009, p. 2). This occurred even as demand for lion trophies has grown in the U.S. and has held stable in the European Union since the mid-1990s. The steepest declines in lion harvests occurred in jurisdictions with the highest harvest intensities. Packer et al. (2009) identified Zambia as one of the countries where trophy hunting is likely to have contributed to the decline in lion populations in the 1980s and 1990s.

### x) Zimbabwe

Between 1999 and 2008, Zimbabwe exported 2,043 lion specimens including 871 trophies, 536 claws, 146 skins, 20 bodies and 145 live (Table A81). This represents at least 1,182 lions (adding trophies, skins, bodies and live). The total number of exports has decreased over the decade, as has the number of exported trophies, skins and skulls. The vast majority of specimens exported were wild source, the exceptions being 181 that were captive-bred (Table A82), one that was F1 captive-born (Table A83), 89 from illegal sources (Table A84), and 16 that were ranch-raised (Table A85). Captive-bred lions were exported for a variety of purposes including 77 exported to South Africa for breeding, 10 live lions to Kenya and 11 to South Africa for commercial purposes (Table A82). A total of 868 wild source lion specimens were exported for commercial purposes including 343 claws, 229 trophies, 94 skins, 63 live animals, and 15 bodies; this represents a minimum of 401 wild source lions exported for commercial purposes (Table A86).

The main importer of wild source lion parts for commercial purposes was the U.S. (Table A87). A total of 961 wild source lion specimens were exported for hunting trophy purposes including 706 trophies, 1 body, 40 skins and 160 claws. This represents a minimum of 747 wild lions exported for hunting trophy purposes (Table A88). The main importer of wild source lion parts as hunting trophies was the U.S. (Table A89). A total of 120 wild source lion specimens were exported for personal purposes including 48 trophies, 19 skins, 1 body and 27 claws (Table A90); this represents a minimum of 68 wild source lions exported for personal purposes. The U.S. imported some of these (Table A91). In addition, 56 wild source lion specimens were exported for circus, education and scientific purposes (Table A92) including 15 live wild lions for circus or travelling exhibition purposes and two skins for educational purposes. This represents 17 wild source lions exported for these purposes. Thus, in total, during the decade, Zimbabwe exported 1,233 wild source lions. However, Zimbabwe also imported 19 of these wild source lions (all trophies) from other countries: four from Tanzania, seven from South Africa, three from Zambia, three from Mozambique, and two from Botswana. Thus the total number of wild source lions of Zimbabwean origin exported during the decade totaled 1,214. Thus, it is of concern that 1,214 wild source lions were exported from the Zimbabwe during the decade; this is 89 percent of the population (1,214 of 1,362). Annualized, these exports represent 8.9 percent of the population (Table 4), a percentage not considered to be sustainable (Packer et al., 2006; Packer et al., 2009).

Packer et al. (2009) discussed the historic over-utilization of lions in Southern Africa, stating that "...off-takes peaked then fell sharply in the 1980's and 1990's in Botswana, CAR, Namibia, Tanzania, Zambia and Zimbabwe". This downward harvest trend "…most likely reflected declining population sizes: success rates (as measured by harvest/quota) have fallen" for lions (Packer et al., 2009, p. 2). This occurred even as demand for lion trophies has grown in the U.S. and has held stable in the European Union since the mid-1990s. The steepest declines in lion harvests occurred in jurisdictions with the highest harvest intensities (Packer et al., 2009).

Packer et al. (2006) stated that lion hunting off-take in Zimbabwe is unsustainable with harvests of male lions in some areas reaching "exceptionally high" levels (11 males/1000 $km^2$ in the Matetsi Safari Area in 1990). From 1988 to 2004, Zimbabwe harvested a higher proportion of lions than any other country, and its off-take rate has been up to three times more than most other countries in that same time period (Packer et al., 2006). However, the number of trophies exported by Zimbabwe has decreased in recent years from about 106 per year for1999-2003 to about 67 per year in 2004-2010 (Packer et al., 2009).

#### 5. Domestic Hunting

The African lion is killed for purposes that do not involve international trade; however, there are no comprehensive data on the levels or impact of these activities.

#### 6. Traditional Practices

The African lion is used for traditional purposes in Africa. For example, body parts of lions, including fat, skin, organs and hair are highly valued for treatment of a variety of different ailments in Nigeria, with lion fat being the most highly valued (Morris, n.d.). A household questionnaire in rural communities found that 62 percent of respondents described using lion fat in medicine, with just over half of those respondents reporting to have used it in the last 3 years (Morris, n.d.). The putative medicinal benefits included were the healing of fractured and broken bones, back pain and rheumatism (Morris, n.d.). Hunting African lions for their skins for use in traditional ceremonies is considered to be the primary threat to lions in certain African countries, including Guinea-Bissau and parts of Guinea (Brugiere, Badjinca, Silva, Serra, & Barry, 2005). The use of lions in traditional African medicine also occurs in East Africa, although it is not well documented. For example, in May 2010 it was reported that five lions killed close to Queen Elizabeth National Park in Uganda were poisoned for their skin and medicinal value (Karugaba, 2010). Lion fat is also used in traditional medicine in Tanzania (Baldus, 2004).

### *C. Disease or Predation*

Habitat loss, persecution and exploitation have been long-considered threats to large carnivores but in recent years disease has come to be viewed as an emerging issue. According to Cleaveland et al. (2007) the canine distemper virus and rabies have been major pathogens affecting wild carnivore populations, calling into question the opinion that diseases are always a "natural regulatory component of ecosystems" (p.613). In the African lion, risk of disease is believed to be increasing because populations have become isolated, placing them at a higher risk when

confined by fencing (Keet et al., 2009). In addition, their increasing proximity to man and domestic animals exposes them to new diseases (IUCN SSC Cat Specialist Group, 2006b).

### 1. Viral Diseases

Viruses known to infect the African lion include canine distemper virus, feline leukemia virus, feline immunodeficiency virus, feline herpesvirus, feline calicivirus, feline parvovirus, and feline coronavirus. While viral infections and their impacts are well-studied in domestic cats, with free-ranging lions, there is only limited available (Hofmann-Lehmann et al., 1996).

More than 40 years of continuous research on lions in Serengeti National and Ngorongoro Crater, Tanzania, has advanced what is known about the prevalence of six of the seven viruses (feline leukemia was absent) known to infect lions (Packer et al., 1999). Based on this research, two viruses (feline herpesvirus and feline immunodeficiency virus) are believed to be endemic in the host populations and four (feline calicivirus, parvovirus and coronavirus, and canine distemper virus) "…repeatedly show a pattern of seroprevalence indicative of discrete disease epidemics" (Packer et al., 1999).

#### a) Canine Distemper Virus

In 1991 and 1992, captive felids in U.S. zoos were found infected with CDV-like morbilliviruses (Harder et al., 1995) and in 1994, one-third of the lions in Serengeti National Park died from the disease (Craft, Volz, Packer, & Meyers, 2009).

In 2001, a CDV epidemic (coupled with tick-borne diseases) wiped out at between 34 and nearly 40 percent of Tanzania's Ngorongoro Crater lion population (Kissui & Packer, 2004; Munson et al., 2008). Scientists examined serological exposure to CDV in these well-studied populations and found that at least five "silent" CDV epidemics had occurred between 1976 and 2006 with little mortality or clinical signs of the disease (Munson et al., 2008).

The fatal 1994 and 2001 epidemics coincided with unusually high levels of *babesia* infections. According to Munson et al. (2008) *babesia* is a "tick-borne intraerythrocytic protozoan (hemoparasite) that usually infects the African lion at low levels without compromising their health" (p. 3). Both outbreaks were preceded by extreme drought conditions that led to die-offs of host animals such as buffalo. When the rains returned, the surviving animals were heavily infected with ticks, which led to the higher *babesia* levels in the lion populations.

Climate extremes, such as severe and unseasonal droughts, can exacerbate the severity and occurrence of die-offs caused by CDV as well as the occurrence of deadly co-infections. (Kissui & Packer, 2004; Munson et al., 2008,). The Serengeti lion population eventually recovered to pre-epidemic levels due to high cub survival. Repeated outbreaks of CDV over a relatively short time span have prevented recovery of the Ngorongoro population to its carrying capacity (Packer et al., 2011). This population has been rendered especially vulnerable due to inbreeding and close proximity to human populations (Kissui & Packer, 2004).

### b) Feline Immunodeficiency Virus

FIV is found in the domestic cat, in which it causes an AIDS-like immunodeficiency disease (Troyer et al., 2004) and which permanently infects the host. Collectively, Olmsted et al. (1992), Troyer et al. (2004), and Osofky et al. (1996) have documented FIV in eight wild cat species including the African lion (as cited in Roelke et al., 2009). The African lion is infected with a lion-specific strain of FIV, known as FIVple, of which there are multiple, highly-divergent strains (O'Brien, S.J., Troyer, J.L., Roelke, M., Marker, L., & Pecon-Slattery, J., 2006; Troyer et al., 2004). "FIVple is thought to be a relatively old virus perhaps infecting lions for thousands of years" (Roelke et al., 2009, p.3). It is uncertain how FIVple affects the African lion, although anecdotal reports of morbidity from FIVple exist (Roelke et al., 2009).

FIV infection is common in East Africa and South Africa, with infection rates in four sampled lion populations ranging from 70 to 91 percent (Brown, Yuhki, Packer, & O'Brien, 1994). The Serengeti lion population incidence of FIV is very high and has been consistently maintained over many years and is, therefore, believed to be endemic (Brown et al., 1994; Hofmann-Lehmann et al., 1996 ; Olmsted et al., 1992; Packer et al., 1999, Troyer et al., 2005).

Following a study in Botswana (1999-2006) in which infected and uninfected African lions were anesthetized and sampled on multiple occasions, Roelke et al. (2009) found "relative increases in the occurrence of specific and non-specific clinical symptoms including lymphdenopathy, gingivitis, papillomas, dehydration, and loss of coat condition were found in FIVple-infected lions, as were biochemical profiles indicative of hyperglobulinemia, anemia, and hypoalbuminemia" (p. 3). Roelke et al. (2009) cautions,

> Given the high prevalence of FIVple in many lion populations, it is evident that in several different ecosystems many lions with FIVple have survived and thrived. However, in natural settings, small decreases in fitness can have large effects during times of stress. Thus, while FIVple-infected animals may do well under normal circumstances, they may potentially be more sensitive than uninfected animals to secondary assaults, such as new disease outbreaks. (p.9)

### c) Other Viral Diseases

Herpesvirus has caused the death of a captive lion (Craft, 2008), but although 100 percent of the Serengeti population is infected, clinical signs of disease have not been detected (Craft, 2008). Lions in the Serengeti have also been exposed to periodic outbreaks of feline parvovirus, calicivirus and coronavirus. However, there have been no consistent signs of clinical disease, excess mortality or decreases in lion fecundity due to infections from any of these three viruses (Driciru et al., 2006; Hofmann-Lehmann et al., 1996; Packer et al., 1999; Spencer, 1991; Spencer & Morkel, 1993).

### 2. Bovine Tuberculosis

Bovine tuberculosis (bTB) is caused by *Mycobacterium bovis.* Although it infects a wide range of African wildlife (Cleaveland et al., 2007), it is not indigenous to Africa and was most likely brought to the Continent through the importation of cattle from Europe (Michel et al., 2006). African wildlife has not yet developed immunity to bTB and many species have the potential to act as a reservoir of infection (Renwick, White, & Bengis, 2007). bTB is a growing concern (Cleaveland et al., 2007) associated, in part, with increased numbers of domestic livestock and the increased overlap between livestock and wildlife (Renwick et al., 2007).

In Kruger National Park, South Africa, bovine tuberculosis spread to wild animal populations through the intermingling of domestic cattle with wild Cape buffalo (*Syncerus caffer*), sometime in the late 1950s or early 1960s (Keet et al., 2009). The disease has since spread throughout the park by the migration of the Cape buffalo. The buffalo are referred to as "maintenance hosts" as they do not experience the serious physical affects associated with the disease. The pathogen is also present in kudu (*Tragelaphus strepsiceros*), and other species in the Park (Keet et al., 2009), and is contracted by lions through the ingestion of infected prey (Keet et al., 2009). Organs such as the lungs and the lymph nodes contain most of the infectious material (Renwick et al., 2007). Once infected, lions may transmit the disease to other lions primarily through inhalation and secondarily through percutaneous contact (i.e. biting and scratching) (Keet et al., 2009).

In many parts of the Kruger Park, buffalo are the primary prey of lions and over 80 percent of lions were infected by bTB. The clinical signs of infection in lions include respiratory problems, emaciation, lameness and blindness (Renwick et al., 2007). Once an individual lion becomes infected, it will either become latently infected or develop the disease, become clinically affected, and die. Approximately 20 percent of infected lions remain disease-free (latent), and 80 percent became infectious (i.e., diseased and contagious) within a five year period (Keet et al., 2009). However, despite the high incidence of the disease, the Kruger lion population has remained constant over the past 20 years (Ferreira & Funston, 2010).

Bovine tuberculosis has also been confirmed in a number of wild ungulate species in the Serengeti and Tarangire ecosystems in northern Tanzania (Cleaveland et al., 2005) and the Ruaha ecosystem in Tanzania (Mazet et al., 2009). Serological tests of lions in the Serengeti demonstrate their exposure to bTB since at least 1984; however, the incidence of the disease has remained below 4 percent for the past 20 years (Cleaveland et al., 2007). The disease has been detected in buffalo in Gonarezhou National Park in Zimbabwe. It is also found in Queen Elizabeth National Park in Uganda (Chardonnet et al., 2010).

### 3. Other Diseases

Domesticated pets such as cats and dogs have been known to transmit diseases to African lions such as rabies and feline leukemia virus (FLV) (Chardonnet et al., 2010) but neither disease is known to have inflicted measurable harm.

### *D. Inadequacy of Existing Regulatory Mechanisms*

The conservation, management and protection of the African lion is addressed either directly or by inference in several international treaties and regional agreements as well as by national laws and regulations of many African range States. However, as fully explained in this section, these regulatory mechanisms and/or their implementation and enforcement are inadequate to address existing threats to the survival of the African lion.

#### 1. International Law and Agreements

There are several African regional agreements that have relevance to the African lion: the African Union's African Convention on the Conservation of Nature and Natural Resources, 1968; the Revised African Convention on the Conservation of Nature and Natural Resources, 2003; and the Protocol on Wildlife Conservation and Law Enforcement of the Southern African Development Community, 1999 (Union Africaine, 2010; UNEP, 2009).

The Convention on Biological Diversity (CBD) addresses "conservation of biological diversity", the "sustainable use" of its components and the "fair and equitable sharing of the benefits" arising from the use of biological and genetic resources. The CBD also provides guidelines to manage biodiversity, but does not provide specific protection for the African lion or any individual species. Nor is the lion protected under the Convention on Migratory Species (the Bonn Convention) (Convention on Migratory Species, 2009). The only international agreement that offers specific and significant protection to the African lion is CITES.

##### a) CITES

The African lion is used extensively for commercial, recreational, and scientific purposes. The main use of the African lion in this regard is as hunting trophies and for commercial purposes, both of which involve international trade. As shown earlier, the U.S. is by far the largest importer of such specimens.

The African lion is listed on Appendix II of CITES by virtue of its inclusion in the cat family, Felidae, which is listed in its entirety on that Appendix. International trade in species listed on Appendix II must be strictly regulated in order to avoid utilization incompatible with their survival. Convention on International Trade in Endangered Species of Wild Fauna and Flora, art. II, Mar. 3, 1973. Regulation of trade in specimens of Appendix II species is accomplished by the issuance of permits from the exporting country, and the presentation of those export permits to the importing country. The exporting country must ensure that a number of conditions are met before issuing an export permit. These are:

> (a) a Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species;
> (b) a Management Authority of the State of export is satisfied that the specimen was not obtained in contravention of the laws of that State for the protection of fauna and flora; and

> (c) a Management Authority of the State of export is satisfied that any living specimen will be so prepared and shipped as to minimize the risk of injury, damage to health or cruel treatment." CITES, Article IV.

Furthermore, a Scientific Authority of the exporting country must monitor both the export permits granted and the actual exports of such specimens. CITES, Article IV.

> Whenever a Scientific Authority determines that the export of specimens of any such species should be limited in order to maintain that species throughout its range at a level consistent with its role in the ecosystems in which it occurs and well above the level at which that species might become eligible for inclusion in Appendix I, the Scientific Authority shall advise the appropriate Management Authority of suitable measures to be taken to limit the grant of export permits for specimens of that species.

The CITES Parties have recognized that proper implementation of Article IV is essential for the conservation of Appendix II species, CITES, Resolution Conf. 12.8 (Rev. CoP13), and national laws are paramount to that implementation. The Parties have agreed to a "Significant Trade Review" for certain Appendix II species where the biology and management of and trade in these species are examined and, when the provisions of Article IV are not being met, remedial measures are directed to the relevant Parties. Non-compliance with recommended measures can result in trade suspensions.

Over the years it has become evident that many Parties, particularly lesser-developed countries, do not adequately implement Article IV due to financial constraints and lack of capacity (CITES, 1992a). For example, Tanzania has trade suspensions in place for three species due to inadequate implementation of Article IV. CITES, Notification to the Parties 2010/012, 2010. Although the African lion has not been the subject of a Significant Trade Review, some of the major lion exporting countries have been found to have inadequately implemented Article IV for other species. The African lion was suggested for inclusion in the Significant Trade Review in 2004 and 2005, CITES Animals Committee, Summary Records, but was ultimately not reviewed.

Currently, lion specimens are exported from countries where lion off-take is unsustainable and the U.S. imports lion specimens from countries where lion off-take is unsustainable (see the *Commercial Trade* section of this Petition, above). This is a clear indication that CITES Article IV is not being complied with, either due to insufficient domestic implementing legislation or inadequate enforcement, and that the Convention does not adequately protect the African lions from extinction. Further, the CITES-implementing legislation in the U.S., the ESA, does not currently provide any protection for the African lion — lion specimens are imported to the U.S. simply upon presentation of a CITES export permit from the country of export. There is no requirement under the ESA or CITES that the U.S. examine the basis for the permit or verify that the export permit was issued in compliance with CITES.

In addition, CITES Article VIII requires Parties to "take appropriate measures to enforce the provisions of the Convention and to prohibit trade in specimens in violation thereof". Resolution Conf. 8.4 (Rev. CoP15), on national laws for implementation of the Convention, established a

National Legislation Project in 1992 to review national legislation of Parties (CITES, 1992b). As a result of this review, Parties were categorized according to their level of compliance with Article VIII. CITES Standing Committee, 2010, SC59, Doc. 11. Several major lion exporting countries, including South Africa, Tanzania, Mozambique, Botswana and Zambia, are currently listed under "Category 2", which means they meet some, but not all, of the necessary legislative requirements for implementing CITES. Several lion exporting countries, including Central African Republic and Chad, are listed under "Category 3" which means they do not meet any of the necessary legislative requirements for implementing CITES. Thus, although they are Parties to CITES, none of these important lion range States have the national legislation necessary to fully implement the Convention.

### b) Rotterdam Convention

The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade is an international instrument aimed at helping developing nations make informed decisions regarding the import of hazardous pesticides. The Convention requires that whenever a country makes an internally banned or severely-restricted chemical available for export, it must provide the importer with an export notification containing practical and detailed information about the chemical and the shipment (Secretariat for the Rotterdam Convention, 2006). Currently the PIC list does not contain some of the chemicals that have most often been used to poison African lions for retaliatory killing; therefore, this mechanism is inadequate to protect the African lion. The U.S. is a signatory but not a party to this Convention, however, it has enacted a law, the Federal Insecticide, Fungicide and Rodenticide Act (see below), which requires the U.S. to undertake activities similar to those required under this Convention.

### c) African Union

The African Union (AU), formed in 1992, is an intergovernmental organization comprising 53 of 54 African States (only Morocco is not a member). It is a successor to the Organisation of African Unity (OAU) which was formed in 1963 and disbanded upon formation of the AU in 1992. All African lion range States have ratified the AU Constituent Act (African Union, 2000), which provides, *inter alia*, an Executive Council to coordinate and take decisions on policies in areas of common interest to Member States, including environmental protection. Article 13 (1)(e).

Two AU Conventions are relevant to African lion conservation: the African Convention on the Conservation of Nature and Natural Resources (entered into force in 1968), and the Revised African Convention on the Conservation of Nature and Natural Resources (negotiated in 2003, not yet entered into force).

Parties to the African Convention on the Conservation of Nature and Natural Resources (African Union 2010a), which entered into force in 1969, have agreed to "adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people" Article II. The Convention lists the African lion as a Class B protected species, Article VIII;

Class B species "shall be totally protected, but may be hunted, killed, captured or collected under special authorization granted by the competent authority." Article VIII (1)(b). Ten African lion range States—some of which are significant exporters of African lion specimens—have not ratified the Convention: Benin, Botswana, Burundi, Ethiopia, Guinea, Guinea Bissau, Namibia, Somalia, South Africa, and Zimbabwe. The remaining African lion range countries have ratified the Convention; nevertheless, this law does not provide sufficient protection for the African lion.

The Convention does not establish a Secretariat or designate the role and frequency of meetings of the Conference of the Parties; it also does not contain enforcement measures to address non-compliance with the Convention.

Burundi, Ghana, Mali, Niger and Rwanda are the only African lion range States to have ratified the Revised African Convention on the Conservation of Nature and Natural Resources (African Union, 2010b). The Revised Convention has not yet entered into force because fifteen Parties must ratify it and only eight have done so (African Union, 2003).

### d) SADC Protocol on Wildlife Conservation and Law Enforcement

Eleven African lion range States have signed the Treaty of the Southern African Development Community (SADC): Angola, Botswana, DRC, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe (SADC, 2008). Among SADC's objectives is to "achieve sustainable utilisation of natural resources and effective protection of the environment" Article 5 (g). Article 22 of SADC calls for the establishment of Protocols to achieve the Treaty's objectives. The SADC Protocol on Wildlife Conservation and Law Enforcement of the Southern African Development Community (SADC, 1999) elaborates on Article 5 (g) of the Treaty. Its objectives are to:

> a) promote the sustainable use of wildlife; b) harmonise legal instruments governing wildlife use and conservation; c) enforce wildlife laws within, between and among States Parties; d) facilitate the exchange of information concerning wildlife management, utilisation and the enforcement of wildlife laws; e) assist in the building of national and regional capacity for wildlife management, conservation and enforcement of wildlife laws; f) promote the conservation of shared wildlife resources through the establishment of transfrontier conservation areas; and g) facilitate community-based natural resources management practices for management of wildlife resources (Article 4).

With regard to wildlife management and conservation programs, Parties shall: "establish management programmes for the conservation and sustainable use of wildlife and integrate such programmes into national development plans" and "assess and control activities which may significantly affect the conservation and sustainable use of wildlife so as to avoid or minimise negative impacts." Article 7 Parties are also to take measures to ensure the conservation and sustainable use of wildlife including:

> a) the protection of wildlife and wildlife habitats to ensure the maintenance of viable wildlife populations; b) prevention of over-exploitation and extinction of

> species; c) restrictions on the taking of wildlife, including but not limited to restrictions on the number, sex, size or age of specimens taken and the locality and season during which they may be taken; and d) restrictions on trade in wildlife and its products, both nationally and internationally, as required by relevant international agreements.

Article 12 of the Protocol concerning sanctions states:

> 1. Sanctions may be imposed against any State Party which: a) persistently fails, without good reason, to fulfill obligations assumed under this Protocol; or b) implements policies which undermine the objectives and principles of this Protocol. 2. The Council [SADC Council of Ministers] shall determine whether any sanction should be imposed against a State Party and shall make the recommendation to the Summit if it decides that a sanction is called for. The Summit shall decide, on a case-by-case basis, the appropriate sanction to be imposed.

However, it appears that no such sanctions have been considered or approved.

#### e) Lusaka Agreement

Five African lion range States are Parties to the Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora: Kenya, Tanzania, Republic of Congo (Brazzaville), Uganda and Zambia. The Agreement entered into force in 1994 and is aimed at "facilitating cooperative activities in/among the Party states to the Lusaka Agreement, in carrying out investigations on violations of national laws pertaining to illegal trade in wild fauna and flora" (Lusaka Agreement Task Force, n.d.).

The Lusaka Agreement is focused generally on fighting illegal wildlife trade in and between member States, including through wildlife enforcement officer training. The African lion could benefit in the future from such Lusaka Agreement activities but, to date, there have been no specific programs aimed at illegal lion trade.

### 2. U.S. Law

The two primary U.S. laws that pertain to the African lion are the ESA and the Lacey Act. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) also has implications for the African lion, as it pertains to American-made chemicals being exported to African lion range States where they are used to *inter alia* poison lions.

#### a) Endangered Species Act

The purpose of the ESA is "to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of . . . treaties and conventions" (including CITES). 16 U.S.C. § 1531(b).

Thus, in addition to being the CITES-implementing legislation in the U.S., the ESA provides independent protections to species recognized as endangered. *See* 16 U.S.C. §§ 1538(a), 1539(a) (prohibiting take, import/export, and interstate/foreign commerce of endangered species, and permitting otherwise prohibited trade and commerce only for scientific purposes or to enhance the propagation or survival of the species).

While the African lion has been listed on CITES Appendix II since 1976 as part of Family Felidae, CITES has not adopted any special measures, such as export quotas, for the species. Consequently, the importation of African lion specimens into the U.S. is currently allowed if such specimens, including trophies, arrive with a valid CITES export permit from an exporting country. As detailed in the *Commercial Trade* section of this Petition, lion specimens are exported from countries where lion off-take is unsustainable, and the U.S. imports more lion specimens than any other country, including from countries where lion off-take is unsustainable. This is a clear indication that lion-exporting countries are not complying with CITES Article IV and that the existing regulatory mechanism—inclusion of lions on CITES Appendix II with no separate ESA listing—is inadequate to address the international trade-related threats to the African lion. Without the Endangered listing that this Petition seeks, there is no requirement under federal law or CITES that the U.S. examine the basis on which the permit was granted or to ensure that import would provide a conservation benefit to the subspecies.

The ESA allows for the listing of species as either Threatened or Endangered; however, as this Petition demonstrates, the African lion is in danger of extinction throughout a significant portion of its range and, therefore, should be listed as Endangered. Doing so will more fully protect the African lion from a variety of threats, including that posed by the continued importation of lion trophies to the U.S.. If the African lion were only to be listed as a Threatened species under the Act, the ESA would not prohibit the importation of lion trophies. Specifically, importation into the U.S. of any fish or wildlife shall "be presumed to be an importation not in violation of any provisions of this Act or any regulation issued pursuant to this Act" when:

> (A) such fish or wildlife is not an endangered species listed pursuant to section 4 of this Act but is listed in Appendix II to the Convention, (B) the taking and exportation of such fish or wildlife is not contrary to the provisions of the Convention and all other applicable requirements of the Convention have been satisfied, (C) the applicable requirements of subsections (d), (e), and (f) of this section have been satisfied, and (D) such importation is not made in the course of a commercial activity.

Regulations promulgated under the Act make clear that the USFWS does not consider hunters who import their personal sport-hunted trophies to be involved in a commercial activity (USFWS, 2007). Consequently, hunters who wish to import trophies of Threatened, CITES Appendix II species only require an export permit issued by the country of export. The Act would therefore not protect a threatened foreign species from detrimental trade in cases where a CITES export permit has been granted without a scientifically-based Non-Detriment Finding having been made.

If the African lion were to be listed as Endangered under the Act, the importation of lions and their parts—whether commercial or not—would be generally prohibited. Importations would only be allowed if a permit is obtained after it has been demonstrated that such importation would enhance the propagation or survival of the species or is for scientific purposes.

However, as the subspecies is not listed under the Act, the African lion and its parts currently flow freely into the U.S. provided that they are accompanied by a CITES export permit. This means that the largest African lion importing country—the U.S.—has no protective measures for the species, despite evidence that such imports are having a detrimental impact; therefore, federal law is currently inadequate to protect the African lion from extinction.

#### b) Lacey Act

Under the Lacey Act, 16 U.S.C. §§ 3371-3378, it is unlawful to import, export, sell, acquire, or purchase fish, wildlife or plants taken, possessed, transported, or sold: 1) in violation of U.S. or Indian law, or 2) in interstate or foreign commerce involving any fish, wildlife, or plants taken possessed or sold in violation of State or foreign law. 16 U.S.C. § 3372(a)(1), (a)(2)(A). As discussed above, the cornerstone U.S. wildlife law, the ESA, does not provide any legal protection to the subspecies; thus, the African lion receives protection under this Act to the extent that specimens are in interstate or foreign commerce in violation of a foreign law or international treaty such as CITES. The Captive Wildlife Safety Act (Pub. Law 108-191), which amended the Lacey Act in 2003, only regulates live lions and so does not address the majority of international trade in subspecies.

#### c) Federal Insecticide, Fungicide and Rodenticide Act

Under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), 7 U.S.C. §§ 136 *et seq*., and its implementing regulations, exporters of unregistered pesticides, including those - such as carbofuran - that have been used, *inter alia*, to illegally poison lions in Africa (Kahumbu, 2010), can export those pesticides provided they first obtain the foreign purchaser's signature on a statement acknowledging that the pesticide is unregistered and cannot be sold in the U.S., 7 U.S.C. § 136o(a)(2), and submit these statements to the U.S. Environmental Protection Agency. However, the EPA's Office of the Inspector General found that EPA does not ensure that pesticide manufacturers are complying with this section of FIFRA, which means that importing countries may not be fully aware of the hazards associated with the chemicals. Therefore, this regulatory mechanism is inadequate to protect the African lion.

### 3. Lion Range Country Mechanisms

Rapid decline in both the population and range of lions in Africa due to trophy hunting, commercial trade, loss of habitat and prey, and retaliatory killing, clearly shows that many range States do not appear to have adequate regulatory mechanisms to protect the African lion.

It has been acknowledged that best management practices for trophy hunting have yet to be fully incorporated into existing regulations in many countries (Packer et al., 2011) and that trade in

trophies is not adequately regulated by national laws, regional agreements, or international laws (IUCN SSC Cat Specialist Group, 2006a).

For example, despite a number of Tanzanian laws regarding lion trophy hunting, poorly-regulated trophy hunting appears to have been the primary driver of the decline in lion abundance in Tanzania's hunting areas (Packer et al., 2011) and is thought to be negatively affecting lion populations in adjacent National Parks (Packer et al., 2011). Numerous recommendations made by lion experts for improving Tanzania's lion trophy hunting regulations have yet to be implemented by the government, including reduced quotas and mandatory minimum-age kills with independent age verification and subsequent bans on the export of under-age trophies (Packer et al., 2011). Regulatory concerns related to lion trophy hunting also exist for other countries. For example, in some parts of Mozambique quotas are largely based on information gathered from trophy hunting operators, who have a vested interest and the incentive to inflate lion numbers in order to increase their quota. This information is generally not corroborated by annual lion surveys (Chardonnet et al., 2009).

With regard to laws regulating commercial trade in African lions and their parts throughout their entire range, lion range States have lack specific regulations to control the trade (IUCN SSC Cat Specialist Group, 2006a; IUCN SSC Cat Specialist Group, 2006b).

Loss of habitat and prey is a major threat to the African lion throughout their range. For example, in Eastern and Southern Africa, there is a lack of supportive wildlife policy frameworks on a national level; indeed, such policies and planning are non-existent in many countries (IUCN SSC Cat Specialist Group, 2006a). Where such policies do exist, they are often ineffectively drawn and/or implemented, thus actually contributing to greater loss of habitat for African lions and their prey (IUCN SSC Cat Specialist Group, 2006a). In Tanzania, habitat protection measures are largely ineffective in stopping the continuing loss of grasslands, woodlands and forests, which serve as habitat for African lions and their prey. Between 1990 and 2005, Tanzania lost forest cover at a rate twice the average for low human development countries and five times the mean global rate (Chardonnet et al., 2010). More than 37 percent of the country's forest and woodland habitat has disappeared since 1990 (Packer et al., 2009).

Indiscriminate lion killing – including poisoning, trapping and shooting - has been found to be one of the most important threats to the African lion in areas with the most dense lion populations (IUCN SSC Cat Specialist Group, 2006a) and in some countries is the primary cause of lion mortality (Chardonnet et al., 2009). It is clear that existing laws are not adequately addressing this continuing problem (IUCN SSC Cat Specialist Group, 2006a). For example, despite a number of laws in Tanzania addressing control of problem animals, the government's Problem Animal Control (PAC) efforts face significant challenges. Due to logistical and financial short-comings, PAC may have a negative impact on lion populations because the number of African lions killed is high and the operations often poorly controlled (Mésochina et al., 2010). In Mozambique, laws and regulations that govern hunting also allow for the control of problem lions through PAC. According to Chardonnet et al. (2009), "Lion PAC operations [in Mozambique] would be considerably improved with a clear logical framework, well-defined decision-making process and implementation procedures, as well as proper data analysis and reporting."

Ineffective lion conservation policies and inadequate enforcement throughout many lion range States, as well as lack of efficacy of management and lack of government resources, have been identified as threats to the survival of lions (IUCN SSC Cat Specialist Group, 2006a; IUCN SSC Cat Specialist Group, 2006b).

#### 4. Conclusion

In conclusion, despite various local, national, regional and international regulatory mechanisms, African lion populations have continued to decline and therefore, existing regulatory mechanisms do not appear to be sufficiently adequate for protecting and conserving the African lion. The African lion population has declined approximately 30 percent in the past twenty years (Bauer et al., 2008). The African lion is continuing to lose habitat and their natural prey is declining due to growing human pressures. Existing regulatory mechanisms are not preventing this downward spiral. Given many glaring deficiencies in existing regulatory mechanisms, coupled with the alarming and ongoing decline of the subspecies, it is clear that the current regulatory framework simply cannot guarantee the effective protection of the African lion. Listing *Panthera leo leo* as Endangered under the ESA would substantively contribute to the preservation of this keystone subspecies.

### *E. Other Natural or Manmade Factors Affecting the Species' Existence*

#### 1. Retaliatory Killing

A lack of prey and useable habitat pose serious threats to the continued existence of the African lion, and both stem from continuous and increasing competition with humans for vital resources and space. When the African lion prey-base is reduced by human or natural means, lions rely on domestic herds, particularly those herds that reside in areas adjacent to Protected Areas (Chardonnet et al., 2010). For example, Gebresenbet et al. (2009) reported that in Ethiopia, as wild prey disappeared, predation by lions on cattle and attacks on humans increased.

Livestock depredation and attacks on humans are the main conflict between people and African lions (Chardonnet et al., 2010). As a result, retaliatory killing, as a consequence of livestock losses and threat to human life, is common throughout all of sub-Saharan Africa (Frank et al., 2006).

The indiscriminate nature of poisons is often responsible for the death of entire prides and together with spearing, retaliatory killings through poisoning are decimating lions in southern Kenya (Frank et al., 2006).

Historically, a variety of chemicals including strychnine and various organophosphates have been used and are still used by a small number of commercial ranchers to poison lions. Recently however, a carbamate insecticide, carbofuran, seems to be one of the most commonly used (Frank et al., 2006). Carbamate pesticides, developed in the 1930s, are neurotoxins and have a relatively high mammalian toxicity (Otieno, Lalah, Virani, Jondiko, & Schramm, 2010). Carbofuran is an acetylcholine esterase inhibitor and causes acetylcholine to accumulate at the

junction of a nerve cell and the receptor sites. This causes the nerves to fire continuously, leading to tremors, convulsions, and eventually death.

Carbofuran comes in a liquid and granular form, but in Africa the granular form is most commonly used. In eastern lion range States it was readily available and legally sold over the counter and used to kill soil insects and nematodes, which threaten the production of a variety of crops (Otieno et al., 2010). A few grams of the odorless, tasteless poison can kill an adult lion. A small bottle of carbofuran can kill an entire pride and costs just a few dollars. According to a report submitted to the Kenyan Parliament, carbofuran was blamed for the deaths of at least 40 lions in 2008 (Kahumbu, 2010). In addition to Kenya and Uganda, lion poisonings from carbofuran have been suspected in Tanzania, Zimbabwe, Namibia, South Africa, and Botswana and possible carbofuran poisonings have occurred in the Republic of the Congo, Rwanda and DRC (Joubert, personal communication, June 15, 2010). The American manufacturer of a carbofuran product called Furadan withdrew it from the markets in Kenyan, Tanzania and Uganda and instituted a buyback program in 2009 (FMC, 2009). However, as recently as January 19, 2011, a lion was suspected to be killed with Furadan on the Tanzania side of the Tanzania-Kenya border; this lion was most likely from Amboseli National Park on the Kenya side of the border (Frank, 2011). One year earlier, a pride of five Amboseli lions was poisoned suspectedly with Furadan on the Kenya side of the border (Frank, 2011). This illustrates that carbofuran and other chemicals, continue to threaten wild lions.

### 2. Compromised Viability

As habitat is lost across the continent, the African lion is increasingly restricted to small and disconnected populations, which increases the threat of inbreeding. Genetic population models have demonstrated that large lion populations with 50 to 100 prides are necessary to avoid negative consequences of inbreeding (Bjorklund, 2003). In addition, population connectivity is essential to allow males to be able to move to other areas in order to spread genes and conserve genetic variation (Bjorklund, 2003). In general, inbreeding has negative impacts on fecundity, survival, and growth, as well as increasing susceptibility to environmental stress and disease (Bjorklund, 2003). For example, it is believed that the lions in Ngorongoro Crater, Tanzania, are inbred, which increases their vulnerability to disease. As a result, canine distemper virus killed 35 to 45 percent of lions in this population (Kissui & Packer, 2004).

### 3. Ritual Killing

Maasai tribesmen in East Africa hunt and kill lions for ritual purposes; a process called *Ala-mayo.* In the Serengeti-Ngorongoro area, ritual kills, which number approximately 2 per year, are uncommon compared to retaliatory killing (3-4 per year), and trophy hunting (11.5 per year) (Packer et al., 2011). The same can also be said for the Tarangire National Park system (Packer et al., 2011). However, ritual killing may have more impact on lion populations than currently thought, or it may pose an exacerbating threat in conjunction with retaliatory killings and trophy hunting. At this point, there is a lack of information on the frequency and effect of ritual killing (Packer et al., 2011).

## V. CONCLUSION

This Petition demonstrates that the African lion subspecies meets the statutory criteria for an Endangered listing under the ESA. The subspecies is in "danger of extinction throughout all or a significant portion of its range" and, therefore, must be listed as Endangered throughout its range. 16 U.S.C. § 1532(6). The future security and viability the African lion is uncertain. The subspecies faces a multitude of threats, from unsustainable international trade in trophies to habitat loss; disease to retaliatory killings; loss of natural prey to commercial trade in parts. Lion numbers continue to decline precipitously. The African lion was likely extirpated in three range States where as recently as 2008 they were thought to be present. The African lion is increasingly rare outside Protected Areas and they are growing more isolated and fragmented throughout their shrinking range. Existing regulatory measures at the international, regional, and national levels are not adequately protecting African lion from these threats.

As the U.S. is not part of the African lion's natural range, protection under the ESA would occur by, *inter alia*, a prohibition on the import into the U.S. of lion specimens except where the import enhances the propagation or survival of the species or is for scientific purposes. 16 U.S.C. §§ 1538(a), 1539(a). Listing the African lion under the ESA would allow for and encourage the U.S. to provide lion range States with assistance in the development and management of programs useful to the conservation of the subspecies. Such a listing would also serve to heighten awareness of the importance of conserving the African lion among foreign governments, conservation organizations, and the general public.

The iconic African lion is in danger of extinction if current trends are not reversed and if action is not taken now. The U.S. is the world's largest importer of African lions and their parts including hunting trophies and for commercial purposes such as the lion skin or claw trade. With this in mind, the U.S. must play a leading role in the effort to save the African lion. Listing the subspecies as Endangered under the ESA is a significant and necessary step toward controlling unsustainable exploitation of the subspecies by Americans, and toward bringing this crisis to the attention of the global conservation community.

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