CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

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Twenty-eighth meeting of the Animals Committee
Tel Aviv (Israel), 30 August-3 September 2015

Species trade and conservation

Periodic Review of species included in Appendices I and II
[Resolution Conf. 14.8 (Rev. CoP16)]

Species review

PERIODIC REVIEW OF *PANTHERA LEO*

The attached information document has been submitted by the Secretariat at the request of the International Union for Conservation of Nature (IUCN) in relation to agenda item 20.3.1.*

* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

Lion

IUCN Red List of Threatened Species 2015.2

Vulnerable

Scientific Name: *Panthera leo*

Species Authority: (Linnaeus, 1758)

Infra-specific Taxa Assessed: See *Panthera leo* (West Africa subpopulation)

See *Panthera leo ssp. persica*

Common Name(s):

English – Lion, African Lion; French – Lion d'Afrique; Spanish – León

Synonym(s): *Felis leo* Linnaeus, 1758

Taxonomic Notes: Taxonomy currently used by the IUCN SSC Cat Specialist Group:

Panthera leo persica—Asian subpopulations

Panthera leo leo—African subpopulations.

The latest published phylogeographical study of lions shows that the traditional split between Asian and African lions as distinct subspecies is untenable (Barnett et al. 2014). Based on Barnett et al. (2014) the Cat Classification Task Force of the IUCN SSC Cat Specialist Group has provisionally proposed a different split into two subspecies, *P. l. leo* of Asia and West, Central and North Africa, and *P l. melanochaita* from South and East Africa. However, Barnett et al. (2014) is based only on mtDNA and could reflect female philopatry. In conjunction with the African Lion Working Group, Laura Bertola and colleagues are preparing a taxonomic paper, which will include reference to new molecular data from current studies, including complete mitochondrial genomes, microsatellites, and autosomal SNPs, which strongly support this taxonomic arrangement and recognize several management units within these revised subspecies. Given the poor conservation status of some regional lion populations, it is important that this new taxonomic arrangement is immediately available for use by the IUCN Red List to support the next stages in developing a conservation strategy for the lion based on coherent and sound science (Barnett et al. 2006a,b, 2014; Bertola et al. 2011; Dubach et al. 2005, 2013).

Assessment Information

Red List Category & Criteria: Vulnerable A2abcd ver 3.1

Year Published: 2015

Date Assessed: 2014-06-15

Assessor(s): Bauer, H., Packer, C., Funston, P.F, Henschel, P. & Nowell, K.

Reviewer(s): Hunter, L., Hoffmann, M., Breitenmoser-Wursten, C. & Breitenmoser, U.

Contributor(s): Bauer, H., Becker, M., Bertola, L., Begg, C., Croes, B., Dricuru, M., Funston, PF, Groom, R., Henschel, P., Loveridge, A., Packer, C., Petracca, L., Robinson, H., Tende, T., Tumenta, P., Venktraman, M., White, P. & Winterbach, C.

Justification:

The Lion population is inferred to have undergone a reduction of approximately 42% over the past 21 years (approximately three Lion generations, 1993-2014). We infer a decline of 42% based on time trend analysis of census data for 47 relatively well monitored Lion subpopulations. These subpopulations approximately totalled

an estimated 7,500 Lions in 2014 and comprise a substantial portion of the total species population, so that we feel confident in applying observed trends to the species as a whole as well as on a regional basis.

The overall classification of the Lion as Vulnerable masks a dichotomy: we observe that sample Lion subpopulations increased by 11% in four southern African countries (Botswana, Namibia, South Africa and Zimbabwe) and in India, while an observed decline of 60% in sample subpopulations outside these countries is inferred for the remainder of its African range. In other words, in the majority of its range the Lion meets the A2 criterion for Endangered with the inferred rate of decline over 50% in three generations, but this trend is numerically mitigated by a small number of subpopulations in a restricted geographical range.

This dichotomy is reflected in listings of the species in different Red Lists: in South Africa, the Lion will be categorized as Least Concern on the national Red List in preparation (Child et al. In prep.), whereas in India it is Endangered (as subspecies *P. l. persica* on the global IUCN Red List: Breitenmoser et al. 2008) and in the region of West Africa meets the criteria for Critically Endangered (Henschel et al. 2014, http://www.iucnredlist.org/details/68933833/0). The range state list in Table 1 (attached Supporting Material) further illustrates the high threat levels across the species' broad geographic range, as Lions have been recently extirpated in 12 African countries and we suspect possible recent extirpation in another four.

Among the causes, the most important are indiscriminate killing in defence of life and livestock, habitat loss, prey base depletion, bushmeat trade and poorly regulated sport hunting (IUCN 2006a,b; Packer et al. 2009, 2011; Becker et al. 2013; Riggio et al. 2013). The population reduction and its causes are unlikely to have ceased. This suspected reduction is based on direct observation; appropriate indices of abundance; a decline in area of occupation, extent of occupation and habitat quality; and actual and potential levels of exploitation.

Several subpopulations have been stable, among them the only remaining subpopulation in Asia (surviving in the Gir Forest area of Gujarat, India) and several subpopulations in southern Africa. Subpopulations appear to be stable where management is properly funded; fencing is one of several effective conservation management techniques (Packer et al. 2013). However, many Lion subpopulations occur in areas where management budgets are low, leading to local decline and even extinction, for example in West Africa (Henschel et al. 2014). Little is known about Lion subpopulations in Angola, Central African Republic and South Sudan, but we fear drastic declines especially for the latter two.

In conclusion, we assess the Lion as Vulnerable based on criterion A, more specifically A2abcd. Lion range and abundance exceed the Vulnerable thresholds for criteria B, C and D, respectively, so these criteria do not contribute to the present assessment, whilst criterion E was not applied. Vulnerable A2abcd is the same listing as the previous assessment but with a different underlying method. Previous assessments were based on a suspected decline of the total estimated number of Lions, which necessarily included low quality data. In the present assessment we did not use total Lion estimates, because we had a better alternative. We now have enough good quality data for a representative sub-set of Lion subpopulations to calculate an observed decline, from which we infer a decline for the species as a whole.

History:

2012 – Vulnerable

2008 – Vulnerable

2004 – Vulnerable

2002 – Vulnerable

1996 – Vulnerable

Geographic Range

Range Description: Outside sub-Saharan Africa, the Lion formerly ranged from northern Africa through southwest Asia (where it disappeared from most countries within the last 150 years), west into Europe, where it apparently became extinct almost 2,000 years ago, and east into India (Nowell and Jackson 1996, Sunquist and Sunquist 2002). Today, the only remainder of this once widespread northern population is a single isolated subpopulation in the 1,400 km² Gir Forest National Park and Wildlife Sanctuary. Lions are extinct in North Africa, having perhaps survived in the High Atlas Mountains up to the 1940s (Nowell and Jackson 1996, West and Packer 2013).

Lions are found in most countries of sub-Saharan Africa. The last assessment of extant Lion range is provided by Riggio et al. (2013); they identified 67 Lion areas comprising 3.4 million km², which is 17% of historical range or about 25% of savanna Africa. We took those layers as a starting point, but made a few modifications to reflect the cautionary approach used by the IUCN Red List. Like with numbers (see previous section), Riggio et al. (2013) copied old layers in the absence of new information. De facto, this means that large swathes of land are classified as Lion range based on the group exercises led by WCS and the IUCN SSC Cat Specialist Group; they found 86 Lion Conservation Units (LCUs) covering 4.6 million km² or 22% of historical range (IUCN 2006a,b; Bauer 2008). Henschel et al. (2010, 2014) found that many of these LCUs in West and Central Africa no longer contained Lions. Furthermore, some of the mapped LCUs are located in areas where armed conflict may have had an impact on lion persistence (e.g. Central African Republic and South Sudan). Until proof of the contrary, we therefore reclassified such areas as Possibly Extinct and only maintained Protected Areas inside mapped range polygons as Lion range. Areas where we consider Lion populations Possibly Extinct total 1,811,087 km², over half (52%) of the range classified as extant by Riggio et al. (2013). We estimate extant lion range, areas where we are reasonably confident that lions persist, based on recent records, at 1,654,375 km², or 8% of historical range. This range reduction reflects a combination of recent known and inferred decline, as well as improved knowledge.

Countries:

Native:

Angola (Angola); Benin; Botswana; Burkina Faso; Cameroon; Central African Republic; Chad; Congo, The Democratic Republic of the; Ethiopia; India; Kenya; Malawi; Mozambique; Namibia; Niger; Nigeria; Senegal; Somalia; South Africa; Sudan; Swaziland; Tanzania, United Republic of; Uganda; Zambia; Zimbabwe

Possibly extinct:

Côte d'Ivoire; Ghana; Guinea; Guinea-Bissau; Mali; Rwanda; Togo

Regionally extinct:

Afghanistan; Algeria; Burundi; Congo; Djibouti; Egypt; Eritrea; Gabon; Gambia; Iran, Islamic Republic of; Iraq; Israel; Jordan; Kuwait; Lebanon; Lesotho; Libya; Mauritania; Morocco; Pakistan; Saudi Arabia; Sierra Leone; Syrian Arab Republic; Tunisia; Turkey; Western Sahara

Population:

This assessment is based on a time trend analysis of census data from relatively well-studied Lion subpopulations (Packer et al. 2013, plus additional unpublished data provided by contributors). Census estimates were obtained by scientific research methods including total count, individual identifications, total or sample inventory using calling stations, radio telemetry, photo databases, spoor counts and density estimates based on direct observations corrected for patrol effort. These methods are rated as producing the most reliable type of Lion population estimates by background papers for the 2006 IUCN regional Lion workshops (Table 5 in Bauer et al. 2005a, b). We did not include population estimates for sites which were based on extrapolation of Lion densities obtained by research in other areas, or informed guesstimates by researchers. The minimum number of census surveys per site over the assessment time period is two, but some sites have been more regularly monitored (Table 3 - Data Points column, in attached Supporting Material). In some cases census methodology varied between years, and for some surveys accuracy may have been low, but the complete data set shows an obvious trend that is unlikely to be an artefact of methodological insufficiencies.

IUCN Red List Criteria define three generations as the relevant time span for trend assessment. Lion Generation Length (GL) is based on the formulation of Pacifici et al. (2013):

GL = Rspan*z +AFR

Where AFR = Age of first reproduction = 3.5 yrs (Packer et al. 1998)

Rspan = 15.5 (the age when 95% of females are no longer reproductive) - AFR = 12 yrs (Packer et al. 1998)

Z = 0.29 (a constant "depending on survivorship and relative fecundity of young vs. old individuals in the population" (IUCN 2013), calculated as the slope of the linear regression between GL and Rspan for 221 mammalian species (Pacifici et al. 2013)

Thus GL = 12*0.29 +3.5 = 6.98 yrs

To fill gaps between censuses conducted in non-consecutive years, we interpolated population sizes, assuming a linear change between years. For surveys conducted for only a few years between 1993 and 2014, we extrapolated to the beginning and end points based on an exponential rate of change taken from the observed growth rate for each respective population. However, all extrapolations are capped by the estimated carrying capacity for each reserve so that populations that experienced dramatic population change were not assumed to have been at implausibly high totals in either 1993 or 2014. Populations were first categorized according to whether or not the reserves were surrounded by a fence; unfenced populations were further categorized according to geographical location with the exception of Niassa Reserve (Mozambique), treated as an outlier as discussed below.

In graph form (Figures 1-4 in the attached Supporting Material) we summarize the repeated censuses of 46 different African Lion populations using all available repeat-survey data. Figure 5 (in the attached Supporting Material) addresses the 47th Lion population in our analysis, the only Asian subpopulation.

Outside parts of southern Africa, Lions in 23 unfenced reserves in 11 countries are estimated to have dropped by 62% between 1993 and 2014 (see Figure 1 in the attached Supporting Material). Although these totals only included about 4,600 Lions in the year 1993, several surveyed areas are restricted to the best-protected portions of much larger ecosystems (e.g., the phototourism areas of Selous and Serengeti).

In contrast, the total number of Lions in six unfenced reserves in Botswana, Namibia and Zimbabwe only declined by about 10% (Figure 2, attached Supporting Material). Note that the overall stability in southern Africa masks considerable heterogeneity: between 1993 and 2014 the monitored Lion subpopulation in a portion of the Okavango ecosystem is estimated to have declined by 46%, whereas the much smaller subpopulations in Gonarazhou and Kunene have increased dramatically.

The striking contrast between these three countries in southern Africa and the rest of the continent is probably related to the equally striking differences in human population densities (Packer et al. 2013) in Namibia (2.5/km²), Botswana (3.4) and Zimbabwe (26) vs. Benin (78), Burkina Faso (57), Cameroon (40), Cote d'Ivoire (64), Ghana (102), Kenya (67), Nigeria (189), Rwanda (420), Senegal (68), Tanzania (48), Uganda (137) and Zambia (45).

The unfenced Niassa subpopulation is estimated to have increased by over 250% since 1993 (Figure 3, attached Supporting Material); despite severe bushmeat poaching the Lions are still recovering from excessive prey depletion during civil war. In addition, on a shorter time scale, Lions have benefited from extensive ivory poaching, which has provided them with sizeable quantities of elephant meat (Colleen Begg pers. comm. 2014). Human population density in Mozambique is 74/km² with sizeable numbers of people living inside Niassa Reserve, so unless management is further strengthened, this unfenced Lion population may soon experience declining food supplies and increased human-lion conflicts. These arguments strongly suggest that the 'boom' in the Niassa Lion population has stopped and is unlikely to be repeated in the future. We therefore consider Niassa to be a special case and treat it as an outlier in our analyses.

The 16 fenced populations (10 in South Africa, and all but one in southern Africa) have grown by ~30% since 1993, most having already reached their presumed carrying capacities by 2013 (Figure 4, attached Supporting Material). Note that although these numbers now total over ~3,000 Lions, our data come from the great majority of fenced reserves in Africa and that little further growth can be expected in these populations.

Asia is home to a single contiguous subpopulation in the Indian state of Gujarat (Figure 5, attached Supporting Material). While the population has stabilized inside the Gir Reserve, the so-called "satellite" population in the surrounding countryside has expanded by ~400% in the past 21 years.

The 47 sample Lion subpopulations totalled an estimated 9,610 Lions in 1993 (excluding Niassa, which is treated as an outlier as described above); that number shrank by 22% to 7,468 Lions in 2014 (Table 2, attached Supporting Material). However, as described above, there are significant regional differences evident in population trend, and we use these to inform our inferences about population trend for the species as a whole. Table 2 (attached Supporting Material) groups the sample populations by region in Africa, following the IUCN (2006) regional Lion conservation strategies, but combining West and Central Africa due to a small sample size

for Central Africa. In Southern Africa, the sample population grew by 7%, while in sharp contrast, sample populations declined by 57% in Eastern Africa and 66% in West and Central Africa.

Table 3 (attached Supporting Material) shows the estimated Lion population size in 1993 and 2014 for each of the 47 sample populations with percentage change, and it can be seen that most countries had a declining trend for sample Lion populations, with only four countries (India, Namibia, South Africa and Zimbabwe) seeing a growth trend. Table 4 (attached Supporting Material) groups these countries with Botswana, which had a relatively low average rate of decline for its sample populations; two out of three sample populations increased; the decline documented in the Okavango population was restricted to only part of the protected area; and overall 2012 estimates for the national population suggest that it his increased since 2003 (C. Winterbach unpubl. data). Mozambique is not included in this group as the increasing trend in its Niassa population is treated as an outlier in this analysis. The sample Lion population in five countries (Botswana, India, Namibia, South Africa, Zimbabwe) grew by an estimated 11%, whereas the Lion population in the remaining African range countries declined by an estimated 60% (Table 4, attached Supporting Material).

We infer population trend for the total Lion species population based on these two rates of change, as follows. In 2002, two separate country compilations of population estimates for Lions in Africa estimated the number of lions in Botswana, Namibia, South Africa and Zimbabwe to comprise between 1/4 to1/3 of the total African Lion population, as shown in Table 5 (attached Supporting Material). We suspect that this proportion was somewhat lower in 1993, given that the number of Lions is inferred to have increased in these countries while decreasing in the remainder, and use a figure of 1/4 or 25% for our species population trend calculation. If 25% of the Lion population increased by 11%, and 75% decreased by 60%, this results in an inferred trend of (0.75*-60%) + (0.25*11%) = -42% between 1993 and 2014 (Table 6, attached Supporting Material).

This qualifies the Lion as Vulnerable, but it is of great concern that the vast majority of the population is inferred to have declined at a rate that meets the criteria for Endangered. Since our sample populations were all monitored, we suspect an even greater average rate of decline for unmonitored unfenced populations across much of Africa, since lack of monitoring could suggest lack of conservation effort.

Abundance

A recent paper summarized and updated efforts to estimate the size of the African Lion leading to the most recent estimate of 32,000 Lions in 67 Lion areas (Riggio et al. 2013). The paper presents some recent data, but where no new data were available it included unaltered numbers from earlier sources, such as Bauer and Van Der Merwe (2004) and Chardonnet (2002). As a consequence, Riggio et al. (2013) include numbers from 2002 and 2004 for areas where we believe the downward trend described above occurred. We therefore consider these sources to be insufficiently precautionary for our purpose and feel that an assessment on numbers is less robust than our assessment based on trends.

However, we do attempt to correct for outdated sources in the Riggio et al. (2013) estimate by application of the regional trends we found (Table 2, attached Supporting Material) to the 2002 population size estimates within the respective regions (Bauer and Van Der Merwe 2004, Chardonnet 2002). We calculated putative present Lion numbers per region (Table 7, attached Supporting Material) by applying the observed trend over the subsequent 12 years, except that numbers for West Africa were taken from a comprehensive recent survey (Henschel et al. 2014) because of their greater precision. As a small modification from Chardonnet (2002) we moved the estimate for Selous ecosystem to Eastern Africa to be consistent with the regional divisions used here. The two 2002 estimates were compared in detail (Bauer et al. 2005a,b), showing the ALWG study (Bauer and Van Der Merwe 2004) was more conservative and stricter on data quality. With this in mind, we have greater confidence in the estimate of fewer than 20,000 Lions in Africa than in a number over 30,000.

Population Trend: Decreasing

Habitat and Ecology

The Lion has a broad habitat tolerance, absent only from tropical rainforest and the interior of the Sahara desert (Nowell and Jackson 1996). There are records of Lion to elevations of more than 4,000 m in the Bale Mountains and on Kilimanjaro (West and Packer 2013). Although Lions drink regularly when water is available, they are capable of obtaining their moisture requirements from prey and even plants (such as the tsama melon in the Kalahari desert), and thus can survive in very arid environments. Medium- to large-sized ungulates (including antelopes, zebra and wildebeest) are the bulk of their prey, but Lions will take almost any animal, from rodents to a rhino. They also scavenge, displacing other predators (such as the Spotted Hyaena) from their kills.

Lions are the most social of the cats, with related females remaining together in prides, and related and unrelated males forming coalitions competing for tenure over prides. Average pride size (including males and females) is four to six adults; prides generally break into smaller groups when hunting. Lions tend to live at higher densities than most other felids, but with a wide variation from 1.5 adults per 100 km² in southern African semi-desert to 55/100 km² in parts of the Serengeti (Sunquist and Sunquist 2002). Pride ranges can vary widely even in the same region: e.g., from 266-4,532 km² in the Kgalagadi Transfrontier Park of South Africa (Funston 2001).

In India, the habitat of the Asiatic Lion is dry deciduous forest. The Gir National Park and Wildlife Sanctuary is surrounded by cultivated areas and inhabited by the pastoralist Maldharis and their livestock (Meena et al. 2014). Domestic cattle have historically been a major part of the Asiatic Lion's diet, although the most common prey is the Chital Deer. Mean pride size, measured by the number of adult females, tends to be smaller than for African Lions: most Gir prides contain an average of two adult females (Nowell and Jackson 1996).

Major Threat(s)

The main threats to Lions are indiscriminate killing (primarily as a result of retaliatory or pre-emptive killing to protect life and livestock) and prey base depletion. Habitat loss and conversion has led to a number of populations becoming small and isolated (Bauer et al. 2008). Furthermore, Trophy hunting has a net positive impact in a few areas in Zimbabwe but may have contributed to population declines in Botswana, Namibia, Tanzania and Zimbabwe (Packer et al. 2009, 2011, 2013).

Conflict

The economic impact of stock raiding can be significant: Patterson et al. (2004) estimated that each Lion cost ranchers in Kenya living alongside Tsavo East National Park US$290 per year in livestock losses. Likewise, annual losses of cattle to Lions in areas adjacent to Waza National Park in Cameroon comprised only about 3.1% of all livestock losses, but were estimated to represent more than 22% of financial losses amounting to about US$370 per owner (Bauer 2003). Consequently, Lions are persecuted intensely in livestock areas across Africa; their scavenging behaviour makes them particularly vulnerable to poisoned carcasses put out to eliminate predators. Little actual information exists on the number of Lions killed as problem animals by local people, even though this is considered the primary threat to their survival outside protected areas. Implementation of appropriate livestock management measures, coupled with problem animal control measures and mechanisms for compensating livestock losses, are some of the primary responses to resolving human-Lion conflict (Frank et al. 2006, Bauer et al. 2010, Hazzah et al. 2014).

Prey depletion

Lion population density across the species' range is known to track the biomass of principle Lion prey species; large wild herbivores (Van Orsdol et al. 1985, Hayward et al. 2007). The latter are increasingly under threat from an unsustainable and increasingly commercialized bushmeat trade, leading to collapses in prey populations across large parts of savannah Africa (Lindsey et al. 2013a). Regional Lion population trends reported in this assessment, are closely mirrored by time series data on main Lion prey species from 78 herbivore populations monitored between 1970 and 2005 in West, Eastern and Southern Africa; while herbivore population sizes increased by 24% in Southern Africa, they declined by 52% in Eastern Africa and by 85% in West Africa (Craigie et al. 2010).

Trophy hunting

Trophy hunting is carried out in a number of sub-Saharan African countries and is considered an important management tool for providing financial resource for Lion conservation for both governments and local communities. However, there is concern that current management regimes can lead to unsustainable offtakes (Packer et al. 2006). A sustainable offtake level of one male lion per 2,000 km² has been recommended (Packer et al. 2011), but offtake is higher in many areas, which suggests that it is potentially a threat (Lindsey et al. 2013b). Trophy hunting can thus be a tool for conservation but also a threat, depending on how it is regulated and managed (Whitman et al. 2004, Loveridge et al. 2007, Packer et al. 2011).

Other

Disease has also been a threat to Lion populations (Munson et al. 2008, Trinkel et al. 2011). In parts of southeastern Tanzania there have been alarmingly high incidences of people killed by Lions, with up to 400 human Lion-related fatalities recorded from 1997-2007 (Ikanda 2007).

Conservation Actions

Since 1975 *P. leo* has been included in CITES Appendix II, and the Endangered Asiatic Lion subspecies *P. leo persica* in CITES Appendix I. CITES listing of the Lion is currently undergoing a Periodic Review process to evaluate whether this accurately reflects the present situation, with a final recommendation of the Animals Committee expected at its 28th meeting in 2015. The Animals Committee also noted recent information regarding possible changes in the nomenclature of Lions and requests its nomenclature expert to review this information (CITES AC27 WG8). In Africa, Lions are present in a number of large and well-managed protected areas, and remain one of the most popular animals on the must-see lists of tourists and visitors to Africa. Most range states in east and southern Africa have an infrastructure which supports wildlife tourism, and in this way Lions generate significant cash revenue for park management and local communities and provide a strong incentive for wildland conservation.

Regional conservation strategies have been developed for Lions in west and central Africa (IUCN 2006a) and eastern and southern Africa (IUCN 2006b). By setting out common priorities to guide action on both national, community and landscape levels, the regional conservation strategies have the potential for broad and significant improvement of Lion status and management (Nowell et al. 2006). These regional strategies have been used in many countries to develop Lion Conservation Action Plans. While all these documents show awareness of the threats and recognition of solutions, the continued decline in Lion range and numbers show that political priority and funding are not sufficient (Packer et al. 2013).

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Lion (*Panthera leo*)

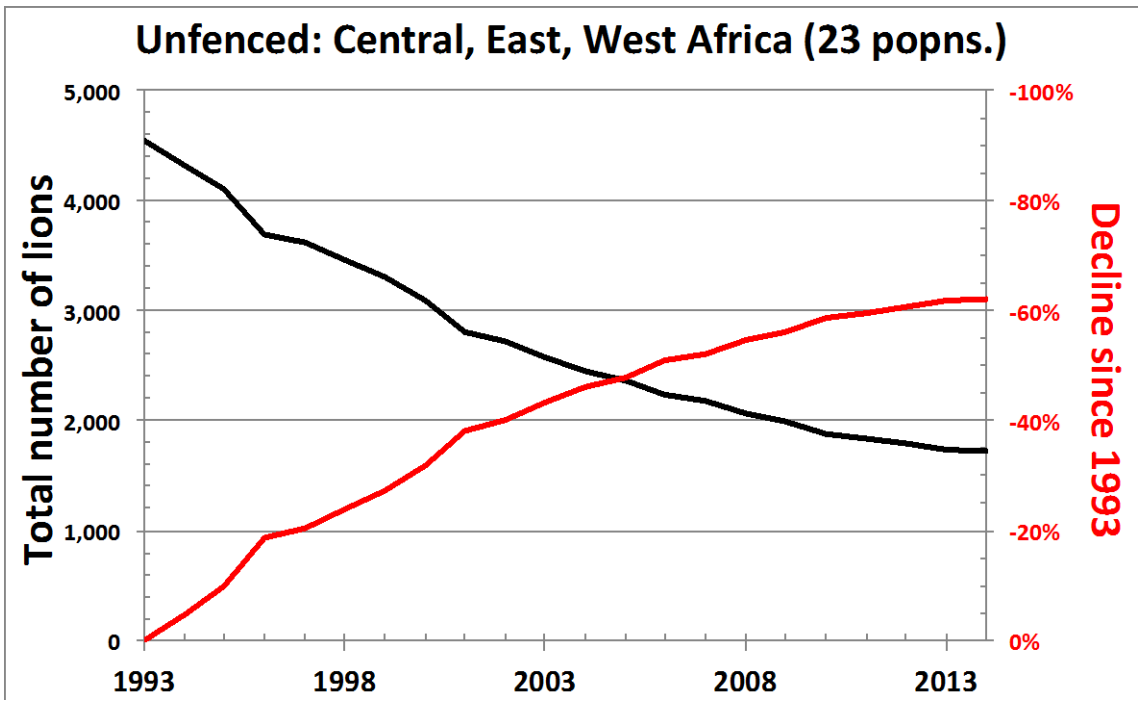

Figure 1. Combined Lion numbers from 1993-2014 (black) and overall decline (62%) since 1993 (red) in 23 unfenced populations from 11 countries across Central, East and West Africa including Zambia, which is sometimes categorized as part of southern Africa. *Benin*: Pendjari, *Cameroon*: Bénoué, Waza, *Côte d'Ivoire*: Comoe, *Ghana*: Mole, *Kenya*: Laikipia, Maasai Mara, Mbirikani, Nairobi, Samburu, Taita, *Niger*: W, *Nigeria*: Kainji, Yankari,, *Senegal*: Niokolo, *Tanzania*: Katavi, Matambwe, Ngorongoro Crater, Serengeti, Tarangire, *Uganda*: Murchison Falls, Queen Elizabeth, *Zambia*: Luangwa

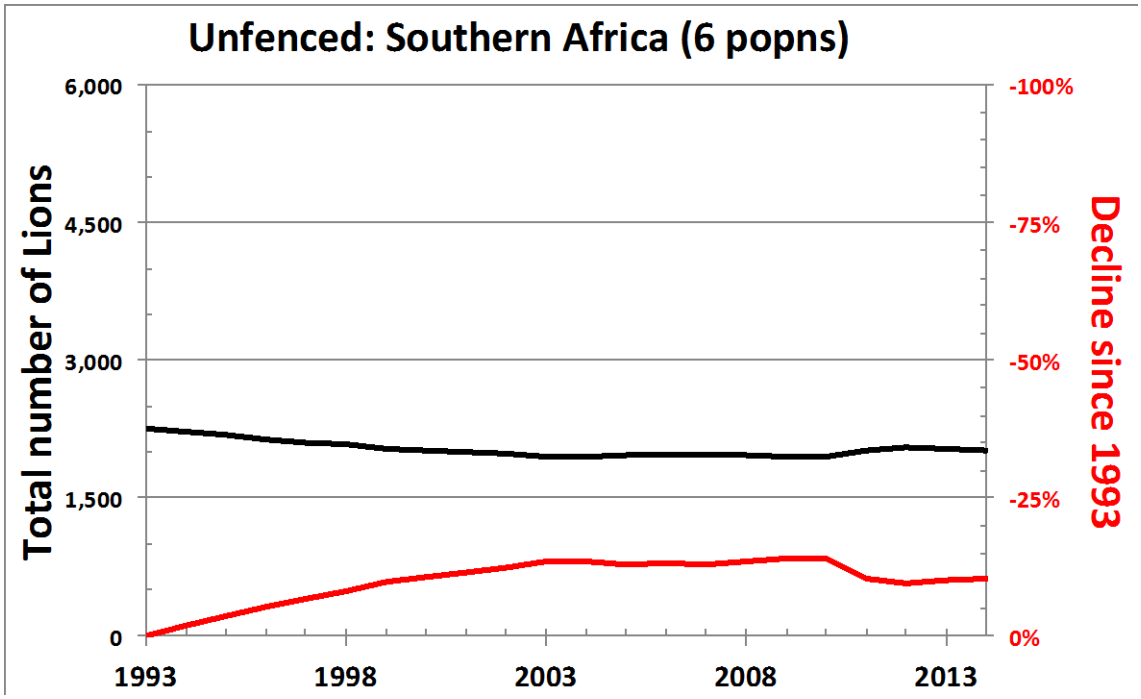

Figure 2. Combined Lion numbers from 1993-2014 (black) and overall decline since 1993 (red) in six unfenced populations from three countries in Southern Africa. *Botswana*: Okavango, Kwando/Chobe, Makgadikgadi; *Namibia*: Kunene, *Zimbabwe*: Gonarezhou, Hwange.

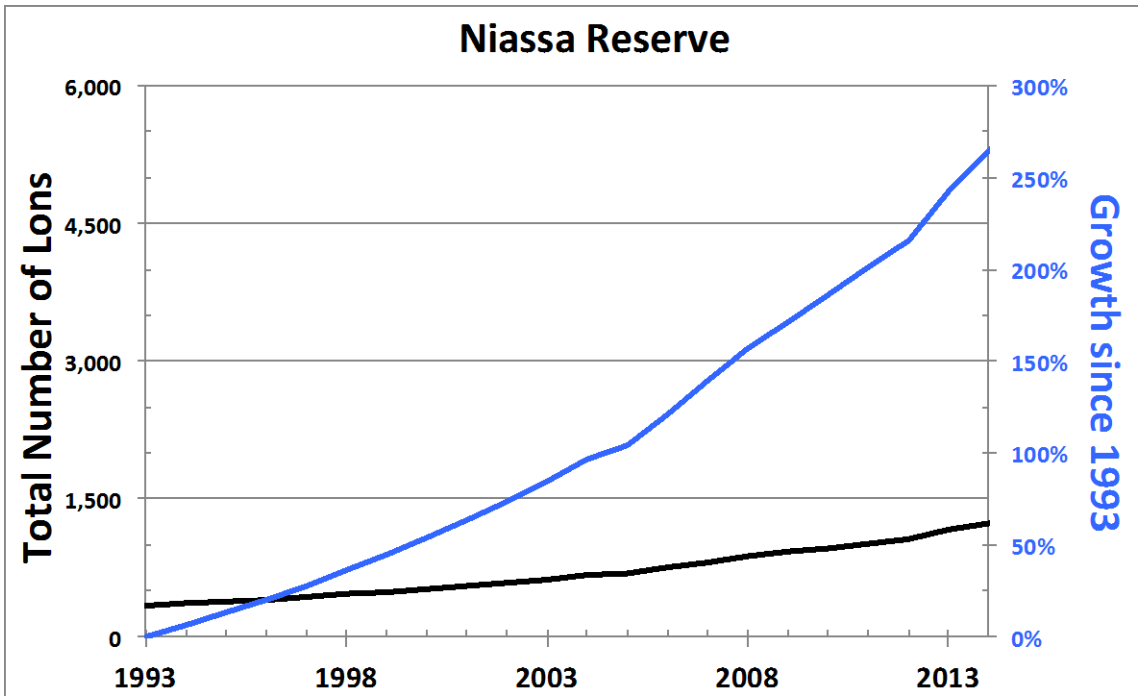

Figure 3. Estimated Lion numbers (black) and overall population growth (blue) in the Lion population in Niassa Reserve, Mozambique.

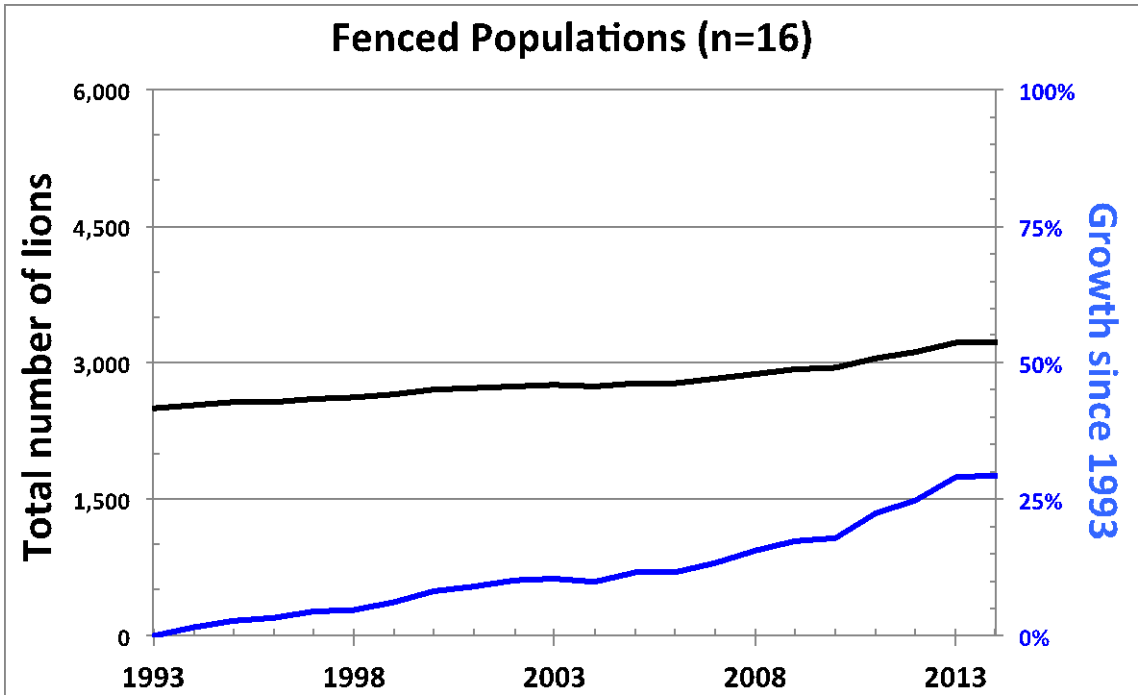

Figure 4. Combined Lion numbers from 1993-2014 (black) and growth since 1993 (blue) in 16 fenced subpopulations from four different countries. *Kenya:* Ol Pejeta, *Namibia:* Etosha, Ongava, *South Africa:* Hluhluwe iMfolozi, Kgalagadi, Kruger, Kwandwe, Madikwe, Makalali, Phinda, Pilanesberg, Tembe, Welgevonden, *Zimbabwe:* Bubye Valley, Malilangwe, Save Valley.

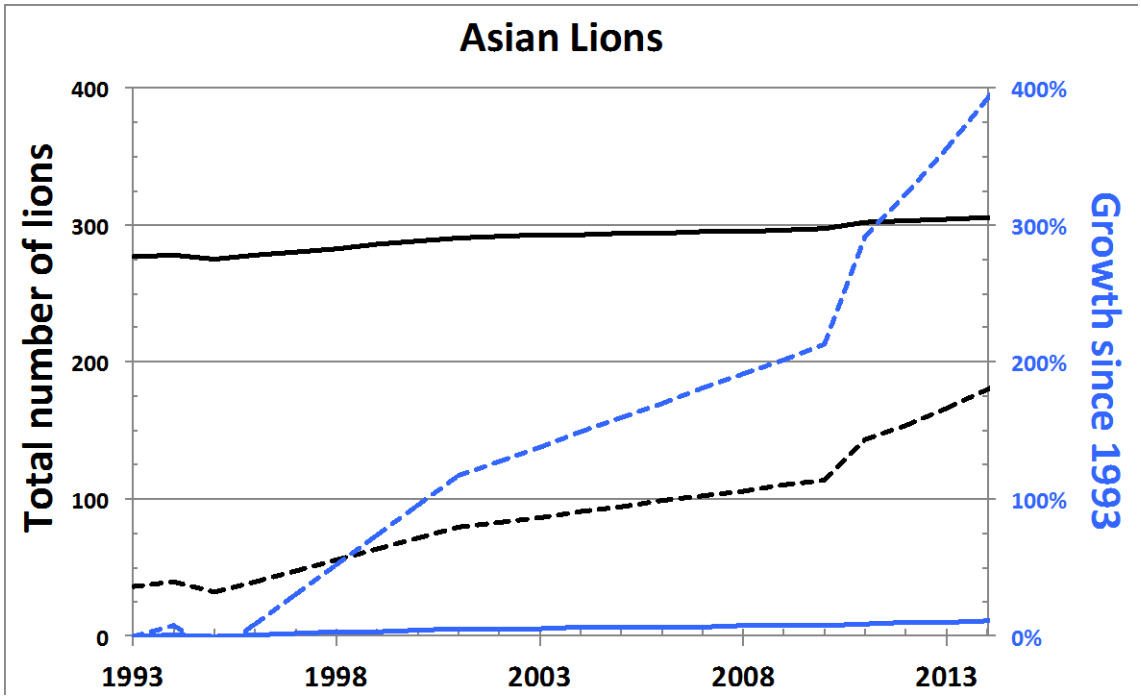

Figure 5. Lion numbers from 1993-2014 (black) and overall growth since 1993 (blue) inside India's Gir National Park (solid lines) and the surrounding "satellite" areas (dashed lines).

Table 1. Lion Range States according to literature and unpublished records (this list is based on evidence at our disposal which may be incomplete, international organizations in need of a list of Range States should first consult governments of the countries concerned and give them opportunity to provide evidence).

Region	Country	Historical range		IUCN 2008			Present assessment			Recently extirpated	Possibly extirpated	Remarks
		Absent	Present	Absent	Possible	Present	Absent	Possible	Present			
West Africa	Benin		1			1			1			
	Burkina Faso		1			1			1			
	Côte d'Ivoire		1			1	1			1		
	Gambia		1	1			1			1		
	Ghana		1			1		1			1	reports of roars in Mole NP
	Guinea		1			1		1			1	
	Guinea Bissau		1			1	1			1		
	Liberia	1		1			1					
	Mali		1			1	1			1		
	Mauritania		1	1			1			1		
	Niger		1			1			1			
	Nigeria		1			1			1			
	Senegal		1			1			1			
	Sierra Leone		1	1			1			1		

	Togo		1		1			1			1	reports of roars in Oti-M. NP
Western Africa		**1**	**14**	**4**	**1**	**10**	**7**	**3**	**5**	**6**	**3**	
Central Africa	Cameroon		1			1			1			
	C.A.R.		1			1			1			
	Chad		1			1			1			
	Congo		1			1	1			1		
	D.R.C.		1			1			1			
	Equatorial Guinea	1		1			1					
	Gabon		1			1	1			1		
	Sudan		1			1			1			
	South Sudan		1			1			1			
Central Africa		**1**	**8**	**1**	**0**	**8**	**3**	**0**	**6**	**2**	**0**	
East Africa	Burundi		1			1	1			1		
	Djibouti		1	1			1			1		
	Eritrea		1	1			1			1		
	Ethiopia		1			1			1			
	Kenya		1			1			1			
	Rwanda		1			1		1			1	recently reintroduced

	Somalia		1			1			1			
	Tanzania		1			1			1			
	Uganda		1			1			1			
Eastern Africa		**0**	**9**	**2**	**0**	**7**	**3**	**1**	**5**	**3**	**1**	
Southern Africa	Angola		1			1			1			
	Botswana		1			1			1			
	Lesotho		1	1			1			1		
	Malawi		1			1			1			
	Mozambique		1			1			1			
	Namibia		1			1			1			
	South Africa		1			1			1			
	Swaziland		1			1			1			extirpated but reintroduced
	Zambia		1			1			1			
	Zimbabwe		1			1			1			
Southern Africa		**0**	**10**	**1**	**0**	**9**	**1**	**0**	**9**	**1**	**0**	
Total Sub Saharan Africa		**2**	**41**	**8**	**1**	**34**	**14**	**4**	**25**	**12**	**4**	
India			1			1			1			

Table 2. Regional trends for 47 monitored Lion subpopulations (listed in Table 3) from 1993-2014.

Region	Estimated lions in sample subpopulations		Percent change
	1993	2014	
Asia	312	485	**+55%**
Southern Africa*	4,887	5,265	**+8%**
Eastern Africa	3,112	1,266	**-59%**
West and Central Africa	1,304	439	**-66%**
Total	**9,615**	**7,455**	**-22%**
Niassa Res, MZ**	339	1,235	**+265%**

Regions include the following countries with known or possible Lion presence in 2014, sorted by three African regions following the IUCN (2006) regional conservation strategies. Number of sample subpopulations in parentheses; two transboundary subpopulations were allocated as follows: W National Park (Benin), Kgalagadi (South Africa).

**Mozambique's Niassa Reserve is treated as an outlier and not included in this regional analysis.

Central and West Africa (9): Benin (2), Cameroon (2), Central African Republic, Chad, Democratic Republic of the Congo, Gabon, Ghana (1), Guinea, Côte d'Ivoire (1), Niger, Nigeria (2), Senegal (1), Togo

Eastern Africa (14): Ethiopia, Kenya (7), Somalia, South Sudan, Tanzania (5), Uganda (2)

***Southern Africa (23):** Angola, Botswana (3), Malawi, Mozambique (1) (shown separately and not included in regional totals), Namibia (3), South Africa (10), Swaziland, Zambia (1), Zimbabwe (5).

Asia (1): India (1)

Table 3. Inferred Lion population trend based on interpolated census data from 1993-2014 in 47 monitored Lion subpopulations (note that these are study subpopulations not necessarily representing total site subpopulation).

Region	Country	Sample subpopulation	Fenced?	State run	Trophy hunt**	*Data points	Data sources (see legend)	Estd Lions (1993)	Estd Lions (2014)	Percent change
Asia	India	Gir National Park***	Y	Y	N	3	4,5	276	306	11
	India	Gir satellite areas***	N	N	N	3	4,5	36	179	397
	India							**312**	**485**	**55**
East Africa	Kenya	Laikipia	N	N	N	11	1	135	59	-56
		Maasai Mara	N	Y	N	2	1	455	209	-54
		Mbirikani	N	N	N	7	1	2	41	1950
		Nairobi	N	Y	N	8	1	30	17	-43
		Ol Pejeta	Y	N	N	6	1	11	85	672
		Samburu	N	Y	N	8	1	26	20	-23
		Taita	N	N	N	7	1	89	18	-80
	Kenya							**748**	**449**	**-40**
	Tanzania	Ngorongoro Crater	N	Y	N	15	1	61	55	-10
		Katavi	N	Y	Y	8	1	1118	0	-100

		Matambwe (Selous GR)	N	Y	N	5	1	124	98	-21
		Serengeti	N	Y	N	15	1	232	314	35
		Tarangire	N	Y	N	8	1	252	141	-44
	Tanzania							**1787**	**608**	**-66**
	Uganda	Murchison	N	Y	N	5	1,4	347	75	-78
		Queen Elizabeth	N	Y	N	4	1,4	230	134	-42
	Uganda							**577**	**209**	**-64**
	Botswana	Kwando/Chobe	N	Y	N	2	4	155	286	84
		Makgadikgadi	N	Y	N	2	4	148	327	121
		Okavango	N	Y	N	2	4	1932	1050	-46
	Botswana							**2235**	**1663**	**-26**
	Mozambique	**Niassa**	**N**	**Y**	**Y**	**3**	**1,4**	**339**	**1235**	**264**
	Namibia	Etosha	Y	Y	N	3	1,4	505	472	-7
		Kunene	N	N	Y	13	1	6	242	3933
		Ongava	Y	N	N	10	1	4	11	175
	Namibia							**515**	**725**	**41**
	South Africa	Hluhluwe-iMfolozi	Y	Y	N	8	1	60	108	80
		Kruger	Y	Y	N	2	1	1733	1648	-5
		Kwandwe	Y	N	N	9	1	1	22	2200

		Madikwe	Y	Y	N	5	1	9	37	311
		Makalali	Y	N	N	11	1	10	30	200
		Phinda	Y	N	N	12	1	12	27	125
		Pilanesberg	Y	Y	N	5	1	6	33	450
		Tembe	Y	N	N	10	1	1	15	1400
		Welgevonden	Y	N	N	9	1	3	23	667
	SA/Botswana	Kgalagadi	Y	Y	N	3	1	111	131	18
	South Africa							**1946**	**2074**	**-7**
	Zambia	**Luangwa**	**N**	**Y**	**N**	**5**	**4**	**139**	**100**	**-28**
	Zimbabwe	Bubye	Y	N	Y	5	1	9	330	3567
		Gonarezhou	N	Y	N	5	4	1	80	7900
		Hwange	N	Y	Y	10	1,4	21	39	86
		Malilangwe	Y	N	Y	7	1	18	42	133
		Save Valley	Y	N	Y	5	1	3	212	6967
	Zimbabwe							**52**	**703**	**1252**
West Africa	**Benin**	**Pendjari**	**N**	**Y**	**N**	**3**	**1,2,4**	**25**	**108**	**332**
	Benin/Burkina Faso/Niger	**W**	**N**	**Y**	**N**	**3**	**2,4**	**76**	**63**	**-17**
	Cameroon	Benoue	N	Y	N	4	1,2,4	253	208	-18
		Waza	N	Y	N	4	1,2,4	69	11	-83
	Cameroon							**322**	**220**	**-32**

	Ghana	**Mole**	**N**	**Y**	**N**	**4**	**1,2,4**	**131**	**0**	**-100**
	Côte d'Ivoire	**Comoe**	**N**	**Y**	**N**	**4**	**1,2,4**	**265**	**0**	**-100**
	Nigeria	Kainji	N	Y	N	4	2,4	155	21	-86
		Yankari	N	Y	N	5	2,4	129	11	-91
	Nigeria							**284**	**32**	**-89**
	Senegal	**Niokolo**	**N**	**Y**	**N**	**5**	**2,4**	**201**	**16**	**-92**

*Data points: number of years per site with census data; the remaining years are interpolated as described in the text

**Trophy hunt: Trophy hunting allowed or known to affect population (Packer *et al* 2013)

**Gir NP and satellite area lions are graphed separately in Figure 5 but treated as a single subpopulation otherwise.

Table 4. Based on Table 3, four range countries (excluding Mozambique*) had overall increasing trends in sampled Lion subpopulations; Botswana is included with this group due to its relatively small rate of overall decline. In contrast, the remainder of African range states had decreasing trends in sampled subpopulations.

	Estimated Lions in sample subpopulations		Percent change
	1993	2014	
Five range countries: Botswana, India, Namibia, South Africa and Zimbabwe	5,060	5,650	**+11%**
Remainder of African range	4,555	1,805	**-60%**

*Niassa (Mozambique), treated as an outlier, as described in the text

Table 5. Estimated percentage of species population in four southern African countries (Bauer *et al.* 2005) in 2002, used to estimate the proportion of total species population that has increased by 11% since 1993 (Table 6).

	ALWG	**IGF**
Botswana+Namibia+South Africa+Zimbabwe	7,581	9,436
Total estimated African population	23,000	39,373
Four country percentage of African population	33%	24%

ALWG = African Lion Working Group (Bauer and van der Merwe 2004, national totals as given in Bauer *et al.* 2005).

IGF = International Foundation for the Conservation of Game (Chardonnet 2002, national totals as given in Bauer *et al.* 2005)

Table 6. Calculation of Lion decline over three generations (1993-2014) from observed rate in sample subpopulations in two different parts of extant range.

	5 countries: Botswana, India, Namibia, South Africa, Zimbabwe	**Remaining range (Africa)**	**Total**
Starting proportion of population in 1993	25	75	100
Population average annual trend	+0.5%	-2.8%	
Total change over 3 generations	+11%	-60%	
Ending proportion of population	28	30	58 (42 % decline)

Table 7. Regional trends for 47 monitored Lion subpopulations from 1993-2014 and putative number of Lions if those trends are applied to 2002 estimates.

Region	Estimated Lions in sample populations		Percent change	Putative 2014 Lion numbers, trend applied to 2002 estimates	
	1993	2014		Bauer and Van Der Merwe (2004)	Chardonnet (2002)
Asia	312	445	+55%	-	-
Southern Africa	4,887	5,265	+8%*	10,385	15,925
Eastern Africa	3,112	1,266	-59%	7,345**	13,316
West Africa	1,304	439	-66%	406***	406***
Central Africa				590	1,748
Total putative Lions in Africa				18,841	31,394

* excludes outlier Niassa, as explained in the text; with Niassa: +24%.

** Ruaha and Tarangire ecosystems recognized as substantial missing data

*** trend applied to Central Africa only, West Africa from Henschel *et al.* (2014)

Note: References mentioned above are cited in full under the Bibliography page for the species on *The IUCN Red List of Threatened Species*™.