UNEP-WCMC **technical report**

Review of *Panthera leo* from the United Republic of Tanzania and from Zambia

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UNEP WCMC

Review of *Panthera leo* from the United Republic of Tanzania and from Zambia

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Introduction and summary

This document provides a review of *Panthera leo* from the United Republic of Tanzania and from Zambia, following the publication of the 2015 IUCN Red List assessment for this species.

While the 2015 IUCN Red List assessment of *Panthera leo* maintains the global status of the species as 'Vulnerable', the 2015 assessment highlighted declines in a number of lion populations. The IUCN highlighted declines in subpopulations in two countries where the importation of trophies from the species is being reviewed by the European Union: the United Republic of Tanzania where the species is currently subject to a positive SRG opinion and Zambia which is subject to a 'No Opinion iii)' (Table 1).

Table 1: Overview of current SRG opinions as of 21/08/2015 for *Panthera leo*, and subpopulation numbers and changes reported by the IUCN in the 2015 assessment of the species.

SRG opinions			IUCN 2015 Red List information on 47 monitored sample subpopulations, by country			
Party	**Opinion**	**Last confirmed**	**1993 estimate**	**2014 estimate**	**% change 1993-2014**	**Notes**
Benin	-ve	03/09/2014	25	108	**+332%**	(see also Burkina Faso)
Botswana	No op. i)	28/05/2014	2235	1663	**-26%**	(3 populations considered, 1 declined)
Burkina Faso	-ve	09/04/2015	76	63	**-17%**	(1 population considered, overlapping with Benin and Niger)
Cameroon	-ve	09/04/2015	322	220	**-32%**	(2 populations considered, 2 declined)
Central African Republic	No op. iii)	07/06/2012	-	-	**-**	
Ethiopia	Susp. (b)	28/05/2015	-	-	**-**	
Mozambique	No op. iii)	27/03/2015	339	1235	**+264%**	(1 population considered)
Namibia	+ve	07/06/2012	514	725	**+41%**	(3 populations considered, 1 declined)
South Africa	+ve	03/09/2014	1946	2074	**+7%**	(10 populations considered, 1 declined)
South Sudan	No op. iii)	07/06/2012	-	-	**-**	
Sudan [prior to secession of S. Sudan]	No op. iii)	07/06/2012	-	-	**-**	
United Republic of Tanzania	+ve	24/10/2014	1787	608	**-66%**	(5 populations considered, 4 declined)
Zambia	No op. iii)	11/09/2012	139	100	**-28%**	(1 population considered)
Zimbabwe	+ve	08/12/2014	52	703	**+1252%**	(5 populations considered, 0 declined)

The CITES Authorities of the United Republic of Tanzania (hereafter referred to as Tanzania) and Zambia have been contacted to seek further clarification on the conservation status and management of the species in these countries. The Management Authority of Tanzania replied and provided more detailed information on the species' status in the country. However, at the time of submission of the present report, no reply had been received from Zambia.

Expert input has been sought from nine lion experts. Replies were received from six of these experts and relevant information has been included in this report.

Panthera leo II/B (*Panthera leo persica* I/A)

COMMON NAMES:	Lion (EN), Lion d'Afrique (FR), León (ES)
RANGE STATES:	Afghanistan (extinct), Algeria (extinct), Angola, Benin, Botswana, Burkina Faso, Burundi (extinct), Cameroon, Central African Republic, Chad, Congo (extinct), Côte d'Ivoire (possibly extinct), Democratic Republic of the Congo, Djibouti (extinct), Egypt (extinct), Eritrea (extinct), Ethiopia, Gabon (extinct), Gambia (extinct), Ghana (possibly extinct), Guinea (possibly extinct), Guinea Bissau (possibly extinct), India, Iran (Islamic Republic of) (extinct), Iraq (extinct), Israel (extinct), Jordan (extinct), Kenya, Kuwait (extinct), Lebanon (extinct), Lesotho (extinct), Libya (extinct), Malawi, Mali (possibly extinct), Mauritania (extinct), Morocco (extinct), Mozambique, Namibia, Niger, Nigeria, Pakistan (extinct), Rwanda (possibly extinct), Saudi Arabia (extinct), Senegal, Sierra Leone (extinct), Somalia, South Africa, South Sudan, Sudan, Swaziland, Syrian Arab Republic (extinct), Togo (possibly extinct), Tunisia (extinct), Turkey (extinct), Uganda, United Republic of Tanzania, Western Sahara (extinct), Zambia, Zimbabwe
UNDER REVIEW:	United Republic of Tanzania, Zambia
EU DECISIONS:	Current positive opinion for wild specimens from Tanzania formed on 24/10/2014. Current no opinion iii) for wild specimens from Zambia formed on 11/09/2012.
IUCN:	Vulnerable

Taxonomic note

The current taxonomy of the African and Asian subspecies of *Panthera leo* was considered invalid (Barnett *et al.*, 2014). Based on Barnett *et al.* (2014), 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 was provisionally proposed by the IUCN SSC Cat Specialist Group in 2015 (Bauer *et al.*, 2015).

Trade patterns

Panthera leo persica was listed in CITES Appendix II on 01/07/1975 and *P. leo* in CITES Appendix III on 26/02/1976 by Ghana. On 04/02/1977, *P. leo* was listed in CITES Appendix II (included in Felidae spp.) and *P. leo persica* in CITES Appendix I. *P. leo* was listed in Annex B (included in Felidae spp.) and *P. leo persica* in Annex A of the EU Wildlife Trade Regulations on 01/06/1997.

The United Republic of Tanzania (hereafter referred to as Tanzania): Tanzania has not published any export quotas for *P. leo*. Direct trade in *P. leo* from Tanzania to the EU-28 between 2004 and 2013 consisted primarily of hunting trophies (Table 1). With the exception of two trophies reportedly seized/confiscated by Australia in 2010, all trade was wild-sourced. Apart from

specimens and hair, which were traded for scientific purposes, all trade was recorded as either purpose 'H', 'T', 'P' or reported without a purpose specified. In total there were 237 wild-sourced trophies, six skins and six skulls, reported imported by the EU-28 between 2004 and 2013. To estimate the number of individuals in trade for hunting trophies a permit analysis was undertaken to identify cases where multiple items were exported on the same permit, and therefore might represent the same individual. On the basis of this permit analysis, this is estimated to equate to 244 individuals.

The principal EU importers of trophies were Spain, Germany and France, while the principal EU importer of scientific specimens was the United Kingdom. Overall, the trend in EU imports of trophies is declining. The majority of direct trade to the rest of world was in wild-sourced trophies and trophy items.

With the exception of 2007, all CITES annual reports were submitted by Tanzania for the years 2004-2013.

Indirect trade in *P. leo* from Tanzania to the EU-28 principally consisted of low levels of wild-sourced trophies and trophy items (Table 2). Trade in specimens for scientific purposes was also reported in 2010-2011.

Small quantities of trade (direct and indirect) in lion parts and derivatives (including bones) other than those reflected in Tables 1 and 2 have been excluded from this analysis.

Table 1: Direct exports of *Panthera leo* from Tanzania to the EU-28 (EU) and the rest of the world (RoW), 2004-2013. Tanzania did not submit an annual report for 2007.

Importer	Term (unit)	Source	Purpose	Reported by	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU	feet	W	H	Importer										
				Exporter						2				
	skins	W	H	Importer	3									
				Exporter						34	14	3	1	1
			P	Importer	1									
				Exporter										
			T	Importer		1								
				Exporter										
			-	Importer	1									
				Exporter										
	skulls	W	H	Importer	2	1								
				Exporter						34	14	3	1	1
			P	Importer	1	1								
				Exporter										
			-	Importer	1									
				Exporter										
	specimens (kg)	W	S	Importer			0.9							
				Exporter										
	specimens (l)	W	S	Importer		0.4	0.225							
				Exporter										
	specimens	W	S	Importer		77	201							
				Exporter	31	515								
	trophies	I	-	Importer							2			
				Exporter										
		W	H	Importer	30	39	42	27	21	18	17	9	10	1
				Exporter	37	87	65		14	8	10	1	1	
			P	Importer		1		1	1	10	2		1	
				Exporter										

Importer	Term (unit)	Source	Purpose	Reported by	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
			T	Importer	2	1	1		3					
				Exporter										
RoW	live	C	Z	Importer						1				
				Exporter										
	skins	W	H	Importer		2	10			2	7	11	6	
				Exporter						39	32	3	6	5
			P	Importer	1		1							
				Exporter										
			T	Importer	1									
				Exporter										
	skulls	W	H	Importer		3	9			4	8	11	6	
				Exporter						39	32	2	6	8
			P	Importer	1									
				Exporter										
			T	Importer	1									
				Exporter										
	specimens	I	S	Importer								113		
				Exporter										
		W	S	Importer	12			90	29					
				Exporter										
	trophies	I	H	Importer					1			2		
				Exporter										
		O	H	Importer								1		
				Exporter										
		W	H	Importer	93	116	129	79	104	112	98	42	51	10
				Exporter	50	111	115		42	10	11	4	9	3
			P	Importer			1							
				Exporter								1		
			T	Importer			1	1						
				Exporter										
		-	H	Importer										
				Exporter	1									

Source: CITES Trade Database, UNEP-WCMC, Cambridge, UK, downloaded on 10/08/2015. See Annex 1 for a full list of CITES Source and Purpose codes.

Table 2: Indirect exports of *Panthera leo* originating in Tanzania to the EU-28, 2004-2013.

Importer	Term (unit)	Source	Purpose	Reported by	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU	bodies	W	H	Importer										
				Exporter						1				
			P	Importer										1
				Exporter										
	skins	W	H	Importer										
				Exporter							1	1		
	skulls	C	H	Importer										
				Exporter								1		
		W	H	Importer										
				Exporter			2				2	1	3	
	specimens	W	S	Importer							122			
				Exporter							122	6		
	trophies	C	H	Importer										
				Exporter								2		
		U	P	Importer										
				Exporter									1	
		W	H	Importer	2	2	1			1		2		
				Exporter	4	4	2	2	1	1	2	4	3	2

Importer	Term (unit)	Source	Purpose	Reported by	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU (cont.)	trophies (cont.)	W	P	Importer	1							1		
				Exporter	1	1								2
			T	Importer						1				
				Exporter								1		

Source: CITES Trade Database, UNEP-WCMC, Cambridge, UK, downloaded on 10/08/2015. See Annex 1 for a full list of CITES Source and Purpose codes.

Zambia: Zambia has not published any export quotas for *P. leo*.

Direct trade in *P. leo* from Zambia to the EU-28 between 2004 and 2013 consisted primarily of wild-sourced trophies and trophy items (Table 3). Apart from specimens, which were traded for scientific purposes, all trade was recorded as either purpose 'H', 'T', 'P' or reported without a purpose specified. In total there were 57 wild-sourced trophies, one skin, five skulls and two feet, reported imported by the EU-28 between 2004 and 2013. To estimate the number of individuals in trade for hunting trophies a permit analysis was undertaken to identify cases where multiple items were exported on the same permit, and therefore might represent the same individual. On the basis of this permit analysis, this is estimated to equate to 62 individuals. The principal importer of trophies was Spain, while the principal importer of scientific specimens was Sweden (according to exporters) and the United Kingdom (according to importers). The majority of direct trade to the rest of world was in wild-sourced trophies and trophy items.

Zambia has not yet submitted an annual report for 2013.

Indirect trade in *P. leo* from Zambia to the EU-28 principally consisted of low levels of wild-sourced trophies and trophy items. Trade in specimens for scientific purposes was also reported. No indirect trade was reported in 2004-2005 and 2007.

Small quantities of trade (direct and indirect) in lion parts and derivatives other than the ones referred to in Table 3 and 4 have been excluded from the analysis.

Table 3: Direct exports of *Panthera leo* from Zambia to the EU-28 (EU) and the rest of the world (RoW), 2004-2013. Zambia has not yet submitted an annual report for 2013. Quantities have been rounded to the nearest tenth of a litre, where applicable.

Importer	Term (unit)	Source	Purpose	Reported by	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU	feet	W	H	Importer							2			
				Exporter										
	skins	W	H	Importer							1			
				Exporter										
	skulls	W	H	Importer						4	1			
				Exporter								4		
	specimens (l)	W	S	Importer								0.01		
				Exporter										
	specimens	W	S	Importer			9							
				Exporter			9					2	108	
	trophies	W	H	Importer	4	1	7	6	10	6	2	10	3	2
				Exporter		7	16	9	15	11	12	12	17	
			P	Importer							1	2	1	
				Exporter										
			T	Importer						1				
				Exporter										
		-	-	Importer								1		
				Exporter	3									
RoW	live	C	E	Importer					3					

Importer	Term (unit)	Source	Purpose	Reported by	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
				Exporter										
RoW (cont.)	skins	W	H	Importer			4			3	2	3	3	
				Exporter						1				
			P	Importer					1					
				Exporter							1			
	skulls	W	H	Importer			4			1	3	3	3	
				Exporter		1						8	4	
			P	Importer						1			2	
				Exporter			1							
			T	Importer									2	
				Exporter										
	specimens (kg)	-	S	Importer										0.6
				Exporter										
	specimens (l)		S	Importer									0.19	
				Exporter										
	specimens	I	S	Importer										74
				Exporter										
		W	S	Importer							88	118		211
				Exporter							95	124	378	
		-	S	Importer							7	2		
				Exporter										
	trophies	C	H	Importer		2								
				Exporter										
		I	H	Importer				1	1					
				Exporter										
		R	H	Importer										
				Exporter		1								
		W	H	Importer	39	59	37	40	42	38	23	20	39	21
				Exporter		53	49	47	35	29	77	25	56	
			P	Importer										
				Exporter			1					2		
			T	Importer										
				Exporter			1						2	
		-	-	Importer										
				Exporter	34									

Source: CITES Trade Database, UNEP-WCMC, Cambridge, UK, downloaded on 10/08/2015. See Annex 1 for a full list of CITES Source and Purpose codes.

Table 4: Indirect exports of wild-sourced *Panthera leo* originating in Zambia to the EU-28, 2004-2013.

Importer	Term (unit)	Purpose	Reported by	2006	2008	2009	2010	2011	2012	2013
EU	skulls	H	Importer							
			Exporter	1						
		T	Importer							
			Exporter	2						
	specimens	S	Importer							
			Exporter				1		4	12
	trophies	H	Importer		1			1		
			Exporter	1	1	1				
		P	Importer							
			Exporter						1	

Source: CITES Trade Database, UNEP-WCMC, Cambridge, UK, downloaded on 10/08/2015. See Annex 1 for a full list of CITES Source and Purpose codes.

Conservation status

Panthera leo was reported to occur in most Sub-Saharan African countries (Wilson and Reeder, 2005; Bauer *et al.*, 2015), with a single isolated subpopulation remaining in Gir Forest National Park and Wildlife Sanctuary in India (Bauer *et al.*, 2015). Riggio *et al.* (2013) estimated the extant range of *P. leo* at 3.4 million km², reportedly representing 17 per cent of its historic range (Bauer *et al.*, 2015). However, based on recent records and inferred declines, Bauer *et al.* (2015) estimated the extent of occurrence of *P. leo* at 1.65 million km², representing 8 per cent of its historical range.

The species was reported to occur in all African habitats, with the exception of deep desert and deep rainforest, making it an "important element in many African ecosystems" (IUCN SSC Cat Specialist Group, 2006c).

The species lives in matriarchal prides, with males (single or coalitions) generally holding tenure over 2-3 years (Wilson and Mittermeier, 2009). Females usually lose their cubs to infanticide after takeovers, as males try to ensure paternity of offspring (Wilson and Mittermeier, 2009). Although males reach sexual maturity at 26 months, they usually only get the opportunity to breed at five years of age and while holding tenure of a pride (Wilson and Mittermeier, 2009).

"Educated guesstimates" of African *P. leo* numbers by the IUCN SSC Cat Specialist Group in the early 1990s ranged from 30 000 to 100 000 animals (Nowell and Jackson, 1996). In 2002, Chardonnet (2002) estimated 39 000 animals, with about half of the species' range in unprotected areas. Also in 2002, Bauer and Van Der Merwe (2004) estimated 23 000 *P. leo,* primarily occurring in protected areas. In 2006, the population was estimated at between 29 995 and 36 495 animals (IUCN SSC Cat Specialist Group, 2006c, 2006a); however, later counts in Western Africa found fewer animals than previously estimated, therefore requiring reduction of the 2006 estimates (LionAid, 2011). Riggio *et al.* (2013) estimated 32 000 animals, occurring in 67 areas, of which only 15 were reported to hold at least 500 animals; the majority of subpopulations were considered to be small and isolated. Ten *P. leo* "strongholds" (four in East Africa and six in Southern Africa), containing more than 24 000 lions in total (of which roughly 19 000 lions were in protected areas) were reported to exist (Riggio *et al.*, 2013). Bauer *et al.* (2015) noted that the population estimate of 32 000 by Riggio *et al.* (2013) included numbers from earlier sources where no new data was available. Applying regional trends to these sources, Bauer *et al.* (2015) recalculated the number of animals per region, with the exception of West Africa, which was instead based on a recent survey by Henschel *et al.* (2014). In total, Bauer *et al.* (2015) estimated fewer than 20 000 animals in Africa, providing the most recent estimate for this species.

While genetic modelling was reported to have shown that large populations (50-100 *P. leo* prides) and male dispersal were required to conserve genetic diversity and avoid inbreeding (Bjorklund, 2003), such conditions were considered to be met by few wild populations (Bauer, 2008; in Bauer *et al.,* 2008).

P. leo was categorised as Vulnerable in the IUCN Red List, based on a reduction of approximately 42 per cent over the past 21 years (three generations, 1993-2014) (Bauer *et al.*, 2015). This decline was calculated using time trend analysis of census data[1] for 47 "relatively well-studied" subpopulations estimated to total 7500 animals in 2014, which was considered to comprise a substantial proportion of the total population and enough to infer the observed decline for the species as a whole (Bauer *et al.*, 2015). Bauer *et al.* (2015) noted that the vast majority of the

[1] Census estimates were reported to have been obtained by 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 (Bauer *et al.*, 2015).

population was inferred to have declined at a rate that meets the criteria for categorisation as Endangered. Subpopulations in four southern Africa countries (Botswana, Namibia, South Africa and Zimbabwe) were observed to have increased by 11 per cent, while an observed decline of 60 per cent in sample subpopulations outside these countries was inferred for the remainder of the species range in Africa (Bauer *et al.*, 2015). Bauer *et al.* (2015) reported that the species had been recently extirpated in 12 African countries, with lions suspected have been recently extirpated in an additional four.

Likewise, Riggio *et al.* (2013) noted that there was evidence of widespread declines and local extinctions across Africa.

The main threats to the species were reported to be indiscriminate killing (primarily retaliatory or pre-emptive in defence of life and livestock) and prey base depletion (Bauer *et al.*, 2015). However, Bauer *et al.* (2015) noted that there is little information available on the number of lions killed as problem animals by local people. A number of populations were noted to have declined and become isolated due to habitat loss and conversion (Bauer *et al.*, 2015). Disease was also reported to have been a threat to populations (Munson *et al.*, 2008; Trinkel *et al.*, 2011 in Bauer *et al.*, 2015).

Poorly managed trophy hunting was considered a possible contributing factor to population declines (e.g. Packer *et al.*, 2006; Hunter *et al.*, 2013; Lindsey *et al.*, 2013; Bauer *et al.*, 2015). This includes impacts on reproduction among hunted populations, with increased turnover rates of pride males and reduced cub survival, if prime males were targeted (Whitman *et al.*, 2004) and changes in socio-spatial behaviour (e.g. Davidson *et al.*, 2011). The main problems associated with current management practices of lion hunting in some countries were identified as: non-scientific bases for setting quotas; excessively high quotas and off-take levels in some countries; fixed-quotas, which encourage over-harvest; lack of age restrictions; and hunting of females (in Namibia and Zimbabwe) (Hunter *et al.*, 2013).

However, well-managed trophy hunting was thought to represent a trivial threat to the species, if breeding biology and social behaviour were considered adequately, with strict restriction of hunting to males of a "safe minimum age" of ≥6 years (Whitman *et al.*, 2004, 2007). Similarly, Loveridge *et al.* (2009) considered *P. leo* populations to be "incredibly resilient", provided that the social structure remained relatively intact and immigration from other populations was possible. Furthermore, well-managed trophy hunting was considered an important management tool for *P. leo* conservation, (e.g. Packer *et al.*, 2006) that can provide revenues to government conservation authorities (IUCN SSC Cat Specialist Group, 2006a). Lions were considered amongst the most valuable trophy species, and the price of lion hunts was reported to be increasing faster than most other trophy species (Hunter *et al.*, 2013).

Palazy *et al.* (2011) considered scientifically established hunting quotas, regulated at an international level, combined with improved protection methods to be urgently required. Likewise, Hunter *et al.* (2013) considered that urgent and comprehensive reforms of lion management was required, and recommended the implementation and enforcement of age restrictions (6 years or older); improved, independent trophy monitoring and adaptive management of quotas; restriction of harvest to males; and a minimum length of lion hunts of at least 21 days (to allow time for selection and to maximise revenues). A sustainable offtake level of one male lion per 2000 km² was recommended by Packer *et al.* (2011).

LionAid (2011) considered trophy hunting to be highly unsustainable when depending on unknown source populations, and recommended a ban of all *P. leo* trophy hunting, until independent assessments of all populations within hunting concessions have been made and such populations have stabilised. Lindsey *et al.* (2012), however, noted that a hunting ban may have negative impacts on the conservation of the species and its habitat, compared to ecologically

unfavourable alternatives, and Frank *et al.* (2006) noted that "benefits of wildlife must outweigh the costs" to ensure conservation of the species. Likewise, Hunter *et al.* (2013) cautioned that, while trade restrictions may confer immediate benefits for overexploited populations, there are substantial associated risks, including removing or reducing the economic justification to retain large blocks of land for wildlife; undermining the potential for developing wildlife-based land uses; removing or reducing the funds for anti-poaching; and reducing the tolerance for lions. Lindsey *et al.* (2012) recommended that an intervention should focus on a reduction of hunting to sustainable levels, combined with improved management. Temporary hunting moratoria though were found to be potentially useful interventions to restore populations in hunting areas (Davidson *et al.*, 2011).

The species was reported to be present in a number of large and well-managed protected areas and was noted to generate significant cash revenue through wildlife tourism for park management and local communities, providing a strong incentive for conservation (Bauer *et al.*, 2015).

The species had been identified as a possible candidate for the CITES Review of Significant Trade in 2004, based on trade levels in trophies, mainly originating from Botswana, Namibia, South Africa, Tanzania, Zambia and Zimbabwe (AC20 Inf. 12), but it was not selected for review (AC20 Summary Record).

Also in 2004, a proposal by Kenya to transfer the species from Appendix II to Appendix I (COP13 Prop. 6) was withdrawn, with the Conference of the Parties recommending a series of workshops in support of the development of regional conservation strategies instead. The IUCN SSC Cat Specialist Group consequently published the *Conservation Strategy for the Lion in West and Central Africa* (IUCN SSC Cat Specialist Group, 2006a) and the *Regional Conservation Strategy for the Lion in Eastern and Southern Africa*, both of which were intended for implementation in the ten years following development (IUCN SSC Cat Specialist Group, 2006c).

The *Eastern and Southern African Regional Conservation Strategy* emphasised the importance of trophy hunting as a management tool capable of providing benefits to local people and revenues to government conservation authorities, if best practices ensuring sustainability are implemented (IUCN SSC Cat Specialist Group, 2006c).

The Strategy identified areas where management could be improved, and developed a series of objectives within the Strategy:

- Improved lion population management through national action plans for the species including sustainable trophy hunting, recognising its importance as a revenue generator and management tool. Recognition that traditional lion hunting required management too;

- Mitigation of human-lion conflict through preventive measures and damage compensation;

- Equitable sharing of costs and benefits derived from lion conservation;

- National legal frameworks for the promotion of wildlife-integrated land use;

- Better reflection of the regional and national intent in global policies in support of the sustainable use of lions; and

- Best practices in monitoring and trophy hunting management, improved regulation of legal trade while curbing illegal trade through increased efficiency of enforcement;

The Strategy also recommended the consequent development of national action plans for the species (IUCN SSC Cat Specialist Group, 2006c).

In February 2012, the Second African Lion Working Group meeting was held in Etosha, Namibia. In March 2012, Lion Aid organised a meeting on the conservation needs and status of *P. leo*, which directed all range States that had not yet developed National Lion Action Plans for lion conservation and management, in a structured and coordinated way, to urgently do so by April 2013.

At the 25th meeting of the CITES Animals Committee (July 2011), the Committee acknowledged that Kenya and Namibia had offered to lead the review of *P. leo* as a high priority with range State consultation, as a contribution to the Periodic Review of Felidae called for in Decision 13.93 (Rev. COP15) (AC25 summary record). A Periodic Review of *P. leo* by Kenya and Namibia was presented at AC27 (AC27 Sum. 2 (Rev.2)), recommending that *P. leo* did not meet the biological criteria for Appendix I and was appropriately listed in Appendix II (AC27 Doc. 24.3.3; AC27 Inf. 15). At its 27th meeting, the Animals Committee noted the then upcoming 2015 IUCN Red List assessment of *P. leo* and requested Namibia and Kenya to incorporate this information into their review and prepare a revised review for consideration at AC28 in August 2015 (AC27 WG8 Doc. 1). The Animals Committee also noted recent information regarding changes to the nomenclature of *P. leo* and requested its nomenclature expert to review this information (AC27 WG8 Doc. 1).

The addition of *P. leo* in Appendix II under CMS was proposed by Kenya at the 11th Meeting of the Conference of the Parties (COP) in 2014. (UNEP/CMS/ScC18/Doc.7.2.2). Resolution 11.32 invites range States to work towards developing an Appendix II listing proposal to be presented at the 12th COP to CMS.

P. leo has been proposed for official listing as Threatened on the U.S. Endangered Species Act (U.S. Fish & Wildlife Service, 2015) and is currently under consideration. The proposed listing includes a rule under Section 4(d) of the Act requiring import permits for all lion products (U.S. Fish and Wildlife Service, 2014).

United Republic of Tanzania

Tanzania was reported to host the largest population of *P. leo* in Africa (Mésochina *et al.*, 2010; Riggio *et al.*, 2013). Mésochina *et al.* (2010), estimated the total range to be approximately 749 700 km², comprising roughly 85 per cent of the total terrestrial land area of Tanzania. The majority (69 per cent) of this area was considered a 'permanent presence' lion range (Mésochina *et al.*, 2010). However, updated information on population size and trends was reported to be lacking for most populations (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015). One expert considered that lion population size and status has not been systematically assessed in the vast majority of conservation areas in Tanzania (Anon 1, 2015a). The same expert considered the known lion range in Tanzania to cover 377 000 km² (Anon 1, 2015a).

Distribution

The four main subpopulations of lions in Tanzania were reported as:

1) the Maasailand Ecosystem, mostly in Mara, Arusha, Kilimanjaro and Manyara Regions (north-eastern Tanzania);

2) Kagera and Kigoma Regions (north-western Tanzania);

3) Rukwa, Tabora and Mbeya Regions (central and western Tanzania); and

4) the Selous Ecosystem, mostly in Lindi, Morogoro and Ruvuma Regions (southern Tanzania) (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015).

Packer (2009) noted that unlike in other range countries, significant numbers of *P. leo* were found outside protected areas in Tanzania. According to Mésochina *et al.* (2010), the majority (around 55 per cent) of the species' range was in non-gazetted areas; however, the authors noted that in most sites outside protected areas, the species had been observed rarely, and that approximately 81 per cent of the total population was found within protected areas, including National Parks (21.5-24 per cent) and hunting areas (i.e. Game Reserves, Game Conservation Areas, and Open Areas) (57 per cent) (Mésochina *et al.*, 2010). Mésochina *et al.* (2010) recorded occurrence in 17 out of the 19 protected areas with no trophy hunting, and found lions to be present in all protected areas where hunting was practiced. Packer (2009) noted that out of the five areas with significant populations of *P. leo* (considered by Packer (2009) as Serengeti, Maasai Steppe, Selous, Moyowosi-Kigosi-Ugalla and Rukwa-Rungwa-Ruaha) in Tanzania, only Serengeti was primarily a National Park, whereas the rest were conserved primarily for hunting purposes. Mésochina *et al.* (2010) recorded occurrence in 72 out of 97 studied Districts, and noted that the species was absent in some areas in north-eastern Tanzania, the southern shores of lake Victoria, and the vicinity of lake Malawi. According to TAWIRI (2009), the species was also absent in the Usambara and Pare mountains.

Population size and status

Ikanda (2008) stated that mainly due to the high cost and inefficiency of aerial surveys, the total population size of *P. leo* in Tanzania had not been accurately determined. Mésochina *et al.* (2010) reported that the status of populations outside protected areas was particularly poorly known, and Riggio *et al.* (2013) noted that population numbers from Tanzania include many uncertainties.

The Ministry of Natural Resources and Tourism (*in litt.* to UNEP-WCMC, 2015) reported that its Wildlife Division, in collaboration with TAWIRI (Tanzania Wildlife Research Institute), had launched a national large carnivores survey in 2014 to monitor the status and population trends of *P. leo* in the tourist hunting areas of Tanzania. Surveys were undertaken in the eastern border of the Tarangire Ecosystem and the Selous Game Reserve during 2014 and 2015. Whilst preliminary results suggest that densities in Selous Game Reserve are comparable to those observed by Brink *et al.* (2013), and lion densities may have increased in some areas, the survey results are currently being analysed and the overall results are not yet available (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015).

One expert claimed that there was a lack of transparency around trophy hunting in Tanzania, and questioned whether TAWIRI had the resources and independence required to monitor lion populations (Anon 2, 2015). Another expert questioned the impartiality of the entities responsible for carrying out survey work underway in Tanzania (Anon 1, 2015a).

Ikanda (2008) estimated the size of eight known populations in National Parks and Game Reserves at 13 000 individuals, and after combining this to data collected from other suitable habitats by Chardonnet (2002), concluded the minimum population size to be 18 215 individuals. Ikanda and Packer (2006, cited in Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015) estimated the population to be 17 564. A considerably lower estimate of 7073 individuals in 2001/2002, was given by Bauer and Van Der Merwe (2004), although they noted that some important range areas were omitted. The IUCN SSC Cat Specialist Group, (2006b) reported a population estimate of less than 15 400 individuals, including some cross-border populations. Some Tanzanian populations of *P. leo* were considered to be connected with populations found in Kenya, Rwanda, Malawi, Mozambique and possibly Zambia (Mésochina *et al.*, 2010). Mésochina *et al.* (2010) estimated the population size to be 16 800 individuals, recalculated to be 15 818 by Riggio *et al.* (2013)

to exclude areas where lions were considered a temporary presence. The Tanzanian Wildlife Division accepted the estimate of 16 800 by Mésochina *et al.* (2010) as the latest nationwide lion estimate (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015). One expert raised concerns about the reliability of the methods used in prior estimates of lion population sizes in Tanzania (e.g, by Mésochina *et al.* (2010)) and reported that only 8 per cent of known lion range had been subject to systematic survey work utilising appropriate field methodology (Anon 1, 2015a).

Average densities calculated in different regions were reported to vary between 0.01 on the southern plains of the Serengeti to 0.38 individuals per km² in Manyara National Park and the grass plains of the Serengeti (TAWIRI, 2009).

The size of the four main subpopulations, according to the assessment by Mésochina *et al.* (2010), were reported at around: 3700 in the Maasailand Ecosystem; 520 in Kagera and Kigoma Regions; 2300 in Rukwa, Tabora and Mbeya Regions; and 7200 on the Selous Ecosystem (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015). The total figure for these four subpopulations is around 13,700 individuals.

The Selous Game Reserve (SGR) in Tanzania was believed to contain the largest lion population in Africa (Bauer and Van Der Merwe, 2004 in Brink *et al.*, 2012). However, few population surveys were reported to have been undertaken (Brink *et al.*, 2012). Between 2006 and 2009, Brink *et al.* (2012) combined individual recognition surveys with call-up surveys in a study area to estimate the overall number of *P. leo* throughout the SGR at around 4300 individuals (within an estimated range of 1700-6900 individuals) at densities of 0.06 adult lions per km² [2].

The Tarangire lion area was reported to hold an estimated 700 lions, of which only around 200 occurred in protected areas (IUCN categories I-VI); the remainder were reported to occur in non-designated hunting areas (Riggio *et al.*, 2013).

Katavi National Park was surveyed by Kiffner *et al.* (2009) in 2005 to assess lion density and identify the key factors influencing lion abundance. The population was estimated to be at 31-45 per cent of the parks carrying capacity, with considerably fewer sub-adult males observed than expected (Kiffner *et al.*, 2009). *P. leo* were also found to be less abundant near the park boundaries and were not detected outside (Kiffner *et al.*, 2009).

Ikanda (2008) noted that although the past abundance of *P. leo* in Tanzania was poorly known, "historical tribal tales and legends suggest fewer lions survive today than did in the past 50 years". In a study based on questionnaire surveys, Mésochina *et al.* (2010) reported that the majority of informants considered the recent population trend to be decreasing outside the protected areas but increasing or stable within the protected areas. Similarly, Chardonnet (2002) considered the populations in protected areas generally stable, however the populations outside protected areas were considered to be decreasing mainly due to livestock competition.

The IUCN SSC Cat Specialist Group, (2006b) reported varying increasing and decreasing trends for different populations in Tanzania. Packer *et al.* (2011) reported a decreasing population or hunting trend in 9 out of 12 areas where photo-tourism or hunting occurred. More recently, Bauer *et al.* (2015) reported declines in four out of five monitored subpopulations (Ngorongoro Crater, Katavi, Matambwe (Selous GR) and Tarangire) from 1993-2014 (Table 5). One subpopulation in the Serengeti was observed to have increased (35 per cent); however, overall the population in these five monitored subpopulations was inferred to have declined by 66 per cent. Bauer *et al.* (2015) noted that these study subpopulations do not necessarily represent total site populations.

[2] The authors noted that the density estimates should be viewed with caution and could decrease if a greater maximum call-up distance than 1.5 km was used (Nelson *et al.*, 2013).

Table 5: Inferred lion population trend based on census data from 1993-2014 in five monitored lion subpopulations in Tanzania (*Bauer et al., 2015*)

Sample Subpopulation	Estimated Lions (1993)	Estimated Lions (2014)	Percentage change
Ngorongoro Crater	61	55	-10
Katavi	1118	0	-100
Matambwe (Selous GR)	124	98	-21
Serengeti	232	314	+35
Tarangire	252	141	-44
Overall	**1787**	**608**	**-66**

The Ministry of Natural Resources and Tourism (*in litt.* to UNEP-WCMC, 2015) noted that the majority of lion surveys in Tanzania have taken place in National Parks, and only sporadically outside of these areas [noting the exception of Mésochina *et al.* (2010)].

The Ministry of Natural Resources and Tourism (*in litt.* to UNEP-WCMC, 2015) questioned the finding of zero lions for the sample subpopulation in Katavi, stating that lions are seen regularly in the Katavi Ecosystem (Mésochina *et al.*, 2010) and that 41 adult males (>5 years) have been harvested from Katavi since 2010.

The Ministry of Natural Resources and Tourism (*in litt.* to UNEP-WCMC, 2015) stated that the estimate of inferred decline for Tanzania by Bauer *et al.* (2015) should be considered with caution stating that due to the small study areas in National Parks and a small sample size, the assessment could not be considered representative of lion status and trends in the whole country.

Threats

The main threats to *P. leo* in Tanzania were considered to include habitat loss and illegal killing (TAWIRI, 2009; Mésochina *et al.*, 2010). Almost 200 lions were reported killed each year in response to livestock attacks, with an estimated minimum of 500 livestock lost each year. Less than 10 lions were reported to have been killed through official "problem animal control" (PAC) for this reason per year (AC27 Doc. 24.3.3). Poisoning of lions and habitat loss were reported to be growing threats (AC27 Doc. 24.3.3). Increasing human population was reported to have caused habitat loss, particularly outside protected areas (Ikanda, 2008).

Trophy hunting was reported to have contributed to population declines outside of (and within some) protected areas in Tanzania (Lindsey *et al.*, 2013) and was considered by Packer *et al.* (2011) to pose the greatest threat to the populations in trophy hunting areas. Lindsey *et al.* (2012) noted that recent studies indicated a notable negative impact of trophy hunting on populations of *P. leo* in Tanzania. Packer *et al.* (2011) recorded significant declines in four out of the seven hunting areas studied, with particularly steep declines in hunting areas with highest harvest levels, concluding that the hunting quotas, at that time, of approximately 500 individuals were unsustainable (see management section for details on quotas in Tanzania). LionAid (2011) considered the quotas allocated at the time, to be excessive, with the species overhunted in concessions and concluded that trophy harvest levels were unsustainable. Kiffner *et al.* (2009) found evidence to suggest that the intensity of hunting outside park boundaries had an impact on the abundance of *P. leo* within protected areas. Hunting of lions was considered to be responsible for the skewed sex ratio and low abundance in edge areas and outside of the Katavi National Park (Kiffner *et al.*, 2009) and was reported to have resulted in changes in the sex ratio of the Selous population (Brink *et al.*, 2012).

Decreasing wild prey base and increasing human population were seen as a main factor in human-lion conflicts (Mésochina *et al.*, 2010; Nyahongo and Røskaft, 2011). Mésochina *et al.* (2010) recorded conflicts in the majority (82 per cent) of studied Districts, with livestock depredation most commonly recorded in central and northern Tanzania and human casualties in southern and central parts of the country. According to Kushnir *et al.* (2010), lions attacked over 1000 people in Tanzania during 1990-2007. Ikanda (2008) noted that the impact of retaliatory killing was difficult to measure, as it typically took place in remote areas and was rarely reported to wildlife authorities.

Human-lion conflict was reported to pose a threat to the largest population in the Selous Game Reserve (Brink *et al.*, 2012). Since 2006, numbers of pastoralists in areas adjacent to Selous were reported to be increasing, which was considered likely to impact on the Selous lion population (Dr Brink *in litt.* to UNEP-WCMC, 2015).

P. leo was also reported to be illegally hunted as part of rituals (Kissui, 2008; Ikanda, 2008). In a study conducted in the Tarangire ecosystem, Lichtenfeld (2009) found that the Maasai killed approximately 6.4-8.8 per cent of the *P. leo* population annually. In a later study in the region, Maasai villagers gave livestock depredation as the main reason given for hunting lions (95 per cent of informants); interviewees mentioned that lions perceived as preparing to attack were often killed (Goldman *et al.*, 2013). In addition to retaliatory killing and cultural killing, *P. leo* was also reported to be poached for commercial purposes, traditional uses or due to accidental catching in bushmeat snares (Mésochina *et al.*, 2010). Illegal trade was considered rare (Ikanda, 2008; Packer *et al.*, 2011; AC27 Doc. 24.3.3); however, the Ministry of Natural Resources and Tourism (*in litt.* to UNEP-WCMC, 2015) noted an increase in the number of trophy items impounded by wildlife authorities around the country, which indicated illegal killing of lions. In addition, they noted a potential growing trade in lion bones to Asia from Tanzanian lions.

Management

Key management measures discussed in this section in place in Tanzania include compulsory age-based restrictions, quotas and national laws. Other management measures are also discussed.

Compulsory age-based restrictions below six years of age of hunted lions (Table 6) (stipulated in sections 24(5)(a) and 24(6) of the Tourist Hunting Regulations of 2010) (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015), controlled by annual inspection of trophies by the Tanzania Wildlife Division, were reported to have been implemented in Tanzania (AC27 Doc. 24.3.3; Lindsey *et al.*, 2013). Under the new rule, professional hunters are liable to fines or imprisonment for hunting lions under six years old (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015). A monitoring and control programme run by the Wildlife Division was reported to have been established (AC27 Doc. 24.3.3). According to the Ministry of Natural Resources and Tourism (*in litt.* to UNEP-WCMC, 2015), trophy hunting is monitored through a specific database which records all hunting permits, and is used to follow up on lion trophy activities (e.g. hunting success, hunting effort), however it is unclear how the impacts on populations are monitored. An overview of management measures in place in Tanzania compiled by Lindsey *et al.*, 2013 is provided in Table 6. A comparison of these measures with management measures in place in Zambia is provided in Annex 1, Table 3.

The report received from the Management Authority of Tanzania provides an overview of current management measures in place. While much of the information provided in Lindsey *et al.*, 2013 is still applicable (e.g. minimum age restrictions, sex of lions hunted, etc.), there were some areas that differed: the hunting season was reported to last from 1st July to 31st Decemeber; a specific database to monitor lion trophy hunting was reported; and a new aged-based lion quota setting system based on

the age of the lions harvested during the previous hunting season was reported (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015).

Table 6: Trophy hunting rules and processes in Tanzania

The rules and processes relating to the allocation of hunting blocks and management of lion hunting in Tanzania (sourced from (Lindsey *et al.*, 2013) from surveys with senior officials).

Concession allocation process	Closed tender, fixed fee (depending on status of wildlife in blocks)
Lease period	5 years
Community benefits from hunting in areas occupied by people	In Wildlife Management Areas (WMAs), communities accrue 60–65% of total hunting income; in Game Controlled and Open areas benefits limited to mandatory contributions from operators to community projects
Basis for establishing lion quotas	Based on various source of info: operators provide recommendations; officers working for the Wildlife Division provide opinion regarding whether the previous quota was too big or too small; info from surveys or reports where available.
Mandatory quota payments required from operators ('Fixed quota')	40% of total quota regardless of off-take
Monitoring	Official observer, hunt return form
Season	1 Jul–31 Mar
Time	Sunrise – Sunset (no artificial light)
Minimum stipulated length of lion hunts (in days)	21
Sex of lions hunted	Male
Minimum age/size	6 years
General	Must be shot >200 m away from a vehicle, >2 km from a national park boundary and >500 m from a water source

Mésochina *et al.* (2010) noted that trophy fees were paid based on the fixed hunting quota, even if the animals were not hunted, which may act as an incentive for hunting younger individuals. It was noted that the centralised system of collecting hunting profits gave insufficient incentive for communities to conserve wildlife (Lindsey *et al.*, 2012). Furthermore, the lack of a compensation scheme or insurance system for human-lion conflicts was seen as problematic for lion conservation in Tanzania (Mésochina *et al.*, 2010). In 2012, changes were reportedly made to the regulatory framework for community-based conservation in the form of the Wildlife Management Area regulations, which grant local communities that have established Wildlife Management Areas greater involvement in granting trophy hunting concessions, and provide greater clarity regarding sharing revenues from hunting (Nelson *et al.*, 2013). Lindsey *et al.* (2012, 2013) considered the five-year leases of hunting concessions to potentially discourage incentives to invest in wildlife protection, and Mésochina *et al.* (2010) considered the introduction of a longer lease period as a key issue in improving the management of *P. leo* hunting in Tanzania. Furthermore, the majority of government income from hunting blocks was reported to come from trophy and licence fees, which may encourage higher quotas (Nelson *et al.*, 2013). LionAid (2011) claimed that corruption was a contributing factor in the assignment of hunting areas and in the lack of assessment of hunting pressure at the time.

The Ministry of Natural Resources and Tourism (*in litt.* to UNEP-WCMC, 2015) reported that a new aged-based quota system, which sets and allocates quotas to each hunting area according to the age of the lions harvested in the previous hunting season, has been adopted. Although hunting quotas in Tanzania were reported to be high compared to other range States, quotas were reported to have been reduced, from 520 in 2008-2009 to 315 in 2011-2012 (Lindsey *et al.*, 2013). Based on data provided by the Ministry of Natural Resources and Tourism (*in litt.* to UNEP-WCMC, 2015), quotas in 2013-2014 were between 250-300 individuals.

A general reduction in offtake since 2008 was reported, from 165 in 2008 to 42 in 2014 (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015), although it was noted that this could be at least partly due to continued population declines (Lindsey *et al.*, 2013; Nelson *et al.*, 2013). Furthermore, regional harvest rates in 2013-2014 in the main ecosystems of the lion range were reported to be below the recommended sustainable harvest rate as recommended by Packer *et al.* (2011), with the exception of the Serengeti (0.52 per 1000 km²) in 2013 (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015).

Prior to the decrease in quotas and due to the decrease in *P. leo* populations within the country, Packer *et al.* (2011) and Lindsey *et al.* (2012) suggested a reduction in the hunting quotas to a maximum of 0.5 individuals per 1000 km² (with a slightly higher quota of one individual per 1000 km² within the Selous Game Reserve). Alternatively, Lindsey *et al.* (2012) suggested that a short-term moratorium followed by reduced hunting quotas could also be of benefit to lion populations. Due to the high income of lion trophy hunting, Lindsey *et al.* (2012) considered Tanzania to be economically highly vulnerable to a ban or reduced hunting quota of *P. leo* hunting. Furthermore, as the majority of *P. leo* habitat was found within Hunting Areas (Packer, 2009), which were mainly sustained for the purposes of trophy hunting (Ikanda, 2008), Mésochina *et al.* (2010) cautioned that a ban could lead to significant habitat loss without the incentives to conserve the land for hunting. It was also noted that it could reduce the overall competitiveness of wildlife-based land uses (Lindsey *et al.* 2012).

Tanzania's categories of protected areas include 15 National Parks (covering 4.5 per cent of land area), 34 Game Reserves (13 per cent), the Ngorongoro Conservation Area (1 per cent), 46 Game Controlled Areas (5.5 per cent), 38 Wildlife Management Areas (4 per cent), and 570 Forest Reserves (15 per cent) (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015). Trophy hunting was reported to be conducted in hunting blocks designated as Game Reserves (GRs), Game Controlled Areas (GCAs), Open Areas (OAs), Forest Reserves (FR) and Wildlife Management Areas (WMAs) (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015). Trophy hunting of *P. leo* was reported to occur across a high proportion of its range (34-49 per cent) in Tanzania (Table 4 in Annex).

The sale of lion hunting permits from 2000-2015, was reported to have generated around 2 500 000 USD a year for the Wildlife Division (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015), providing a financial incentive for the retention and development of wildlife areas. The prices for *P. leo* hunting packages in Tanzania were higher compared to the other range countries, and the majority of hunting blocks were considered economically viable (Lindsey *et al.*, 2012).

The Tanzania Wildlife Conservation Act of 2009 (United Republic of Tanzania, 2009) listed *P. leo* under the First, Third (Big Game) and Fourth (Dangerous Animal) Schedules, specifying the need of a permit for hunting or capture. All informal harvesting was reported to be treated as poaching, with fines and penalties involved (Mésochina *et al.*, 2010). The Wildlife Act (1974, 2009) allows for the game scouts to kill 'problem animals' with approval from the district game department and traditional groups to obtain hunting rights (Goldman *et al.*, 2013). In addition to the Wildlife Conservation Act of 2009, trophy hunting in Tanzania was reported to be governed by The Wildlife Conservation (Tourist Hunting) Regulations of 2010 (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015). An amendment to the Tourist Hunting Regulations of 2010 in 2013 stipulated age restriction rules on hunting lions (in sections 24(5)(a) and 24(6) that "*no person shall hunt lion of an age below six years*"), which were adopted by the Wildlife Division (Ministry of Natural Resources and Tourism *in litt.* to UNEP-WCMC, 2015).

Zambia

Distribution

The majority of *P. leo* were reported to occur in protected areas in three ecosystems: the Kafue, the Luangwa Valley and the Lower Zambezi (Midlane *et al.*, 2014). The extent of occurrence of *P. leo* in Zambia was reported at 113 600 km², of which 46 per cent (52 750 km²) was reported to be located within national parks, while 44 per cent (50 350 km²) is located within areas with lower protection status, such as GMAs (Anon 1, 2015b).

Population size and status

In 2002, the population was estimated at 1500, based on a survey conducted for the inventory by Bauer and Van Der Merwe (C. Stuart and T. Stuart, *pers. comm*. in Bauer and Van Der Merwe, 2004), to 3199 animals (Chardonnet, 2002); recalculated by Bauer *et al.* (2005). The IUCN SSC Cat Specialist Group (2006a) reported estimates ranging from 800 to 1980 animals and a stable or unknown population trend for the individual populations, including populations substantially overlapping with neighbouring countries. However, lion numbers were noted to be uncertain, with the population in Liuwa, for example, reported to contain only three lions (LionAid, 2011), rather than the <50 estimated previously (IUCN SSC Cat Specialist Group, 2006b). Furthermore, Riggio *et al.* (2013) noted that the IUCN's statement that populations of *P. leo* in Kafue National Park are stable "may be optimistic" due to the threat poaching poses to the animals' long-term persistence. Becker *et al.* (2013b) noted that little published information on *P. leo* populations in Zambia exists and that estimates of populations in Zambia are likely in need of revision. Monitoring and surveys of lion populations was reported to have been restricted to three study sites located within the main lion areas (Anon 1, 2015b). Hunting operators considered lions to be declining in a significant proportion of hunting areas in Zambia (Lindsey *et al.*, 2013). In 2015, the IUCN reported declines in a monitored subpopulation in the Luangwa of -28 per cent from 139 in 1993 to 100 in 2014 (Bauer *et al.*, 2015).

Populations in South Luangwa National Park, Kafue National Park, and Lower Zambezi National Park, which all border hunting areas, were surveyed between 2001 and 2009 to determine population density, age distribution, and sex ratio (Becker *et al.*, 2013b). The population in the South Luangwa study area (2775 km²) was estimated at 156 individuals in 13 prides and seven coalitions, at densities of 0.020 adults per km² and 0.035 individuals per km²; in the Kafue study area (4720 km²) at 107 individuals in 13 prides and four coalitions at densities of 0.015 adults per km² and 0.018 lions per km²; and in the Lower Zambezi study area (650 km²) and portions of the adjacent Game Management Area (GMA) data was collected for a population of 11-34 individuals in six prides and 13 coalitions at densities of 0.031 adults per km² and 0.037 individuals per km² (Table 7) (Becker *et al.*, 2013b).

Rosenblatt *et al.* (2014) monitored the South Luangwa lion population from 2008 to 2012 and estimated the local population size at a minimum of 94 lions in 2012, a decline from a maximum of 125 in 2009 (excluding cubs below one year of age) (Table 7).

From 2010-2013, Midlane *et al.* (2015) surveyed *P. leo* in the northern sector of Kafue National Park using both call-up surveys and track-count surveys to estimate the species' abundance at 200 individuals over one year of age, with a density of 1.83 per 100 km², at the lower end of density ranges for southern and east African protected areas (Table 7).

Table 7: Estimated size of lion populations in Kafue, South Luangwa and Lower Zambezi

Site	Estimated lion population size	Area assessed (km^2)	% of PA	Year assessed	Source
Kafue	264 (204-325)	11,000	16	2011	(Midlane *et al.*, 2015)
South Luangwa	94 (92-106)	2,775	5	2012	(Rosenblatt *et al.*, 2014)
Lower Zambezi	11-34	650	7	2009	(Becker *et al.*, 2013b)

Threats

The species was reported to be threatened by disease, illegal killing, limited prey availability, livestock encroachment, habitat conversion, resource extraction from protected areas, removal of problem animals and trophy hunting, with levels of threat varying across populations (IUCN SSC Cat Specialist Group, 2006b). According to the responses provided in the latest CITES Periodic Review consultation process, the main threats to *P. leo* in Zambia include snaring, human encroachment and destruction of habitat, especially in areas surrounding national parks and isolated populations (AC27 Doc. 24.3.3). Incidences of human-lion conflict mainly involved the loss of livestock and, on average, seven animals per year were reported to be controlled through official operations (AC27 Doc. 24.3.3). Illegal trade of lion parts and derivatives was reported to occur, but was considered most likely insignificant (AC27 Doc. 24.3.3).

Snaring dynamics and the impact of by-catch on lions in the Luangwa valley was evaluated using data from anti-poaching patrols from 2005-2010 (Becker *et al.*, 2013a). Approximately 11.5 per cent of the adult and sub-adult population and 20 per cent of the adult (>4 years) males were reported to have been snared, with 82 per cent reported to have been immobilised and treated, and subsequently recovered (Becker *et al.*, 2013a). Becker *et al.* (2013a) recommended precautionary management emphasising increased law enforcement as essential to protect wildlife and wildlife-based economies.

Based on findings of a 2010-2013 survey, Midlane (2013) concluded that the abundance of *P. leo* in Kafue National Park was primarily restricted by the suppressed prey population, and further, that prior to a ban on hunting in 2013, hunting quotas were excessive.

Excessive trophy hunting was also reported to have had negative impacts on the population density in South Luangwa National Park, and to have altered sex-ratios and ranging behaviour (Yamazaki, 1996 in Lindsey *et al.*, 2012). LionAid (2011) noted that the population size was uncertain, with high pressure from trophy hunting and concluded that the sustainability of harvest at the time was "highly questionable". Furthermore, monitoring of the South Luangwa lion population from 2008 to 2012 by Rosenblatt *et al.* (2014) indicated a declining population, low recruitment, low sub-adult and adult male survival, depletion of adult males, and a senescing adult female population. The primary cause of mortality was considered to be trophy hunting, with 46 males harvested (Rosenblatt *et al.*, 2014).

Population surveys in South Luangwa National Park, Kafue National Park, and Lower Zambezi National Park observed male-depletion compared to other systems, and male mortality was reported to be mainly due to trophy hunting and wire snares (Becker *et al.*, 2013b). Hunting in the adjacent GMAs was reported to occur every year during the study, with the exception of 2001-02, and 2009 when no lion quota was issued for a GMA adjacent to the Lower Zambezi. Hunters were reported to use bait along the park borders (Becker *et al.*, 2013b). Becker *et al.* (2013b) thought that instituting age limits on male harvest with quota reductions towards compliance with the

recommendation of 0.5 adult males per 1000 km² by Packer *et al.* (2011) would reduce male depletion, and slightly increase population size. Likewise, reducing male mortality from wire snare poaching could have similar results, and combined with changes in hunting regulations, could improve the population size and condition in Zambia (Becker *et al.*, 2013b).

Management

Zambia was reported to have banned lion hunting from 2001 to 2002 and halved their quotas in 2009 in response to concerns over the species' conservation status (AC27 Doc. 24.3.3). On 10th January 2013, a moratorium on safari hunting in the nineteen hunting blocks was imposed (Republic of Zambia, 2015b, 2015a). The reasons for the ban on cat hunting were given by the Government as:

(a) weak regulatory mechanism;

(b) declining lion population in some areas due to indiscriminate and over harvesting;

(c) depletion of habitats for lions; and

(d) unreliable statistics upon which to base the quotas.

Midlane (2013) and Rosenblatt *et al.* (2014) recommended maintaining the ban until at least 2016 to allow populations in Kafue and the South Luangwa to recover and should hunting resume, quotas should be substantially reduced, with strict age restrictions and effective management mandated. Midlane (2013) recommended that a quota of 5.25 lions per annum for the hunting concessions surrounding Kafue may be appropriate, with strict age-based regulations within an adaptive management framework, to ensure sustainability of harvest. Monitoring of other key populations in Zambia was thought to be required to determine the effects of the ban and provide guidance for future management (Rosenblatt *et al.*, 2014).

The ban was lifted on 10th May 2015 and, during a Parliamentary debate on this issue, it was reported that lion hunting will resume in the 2016/2017 hunting season with quotas that allow two lions to be hunted in prime hunting areas and one in secondary areas and game ranches (Republic of Zambia, 2015b, 2015a). Quotas were reported to be based on population estimates of lions, which were reported by Zambia as 1500-2500 animals (Republic of Zambia, 2015a); the basis of this population estimate was unclear. There was opposition to the lifting of the ban voiced according to the parliamentary proceedings and the accuracy of the Government reported population figures was queried at the heading (Republic of Zambia, 2015a).

Clarification was sought from the Zambian CITES Authorities in relation to the hunting ban, however, no response was received.

Prior to the ban, hunting of *P. leo* in Zambia was reported to be regulated through a quota system managed by the Zambia Wildlife Authority (ZAWA) (AC27 Doc. 24.3), who were reported to undertake regular monitoring of all sport hunting activities (AC27 Doc. 24.3). Hunting zones were reported to cover 167 000 km², of which lions were reported to be hunted across 89 035 km² (Lindsey *et al.*, 2013) (Table 4 in Annex). Hunting zones were noted to be impacted by economic, sociological and ecological degradation, and were not considered to provide a suitable basis for a sustainable wildlife tourism industry (UICN/PACO, 2009). ZAWA was reported to rely on safari hunting in Game Management Areas (GMAs) to generate 45-67 per cent of their funding (Manning, 2011; Sichilongo *et al.*, 2013 in Lindsey *et al.*, 2014) and increased quotas and division of hunting blocks as a result were reported in 2003, increasing revenues (Simasiku *et al.*, 2008). The lack of funds was reported to have also resulted in a lack of monitoring of both wildlife populations and trophies (Lindsey *et al.*, 2014). Trophy quotas were reported to be established arbitrarily (Lindsey *et al.*, 2014) and quotas for lions were considered particularly excessive (Lindsey *et al.*, 2014). One expert

considered that revenues from trophy hunting help create economic incentives for the GMAs, but that trophy hunting in Zambia is urgently in need of reform (Anon 1, 2015b).

Fixed quotas of 60 per cent, regardless of offtake, were reported, which were considered to encourage over-harvest (Lindsey *et al.*, 2013) and mean off-takes per unit area were reported to be higher than the 0.5 per 1000 km² recommended by Packer *et al.* (2011) (Lindsey *et al.*, 2013). Prior to 2013, utilisation and trophy quality were reported to be on the decline, which was considered to suggest that quotas were not sustainable (Simasiku *et al.*, 2008). Hunting operators considered lions to be declining in a significant proportion of hunting areas in Zambia (Lindsey *et al.*, 2013). However, quotas were reported to have been reduced significantly in recent years (Lindsey *et al.*, 2013); quotas were reported at ca. 100 in 2007 reduced to 74 in 2012, of which the actual offtake was reported to be 47 (Lindsey *et al.*, 2013). Zambia was also reported to have developed aging guidelines to help ensure that only mature male lions aged six years or older were hunted (AC27 Doc. 24.3.3; Lindsey *et al.*, 2013), however, a minimum age limit of lions for hunting in Zambia was not reported in a review of the country's rules and processes (Lindsey *et al.*, 2013).

National Parks are increasingly isolated, posing a threat to *P. leo* as a wide-ranging, low density, threatened species (Watson *et al.*, 2015). Protected areas in Zambia were considered to be under-performing in ecological, economic and social terms (Lindsey *et al.*, 2014). The reasons given for this by Lindsey *et al.* (2014) included:

> *a) "rapidly expanding human populations, poverty and open-access systems in Game Management Areas (GMAs) resulting in widespread bushmeat poaching and habitat encroachment;*
>
> *b) underfunding of the Zambia Wildlife Authority (ZAWA) resulting in inadequate law enforcement;*
>
> *c) reliance of ZAWA on extracting revenues from GMAs to cover operational costs which has prevented proper devolution of user-rights over wildlife to communities;*
>
> *d) on-going marginalization of communities from legal benefits from wildlife;*
>
> *e) under-development of the photo-tourism industry with the effect that earnings are limited to a fraction of the PA network;*
>
> *f) unfavourable terms and corruption which discourage good practice and adequate investment by hunting operators in GMAs;*
>
> *g) blurred responsibilities regarding anti-poaching in GMAs resulting in under-investment by all stakeholders."*

The impact of these was reported to include a "major reduction" in wildlife densities in most protected areas (Lindsey *et al.*, 2014). The authors noted that wildlife is more successful in areas with investment from the private and/or NGO sector and where there is no human settlement (Lindsey *et al.*, 2014).

In March 2015, a ministerial statement from the Minister of Tourism and Arts during a parliamentary debate, announced the transformation of the Zambia Wildlife Authority (ZAWA) into a Government department, under the Ministry of Tourism and Arts (Republic of Zambia, 2015c).

In 2009, ZAWA published a Conservation Strategy and Action Plan for *P. leo* in Zambia, which identified objectives under seven thematic areas: research and management; mitigation of human-lion conflicts; local community benefits from lion utilisation; land use planning and zoning, management of the conservation politics at national and international levels and trade in the African lion (Chansa *et al.*, 2009). However, LionAid (2013) reported that this had not been enacted.

P. leo is protected under the Zambia Wildlife Act, 1998, which prohibits the hunting, killing, capture or possessions of individuals without a license (AC27 Doc. 24.3.3).

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Annex 1

Table 1: Purpose of trade

Code	Description
T	Commercial
Z	Zoo
G	Botanical garden
Q	Circus or travelling exhibition
S	Scientific
H	Hunting trophy
P	Personal
M	Medical (including biomedical research)
E	Educational
N	Reintroduction or introduction into the wild
B	Breeding in captivity or artificial propagation
L	Law enforcement / judicial / forensic

Table 2: Source of specimens

Code	Description
W	Specimens taken from the wild
R	Ranched specimens: specimens of animals reared in a controlled environment, taken as eggs or juveniles from the wild, where they would otherwise have had a very low probability of surviving to adulthood
D	Appendix-I animals bred in captivity for commercial purposes in operations included in the Secretariat's Register, in accordance with Resolution Conf. 12.10 (Rev. CoP15), and Appendix-I plants artificially propagated for commercial purposes, as well as parts and derivatives thereof, exported under the provisions of Article VII, paragraph 4, of the Convention
A	Plants that are artificially propagated in accordance with Resolution Conf. 11.11 (Rev. CoP15), as well as parts and derivatives thereof, exported under the provisions of Article VII, paragraph 5 (specimens of species included in Appendix I that have been propagated artificially for non-commercial purposes and specimens of species included in Appendices II and III)
C	Animals bred in captivity in accordance with Resolution Conf. 10.16 (Rev.), as well as parts and derivatives thereof, exported under the provisions of Article VII, paragraph 5
F	Animals born in captivity (F1 or subsequent generations) that do not fulfil the definition of 'bred in captivity' in Resolution Conf. 10.16 (Rev.), as well as parts and derivatives thereof
U	Source unknown (must be justified)
I	Confiscated or seized specimens (may be used with another code)
O	Pre-Convention specimens

Table 3: Trophy hunting rules and processes

The rules and processes relating to the allocation of hunting blocks and management of lion hunting in Tanzania and Zambia (sourced from (Lindsey *et al.*, 2013) from surveys with senior officials).

	Tanzania	Zambia
Concession allocation process	Closed tender, fixed fee (depending on status of wildlife in blocks)	Game Management Areas (GMAs): closed tender process. Game ranches: long term lease
Lease period	5 years	GMAs: 10–15 years (depending on status). Game ranches: long term lease
Community benefits from hunting in areas occupied by people	In WMAs, communities accrue 60–65% of total hunting income; in Game Controlled and Open areas benefits limited to mandatory contributions from operators to community projects	In GMAs, communities accrue 50% of trophy fees and 20% of concession fees
Basis for establishing lion quotas	Based on various source of info: operators provide recommendations; officers working for the Wildlife Division provide opinion regarding whether the previous quota was too big or too small; info from surveys or reports where available	A set % of estimates of lion populations, but modulated by local communities and operators recommendations
Mandatory quota payments required from operators ('Fixed quota')	40% of total quota regardless of off-take	60% of total quota regardless of off-take (Prime hunting blocks – 5 'classic' & 7 'mini' safaris; Secondary hunting blocks –3 classic and 5 mini safaris)
Monitoring	Official observer, hunt return form	Official observer; completion of a hunt return form and submission of photos of the trophy required as a pre-requisite for obtaining export permits
Season	1 Jul–31 Mar	1 May-31 Dec
Time	Sunrise – Sunset (no artificial light)	Sunrise – Sunset (no artificial light)
Minimum stipulated length of lion hunts (in days)	21	No stipulation
Sex of lions hunted	Male	Male
Minimum age/size	6 years	None
General	Must be shot >200 m away from a vehicle, >2 km from a national park boundary and >500 m from a water source	Must be shot >200 m away from a vehicle

Table 4: Trophy hunting areas

The area in which lions occur, total area in which trophy hunting occurs and the area across which lions are hunted (sourced from (Lindsey *et al.*, 2013).

	Total lion range (km^2)	Total hunting area (km^2)	Area across which lions are hunted (km^2)	% of lion range where lions are hunted	% of hunting area with lion on quota
Tanzania	516,000	300,000	254,207	49%	85%
Zambia	200,237	167,000	89,035	44%	53%