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How Can 'We' Save the African Lion, *Panthera Leo*?

Let's start by saying that I do not understand how anyone could want to kill an animal and put its remains on home display, particularly a lion from a rapidly dwindling wild population (or a 'canned' lion from an abhorrent captive environment either). From that stand-point, I do not understand Trophy Hunting.

But trying to put 'emotions' aside, the hunting industry that surrounds Trophy Hunting has been diminished, but still remains present and powerful (with Government income streams from hunting at stake).

The question is, if there are indeed any redeemable elements contained within the hunting industry (to be determined), how can we work in unison to immediately eradicate the bad and work in unison to potentially 'enhance' redeemable elements to a mutually acceptable level? To some, there is no substitute for an immediate and complete Trophy Hunting ban (which can only ever happen with relevant Governments' support in country).

From a pragmatic point of view, a rapid evolution ('Disruptive Innovation') to a better way is perhaps better than striving for a potentially unachievable revolution?

When it comes to the African lion's plight (and similarly persecuted species), the threats evident are urgent, sharp and numerous (and not just limited to excessive hunting quotas).

1. Introduction

- 1.1. In a new approach to funding 'lion conservation,' we had the launch (3 January 2016) of a raffle for an 18 day lion hunt. The raffle was

launched (and then cancelled) by The Bubby Valley Conservancy (B.V.C.), Zimbabwe in conjunction with Martin Nel Safaris. The result of the raffle was to be announced at Safari Club International's (SCI's) Las Vegas, "Ultimate Hunters' Market" conference, February 2016.

- 1.2. The raffle hoped to raise some \$150,000 USD with the sale of 100 tickets to hunters, or indeed non-hunters, with the latter having the option of a "*photographic safari*" and the promise the lion victim will be collared and form part of WildCRU's on-going lion research, as was Cecil (may he RIP) - WildCRU had no knowledge of this "*fund raising initiative*." Basically, there was a lion with a gun pointing at it and this 'novel' approach pitched the hunter's perceived intent to kill that lion directly against the chance for someone to save the lion in question. Which sounds a lot like some twisted form of blackmail doesn't it? But this is happening every day, with hunting quotas hanging over lions' heads.
- 1.3. Besides the moral argument, that raffling a lion's life/death might be repugnant to a majority, this 'inclusive' approach to raising funds to 'conserve' hunted lions (not sanctuary protected lions) is something new.
- 1.4. There was no obvious information given by the B.V.C. or Martin Nel Safaris on the intended lion victim and whether and subsequent hunt would conform to recommended criteria (lion condition, male (most likely), or assurance that the lion victim's age was greater than 6 years old?).
- 1.5. So, with the many variables impacting on the future survival of *Panthera leo* (the African lion, or lion), what is the current status and future?

2. Interested Parties in African Lions

- 2.1. There are many variables and interested parties ("*stakeholders*") directly affected by the lion species in Africa. The threats to lions can of

course be read across to any other similarly declining and persecuted species (such as the cheetah), but this paper will just consider the specifics for the African lion (but with lessons for all similar cases).

2.2. The 'stakeholders' for the African lion includes Governments, hunters, hunting associations, tourism associations, local communities, animal welfare groups, animal conservancies, conservationists, Nongovernment Organisations (NGOs) etc., plus of course concerned individuals.

2.3. The monies raised from selling hunting concession (leased land), hunting permits (hunting quotas) and hunting tours can be partially seen as investing in habitat protection from other threats (such as poaching), but the management of the hunting system and habitat is not consistent, or always to the benefit of species numbers/conservation⁽¹⁾. The assertion is that the majority of funds so raised are not directed to conservation, or local community support, but towards profiteering and general Government income/expenditure. Hunting quotas are often being driven by income/profit seeking, not science to support conservation.

2.4. As the human population increases (and shows no sign of abating), particularly in Africa lion range countries, the demands on lion habitat will only increase, not ease the economic pressures to finance and maintain hunting areas and protected reserves. Plus, there is increasing pressure on lion Trophy Hunting to prove it is 'conservation' before trophy imports will be permitted (Australia, France, United States of America and European Union)⁽²⁰⁾⁽²¹⁾. Will potential restrictions on trophy imports deter Trophy Hunting and the income the industry generates to lease hunting concessions (land)?

3. Summary of risks/threats to the African lion

3.1. Habitat Loss – For human needs for agriculture and livestock. As the human population increase (particularly in Africa) this will no doubt

place more pressure on habitat, then the economics of hunting reserves and protected areas will become more strained. This 'shift' has been evidenced by the reported buying up of African lands by the Chinese⁽¹⁹⁾ for future agricultural growth, but the full potential extent of Africa's 'green revolution' is yet to materialise and negatively contribute to habitat loss.

3.2. Disease – As habitat is lost, lions are brought into closer contact with humans and domestic animals, which can present new diseases to the lion's immune system. Lions can be susceptible to one-off, stochastic events that can have enough of an impact in terms of numbers lost to devastate small lion populations. For example, in Serengeti in 1994, an outbreak of morbillivirus (linked to domestic dogs) killed 35% of the Mara Lion Conservation Unit (Roelke-Parker et al. 1996). Plus, smaller lion sub-populations enhance the chances of inbreeding and genetic deficiencies that make recent generations more susceptible to disease.

3.3. Loss of Prey Base – Commercial hunting of the lion's natural prey to supply "bush-meat" for human consumption is on the increase. This 'hunting' shows little regard for wildlife, with indiscriminate snares widely used and seemingly accepted. This 'hunting' drives the lion to roam wider in search of prey, potentially the lion targets livestock thereby increasing the occurrence of human-lion conflict.

3.4. Human-lion conflict – As human activities encroach ever closer to hunting and protected areas (and even encroachment that is sanctioned, or otherwise onto protected areas), this brings with it conflict, as livestock herds become lion prey. In retaliation, either herdsmen directly seek to poison lions, or hunting concessions are granted to help 'eradicate' the lion threat on lands where such conflicts occur. The incentives for local communities and herdsmen to enshrine the protection of lions appears minimal:

3.4.1. 2001 to 2006 – Over 140 lions killed by Maasai (Ambiseli-Tsavo ecosystem);

3.4.2. Incidents currently persist - December 2015 – “Maasai lions: Two charged with Kenya poisoning”⁽¹²⁾

3.4.3. To help change attitudes to lions and potential conflict, reliable and consistent funding and implementation is required to support:

3.4.3.1. Education – Engagement in lion research, livestock management, conflict mitigation and anti-poaching activities.

3.4.3.2. Compensation – Funds to compensate for livestock loss without lion retaliation. But if too generous and available, compensation can promote a lax attitude (Maclennan et al., 2009) to livestock management and conflict mitigation, with lions blamed regardless of complicity. Plus, livestock herds moved into compensation areas, thus pushing capacity limits and increasing the likelihood of conflict with lions. So, compensation must be based on good livestock husbandry and conflict mitigation, with compensation paid quickly when warranted to avert retaliation against lions.

3.4.3.3. Conflict Mitigation – Minimising livestock incursion into lion habitat, fenced (bomas) protection for livestock at night, and ‘lions lights’ that deter lions from approaching bomas. However, on the scale required, this level of ‘basic’ protection is not cheap – it is estimated⁽¹³⁾ that to build a bomas (at £1,200 (\$1,940 USD) per household) to protect the livestock held by the population of Zambia (approximately 236,097 households exist in Zambia’s lion ranges, 68% of these households keep livestock), the cost to fence/bomas every household’s livestock would be in the region of £192m (\$311m USD). Then roll this out across the entire range of the lion across Africa.....without considering on-going population expansion, compensation schemes and management costs etc. The financial resources and will just do not exist to make such Conflict Mitigation programmes universally available.

3.5. Trophy Hunting – Hunting concessions (land leased specifically for hunting) are widespread. In order to make this investment in leased lands pay, there is an incentive for hunting quotas (and the actual numbers killed, or the “*off-take*”), to be maximised.

3.5.1. This can lead to excessive hunting quotas and an incentive for “*off-take*” close to the quota to prevail, much to the detriment of lion population sustainability.

3.5.2. It should be noted, that Governments set the hunt quotas and sell hunting permits (often requiring payment upfront for a theoretical, but high “*off-take*”) partly based on the evidence provided by hunt operator themselves, clearly a ‘source’ with a financial incentive to seek break-even, or profit from quotas in their favour. This approach does not set much priority in the longer-term conservation considerations of the target species, particularly in the case of one of “*the big 5*” (African lion, African elephant, Cape buffalo, African leopard, and White/Black rhinoceros) that ‘hunters’ are encouraged to kill at some point in their ‘hobby’ and add to their CV.

4. Trophy Hunting Areas

4.1. The most recent estimate of the lion’s range throughout Africa comes from Bauer et al. (2015a, un-paginated) who estimate the extant lion range (areas reasonably confident that lions persist based on recent records) to be approximately 1.6 million km², or just 8 percent of the lion’s historical range in Africa.

4.2. In sub-Sahara Africa, very large areas are used for big game hunting (approximately 1.4 million km²). This big game hunting area is 22% larger than all the areas designated to National Parks in the same region. So, lions now range predominantly in hunting areas, protected reserves and parks.

- 4.3.** So, “*big game hunting*” occupies huge areas of land⁽²⁾ – in 2009 it was estimated that for the 11 main big game hunting countries (South Africa, Namibia, Tanzania, Botswana, Zimbabwe, Zambia, Cameroon, Republic of Central Africa (RCA), Ethiopia, Burkini Faso, Benin), the surface area occupied for hunting was some 1.1 million km², or approximately 14.9% of the total cumulative land area available. In addition to these hunting areas, protected areas occupy in these same 11 countries, an additional 0.7 million km², or an additional 9.4% of the national territory. The sum of the hunting areas and protected areas therefore represents some 24.3% of the surface area of these countries.
- 4.4.** So, there is no denying, when it comes to habitat the hunting industry has control over these vast hunting areas and therefore, significant influence. The hunting industry claims that its hunting areas protects habitat, generates revenue for local communities, and provides funds for anti-poaching units (Deere, 2011; Lindsey et al. 2012).
- 4.5.** The IUNC (2009) reported that the economic benefits to local communities of hunting areas are minimal⁽⁴⁾, employment opportunities are poor and the wildlife contained within hunting areas are far less well protected than wildlife contained within protected, non-hunting areas. So, apart from saving the habitat, it’s questionable what other benefits the majority of hunting areas actually deliver for conservation, particularly when quotas for Trophy Hunting “*off-take*” predominantly of male lions has also been shown to be excessive⁽¹⁸⁾ in many cases, actually perpetuating the species’ decline?
- 4.6.** An undeniable result of the current habitat within the hunting industry’s control is that these lands are entirely financed by the hunters, without support from other donors and often without Government commitment. Such lands are often leased on long term concessions to hunt operators, but little consideration^(1, page 86) is given to the conservation credentials of any given bidder for such leases, but

transactions based purely on commercial considerations (ie. the highest bidder).

4.7. The hunting industry across sub-Saharan Africa generates an income of approximately \$230m USD per annum⁽²⁾⁽³⁾. So, that equates to approximately \$230m USD/1.4 million km², or approximately \$164.3/km² (\$1.64/hectare). In contrast, it is suggested⁽²⁾ agriculture generates 300, to 600 times more per land unit area, so there is undeniable pressure on habitat/land returns as human population growth will increasingly demand (and will look increasingly economically viable) more land use for livestock and agriculture.

4.8. However, the question is, are these vast hunting areas and the habitat contained being optimised for the good of any given “Endangered” or “Threatened” species, in particular *Panthera Leo*?

4.9. Without such hunting areas, how could the habitat contained continue to be funded and safeguarded from other invasive uses to the detriment of wildlife?

4.10. Are there examples of lion conservancies that work to protect the species and also support sustainable lion Trophy Hunting?

4.10.1. The Bvumba Valley Conservancy (B.V.C.), Zimbabwe opened in 1999 and is a privately owned reserve of some 850,000 acres (3,440 km²). From IUCN sub-population numbers (given at Appendix 1), the estimated lion sub-population in Bvumba, Zimbabwe was 9 lions in 1993, but by 2014 it was 330 lions. Was this recovery due to B.V.C.? The B.V.C now claims to have some 500 lions in its conservancy. The B.V.C. lion population is also monitored for research purposes by Wild Conservation Research Unit (WildCRU), Oxford University. So, could this be given as an example of a lion conservation success story which includes lion Trophy Hunting? Can such a private big-cat ‘conservancy’ contribute to saving the species, despite a reliance on Trophy Hunting for income? Is the B.V.C. lion population now large

enough and genetically diverse enough to continue to grow in a healthy manner to the reserve's capacity limit? Could such a conservancy be funded without hunting (of course, but the alternative source of funding is the key)? LionAid⁽²⁴⁾ sheds the true light on Buby (B.V.C):

“Buby (B.V.C)..... is a fenced reserve. Lions were introduced as a hunting commodity and are now being trophy hunted.”

5. Human Population Growth

5.1. To put that increasing human demand into perspective, between 2015 and 2050, half of the world's population growth is expected to occur in 9 countries, 6 of which are within the lion's range (India, Nigeria, Democratic Republic of the Congo (DRC), Ethiopia, Tanzania, and Uganda (UN 2015, p. 4). Africa has the fastest population growth rate in the world (UN 2015, pp. 3, 9; UNEP 2012a, p. 2), and future population growth in sub-Saharan Africa is projected to be large and rapid (UN 2013, p. 9). By 2100, Angola, Burundi, DRC, Malawi, Mali, Niger, Somalia, Uganda, Tanzania and Zambia are projected to increase by at least five-fold (UN 2015, p. 9).

6. Hunting Income Dividends to Local Communities and Wildlife Conservation

6.1. The income generated to local communities from hunting areas is minimal, estimated⁽⁴⁾ at less than 3% of total hunting income per annum, or equating to £0.4 (\$0.62 USD)/per annum⁽³⁾ per 'local community' person (or less). The remaining 97% of hunting income going to Government's general income/taxation pot, hunt operators and those directly employed in the hunting industry. How much of this income filters down into local communities and actual wildlife conservation remains opaque, but at best looks minimal.

6.2. For example, Zimbabwe's CAMPFIRE programme (established

1981) was introduced to distribute dividends derived from Trophy Hunting to local communities. In 2007 (Mutandwa and Gadzirayi) surveyed communities that should have benefited from the CAMPFIRE programme reported that dividend had not been received since 1997, with no discernible additional benefits for employment or improved infrastructure.

6.3. One has to remember, that corruption is widespread within the range of the lion (Transparency International 2014⁽¹¹⁾). All but one lion range country (Botswana) scored below 50 (out of 100) on Transparency International's 2014 Corruption Perception Index (CPI), which measures perceived levels of public sector corruption based on expert opinion and is based on a scale of 0 (highly corrupt) to 100 (very clean). Approximately half of the current lion range countries— including Tanzania and Kenya, where more than half of all wild lions occur—are among the most corrupt countries in the world, ranking in the lower 30 per cent of 174 countries assessed (Transparency International 2014)⁽¹¹⁾.

6.3.1. For example, in 2013, the Tourism Minister of Zambia banned hunting in 19 game management areas for 1 year due to allegations of corruption and malpractice among the hunting companies and various Government departments.

7. Future Funding for Hunting Areas

7.1. Therefore, the hunting areas currently held by the hunting industry look increasingly under economic threat from human demands – Future concessions for land are likely to be more expensive and on less favourable, short lease terms. The hunting industry's model and defence that hunting maintains habitat, thereby hunting must equate to 'conservation' appears economically unsustainable regardless of 'conservation' performance. Therefore, the hunting industry's model could well collapse without:

7.1.1. Increased income per hunt, ie. hunters paying more, or more of the current income being channelled into ‘conservation’ and less into profit taking;

7.1.2. More hunting, which will potentially promote more cases of excessive quotas and “*off-take*” to increase income, with little thought for conserving a given species. However, if hunting interest declines (perhaps due to trophy import restrictions), then this will put more financial pressure on hunt operators to finance their concessions, leading to less habitat concessions purchased and maintained exclusively for hunting;

7.1.3. Additional donor and/or Government support, which would suggest pooling of funds;

7.1.4. A joint strategy across all ‘stakeholders’ with impartial, but consistent management adhering to conservation standards in all lion hunting habitat areas is urgently required;

7.1.5. Sources and Pooling of Funds to support habitat and conflict mitigation.

7.2. What does it cost to run a reserve? The cost estimate suggested for maintaining lion populations in protected areas range from an annual budget of \$500 USD per km² in smaller fenced reserves, to \$2,000 USD per km² for unfenced reserves (Packer et al. 2013, p. 640).

7.3. Whatever strategy emerges, it has to be implemented and not be a paper “lion conservation plan” exercise (as witnessed in 2006), where strategies are formed, but never implemented.

8. Lion Trophy Hunting’s Future

8.1. If Trophy Hunting is to (continue to) help significantly in the future conservation of the lion and other endangered species, then the hunting industry needs to welcome and permit a transition to a better way:

8.1.1. Hunting Associations need to openly differentiate between good and bad hunting practices, which of course first means acknowledging that there are indeed bad hunting practices prevalent (such as 'canned' hunting and the existence of excessive hunting quotas).

9. 'Canned' Hunting

9.1. The 'canned' industry has been in existence since the 1990s, with the plight and abuse of the animals held captive highlighted in Gareth Patterson's 1998 book, "*Dying to be Free.*⁽⁸⁾" So, 'canned' hunting is not a recent phenomenon - *Also refer to the Campaign Against Canned Hunting, <http://www.cannedlion.org/>*

9.2. For readers not familiar, 'canned' hunting/farming is where:

9.2.1. Lions and other big cats are held captive in cramped conditions;

9.2.2. Overbreeding is evident (cubs taken from mothers so the mothers can breed again);

9.2.3. Cubs are used to generate income from tourist 'petting' and 'lion walks' plus hand-reared by paying volunteers – All of which hide the deceit, that the cubs are eventually transferred back to be callously 'hunted;'

9.2.4. Due to the intense breeding within small populations, genetic mutation of the species held captive in 'canned' farms is evident. To counteract this, cubs are often taken from wild prides to supplement the 'canned' gene pool;

9.2.5. Eventually, the option to take the pre-meditated decision by a ‘hunter’ to pay to kill one of these tame, hand-reared lions and big cats is ‘sold.’ The hunter takes the trophies (head, skin, claws etc.), whilst the rest of the deceased animal’s body parts are sold into the trade for hypothetical medicines in Asia, thus enhancing the ‘canned’ entrepreneur’s profit taking.

9.3. Is ‘canned’ hunting conservation?

9.3.1. The South African Environment Minister tried to enforce a 24 month wilding rule (under Threatened or Protected Species Regulations) to ensure no previously captive (‘canned’) lion or big cat could be ‘hunted’ unless it had been freed from captivity for 24 months, or more. The Predator Breeders Association (PBA) (the PBA supplies the ‘canned’ industry) sued the Environment Minister for this attempted regulation of their activities, but the PBA lost in the South African High Court.

9.3.2. However, after the PBA applied to the South African Supreme Court of Appeal (SCA), the SCA ruled⁽⁶⁾ in November 2010 (of its own volition, “*mero motu*”), that ‘since no captive bred lions have ever been released back into the wild, then lion farming had nothing to do with conservation. Therefore, in the SCA’s view, the Environment Minister had no jurisdiction to impose restrictions on what was essentially being declared animal ‘farming.’

9.3.3. Since the SCA’s ruling in November 2010, the ‘canned’ industry has flourished (some 200 ‘canned’ farms and 8,000 big cats (7,000 lions) are currently held in South Africa, with a turnover of \$70m USD in 2012⁽³⁾). The ‘canned’ industry has been virtually unregulated and unchecked since the SCA’s ruling in November 2010.

9.3.4. However, it has taken until very recently for any hunting association to distance them-selves from the 25 year old+ ‘canned’ hunting

industry. In something of a sudden epiphany, in November 2015, the Professional Hunters' Association of South Africa (PHASA)⁽⁷⁾ has finally realised that killing a hand-reared lion or big cat in a restricted enclosure is not hunting – Hunting a wild lion can take up to 21 days, 'hunting' a 'canned' lion in a baited enclosure can take minutes.

9.3.5. Will other 'hunting' associations now follow the PHASA's lead? Will the PHASA stick with its stance regarding 'canned' hunting?

9.4. Why is 'canned' farming of lions (or any other species so 'farmed') bad for wild populations of a given species and not helping conservation?

9.4.1. Wild cubs are taken to supplement 'canned' populations and help diversify the gene pool from which to breed more 'product.'

9.4.2. 'Canned' lions 'hunted'/killed fuel and profit from the nonsensical trade in hypothetical medicines derived from big cat body parts. This encourages the 'poaching' of wild population numbers to seek to infiltrate and profit from this 'trade.'

9.4.3. In 2008 South Africa began issuing CITES⁽⁹⁾ permits for the export of 'canned' lion body parts to Asia. In 2008, 50 lion skeletons were exported. By 2011, 573 lion skeletons were exported. In the period 2008 to 2011 this 'trade' has encompassed a total of 1,160 skeletons weighing approximately 10.8 tonnes. That is the 'legal' trade, plus any poached items that have infiltrated and profited from the 'trade.'

9.4.4. Since 2011 how many more skeletons and tonnes have been exported and who is benefitting? 85% of historical exports of 'canned' lion body parts has gone to Laos (between Thailand and Vietnam), reportedly to the 'Xaysavang Network,' a trafficking syndicate that also 'deals' in the illicit rhino horn trade in South Africa (Williams *et al.* 2015, pp. 7–10, 59; Environmental Investigative Agency 2014, p. 13; U.S. Department of State 2013, unpaginated). This also begs the question, how South Africa's recent attempt

(November 2015) to manipulate laws and selfapprove rhino horn harvesting⁽¹⁰⁾ can be seen as anything other than seeking to profit from trafficking in a seemingly similar, 'legal' fashion?

9.4.5. The 'cliental' the 'canned' hunting industry attracts is the fly-in, fly-out 'hunter' that wants a quick, easy and comparatively 'cheap' kill, but the 'trophy' that they will hang on their wall must look 'good' – They want young and beautiful animal heads and skins to display. In terms of hunter 'ethics' (which should equate to taking only the old and weak when absolutely necessary), the 'canned' hunters' approach is an anathema.

9.4.6. It could be argued that the 'canned hunter' client base so nurtured, will graduate and develop a taste for taking wild population numbers, but bring the same 'canned ethics' (or lack thereof) with them – eg. hurriedly "taking/harvesting" a wild:

9.4.6.1. Male lion that is obviously too young and will cause a pride's potential downfall (a male lion less than 6 years old);

9.4.6.2. Pregnant mother, thus depleting a pride of its potential expansion and stability – Though lion Trophy Hunting is predominantly biased towards male lions, hunting is not exclusively of males;

9.4.6.3. Mothers in front of their cubs thus leaving the cubs highly vulnerable;

9.4.6.4. Not take a clean shot for a quick kill (head shot), but seek to protect the 'condition' of their prize/trophy to seek recognition and extra 'points' back at their Hunting Association's assessment of their 'prowess' and 'skill;'

9.4.6.5. Inflict unnecessary suffering to their target/victim by using an amateur approach (poor shot), or from wanting to 'prove their

skill' using less reliable 'clean kill' equipment (ie. bow and arrow rather than a rifle);

9.4.6.6. Shoot collared/research animals;

9.4.6.7. Sanction and/or assist the baiting of a wild lion from a protected area in order to get their kill.

9.4.7. There is no scientific evidence to support the 'canned' industry's claim that a captive hunt 'saves' the taking of a wild animal of the same species. Captive hunting breeds hunters, which will potentially breed more wild animal hunters and at the same time, encourage poaching to also try to 'cash-in.'

9.5. What next for 'canned' hunting?

9.5.1. All of the above, begs the question why (for so long) have the hunting associations and 'ethical hunters' embraced and protected the 'canned hunter' interloper, plus the dark trade in animal body parts the 'canned' industry thrives and prospers from? Or, are there no 'ethical hunters' left perhaps, or are the bullying voices within such associations too loud to confront even from within?

9.5.2. If the United States Fish and Wildlife Service's (USFWS's) planned implementation (22 January 2016) of tighter lion trophy import rules applies to halt the import of 'canned' lion trophies, will this end 'canned' hunting? Well it could, because lion Trophy Hunters are predominantly (60%) from the USA and 'want' their trophies. CITES 2013 data suggests that of the 627 lion trophies imported into the USA, 545 (87%) originated from South Africa - "*the majority of which are reported to be of captive-born origin.*" At the moment, apparently "99%" of lion hunting trophies exported from South Africa are derived from 'canned' hunting, so that means of the 545 lion trophies imported in the USA in 2013, 540 were 'canned' lions.

9.5.3. South Africa has a population of some 2,000 - 2,500 wild lions, with no hunting quota set. So, if the amateur hunters' enthusiasm for 'canned' hunting subsides because of trophy imports restrictions into the USA, will this mean more pressure on wild lion hunting quotas? Well, no one knows for sure, but:

9.5.3.1. Perhaps the potential 'canned' hunter will begin to realise that their 'hobby' and 'trophy' is not meeting with public, hunting association (PHASA), or authority (USFWS, EU etc.) approval.

9.5.3.2. That the emphasis being placed on scientifically based hunting quotas potentially means less availability and increased hunting package costs. Perhaps the potential lion trophy enthusiast will find something less morally reprehensible to do with their time and money.

9.5.3.3. But will such a scenario where 'canned' hunting is in steep decline end 'canned' farming? Well, despite public condemnation and outcry, I doubt the 'canned' industry will not continue to seek to maximise 'legal' profiteering from supplying (with CITES permits) the export of lion body parts.

9.5.3.4. How can this 'trade' in lion body parts be curtailed? Would the 'uplist' of *Panthera leo* to CITES Appendix I not curtail the 'trade?' Well, not if South Africa and other nations that seek to 'trade' such items exempt themselves. CITES has not been known in the past for seeking to crush such markets/trade, but has thought that perhaps such trade might quell poaching to meet demand. But when the demand is exponentially rising, that notion looks increasingly naïve. Only international inter-Government pressure and public pressure might prevail.

10.Excessive Hunting Quotas

- 10.1.** Specifically, Lindsey *et al.* (2013a, p. 8) found that of the nine countries allowing trophy hunting of lions in 2013 (including data from Zambia prior to the moratorium in 2013), eight have quotas set higher than recommended by Packer *et al.* (2011, p. 151, “1 lion per 2,000 km²”) and five countries had quotas set to more than double Packer’s recommendations.
- 10.2.** The reported number of trophies increased rapidly⁽¹⁸⁾ for lion Trophy Hunting (CITES trophy exports) as markets grew during the 1980s and 1990s (Figure 1). Since 2006, the CITES lion trophy import data⁽¹⁾ indicates that there has been a downward trend in wild lion trophy imports (and an implied decline in lion Trophy Hunting). But the data is ‘confused’ because a ‘lion trophy’ can refer to multiple lion parts and not necessarily reference a single lion. Plus captive, ‘canned’ hunted lions from South Africa were for a time widely recorded as “wild” hunted lions, when that is clearly not the case - prior to 2010 and the ‘canned’ industry being of no conservation value, because no animal held could be declared wild, or with any chance of release into the wild. Such non-compliant discrepancies still continue to this day, though “99%” of South African lion trophy exports are reportedly from ‘canned’ hunts and ‘canned’ (captive), not wild lions.
- 10.3.** According to the UNEP–WCMC CITES Trade Database⁽²³⁾, between 2005 and 2012, exports of lion trophies demonstrated a decreasing trend, if exports of captive-born lions from South Africa are excluded (UNEP-WCMC 2014, unpaginated). UNEP–WCMC indicates that 521 lion trophies were exported (excluding South Africa) in 2005 and 303 were reported (excluding South Africa’s ‘canned’ lions) in 2012.

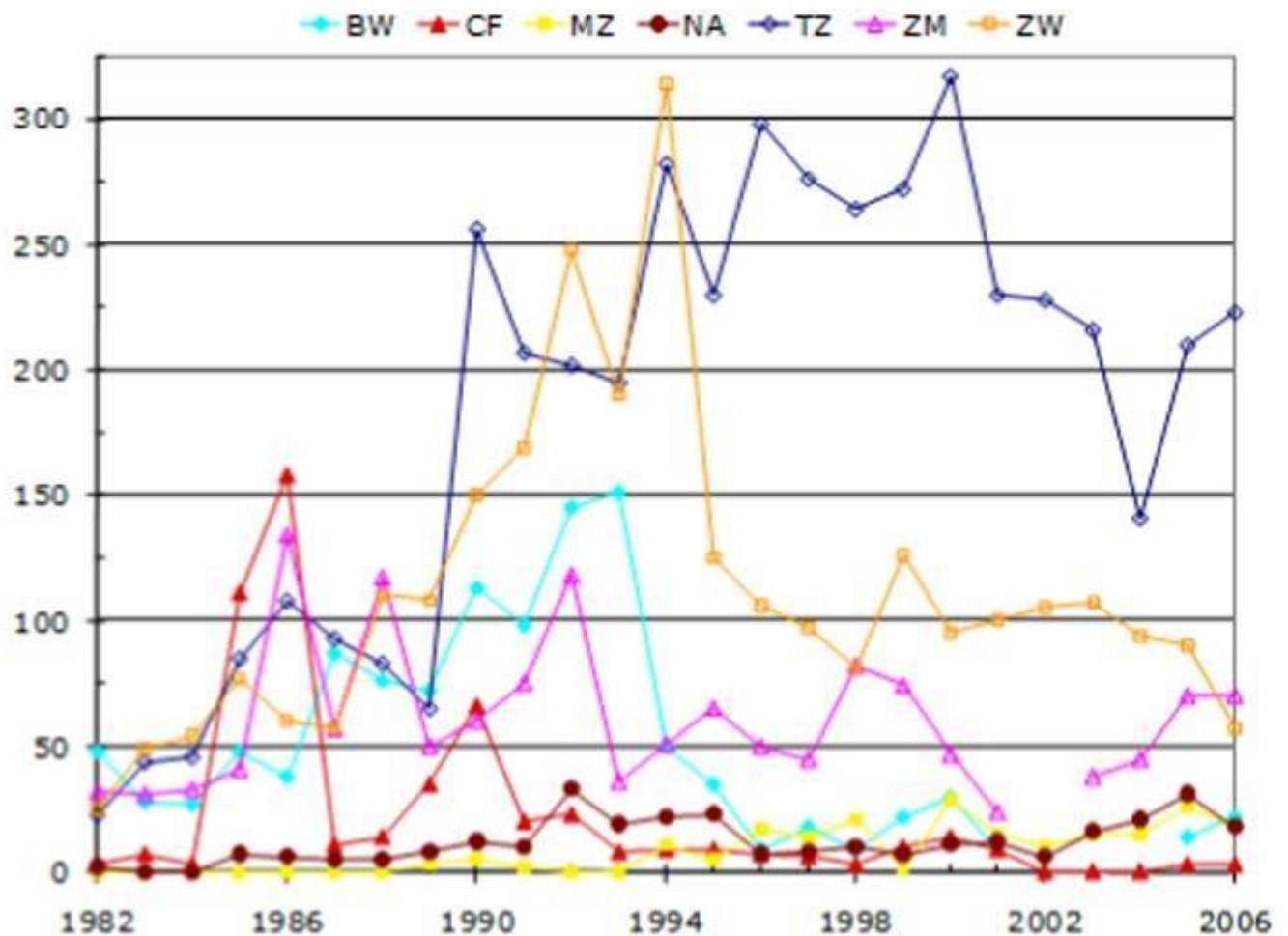


Figure 1 - CITES-reported Trophy Exports of African Lions 1982 – 2006⁽¹⁸⁾

BW = Botswana, CF = Central African Republic, MZ = Mozambique, NA = Namibia, TZ = Tanzania, ZM = Zambia, ZW = Zimbabwe.

10.4. Tanzania has one of the largest lion populations. However, in the absence of any concrete data on overall lion numbers, the Tanzanian Wildlife Division recently (August 2015) ‘accepted’ the estimate of 16,800 lions in country based on a 2010 summary (Mésocina et al., 2010). Tanzania has been the largest exporter of wild-origin lion trophies, but lion trophy exports from Tanzania have decreased significantly since 2008:

- In 2008, approximately 138 trophies were exported;
- In 2011, 55 were exported;

- In 2012 Tanzania established an annual quota to limit trophy hunting to no more than 50 animals (Jackson 2013, p. 7);
- In 2013, 11 were exported (UNEP-WCMC 2014, unpaginated);
- In 2014, an “*off-take*” of 42 lions was reported from a 2013 – 2014 lion hunting quota of between 250 – 300 lions (to UNEP-WCMC, 2015)⁽⁵⁾.

10.4.1. Again, it should be noted that there may be discrepancies between the annual quota and the actual number of trophies exported in a given year. Regardless, the numbers of lion trophies exported by Tanzania according to the UNEP–WCMC CITES Trade Database suggest a decreasing trend despite hunting quotas in excess of actual “*off-take.*”

11. Lion Trophy Hunting’s Adherence to a Clear Set of Guidelines

11.1. Scientific Setting of Trophy Hunting Quotas.

11.1.1. Trophy Hunting quotas and potential “*off-take*” should be based on independently verified science. At the moment, it is prevalent that hunting quotas are based on arbitrary and/or biased figures formed in association with hunt operators. Reference Table 1 at Appendix 1 – the lion population data on which Governments in lion range countries base their ‘views’ is often taken from monitored sub-populations, which may, or may not accurately represent lion populations for all sub-populations across the entire country’s lion range. The bottom line is, no one really knows the actual number of African lions left, with no recent overall census taken, but a ‘picture’ formed from a piecemeal of disparate, often extrapolated data.

11.1.2. But how can ‘sustainable’ hunting quotas be set in the absence of reliable and complete lion population and subpopulation data? One Management Strategy Evaluation (MSE) approach developed in 2013 is titled “*Data-poor management of African lion hunting using a relative index of abundance*”⁽¹⁴⁾. This MSE approach (where MSE is often applied in marine

and fishery applications) bases hunting quota setting for “sustainability” based on a key ‘indicator’ to derive an implied population abundance/availability for “harvesting:”

“In this investigation, we show how an indirect measure of abundance can be used to set quotas in a sustainable manner, even in the absence of information on population size. Focusing on lion hunting in Africa, we developed a simple algorithm to convert changes in the number of safari days required to kill a lion into a quota for the following year. This was tested against a simulation model of population dynamics, accounting for uncertainties in demography, observation, and implementation. Results showed it to reliably set sustainable quotas despite these uncertainties, providing a robust foundation for the conservation of hunted species” - Charles

T. T. Edwards, Nils Bunnefeld, Guy A. Balme, and E. J. MilnerGulland, November 2013⁽¹⁴⁾

11.1.3. The key ‘indicator’ used to derive the proposed African lion MSE “relative index of abundance” is the distribution of “waiting time in days required to kill a lion” as reported by hunt operators. However, this approach has a number of obvious assumptions, with potentially erroneous foundations:

11.1.3.1. There is an implied direct correlation between “the waiting time it takes to find a lion to kill” and the actual lion subpopulation available in any given hunt’s search area. Or to put it another way, the “abundance” (or lack thereof) of lions can be derived by how easy it is to find a lion suitable to target as a trophy (ie. male \geq 6 years old). This ‘correlation’ can be challenged in a number of ways:

11.1.3.1.1. In the “waiting time” analysis used to ‘verify’ the proposed relative index of lion abundance⁽¹⁴⁾, the sample “waiting time” data was analysed for 1997 (76 data points), 1998 (76 data points), 2000 (55 data points) and 2001 (53

data points). The data points for the given years were found to fit a negative binomial distribution. There was an increase from 1997 to 2001 noted in the mean “*waiting time*” from 13.5 days (1997) to 16.0 days (2001), a 19% increase in “*waiting time*.” The paper⁽¹⁴⁾ postulates that this increased “*waiting time*” supports the assumption that the noted decline in the lion population⁽¹⁸⁾ during the same 4 year window between 1997 and 2001 is represented by “*waiting time*.” This key ‘support’ of this relative index theory seems to be based on just a four year window of data, the source of the data is not clear (is it one country’s lion range hunting data, or across many countries’ lion ranges?). I would suggest that the correlation between “*waiting time*” and “*lion abundance*” needs to be proven using a much wider window (years 1980 to 2014), removing anomalies for changes in hunting practices, improved technology, range variations etc., to directly prove a close fit to relevant, documented lion population declines in the same period;

11.1.3.1.2. It is assumed that hunting operators’ data is highly accurate, verifiable, including the sex and age of any target lion (of course, the actual age of any given lion only being truly verifiable after the lion has been killed);

11.1.3.1.3. It is assumed that hunting operators can be relied upon to accurately report “*waiting time*,” when a self-interested view would be for the hunting operator to report a short “*waiting time*” and hence give the impression of lion abundance and the sustainability of ‘high’ hunting quotas (and attempt to secure the on-going income on which the hunting operators’ livelihood relies);

11.1.3.1.4. It is assumed that all lion kill “*waiting time*” is equally significant – Some lion kills could be conducted where the hunting operator knows a target lion is in residence. Other

lion hunts and kills based on fortuitous searching, where pure co-incidence intervenes and a suitable target lion was happened upon quickly;

11.1.3.1.5. It is assumed hunters will conform willingly to any male lion age limit stipulation and take the time not to target younger male lions that they might first happen upon. If the taking of younger male lions becomes prevalent (either through the hunters' neglect, or 'accidental' noncompliance), this could skew the "*mean waiting time*" unfavourably against lion conservation because of pride/sub-population depletion that may result from the loss of too many younger male lions within any given hunting quota's return data;

11.1.3.1.6. It is assumed that the data points gathered from hunting operators' data regarding "*waiting time*" are statistically significant and reliable, ie. is the mean "*waiting time*" to find a target lion based on 2 data points, or 1,000 data points – In that regard, data from at least 20 lion 'kills' is recommended⁽¹⁴⁾, but is the data constantly rolling forward and the mean adjusted accordingly?;

11.1.3.1.7. It is assumed that all hunting operators have the same dedication to data gathering, target location skill, knowledge and 'search pace' - this 'pace' being assumed as a level indicator across any lion hunting area regardless of hunt area terrain, prevalent climatic conditions, hunting party preferences for a given 'pace' plus and hunting practices employed, such as baiting, camera traps and/or aerial scanning using drones to capture target location data etc.;

11.1.4. It is assumed that the "*abundance*" of lions derived via the suggested method will not immediately adjust for any stochastic

events that may suddenly reduce a lion sub-population's 'abundance,' such as disease or retaliatory lion killings taking a significant toll. The time such an event will take to filter through into a corresponding movement in the mean hunting "*waiting time*" it takes to find a target lion is not clear, but the mean "*waiting time*" is unlikely to be 'responsive' in itself.

11.1.5. It is assumed that the dynamics of lion population growth of a given pride/sub-population less "*harvested*" trophy lions, can be accurately predicted and modelled:

11.1.5.1. It is assumed that lion reproduction and fecundity are fully understood;

11.1.5.2. It is assumed that no stochastic event, such as disease has an immediate impact on population sustainability;

11.1.5.3. It is assumed that the 'dynamics' are the same for small sub-populations as well as large sub-populations (hence a limit of applicability to sub-populations needs to be established, particularly if the sub-population is small and hunter noncompliance is evident with regard to age limit rules etc.).

11.1.6. The proposed algorithm⁽¹⁴⁾ is: $Q = H/c\mu$

Where: $Q = \text{Hunting quota}$

$H = \text{Harvest rate (suggested as 0.8, or 80\% of target male lions } \geq 6 \text{ years old, but assumes complete hunter compliance)}$

$c = \text{Constant for the "catchability" of lions, where } c \text{ is also adjustable for prevalent 'conditions' to make the resultant model more applicable.}$

μ = Mean waiting time it takes to find a lion to kill

11.1.7. The adoption of the “*Data-poor management of African lion hunting using a relative index of abundance*” method proposed⁽¹⁴⁾ should be met with caution. It appears to be a method that could be promoted to prolong wild lion hunting in the absence of real lion population data, with the proposed method based less on science and more on guess work and potentially false assumptions.

11.2. Less than 5% of any scientifically proven population set as a Trophy Hunting quota (Creel and Creel, 1997).

“for a quota to be considered sustainable for lions, it should be limited to no more than 5 percent of the population.”

11.3. Less than or equal to 1 lion per 2,000 km² set as a Trophy Hunting quota (as recommended by Packer *et al.* (2011)).

11.3.1. Higher harvest rates per km² can lead to reduce lion harvests⁽¹⁸⁾, as illustrated at Figure 2 - which would imply Trophy Hunting in excess of this recommended limit leads to less abundance and lion sub-population decline. For example, in Zimbabwe, after a peak “*off-take*” of some 300 lions in 1994 (Figure 1), the lion harvest rate dropped an average of 13% in subsequent years, due to over harvesting. Several countries instituted temporary bans on lion Trophy Hunting (Botswana in 2001–2004, Zambia in 2000–2001 and western Zimbabwe in 2005–2008) or banned female lions from quota (Zimbabwe, starting in 2005), but these measures were implemented well after the major decline in lion “*off-take*” in each country⁽¹⁸⁾.

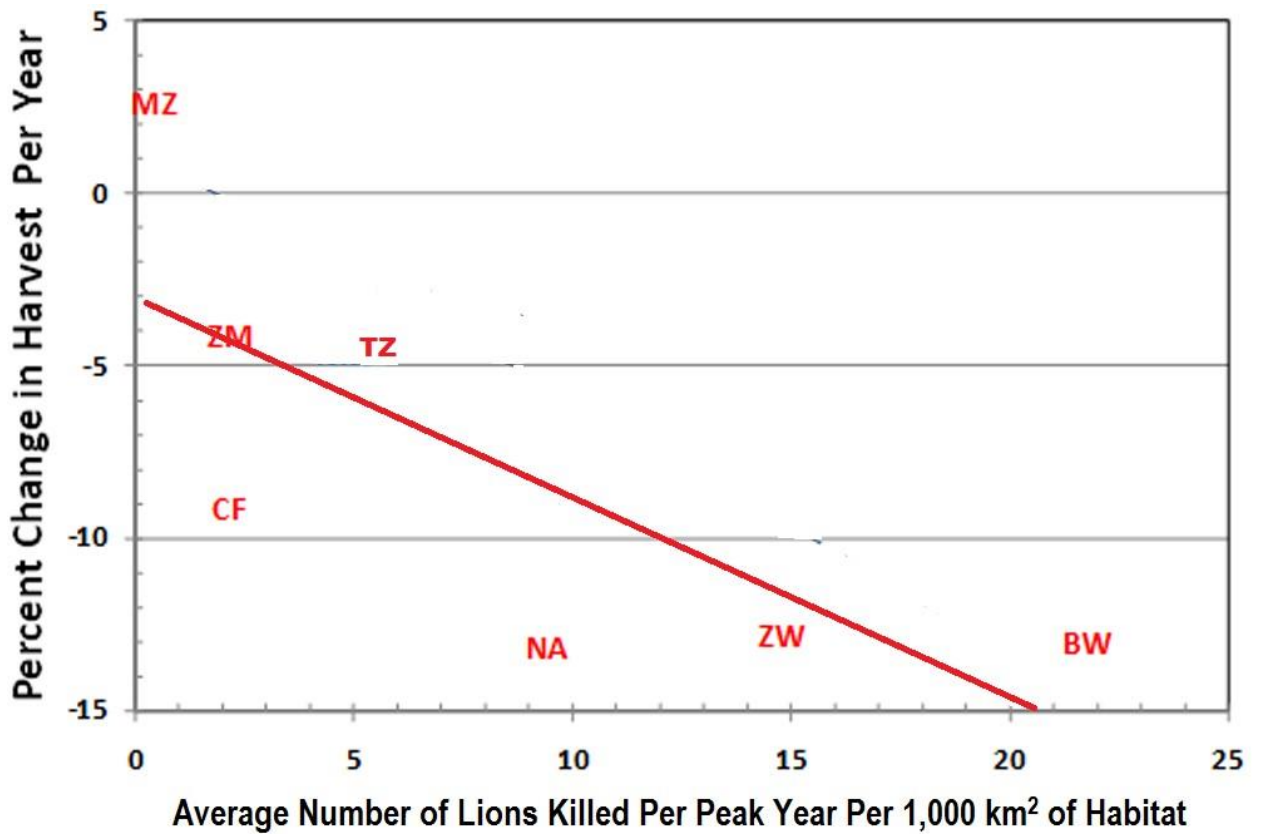


Figure 2 - Trends in Lion “Off-takes” in Peak Year (between 1982 – 2006) as a Function of “Harvest” Intensity⁽¹⁸⁾

Jurisdictions with the highest harvest intensity showed the greatest decline in offtakes ($r^2 = 0.5796$, $P = 0.0468$). BW = Botswana, CF = Central African Republic, MZ = Mozambique, NA = Namibia, TZ = Tanzania, ZM = Zambia, ZW = Zimbabwe.

11.3.2. Interestingly, the same decline in lion abundance cannot be drawn from habitat loss:

“Across jurisdictions, declining harvests were unrelated to habitat loss for lions.”⁽¹⁸⁾

11.3.2.1. For example, reference Figure 3, where Mozambique can be seen as enduring the same level of habitat loss as Botswana, but in Mozambique, the lion harvest increased by 2.5 % because of a much lower harvesting (1 lion per 1,000 km²), whereas

Botswana’s harvest rate declined by 13% with an average of 22 lions per 1,000 km² (Figure 2).

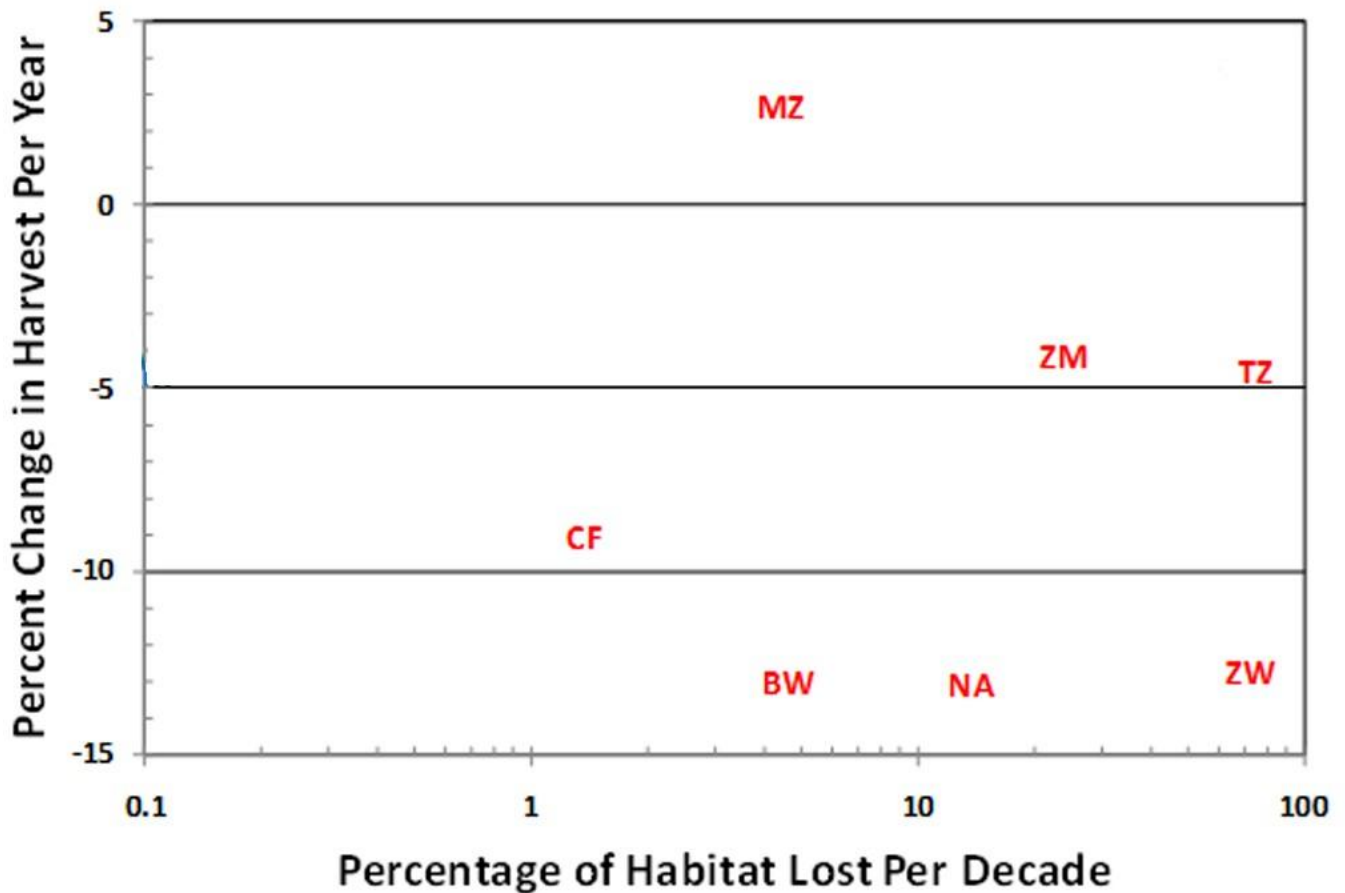


Figure 3 - Trends in Lion “Off-takes” in Peak Year (between 1982 – 2006) as a Function of Habitat Loss⁽¹⁸⁾

Note: *Logarithmic scale for percentage of Habitat Loss Per Decade*

BW = Botswana, CF = Central African Republic, MZ = Mozambique, NA = Namibia, TZ = Tanzania, ZM = Zambia, ZW = Zimbabwe.

11.4. No population less than 500 lions to be targeted for Trophy Hunting.

11.4.1. A population of 500 is widely considered the minimum population size (Packer et al., 2011) to sustain an adequate gene pool, and/or survive other overbearing threats, or stochastic events having a potentially devastating impact on the population.

11.5. Targeted male lions must be six years old, or older.

11.5.1. This will attempt to ensure minimal impact on a given pride's dynamics. However, a ≥ 6 years of age limit assumes the age at which a male lion holds a senior rank (tenure) within a pride is 4 years of age, with 2 further years of reproduction. This assumption has been challenged in studies (Nicholls et al.), which concluded that pride tenure can extend to lions of a mean age of 7.8 years.

11.5.2. Plus of course, the feasibility of determining any lion's age from distance, in the field is incredibly unreliable⁽¹⁵⁾, particularly the 'recommended' method to hunters and their guides of using a lion's nose colouration as a key indicator of age (Whitman et al. 2004, Whitman and Packer, 2007). Aging error in the field using a target lion's nose pigmentation as the key indicator is a problem⁽¹⁶⁾⁽¹⁷⁾ – how 'reliable' or motivated will any hunter be to age their target lion accurately, when interpreting the key lion age indicator is subjective and unreliable?

- i. Nose pigmentation $\geq 70\%$ - There is a 95% probability the target lion ≥ 6 years of age;
- ii. Nose pigmentation $\geq 40\%$ - There is only a 62% probability the target lion is ≥ 6 years of age.

Whitman et al. (2004) showed that the lions' noses become increasingly pigmented with age (Fig. 4).... Although the tip of the nose may not be the easiest metric to evaluate in the field, it is a far more reliable indicator of age than the lion's mane⁽²⁵⁾

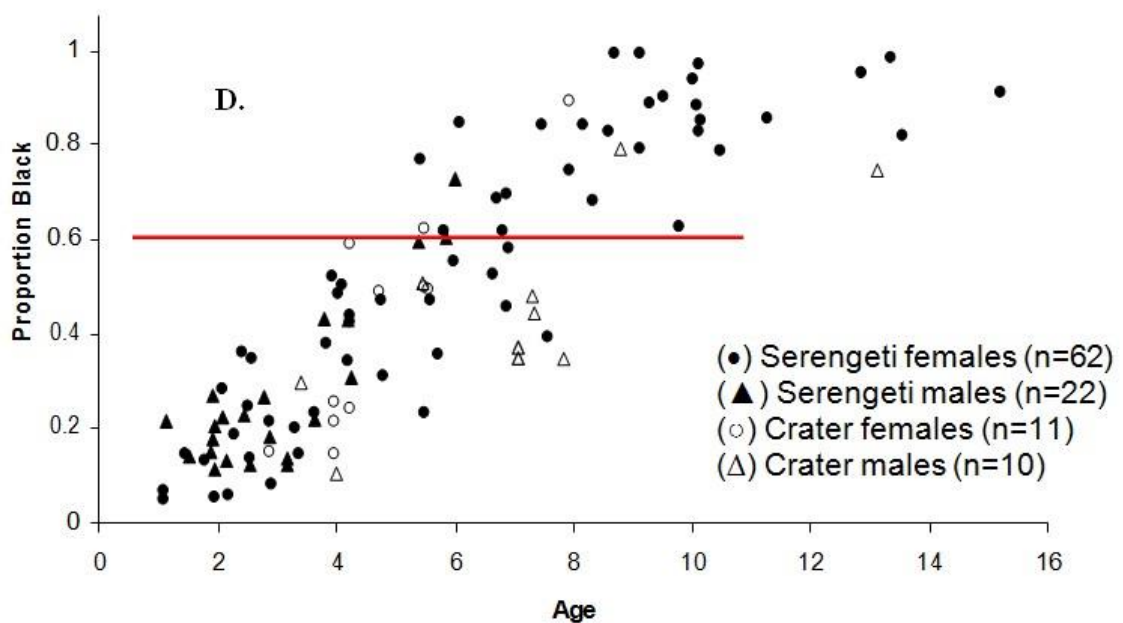


Figure 4. Age-estimation for adult lions using nose colouration (Whitman, et al.

2004))

A. Identification photograph of a 3 yr old male.

B. Excised photo of nose tip.

C. GIS rendering of nose colouration.

D. Age-change of nose colouration for males and females in two separate populations. Horizontal red line indicates the recommended 60% minimum.

11.5.3. The predominant killing of pride males lions for trophies has been linked to pride disruption and cases of infanticide, where an incoming dominant male kills the cubs within the pride that he has not directly fathered⁽¹⁶⁾⁽¹⁷⁾. Therefore, before any male lion is “harvested” for a trophy, the impact must be considered, because the pride’s resilience could be adversely and severely affected.



Figure 5 – A Sample of Under-aged Male African Lions Shot by “Sport Hunters” in Various Countries from 2004–2008⁽¹⁸⁾

“Harvesting of males that are too young can have devastating impacts to the population. If male lions are harvested too young (even as old as 3 years of age), combined with quotas that are too high, the population will be driven to extinction as female populations collapse as they eventually are unable to mate” -

11.5.4. In Katavi, Tanzania the estimated lion numbers were recorded as zero in 2014, from a population of 1,118 in 1993⁽⁵⁾. It should be noted, that from 2010, 41 adult males (less than five years old) had been “*harvested*” for trophies in Katavi. Could this excessive Trophy Hunting of young male lions have been the end of the Katavi sub-population?

“Trophy Hunting was reported to have contributed to population declines outside of (and within some) protected areas of 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.”

11.6. Minimum hunt package duration, 21 days.

11.6.1. Currently, there are no set lengths for hunting safaris in Mozambique, Namibia, Zambia, and Zimbabwe. Burkina Faso has a minimum requirement of 12 days, and Benin and Cameroon require 12 to 14 days. Tanzania has a minimum length of 21 days while CAR varies from 12 to 21 days.

11.6.2. The minimum hunt duration of 21 days is recommended so there is no hurried imperative to take a kill without due consideration.

11.7. ‘Optional’ quotas to replace ‘Fixed’ quotas.

11.7.1. Optional quotas to replace fixed quota – Fixed quotas are where a hunt operator might be forced to pay for government issued permits for 60% or more of potential “*off-take*” of the hunting quota and therefore, have a financial break-even point incentive to hunt

and kill close to the quota threshold, rather than an incentive to conserve species numbers.

11.8. Hunting quotas not to target human/lion conflict areas.

11.8.1. Hunt quotas not set to target areas where human lion conflict is occurring - Namibia, Mozambique, and Zimbabwe may have been influenced by human–lion conflict, with higher quotas being allocated to locations with reportedly higher levels of human–lion conflict (Lindsey *et al.* 2013b, p. 4).

“Thus, sport hunting quotas may sometimes reflect pressures to control carnivores (such as lions) rather than to conserve them.”⁽¹⁸⁾

12. Conclusions

12.1. The total African lion population in Africa is estimated (in 2014) at between 18,726 and 31,395 (Table 2, Appendix 1), but these numbers were based on extrapolated trend data from 2002/2004. So, the bottom line is, no one really knows how many lions are left in Africa without a full, comprehensive lion census across all lion ranges.

12.2. In the absence of solid, all-encompassing lion population data on which to base scientific decisions, proposals are available to form “*relative indexes*” (reference Para. 11.1.2.) to represent “*lion abundance*” (or lack thereof). Considering the decline of the species in question from an overall population of some 450,000 in the 1940s to a 2014 estimate of as low as 18,726 (a 96% implied decline), basing any future lion trophy hunting quotas on anything but current, independently verified lion population numbers (not some notion of a relative measure) seems farcical.

12.3. The majority of lion Trophy Hunting quotas are not based on science, but guesstimates with quotas derived with short terms aims for

income. Conservation is a background header for the industry, but long term sustainability often appears absent in comparison with short term profit seeking. Perhaps that will now change with tighter lion trophy import restrictions, with the hunting industry committing to closer adherence to guidance as per Para. 11.1 to 11.8.

12.4. Lion population sustainability is perhaps more sensitive to excessive hunting quotas than to habitat loss (Figures 2 and 3 respectively).

12.5. The incentives for local communities (Reference Para. 6) to protect wildlife held within hunting concessions (and protected reserves even) appear minimal when compared to the direct motivation local communities have for their own livestock's welfare and immediate agricultural needs, particularly as population growth will increase those demands.

12.6. The current 'hunting' model looks unsustainable without changes in the near future, to be able to maintain hunting areas under increasing competition for land and the subsequent economic pressures that implies.

12.7. The potential lion Trophy Hunting options to explore in light of the current outlook:

12.7.1. A complete moratorium of all lion Trophy Hunting until independently verified, scientifically based hunting quotas can be established for all lion range countries. This would be unenforceable without the full consent of all parties concerned and the acceptance of reduced income by the hunting industry (including Governments). But we have seen various countries impose hunting bans in an effort to conserve the species, but without a transition to protect all current habitat for the lion, a rapid shut-down of all hunting areas that do offer some protection could be detrimental.

12.7.2. Restrictions on lion trophy imports may have an impact. But the USFWS approach could be seen as too open and fragmented to set a clear, decisive restriction in the short term. The effectiveness and impact on any such Trophy Hunting imports needs to be seen once actions have been taken to enforce such restrictions. Will this force greater weight to sustainable lion conservation is hunting quotas and applicable stipulations?

12.7.3. Give the hunting industry time to prove it can truly balance conservation with on-going hunting quotas. Or perhaps, there has been too much leniency to date with limited conservation success?

12.7.4. Sources and Pooling of Funds to support habitat and conflict mitigation;

12.7.4.1. Clearly the tourism industry has the means and incentive to do more, where tourism clearly outstrips hunting income (Table 1).

Table 1 – Trophy Hunting, Tourism Income and Population

	Population ^(a) (million)	Trophy Hunting Revenue ⁽²⁾ (b) (\$m USD)	Tourism Revenue ^{(2)(b)(c)} (\$m USD)	Trophy Hunting Revenue as % of Tourism Revenue
South Africa	51.4	112	9,547	1.2%
Ethiopia	84.3	1.45	522	0.3%
Cameroon	18.9	2.4	159	1.5%
Tanzania	44.9	32.9	1,457	2.3%
Zambia	11.8	7	125	5.6%
Botswana	2.0	25.4	218	11.7%
Namibia	2.1	32.8	517	6.3%
Burkina Faso	15.7	0.8	72	1.1%
Zimbabwe	11.8	20	634	3.2%
	242.9	234.75	13,251	1.77%

(a) Based on US Census numbers (2009)

(b) All figures converted to 2011 \$ USD

(c) UNWETO (2012)

Note 1 - It is not clear in the context used if 'Trophy Hunting' includes, or excludes 'Canned Hunting.'

Note 2 – It is not clear how Governments set their permitted hunt quotas – It is not often scientific and is suspected to be corruption (reference "Trophy Hunting in Sub Saharan Africa : Economic Scale and Conservation Significance"- Peter A Lindsey, 2008 , para4.2, iii) in many cases, Government revenue appears the main driver.

12.8. International Governments could do more to promote and fund conservation habitat, but clearly there are signs of improvements in trophy import restriction until an export country's 'conservation' principles have been truly verified.

12.9. Non-government Organisations (NGOs) play a significant role in picking up the slack where in country Governments and hunting income distribution fails to materialise for lion conflict resolution, compensation and safe sanctuary. But after the demonstration of the sheer costs of what would appear a simple solution of fencing of livestock herds (Reference Para. 3.4.3.3), the tasks required are financially daunting.

12.10. Would the listing of *Panthera leo* under CITES Appendix I listing help?

12.10.1. Currently, *Panthera leo* is only listed under CITES Appendix II. An Appendix-I listing includes species threatened with extinction whose trade is permitted only under exceptional circumstances, which generally precludes commercial trade. The import of specimens (both live and dead, as well as parts and products) of an Appendix-I species generally requires the issuance of both an import and export permit under CITES. Import permits are issued only if findings are made that the import would be for purposes that are not detrimental to the survival of the species in the wild and that the specimen will not be used for primarily commercial purposes.

12.10.2. Therefore, this CITES Appendix I approach would force all 181 parties to CITES (that did not opt out) to comply with ensuring

any lion trophy import was derived from a sustainable source dedicated to conservation of the species. This would help dictate (as per the USFWS 's intentions on behalf of the United States) that hunting quotas and hunting rules are in accordance with current thinking (such as “*off-take*” age restrictions etc.). Of course, this does not ensure compliance, but any country that wants to promote and sustain a ‘reputable’ lion hunting industry would eventually find market forces dictating compliance. But again, how can the “*sustainability*” of *Panthera leo* be assessed, when the population data to make such judgements is clearly missing (Reference Para. 12.1)?

12.11. Some innovative thinking will be required to try to ensure the species’ survival (but I doubt a life/death raffle will be the answer – Reference Para 1). That innovation should not be biased to ‘inventing’ ways (Reference Para. 11.1.2) to justify lion abundance and the continuation of lion Trophy Hunting in the absence of verifiable, current, scientifically based lion population data.

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Appendix 1

Table 1 – Overview of Sub-population Numbers – Africa (IUCN 2015 Assessment)

Country	1993 Est. (1)	2014 Est. (1)	% Change 1993 – 2014	Current Government Guesstimate of Total Population	EU Assess. (2015) approx.	Expected Government Quota (2016/17)	Possible Quota % of Remaining Population	Notes	Assessment
Benin	25	108	+332%	?		5 (2009) “Off-take” 2±0.4 (2007 - 2009)	5%? “Off-take” age restrictions still pending.	Also see Burkina Faso.	Small population < 500
Botswana	2,235	1,663	-26%	?		No Trophy Hunting 2001 – 04 2008 - present		3 pop. considered, 1 declined.	Retaliatory killings highlighted in the past.
Burkina Faso	76	63	-17%	?		6 (2015/16) 20 (2014/15) “Off-take” 13.3±1.45 (2006 - 2009) > 1 lion per	10%? “Off-take” age restrictions still pending.	1 pop. considered, overlapping with Benin and Niger.	

						2,000 km ²			
Cameroon	322	220	-32%	?		No Trophy Hunting		2 pop. considered,	

								2 declined.	
Central African Republic	-	-	-	?		31 (2009) "Off-take" 13.7±6.9 (2008 – 2011)	?		
Côte d'Ivoire	265	0	-100%	?		No Trophy Hunting			
DRC	-	-	-	?		Lion Hunting Legally Permitted			

Ethiopia	-	-	-	?		Dangerous Animals Only Legally Permitted			
Ghana	131	0	-100%	?		No trophy Hunting			
Kenya	748	449	-40%	2,280 (2004 est.)		No Trophy Hunting	N/A	7 pop. considered, 5 declined.	Habitat and prey loss apparent.
Mali	-	-	-	?		Lion Hunting Legally Permitted			
Mozambique	339	1,235	+264%	?		42 – 60 (2013) “Off-take” 19.2±7.3 (2008 – 2011)	5% < 1 lion per 2,000 km ² Males ≥ 6	1 pop. considered.	

							years old introduced, but full conservation strategy commitment due.		
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Namibia	514	725	+41%	?		15 (2010) "Off-take" 14.0±3.2 (2008 – 2011) > 1 lion per 2,000 km ²	2%	3 pop. considered, 1 declined.	Population too close to minimum 500 thresholds for sustainability?
Nigeria	284	32	-89%	?		No Trophy Hunting			
Senegal	201	16	-92%	?		No Trophy Hunting			
Somalia	-	-	-	?		Lion Hunting Legally Permitted			
South Africa	1,946	2,074	+7%	2,000 - 2,500		No Wild Lion Hunting Quotas Set "Off-take" 'Canned' lions 400 est. (2014)		10 pop. considered, 1 declined.	However, Trophy Hunting of 7,000 'canned' lions permitted.
South Sudan	-	-	-	?					

Sudan (prior to secession of S Sudan)	-	-	-	?					
Tanzania	1,787	608	-66%	16,800 (3)? (2010)	608 (2)	250 – 300 (2013/14) 50 (2013) 315 (2012)	>2% Current total lion population unknown	5 pop. considered, 4 declined.	Current total lion population unknown, but -66% subpopulation decline noted.
Togo	-	-	-	?		“Off-take” 165 (2008) 42 (2014) Lion Hunting Legally Permitted			
Uganda	577	209	-64%	?		Dangerous Animals Only Legally Permitted		2 pop. considered, 2 declined.	

Zambia	139	100	-28%	1,500 – 2,500 (4)	307 – 465 (5)	50 (2013) Lion Trophy Hunting to be re-introduced for 2016/17 season. No age limit restriction	>= 40%? Current total lion population unknown	1 pop. considered.	Decline evident and no science behind hunting quota setting.
Zimbabwe	52	703	+1252%	?		evident. > 1 lion per 2,000 km ² 50 (2015) 101 (2014) “Off-take” 42.5±7.5 (2008 – 2011) > 1 lion per 2,000 km ²	7% Males ≥ 6 years old now introduced	5 pop. considered.	Is hunting quota still too high? Population too close to minimum 500 thresholds for sustainability?

Notes:

(1) IUCN Red List Information, <http://www.iucnredlist.org/details/full/15951/0>

- (2) Based on five monitored sub-populations (Ngorongoro Crater, Katavi, Matambwe (Selous GR), Serengeti and Tarangire) – Noted by Bauer et al. (2015) noted “that these study subpopulations do not necessarily represent total site populations.”
- (3) The Tanzanian Ministry of Natural Resources and Tourism, chose to cite to UNEP-WCMC a 2006 (Ikanda and Packer) estimate of total population of 17,564, but the Tanzanian Wildlife Division ‘accepted’ the estimate of 16,800 (Mésocina et al., 2010), or a 5% decline between 2006 and 2010. So, it is assumed that this latter ‘estimate’ is the Tanzanian Governments’ current ‘belief.’ This ‘belief’ is also based, in-part on “operators” with a vested interest in setting lion population estimates and “offtake” quotas high. The actual “offtake” cited by the Ministry of Natural Resources and Tourism to UNEP-WCMC, 2015, was “168 in 2008” and “42 in 2014” the reduction “possibly” due to continued population declines (Lindsey et al., 2103; Nelson et al., 2013).
- (4) The Zambian Government/Authorities failed to reply to UNEP-WCMC on how they had arrived at their ‘estimates,’ but it should be noted that quotas are based, in-part on operators’ recommendations – not verifiable science, but on “operators” with a vested interest in setting lion population estimates and “offtake” quotas high.
- (5) The EU assessment of Zambia’s lion population in Kafue (Midlane et al., 2015), South Luangwa (Rosenblatt et al., 2014) and Lower Zambezi (Becker et al., 2013).

Table 2 – Application of Regional Trends to Two Sets of African Lion Population Estimates

Region	Estimated Lions in 2002		Estimated Lions in 2014 applying regional trends data (IUCN Table 2) (Note 1)	
	Bauer and van der Merwe (2004)	Chardonnet (2002)	Bauer and van der Merwe (2004)	Chardonnet (2002)
Southern Africa*	9,946	15,251	10,385	15,925
Eastern Africa**	11,112	20,144	7,345	13,316
West Africa***	835	1,163	406	406
Central Africa***	950	2,815	590	1,748
Total lions	22,843	39,373	18,726	31,395

Notes:

1. <http://www.iucnredlist.org/details/full/15951/0>

*Although Mozambique's Niassa subpopulation is excluded from the regional trend calculation, estimates of its population size are included in both 2002 inventories.

** Chardonnet included estimates for several large areas where Bauer and van der Merwe did not, due to lack of information. The most substantial are Tanzania's Lion subpopulations of Ruaha and Tarangire, estimated by Chardonnet at 5,244. Tanzania's Selous subpopulation was originally grouped with Southern African Lion subpopulations by Chardonnet, but moved here to East Africa to maintain consistent regional groupings by country.

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