URGENT AND COMPREHENSIVE REFORM OF TROPHY HUNTING OF LIONS IS A BETTER OPTION THAN AN ENDANGERED LISTING; A SCIENCE-BASED CONSENUS

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Free-ranging African lions (*Panthera leo*) have declined over the last century, and particularly in recent decades, to fewer than 35,000 today (Riggio et al., 2012). Lion decline is driven primarily by the conversion of savanna habitat to support people and the associated loss of prey and killing of lions by pastoralists in defence of their livestock (IUCN, 2006; Riggio et al., 2012). Among other potential threats, the effect of trophy hunting on lions is controversial. Practitioners whose primary concern is the welfare of individual animals contend that hunting is unequivocally negative and advocate for its cessation, whereas those whose primary concern is the status of populations suggest that hunting has the potential to confer both positive and negative impacts on lions, and question whether bans achieve intended conservation outcomes.

In response to this uncertainty, we initiated a consensus-building process among published scientists with expertise in conservation and management of wild lions. Our objectives were to evaluate the impacts of trophy hunting on lions, identify the key problems in its management and evaluate the potential consequences, negative or positive, of banning the practice. Finally, we sought to establish clear science-based standards by which sustainable hunting of lions could be achieved. Here we present a summary of that consensus.

Problems with Lion Hunting

Lions are particularly sensitive to excessive harvests because the removal of pride males through hunting accelerates rates of infanticide (Whitman et al. 2004). There is considerable scientific evidence of negative population impacts associated with poorly-managed trophy hunting of lions. Excessive off-takes from trophy hunting lowered population density and/or altered sex-ratios of lions in South Luangwa, Kafue and Lower Zambezi National Parks in Zambia (Yamazaki, 1996; Becker et al., 2012), Tuli Safari Area, Gonarezhou National Park and Hwange National Park in Zimbabwe (Loveridge et al., 2007; Davidson et al., 2011; Grooms et al, in press), and the Bénoué Complex in Cameroon (Croes et al., 2011). Trophy hunting also appears to be a factor in lion population declines in Tanzania, a country that holds between 30-50% of Africa's lions (Packer et al., 2011).

There are five main problems associated with the current management of lion hunting that increase the likelihood of negative impacts (Hunter et al. submitted). We exclude South Africa from this discussion as a unique case where 99% of hunted lions are captive-bred (Lindsey et al 2012).

1) Systematic means of establishing lion quotas are rarely applied, partly because population monitoring is rarely undertaken. Accordingly, quotas are often established with little scientific oversight and with few safeguards for sustainability.
2) Quotas and off-takes are too high in many areas. Documented negative population-level impacts resulting from hunting demonstrate that quotas and harvests are higher than populations can sustain in several countries.
3) 'Fixed quotas' are in place in several countries, whereby operators are charged for a proportion (30-100%) of the total quota, irrespective of whether animals are actually hunted. Fixed quota fees are likely to encourage utilization of the entire fixed portion of the quota regardless of sustainability.
4) Restrictions on the age of lions that may be hunted are only applied in Tanzania, western Zimbabwe, and Niassa National Reserve in Mozambique (though such restrictions have been drafted in the provisional lion action plan for Benin; P. Henschel pers. comm.).
5) Hunting of females is permitted in Namibia and Zimbabwe. Female mortality is likely to further exacerbate the perturbation effect of hunting males due to the loss of the most productive portion of the population and the risk of dependent cubs dying when mothers are killed (Mosser and Packer, 2009).

Growing Pressure on Lion Hunting

Partly in response to these problems, there is increasing scrutiny on lion hunting and pressure from some sectors for its restriction and reform. In addition to the petition submitted to the USFWS for an Endangered listing for lions, efforts are underway by some NGOs to encourage the European Union to ban imports of lion trophies. Both measures would have a significant impact on lion hunting by limiting imports of trophies into key markets. The US and the EU together represent the majority of the market for African trophy hunting and the majority of lions hunted in Africa are exported as trophies to the US or the EU (85% of non-South African [i.e. trophies of non captive-bred lions], www.unep-wcmc-apps.org, accessed January 2012). Such restrictions would make it much more difficult for hunting operators to sell lion hunts and likely greatly reduce the price obtainable from hunting packages.

To Ban Lion Hunting or to Reform it?

Given documented negative impacts on lion populations resulting from trophy hunting, 'business-as-usual' is unacceptable. We see two options; a) wide-reaching trade restrictions on lion trophies, or b) comprehensive and urgent reform of hunting practices to address their demonstrated negative consequences on lion populations. At this stage of the debate, both have potential to confer benefits for lions. The first option would likely confer immediate benefits for overexploited lion populations. However, there are also substantial risks associated with such an approach.

Lions are hunted in at least 11 African countries, across an area of approximately 650,000 km^2/250,967 sq mi (Lindsey et al. unpublished data), comprising ~19.2% of the species range of 3,390,821 km^2/1,309,203 sq mi (Riggio et al., 2012). In some countries, notably Central African Republic (77%), Cameroon (68%), Burkina Faso (67%), Tanzania (33-49%) Zimbabwe (38%) and Benin (32%), lions are hunted as trophies over particularly high proportions of their range (Lindsey et al. unpublished data). Consequently, trophy hunting has potential to confer significant impacts, positive or negative, on lions in Africa.

The human population in Africa is growing rapidly, and key threats to wildlife conservation include competition for land, human encroachment of wildlife areas and the illegal bushmeat trade. Trophy hunting has potential to play an important role for conservation in Africa by providing a basis for governments to justify the retention of large blocks of state land for wildlife (in addition to fully protected parks) and in driving a shift in land use from livestock to wildlife ranching on private and communal land. A significant proportion of the land where trophy hunting occurs is unlikely to be viable for alternative wildlife-based land uses such as photo- or ecotourism due to remoteness, lack of infrastructure including integration in established tourism circuits, lack of spectacular scenery or lack of high densities of viewable wildlife (Norton-Griffiths, 2007). In addition, relying too heavily on ecotourism is risky because it is highly susceptible to political instability (Lindsey et al., 2006).

Restrictions on trade in lion trophies have potential to undermine the viability of trophy hunting for a number of reasons:

- Lions are the single most valuable trophy species (with the possible exception of large tusked elephants) and the price of lion hunts is increasing faster than that of most other trophy species (Lindsey et al., 2012).
- In some countries, the viability of trophy hunting is already affected by trade restrictions on trophies of other key species. For example, the USFWS does not permit the import of elephant trophies from Zambia and Mozambique, nor of both elephants and leopards from West or Central Africa (elephants and leopards are legally hunted in Cameroon and the Central African Republic respectively, but imports into the US are prohibited; Lindsey et al., 2007; Lindsey et al., 2012).
- There is a risk that effectively removing lions from quota could promote over reliance of other species. We foresee the need for reducing quotas of some other species in some scenarios. Maintaining lion hunting would increase flexibility and make trophy hunting more likely to be sustainable following any adjustments in quotas of other key species.
- Removing lions from quota for US hunters would homogenize the trophy hunting product among countries and make it more difficult for the less affordable, accessible and safe countries to attract clients and thus generate income from/for wildlife.

Across as much as 60,000 km^2/23,166 sq mi, trade restrictions on lion trophies could render trophy hunting completely unviable, particularly where other key species are not on quota (Lindsey et al. 2012). Across a much a larger area, however, trade restrictions would reduce the profitability of

trophy hunting. Such impacts are potentially significant for lion (and other species' conservation) for the following reasons (Lindsey et al. 2012):

- Removing/reducing the economic justification for the retention of large blocks of state land for wildlife. If the land use shifted from wildlife to livestock and/or subsistence farming, lion populations would likely suffer due to elevated conflict with pastoralists, habitat loss, snaring and loss of prey to the bushmeat trade, all of which are invariably more severe in areas close to human settlement (Hofer et al., 2000).
- Removing/undermining the massive potential that exists for developing wildlife-based land uses in areas in addition to the current wildlife estate in countries such as Zambia, Mozambique and others.
- Removing/reducing funds available for anti-poaching by state wildlife authorities, private land owners, communities and hunting operators. Some African state wildlife agencies rely heavily on trophy hunting for revenue, particularly when they are formed as parastatals and not allocated central government funding. For example, both Zambia's and Zimbabwe's wildlife authorities derive the majority of their operational funding from trophy hunting, thus reductions in income as would arise from trade restrictions could negatively impact fully protected national parks in addition to hunting areas (D. Cumming former head of research, Zimbabwe Parks and Wildlife Management Authority, pers. comm., Chivumba, 2011). Such reductions have potentially severe consequences: the illegal bushmeat trade is emerging as one of the most severe conservation issues affecting African savannas, and anti-poaching enforcement and extending benefits from wildlife to communities are the key elements of combating it (Lindsey et al. in press).
- Reducing tolerance for lions in areas where the species occurs and is hunted on private and communal lands. Lions have increased significantly in number in several Zimbabwean conservancies (where cumulatively hundreds of individuals now occur) and on Namibian communal lands (which now comprise 157,000 km^2/60,618 sq mi) (Packer et al. in press; www.nacso.org, accessed January 2013). Lions are costly to live with and tend to conflict with livestock farmers wherever they overlap (Woodroffe & Frank, 2005, Frank, 2011). In the absence of benefits from hunting, we expect that tolerance for lions would decrease in areas where they coexist with humans and where local people currently benefit from trophy hunting income.

Despite the recorded negative impacts of lion hunting on populations of the species, we know of no case where trophy hunting has caused or contributed to the extinction of a lion population. Lions breed rapidly and recover quickly following perturbation, as in North West Zimbabwe following the temporary moratorium on hunting there (Loveridge et al., 2009). In addition, there are a number of steps that can be taken to reduce or remove negative impacts associated with trophy hunting on lion populations. As a result of these factors, and given the potential risks associated with trade restrictions, we suggest that comprehensive reforms in the management of lion hunting may be preferable to trade restrictions.

Essential Reforms Needed for the Management of Lion Hunting

1. *Implementation and Enforcement of the 6-year rule on lion trophies in all range states*

Based on dynamics of the Serengeti lion population, the restriction of trophy harvests to males of six-years or older effectively ensures sustainability of harvest in the absence of reliable population monitoring (Whitman et al., 2004). By six years, male lions have typically had the opportunity to sire at least one litter of cubs, the recruitment of which is sufficient to maintain population stability (Whitman et al., 2004). Age restrictions in Niassa NR and Tanzania resulted in greatly reduced off-takes, by forcing hunters to be much more selective (C. Begg unpublished data, D. Ikanda,

unpublished data). We believe that a six year minimum age restriction on lion trophies should be implemented in all countries where the species is hunted.

Compliance with age restrictions should be tightly enforced and evaluated by multiple independent assessors at a central repository to ensure consistency. Ideally, such a system should have three age categories, to allow for the difficulty associated with definitively aging lions such that punitive measures (or rewards) depend on the age category of the lion that is shot, that is: (i) hunting of lions under 4 years old is strictly forbidden, (ii), hunting of lions between 4 and 6 years old is tolerated but repeated infractions attract penalties, and (iii) hunting of lions above 6 years old attracts rewards. In Niassa National Reserve in Mozambique, operators are penalized by quota reductions if they shoot underage lions (to an extent depending on the age of the animal and the repetition of offences), while those who shoot sufficiently old lions are rewarded with elevated quotas. In Tanzania, a six year age limit is enforced through a system of fines, quota reductions and even imprisonment. In both countries, monitoring includes obligatory completion of a questionnaire, submission of photographs and x-ray analysis of pre-molar teeth. Importing countries could contribute to regulation of lion hunting by assessing the age of skulls on arrival.

2. *Introduction of independent trophy monitoring and adaptive management of quotas*

Given the lack of precise data on most lion population sizes, the development of a standardized monitoring programme for lion hunting and of lion trophies is essential to allow for adaptive quota management. A variety of indices should be measured, at a minimum, hunt effort for successful and unsuccessful hunts, and the age of animals killed. Consistent changes in these indices over time would indicate that quotas need to be changed accordingly. This allows for adaptive quota setting in response to changes in population abundance and would prevent both over-harvesting and excessively conservative quotas. To be effective, monitoring programmes require that the submission of hunt effort and trophy quality data is mandatory and strictly enforced by being a pre-requisite for receiving an export permit. In the interests of objectivity and transparency, this monitoring should be conducted by independent, scientific bodies with relevant expertise, for example, from academia and some conservation NGOs.

3. *Implementation of maximum quotas to prevent excessive harvests, until age restrictions and trophy monitoring are in place.*

Until such time as age restrictions and trophy monitoring are implemented, we recommend that quota caps should be imposed as a precautionary measure. Packer et al. (2011) estimated that maximum harvests of 0.5 lions per 1,000 km^2/386 sq mi in general or 1.0 per 1,000 km^2/386 sq mi in areas with high densities of lions are conservative and likely to be sustainable in most cases. Such caps provide a short-term means of reducing the risk of negative population impacts while more robust methods are being implemented. Areas that are smaller than 1,000 km^2 should be granted the equivalent fraction of 0.5 lions per year: for example, an area of 200 km^2/77.2 sq mi would be allocated 0.1 lions per year, or one tag every ten years. Such a system would reduce the extent to which hunting in small concessions adjacent to protected areas parks affects protected populations, as in Zambia and Zimbabwe (Yamazaki, 1996;Loveridge et al., 2007; Davidson et al., 2011; Becker et al., 2012; Grooms et al, in press).

4. *Restriction of harvest to males*

We believe that trophy harvest should be restricted to males, except in exceptional situations where the express management intention is to reduce the density of lions, as may occur in certain scenarios where lions occur on communal or private lands. Though allowing hunting of females, Zimbabwe has moved largely to such a system since 2004, for example, on Save and Bubye Conservancies where lion population control was deemed necessary (A. Loveridge, pers. comm.).

5. *Abolish fixed quota fees for lions*

Operators should not be required to pay for lions before they hunt them. Such requirements impose an incentive to shoot even if a sufficiently old lion is not found.

6. *Development of a unified approach to the management of lion hunting*

We recommend that a unified approach is developed for the management of trophy hunting among all 11 countries where lions are hunted as trophies. Such a unified approach would mean that the negative ecological impacts of lion hunting would be reduced across all areas in which lions are hunted. In addition, no single country would be disproportionately disadvantaged by the reforms.

7. *Particular care required in West and Central Africa*

In West Africa, where lions are considered regionally endangered on the IUCN Red List (Bauer & Nowell, 2004), and populations are declining and becoming increasingly isolated (Henschel et al., 2010), reforms of the current hunting practices are most urgently required.

Conclusions

The extremely high willingness of US clients to pay to hunt lions represents an opportunity for lion conservation in the context of severe funding shortages to protect and manage African wilderness. However, demonstrated negative impacts associated with the trophy hunting of African lions mean that significant changes to the management of lion hunting is urgently required. We believe that reforms are preferable to trade restrictions due to the collateral long-term risks associated with the latter. We urge the USFWS to grant African governments the opportunity to improve the management of lion hunting, acknowledging the important steps already made by some to improve its sustainability and contribute to conservation goals. The failure of African governments to adopt the necessary reforms in a rapid and reasonable time frame (for example, three years) would create a strong case for trade restrictions.

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