

# MANE ASSUMPTIONS

A review of Lindsey et al (2012)  
The significance of African Lions for the Financial Viability of  
Trophy Hunting and the Maintenance of Wild Land

**Final report**

2012 - Commissioned by:  
The African Lion Coalition

**Report prepared by:**

Economists at Large Pty Ltd  
Melbourne, Australia  
www.ecolarge.com  
research@ecolarge.com  
Phone: +61 3 9005 0154  
Fax: +61 3 8080 1604

**Citation:**

Campbell, R. 2012. *Mane Assumptions: A review of Lindsey et al (2012) - The Significance of African Lions for the Financial Viability of Trophy Hunting and the Maintenance of Wild Land*, a report for the African Lion Coalition, prepared by Economists at Large, Melbourne, Australia.

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## Contents

<b>SUMMARY</b>	<b>4</b>
<b>INTRODUCTION</b>	<b>8</b>
<b>BACKGROUND</b>	<b>8</b>
<b>THIS PAPER</b>	<b>9</b>
<b>THE MODEL</b>	<b>10</b>
<b>REVENUE</b>	<b>10</b>
<b>COSTS</b>	<b>11</b>
<b>NET REVENUE AND VIABILITY</b>	<b>13</b>
<b>MODELED SCENARIOS</b>	<b>14</b>
<b>CRITICISMS OF THE LINDSEY ET AL. ARTICLE</b>	<b>15</b>
<b>EMPHASIS ON A LION HUNTING BAN</b>	<b>15</b>
<b>PRESENTATION OF RESULTS</b>	<b>15</b>
<b>HUNTING AREA VIABILITY AND CONSERVATION/LAND USE CHANGE</b>	<b>17</b>
<b>OMISSIONS AND UNDERESTIMATES</b>	<b>18</b>
<b>CONCLUSION</b>	<b>22</b>
<b>REFERENCES</b>	<b>24</b>

## Summary

### Trophy Hunting

Trophy hunting generates controversy due to the nature of the industry – wealthy foreigners from developed countries killing wild animals in low-income countries, where there is limited oversight of the industry. Trophy hunting is offered by operators who obtain leases across large areas of land where foreign hunters are able to shoot various animals including lions. There are thought to be 23,000 to 39,000 wild lions in Africa, at best nearly 50% less than in 1980. Despite this decline, at least 7,090 wild lions were killed and their parts exported from African countries for trophy purposes between 1999 and 2008 (Place et al. 2011). Trophy hunting advocates claim that the significant sums paid by lion hunters provide incentive for their conservation, however recent studies have found that trophy hunting is directly contributing to rapid decline in lion numbers.

### Lindsey et al. (2012) publication

Against this backdrop a study has recently been published on the PLoS ONE online journal, *The Significance of African Lions for the Financial Viability of Trophy Hunting and the Maintenance of Wild Land*, written by P. Lindsey, G. Balme, V. Booth and N. Midlane. The paper is based on a financial model and data from hunting websites, government agencies and a survey of hunting operators. The article's key conclusion is that:

*If lion hunting was effectively precluded, trophy hunting could potentially become financially unviable across at least 59,538 km<sup>2</sup> that could result in a concomitant loss of habitat.(p1)*

The African Lion Coalition, a coalition of animal protection organizations with an interest in lion conservation, has asked Economists at Large to review the article by Lindsey et al. In this review we present a thorough explanation of the Lindsey et al. model, place its results in context, and question its assumptions and conclusions.

### Explanation of the model

The Lindsey et al. model estimates the financial viability of trophy hunting areas based on estimates of revenues, operating costs and start-up costs. Net revenue (revenue less operating costs) is compared to start-up costs to estimate return on investment. An area is considered viable if return on investment is above a certain rate.

Lindsey et al. compare the financially viable areas under three different scenarios:

- SCENARIO 1: Current hunting practices of all species.
- SCENARIO 2: A reduction in lion hunting, no reduction in hunting of other species.
- SCENARIO 3: A ban on lion hunting, no reduction in hunting of other species.

Several calculations are unclear from the article, particularly fixed operating costs, and requests for clarification from the corresponding author were not answered.

## Model results

The table below shows the Lindsey et al. results in change in financially viable land area, and this change as a percentage of total area and change from the current scenario.

Table 1: Summary of model results

	Total hunting area in analysis (Km <sup>2</sup> )	Scenario 1, financially viable area under current hunting practices, (Km <sup>2</sup> )	Scenario 2, financially viable area under reduced lion hunting	Scenario 3, financially viable area under lion hunting ban
Total	373,672	209,468	202,463	149,930
% of total		56%	54%	40%
Change from current scenario			2%	16%

We see that the different scenarios result in reductions in financially viable hunting areas of 2% (reduced lion hunting) and 16% (no lion hunting). It is interesting to note that the Lindsey et al. model indicates that 44% of hunting areas in the analysis are currently unviable. Indeed, most hunting areas in 3 of 5 countries considered in the analysis, are already financially unviable:

Table 2: Current financially unviable hunting areas

Country	Percentage of hunting areas currently financially unviable under Lindsey et al. model
Mozambique	92%
Namibia	67%
Tanzania	19%
Zambia	67%
Zimbabwe	44%

## Criticisms of the Lindsey et al. article

### Presentation of results

Lindsey et al.'s results suggest that existing hunting areas are already largely financially unviable and that comparatively small changes in financial viability occur under different hunting scenarios. That is, 44% of hunting areas considered are financially unviable without any changes in lion hunting, and only an additional 2% would be unviable if lion hunting were reduced. In the article, particularly the abstract, these changes are presented in total area rather than

percentage terms, leading readers to believe the changes would be large, rather than the actual 16% total area changed under the most extreme scenario.

#### Emphasis on a lion hunting ban

The article highlights the differences in financially viable trophy hunting areas under the lion hunting ban scenario and the current scenario, and then links animal protection campaigns with a lion hunting ban. However, there are no campaigns advocating for an Africa-wide lion hunting ban and no practical way of introducing or enforcing one. While a theoretical ban on lion hunting may be interesting to consider, should the existing campaigns to reduce pressure on lion populations from trophy hunting and trade be successful, the likely outcome will be closer to scenario 2, reduced lion hunting and its minor 2% change in financial viability.

#### Omissions and underestimates

Lindsey et al. make no consideration of trophy hunting businesses' marketing costs. Other authors point out that marketing costs for trophy hunting businesses are considerable and important. Lindsey et al. used data from surveys at trophy hunting conventions, but failed to include the costs of attending such conventions in their model.

The authors overestimate businesses' ability to access credit and underestimate interest rates. The model assumes that trophy hunting start-up businesses with considerable risks—operations in Africa, high security risks, exposure of high-end hunting market to economic fluctuations—can easily access credit at close to prime rates of interest.

These flaws serve to overstate the number of businesses that are viable to begin with, thus ensuring that numbers that become unviable with any change are also overstated.

#### Lack of substitution

The model assumes that reduced lion hunting revenues are lost from the trophy hunting industry all together. This assumes that hunters who would hunt lions do not substitute their lion hunt with hunting another species, but desist from hunting entirely. This seems unlikely as lion hunters routinely hunt other animals whilst hunting lions. If hunters decide to hunt another species instead of giving up hunting altogether, changes to the financial viability of trophy hunting areas with reduced or no lion hunting are likely to be minimal.

#### No consideration of opportunity cost

From an economic perspective, land use change is driven less by fluctuations in the financial viability of one particular land use, but in the relative returns offered by all competing land uses. Assessing the opportunity cost of hunting tourism and how it compares to land uses such as photographic tourism, or agriculture and livestock raising is more important in understanding land use change. While other authors have discussed trophy hunting's inferior rates of return, Lindsey et al. do not analyze these opportunity costs.. Moreover, since most hunting areas in most countries studied by Lindsey et al. are not financially viable, clearly financial viability is not a requirement of hunting businesses. There must be other non-financial benefits, such as lifestyle, to owning those businesses.

### Unsubstantiated Wider Conclusions

Lindsey et al.'s results relate to changes in trophy hunting area viability under modeled scenarios. However, many prominently stated conclusions of the paper do not relate to these topics:

*“Restrictions on lion hunting may also reduce tolerance for the species among communities where local people benefit from trophy hunting, and may reduce funds available for anti-poaching.” (p1)*

*“Blanket trade restrictions would unfairly punish countries where lion hunting is well managed and could be negative for lions by undermining the competitiveness of wildlife-based land uses....” (p9)*

This paper does not relate to changes in human-animal conflict, ability of communities to benefit from trophy hunting, trophy hunting's ability to produce conservation improvement, etc. These are complex topics with considerable literature. Lindsey et al.'s results do not add to our understanding of these topics.

In conclusion, Economists at Large disagree with the conclusions of Lindsey et al., that reductions in lion hunting will significantly reduce the financial viability of hunting areas and that this reduction could lead to loss of habitat that would not otherwise occur. Lindsey et al.'s model needs to more accurately reflect the existing conditions of the industry and incorporate the wider factors influencing land use before it can be of use to conservation discussions.

## Introduction

### Background

While the romanticized African safaris of the colonial era are gone, trophy hunting still exists in Africa today. Trophy hunting operates to differing degrees in around 14 African nations, major countries being South Africa, Tanzania, Botswana and Zimbabwe (Booth 2010). Revenue from hunting, considered as part of the tourism sector by these countries, typically accounts for 1-5% of their tourism revenue (IUCN 2009; Booth 2010).

Though a small industry, trophy hunting attracts much attention due to the nature of the business – foreign tourists (aided by foreign hunting companies) killing wild animals, including endangered species, in low-income countries with limited governance. Animal protection groups denounce the killing of animals for sport, while hunting groups claim the “right” to hunt (Amrhein 2009). Conservationists express a range of opinions, sometimes condemning the pressure hunting puts on vulnerable populations and sometimes arguing that revenues from trophy hunting can provide incentives for conservation. Some local communities receive financial benefit from hunting tourism, but all-too-often they receive too little to compensate for hunting activities, which generally prevent them from using land under a hunting lease for other purposes (IUCN 2009).

Numbers of wild lions have been in rapid decline in recent years. Estimates of the current population, based on 10-year old data, are less than 40,000, with a range of 23,000 to 39,000, a decline of at least 48.5% from a 1980 estimate of 75,800 (Place et al. 2011). While the main causes of this decline are habitat encroachment and human-animal conflict between lions and farming communities, studies such as Packer et al. (2010) have shown that trophy hunting is also directly contributing to this decline. There is little debate, even from lion trophy hunting advocates such as Lindsey et al. (2012) that the survival of wild lion populations will be assisted by fewer lions being shot by trophy hunters.

Despite being listed by the IUCN as “vulnerable” with moves to increase protection through listing the species on Appendix I under the Convention on International Trade in Endangered Species (CITES), European Union import regulations, and Endangered listing under the U.S. Endangered Species Act, trophy hunting of wild lions still occurs in at least 8 countries (Lindsey et al. 2012). Lion hunts typically last from 18-21 days, with hunters paying fees of \$1800 to \$3000 USD per day and an additional trophy fee of \$5000 to \$23000 if a lion is killed. These prices are similar to those for hunts of other dangerous species, and more expensive than for hunts of more common “plains game”.

Trophy hunters typically book their hunts through hunting “outfitters” who advertise online or at hunting conventions held in developed countries such as the U.S. and European countries. Fees paid from hunters to outfitters often include travel and accommodation expenses and fees related to the hunt. Trophy fees are also payable depending on which animals are actually killed.

It is important to note that the above figures and all discussion of trophy hunting of lions in this report refer to the hunting of wild lions, as opposed to “canned hunting” or “put-and-take” hunting. Canned hunting is the shooting of captive lions in enclosed spaces, while put-and-take



involves releasing captive animals into small hunting areas just before the beginning of a hunt. Most lion hunting in South Africa is of this kind (Patterson and Khosa 2005), hence there is little reference to South Africa in many discussions of lion hunting, despite many lions being killed there.

Several animal protection organizations, including International Fund for Animal Welfare (IFAW), Humane Society International (HSI) and Born Free Foundation / Born Free USA have formed the African Lion Coalition to lobby for increased legal protection of wild lion populations. One initiative of the coalition is a petition to list the African lion as endangered under the Endangered Species Act (ESA) of the United States. The impact of such a listing would be to end the importation into the USA of lion parts, including hunting trophies. An ESA listing does not amount to a ban or moratorium on lion hunting; it is aimed at assisting a reduction of lion hunting by Americans alone.

### This paper

The African Lion Coalition has asked Economists at Large to review *The Significance of African Lions for the Financial Viability of Trophy Hunting and the Maintenance of Wild Land*, written by P. Lindsey, G. Balme, V. Booth and N. Midlane, published on the PLoS ONE online journal on 11 January 2012. The article's conclusions include:

*If lion hunting was effectively precluded, trophy hunting could potentially become financially unviable across at least 59,538 km<sup>2</sup> that could result in a concomitant loss of habitat. (p1)*

The article suggests maintaining the practice of lion hunting, despite reports such as (Packer et al. 2009) finding that trophy hunting is directly leading to the decline of lion populations in the wild. Given the urgency of finding effective ways to address the declining wild populations of lions, the Coalition is keen to examine and understand Lindsey et al.'s(2102) findings.

The article by Lindsey et al. is based on a financial model using data from hunting operator websites, hunting client reports<sup>1</sup>, government agencies and a survey of hunting operators attending a hunting convention in the U.S. Their model estimates the area over which trophy hunting is financially viable under three scenarios:

- SCENARIO 1: Current hunting practices.
- SCENARIO 2: A reduction in lion hunting, no reduction in hunting of other species.
- SCENARIO 3: A ban on lion hunting, no reduction in hunting of other species.

We believe there are many flaws in Lindsey et al.'s methodology that limit the validity of their findings and the usefulness of their conclusions. In this paper we:

- Present a detailed explanation of the Lindsey et al. model and all revenue and cost calculations. We point out where these calculations are not adequately explained in the text.

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<sup>1</sup> Specifically those submitted voluntarily to [www.thehuntingreport.com](http://www.thehuntingreport.com)

- Put the results of the Lindsey et al. model in context and discover that any impacts of reducing lion hunting are in fact relatively mild.
- Discuss the modeled scenarios, in particular a mistaken emphasis on a complete lion hunting ban.
- Discuss flaws and omissions in the model, such as marketing costs, access to credit and substitution.
- Explore the assumption of financial viability of trophy hunting contributing to habitat conservation.
- Discuss the need to consider opportunity cost and returns from other land uses in understanding land use change.
- Show that Lindsey et al.'s results demonstrate that financial viability is not required for the existence of trophy hunting areas.
- Examine how some conclusions of Lindsey et al. are not supported by their data and results.

## The model

This section examines the model used by Lindsey et al.. The model estimates the financial performance of trophy hunting areas (or blocks) in five African countries, Mozambique, Zambia, Tanzania, Namibia and Zimbabwe. Trophy hunting businesses that have permission to bring client hunters to blocks of land, called “hunting concessions”, earn revenue by charging hunters fees per animal killed, and incur costs in setting up their businesses and operating tours. The model then compares the estimated performance of each operator with assessments of financial viability.

Note that our explanation is based on our understanding of the PLoS ONE article. We have requested clarification from the author on several points but this was not provided.

## Revenue

Revenue for each hunting tourism business used in the Lindsey et al. (2012) model is generated from trophy fees and daily fees from clients.

### Trophy revenue

Trophy revenue is the sum of fees paid for each animal killed. To estimate of how many animals are actually killed, or “off-take”, the hunting block’s quota is multiplied by a utilization rate, as quotas are often under-utilized. The calculation is shown below:



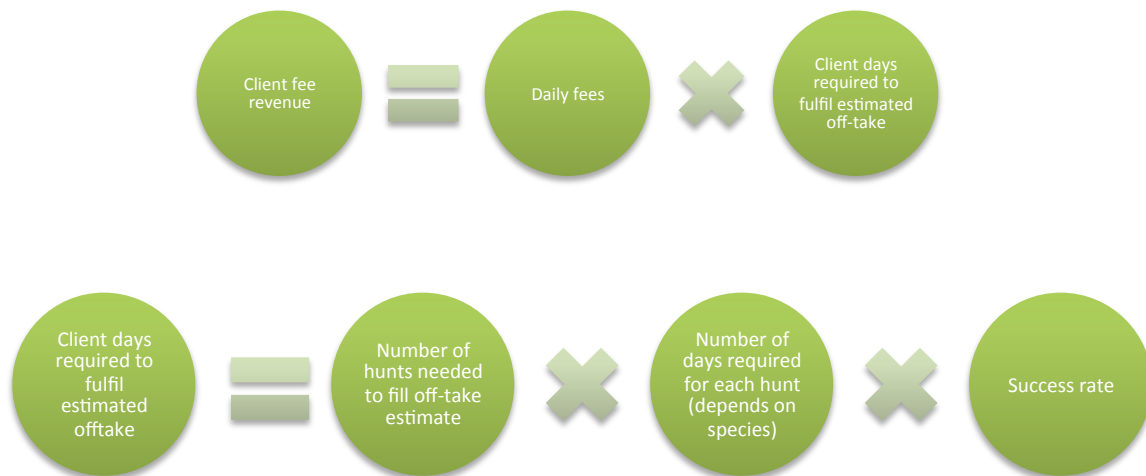
Quota data was obtained from government agencies. In many cases the official quota for each block, for each species – including lions – is available. Utilization rates were reported by groups of operators or government agencies.

Trophy hunting businesses, known as hunting operators, charge a trophy fee for each animal killed by clients. Lindsey et al. estimated this fee for each species in each country from a survey of operator websites. The businesses must in turn pay a trophy fee to the relevant government agency from whom they lease their hunting block. It is not clear from the Lindsey et al. article if this cost to operators has been removed from trophy revenue. Trophy revenue in the model should include only the operators’ mark-up and should not include the liability to the government agency. If this liability has not been removed then the model overstates the revenue of all hunting tourism businesses.

### Client fee revenue

From the estimates of off-take of each species, Lindsey et al. calculate revenue from clients’ daily fees. Hunts are usually sold as packages, with set numbers of days required to be purchased and paid for depending on the key species targeted. For example, lion hunts typically last 21 days. Working backwards from the allowable off-take of each species, they were able to estimate the hunting days that needed to be bought to achieve that off-take. For example, if a hunting block had an allowable off-take of two lions, it would require at least 42 client days to hunt these lions.

A further consideration is the success rates of the hunting trips. As not all hunts are successful in killing their target species, it may take several more hunting trips to actually fulfill the allowable off-take. For example, in a block with allowable off-take of two lions and a success rate of 0.5, it would take four 21 day trips to secure that level of off-take. This would mean a total of 84 client days for an off-take of 2 lions. Lindsey et al. estimated daily fees from operator websites and success rates from client reports posted on a popular hunting website.



## Costs

The Lindsey et al. (2012) model uses data from surveys of hunting operators to estimate the start-up costs and operating costs of their businesses. Operators from main lion hunting countries were surveyed at hunting industry shows in the United States, specifically in Dallas, Houston and Atlanta.

*Operators were asked to determine the length of lease of their hunting block(s), and provide an estimate of the total start-up and annual running costs (split into fixed and variable) associated with their hunting operation. (p3)*

### Start-up costs

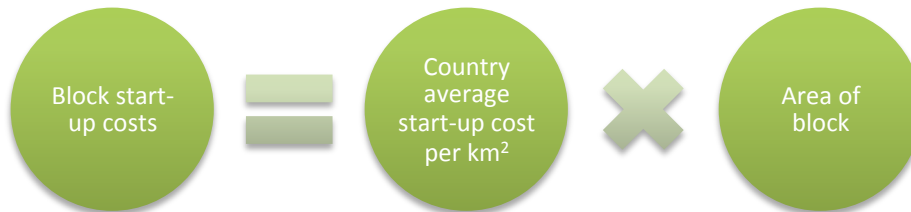
Table 2 in Lindsey et al (2012) shows the maximum and minimum estimates of start-up costs in each country. Each operator was also asked the area of their hunting block to obtain start-up cost per km<sup>2</sup>. Each country's mean start-up cost per km<sup>2</sup> is then used to estimate the start-up costs of each hunting block included in the analysis.

Lindsey et al. 2012 assume that start-up costs consist of:

- 60% lease acquisition costs
- 30% vehicles and equipment
- 10% camp costs

Lease and camp costs are depreciated over the term of the lease while vehicles and equipment are depreciated over a 5-year period.

Lindsey et al 2012 assumes that operators will fund start-up costs with 50% equity and 50% debt. The debt attracts a 4.25% interest rate. It is not clear over what term this is compounded.



### Running costs

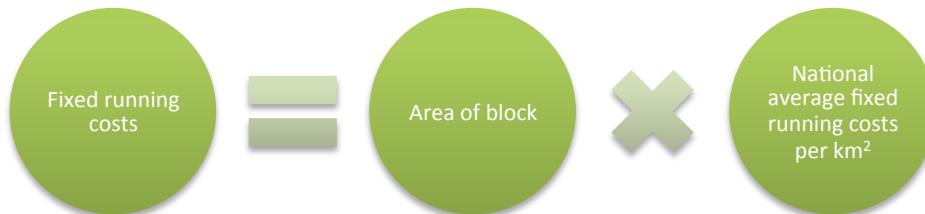
Operators were asked to estimate their annual operating costs and what portion of these were fixed and what were variable.



While it is not clear from the article, we surmise that variable running costs are determined by dividing the variable running cost estimate of each operator in the survey by the number of client days reported. We surmise that a national average variable cost per client day is then applied to the number of days required to fulfill allowable off-take.

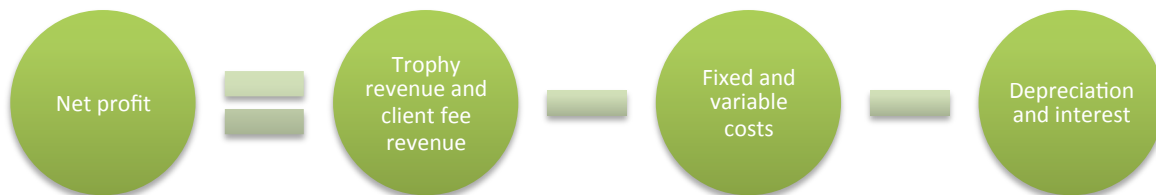


The article does not mention how fixed running costs are calculated for each block, but we surmise that fixed operating costs are applied on a per area basis, using a national average fixed running cost per square kilometer.



### Net revenue and financial viability

With the above variables, the authors calculate net revenue for each hunting block in their analysis. Trophy revenue and client fee revenue are combined for total revenue, from which the operating costs, interest on debt and depreciation of assets are deducted. The corporate tax rates of each country are then applied to blocks with positive net revenue to obtain net profit after tax.



Net profits after tax are divided by the total start-up costs for each block to give a return on investment (ROI), expressed as a percentage rate. Where this rate exceeds a rate of 6.96% the block is considered financially viable. If the ROI does not meet 6.96% it is considered unviable. The rate of 6.96% was selected by Lindsey et al. as an un-named tourism company uses this rate to evaluate tourism projects in sub-Saharan Africa.



### Modeled scenarios

Lindsey et al compares the results of the above model across three scenarios:

- SCENARIO 1: Current hunting practices of all species, including lions.
- SCENARIO 2: A reduction in lion hunting to rates recommended by (Packer et al. 2010), no reduction in hunting of other species.
- SCENARIO 3: A ban on lion hunting, no reduction in hunting of other species.

The differences in viability between these scenarios are the key results of the Lindsey et al. article and are emphasized in the abstract:

*If lion hunting was effectively precluded, trophy hunting could potentially become financially unviable across at least 59,538 km<sup>2</sup> ... If lion off-takes were reduced to recommended maximums (0.5/1000 km<sup>2</sup>), the loss of viability and reduction in profitability would be much lower than if lion hunting was stopped altogether (7,005 km<sup>2</sup>).*

## Criticisms of the Lindsey et al. article

### Emphasis on a lion hunting ban

The authors compare viable hunting area over three different scenarios:

- current quotas for all species including lions,
- current quotas for all species but with lion off-take reduced to rates recommended by (Packer et al. 2010)
- current quotas for all species with zero lion off-take – a “ban” on lion hunting

While the paper focuses on the loss of hunting operation financial viability if lion hunting were to be banned, this provides little insight into existing regulatory proposals. There are no proposals for a continent-wide ban of lion hunting and no such ban seems practical or enforceable.

Proposals to increase protections for lions with domestic laws in the United States or EU do not equate to a ban on lion hunting. Hunters from other countries with a tradition of trophy hunting, such as Russia, Canada and Mexico, could and would still hunt lions and be able to import their trophies to their home country, and hunters from both the U.S. and EU countries could still legally hunt lions abroad but could not import the trophies.

Even a CITES Appendix I listing would not ban lion hunting although it would end international commercial trade in lions and their parts and products. Listing on CITES Appendix I imposes a requirement on the importing country to make a finding that the trade is not detrimental to the survival of the species. This may have the result of some countries may not allow the importation of lion hunting trophies, but it will not ban lion hunting. Species listed on CITES Appendix I are hunted and their trophies traded internationally for non-commercial purposes; the cheetah is an example. However, because the cheetah is listed as an endangered species under the U.S. Endangered Species Act, trophies cannot be imported to the U.S. Thus, the main result, highlighted in the abstract, that a lion hunting ban could result in a loss of habitat of nearly 60,000km<sup>2</sup> is misleading and should not be connected with current campaigns for increased protection of lions.

### Presentation of results

The change in financially viable area between the different modeling scenarios is presented without reference to the total area under consideration, both in the abstract and in Table 6. To understand the implications of Lindsey et al.'s model, it is helpful to understand the percentage change in area discussed, rather than absolute area. In the table below, the total hunting tourism area for each country included in Lindsey et al.'s analysis is presented, along with the financially viable hunting tourism area under each scenario.

Table 3: Lindsey et al. results summary

	Total hunting area in analysis <sup>2</sup>	Viable area Scenario 1: current hunting levels	Viable area Scenario 2: Reduced lion hunting	Viable area Scenario 3: Lion hunting ban
<b>Mozambique</b> (Area - km2)	27,532	2,120	2,120	0
<b>% of total area viable</b>		7.7%	7.7%	0.0%
<b>Namibia</b> (Area - km2)	39,465	13,142	13,142	13,142
<b>% of total area viable</b>		33.3%	33.3%	33.3%
<b>Tanzania<sup>3</sup></b> (Area - km2)	180,006	146,165	141,960	102,337
<b>% of total area viable</b>		81.2%	78.9%	56.9%
<b>Zambia</b> (Area - km2)	100,387	33,429	33,429	23,149
<b>% of total area viable</b>		33.3%	33.3%	23.1%
<b>Zimbabwe</b> (Area - km2)	26,281	14,612	11,812	11,302
<b>% of total area viable</b>		55.6%	44.9%	43.0%
<b>Total</b> (Area - km2)	373,672	209,470	202,463	149,930
<b>% of total area viable</b>		56%	54%	40%

We see that 56% of hunting areas are financially viable under current hunting conditions, 54% under reduced lion hunting and 40% under a hunting ban. As pointed out in Lindsey et al.'s abstract, the change in area of viability between scenario 1 and scenario 3 is nearly 60,000km<sup>2</sup>, however here we see that this represents a change of only 16% of total area. Note again that the ban scenario is not reflective of any regulatory proposal. In the next section we will see that even this is likely to be an overestimate.

<sup>2</sup> Derived from Lindsey et al. Table 6, by dividing financially viable area by % viable to get total. Note this leads to inconsistent area over which the Tanzania analysis is carried out.

<sup>3</sup> Note that multiplying the financially viable area by the percentage of financially viable area in Lindsey et al. Table 6 returns an inconsistent total area for Tanzania.



### Hunting area viability and conservation/land use change

A central assumption of Lindsey et al.'s article is that financial viability of hunting areas provides incentive to preserve habitat and wildlife. They suggest that reduced area of financially viable hunting operations "could result in a concomitant loss of habitat." (p1) However Lindsey et al.'s own results call into question this assumption. They find that in a majority of surveyed countries, the majority of hunting areas are already not financially viable.

Table 4: Current extent of financially unviable hunting area

Country	Percentage of hunting areas currently financially unviable under Lindsey et al. model <sup>4</sup>
Mozambique	92%
Namibia	67%
Tanzania	19%
Zambia	67%
Zimbabwe	44%

This suggests that either Lindsey et al.'s model fails to accurately convey the incentives and workings of the trophy hunting industry, or that there are non-financial reasons why these businesses continue. Lindsey et al. suggest a "lifestyle element" of trophy hunting operators, but more important motivations are likely to be political – revenues generated from trophy hunting are important for wildlife bureaucracies and are often siphoned off to enrich corrupt, powerful individuals. See Sachedina (2008) for detailed examples from Tanzania.

This finding of widespread financial non-viability limits the usefulness of the results of the study. Clearly more work needs to be done to understand why operators persist in running businesses that are not financially viable.

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<sup>4</sup> Derived from Lindsey et al Table 6, by subtracting the % of financially viable hunting areas from 100% to give the % of financially unviable hunting areas.

## Omissions and underestimates

The model and analysis carried out by Lindsey et al. contains shortcomings that serve to exaggerate the number of hunting areas that are financially viable under current conditions, and the number that will become unviable with reduced lion hunting. Namely, the omission of marketing costs, using a low interest rate and ignoring substitution effects.

### Lack of marketing costs

It is unclear from the description of the Lindsey et al. methodology in PLoS ONE what consideration, if any, has been made of the marketing costs that hunting operators must incur. Marketing costs certainly exist, as shown by the location of Lindsey et al.'s surveys at trophy hunting conventions in the USA. The costs of running stalls at such conventions are significant, and other marketing costs requiring contacts, space and staff in developed countries must be considered. Booth (2009) describes the importance of marketing for these businesses:

*[Safari hunting] requires a unique marketing approach which is very personal, and is more akin to direct one-on-one executive recruitment as opposed to mass marketing through advertising. Clients are visited in their homes with tailored presentations where the final cost of a safari is negotiated ... These negotiations can take up to 18 months... (p32)*

Baldus and Cauldwell (2004) emphasize the role of marketing in the hunting industry of Tanzania. They claim that the more profitable outfitters are able to secure more productive concessions and take advantage of the industry regulation precisely because of their marketing ability. While other companies:

*[that are] not competent in marketing their hunts directly and thus do not develop a sufficient client base of their own and therefore tend to sublease their hunting to wandering professional hunters and/or other operators. Those persons finally involved in the actual hunting activities have little or no commitment to the area or for their own reputation and are most often the persons that bring the industry into disrepute. (p17)*

The inability to fund adequate marketing operations in client countries is a key reason why community-based hunting businesses fail and the economic benefits are denied to local people, as is made clear in Botswana by Mbaiwa (2004):

*The lack of marketing skills, experience and capital to directly participate in such a highly specialized industry by Trusts in the Okavango Delta suggests that the industry will for the foreseeable future remain dominated by foreign safari companies which have the skills, experience and capital to market hunts from the Okavango and other developing countries*

By omitting marketing costs from their analysis, the return on investment of all operators is increased. This means the number of financially viable blocks in Lindsey et al.'s initial scenario is overstated and the change to non-viability with reduced lion hunting is exacerbated. If marketing costs were included in the model, even fewer blocks would be financially viable under the current off-take scenario and the increase in non-viable areas would be less without lion hunting revenue.

### **Interest rates and access to credit**

Lindsey et al. assume hunting businesses will fund their start-up costs through 50% credit at 4.25% interest. Both the ability to access this credit and to achieve such a low interest rate seem unlikely.

Credit markets are not determined entirely by supply and demand for loans. Instead, access to credit is determined by lending institutions. This is understood by anyone who has been rejected for a bank loan (Werner 2004). The New York Federal Reserve found that in 2010 less than half the small businesses that applied for credit were successful (FRBNY 2010).

While access to credit for small businesses in the US may improve over time, hunting operations are less likely to receive credit than the average business as they involve considerable risk:

- Market risk – as a luxury international tourism operation they are highly exposed to changes in international economic conditions.
- Political risk – they operate in countries with considerable political instability.
- Exchange rate risk – with many operating costs or asset values in foreign currencies.
- Industry risk – large parts of the hunting industry have low financial viability.
- Security risk – threats to health and safety in less developed countries.

Due to the risks involved, hunting businesses that are able to access credit will be unlikely to obtain it at rates as low as 4.25%. Current Small Business Administration program loans through major US banks are charging rates of around 9.75%<sup>5</sup>. In Australia current small business loans are attracting 7.5 – 10.8%<sup>6</sup> while in Africa rates are higher still; Grandes and Pinaud (2005) explore why interest rates faced by African businesses and governments are often 8% higher than internationally.

The effect of overstating hunting business's access to credit and understating the interest rate they would pay is to increase the number of financially viable businesses. As the number of businesses considered initially financially viable is overstated, an overstated number of businesses become unviable when the revenue of the industry is reduced under reduced lion hunting scenarios.

### **Lack of substitution**

From an economic perspective, the most serious shortcoming of the Lindsey et al. model is the omission of substitution between lion hunts and hunts of other species. By comparing revenue under current off-take with industry revenue minus lion hunting revenue, without consideration of what hunters might hunt instead of lions, they assume that the entire revenue from lion hunts is lost from the industry. This assumption means that as opportunities for lion hunting decrease, the would-be lion hunter desists from hunting entirely. This seems unlikely as lion hunters are likely to be committed and experienced hunters, who will most likely choose to hunt another animal rather than finding another hobby.

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<sup>5</sup>At time of writing Bank of America was advertising 6.5% over Wall Street Journal prime rates of 3.5%.

See

[http://www.bankofamerica.com/small\\_business/business\\_financing/index.cfm?template=sba\\_financing](http://www.bankofamerica.com/small_business/business_financing/index.cfm?template=sba_financing) and <http://www.bankrate.com/rates/interest-rates/wall-street-prime-rate.aspx>

<sup>6</sup>[www.rba.gov.au/statistics/tables/xls/f05hist.xls](http://www.rba.gov.au/statistics/tables/xls/f05hist.xls)

We know of no study that has quantified substitution between species for African trophy hunting. The existence of a high degree of substitution for lions is suggested, however, by Lindsey et al. (2006) who investigated which species aroused the interest of both prospective Africa hunters and more experienced hunters. They found that lions ranked fourth behind buffalo, kudu and leopard for preferred species among first time Africa hunters and behind buffalo, leopard and equal with rare antelope among more experienced Africa hunters.

The omission of any substitution has large implications for Lindsey et al.'s conclusions that significant areas of viable hunting blocks may become financially unviable under a no lion hunting scenario. Even small degrees of substitution would have similar effects to the reduced lion hunting scenario, where decreases in financially viable hunting areas are only 2%. As the most likely situation under proposed regulatory changes is similar to the reduced lion hunting scenario including any substitution by affected hunters would replace net income and likely keep financially viable areas close to current levels.

### **Opportunity costs**

From an economic perspective, financial viability alone is not sufficient to ensure continuation of a specific land use, such as trophy hunting. To ensure a specific land use continues, its benefits must be greater than the benefits created by alternative uses. This is called opportunity cost. Opportunity cost refers to the cost of lost opportunity, or the lost benefits of alternative uses of a particular resource.

Opportunity cost helps explain why many industries operate where they do. For example, we do not see farms operating in the middle of city commercial districts. Even if the farm is viable, the opportunity cost of the farm being in the commercial district is the lost profit of the shops and businesses that would otherwise operate there, on a more profitable basis per area. Opportunity cost is particularly important to consider in relation to hunting areas as hunting tends to exclude any other uses of land. This is understood by some of these authors:

*For conservation outside of parks to be successful, sufficient revenues must be generated from wildlife to offset opportunity costs associated with protecting wildlife habitats.*  
(Lindsey et al. 2006)

Yet in their model and subsequent discussion, Lindsey et al. (2012) make no consideration of opportunity cost. They assume that the financial viability, or an adequate return on investment of hunting operations, is the key factor in determining land use and in conserving wildlife and habitat. While understanding return on investment of hunting areas alone is interesting, far more important for understanding land use change is comparing returns from competing land uses. Minor changes in trophy hunting return on investment – such as with varying levels of lion hunting – are far less important than understanding the opportunity costs of different land uses. For example, Baldus and Cauldwell point out that in Tanzania's Selous Game Reserve (SGR):

*Income generation per unit area from all hunting areas of Tanzania is approximately US\$ 40/km<sup>2</sup>. Hunting income per unit area for the SGR is approximately US\$ 70/km<sup>2</sup>. Photographic tourism in the SGR generated approximately US\$ 130/km<sup>2</sup> prior to a recent expansion of the area. (p12)*

The rate of lion hunting is unlikely to have any effect on the industry's ability to compete with higher earning land uses. Operators know this and instead rely on protection:

*Alternative forms of income generation [are prohibited] within hunting areas and outfitters are therefore protected from competing against other forms of wildlife tourism. (Baldus and Cauldwell 2004, p34)*

While Baldus and Cauldwell find that tourism generates greater income than hunting in the Selous Game Reserve, writers such as Lindsey et al. (2006) claim there are large areas where this may not be possible. They suggest that in areas where tourism may not be possible due to remoteness or political instability, hunting may still be financially viable. What will determine land use however, is not if hunting is financially viable, but if it is able to cover the opportunity costs associated with precluding other land uses such as agriculture or cattle raising. This is by no means certain, as emphasized in IUCN (2009).

#### **Unsubstantiated Wider conclusions**

Lindsey et al.'s article attempts to model financial viability of hunting tourism areas under three different lion hunting scenarios. As we have seen, their model has some major shortcomings and the results of the model and data suggest there are problems with the assumption that lion hunting operations need to be financially viable to exist. In light of this, some claims made by the authors are not only unrelated to their data, but also are not supported by their findings:

*“Restrictions on lion hunting may also reduce tolerance for the species among communities where local people benefit from trophy hunting, and may reduce funds available for anti-poaching.” (p1)*

*“Blanket trade restrictions would unfairly punish countries where lion hunting is well managed and could be negative for lions by undermining the competitiveness of wildlife-based land uses....” (p9)*

This paper and its model relate to broad-scale financial viability of hunting tourism operations and shed no light on nuanced topics such as human-animal conflict, benefit sharing with communities, anti-poaching initiatives, and impact of proposed legislative changes or land use change.

## Conclusion

The paper *The Significance of African Lions for the Financial Viability of Trophy Hunting and the Maintenance of Wild Land*, written by P. Lindsey, G. Balme, V. Booth and N. Midlane needs significant revision if it is to more significantly discuss about lion habitat conservation. The paper is based on a financial model that is inadequately explained, with significant calculations that are not transparent. For example, the paper offers no explanation on how fixed operating costs are calculated or of how interest is compounded. Requests for clarification from the corresponding author were not answered.

Three different scenarios were modeled: the current situation, reduced lion hunting and an continent-wide ban on lion hunting, with a comparison of the current situation and a ban as the most prominent calculation. This is misleading as there is no proposal for, nor any practical way of achieving, such a ban. References to campaigns to reduce lion hunting are erroneously equated with a ban, while in reality, if successful, they will likely contribute to a reduction in lion hunting to more sustainable levels.

Lindsey et al. presents the results of their model in absolute terms – claiming that lion hunting maintains the viability of nearly 60,000km<sup>2</sup> of habitat. They neglect to mention that this represents only 16% of the area analyzed in their study, while the more realistic scenario of a reduction in lion hunting rather than an outright ban would change the financial viability of just 2% of the land area.

Even without any change in lion hunting, the Lindsey et al. model finds that 44% of existing hunting areas are already financially unviable, and that most hunting areas in most countries studied are also financially unviable; for example, up to 92% of hunting areas in Mozambique are found to be financially unviable. This calls into question both the assumption that financial viability is important to operators and that change in this measure has any effect on land use.

The model used has some serious flaws:

- Omission of marketing costs
- Unrealistically low interest rates and easy access to credit
- No consideration of substitution

The first two flaws cause an points serve to overstate the number of hunting blocks that are financially viable to begin with and then to overstate the number of hunting areas that become unviable with any change in lion hunting. The third point – lack of substitution – means that the model assumes that any lion hunting tourist who is unable to hunt a lion under reduced hunting scenarios, packs up his/her gun and never hunts again. In reality, it is highly likely they will hunt other species. Relaxing this assumption would result in the changes to financially viable areas being very small.

Modeling minor changes in financial viability of the trophy hunting industry is unlikely to be useful for understanding long-term land use change. Understanding the opportunity costs of competing land uses such as non-consumptive tourism, agriculture or livestock raising is likely to be more important, as are non-financial factors such as political and bureaucratic vested interests that enable seemingly non-viable businesses to continue. These issues are far more important drivers of land use change than reduction in numbers of lions hunted.

Disappointingly, the authors do not realize this and go on to make claims entirely unsupported by their data.

In conclusion, we disagree with the conclusions of Lindsey et al., primarily that reductions in lion hunting will significantly reduce viability of hunting areas, and that this reduction could lead to loss of habitat that would not otherwise occur. Lindsey et al.'s model needs to more accurately reflect the existing conditions of the industry and incorporate the wider factors influencing land use before it can be of use to conservation discussions.

## References

- Amrhein, Jim. 2009. Right to Hunt vs Animal Rights. *The Daily Reckoning*.  
<http://dailyreckoning.com/right-to-hunt-vs-animal-rights/>.
- Baldus, R, and A Cauldwell. 2004. Tourist hunting and its role in development of wildlife management areas in. In *Sixth International Game Ranching Symposium – Paris July 6-9, 2004*, 1-45. Paris, France.
- Booth, Vernon R. 2009. *A Comparison of the Prices of Hunting Tourism in Southern and Eastern Africa. Tourism*. Joint publication of FAO and CIC. Budapest.
- — —. 2010. *Contribution of hunting tourism: how significant is this to national economies*. Joint publication of FAO and CIC.
- FRBNY. 2010. *Facts and trends: Access to Credit: Poll Evidence from Small Businesses*. Small. Federal Reserve Bank of New York.
- Grandes, Martin, and Nicolas Pinaud. 2005. *Reducing Capital Cost in Southern Africa*. Organisation for Economic Cooperation and Development, OECD Publishing.  
[http://www.oecd.org/document/3/0,2340,en\\_2649\\_33731\\_35647619\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/3/0,2340,en_2649_33731_35647619_1_1_1_1,00.html).
- IUCN. 2009. *Big Game Hunting in West Africa. What is its contribution to conservation? Area*. Published by the International Union for Conservation, Gland, Switzerland and Cambridge, UK.
- Lindsey, P. A., R. Alexander, L. G. Frank, A. Mathieson, and S. S. Romanach. 2006. “Potential of trophy hunting to create incentives for wildlife conservation in Africa where alternative wildlife-based land uses may not be viable.” *Animal Conservation* 9 (3) (August): 283-291. doi:10.1111/j.1469-1795.2006.00034.x. <http://doi.wiley.com/10.1111/j.1469-1795.2006.00034.x>.
- Lindsey, Peter Andrew, Guy Andrew Balme, Vernon Richard Booth, and Neil Midlane. 2012. “The Significance of African Lions for the Financial Viability of Trophy Hunting and the Maintenance of Wild Land.” Ed. Brock Fenton. *PLoS ONE* 7 (1) (January 11). doi:10.1371/journal.pone.0029332. <http://dx.plos.org/10.1371/journal.pone.0029332>.
- Mbaiwa, Joseph E. 2004. “The Socio-Economic Benefits and Challenges of a Community-Based Safari Hunting Tourism in the Okavango Delta, Botswana.” *The Journal of Tourism Studies* 15 (2): 37-50.
- Packer, C, H Brink, B M Kissui, H Maliti, H Kushnir, and T Caro. 2010. “Effects of trophy hunting on lion and leopard populations in Tanzania.” *Conservation biology : the journal of the Society for Conservation Biology* 25 (1) (March): 142-53. doi:10.1111/j.1523-1739.2010.01576.x. <http://www.ncbi.nlm.nih.gov/pubmed/20825444>.



- Packer, Craig, Margaret Kosmala, Hilary S Cooley, Henry Brink, Lilian Pintea, David Garshelis, Gianetta Purchase, 2009. "Sport hunting, predator control and conservation of large carnivores." *PLoS one* 4 (6) (January): e5941. doi:10.1371/journal.pone.0005941. <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2691955&tool=pmcentrez&rendertype=abstract>.
- Patterson, Claire, and Patson Khosa. 2005. *A status quo study on the professional and recreational hunting industry in South Africa. Africa*. Prepared for the Panel of Experts appointed by the Minister of Environmental Affairs and Tourism, South Africa. <http://www.africahunting.com/hunting-africa/3047-study-professional-recreational-hunting-industry-south-africa.html>.
- Place, Jennifer, Jeffrey Flocken, Will Travers, Shelley Waterland, Teresa Telecky, Caroline Kennedy, and Alejandra Goyenechea. 2011. Petition to list the African lion (*Panthera leo leo*) as endangered pursuant to the U.S. Endangered Species Act. Petition before the Secretary of the Interior, by International Fund for Animal Welfare, Humane Society International, Human Society of the United States, Born Free and Defenders of Wildlife.
- Sachedina, H. T. 2008. *Wildlife is Our Oil : Conservation , Livelihoods and NGOs in the Tarangire Ecosystem , Tanzania*. PhD thesis from School of Geography and the Environment, University of Oxford. Retrieved from [http://african-environments.ouce.ox.ac.uk/pdf/sachedina\\_dphil.pdf](http://african-environments.ouce.ox.ac.uk/pdf/sachedina_dphil.pdf)
- Werner, R. 2004. *New Paradigm in Macroeconomics: Solving the Riddle of Japanese Macroeconomic Performance*, Basingstoke: Palgrave Macmillan