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Review

Economic and conservation significance of the trophy hunting industry in sub-Saharan Africa

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ABSTRACT

There is a lack of consensus among some conservation NGOs and African governments concerning the acceptability and effectiveness of trophy hunting as a conservation tool. This lack of consensus is due partly to a lack of reliable information on the economic significance and ecological impact of the industry. We provide a review of the scale of the trophy hunting industry, and assess both positive and negative issues relating to hunting and conservation in Africa. Trophy hunting occurs in 23 countries in Africa, with the largest industries occurring in southern Africa and Tanzania, where the industry is expanding. The trophy hunting industry has remained static or is shrinking in Central and West Africa. A minimum of 1,394,000 km² is used for trophy hunting in sub-Saharan Africa, which exceeds the area encompassed by national parks. Trophy hunting is thus of major importance to conservation in Africa by creating economic incentives for conservation over vast areas, including areas which may be unsuitable for alternative wildlife-based land uses such as photographic ecotourism. However, there are a number of problems associated with the industry which limit conservation benefits. Several of these problems are common to multiple countries, suggesting that if solutions were developed, conservation benefits would accrue over large areas.

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1. Introduction

Trophy hunting by early settlers to Africa was largely uncontrolled with negative consequences for wildlife populations, and particularly those of large bodied species (Roulet, 2004a). Quaggas (*Equus quagga*) and blue buck (*Hippotragus leucophaeus*), for example were made extinct due to over hunting (Adams, 2004). Following the devastating impact of hunting by early settlers and explorers, by the late 19th century there was recognition among some hunters of the need to protect remaining 'game' populations (Adams, 2004). During the early 20th century, hunters played a key role in the establishment of protected areas in various African countries (Fitter and Scott, 1978; Adams, 2004).

Later, during the early 20th century, the tourist trophy hunting industry arose in Kenya, with visits to the region by wealthy Europeans and Americans guided on hunting safaris by pioneer farmers and explorers (Adams, 2004; Booth, 2005). Later still, professional trophy hunting industries developed elsewhere in Africa. For the rest of the paper, the term 'trophy hunting' (also known as 'safari' or 'sport' hunting) is used to describe hunting by paying tourists, typically with the objective of selecting individuals with exceptional physical attributes (e.g., large horns, tusks, body size or skull length) and usually in the company of a professional hunting guide. The trophy hunting industry is run by hunting operators who market and sell hunts to clients (often at international hunting conventions), lease or own hunting areas and safari camps, and employ the requisite staff (professional hunters, trackers, drivers, skimmers and camp staff).

During the 1980s and 1990s, the potential for trophy hunting revenues to promote conservation was increasingly acknowledged (Adams, 2004). In several African countries, there was a gradual alignment of trophy hunting industries

with conservation and development policies, supported by a number of international donor agencies. This happened first in southern Africa (e.g., as part of the Communal Areas Management Programme for Indigenous Resources [CAMPFIRE] program in Zimbabwe and Administrative Management Design program [ADMAD] in Zambia), then in Central Africa (e.g., through the Programme de Développement des Zones de Chasse Villagesoise [PDZCV] in CAR and Zones d'Intérêt Cynégétique à Gestion Communautaire [ZICGC] in Cameroon), and more recently in West Africa (e.g., through Gestion Participative des Ressources Naturelles et de la Faune [GEPRENAF], and Ecosystèmes Protégés d'Afrique Soudano-Sahélienne [ECOPAS]).

Today, hunters and hunting advocates insist that trophy hunting is of a major importance for conservation in Africa (see online journal *African Indaba* [Editor: Gerhard Damm] www.africanindaba.co.za, or the Conservation Force website [www.conservationforce.org] for examples [last accessed 25 July, 2006]). Certainly, where well managed (as in some southern African states), trophy hunting involves low off-takes and is sustainable (Bond et al., 2004). Low off-takes and high prices mean that trophy hunting can play a role in creating incentives for the conservation of threatened and endangered species (Leader-Williams et al., 2005). Trophy hunters pay higher fees per client than conventional tourists (Chardonnet, 1995; Baker, 1997; Lewis and Alpert, 1997) and so revenues can be generated from lower volumes of people, resulting in potentially lower environmental impacts (Gössling, 2000; Mayaka et al., 2004). Significantly, trophy hunting generates revenues for conservation in areas which may not be suitable for tourism, including some countries experiencing political instability (Leader-Williams and Hutton, 2005; Lindsey et al., 2006).

There are, however, a number of well publicized problems associated with trophy hunting which limit the extent to

which the industry contributes to conservation objectives. These include ethical, biological and social problems (Lindsey et al., 2006). Partly as a result of these problems, there is a lack of consensus among conservation NGOs and some African governments (notably Kenya) over the acceptability and effectiveness of hunting as a conservation tool (Wilkie and Carpenter, 1999; Mayaka et al., 2004). Meanwhile, animal rights and welfare groups oppose hunting due to a fundamental rejection of the concept of killing animals for sport (Finch, 2004).

Discussion concerning trophy hunting is polarized, with animal rights groups and protectionists on one side, and hunters and pragmatic conservationists on the other (Hutton and Leader-Williams, 2003; Loveridge et al., 2006). This polarisation is exacerbated by a lack of reliable data on the impact of trophy hunting on wildlife conservation. Most information on African trophy hunting occurs in unpublished grey literature, and discussion of hunting in the popular media is sometimes emotive. Examples of titles of negative articles about hunting include: “Lions face new threat: They’re rich, Americans and they’ve got guns” (*The Guardian* [UK], November 2001), “Slaughter on safari” (*Mail on Sunday* [UK], 2 April 2006) and “Clamp down on eco-thugs” (*Mail and Guardian* [South Africa] May 2006). Likewise, some pro-hunting activists or the “lip service brigade” make sweeping statements concerning the positive role of hunting in conservation such as the suggestion that “without hunting wildlife would disappear” without providing genuine contributions to conservation (Baldus and Cauldwell, 2004a).

In this paper, we review available information on trophy hunting in Africa, with the objective of documenting the economic scale of the industry, and assessing both positive and negative impacts of hunting on conservation.

2. Methods

We obtained information in this paper by reviewing both published and unpublished literature. Where possible, we obtained updated statistics from national hunting associations and regulatory authorities. Estimates of total revenues from hunting and of the total number of visiting hunters were made by combining the latest available estimates for the following countries: Benin (Roulet, 2004a, no estimate of revenues available), Botswana (Botswana Wildlife Management Association, 2001, personal communication), Burkina Faso (Chardonnet, 1999; Roulet, 2004a), Cameroon (Mayaka et al., 2004; Roulet, 2004a), Central African Republic (Roulet, 2004a), Ethiopia (J. Roussos, personal communication), Mozambique (Lindsey, 2005, no estimate for number of hunters available), Namibia (Damm, 2005a), South Africa (Professional Hunting Association of South Africa Personal Communication), Tanzania (Baldus and Cauldwell, 2004b), Zimbabwe (Booth, 2002), and Zambia (ZAWA, 1999; Roulet, 2004a). Data were generally only available for nations with significant hunting industries. Our estimates of total revenues and numbers of visiting hunters thus exclude data from several West African nations. However, the countries for which data were missing have minor hunting industries, and we are confident that the lack of information for these nations does not significantly affect the scale of our estimates.

We conducted a survey of hunting operators’ internet websites to determine which species are used most commonly to advertise trophy hunting, and to quantify the proportion of hunting operators working in Africa that are based in Africa. We found websites ($n = 179$) using Google (www.google.com), and from hunting advertisements in publications such as the *Safari Club International Magazine*, and the *African Sporting Gazette*.

3. Results and discussion

3.1. Trophy hunting in Africa

Trophy hunting is permitted in 23 sub-Saharan African countries (Roulet, 2004a). Using the most recent estimates for the countries with significant hunting industries, where estimates are available, we estimate that trophy hunting generates gross revenues of at least US\$201 million per year in sub-Saharan Africa: from a minimum of 18,500 clients. These revenues compare favourably with the US\$33–39 million dollars generated from 45,000 to 60,000 foreign hunters in Eurasia (Hofer, 2002). Over 1,394,000 km² is used for hunting in sub-Saharan Africa, exceeding the area encompassed by national parks by 22% in the countries where hunting is permitted. In this paper, we use the term ‘national parks’ to describe protected areas where consumptive utilization is not permitted.

South Africa has the largest hunting industry in terms of numbers of operators, visiting hunters, animals shot and revenues generated (Figs. 1 and 2, Table 1), although hunting is conducted across a larger geographical area in Tanzania (Table 2). As a proportion of GDP (Central Intelligence Agency,

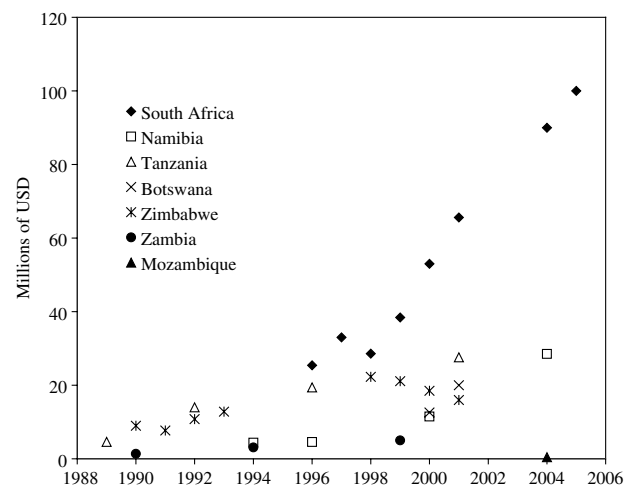


Fig. 1 – Recent trends in gross annual revenues from trophy hunting in southern and East Africa. Data are derived from: Lewis and Alpert (1997), ZAWA (1999), Leader-Williams (2000), Botswana Wildlife Management Association (2001), Booth (2002), Chardonnet (2002), Van der Merwe (2002), Baldus and Cauldwell (2004), Bond et al. (2004), Professional Hunting Association of South Africa (2006), and Damm (2005a,b).

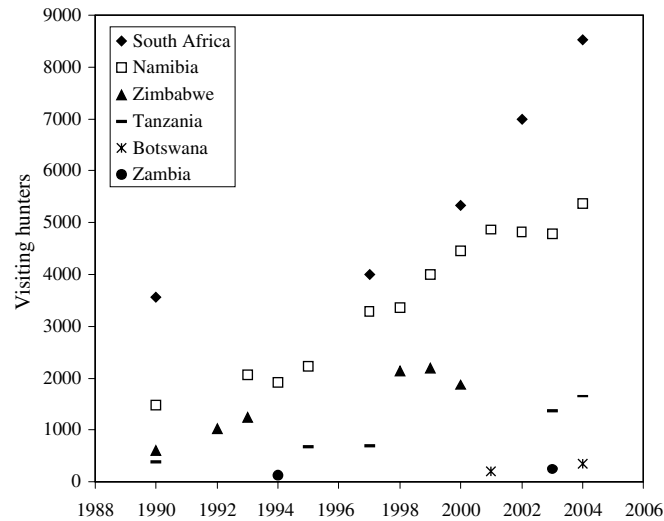


Fig. 2 – Recent trends in the number of foreign hunters visiting southern and East Africa. Data are derived from: Lewis and Alpert (1995), Elliott and Mwangi (1998), Hurt and Ravn (2000), Booth (2002), Chardonnet (2002), Van der Merwe (2002), Roulet (2004a), Baldus and Cauldwell (2004), Damm (2005a); Botswana Wildlife Management Association, Personal Communication; Professional Hunting Association of South Africa, Personal Communication.

2006), our review suggests that trophy hunting is most significant in Botswana (0.13% of GDP), Tanzania (0.11%), and Namibia (0.08%). By contrast, in Hungary (which has the joint largest tourist trophy hunting industry in Europe), hunting contributes only 0.0005% of GDP (Hofer, 2002).

3.2. Southern Africa

Our review indicates that the hunting industry is larger in southern Africa than in other regions on the continent, with well developed industries in South Africa, Zimbabwe, Botswana and Namibia, and smaller industries in Zambia, Mozambique (re-opened for trophy hunting in 2000, Roulet, 2004a) and Swaziland (Lindsey, 2005). Eighty-eight percent of clients hunting in Africa do so in southern Africa (Fig. 3). In southern Africa, unlike elsewhere on the continent, large areas of private land are used for trophy hunting in addition to state-owned wildlife areas (Tables 2 and 3).

The southern African trophy hunting industry has expanded considerably during recent years (Figs. 1 and 2), partly due to the closure of hunting in other countries (e.g., Kenya), the loss of wildlife elsewhere (e.g., West Africa) and political instability in other countries (e.g., Sudan, Democratic Republic of Congo, DRC) (Bond et al., 2004). However, successful wildlife conservation outside protected areas, both on privately and communally owned land has also doubtless played a role (Bond et al., 2004; Child, 2005).

High-value dangerous species such as elephants (*Loxodonta africana*), buffalo (*Syncerus caffer*), lion (*Panthera leo*) and leopard (*Panthera pardus*) can be hunted in all southern African countries (except Swaziland) (Table 4). South Africa, and Namibia are the only countries where both black (*Diceros bicornis*) and white rhinoceroses (*Ceratotherium simum*) are hunted as trophies by tourists. The most commonly hunted species in southern Africa are impala (*Aepyceros melampus*), warthog (*Phacochoerus aethiopicus*) and kudu (*Tragelaphus strepsiceros*)

(Table 1). In Zimbabwe and Botswana, trophy hunting generates most income from elephants (27% and 56% respectively, Booth, 2002; Botswana Wildlife Management Association, 2001), whereas in South Africa where fewer elephants are hunted, most hunting income is generated from kudu (13.2%), gemsbok (*Oryx gazella*) (8.7%) and lion (8.2%) (Patterson and Khosa, 2005).

3.3. East Africa

As the birth place of African trophy hunting, Kenya is viewed with nostalgia by hunters (Lindsey et al., 2006). However, trophy hunting was banned in Kenya in 1977 due to overshooting and corruption (Booth, 2005; Leader-Williams and Hutton, 2005), costing the country an estimated US\$20–40 million/year in lost revenues (Elliott and Mwangi, 1998; Hurt and Ravn, 2000). Trophy hunting in East Africa is now limited primarily to Tanzania, which has a sizeable and growing hunting industry (Figs. 1–3; Baldus and Cauldwell, 2004b). More buffalo, leopard and lion are hunted in Tanzania than anywhere else (Table 3), and these species are typically used by operators to attract clients to the country (Table 5). Buffalo, leopard and lion generate 42% of income from hunting for the Tanzanian Wildlife Division, with buffalo alone generating 22.1% (Baldus and Cauldwell, 2004b).

During the 1970s, trophy hunting was also conducted on a large scale in Ethiopia, in 14 large concession areas (Duckworth, 2004b). However, increasing human populations, increasing human encroachment into wildlife habitat and political instability have resulted in a 95% decrease in the area used for trophy hunting (Duckworth, 2004b; Flack, 2005). Revenues from trophy hunting in Ethiopia have declined, from US\$1.68 million in 1989 (Chardonnet et al., 1995) to US\$1.4 million presently (J. Roussos, personal communication). The endemic mountain nyala (*Tragelaphus buxtoni*) is the species most used by operators to attract hunters to Ethiopia

Table 1 – African trophy hunting statistics

^a Country	Operators (professional hunters)	# of clients /year	Client nationalities (%)	Hunting days sold/year	Revenues/year (US\$ million)	Animals shot/year	Most hunted species	Jobs from hunting	Source
South Africa	1000 ^a (2000)	8530 ^b	USA 57 ^a Spain 8 Germany 5	73,938 ^a	100 ^c	53,885 ^a	Impala ^a Warthog Kudu	5–6000 ^a	^a Patterson and Khosa (2005); ^b PHASA Personal Communication. ^b ; ^c Professional Hunting Association of South Africa (2006)
Namibia	? (505) ^a	5363 ^a	Germany 35 ^a USA 21 Austria 8	15,540 ^a	28.5 ^d	22,462 ^a	Gemsbok Kudu ^a Warthog	2125 ^b	^a Damm (2005a). ^b Chardonnet (2002)
Tanzania	42 ^a (221) ^b	1,654 ^a	USA 45 ^b Spain 15 France 9	20,500 ^a	27.6 ^a	7034 ^c	Buffalo ^a Impala Zebra	4328 ^d	^a Baldus and Cauldwell, 2004; ^b Savannas Forever Personal communication. ^c Leader-Williams (2000); ^d Tanzanian Embassy (2006)
Botswana ^d	13 ^a (?)	350 ^b	USA 80 ^b EU 12	5570 ^c	20 ^d	2500 ^d	Impala ^d Lechwe Steenbok	1000 ^e	^a Peake (2004a); ^b BWMA Personal Communication. ^c Humavindu and Barnes (2003); ^d Botswana Wildlife Management Association (2001); ^e (Chardonnet et al., 2002)
Zimbabwe	149 ^a (545) ^b	1874 ^a	USA 57 ^a Germany 9 Spain 6	19,646 ^a	16 ^a	11,318 ^a	Impala ^a Kudu Warthog	?	^a Booth (2002); ^b Damm (2005c)
Zambia ^d	22 ^a (?)	250 ^b	?	?	5 ^c	5436 ^b	?	?	Baldry (2004); Chardonnet et al. (1995); ^c Lewis and Alpert (1997)
Cameroon	23 ^a (47)	150–200 ^b	France (most) ^a	?	2 ^a	960 ^b	?	1200 ^b	^a Mayaka et al. (2004); ^b Roulet (2004a)
CAR	19 (41)	100–200	France (most)	?	1.4	738	?	1700	Roulet (2004a)
Ethiopia	4 ^a (15) ^b	50–55 ^c	USA ^d Denmark Germany	?	1.3 ^d	?	Dik dik spp. Lesser kudu Bushbuck ^d	?	^a Duckworth (2004a); ^b Flack (2005); ^c Roulet (2004a); ^d ERVS Personal Communication. ^f
Burkina Faso	? (?)	250–350 ^a	EU (most) ^c	?	0.6 ^b	994 ^a	?	?	^a Roulet (2004a); ^b Chardonnet (1999) ^c Roulet (2004)
Benin	? (?)	80–100 ^a	EU (most) ^b	?	?	?	?	?	^a Roulet (2004a); ^b Roulet (2004)
Chad	8 (?)	50–100	EU (most) ^b	?	?	?	?	?	Roulet (2004a); ^b Roulet (2004)
DRC	3 (?)	?	?	?	?	?	?	?	Roulet (2004a)
Congo Brazzaville	1 (2)	?	?	?	?	?	?	?	www.huntingreport.com (2006)

a No estimates are available for Mozambique, or nations in Central and West Africa other than those listed.

b Professional Hunting Association of South Africa.

c Savannas Forever (a non-governmental organisation working on certification of hunting in Tanzania, contact person – Susan James).

d An unknown, but small number of additional operators also hunt on private land in Botswana and Zambia.

e Botswana Wildlife Management Association.

f Ethiopian Rift Valley Safaris.

Table 2 – Land types and land areas utilised for hunting in East and southern Africa

Region/country	Type of land used for hunting	Size (km ²)	% of country	Parks	% of country	Source
<i>East Africa</i>						
Ethiopia	State concessions	9600	0.8	32,403	2.7	ERVS ^a Personal Communication
Tanzania	Game reserves, game controlled, forestry, open, and wildlife management areas	250,000	26.4	134,881	14.1	Baldus and Cauldwell, 2004
Total/mean ± SE		259,600	13.6 ± 12.8	167,284	8.4 ± 5.7	
<i>Southern Africa</i>						
Botswana	Wildlife Management Areas (97.2%) communal land (some), private land (least)	133,451	23.0	104,120	18.0	BWMA ^b Personal Communication
Mozambique	Coutada hunting areas (69%); buffer areas adjacent to Niassa GR (24%); communal land (7%)	82,250	10.5	43,455	5.6	Hatton et al. (2001) and C. Begg, Personal Communication.
Namibia	Community conservancies (75%); ^b private land (25%); state concessions (some)	94,052	11.4	107,125	13.0	Cumming (1999), Krug (2001) ^c and Weaver and Skyer (2003)
South Africa	Private land (mostly), provincial reserves (some)	160,000	13.1	56,500	4.6	Roulet (2004b)
Swaziland	Private land	46	0.3	50	0.3	Roulet (2004b)
Zambia	^d Game Management Areas (mostly); private land (some)	160,488	21.3	59,451	7.9	Lewis and Alpert (1997); Cumming (1999)
Zimbabwe	^e Private land (46%); state concessions (26%); communal land 22%; state-owned forestry (6%)	64,945	16.6	49,418	12.7	Booth (2002) and Cumming (1999)
Total/mean ± SE		695,232	14 ± 2.9	420,119	9 ± 2.3	

a Ethiopian Rift Valley Safaris informed us that there are 16 concessions in Ethiopia ranging from 200 to 1000 km²: an estimate of the land area used for hunting was made arbitrarily by using a mid point concession size of 600 km².

b Botswana Wildlife Management Association.

c Krug (2001) states that there are 400 hunting ranches of 30–100 km² in Namibia, and from this information, an estimate of the land area was made arbitrarily using a mid point ranch size of 60 km².

d The wildlife populations of some Zambian game management areas are too depleted to support trophy hunting Lewis and Alpert (1997).

e Land re-distribution in Zimbabwe has reduced the area available to trophy hunting on private land, though hunting continues in parts of the large conservancies (Savé Valley, Bubiiana, Buby Valley, Midlands and Gwayi River, Booth (2005)).

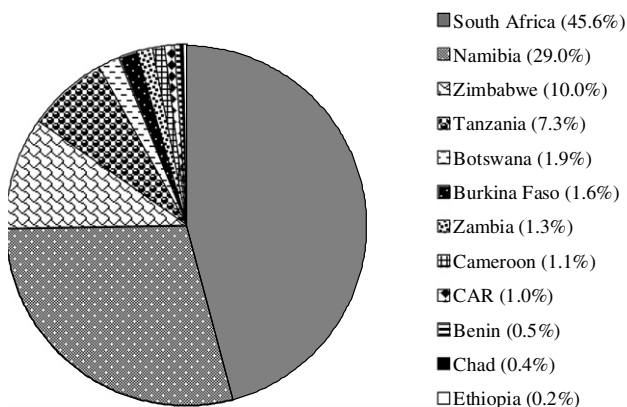


Fig. 3 – Proportion of hunters visiting each country (based on latest estimates for hunters visiting each nation). Data are derived from: Lewis and Alpert (1997), Elliott and Mwangi (1998), Hurt and Ravn (2000), Booth (2002), Chardonnet (2002), Van der Merwe (2002), Roulet (2004a), Baldus and Cauldwell (2004), Damm (2005a); Botswana Wildlife Management Association, Personal Communication; Professional Hunting Association of South Africa, Personal Communication.

(Table 5). Trophy hunting was banned in Uganda in 1979, though the Uganda Wildlife Authority has recently approved two pilot schemes for trophy hunting in an attempt to create incentives for wildlife conservation (Lindsey, 2005).

3.4. Central and West Africa

In Central Africa, most trophy hunting is conducted in Cameroon and Central African Republic (CAR) (Roulet, 2004a). Hunting operators in those countries rely less on dangerous species and more on geographically restricted and spectacular species such as Lord Derby Eland *Taurotragus derbianus* and bongo *Tragelaphus euryceros* to attract clients (Table 5). Trophy hunting in Chad is presently severely disrupted by political instability there (Causey, 2006a). Trophy hunting reopened on a small scale in Democratic Republic of Congo (DRC) in 2004 (Roulet, 2004a). Trophy hunting ceased in Congo Brazzaville in 1999 (Roulet, 2004a).

West Africa is best known among hunters for bird shooting, rather than for hunting mammals (Roulet, 2004). However, some trophy hunting occurs in West Africa, primarily in Benin and Burkina Faso (Duckworth, 2004a; Roulet, 2004). Hunting also occurs on a minor scale in Senegal (Duckworth, 2004a;

Table 3 – Land types and land areas utilised for hunting in Central and West Africa

Country	Type of land used for hunting	Size (km ²)	% of country	Parks	% of country	Source
<i>Central Africa</i>						
Cameroon	State concessions, communal land	43,860	9.2	30,500	6.4	MINEF (2002)
Central African Republic	State concessions, communal land	196,035	31.5	68,918	11.1	Roulet (2004b)
Democratic Republic of Congo	State concessions	90,362	3.9	124,700	5.3	Roulet (2004b)
Total/mean ± SE		330,257	15 ± 8.5	224,118	3.1 ± 1.77	
<i>West Africa</i>						
Benin	State concessions	4000	3.6	8435	7.5	Roulet (2004b)
Burkina Faso	State concessions, communal land	21,500	7.8	31,937	11.6	Rouamba (2002)
Chad	State concessions	34,320	2.7	116,890	9.1	Roulet (2004b)
Gambia	State concessions	600	5.3	230	2.0	Roulet (2004b)
Ghana	State concessions	1137	0.5	13,489	5.7	Roulet (2004b)
Guinea Bissau	State concessions	8000	22.1	3,780	10.5	Roulet (2004b)
Mauritania	?	6000	0.6	17,500	1.7	Roulet (2004b)
Niger	State concessions, communal land	9169	0.7	84,130	6.6	Roulet (2004b)
Senegal	State concessions	24,344	11.1	21,800	12.4	Roulet (2004b)
Total/mean ± S.E.		109,070	7.0 ± 2.33	298,191	7.5 ± 1.29	

Rouget, 2004), Gambia (warthogs only, Rouget, 2004), Ghana (Roulet, 2004a), Guinea (Causey, 2006b), Guinea Bissau, Mauritania (warthogs only, Roulet, 2004b), Mali, and Niger (Roulet, 2004a). The planned re-opening of trophy hunting in Ivory Coast was stalled by the recent political instability (Roulet, 2004a). Little hunting of dangerous species occurs in West Africa; elephant hunting is permitted only in Guinea and leopard hunting is not permitted in the region at all (Table 4).

Central and West Africa attract fewer hunters than East and southern Africa, and generate comparatively modest revenues from hunting. Furthermore, for the Central/West African countries for which data are available, revenues and client numbers appear to be static or declining slightly. For example, in Central African Republic, hunting revenues declined from US\$4.4 million in 1989 to US\$1.4 million in 1995 (Roulet, 2004a) and the number of visiting hunters declined from 268 in 1990 to 100–200 in 2003 (Roulet, 2004a). In Burkina Faso, revenues from hunting fell from US\$2.7 million in 1989 to 0.57 million in 1999, though the numbers of visiting hunters remained fairly stable, from 276 in 1990 to 250–350 in 2003 (Roulet, 2004a). In Cameroon, hunting revenues increased slightly over more than a decade, from US\$0.75 million in 1989, to US\$1.5 million in 2001 and US\$2 million in 2003, and the number of visiting hunters has stayed constant at around 200/year during 1990 and 2003 (Mayaka et al., 2004; Roulet, 2004a).

The relatively limited scale and poor performance of the trophy hunting industry in Central and West Africa is likely the result of multiple causes, including higher human population pressures, the depletion of wildlife populations due to the bush-meat trade, lack of privately owned land, difficult habitat for hunting (rain forest), dependency on logging roads for access to forest areas, political instability, poor infrastructure, and in the case of West Africa, smaller areas of remaining wilderness (Wilkie and Carpenter, 1999). In addition, Central and West Africa appear not to have capitalized on the largest market of international hunters, the US. The majority of hunters visiting Central and West Africa are European (Lubin and Lubin, 2004; Mayaka et al., 2004), and the region is generally only visited by experienced US hunters (Lindsey et al., 2006). Finally, several West and Central African countries do not offer high value dangerous-species hunts,

meaning that revenues rely on lower value 'plains' species (e.g., antelopes, warthogs).

4. Trophy hunting as a conservation tool

Trophy hunting has a number of characteristics which enable the industry to play a potentially key role in conservation outside of national parks and where alternative wildlife-based land uses such as photographic ecotourism (tourism based on visitors paying for wildlife viewing opportunities) may not be viable.

4.1. Trophy hunting can be sustainable

Well monitored trophy hunting is inherently self-regulating, because modest off-take is required to ensure high trophy quality and thus marketability of the area in future seasons. Accordingly, off-takes for many species are well below available quotas (Table 4). On a local level, financial incentives for sustainable hunting are likely to be most effective where the same hunting operators are given tenure over hunting areas for multiple seasons.

Low off-take rates mean that trophy hunting can play a key role in endangered species conservation (even when excessive hunting was the original cause of the conservation problem). Initially, when species are critically endangered, a complete cessation of all human-caused mortality is necessary. Subsequently, however, revenues from tightly regulated trophy hunting can provide important incentives for careful management, protection and reintroductions. On private land in South Africa, for example, trophy hunting has facilitated the recovery of bontebok (*Damaliscus dorcas*), black wildebeest (*Connochaetes gnu*) and cape mountain zebra (*Equus zebra*) by providing financial incentives for reintroductions (Flack, 2003). Similarly, the recovery of southern white rhinoceros populations was accelerated by incentives from trophy hunting, which encouraged reintroductions onto game ranches (Leader-Williams et al., 2005).

Trophy hunting can also play an important role in the rehabilitation of wildlife areas by permitting income generation from wildlife without jeopardizing population growth of

Table 4 – Number of each of various species on quota or that are killed each year (number killed without parentheses, quotas in parentheses, where no information on numbers was available, YES or NO is given to denote whether each species is hunted or not)

	Elephant <i>Loxodonta africana</i>	Buffalo <i>Syncerus caffer</i>	Lion <i>Pantheraleo</i>	Leopard <i>Panthera pardus</i>	Black rhino <i>Diceros bicornis</i>	White rhino <i>Ceratotherium simum</i>	Cheetah <i>Acinonyx jubatus</i>	Crocodile <i>Crocodylus Niloticus</i>
<i>East Africa</i>								
Ethiopia	YES	YES	3 ^a (20 ^b)	(500 ^b)	NO	NO	NO	(5 ^c)
Tanzania	35 (100 ^b)	2000 ^d	250 ^d (500 ^b)	300 ^d (500 ^b)	NO	NO	NO	170 ^m (1600 ^c)
Uganda	NO	NO	NO	NO	NO	NO	NO	NO
<i>Southern Africa</i>								
Botswana	(270 ^e) (210 ^b)	(160 ^b)	(31 ^e) (130 ^b)	(32 ^e)	NO	NO	(5 ^b)	(50 ^b)
Mozambique	(40 ^b)	YES	8 ^a	(60 ^b)	NO	NO	NO	(900 ^b)
Namibia	36 ^f (90 ^b)	20 ^f	7 ^g	121 ^g (250 ^g)	0 ^h (5 ^b)	2 ^f	142 ^g (150 ^b)	5 ^h (25 ^b)
South Africa	31 ⁱ (100 ^b)	179 ⁱ	190 ⁱ	45 ^j (150 ^b)	0 ⁱ (5 ^b)	60 ⁱ	NO	24 ⁱ
Swaziland	NO	NO	NO	NO	NO	(0.5 ^g)	NO	NO
Zambia	(20 ^b)	YES	39 ^a	(300 ^c)	NO	NO	NO	NO
Zimbabwe	243 ^k (500 ^b)	853 ^k	89 ^k (139 ^b)	303 ^k (500 ^b)	NO	NO	6 ^k (50 ^b)	69 ^k (200 ^b)
<i>Central Africa</i>								
Cameroon	10 ^l (80 ^b)	YES	10 ^a	NO	NO	NO	NO	NO
CAR ^m	NO	YES	9 ⁿ	(40 ^b)	NO	NO	NO	NO
Congo Brazzaville	NO	YES ⁿ	NO	YES ⁿ	NO	NO	NO	NO
DRC	NO	YES	YES	(5 ^b)	NO	NO	NO	NO
<i>West Africa</i>								
Benin	NO	YES	1.5 ^a	NO	NO	NO	NO	NO
Burkina Faso	NO	(94 ^a)	(28 ^a)	NO	NO	NO	NO	NO
Chad	NO	YES	1 ^a	NO	NO	NO	NO	NO
Gambia ^o	NO	NO	NO	NO	NO	NO	NO	NO
Ghana	NO	NO	NO	NO	NO	NO	NO	NO
Guinea	YES ^h	YES ^h	NO	NO	NO	NO	NO	NO
Guinea Bissau	NO	NO	NO	NO	NO	NO	NO	NO
Mali	NO	NO	NO	NO	NO	NO	NO	NO
Niger	NO	NO	NO	NO	NO	NO	NO	NO
Senegal	NO	YES ⁿ	1 ^a	NO	NO	NO	NO	NO

a Duckworth (2004a) (average number of lions exported during 1994–2004).

b CITES export quotas <http://www.cites.org>, 2006.

c Damm (2005d).

d Numbers killed in 2005 Kayera (2005).

e Botswana Government imposed quotas (Botswana Wildlife Management Association, Personal Communication).

f Numbers hunted in 2004, Namibian Ministry of Environment and Tourism, Personal Communication.

g Anon (2005).

h www.huntingreport.com (last accessed March 2006).

i Trophy hunting of 1% of the population (currently 61 animals) permitted annually Reilly et al. (2004).

j Patterson and Khosa (2005) Number hunted during 2003/2004 season.

k Booth (2002).

l Wilkie and Carpenter (1999).

m Central African Republic.

n Roulet (2004a).

o Warthogs the are the only species legally hunted in Gambia Rouget (2004).

trophy species (Bond et al., 2004). For example, trophy hunting operators are playing an important role in facilitating the recovery of wildlife populations in the *Coutada* hunting areas in Mozambique following the civil war (Lindsey et al., 2006).

4.2. Financial incentives for conservation

Our review highlights the fact that financial incentives from trophy hunting effectively more than double the land area that is used for wildlife conservation, relative to what would be conserved relying on national parks alone. Trophy hunting

creates incentives for wildlife and habitat protection under a diversity of scenarios, from state-owned concessions where people are excluded and wildlife is actively protected such as the safari areas in Zimbabwe, areas where local communities live but where wildlife is the primary land use (e.g., Wildlife Management Areas in Tanzania and Botswana), and areas where wildlife is not necessarily the primary land use but where incentives from hunting provide incentives for conservation and the sustainable use of natural resources (e.g., Game Management Areas in Zambia). From a conservation perspective, we believe that the provision of incentives which

Table 5 – Percent occurrence of various species on hunting operators' website advertisements

	Botswana	Cameroon	CAR	Ethiopia	Mozambique	Namibia	South Africa	Tanzania	Zambia	Zimbabwe
Buffalo	45	23	40	0	63	11	22	63	50	20
Lion	36	23	10	33	25	11	24	63	50	27
Elephant	64	38	20	33	13	22	14	25	10	40
Leopard	55	0	30	0	13	22	16	56	40	13
Bushbuck	0	15	10	33	0	6	9	6	20	7
Gemsbok/oryx	18	0	0	33	0	53	12	19	10	7
Lord derby Eland	0	69	80	0	0	0	0	0	0	0
Bongo	0	69	60	0	0	0	0	0	0	0
Zebra	27	0	0	0	0	33	21	19	20	7
Sable	18	0	0	0	13	6	9	19	37	7
Giraffe	0	0	0	0	13	50	16	13	0	13
Roan	0	23	40	0	0	6	2	13	20	0
Wildebeest	27	0	0	0	0	28	9	19	10	7
Red Hartebeest	27	0	0	0	0	28	7	6	0	7
Springbok	18	0	0	0	0	33	10	6	0	7
Crocodile	9	0	0	0	13	0	3	19	20	7
Mountain nyala	0	0	0	67	0	0	0	0	0	0
Kob	0	15	0	0	0	0	0	0	0	0
Sitatunga	0	23	0	0	0	0	2	6	28	0
Steenbok	0	0	0	0	0	21	3	0	0	7

promote wildlife as a land use is the single most important contribution of the trophy hunting industry.

4.3. Privately owned land

In southern Africa during the 1960s and 1970s, legislative changes granted landowners ownership of wildlife and/or the right to derive income from consumptive utilisation (i.e., utilization involving killing animals), resulting in large scale conversion of livestock ranches to game ranches (Krug, 2001). Trophy hunting has been a key stimulant behind the shift to game ranching and typically forms the entry point into wildlife ranching for former cattle ranchers (Bond et al., 2004). In Zimbabwe, trophy hunting was largely responsible for the conversion of 27,000 km² of livestock ranches to game ranching (prior to the land redistribution programme) and a subsequent quadrupling of wildlife populations (Bond et al., 2004). In South Africa there are approximately 5000 game ranches and 4000 mixed livestock/game ranches with a population of >1.7 million wild animals (Bond et al., 2004). The conversion of livestock ranches to game ranching in South Africa continues at a rate of ~5000 km² per year (Flack, 2002). In Namibia, the shift to game ranching resulted in an 80% increase in wildlife populations during 1972–1992 (Barnes and De Jager, 1996; Bigalke, 2000) and presently 15–25% of ranches are used for wildlife production (Krug, 2001).

4.4. State-owned land

Several African countries have allocated large blocks of land for wildlife utilization in addition to national parks, as game reserves or wildlife/game management areas (Tables 2 and 3). Trophy hunting is vital in generating revenues for many of these areas, and justifying their existence in the context of increasing human populations and demand for land. Significantly, many of these state-owned concessions occur in countries which otherwise have a relatively small proportion of

their land surface devoted to wildlife conservation such as Cameroon, Ethiopia and Mozambique (Tables 2 and 3).

4.5. Communally owned land

Trophy hunting is a key component of community conservation schemes in several countries. In parts of Zambia, Zimbabwe, Botswana, Namibia and Tanzania, revenues from trophy hunting have resulted in improved attitudes towards wildlife among local communities, increased involvement of communities in CBNRM programs, requests to have land included in wildlife management projects, and in some cases increasing wildlife populations (Lewis and Alpert, 1997; Child, 2000; Weaver and Skyer, 2003; Baldus and Cauldwell, 2004b; Child, 2005). In Namibia, revenues from trophy hunting have been the primary stimulus for the development of wildlife conservancies on >70,000 km² of communally owned land (Weaver and Skyer, 2003). In Tanzania, incentives from trophy hunting have been partially responsible for the decision of 50 of 80 villages neighbouring Selous Game Reserve to create Wildlife Management Areas where sustainable wildlife utilization is the primary land use (Baldus and Cauldwell, 2004b). In CAR, partnerships between hunting operators and communities (established through the PDZCV programme) have provided the only income from wildlife (US\$175,000 during 2003/2004) for local people during times of economic crisis, with the effect that poaching in hunting areas has declined and wildlife now occurs at higher densities in hunting concessions than in the neighbouring national parks (Roulet, 2004a; Renaud, 2005).

4.6. Trophy hunting generates revenues in areas where alternatives such as photographic ecotourism may not be viable

Trophy hunting is viable in several countries that receive few conventional tourists (e.g., CAR, Chad, and Ethiopia), and in remote parts of countries that are popular among tourists

(e.g., northwest South Africa, and southern Tanzania). In Botswana, 74% of the wildlife estate relies on revenues from consumptive wildlife utilization (Barnes, 2001). Hunting has several advantages over photographic ecotourism which enable the industry to generate revenues under a wider range of scenarios. For example, trophy hunting is potentially viable in remote areas lacking infrastructure, attractive scenery, or high densities of viewable wildlife (Wilkie and Carpenter, 1999; Lindsey et al., 2006). In addition, the hunting industry is also generally more resilient to political instability than tourism; with the onset of land redistribution in Zimbabwe, for example, tourist occupancy fell by 75%, whereas trophy hunting revenues dropped by only 12.2% (Booth, 2002; Bond et al., 2004).

Trophy hunting revenues are vital in part because there are not enough tourists to generate income for all protected areas. Even in the most visited countries such as South Africa and Tanzania, tourism revenues are typically sufficient to cover the costs of only some of the parks (Baldus, 2005) and certainly not to justify wildlife as a land use outside of protected areas. In countries with large parks networks and relatively little tourism such as Burkina Faso, Central African Republic and Zambia, wildlife may be conserved more effectively if some fully protected areas were designated as multiple use reserves where some trophy hunting is permitted (Baldus, 2005).

Photographic ecotourism undoubtedly generates greater gross revenues than trophy hunting in Africa, and where large numbers of tourists visit, employment opportunities for local people can be higher than from hunting. For example, Tanzanian National Parks receive ~US\$11 million/year from photographic tourism just from the Serengeti and Ngorongoro Conservation Area, whereas the Tanzanian Wildlife Division receives only US\$10.5 million/year from hunting throughout Tanzania (Thirgood et al., 2006). However, hunting revenues are significant because they enable wildlife production to be a viable land use across a wider range of land uses than would be possible relying on revenues from photographic ecotourism alone.

4.7. *Trophy hunting does not preclude other forms of resource use*

In contrast to most national parks, many hunting areas in Africa permit regulated natural resource extraction by local communities in the form of grazing, firewood collection, and in some cases controlled subsistence hunting. The provision of revenues from trophy hunting combined with the retention of sustainable traditional user rights over natural resources has the potential to promote broad acceptance of conservation objectives.

4.8. *Trophy hunting generates high revenues from low volumes of hunters*

Trophy hunting generates considerably more income per client than ecotourism (Baker, 1997; Lewis and Alpert, 1997) though not necessarily higher gross revenues. In Zimbabwe and Tanzania, for example, revenues generated by hunting clients are respectively 30 and 14 times greater than those

generated per photographic client (Chardonnet, 1995). Consequently, hunting revenues can potentially be generated with lower environmental impacts from littering, fossil fuel use and habitat conversion for infrastructure development (Gössl, 2000; Mayaka et al., 2004).

4.9. *Trophy hunting as a tool for problem animal control*

There is interest among clients in hunting problem animals (crop raiders or livestock killers) with the effect that trophy hunting has the potential to generate revenues from animals that would have died anyway and potentially to reduce indiscriminate revenge-killings of wildlife by angry local people. Over 50% of clients are willing to pay more or the same as typical trophy fees to hunt problem animals, even if they are poor trophies (Lindsey et al., 2006). Marketing hunts of problem animals may be difficult, however, because hunts are booked in advance and problem animals occur unpredictably in time and space. One option would be state wildlife agencies to auction the sale of problem animal hunts to operators as they occur. Hunting operators with interested clients could then extend their stay or take time out of their schedule to hunt the animal. Caution would clearly be required to ensure that animals are not falsely declared “problems” as an excuse for trophy hunting. Encouragingly, however, problem animal hunts by hunting clients in Zimbabwe have led to a reduction in the number of problem elephants killed (from several hundred to ~125/year), due to increasing awareness among communities of their value of wildlife as potential trophies (Child, 2005).

4.10. *The presence of trophy hunting operators can reduce illegal hunting*

Lease agreements in some countries (e.g., Zambia, ZAWA, 1999; and Baldus and Cauldwell, 2004b) require assistance with anti-poaching from hunting operators in hunting concessions. Even where anti-poaching is not a legal prerequisite, operators often conduct anti-poaching to protect the wildlife resource on which they depend (Hurt and Ravn, 2000). In Savé Valley Conservancy in south eastern Zimbabwe, for example, revenue from trophy hunting enables hunting operators to employ approximately 150 anti-poaching game scouts. In Zambia, one of the achievements of ADMAD has been the use of hunting revenues to employ 500 village scouts for anti-poaching in Game Management Areas (Lewis and Alpert, 1997).

4.11. *Relatively low leakage of revenues*

Ecotourism packages are often booked through overseas agents, with the effect that a significant proportion of revenues are lost from host countries. By contrast, our website review indicates that most hunting operators working in Africa are based in Africa (92.6%) and many are based in the countries in which most hunting is conducted (88%). The fact that most hunting operators are based in-country does not necessarily mean that all revenues remain within that country, but available estimates indicate that leakage of revenues from hunting is lower than for photographic ecotourism. In Tanza-

nia, for example, 33% of trophy hunting revenues accrue to the state, compared to 8% of tourism revenues (Baldus and Cauldwell, 2004b). Likewise, 75% of trophy hunting revenues remain within Botswana, compared to 27% of tourism revenues (Botswana Wildlife Management Association, 2001). However, in Central and West Africa, most operators are based in Europe and so significant proportions of revenues are leaked overseas (Roulet, 2004a).

5. Factors limiting the conservation role of trophy hunting

5.1. Private land

In Namibia, Botswana and South Africa, game ranches are required by law to have perimeter game fencing (Bothma, 2002; Nuding, 2002), with the effect that natural wildlife migrations have been interrupted in some areas (Booth, 2005). In South Africa particularly, fenced ranches are small (8.2–49.2 km²) and often over stocked, resulting in ecological degradation (Bond et al., 2004; Patterson and Khosa, 2005). Ranchers with fenced properties often persecute 'non-huntable' predators such as wild dogs *Lycaon pictus* or cheetahs *Acinonyx jubatus* that they perceive to compete for potential trophies (Lindsey et al., 2005). Exotic species are frequently introduced onto game ranches to increase the diversity of saleable trophies (e.g., fallow deer *Dama dama* and lechwe *Kobus leche* in South Africa, black wildebeest and blesbok *Damaliscus dorcas philippii* in Namibia) (Hamman et al., 2003; Lindsey, 2005). In some cases, ranchers purposefully hybridize closely related species (e.g., black and blue wildebeest *Connochaetes taurinus*) to offer unique trophy 'species' such as 'red wildebeest', or manipulate genetics to offer prized aberrant varieties such as white or black springbok (*Antidorcas marsupialis*) (Hamman et al., 2003).

There are also ethical issues associated with trophy hunting on some game ranches. These issues generally have relatively little relevance to conservation per se, but negatively impact public perception of trophy hunting as a conservation tool. These activities include shooting from vehicles; shooting female animals or young animals; luring animals from parks; using baits and spotlights; hunting leopards with dogs; put-and-take hunting (the practice of releasing trophies immediately prior to the onset of a hunt); and 'canned hunting' (the practice of shooting animals in small enclosures in which they have no chance of escaping the hunter). An estimated 80–90% of the lions hunted in South Africa for example, are believed to be canned (Damm, 2005a; Patterson and Khosa, 2005). Canned lion hunting is contentious and we believe that for trophy hunting to achieve wider acceptance as a valid conservation tool, such practices should be eradicated. Encouragingly, a panel of experts reporting to the South African Minister of Environmental Affairs and Tourism recently recommended that canned hunting and put and take hunting be prohibited in South Africa (SADET, 2005).

5.2. State and communally owned land

Despite some successes, local communities living in or near wildlife rarely benefit adequately from trophy hunting activities. We believe that the inequitable distribution of hunting

revenues represents the most serious threat to the long term sustainability of the industry. Reasons for this inequity include; inadequate legislation enforcing community involvement, failure of national governments to devolve wildlife ownership to communities, and the lack of skills among communities required for them to run hunting operations or negotiate improved terms with operators (Lewis and Alpert, 1997; Murombedzi, 1999; Mayaka et al., 2004; Mbwaia, 2004; Child, 2005). In Botswana, for example, benefits accruing to communities are limited by a lack of marketing and management skills among communities, by inappropriate distribution of hunting revenues and through over-reliance on foreign hunting operators and donor agencies (Mbwaia, 2004). In Cameroon, <3% of trophy hunting revenues accrue to local communities, most of which are received by a small proportion of the population, with the effect that local people have negative attitudes towards conservation and trophy hunting (Mayaka, 2002; Mayaka et al., 2004). In Zambia, communities do not own wildlife occurring in Game Management Areas in which they live, and thus receive only 12% of hunting revenues (Lewis and Alpert, 1997). In Tanzania, most of the 25% of hunting revenues required by law to accrue to communities living in or adjacent to hunting areas reach only as far down as local council level, resulting in distrust of the government and resentment that hunting rights are reserved for foreigners (Nshala, 1999).

5.3. Quota setting, over shooting, undershooting

Most state wildlife departments lack the resources to census wildlife populations regularly and quotas are often based on guesswork (Caro et al., 1998a). In some areas, aerial censuses are done, but do not provide accurate estimates for small species or carnivores, are unsuitable for establishing quotas for blocks smaller than the home ranges of large species, and often do not involve consultation with local people (Taylor, 2001). Unsurprisingly therefore, quotas for some species are clearly inappropriate in parts of Africa. In Tanzania, species with patchy or limited distributions (e.g., sitatunga *Tragelaphus spekei*, puku *Kobus vardoni*, kudu *Tragelaphus* spp.) should be hunted more conservatively (Caro et al., 1998a), and in southeastern Cameroon, the current off-takes of bongo may be unsustainable (Elkan, 1994; Roulet, 2004a). In Zimbabwe, Grobbelaar and Masulani (2003) suggest that quotas for buffalo and elephant should be reduced to address declining trophy quality, and Loveridge and Macdonald (2002) have suggested that lion quotas should be reduced.

The value of wildlife as trophies creates pressure for the issuance of large and increasing quotas; in Tanzania during the 1990s, for example, hunting areas were split and the original hunting quotas retained for each portion (Baldus and Cauldwell, 2004b). Furthermore, state wildlife departments typically lack resources to enforce existing quotas. In Tanzania, for example, the Director of Wildlife recently issued a plea to hunting operators to respect quotas in light of widespread overshooting (Tanzanian Development Partners Group, 2006). In contrast, in parts of Zambia quotas are under utilised, reducing revenues from hunting and reducing incentives for conservation (ZAWA, 1999).

5.4. Allocating hunting areas

There are problems associated with the process of leasing hunting concessions in some countries with implications for conservation in those areas. In Tanzania, for example, concession areas are not leased on simple market principles; decisions rely on the discretion of a few individuals, resulting in reduced income for the state, nepotism, abuse of authority and corruption (Nshala, 1999). Tanzanian hunting areas are also often under-sold, with the effect that hunting blocks are sub-leased at up to 20 times their original price, resulting in a loss of income for the state (Baldus and Cauldwell, 2004b).

The required contributions of concession area leaseholders to anti-poaching and community development are often vague and poorly enforced (e.g., Zambia, ZAWA, 1999; Baldus and Cauldwell, 2004b). In addition, the anti-poaching efforts of some operators cease at the end of the hunting season leaving a significant period with little or no protection for wildlife (Caro et al., 1998b). Finally, in some instances, leases for concession areas are too short with no guarantee of renewal, reducing the willingness of operators to invest in anti-poaching, wildlife management or community relations (e.g., Mayaka et al., 2004).

5.5. Corruption

Corruption affects the trophy hunting industry in Africa at multiple levels, from government scouts who overlook the overshooting of quotas, to government ministers favouring certain operators when granting concessions (Lewis and Jackson, 2005).

Duckworth (2004b) for example, suggests that corruption is one of the key problems facing trophy hunting in Ethiopia, and alleges that the Ethiopian Professional Hunting Association is used for the sole benefit of the president, to the detriment of other operators.

5.6. Competition with citizen hunting

In some countries, urban citizens are provided with sizeable hunting quotas at greatly subsidised prices, reducing the number of high value trophies that can be sold to foreign trophy hunters, thus reducing incentives for communities to protect wildlife (e.g., Botswana, Botswana Wildlife Management Association, 2001; Baldus and Cauldwell, 2004b; Zambia, ZAWA, 1999). Furthermore, citizen hunting is often poorly supervised and abused (Baldus and Cauldwell, 2004b).

5.7. CITES limitations

In some countries, CITES restrictions on trophy exports impose limitations on revenues from trophy hunting and thus incentives for conservation. In West Africa, for example, several species of key importance for marketing hunting are not on quota (Table 4), which severely limits hunting revenues. Elephant numbers are increasing in Burkina Faso, and legalized hunting of the species would make the country a more attractive hunting destination and permit the derivation of increased revenues from both from trophy fees and from

the marketing of longer 15–21 day hunts (Damm, 2004). Elephants hunted in Cameroon are not importable into the US, with the effect that hunting operators routinely fail to utilize elephant quotas, limiting revenues from trophy hunting (Wilkie and Carpenter, 1999).

5.8. Failure to maximize revenues

In Central Africa, trophy fees and daily rates are under priced relative to other parts of Africa limiting incentives for conservation among local people (Wilkie and Carpenter, 1999; Roullet, 2004a). Similarly, daily rates and trophy fees have remained largely static in Zimbabwe during the last decade, and growth in the hunting industry has relied on increasing numbers of hunts and thus increased off-take rates (Booth, 2002; Booth, 2005).

5.9. Hunting bans reducing consumer confidence

In Botswana, the recent ban on lion hunting cost the trophy hunting industry 10% of total revenues (US\$1.26 million), and adversely affected community conservation efforts (Peake, 2004b). Likewise, the 2001–2003 ban on trophy hunting in Zambia resulted in an upsurge in poaching due to the removal of incentives for conservation (Lewis and Jackson, 2005). Hunting bans also reduce consumer confidence in affected countries as hunting destinations (Peake, 2004b; Lewis and Jackson, 2005).

5.10. Inadequate regulation of the hunting industry

In some countries in West and Central Africa, and particularly in Cameroon, there is a lack of professionalism among trophy hunting operators due to a lack of formal training, and because concession areas are allocated through a non-transparent procedure which permits hunting by amateur operators (Mayaka et al., 2004). In most countries, operators are not obliged to belong to professional hunting associations or to comply with their standards, making disciplining errant operators difficult (e.g., Zambia, ZAWA, 1999; Booth, 2005). Regulating hunting operators in vast, remote hunting concessions is difficult, particularly given the lack of resources of most African state wildlife departments.

6. Potential solutions to problems affecting the trophy hunting industry

Research into the economic and ecological impacts of trophy hunting in Africa is urgently required. Detailed in-country studies are needed for each nation in which hunting occurs to permit improved assessment of the conservation role of hunting, diagnosis of problems, and the prescription of appropriate, site-specific solutions. For West and Central Africa, investigation into how hunting revenues might be increased is required. For countries where trophy hunting presently does not occur, such as Kenya, in-country assessments of the potential financial gains and conservation positives and negatives would provide a useful basis from which to decide whether to legalise trophy hunting, without relying on input from hunters or northern based animal welfare groups.

Improved monitoring of wildlife populations is necessary to ensure that quotas are sustainable. Where trophy hunting occurs on communal land, simple, repeatable techniques should be used for censuses, and communities should be involved to develop a sense of responsibility for resource management (Taylor, 2001). Greater use should be made of indices such as trophy quality and catch effort to provide a simple and cheap means of determining whether quota sizes are sustainable.

Some of the problems associated with the trophy hunting industry could be addressed by improved enforcement of existing legislation. Improved enforcement could be conducted by state wildlife agencies or by an independent body. We suggest that hunting operators should be forced to belong to state-approved national hunting associations (with representation from mainstream conservation organisations) with the power to remove or suspend hunting licenses in the event of non compliance to hunting legislation. Annual membership levies would be used by the hunting association to monitor compliance to hunting quotas, minimum trophy sizes, use of qualified staff, and contributions to local communities and anti-poaching efforts.

New legislation is also required to tackle some problems associated with trophy hunting. For example, ownership of wildlife should be devolved to communities to permit direct receipt of benefits from hunting and thus create clear incentives for sustainable wildlife management. The provision of ownership of wildlife to private landowners had a rapid and major positive impact on wildlife conservation (Bond et al., 2004). The retention of state-ownership over wildlife in communally owned areas presently constitutes a major barrier to effective wildlife conservation over huge areas. The process of allocating hunting concessions should be made transparent, and based solely on market principles. Concession agreements should include unambiguous and significant minimum contributions to anti-poaching and community development which are subsequently enforced.

Incentives for improved conservation performance by hunting operators should be introduced. One suggestion is the development of a certification system, whereby hunting operators are rated in terms of their commitment to conservation, community development and hunting ethics (Lewis and Jackson, 2005; Packer, 2005; Lindsey et al., 2006). Most hunting clients are concerned that their hunt is conducted in a 'conservation-friendly' manner and would likely select for certified hunting operators (Lindsey et al., 2006). Certification should thus provide an incentive for operators to conduct hunts in a manner more conducive to conservation.

7. Conclusion

Trophy hunting is a major industry in parts of Africa, creating incentives for wildlife conservation over vast areas which otherwise might be used for alternative and less conservation friendly land uses. The trophy hunting industry is increasing in size in southern Africa and Tanzania, and the scope for the industry play a role in conservation should increase accordingly. Presently, however, the conservation role of hunting is limited by a series of problems. Several of these problems are common to multiple countries, and some (such as failure to allocate sufficient benefits to communities, leakage of in-

come and corruption) also affect the photographic ecotourism industry (Christie and Crompton, 2001; Walpole and Thouless, 2005). Developing solutions should thus be a key priority for conservationists, and success would confer large-scale benefits for conservation.

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