16 · *Buffalo Hunting: From a Commodity to a High-Value Game Species*

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A Story Longer Than Thought

Early Days

January 1895. Makanga country, now in Mozambique. Edouard Foa, a French explorer, is struggling to gain an audience with the powerful and feared Chief Tchanetta Mendoza. Foa had come there on his way to cross the continent by foot from the Indian Ocean to the Atlantic Ocean. Eventually, after having threatened Foa, the Chief consented to grant him a clearance to walk across and hunt on this land. At that time, the country was rich in game and Tchanetta forbade unnecessary shooting. Because Arabs used to come there from the North once a year for times immemorial, the Chief had them hunt elephants exclusively, measuring the powder for each hunter himself. Buffalo (*Syncerus caffer*), antelope, and other game were reserved to indigenous hunters for feeding his people. The tribute to be paid to the Chief for hunting elephant was one tusk per elephant killed. When the beast had fallen, the tusk that was on the ground side was the property of the Chief of the territory. Locally, in Portuguese, this tax was named '*o dente da terra*', the Earth's tooth (Foa, 1900).

The price to pay for the right to hunt existed long before Foa. As early as the sixteenth century, Portuguese records state that no elephant could be killed and consumed without the consent of the Chief in the lands south of the Zambezi, where the '*dente da terra*' tax already existed by unwritten law (Manyanga and Pangeti, 2017). Such hunting levies were not only restricted to this area. In western Tanzania, Foa had to pay the '*hongo*', a tribute to walk and hunt on a Chief's land (Foa, 1900).

In western Zimbabwe, Lobengula (1836–1894), Chief of the Ndebele, was issuing hunting concessions for foreign hunters as a way to protect Ndebele hunting rights (Moyo et al., 1993).

These ancient situations reveal extremely important historical traits: systems of governance and management of wildlife were already in place in precolonial times, mainly enacted by traditional leaders and their ruling families (Sansom, 1974; Campbell, 1995; Carruthers, 1995), even endorsed by spirit mediums, at least in the Zambezi valley (Hasler, 1996). These systems did not disappear abruptly under colonial rule and often coexisted with new foreign regulations.

Today, the current trophy fee paid by the hunting tourist is nothing other than a modern form of the historical '*dente da terra*'. The present listing of particular species as fully protected is nothing other than ancient rules such as the prohibition by Lobengula of hunting hippopotamus, and the fee paid by the hunting operator to lease a hunting concession from the State is nothing other than the historical tribute to be paid to the landlord for being allowed to walk and hunt on his land. Today, by delegating the appropriate authority from central to local levels, the now widespread mechanism of community-based natural resources management is in a way reviving precolonial systems, but with more democratic efforts than under the past feudal regimes.

Colonial Times

With the establishment of colonies, foreign powers assumed that the traditional sanctions and precolonial institutions that regulated hunting were an inadequate means of conserving wildlife in the face of growing human populations and competition for wildlife resources (Child, 2004). By transposing their foreign laws, many colonial regimes prescribed wildlife as *res nullius*: with wildlife now belonging to no one and managed by the State, traditional rulers were disempowered from controlling hunting. It is even assumed that some of them let poaching happen to steal State goods in revenge for having lost control.

The settlers who began arriving at the Cape of Good Hope in 1652 hunted wildlife for food and commercial gain (Booth and Chardonnet, 2015), and to open land to develop agriculture and livestock husbandry. In less than two centuries, wildlife had been deeply impacted by the introduction of millions of muzzleloaders, metal gin-traps, etc. (Richards, 1980), the development of agriculture, and the expansion of livestock accompanied by several exotic diseases. The rinderpest

outbreak in the 1880s wiped out up to 95 per cent of the buffalo populations (Robertson, 1996; Spinage, 2003; Chapters 9 and 12). Regarded as common game, buffalo did not benefit from special protection and were even destroyed in southern Africa in the attempt to eradicate tsetse flies. Most colonial regimes maintained special, relatively cheap meat hunting licences to feed populations and plantation workers (Anderson, 2017).

At the end of the nineteenth century, a number of hunters throughout Africa recognized the harm of uncontrolled hunting and played a key role in establishing protected areas (Kruger National Park in 1894 in South Africa, Selous Game Reserve in 1896 in Tanzania). In the meantime, they also introduced modern protective game laws. All over Africa, many if not most of the Hunting Reserves that were gazetted at that time are the ancestors of today's National Parks. The turn of the century was the period when hunting for trading ivory and skins or for collecting specimens for museums (Roosevelt, 1910) gave birth to hunting for sport, adventure and exotic travels named safari (*safari* means travel in Swahili). Hunting tourism arose in East Africa with pioneer farmers and explorers guiding foreign hunters (Lindsey et al., 2007). After the First World War, the hunting safari industry expanded, policed by law and administration. After the Second World War, sport hunting became more organized and regulated as a business (Booth and Chardonnet, 2015).

Independence

After independence, game and hunting laws were progressively modernized and the network of Protected Areas developed. Safari hunting continued except for a few countries like Kenya, where it was banned in 1977, which precipitated the steep decline of game numbers in the country (Western et al., 2009; Ogutu et al., 2016). In contrast, neighbouring Tanzania, after a temporary hunting ban between 1973 and 1977, has maintained until today safari hunting on vast areas while also succeeding in maintaining the highest numbers on Earth of large mammals such as lion and buffalo. Unexpectedly, the bans on hunting in Kenya and temporarily in Tanzania made both safari hunting clients and professional hunters look for new hunting fields in other regions of Africa, which boomed following the bans in East Africa (Hurt and Ravn, 2000).

While buffalo remained common in some areas, more and more situations were arising, especially in West and Central Africa, where local buffalo populations were diminishing as human population growth

drove demand for more land at the expense of wilderness, with agriculture and livestock encroachment, and with increasing poaching pressure for bushmeat. Gradually, hunting became controlled by sustainability norms and integrated into conservation strategies. The rationale was to create sustainable revenue streams for rural communities and State wildlife agencies, thus providing incentives to preserve Hunting Areas as duly gazetted Protected Areas, in a challenging attempt to prevent their conversion into agriculture or other environment-unfriendly land uses (Prins and de Jong, 2022). 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 (Lindsey et al., 2007).

Starting in the 1980s with the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) programme in Zimbabwe, new approaches aiming at increasing benefits from hunting and other wildlife uses for local populations led to a paradigm shift towards connecting sustainable use and hunting with rural development and livelihoods (Murphree, 2000; Chapters 1 and 13). This approach progressively expanded throughout Africa with the Administrative Management Design programme (ADMADE) in Zambia, the *Programme de Développement des Zones de Chasse Villageoises* (PDZCV) in CAR, the *Zones d'Intérêt Cynégétique à Gestion Communautaire* (ZICGC) programme in Cameroon, the *Gestion Participative des Ressources Naturelles et de la Faune* (GEPRENAF) programme in Burkina Faso, and the *Ecosystèmes Protégés d'Afrique Soudano-Sahélienne* (ECOPAS) programme (Lindsey et al., 2007). The foundation of this Community-Based Natural Resources Management (CBNRM) approach is to allocate user rights to local people, thereby allowing for benefits from wildlife use and creating conservation incentives (Baldus, 2009). However, the implementation of this approach is not always that simple. In south-eastern Zimbabwe, for example, Poshiwa et al. (2013) show the limitations of revenues from wildlife diversification, even though wildlife income is less volatile than income from the agro-pastoral system, and wildlife can be used as a hedge asset to offset risk from agricultural production without compromising on return.

In these utilization schemes, hunting tourism has in most cases the highest income potential (Booth, 2010). As one of the most numerous large game animals, the buffalo is a core species for high-income hunting tourism (Lindsey et al., 2012). Buffalo hunts contribute a high share to community hunting income under CBNRM, for example in CAR (Bouché, 2010) and Tanzania (TAWA, 2019).

Hunting Buffalo Today

Hunting Buffalo for Meat and Other Reasons

Informal Bushmeat Hunting Throughout Africa

Hunting for food began millennia ago with the first humans. Today, many rural communities across the continent still heavily rely on bushmeat, both for food security and income (e.g. Loibooki et al., 2002; van Vliet and Mbazza, 2011; Friant et al., 2020). Consumption of buffalo meat occurs broadly across the wide range of wild animal species consumed (Table 16.1). The pay-off for hunting a buffalo is high: a single buffalo represents one of the greatest amounts of meat that can be obtained per capita, and buffalo meat is one of the most nutritive among the wild species usually hunted (Cawthorn and Hoffman, 2015). Buffalo is highly prized in urban markets and restaurants. While not the case everywhere, in some places like in Bangui, Central African Republic (Fargeot et al., 2017), or Manica Province, Mozambique (Lindsey and Bento, 2012), its meat is among the most expensive. This makes buffalo one of the species most targeted by poaching in several areas (Skikuku et al., 2018; Gaodirelwe et al., 2020). Buffalo meat may also be obtained as a by-product of conflicts between the species and the local communities; several communities hunt buffalo in retaliation after the species has raided their crops or attacked people (Long et al., 2020).

Local communities also hunt buffalo for purposes other than meat (Table 16.1). In Ethiopia, for instance, poachers hunt buffalo as trophies to increase their social acceptance and respect in society (Erena, 2014). For the Bisa people in Zambia, there are multiple dimensions to hunting buffalo, including social positioning and cohesion of their society (Marks, 1976). In many areas, buffalo body parts are used for cultural ceremonies and in traditional medicine (Whiting et al., 2011).

There are some communities that are reluctant to hunt buffalo. First, because hunting buffalo may be perceived as too dangerous by local hunters (Dell et al., 2020). In many traditional systems, hunters also have to share the meat from their hunts with a large number of community members. They therefore tend to avoid large species such as buffalo to limit the expense of delivering parts of the hunted animals to relatives living in distant places (Eniang et al., 2017). Finally, for some communities, the buffalo is regarded as a totem or taboo animal, and its hunt is not allowed (FAO/CIG, 2002; Duda et al., 2018; Chapter 1).

That said, hunting for bushmeat largely contributes to local declines of buffalo populations, even sometimes to the vanishing of the species (Prins,

Table 16.1 Uses (either legal or illegal) of African buffalo by local communities: examples across the species range by region, in West, Central, East and Southern Africa (based on data/sources in the table).

Region	Country	Area	Buffalo product	Use	Details	Reference
West Africa	*Burkina Faso*	Bobo–Dioulasso	Meat	Food	Buffalo hunted in groups for commercial purpose, sold to restaurants	Montcho et al. (2020)
			Testis	Traditional medicine	Aphrodisiac potions	
			Trophy	Social prestige		
	Ghana		Meat	Food	Species previously regarded as totems, such as buffalo, started to appear openly on major bushmeat markets because of increasing poverty and the growing scarcity of preferred wildlife species	FAO/CIG (2020)
	Ivory Coast	Comoé National Park	Meat	Food	All the local residents surveyed feed on buffalo flesh and/or skin	Atta et al. (2021)
			Organs and other body parts	Traditional medicine	E.g. tail, heart, leg bones, horns, poop, urine fat, brain, bile to cure diarrhoea, eye aches, folie, heartache, bone weakness, sexual impotence, etc.	
				Witchcraft	Turning away bad luck, banish fear, repulse bad spells, etc.	
			Meat	Food	Near extinction of buffalo because of hunting for food	P. Henschel, unpublished data in Lindsey et al. (2015)

	Location	Body part	Use category	Details	Reference
Nigeria	Abia, Bauchi, Edo, Kogi, Ondo and Zamfara State	Meat	Food		Alarape et al. (2021)
		Penis	Traditional medicine	Used as an aphrodisiac	Adeola (1992)
	Ibadab, Oyo State	Bone	Traditional medicine	Used as anti–vomiting	Oduntan et al. (2012)
	Cross River State	Meat	Food	Hunters prefer not to hunt buffalo because the traditional system demands them to share the meat with community members, sometimes in distant places. However, Fulani herdsmen reported that they responded to the conflict between buffalo and cattle by setting wire snares along trails and shooting buffalo	Eniang et al. (2017)
	South–western towns	Skin, eyeballs, liver, tail, penis, etc.	Traditional medicine	Elephantiasis, loss of hearing/speech/ eyesight vertebral column fracture, prolonged pregnancy; extrusion of placenta after parturition, human skull fracture, fertility	Sodeinde and Soewu (1999)
		Nose, head	Witchcraft	Invoking witches appeasing traditional gods	

(cont.)

Table 16.1 (cont.)

Region	Country	Area	Buffalo product	Use	Details	Reference
Central Africa	*Cameroon*	Kimbi–Fungom National Park	Meat	Food	Buffalo hunting is a source of income	Nda et al. (2018)
					Buffalo is generally avoided in the Pygmy groups because it is considered as having a potential harmful effect on humans	Duda et al. (2018)
	Central African Republic	Bangui	Meat	Food	Buffalo, with snakes, are the most expensive species sold in the markets	Fargeot et al. (2017)
		Yangambi Landscape, Yangambi Biosphere Reserve and the Ngazi Forest Reserve	Meat	Food	The local extirpation of buffalo is explained as the result of overhunting by armed groups (Armed Forces of the DRC, Congolese, Rwandans, and Ugandans from eastern DRC) during the periods of rebellion	Van Vliet et al. (2018)
		Around Lomani National Park	Meat	Food	Buffalo nearly disappeared because of overhunting	Batumike et al. (2021)
	Democratic Republic of Congo	Garamba National Park	Meat	Food	During peacetime, protected species such as elephant and buffalo rarely appeared in the rural markets, but they comprised more than half of all bushmeat sales in the urban markets. During wartime, the sales of protected species in the urban markets increased fivefold	De Merode and Cowlishaw (2006)
		South of the Salonga–Lukenie–Sankuru Landscape	Meat	Food	Buffalo meat sold in large quantities, accounting for the highest percentage of total weight of carcasses found in the local market	Steel et al. (2008)

Region	Country	Location	Product	Use	Description	Reference
	Democratic Republic of Congo and Republic of the Congo	Kinshasa and Brazzaville	Meat	Food	Buffalo meat illegally sold in the restaurants. Buffalo is the most expensive meat among the ungulate species	Gluszek et al. (2021)
	Gabon	Gambia Complex of Protected Areas	Meat	Food	In most locations with buffalo, signs of poaching were found as well. Buffalo meat sold at a price of 2200 CFA-Franc	Litjens (2017)
	Republic of the Congo	Pointe Noire	Meat	Food	Buffalo is among the species most frequently bought and sold in markets and restaurants	Boratto and Gore (2018)
East Africa	Ethiopia	Western Ethiopia			Bushmeat and illegal trophy hunting are the key causes of buffalo collapse. Bushmeat hunting is carried out by local poachers or local militias, whereas most illegal trophy hunters come from the remote parts of Limu, Gidda Ayana and Ebantu districts of the East Wollega Administrative Zone	Erena et al. (2019)
		Oromia Regional State	Trophy	Social prestige	Hunting buffalo for trophies was frequently practised in the area	Erena (2014)
	Kenya	Mount Elgon Biosphere Reserve	Meat	Food	Buffalo is the mostly targeted species, after antelopes. Also hunted by poachers from Uganda	Skikuku et al. (2018)
		Nationwide	Tail	Cultural ornamentation, sign of prestige / Retaliatory killing	Buffalo is the second most commonly killed species in retaliation for damage caused	Long et al. (2020)

(cont.)

Table 16.1 *(cont.)*

Region	Country	Area	Buffalo product	Use	Details	Reference
	Rwanda	Volcanoes National Park	Meat	Food	Hunting buffalo for meat was the most common forest activity in the past. Less common now because of increased law enforcement	Munanura et al. (2018)
	Sudan	Dinder Biosphere Reserve	Meat	Food	During periods of famine, conflict and critical fallback of food sources (crop and domestic livestock), many Sudanese consume all types of wild fauna, including buffalo	Adam (2019)
	Tanzania	Uzungwa Scarp Forest and Mwanihana Forest	Meat	Food	Locally extinct in the Reserve by the early 1970s as a result of intensive hunting for bushmeat trade	Rovero et al. (2012); Hegerl et al. (2017)
		South West Rungwa Game Reserve	Meat	Food	Communities get meat through resident hunting. Buffalo meat is mostly used for trade to generate income	Nachihangu et al. (2018)
		Western Serengeti	Meat	Food	The ethnic groups in Western Serengeti prefer medium–large wildlife such as buffalo for protein and income	Holmern et al. (2006); Ndibalema and Songorwa (2007); Mfunda and Røskaft (2010)

	Location			Description	Reference
	Tarime District	Meat	Food	The harvesting rates of buffalo are alarming. Buffalo was reported to be reduced by 50–90% out of their range	Holmern et al. (2002, 2006); Kideghesgo et al. (2006)
Uganda	Northern Uganda	Meat	Food	Buffalo meat found in local markets	Dell et al. (2021)
	Near Murchison National Park	Meat	Food	Buffalo is perceived by poachers as the most dangerous wild animal to hunt and the most dangerous to trap	Dell et al. (2020)
Southern Africa *Botswana*	Okavango Delta	Meat	Food	Approximately 1800 illegal hunters each harvest an average of 320 kg of bushmeat annually, although some reported harvesting ≥1000 kg. While impala was the most commonly hunted species, buffalo accounted for 30% of all bushmeat production	Rogan et al. (2017)
	In and outside Wildlife Management Areas around the Moremi Game Reserve	Meat	Food	CBNRM communities mostly target impala, followed by Cape buffalo	Gaodirelwe et al. (2020)
Mozambique		Meat	Food	Illegal hunters commonly use gin traps, which are manufactured from steel car springs and used to kill animals as large as buffalo	Lindsey and Bento (2012)
	Manica Province	Meat	Food	Bushmeat from large species such as buffalo is less frequently sold today than during the civil war. However, buffalo is one of the most commonly cited bushmeat species by interviewees	Lindsey and Bento (2012)

Table 16.1 (*cont.*)

Region	Country	Area	Buffalo product	Use	Details	Reference
	South Africa	Pafuri in the Makuleke concession	Meat	Food	Cable from the dilapidated western boundary fence frequently stolen by illegal hunters to make snares to capture hippo and buffalo	C. Roche, unpublished data in Lindsey et al. (2015)
		Xhosa and Sotho communities in the Western Cape Province	Bones	Traditional medicine	Buffalo bone is one of the most expensive animal items sold	Nieman et al. (2019)
		Faraday market, Johannesburg	Skull, horns, skin	Traditional medicine	Buffalo is one of the ungulate species most represented in the market	Whiting et al. (2011)
	Zambia	Luangwa Valley, Upper and Lower Lupande, Lumimba and Sandwe game management areas	Meat	Food	Declining population of buffalo in areas close to human settlements, close to boundary of the National Park	R. McRobb, M. Becker and D. Lewis, unpublished data in Lindsey et al. (2015)

1996; Batumike et al., 2021). Basically, bushmeat hunting is unselective and unlimited; where snares and gin-traps are set for buffalo and other game, any calf, female or male can be taken, and with no limitation in numbers given that traps can be reset. Bushmeat hunting is often considered one of the greatest threats to biodiversity in African savannas and forests, often ahead of other major threats such as deforestation and habitat fragmentation (Wilkie et al., 2011; van Velden et al., 2018).

Regulated Bushmeat Hunting

Some countries, such as Tanzania, allow hunting quotas for meat purposes (including buffalo), while others allow subsistence community hunting, like CAR (Snyman et al., 2021). In most countries, trophy-hunting concessionaries are mandated by their lease agreements to provide local communities – free of charge – the meat obtained by tourist hunters. This is quite stringent in West and Central Africa, where wild meat is extremely sought after. In Zambia, 130 tons of fresh game meat – of which 24 per cent is from buffalo – are provided annually by the hunting tourism industry to rural communities at an approximate yearly value for the meat alone of over €500,000 exclusive of distribution costs (White and Belant, 2015).

In some southern African countries, the production of wild meat constitutes a real industry, one that is organized and regulated. In Namibia, with an annual mean of between 60 and 75 kg of venison produced per square kilometre in 2013 on farmland, hunting for venison is an important sector which contributes more to national food security than livestock, as beef is mainly exported (Lindsey et al., 2013). However, most of the venison is from antelopes, not from buffalo, which is restricted by veterinary regulations. In South Africa, 'biltong hunting' is a recreational hunting by local hunters who harvest wild meat and process it into biltong (dried meat) or sausage (Taylor et al., 2015). It is a major value chain in this country, much larger than trophy hunting; however, it mainly targets common game rather than buffalo.

Buffalo Hunting Tourism

What Are We Talking About?

This section addresses lawful and regulated hunting only, in contrast with outlawed and unregulated hunting, commonly called poaching (see Prins, 2020). The terminology of hunting categories has been debated

at length (Booth and Chardonnet, 2015). One reason is that the terms used in each language are often difficult to translate literally into other languages. Another reason is that the various categories of hunting often overlap (IUCN, 2016). For IUCN, 'trophy hunting is hunting of animals with specific characteristics and involves the payment of a fee by a foreign or local hunter for a hunting experience, usually guided; it may be a distinct activity or overlap with recreational or meat hunting'. While trophy hunting reflects the quest for an outstanding trophy, sport hunting rather reflects the quest for a challenging fair chase of the game by tracking on foot, whatever the trophy. The trophy is a key part of a safari, but the hunting experience and adventure in the bush are also what attracts clients, and there also has to be the feeling of a fair chase to the proper hunter with no guarantee of success (Hurt and Ravn, 2000). While some authors prefer the term 'regulated hunting' (Dickson et al., 2009; Booth and Chardonnet, 2015), many other terms are commonly used, for example safari hunting, recreational hunting, tourism hunting, hunting tourism. For Spenceley (2021), 'hunting tourism is a consumptive mode of nature-based tourism that uses renewable natural resources in a wild or undeveloped form for the purpose of enjoying natural areas or wildlife and contribute to conserve and value wilderness areas'. It is a typical tourism value chain with (i) emitting countries, that is countries of origin of the clients (hunting tourist or tourist hunter), and (ii) receiving countries, that is countries selling operating rights to tourism operators (hunting company or hunting operator or outfitter), themselves selling tourism services (hunting safari or hunting trip or hunting party or hunt) to their clients.

Throughout Africa

To most hunters, the buffalo is a fascinating game for being (i) one of the so-called 'dangerous game' and (ii) one of the 'Big Five', the term commonly used to describe the five major big game species. Hunting accidents with buffalo are not uncommon, even with experienced professional hunters. The buffalo is widely regarded as dangerous to hunt, which certainly adds to the attractiveness of its hunt: '*He looks as if you owe him money*' (Ruark, 1987, italics added for emphasis). In 2022, buffalo can be legally hunted by hunting tourists in 16 sub-Saharan African countries, that is in 43 per cent of the 37 buffalo range countries (Figure 16.1). The COVID-19 pandemic in 2020 and 2021 prevented hunting tourists from travelling, which severely impacted hunting tourism like all forms of tourism. The situation slightly returned to normal in 2022.
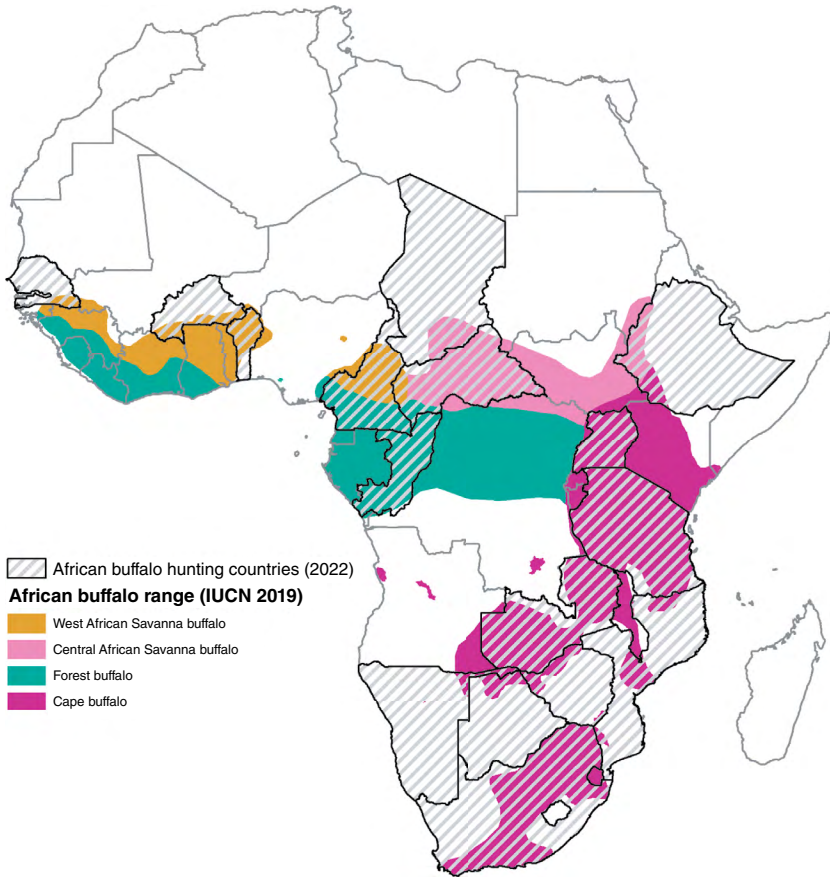
Figure 16.1 Buffalo range countries where hunting tourism is lawful in 2022 for the four subspecies of buffalo recognized by the IUCN Red List so far. Note: Buffalo in northern and central Angola were categorized as 'Cape buffalo' by IUCN (2019), but phenotypically and perhaps even genetically they are 'forest buffalo'. Source: Author.

Among the four subspecies thus far recognized by the IUCN Red List (Chapters 3 and 4), the Cape buffalo is by far the most hunted, being legally hunted in nine countries. This obviously reflects its much higher abundance than the other subspecies, but also other factors like a greater development of the tourism industry, a safer security situation, a larger expansion of CBNRM programmes, etc. The forest buffalo is the least hunted subspecies with only three countries where it can be hunted legally, a situation resulting from a more restricted range, landlocked hunting grounds, the difficulty of the hunt in thick habitats, and also

probably a degraded conservation status. The West and Central African savanna buffalo, both subspecies being rather similar and intermixed, can be hunted in eight countries. However, the overall number of buffalo trophy-hunted annually in these two regions has always been quite low, about 300 a year. We need to mention that the hunting community recognizes a fifth subspecies, the Nile buffalo, which ranges in Ethiopia, northern and western Uganda, and appears as an intermediate form between the Central African savanna buffalo and the Cape buffalo. The reality of the transitional shape of its trophy explains that hunters specifically hunt this particular buffalo and register their trophies distinctly in the records books.

Hunting quotas (the maximum number of adult male buffalo allowed to be hunted per year per Hunting Area) and offtakes (number of buffalo effectively harvested per year per Hunting Area) vary greatly between regions, with the highest figures in Tanzania and Southern Africa and the lowest in West and Central Africa (Table 16.2). The national offtake rate (ratio of offtake to quota) is not only the result of the number of buffalo taken per Hunting Area, but also of the percentage of Hunting Areas being leased and operational, which is a sign of the functionality of the industry in the country. In nearly all of the hunting countries, the hunt concerns free-ranging buffalo in unfenced Hunting Areas. South Africa, where buffalo hunting happens behind fences, is a major exception. Another peculiar feature of South Africa is that hunting quotas are set by the landowner, while they are generally set by government authorities quasi-everywhere else.

West Africa

Three countries of West Africa allow legal hunting of buffalo. In Senegal, with a relict population of West African savanna buffalo in the far southeastern corner of the country, buffalo trophy hunting is anecdotal. In contrast, Benin and Burkina Faso have developed a well-organized and regulated big game hunting tourism industry with the West African savanna buffalo as the main attraction together with the roan antelope (*Hippotragus equinus*). Buffalo hunting there is renowned for being a challenging, fair chase by stalking on foot with excellent local trackers.

In Burkina Faso, in 2017, 303 hunting tourists (9 per cent of all tourists) harvested 424 mammals for a production of 86 tons of meat and a direct revenue of about €827,000 (Ouedraogo, 2018). Over seven years between 2012 and 2018, the average national annual quota was 166

Table 16.2 *Buffalo hunting quotas and offtakes in selected countries throughout Africa.*

		2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	Average
West Africa	*Benin* (PNP, 2018; PNW, 2018, 2019)	Buffalo quota (N buffalo)	n/a	n/a	n/a	n/a	n/a	n/a	75	75	n/a	75
		Buffalo offtake (N buffalo)	n/a	n/a	n/a	n/a	n/a	n/a	57	59	n/a	58
		Buffalo offtake rate (%)	n/a	n/a	n/a	n/a	n/a	n/a	76	79	n/a	**77**
	Burkina Faso (DFRC, 2018)	Buffalo quota (N buffalo)	147	163	153	153	183	183	181	n/a	n/a	166
		Buffalo offtake (N buffalo)	115	136	129	82	115	81	81	n/a	n/a	106
		Buffalo offtake rate (%)	78	83	84	54	63	44	45	n/a	n/a	**64**
Central Africa	*Cameroon* (MINFOF, 2020)	Buffalo quota (N buffalo)	n/a	n/a	n/a	n/a	n/a	352	341	356	381	358
		Buffalo offtake (N buffalo)	n/a	n/a	n/a	n/a	n/a	156	184	125	99	141
		Buffalo offtake rate (%)	n/a	n/a	n/a	n/a	n/a	44	54	35	26	**39**
East Africa	*Tanzania* (Wildlife Division, personal communication, 2021)	Buffalo quota (N buffalo)	2130	2130	2130	1948	1456	1456	1456	1456	1456	1735
		Buffalo offtake (N buffalo)	1129	901	889	940	828	672	655	625	737	820
		Buffalo offtake rate (%)	53	42	42	48	57	46	45	43	51	**47**

(cont.)

Table 16.2 (*cont.*)

		2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	Average
Southern Africa *Zimbabwe* (ZPWMA, personal communication, 2022)	Buffalo quota (N buffalo)	n/a	n/a	1794	1751	1205	1308	1343	1252	1289	1420
	Buffalo offtake (N buffalo)	n/a	n/	717	699	593	642	592	585	200	575
	Buffalo offtake rate (%)	n/	n/	40	40	49	49	44	47	16	**41**
Namibia (only for Communal Conservancies) (MEFT and NACSO, personal communication, 2022)	Buffalo quota (N buffalo)	n/a	n/a	106	106	108	122	122	122	132	117
	Buffalo offtake (N buffalo)	n/a	n/a	88	93	93	110	99	114	61	94
	Buffalo offtake rate (%)	n/a	n/a	83	85	86	90	81	93	46	**80**

buffalo/year (147–183), and the average national annual offtake was 106 buffalo hunted/year (81–136) for a national annual offtake rate of 64 per cent (44–84) (DFRC, 2018; Table 16.2).

In Benin, over the two hunting seasons 2017–2018 and 2018–2019, the five existing Hunting Areas (only four of which were operational) harvested an annual average of 58 buffalo out of an average annual quota of 75 for an average annual offtake rate of 77.3 per cent (PNP, 2018, 2019; PNW, 2018, 2019; Table 16.2). In 2018, the W National Park eco-system earned 76 per cent of its revenue from 19 hunting tourists visiting the Mekrou Hunting Area and 2 per cent from 476 photographic tour-ists visiting the W National Park (PNP, 2018, 2019; PNW, 2018, 2019; Table 16.2).

Since 2019, the severe degradation of the security situation in the region (with terrorism taking over vast wilderness areas) has prevented many National Parks and Hunting Areas from operating in West Africa.

Central Africa

Central Africa is the region where buffalo are the most diverse, with three subspecies occurring out of four. Buffalo there is not the first game of appeal for tourist hunters, who mainly look for the Eastern giant eland (*Tragelaphus derbianus gigas*) and the Western or lowland bongo (*Tragelaphus eurycerus eurycerus*). However, buffalo is part of the hunting package and is sought after for providing serious stalking by foot with outstandingly skilful trackers from local communities.

Cameroon is the country with the highest number of legal big game hunters in all of West and Central Africa in recent years. In 2018, 285 tourists came to Cameroon for hunting (MINFOF, 2019). In this coun-try, Hunting Areas are a major component of the national network of Protected Areas: 71 gazetted Hunting Areas (*Zones d'Intérêt Cynégétique*) cover 57,000 km² (11.9 per cent of the country), that is 1.5 times the size of National Parks and Reserves (39,000 km², 8.2 per cent of the country; MINFOF, 2019). Over four hunting seasons between 2016 and 2020, the average annual quota was 358 buffalo (341–381) with 69 per cent savanna buffalo and 31 per cent forest buffalo. During this period, an annual average of 141 buffalo (99–184) were hunted for an average annual offtake rate of 39 per cent (MINFOF, 2020; Table 16.2). Such a low offtake rate reflects an important proportion of unleased Hunting Areas, as a number of them are no longer operational due to degradation by all sorts of activities which are illegal in protected
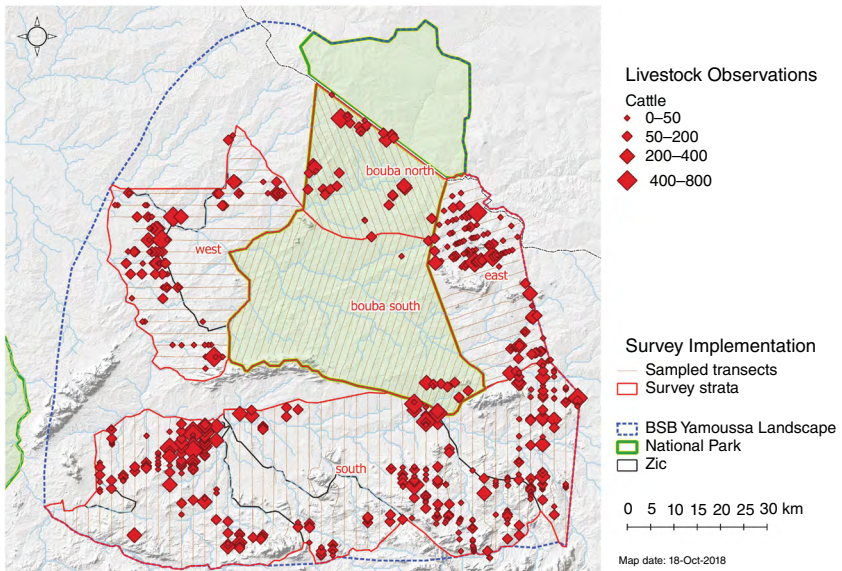
Figure 16.2 Livestock sightings in the BSB landscape covering the transboundary national parks of Bouba Ndjidda (Cameroon) and Sena Oura (Chad) as well as the seven neighbouring Hunting Areas (Cameroon), during the aerial wildlife survey in 2018 (total surface of about 10,500 km²). The estimated livestock population (117,134 heads) was six times higher than the estimated population of the 11 largest wild mammals (20,136 individuals), and located mostly within the Hunting Areas surrounding the National Parks (data and illustration reproduced from WCS and MINFOF, 2018, with permission).

areas: poaching, livestock invasion (Figure 16.2), cotton encroachment, gold mining, logging, and the charcoal trade.

The Central African Republic (CAR) could be named the 'buffalo country', as it is the only one on the continent where three subspecies of buffalo occur and can be legally hunted, although the forest buffalo is rarely hunted there. In this country, 89 gazetted Hunting Areas cover 220,000 km² (35 per cent of the country), that is 3.6 times the size of the National Parks and Reserves (61,000 km², 10 per cent of the country). Before the political unrest initiated in 2012, CAR was a prime destination for big game hunting. It is still practiced in 2022, but so far remains marginal. Before the collapse of tourism, the buffalo was the second most abundant large game species after the giant eland in the *Zones cynégétiques villageoises* (ZCV, Village Hunting Zones) of northern CAR, with a density of 1.1 buffalo per km² (Bouché, 2010). In these ZCV only,

the buffalo was the most hunted game species: in the 2008–2009 hunting season, 44 buffalo were harvested by hunting tourists, ahead of 26 giant eland (Bouché, 2010).

Chad is renowned for hosting the typical form of *Syncerus caffer aequinoctialis* with its wide, flattened horn shape. The country used to be famous for big game hunting until the contemporary civil turmoil. Despite these constraints, hunting tourism continued to be practiced in 2022, but at a lower scale.

In the Republic of Congo, hunting tourism has recently resumed with only a few forest buffalo harvested per year.

The security situation in Central Africa has been deteriorating for a longer time than in West Africa, and this has undermined the hunting industry as well as conservation. The region is experiencing what Scholte et al. (2021) call a conservation overstretch: with increasing insecurity and declining revenues, governments find themselves confronted with too few resources to protect vast areas.

East Africa

In East Africa, three countries have developed a well-structured hunting tourism industry. In Ethiopia, few buffalo are hunted for the simple reason that the Hunting Areas are not exactly located within the buffalo range in this country. The buffalo is not the game of appeal for tourist hunters coming to this country. In Uganda, the hunting industry has developed over the last 20 years to a point where it is now a real alternative to the other East and Central African hunting destinations. A special attraction is the so-called Nile buffalo, and Uganda is the place to find it (Siege and Siege, 2020).

Tanzania, which hosts the largest number of African buffalo on Earth, unsurprisingly comes first among all African countries for regulated hunting of free-ranging buffalo. Tanzanian buffalo are famous for their large herds and their magnificent wide horns.

The hunting domain is an essential pillar of the national network of Protected Areas in this country. In 2004, proclaimed Protected Areas gazetted as Hunting Areas covered over 250,000 km² (26.4 per cent of the country), nearly twice the size of the National Parks (134,881 km², 14.1 per cent; Baldus and Cauldwell, 2004). The number of Hunting Areas was progressively reduced from 164 to 113 in 2020 with the gazetting of several Game Reserves as National Parks. However, Hunting Areas still cover nearly a quarter of Tanzania's surface. Many if not most

Hunting Areas are not viable for other conservation options such as eco–tourism due notably to remoteness, lack of scenery and poor visibility of wildlife compared to the top National Parks.

Hunting tourism is an important and organized sector in Tanzania. For the 2013–2018 period, out of 164 Hunting Areas, 149 were awarded to 60 hunting companies. However, there was considerable financial pressure during this period due to adverse publicity regarding sport hunting, and the impact of hunting bans on elephant and lion trophy imports to the USA, Europe and Australia (TAWA, 2019). With fewer hunting clients visiting Tanzania than in previous years, hunting tourism revenues dropped from €44 million in 2008 with 1673 hunters (Booth, 2010) to €28.3 million in 2014 with 708 hunters (Booth, 2017). When the cost of maintaining Hunting Areas became higher than the income, many hunting companies returned their Hunting Areas to the wildlife authorities. By the end of 2018, 81 Hunting Areas were handed back, representing slightly less than 130,000 km² (approximately 52 per cent) of the area set aside for hunting (TAWA, 2019).

This downtrend also impacted buffalo conservation in two contrasting ways. First, when the Hunting Areas formerly leased for hunting were abandoned, these 13 million ha of wilderness became vacant, and hence were exposed to poaching and encroachment by other land uses detrimental to the environment. Highly susceptible to these threats, buffalo became a collateral victim of the bans on the importation of hunting trophies directed at elephants and lions, two species listed on CITES Appendices. Second, as the buffalo is not a CITES-listed species, the bans turned the buffalo, once considered a secondary game species, into a first-choice species for hunters travelling to Tanzania. The character of the Tanzania hunting industry has changed over the last 10 years from being a 'big four' game hunting destination to one that is now heavily dependent on leopard and buffalo (TAWA, 2019).

However, although the trophy fee for buffalo is cheaper than that of the flagship game species, buffalo remains the first tax-earning species in this country due to the larger number harvested: in 2019/2020, the trophy fees (€2080 per buffalo) of 737 buffalo hunted in 77 Hunting Areas earned €1.53 million, to which all other revenue sources should be added, that is hunting block fees, licences, daily fees (Wildlife Division, personal communication).

Over eight years between 2012 and 2020, the average national annual quota was 1681 buffalo/year (1456–2130), and the average national annual offtake was 781 buffalo hunted/year (625–940) for a national

annual offtake rate of 46.3 per cent (41.7–56.8; Wildlife Division, personal communication). A yearly offtake of 781 individuals represents an annual taking of about 0.3 per cent of the roughly evaluated 250,000 buffalo population in Tanzania (see Chapter 4 for actual best estimates).

Southern Africa

In Southern Africa, there are six countries with legal hunting tourism, and the Cape buffalo is a major game. In Botswana, buffalo hunting was resumed in 2020. Hunting is organized in registered Hunting Areas covering 75,000 km² (13 per cent of the country) for an annual revenue of €40 million in 2012 (Di Minin et al., 2016). In Zambia, buffalo is a major game species for 36 hunting concessions within Game Management Areas covering 170,000 km² (23.6 per cent of Zambia; Snyman et al., 2021). In Zimbabwe, hunting is undertaken in 78,000 km² (20 per cent of the country) and generated €24.4 million revenue in 2015 (Chitauro, 2016 in Snyman et al., 2021). Buffalo is an important game outside the central plateau in both State land and in the 10 CAMPFIRE communal areas. In Mozambique, buffalo is also a major game species for the various categories of Hunting Areas (*Coutadas*, *Fazendas do bravio*, etc.) covering 135,000 km² (17 per cent of the country) (Di Minin et al., 2016). In Namibia, buffalo hunting is restricted to the Caprivi strip because existing veterinary policies prevent the reintroduction of buffalo, although it is a key species for tourism and safari hunting (Lindsey et al., 2013). Hunting is a major driver of the wildlife-based tourism in Namibia, with €26.6 million direct revenue in 2016 (Snyman et al., 2021) over 287,000 km² (Lindsey et al., 2013). Hunting is undertaken in two land categories: (i) communal conservancies (86 of them in 2021 cover 166,000 km², i.e. 20.2 per cent of Namibia), which collect 100 per cent of the hunting fees (€2.3 million in 2018) in their 48 hunting concessions (Snyman et al., 2021); and (ii) private game ranches (so-called 'freehold lands'), which contain 21–33 times more wildlife than Protected Areas (Snyman et al., 2021).

South Africa has the largest African hunting industry in terms of numbers of operators, visiting hunters, animal collected, and revenues generated (Lindsey et al., 2007). South Africa also hosts the highest number of buffalo in southern Africa, yet with a peculiar situation that contrasts sharply with the rest of the continent: there are no free-ranging buffalo in this country, all of them being enclosed, so that buffalo are always hunted behind fences (Chapter 13). Hunting Areas there are hence considerably smaller in size than anywhere else in Africa, largely due to the

requirement for fencing (Taylor et al., 2020). The average size of a game ranch is slightly less than 3000 ha (Cloete et al., 2015), that is in the order of between 10 and 100 times smaller than Hunting Areas in the rest of Africa (e.g. the average size of the 17 Hunting Areas of Niassa Special Reserve in Mozambique is 2486 km²). Overall, Hunting Areas cover 150,000 km² in South Africa, that is 12 per cent of the country (Snyman et al., 2021). Since the Game Theft Act of 1991, properly fenced wildlife in South Africa is the property of the landowner, a situation almost non-existent in most other African countries. This ownership of wildlife allowed the private sector to develop a dynamic wildlife industry providing substantial benefits to local and national economies (Snyman et al., 2021). For half of the nearly 10,000 game ranches, hunting is a source of income, and for 30 per cent of them hunting is the main source of income (Nel, 2021).

Buffalo in South Africa is a typical example of a high-value species producing high income from a very low percentage of the population harvested. It does not appear on the list of the 10 most hunted game species in South Africa (NWU, 2017 in Snyman et al., 2021), yet it is the top income-earning species with €13.2 million generated in 2016 and €9.2 million in 2019 (South African Professional Hunters statistics, 2019), well ahead of the second high-value game species, sable (*Hippotragus niger*).

Since the amendment in 2019 of the Animal Improvement Act of 1998, buffalo are legally subject to selection programmes for enlarging and reshaping their horns in order to raise their commercial value for live sales and hunting trophies (e.g. the first 50-inch-wide trophy live bull in South Africa was auctioned at an all-time record for buffalo of €10.5 million). The selection methods combine (i) extreme inbreeding among the most desired individuals and (ii) outbreeding with East African buffalo, which have greater horn spread than South African buffalo. Whether this development is a matter of manipulated genetic engineering or the restoration of historic natural genetic integrity is an issue of tense debate, including in the international arena (IUCN SSC Antelope Specialist Group, 2015; IUCN WCC, 2016). There is considerable concern about the negative genetic consequences of intensive selective breeding of wildlife, as well as about the image and tourism economy of South Africa (e.g. Selier et al., 2018; Russo et al., 2019; Somers et al., 2020). Game ranching in South Africa is certainly a success story in many ways (socioeconomic, rewilding, recovery of endangered species, etc.; Chapter 13), for example there are roughly three times more wildlife in private game ranches than in the National Parks

(Kitshoff-Botha, 2020). The sustainable-use approach of wildlife ranching has furthermore proved to be a legitimate way to conserve biodiversity, and one that may even be advisable for other African countries to be considered (Taylor et al., 2020). However, a great many stakeholders and observers disapprove of the creation of so-called 'superior' bigger trophy animals, as well as of introducing exotic taxa and canned or put-and-take hunting (Snyman et al., 2021).

Administration and Management of Buffalo Hunting

Legal Framework at a Glance

International Scene

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) does not list the African buffalo in any of its Appendices of protected animals (CITES, 2022). No CITES Party has passed stricter domestic measures for the African buffalo to date. For example, the European Union does not list this species in the Annexes of the EU Wildlife Trade Regulations (European Commission, 2010), and the USA do not include this species in the list of foreign species of its Endangered Species Act (ESA) (US Fish and Wildlife Service, 2022). Therefore, international trade of buffalo and their parts including trophies is not subject to specific controls beyond general custom, wildlife and veterinary regulations. In 2022, the African buffalo is listed in the 'Near Threatened' Category of the IUCN Red List, the second lowest category on the risk scale (IUCN SSC Antelope Specialist Group, 2019). Thus far, the Red List does not distinguish between buffalo subspecies, a matter for discussion as the conservation status of each subspecies is evolving differently (Chapter 4).

National Settings

Each buffalo range country has established its own environmental legislation with an array of laws and regulations to protect and manage biodiversity. All of the countries that allow the legal hunting of buffalo have set their respective permit systems with precise rules, so that hunting buffalo without the proper licences is taken as poaching and subject to penalties. In most countries, the rules, taxes and fees are different between citizens, resident expatriates and foreigners. The cost to hunt a buffalo is much higher for foreign hunting tourists than for citizens.

Costs consist of government levies, payments for the services of safari operators and royalties or retention schemes for local communities and landowners (Hurt and Ravn, 2000). The revenues generated by buffalo hunting provide incentives for (i) the State to preserve the national network of Protected Areas, and (ii) communities and landowners to keep game on their lands and avoid landscape conversion into alternative land uses that are environmentally unfriendly.

Monitoring Buffalo Hunting

Monitoring is an essential process for the assessment of population trends in evaluating the conservation status of species at multiple scales over time. For management purposes, monitoring helps determine whether an intervention like hunting is on track to meet its objective and, if not, when, where and how changes may need to be made (Bell, 1983, 1984; CSIR, 1983; Martin, 1984).

Monitoring Buffalo Populations

Knowing how many animals there are in a given area at different times helps to measure the population trend. However, this is not simple, and a selection of appropriate methods and techniques (Collinson, 1985) is crucial, underpinned by clear objectives and a decision-making process (Caughley, 1977). While the aerial survey is often the method of choice in open savanna landscapes (Norton-Griffiths, 1978), it is not appropriate for forest or savanna–forest mosaics. However, as a herding species, buffalo are usually non-randomly distributed in clusters, which makes the count less reliable than for more evenly distributed species (Norton-Griffiths, 1978; Taylor and Mackie, 1997). Nevertheless, the aerial survey (with photography) remains the most cost-effective approach in large savanna landscapes (1000–10,000 km² and above). Ground counts using distance sampling methods (Buckland et al., 2001), also referred to as road strip or line transect counts, are also used either on foot or in vehicles, including for community-based game counts (NACSO, 2021).

Counting buffalo in forest landscapes is much more tedious and time- and money-consuming, using either transect surveys (line, recce or strip transects) or point sampling in, for example, forest clearings. More recently, camera traps have been utilized to assess densities by using distance sampling methods (Hofmeester et al., 2017; Howe et al., 2017). Another method, the Pooled Local Expert Opinion (PLEO) method, is

based on traditional knowledge. A number of local hunters are asked to estimate wildlife abundance in a specified area, after which densities are calculated per species, and the estimates are pooled and extrapolated for the whole area (Van der Hoeven et al., 2004). Using citizen science and local communities as resource managers contribute to improving conservation monitoring (Rigava et al., 2006; Keeping et al., 2018).

Quota Setting for Hunting

The primary objective of monitoring a hunted population is to assess the demographic trend in that population in order to set hunting quotas that allow sustainable hunting. However, detecting trends on a regular basis is often fraught with the difficulty of making decisions based on inadequate and/or imprecise data (Taylor, 2001). Consequently, it is important to consider multiple sources or lines of evidence that can provide more robust data or information on the species being hunted. In addition to survey data, other indices of abundance should be used as well as the local knowledge of multiple stakeholders ultimately involved in the management and use of the species. Fortunately, the buffalo lends itself comparatively easily to this approach.

In a number of African countries, annual trophy hunting quotas are still set by the wildlife management authorities as a percentage of the total population size of the given species, for example 1–2 per cent of the buffalo population size. However, such a method appears impractical in most African conditions where population sizes are usually either unknown or imprecisely known or not updated on a yearly basis (Bell, 1984). Quota-setting methods relying on wildlife censuses face serious limitations because estimating the density or population size of large herbivores with high precision and accuracy is difficult, especially over large areas, and requires considerable investment of time, people and money (Morellet et al., 2007). In these situations, it is meaningless to attempt to set quotas on a percentage basis, and it is preferable to set quotas either (i) by specifying biological rules such as minimum trophy size or age of individuals to be taken (Morellet et al., 2007) and/or (ii) by adjusting quotas according to participative assessments of population trends (WWF, 1997, 2000) as has been done with success for decades in several southern African countries as well as in North America and Europe.

The quota-setting method based upon trends requires the involvement of an 'extended peer community' consisting of those with a stake in the issue of concern (Funtowicz and Ravetz, 1993). This is counter

to conventional wisdom, which seeks to maintain centralized control (Bell, 1987). Failure to integrate knowledge held among all stakeholders undermines effective resource management (Hulme and Taylor, 2000). Participatory quota setting for the harvesting of wildlife species reflects a relatively recent departure from the conventional norm, whereby local resource managers become active participants in an adaptively managed process with greater devolution of responsibility and accountability (Taylor, 2001; Rigava et al., 2006).

The Participatory Quota-Setting Process

The process should ideally bring together all of the parties involved in establishing a quota and its subsequent use. Typically, this would include wildlife authority managers and ecologists, land occupiers (farmers or resource managers), safari operators and hunters, local communities and even hunting trackers as applicable, regardless of background, education or training. Each stakeholder brings different sets of information, recognizing the importance and value of the information and its source. The use of a facilitator provides greater understanding and demystifies the process of establishing and using a quota. This information provides a set of matrices that can be triangulated. Triangulation comprises an iterative process of examining, assessing and sense-making of information, which results in a reliably informed decision being made (Greyson, 2018). Trend data are assembled by participants and graphically represented for each species and entered into the matrix. The current quota is assessed against the available data and information, and the proposed quota adaptively determined using the full set of indices (Table 16.3). The proposed quota can be submitted to the regulatory wildlife authority for review and approval with or without adjustment, and subsequently used by the safari operator in the coming hunting season.

Monitoring Buffalo Hunts

Hunting during the season is monitored by representatives of the stakeholders and in compliance with applicable laws and regulations as required by specific countries. Regardless of such requirements, completion of a 'Hunt Return Form' (HRF) is essential. This is a crucially important monitoring tool that captures key biological and economic variables associated with every individual hunt. At the end of the hunting season, the set of HRFs collected per hunting area is analysed and

Table 16.3 *An example of the participatory triangulation matrix summarizing the trends in key indicators for individual species in view of proposing new hunting quota.*

Species (males only)	Current quota (Year N)	Aerial survey grounds	Ground count trends	Trends from other monitoring methods	Trophy quality trends	Catch-effort	Illegal activity	HWC and PAC	Other type of info	New quota (Year N + 1)
Greater kudu	8	⇔	⇔	UNK	⇔	⇓	⇐	⇐	X	6
Buffalo	10	⇐	⇔	UNK	⇓	⇔	⇔	⇒	X	8
Impala	20	⇐	⇐	UNK	⇔	⇐	⇔	X	X	20
Other species	...	...	...	...	...	...	...	...	...	...

X, information not available or irrelevant; UNK, information unknown; HWC, human–wildlife conflict; PAC, problem animal control. ⇑, indicator shows a population increasing trend; ⇓, indicator shows a population decreasing trend; ⇔, indicator shows a stable population.

used at both national and hunting area levels for the establishment of further sustainable hunting quotas. Subsequent data analysis provides insights into trends in quotas, offtakes, trophy quality and assessments of 'catch–effort' (Grobbelaar and Muselani, 2003).

Using Quotas for Buffalo

Hunting quotas for buffalo are only set for adult males, ideally old ones. Neither females nor subadult males are hunted by trophy hunt–ers. However, hunting buffalo for trophies is challenged by the fact that the size of the trophy does not well reflect the age of the individual because the horns of old buffalo tend to wear down (Grobbelaar and Muselani, 2003). The largest trophies are thus obtained from animals at or just above middle age, which coincides with the age at which males are breeding bulls. Males aged 5–10 years constitute the breeding cohort, a period when they wear their largest horns. Moreover, trophy males have to be replaced by maturing younger males in order to have trophies available in the next seasons. Trophy hunting will be unsustainable if inappropriate hunting practices take place that remove these younger males in their prime instead of harvesting the oldest bulls. For this reason, trends in trophy quality and age should be carefully monitored (Crosmary et al., 2013).

Trophy Quality

For most species, trophies only represent a small fraction of the older adult males in the population, mainly after their breeding time, and therefore a very small proportion of the total population. Removing this segment of the population does not impact the survival of the population because no females are hunted and only a tiny proportion of the old males are harvested as trophies. However, selection pressure on bulls actively breeding can impact on characters in a population such as horn length. Removing breeding animals with superior horns can possibly result in a decrease in such specimens in the population, and increase specimens with inferior horns (Crosmary et al., 2013). Therefore, trophy quality should be monitored per hunting area per hunting season. The trophy quality is indexed by the trophy size of hunted individuals.

The Rowland Ward (RW) system of measurement, founded in 1870, has been the traditional method for measuring hunting trophies, for example 30th Edition for Africa in 2020 of Rowland Ward's Records
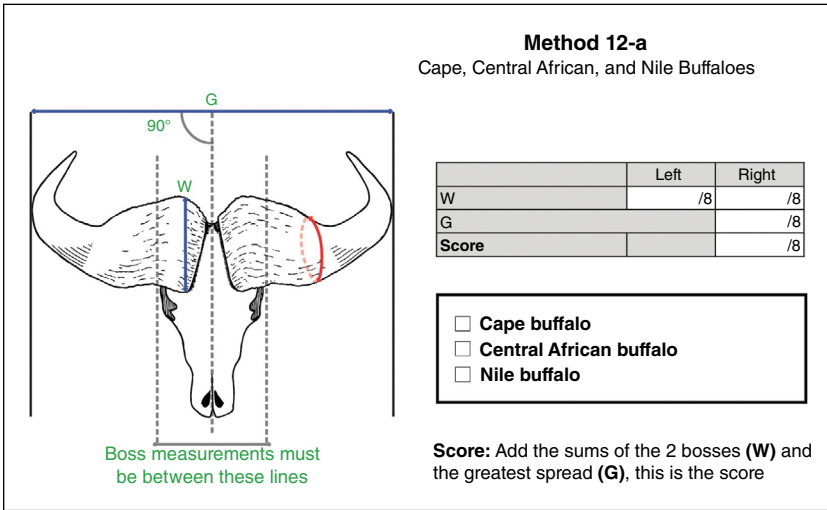
Figure 16.3 Method for measuring the trophies of Cape, Central African and Nile buffalo according to Rowland Ward's Records of Big Game, Rowland-Ward-Method-12-a-Cape.pdf (rowlandward.org). Illustration reproduced from © RowlandWard.org with permission.

of Big Game (Rowland Ward, 2020). In 1977, North American trophy hunters introduced the Safari Club International (SCI) Record Book of Trophy Animals (SCI, 2022) with a measurement system built upon the original RW system, but nonetheless quite different. For buffalo, the RW system measures the greatest outside spread of the horns, which is not affected by the wear of the horns (RW method 12-a for Cape, Central African and Nile buffalo, rowlandward.org; Figure 16.3). Note that RW uses a different method (12-b) for West African and Dwarf buffalo. The SCI system measures the so-called 'tip to tip length of the horns' following the curves all along both horns, which is obviously much affected by the horns' wear (SCI method 4 for African buffalo, safariclub.org). Thus, by penalizing worn horns, the SCI system encourages hunters to hunt younger breeding bulls with longer tip-to-tip lengths (Grobbelaar and Muselani, 2003; Taylor, 2005). Using Taylor's (1988) predictive tooth wear and age relationship, and relating this to trophy score with both RW and SCI systems (Taylor, 2005), it is clear that the SCI scoring system favours the attributes of younger individuals and leads to rates of offtake that are too high for sustaining trophy quality. The Namibian Professional Hunters Association is considering adopting an Age–Related Measuring System that scores according to age

in addition to other criteria, and where immature animals are disqualified (NAPHA, 2021).

While determining the age of individual hunted animals provides an additional refinement to monitoring, it can also be considered as a further imposition on safari operators, professional hunters and their hunters. However, where there may be concern over sustainability and possible diminishing trophy size, the measurement of the first molar tooth for age determination of hunted buffalo (Taylor, 1988) should be implemented as part of good adaptive management. This will necessitate the proper collection, labelling and storing of lower jaws (mandible).

Overall and simply, when hunting a male trophy buffalo, ideally:

(i) do not hunt buffalo males in herds; rather, hunt males in bachelor groups or individually,
(ii) think RW not SCI when selecting the individual to hunt,
(iii) select the oldest of the old males; however, if none of the bulls is old enough refrain from hunting,
(iv) post-hunt measure trophy using RW should be mandatory and SCI optional,
(v) hunter/hunting guide/hunting operator must determine age of hunted buffalo by extracting the first permanent molar and measuring tooth cusp height.

Strengths and Weaknesses of Buffalo Trophy Hunting

Buffalo Hunting, Conservation and Livelihood

According to IUCN (2016), legal, well-regulated trophy hunting can, and does, play an important role in delivering benefits for both wildlife conservation and for the livelihoods and wellbeing of indigenous and local communities living with wildlife.

Hunting Areas More Than Double the Land Area
Dedicated to Wildlife Conservation
Buffalo hunting tourism is conducted in officially gazetted Hunting Areas proclaimed as such by the law of each country. Hunting Areas are recognized by IUCN as Protected Areas under both IUCN Categories IV and VI. They contribute to the national networks of Protected Areas covering the percentage of a country's surface internationally declared

as set aside by the country as Protected Areas. In sub–Saharan Africa, Hunting Areas cover a minimum area of 1,394,000 km^2, exceeding the area encompassed by National Parks (Lindsey et al., 2007). This means that financial incentives from trophy hunting effectively more than double the land area that is used for wildlife conservation, relative to the area that would be conserved by national parks alone (Lindsey et al., 2007). Hence, trophy hunting sustains these immense wilderness areas acting as biodiversity reservoirs, carbon sinks and ecosystem service providers.

The large proportion of Hunting Areas that neighbour National Parks act as buffer zones amortizing the human pressure from outside. Many Hunting Areas are also the last ecological corridors linking National Parks that otherwise would become conservation islands in a human landscape devoid of wildlife. In the final analysis, Hunting Areas are the 'last frontier' of buffalo and large wildlife outside National Parks. Typical examples are two buffalo strongholds: the three National Parks (W, Arly, Pendjari) of the transboundary WAP complex (Benin, Burkina Faso, Niger) in West Africa, and the three National Parks (Faro, Bénoué, Bouba Ndjidda) of northern Cameroon in Central Africa. These National Parks are all embedded in Hunting Areas that also link the parks together with no discontinuity.

In South Africa and Zimbabwe, trophy hunting has been the entry point for the conversion of thousands of livestock ranches to wildlife ranches with the reintroduction of locally extinct species like buffalo and the subsequent multiplication of wildlife populations (Bond et al., 2004; Leader-Williams et al., 2005). Similarly, trophy hunting was the initial driver for local communities to establish the CAMPFIRE programme in Zimbabwe, Community Conservancies in Namibia, Wildlife Management Areas in Tanzania, and Village Hunting Zones in CAR, etc. where wildlife often are more abundant than in neighbouring National Parks. In Mozambique, trophy hunting played an important role in facilitating the recovery of wildlife populations in Hunting Areas after the war (Lindsey et al., 2006) by permitting income generation from wildlife without jeopardizing wildlife population growth (Bond et al., 2004). Buffalo in particular is making a remarkable comeback in this country, with Hunting Areas within Niassa Special Reserve and Marromeu complex as sources of founders for reintroducing locally extinct or depleted buffalo populations in National Parks like Gilé and Zinave (Chardonnet et al., 2017; Fusari et al., 2017; Macandza et al., 2017). Trophy hunting may be a viable alternative for Protected Area-based wildlife conservation in countries or areas where National Parks

fail to protect their wildlife (e.g. Western et al., 2009), in regions of political instability, in remote wilderness areas, or where wildlife densities are low (Lindsey et al., 2006).

Conservation Funding from Buffalo Hunting

Not only are Hunting Areas the only Protected Areas that cost nothing to the State, they also provide funds to the State through leasing taxes, hunting taxes, income taxes, etc. that sustain wildlife administrations and, in several countries, even represent the main source of income for the wildlife administration. In Tanzania, while the funding of TANAPA (Tanzania National Parks, in charge of wildlife within National Parks) mainly comes from park entry fees, 80 per cent of the funding of TAWA (Tanzania Wildlife Management Authority, responsible for wildlife all over the country outside the jurisdiction of TANAPA) comes from hunting tourism (TAWA, 2019). Buffalo is the top tax-earning game in this country (TAWA, 2019), making it crucial for TAWA to maintain all of the Protected Areas other than National Parks in a country where 68 per cent of the Protected Areas rely on income from trophy hunting (Lindsey et al., 2020). In South Africa, becaue buffalo is the top income-earning game species for the hunting tourism sector (DEA, 2016; South African Professional Hunters statistics, 2019), it is a pillar sustaining the privately owned wildlife conservation areas. In this country, trophy hunting contributed more than €341 million and supported more than 17,000 employment opportunities in 2015/2016 (Saayman et al., 2018). In Zimbabwe, 80 per cent of the budget of the Zimbabwe Parks and Wildlife Management Authority comes from tourism, including trophy hunting (Lindsey et al., 2020). In Benin, in 2018, the W National Park ecosystem earned 33 times more money from hunting tourism in the neighbouring Hunting Areas (which provide income to the State) than from photographic tourism within the National Park (which costs the State) with 25 times fewer hunting tourists (19) than photographic tourists (476) (PNW, 2019). In South Africa, in 2013, each foreign leisure hunter spent about €8250, that is about 14 times more than that spent by the average foreign tourist arriving by plane (Oberem and Oberem, 2016). According to Hurt and Ravn (2000), safari hunting produces an income per hectare some seven times higher than that from cattle or game ranching and from far fewer animals harvested. They also reckon that wildlife-viewing tourism can generate even higher returns, but only in areas that are scenic and have very high concentrations of wildlife,

and from massive numbers of tourists (Earnshaw and Emerton, 2000). Lindsey et al. (2012) hold a different view, observing that net returns from livestock in semi-arid African rangelands ($10–30/km^2/year in areas with 400–800 ml of annual rainfall according to Norton-Griffiths 2008) are similar to those from trophy hunting in some areas ($24–164/km^2). However, they conclude that maximizing returns from hunting is key to ensuring the competitiveness of wildlife-based land uses.

Some critiques of the socioeconomic effects of trophy hunting suggest that its contributions to country-level gross domestic product (GDP) are small relative to non-hunting wildlife tourism (Ghasemi, 2021). 't Sas-Rolfes et al. (2022) disagree, arguing that the claim is misleading because national GDP contributions are a poor indicator in terms of both broader socioeconomic relevance and appropriate scale of analysis: (i) GDP metrics fail to consider essential ecosystems services and natural capital (Costanza et al., 1997) and (ii) nation states are an arbitrary level at which to make such assessments. More relevant are the global benefits of effective species conservation and ecosystem services provided by intact habitats, functionally populated with large game, and the more localized benefits that flow to specific rural landowners and communities, who are thereby incentivized to actively support conservation ('t Sas-Rolfes et al., 2022).

Overall, hunting tourism drives a virtuous chain with financial flows of hard currency originating from developed countries (tourist-emitting countries) and directed to developing countries (tourist-receiving countries), from wealthy individuals to poorer people, and supporting vast conservation areas and local communities, as well as providing States of the South with revenues from their renewable natural resources.

Buffalo Hunting Sustaining Livelihood

When sustainable, consumptive utilization of wildlife can promote conservation beyond the borders of National Parks while at the same time generating revenue for local communities (Crosmary et al., 2015a). Where properly managed, trophy hunting can provide income for impoverished and often landlocked rural communities (IUCN, 2016), that is royalties, employment, venison, community infrastructures, social services, etc. Namibia is one of the best examples in this regard, well ahead of many other countries. Trophy hunting finances the budgets of 82 communal conservancies, which cover ~20 per cent of the country (162,000 km^2) and encompass ~189,000 community members, or 9 per cent of Namibia's

population (Naidoo et al., 2016). However, a number of other countries or areas are not as successful for various reasons, for example when the benefits from hunting are captured by local elites (Leader–Williams et al., 2009) or when the benefits are substantial at the community level but too small at the household level. In northern Cameroon, Mayaka et al. (2005) proposed a series of recommendations to improve the benefits of wildlife harvesting, notably by increasing the return to local communities for resource custodianship. In the same area, Akito Yasuda (2011) pointed out that while sport hunting certainly generates tax revenues and provides profit sharing and employment opportunities to local communities, the latter two are too limited and inequitably distributed in the community. Similarly, in south–eastern Zimbabwe, Poshiwa et al. (2013) described the benefits of wildlife tourism but emphasized their limited magnitude. Because high levels of poverty (Matseketsa et al., 2022) and poor governance, such as the leakage of hunting revenues for communities (Burn et al., 2011), are powerful drivers to poaching by local communities, the allocation of sufficient benefits of Hunting Areas to communities is an absolute critical factor for a successful deal between the local community (living on the land), the State (owning the land) and the hunting operator (protecting and valorizing the land).

Access to natural resources is also important for the livelihoods of local communities. In northern Cameroon, populations complain that locals' rights over natural resource use are regulated (Akito Yasuda, 2011). However, while National Parks are strict exclusion areas for local communities, most Hunting Areas are less stringent and allow for some activities by local communities, such as harvesting firewood and non–timber forest products.

Finally, concerns about the negative cultural and environmental impacts of tourism are growing with mass wildlife tourism in Africa (Spenceley, 2005; Lindsey et al., 2007), for example in the Okavango Delta, Botswana (Mbaiwa, 2003). However, due to their very small number, the impacts of hunting clients, such as habitat conversion for infrastructure development and all sorts of pollution, are considerably lower compared to mass tourism.

Threats to Buffalo Hunting

Ill-Managed Hunting Undermines Well-Managed Hunting
There have been and there are cases of hunting poorly conducted by some hunting operators and of hunting sectors poorly regulated by some

wildlife administrations (IUCN, 2016). A variety of problems may hamper the proper functioning of the hunting tourism industry and undermine the conservation role of sustainable wildlife utilization, for example depending on countries, poor governance of the hunting sector (Burn et al., 2011), lack of professionalism in the administration and control of the hunting activity (Booth and Chardonnet, 2015) and risk of corruption (Leader-Williams et al., 2009). We concur with Lindsey et al. (2007) that the inequitable distribution of hunting revenues represents the most serious threat to the long-term sustainability of the industry. In some countries, there is insufficient sharing of hunting taxes by government administrations reluctant to decentralize and empower communities. Too often, benefits are centralized into the hands of elites or captured by local rulers so that promises from trophy hunting fail to materialize at the grassroots level (Nelson et al., 2007). In a number of situations, the management of Hunting Areas certainly needs to be improved. One failure, for example, is the reduction of anti-poaching activity outside the hunting season. Another is the lack of proper monitoring by hunting operators, which weakens their credibility and constraints the sustainability of the activity (Selier and Di Minin, 2015). Nevertheless, all of these problems are far from being specific to the hunting industry, they are also fully shared by other industries, including photographic ecotourism (Christie and Crompton, 2001; Walpole and Thouless, 2005). Finally, poorly managed trophy hunting can cause local wild population declines (Packer et al., 2011). However, in the case of buffalo, no example is known of a buffalo population driven to extinction by hunting tourism, while poaching is well recognized as being responsible for many local extinctions across the buffalo's range.

Hunters Their Worst Enemies?

While the hunting community is certainly skilled, with a great deal of field experience and knowledge of the bush, members rarely produce or publish peer-reviewed scientific articles which nevertheless largely make the basis of conservation politics. Moreover, a number of hunting professionals tend to be reluctant to seek the collaboration of scientists. As a result, reliable standardized data on the hunting sector are certainly missing (Lindsey et al., 2007; Snyman et al., 2021). This situation appears detrimental to the hunting industry at a time it badly needs more science in all sorts of domains, for example biological, socioeconomic, management. In Western Zimbabwe, Crosmary et al. (2015b) showed

that harvested populations of large herbivores in trophy Hunting Areas may perform as well, and sometimes even better, than in National Parks where trophy hunting is not authorized. However, Buckley and Mossaz (2015) pointed out that this study represented only one example, concluding that more studies are needed to understand the benefits of hunting tourism to wildlife conservation. Crosmary et al. agree and concur with Selier and Di Minin (2015) that scientists are needed to establish long-term wildlife monitoring systems that also integrate the social and financial benefits of trophy hunting for local communities.

There is probably some kind of misunderstanding on the part of hunting stakeholders, who find it difficult to accept critics in a polemic context. However, and counterintuitively, the hunting activity holds a broad set of very strong assets in favour of conservation, not only of the hunted game, but also of non-game species and their habitats, of the entire biodiversity in fact (fauna and flora), of all ecosystem services, without even talking about the livelihoods of local communities. In other words, hunters are poor advocates of their achievements. This said, some poorly performing individuals, companies and administrations certainly jeopardize the profession, like in any profession, whether because they lack training, professionalism, ethics or something else. While these kinds of internalities probably affect all sectors, they cannot be hidden in the hunting industry.

Beyond these internalities, there are also powerful externalities that fall beyond the responsibility of the hunting community and severely affect Hunting Areas and the hunting activity. The current hunting industry inherited ancient situations that are no longer suitable today, for example Hunting Areas that are very (too?) large to take care of in view of the fast-growing human population, and which require much more funding than before for their proper management (Scholte et al., 2021). The profession is also facing newly arising tricky situations such as increasing numbers of all sorts of new arrivals claiming to be local communities despite not being indigenous people, more pastoralists with ever larger herds of livestock replacing wildlife in Hunting Areas (e.g. Figure 16.2 in Cameroon; Bouché et al., 2012 and Aebischer et al., 2020 in CAR; Musika et al., 2021 and Musika et al., 2022 in Tanzania), illegal goldminers, wild loggers, without mentioning bandits and even terrorists. Other contemporary constraints are the intense pressure of lobbies promoting commercial crops at all costs, especially the cotton value chain, which are heavily supported by national and international agencies with hardly any exception. Overall, many externalities have appeared on the

scene and reshuffle the game, making hunting work more difficult, less viable and threatening ever more the conservation of natural resources. There is definitely a need to reform the governance and administration of hunting tourism (Booth and Chardonnet, 2015), but given the above-mentioned externalities, the reform should not be considered in isolation (Leader–Williams et al., 2009).

Poaching Versus Hunting
The African buffalo does not give the impression of being a fragile animal. However, it is indeed extremely sensitive to poaching, notably because it is quite easy to stalk on foot provided you strictly approach against the wind. The buffalo shows little resilience under poaching pressure. Poaching means limitless and indiscriminate offtake of any kind of buffalo, whatever sex and age, whereas tourism hunting harvests a tiny percentage of only old bulls (Table 16.4). Legal and illegal hunting are mutually exclusive: where poaching flourishes, hunting tourism deteriorates and even fails. Just like National Parks, Hunting Areas require anti–poaching engagement to be protected and avoid wildlife depletion.

Hunting Bans and the Future of Buffalo
One of the biggest challenges facing the hunting industry is the prescriptive unilateral decision by Western countries to ban imports of hunting trophies from Africa (Ares, 2019), which could have a long–lasting negative impact on many economies, and in turn on conservation, in Africa (Snyman et al., 2021). For local communities in northern Botswana, the safari hunting ban of 2014 led to a reduction of tourism benefits to local communities, for example income, employment opportunities, social services and scholarships. This led to the development of negative attitudes by community-based organizations of rural residents towards wildlife conservation and to an increase in incidents of poaching (Mbaiwa, 2018; Blackie, 2019; Strong and Silva, 2020). For game ranchers and other owners of private conservation areas in South Africa, most believe that the economic viability of their enterprises, biodiversity conservation and the livelihoods of owners and employees would be lost following a hunting ban (Parker et al., 2020). Without hunting activity, most Hunting Areas would no longer protect buffalo, which means that the persistence of buffalo outside of National Parks would be short-lived, as experienced in CAR after the 2012 political events when buffalo was

Table 16.4 *Comparison between poaching and tourism hunting.*

		Illegal unregulated hunting (poaching)	Legal regulated tourism hunting
Wildlife offtake	Species	All wildlife species with value as food or trophy, e.g. ivory, claws, etc.	Only a few selected game species
	Number of individuals	Unlimited	Small % (approx. 1%) of the population
	Sex of individuals	Males and females	Only males (exceptions in South Africa)
	Age of individuals	Any age including calves	Mostly old individuals, often beyond reproductive age
Impacts of the wildlife offtake	For local communities	Meat and other wildlife products	Meat
		Livelihood but with limited income from trade of meat and trophies	Livelihood and formal employment by hunting companies
		Negative impact due to overexploitation leading to depletion of the wildlife resource	According to countries: share of the taxes (% of leasing tax, trophy fees, etc.), royalties
		Conflict with law enforcement leading to fines and prison sentences	Community infrastructures and services (schools, dispensaries, wells, etc.)
	For illegal wildlife traders	High financial gains	No business
	For the Government finances	Negative impact due to absence of revenue from the activity	Taxes (income tax, etc.)
	For the wildlife administration	Negative impact due to the cost of anti-poaching	Taxes (leasing fees for hunting areas, trophy fees, hunting permits, operating licenses, etc.)

For the private sector	Negative impact due to the cost of anti-poaching and the depletion of the wildlife resource	Return from daily fees, paid hunting services
For the national network of Protected Areas	Negative impact due to the degradation of the Protected Areas	Hunting Areas as Protected Areas of the IUCN Cat. VI are maintained by the income of hunting tourism (ecotourism rarely viable in these areas)
For animal welfare	Long death and suffering for animals caught by snares, gin traps, pits or other trapping devices	Instant death in most cases
For the conservation of biodiversity	Negative impact due to the degradation of the wildlife conservation status leading to loss of biodiversity	Improved conservation status of (i) the few income-generating game species, and (ii) all the non-game species of fauna and flora

one of the first large mammals to disappear from the Hunting Areas (Matthieu Laboureur, personal communication). With the authoritarian restrictions by Western countries on imports of elephant and lion hunting trophies from Africa, many Hunting Areas were returned to the governments in Tanzania and Zambia. Without funding or surveillance, these areas are left to poaching, greatly impacting the fate of buffalo.

Hunting trophies import bans dictated by some northern countries without an alternative global conservation framework providing conservation incentives will likely reverse the gains in wildlife conservation and rural development in some southern countries where sustainable utilization is an integral part of the wildlife conservation practice (e.g. Di Minin et al., 2016; Dickman et al., 2019; Nyamayedenga et al., 2021). Where trophy hunting is planned to end, alternatives should be implemented to avoid land conversion and biodiversity loss in Hunting Areas (Di Minin et al., 2013). However, most of these areas appear unsuitable for alternative wildlife-based land uses such as photographic ecotourism because of, for example, difficult and expensive access, absence of infrastructure, lack of attractive scenery and of high densities of viewable wildlife (Wilkie and Carpenter, 1999; Lindsey et al., 2006; Winterbach et al., 2015). IUCN (2016) states that unless better land-use alternatives exist, hunting reforms should be prioritized over bans, while such reforms have proved effective (Booth and Chardonnet, 2015; Begg et al., 2018).

Surprisingly, bans and restrictions on importing hunting trophies of game species listed on CITES Appendices diverted the attention of the hunting industry to buffalo, a non-CITES-listed species. While becoming a new focus, the buffalo has either reinforced or taken the lead as a flagship game in an attempt to compensate the loss of CITES-listed game, even though it does not attract as much income. Buffalo hunting does not draw much public awareness, in contrast with the hunting of the four other representatives of the Big Five, a bit like the wild boar in Europe compared to red deer or chamois. Therefore, the less-charismatic member of the Big Five is now gaining more importance for sustaining Hunting Areas and for wildlife conservation outside National Parks. In other words, from a commodity game, buffalo is turning out to be a high-value game species.

In 2021, Van Houdt et al. surveyed international networks to investigate the divergent views on trophy hunting in Africa. Unlike European respondents, African respondents showed significantly more support for trophy hunting and, unlike North Americans, African respondents supported external subsidies of wildlife areas presently funded by hunting.

Oddly, while Europeans and North Americans carry out trophy hunting in their own countries, they tend to oppose it in African countries. The inquiry concluded that policies on African hunting should better integrate African perspectives, in particular those of rural communities (Van Houdt et al., 2021). While opponents to hunting tourism in Africa often qualify this activity as a colonial relic, it cannot be denied that most Protected Areas have deep roots in the colonial period, either National Parks for wildlife viewing tourism or Hunting Areas for hunting tourism, 'but that makes it even more important that today, the decisions-making and rights of African countries and communities are respected; Westerners must not continue to externally impose their own ideals upon Africans, such as pushing trophy hunting bans and restrictions' (Dickman et al., 2021). A group of African countries called for a 'New Deal' for rural communities (Southern Africa Trust, 2019) that allows them to achieve the self-determination to sustainably manage wildlife and reduce poverty. Dickman et al. (2019) stated that it is incumbent on the international community not to undermine that. More recently, in response to the call of a UK parliamentary committee in 2022 for ending trophy hunting in Africa (but not in the UK), the Community Leaders Network of Southern Africa responded: 'It's a form of colonialism to tell us Africans what to do with our wildlife' (Louis, 2022).

References

Adam, S.A.M. (2019). *Impact of some wildlife offenses on wild animals and their habitats in selected states in Sudan and Dinder Biosphere Reserve during 2013–2017.* MSc thesis, Sudan University of Science and Technology, College of Animal Production Science and Technology, Khartoum.

Adeola, M.O. (1992). Importance of wild animals and their parts in the culture, religious festivals, and traditional medicine of Nigeria. *Environmental Conservation* **19**: 125–134.

Aebischer, T, T. Ibrahim, R. Hickisch, et al. (2020). Apex predators decline after an influx of pastoralists in former Central African Republic hunting zones. *Biological Conservation* **240**: 108326.

Alarape, A.A., R.B. Shuaibu and Z.B. Yaduma (2021). The impacts of bushmeat exploitations on the conservation of wildlife in Nigeria. *Asian Journal of Social Science and Management Technology* **3**: 84–94.

Anderson, J. (2017). The natural history and management of the Cape buffalo. In P. Flack (Ed.), *Hunting the African Buffalo. Nature's Debt Collector − The Six Subspecies.* South Africa: Peter Flack Productions.

Ares, E. (2019). Trophy hunting. House of Commons Library Briefing Paper Number 7908: https://researchbriefings.parliament.uk/ResearchBriefing/Summary/CBP-7908

Atta A.C.-J., O. Soulemane, B. Kadjo and Y.R. Kouadio (2021). Some uses of the African buffalo *Syncerus caffer* (Sparrman, 1779) by the populations living around the Comoé National Park (North-East Ivory Coast). *Journal of Animal and Plant Sciences* **47**: 8484–8496.

Baldus, R. (2009). *A Practical Summary of Experiences after Three Decades of Community-Based Wildlife Conservation in Africa: "What are the Lessons Learnt?"* Budapest: joint publication of FAO and CIC.

Baldus, R. and A. Cauldwell (2004). Tourist hunting and its role in development of wildlife management areas in Tanzania. In: *Proceedings of the 6th International Game Ranching Symposium*, Paris, 6–9 July 2004. Paris: Office National de la Chasse et de la Faune Sauvage.

Batumike, R., G. Imani, C. Urom and A. Cuni-Sanchez (2021). Bushmeat hunting around Lomami National Park, Democratic Republic of the Congo. *Oryx* **55**: 421–431.

Begg, C.M., J.R. Miller and K.S. Begg (2018). Effective implementation of age restrictions increases selectivity of sport hunting of the African lion. *Journal of Applied Ecology* **55**(1): 139–146.

Bell, R.H.V. (1983). Decision making in wildlife management with reference to problems of overpopulation. In R.N. Owen-Smith (Ed.), *Management of Large Mammals in African Conservation Areas*. Pretoria: Haum.

Bell, R.H.V. (1984). Chapter 11, Carrying capacity and off-take quotas. In R.H.V. Bell and E. McShane-Caluzi (Eds.), *Conservation and Wildlife Management in Africa*. The proceedings of a workshop organized by the US Peace Corps, Kasungu National Park, Malawi, October 1984. Washington, DC: Office of Training and Support Program, Forestry and natural Resources Sector, US Peace Corps.

Bell, R.H.V. (1987). Conservation with a human face: conflict and reconciliation in african land use planning. In D. Anderson and R. Grove (Eds.), *Conservation in Africa: People, Policies and Practice*. Cambridge: Cambridge University Press.

Blackie, I. (2019). The impact of wildlife hunting prohibition on the rural livelihoods of local communities in Ngamiland and Chobe District Areas, Botswana. *Cogent Social Sciences* **5**: 1.

Bond, I., B. Child, D. de la Harpe, et al. (2004). Private land contribution to conservation in South Africa. In B. Child (Ed.), *Parks in Transition*. London: Earthscan, pp. 29–61.

Booth, V.R. (2010). The contribution of hunting tourism: how significant is this to national economies? In *Contribution of Wildlife to National Economies*. Budapest: joint publication of FAO and CIC.

Booth, V.R. (2017). *Economic Assessment of the Value of Wildlife to the Tanzania Hunting Industry*. Dar es Salaam, Tanzania: USAID, USFWS and MNRT.

Booth, V.R. and P. Chardonnet (Eds.) (2015). *Guidelines for Improving the Administration of Sustainable Hunting in sub-Saharan Africa*. Rome: The Food and Agriculture Organization of the United Nations. www.fao.org/3/bo583e/bo583e.pdf

Boratto, R. and M.L. Gore (2018). The bushmeat supply chain in Pointe Noire, Republic of the Congo: a conservation criminology analysis. Report prepared for the Wildlife Conservation Society. Michigan State University, Michigan.

Bouché, P. (2010). *Les Zones Cynégétiques Villageoises du Nord de la République Centrafricaine: 15 ans déjà ! June 2010*. Liege: University of Liege Gembloux Agro-Bio Tech.

Bouché, P, R.N.M. Mange, F. Tankalet, et al. (2012). Game over! Wildlife collapse in northern Central African Republic. *Environmental Monitoring and Assessment* **184**(11): 7001–7011.

Buckland, S.T., D.R. Anderson, K.P. Burnham, et al. (2001). *Introduction to Distance Sampling: Estimating Abundance of Biological Populations*. New York: Oxford University Press.

Buckley, R. and A. Mossaz (2015). Hunting tourism and animal conservation. *Animal Conservation* **18**: 133–135.

Burn, R.W., F.M. Underwood and J. Blanc (2011). Global trends and factors associated with the illegal killing of elephants: a hierarchical Bayesian analysis of carcass encounter data. *PLoS One* **6**: e24165.

Campbell, A. (1995). Historical utilisation of wildlife. In *Proceedings of a Symposium on the Present Status of Wildlife and its Future in Botswana, 7–8 November 1995*. Gaborone: Kalahari Conservation Society and Chobe Wildlife Trust, pp 45–68.

Carruthers, J. (1995). *The Kruger National Park: A Social and Political History*. Pietermaritzburg: University of Natal Press, p. 289.

Caughley, G (1977). *Analysis of Vertebrate Populations*. New York: Wiley-Interscience.

Cawthorn, D.M. and L.C. Hoffman (2015). The bushmeat and food security nexus: a global account of the contributions, conundrums and ethical collisions. *Food Research International* **76:** 906–925.

Chardonnet, P., A. Fusari, J. Dias, et al. (2017). *Lessons Learned from the Reintroduction of Large Mammals in Gilé National Reserve, Mozambique*. Saint-Louis, Senegal: SSIG 17.

Child, G. (2004). Growth of modern nature conservation in southern Africa. In B. Child (Ed.), *Parks in Transition: Biodiversity, Rural Development and the Bottom Line*. London: Earthscan.

Chitauro (2016). Status of the hunting sector in Zimbabwe. Internal report prepared by the Director of Exchange Control on behalf of the Reserve Bank of Zimbabwe. Unpublished.

Christie, I.T. and D.E. Crompton (2001). Tourism in Africa. World Bank Africa Region Working Paper Series Number 12. www.worldbank.org/afr/wps/wp12.pdf

CITES (2022). The CITES species: https://cites.org/eng/disc/species.php

Cloete, F.C., P. Van der Merwe and M. Saayman (2015). *Game Ranch Profitability in South Africa*. Johannesburg: ABSA, pp. 1–192.

Collinson, R (1985). *Selecting Wildlife Census Techniques*. Monograph 6. Durban: Institute of Natural Resources, University of Natal.

Costanza, R., R. d'Arge, R. de Groo, et al. (1997). The value of the world's ecosystem services and natural capital. *Nature* **387**(6630): 253–260.

Crosmary, W.G., A.J. Loveridge, H. Ndaimani, et al. (2013). Trophy hunting in Africa: long-term trends in antelope horn size. *Animal Conservation* **16:** 648–660.

Crosmary, W.G., S.D. Côté and H. Fritz (2015a). The assessment of the role of trophy hunting in wildlife conservation. *Animal Conservation* **18:** 136–137.

Crosmary, W.G., S.D. Côté and H. Fritz (2015b). Does trophy hunting matter to long-term population trends in African herbivores of different dietary guilds? *Animal Conservation* **18:** 117–130.

CSIR (1983). *Guidelines for the Management of Large Mammals in African Conservation Areas*, ed. A.A. Ferrar. Report No. 69, South African National Scientific Programmes. Pretoria: CSIR.

DEA (2016). *Biodiversity and Tourism Lab briefing report*, May 2016. Pretoria: Department of Environmental Affairs.

Dell, B., C. Masembe, R. Gerhold, et al. (2021). Species misidentification in local markets: Discrepancies between reporting and molecular identification of bushmeat species in northern Uganda. *One Health* **13**: 100251.

Dell, B.A.M., M.J. Souza and A.S. Willcox (2020). Attitudes, practices, and zoonoses awareness of community members involved in the bushmeat trade near Murchison Falls National Park, northern Uganda. *PLoS One* **15**(9): e0239599.

De Merode, E. and G. Cowlishaw (2006). Species protection, the changing informal economy, and the politics of access to the bushmeat trade in the Democratic Republic of Congo. *Conservation Biology* **20**: 1262–1271.

DFRC (2018). *Rapports Bilans des campagnes d'exploitation fauniques de la Direction de la Faune et des Ressources Cynégétiques (DFRC) de 2012 à 2018*. Ouagadougou, Burkina Faso: DFRC.

Dickman, A., R. Cooney, P.J. Johnson, et al. (2019). Trophy hunting bans imperil biodiversity. *Science* **365**(6456): 874.

Dickman, A., B. Child, A. Hart and C. Semcer (2021). Misinformation about trophy hunting is wrong. Dead wrong. *Changing America*, Feb. 16, 2021.

Dickson, B., J. Hutton and W.A. Adams (Eds.) (2009). *Recreational Hunting, Conservation and Rural Livelihoods: Science and Practice*. Oxford: Wiley-Blackwell.

Di Minin E., D. MacMillan, P. Goodman, et al. (2013). Conservation businesses and conservation planning in a biological diversity hotspot. *Conservation Biology* **27**(4): 808–820.

Di Minin, E., N. Leader-Williams and C.J.A. Bradshaw (2016). Banning trophy hunting will exacerbate biodiversity loss. *Trends in Ecology and Evolution* **31**(2): 99–102.

Duda, R., S. Gallois and V. Reyes-García (2018). Ethnozoology of bushmeat: importance of wildlife in diet, food avoidances and perception of health among the Baka (Cameroon). *Revue d'ethnoécologie* **14**: 41.

Earnshaw, A. and L. Emerton (2000). The economics of wildlife tourism: theory and reality for landholders in Africa. In: Prins, H.H.T., J.G. Grootenhuis and T.T. Dolan (Eds.). *Wildlife Conservation by Sustainable Use*. Conservation Biology Series, vol 12. Dordrecht: Springer.

Eniang, E., C. Ebin, A. Nchor, et al. (2017). Distribution and status of the African forest buffalo *Syncerus caffer nanus* in south-eastern Nigeria. *Oryx* **51**: 538–541.

Erena, M.G. (2014). The indirect socioeconomic impact of illegal hunting of African buffalo (*Syncerus caffer*) for trophy in East Wollega, Ethiopia. *American Scientific Research Journal for Engineering, Technology, and Sciences* **9**: 64–75.

Erena, M.G., H. Jebessa and A. Bekele (2019). Consequences of land-use/land-cover dynamics on range shift of Cape Buffalo in Western Ethiopia. *International Journal of Ecology and Environmental Sciences* **45**: 123–136.

European Commission (2010). Wildlife Trade Regulations in the European Union. An Introduction to CITES and its Implementation in the European Union. https://ec.europa.eu/environment/cites/pdf/trade_regulations/short_ref_guide.pdf.

FAO/CIG (2002). *Assessment of Bushmeat Trade During The Annual Closed Season on Hunting in Ghana (1st August–1st December 2001)*. Ghana: Food and Agricultural Organization and Conservation International.

Fargeot, C., N. Drouet-Hoguet and S. Le Bel (2017). The role of bushmeat in urban household consumption: insights from Bangui, the capital city of the Central African Republic. *Bois et Forêts des Tropiques* **332**: 31–42.

Foa, E. (1900). De l'océan Indien à l'océan Atlantique. *La traversée de l'Afrique du Zambèze au Congo français*. Paris: Librairie Plon.

Friant, S., W.A. Ayambem, A.O. Alobi, et al. (2020). Eating bushmeat improves food security in a biodiversity and infectious disease "hotspot". *EcoHealth* **17**: 125–138.

Funtowicz, S.O. and J.R. Ravetz (1993). Science for the post-normal age. *ScienceDirect* **25**: 739–755.

Fusari, A., C. Lopes Pereira, J. Dias, et al. (2017). Reintroduction of large game species to Gilé National Reserve, Mozambique. In IUGB 33rd Congress, Montpellier, 22–25 August 2017.

Gaodirelwe, I., G.S. Masunga and M.R. Motsholapheko (2020). Community-based natural resource management: a promising strategy for reducing subsistence poaching around protected areas, northern Botswana. *Environment, Development and Sustainability* **22**: 2269–2287.

Ghasemi, B. (2021). Trophy hunting and conservation: do the major ethical theories converge in opposition to trophy hunting? *People and Nature* **3**(1): 77–87.

Gluszek, S., J. Viollaz and M.L. Gore (2021). Using conservation criminology to understand the role of restaurants in the urban wild meat trade. *Conservation Science and Practice* **3**(5): e368.

Greyson, D. (2018). Information triangulation: a complex and agentic everyday information practice. *Journal of the Association for Information Science and Technology* **69**(7): 869–878.

Grobbelaar, C and R. Masulani (2003). Review of offtake quotas, trophy quality and "catch effort" across four wildlife species: elephant, buffalo, lion and leopard. Unpublished report prepared for WWF SARPO and USAID NRMP II.

Hasler, R. (1996) *Agriculture, Foraging and Wildlife Resources Use in Africa: Cultural and Political Dynamics in the Zambezi Valley*. London: Kegan Paul.

Hegerl, C., N.D. Burgess, M.R. Nielsen, et al. (2017). Using camera trap data to assess the impact of bushmeat hunting on forest mammals in Tanzania. *Oryx* **51**: 87–97.

Hofmeester, T.R., J.M. Rowcliffe and P.A. Jansen (2017). A simple method for estimating the effective detection distance of camera traps. *Remote Sensing in Ecology and Conservation* **3**(2): 81–89.

Holmern, T., E. Røskaft, J. Mbaruka, et al. (2002). Uneconomical game cropping in a community-based conservation project outside the Serengeti National Park, Tanzania. *Oryx* **36**: 364–372.

Holmern, T., S.Y. Mkama, J. Muya, et al. (2006). Intraspecific prey choice of bushmeat hunters outside the Serengeti National Park, Tanzania: a preliminary analysis. *African Zoology* **41**: 81–87.

Howe, E.J., S.T. Buckland, M.L. Després-Einspenner and H.S. Kühl (2017). Distance sampling with camera traps. *Methods in Ecology and Evolution* **8**(11): 1558–1565.

Hulme, D and R. Taylor (2000). Integrating environmental, economic and social appraisal in the real world: from impact assessment to adaptive management. In N. Lee and C. Kirkpatrick (Eds.), *Sustainable Development and Integrated Appraisal in a Developing World*. Cheltenham: Edward Elgar.

Hurt, R. and P. Ravn (2000). Hunting and its benefits: an overview of hunting in Africa with special reference to Tanzania. In H.H.T. Prins, J.G. Grootenhuis and T.T. Dolan (Eds.), *Wildlife Conservation by Sustainable Use*. Conservation Biology Series, vol 12. Dordrecht: Springer.

IUCN (2016). Informing decisions on trophy hunting: A Briefing Paper regarding issues to be taken into account when considering restriction of imports of hunting trophies. Briefing paper April 2016. www.wwf.de/fileadmin/user_upload/IUCN-Informing-decision-on-trophy-hunting.pdf.

IUCN SSC Antelope Specialist Group (2015). IUCN SSC ASG Position Statement on the Intentional Genetic Manipulation of Antelopes Ver. 1.0 (30 April 2015) www.iucn.org/sites/dev/files/import/downloads/asg_igm_posnsment_2015_final_19may_2015.pdf.

IUCN SSC Antelope Specialist Group (2019). *Syncerus caffer*. The IUCN Red List of Threatened Species 2019: e.T21251A50195031. https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T21251A50195031.en.

IUCN WCC (2016). WCC-2016-Rec-100-EN Management and regulation of selective intensive breeding of large wild mammals1 for commercial purposes. https://portals.iucn.org/congress/assembly/motions/print?langua.

Keeping, D, J.H. Burger, O. Keitsile, et al. (2018). Can trackers count free-ranging wildlife as effectively and efficiently as conventional aerial survey and distance sampling? Implications for citizen science in the Kalahari, Botswana. *Biological Conservation* **223**: 156–169.

Kideghesho, J.R., J.W. Nyahongo, S.N. Hassan, et al. (2006). Factors and ecological impacts of wildlife habitat destruction in the Serengeti ecosystem in northern Tanzania. *African Journal of Environmental Assessment and Management* **11**: 17–32.

Kitshoff-Botha, A. (2020). Introduction to the South Africa Wildlife Industry and Wildlife Ranching South Africa. Presented to ALU SOWC MBA students, July 2020.

Leader-Williams, N. and J.M. Hutton (2005). Does extractive use provide opportunities to reduce conflicts between people and wildlife. In R. Woodroffe, S.J. Thirgood and A.

Rabinowitz (Eds.), *People and Wildlife: Conflict or Coexistence*. Cambridge: Cambridge University Press, pp. 140–161.

Leader-Williams, N., R.D. Baldus and R.J. Smith (2009). The influence of corruption on the conduct of recreational hunting. In B. Dickson, J. Hutton and W.M. Adams (Eds.), *Recreational Hunting, Conservation and Rural Livelihoods: Science and Practice*. Oxford: Wiley-Blackwell, pp. 296–316.

Lindsey, P.A. and C. Bento (2012). *Illegal hunting and the bushmeat trade in Central Mozambique: a case-study from Coutada 9, Manica Province*. Harare, Zimbabwe: TRAFFIC East/ Southern Africa.

Lindsey, P.A., R. Alexander, L.G. Franket, et al. (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**: 283–298.

Lindsey, P.A., P.A. Roulet and S.S. Romañach (2007). Economic and conservation significance of the trophy hunting industry in sub-Saharan Africa. *Biological Conservation* **134**(4): 455–469.

Lindsey, P.A., G.A. Balme, V.R. Booth and N. Midlane (2012). The significance of African lions for the financial viability of trophy hunting and the maintenance of wild land. *PLoS One* **7**(1): e29332.

Lindsey, P.A., C.A. Havemann, R.M. Lines, et al. (2013). Benefits of wildlife-based land uses on private lands in Namibia and limitations affecting their development. *Oryx* **47**(1): 41–53.

Lindsey, P.A., G. Balme, M. Becker, et al. (2015). *Illegal Hunting and the Bush-Meat Trade in Savanna Africa: Drivers, Impacts and Solutions to Address the Problem*. New York: Panthera/ Zoological Society of London/Wildlife Conservation Society report.

Lindsey, P., J. Allan, P. Brehony, et al. (2020). Conserving Africa's wildlife and wildlands through the COVID-19 crisis and beyond. *Nature Ecology and Evolution* **4**(10): 1300–1310.

Litjens, J. (2017). *African forest buffalo in the Gamba Complex of Protected Areas Gabon*. MSc thesis, Wageningen University, Netherlands.

Loibooki, M., H. Hofer, K. Campbell and M. East (2002). Bushmeat hunting by communities adjacent to the Serengeti National Park, Tanzania: the importance of livestock ownership and alternative sources of protein and income. *Environmental Conservation* **29**: 391–398.

Long, H., D. Mojo, C. Fu, et al. (2020). Patterns of human–wildlife conflict and management implications in Kenya: a national perspective. *Human Dimensions of Wildlife* **25**: 121–135.

Louis, M.P. (2022). It's a form of colonialism to tell us Africans what to do with our wildlife. Community Leaders Network of Southern Africa. *Daily Mail*, June 29, 2022.

Macandza, V.A., C.M. Bento, R.M. Roberto, et al. (2017). Relatório da contagem aérea de fauna bravia na reserva nacional do Gilé. CEAGRE, FAEF, UEM and ANAC.

Manyanga, M. and G. Pangeti (2017). Precolonial hunting in southern Africa: a changing paradigm. In M. Manyanga and S. Chirikure (Eds.), *Archives, Objects, Places and Landscapes: Multidisciplinary Approaches to Decolonised Zimbabwean pasts*. Mankon, Bamenda: Langaa RPCIG, chapter 12.

Marks, S.A. (1976). *Large Mammals and a Brave People: Subsistence Hunters in Zambia*. Seattle: University of Washington Press.

Martin, R.B. (1984). Goals of conservation and wildlife management. In R.H.V. Bell and E. McShane-Caluzi (Eds.), *Conservation and Wildlife Management in Africa*. Proceedings of a Workshop at Kasungu National Park, Malawi, October 1984. Washington, DC: US Peace Corps.

Matseketsa, G., K. Krüger and E. Gandiwa (2022). Rule-breaking in terrestrial protected areas of sub-Saharan Africa: a review of drivers, deterrent measures and implications for conservation. *Global Ecology and Conservation* **37**: e02172.

Mayaka, T.B., T. Hendricks, J. Wesseler and H.H.T. Prins (2005). Improving the benefits of wildlife harvesting in Northern Cameroon: a co-management perspective. *Ecological Economics* **54**(1): 67–80.

Mbaiwa, J.E. (2003). The socio-economic and environmental impacts of tourism development on the Okavango Delta, north-western Botswana. *Journal of Arid Environments* **54**(2): 447–467.

Mbaiwa, J.E. (2018). Effects of the safari hunting tourism ban on rural livelihoods and wildlife conservation in Northern Botswana. *South African Geographical Journal* **100**(1): 41–46.

MINFOF (2019). *Annuaire statistique 2019 du MINFOF.* Yaoundé, Cameroon: Ministère des Forêts et de la Faune.

MINFOF (2020). *Annuaire statistique 2020 du MINFOF.* Yaoundé, Cameroon: Ministère des Forêts et de la Faune.

Mfunda, I.M. and E. Røskaft (2010). Bushmeat hunting in Serengeti, Tanzania: an important economic activity to local people. *International Journal of Biodiversity and Conservation* **2**: 263–272.

Montcho, M., J.-B. Ilboudo, E.D. Dayou, et al. (2020). Human use-pressure and sustainable wildlife management in Burkina Faso: a case study of bushmeat hunting in Bobo-Dioulasso. *Journal of Sustainable Development* **13**: 60–70.

Morellet, N., J.M. Gaillard, A. Hewison, et al. (2007). Indicators of ecological change: new tools for managing populations of large herbivores. *Journal of Applied Ecology* **44**: 634–643.

Moyo, S., P. O'Keefe and M. Sill (1993). *The Southern African Environment.* London: Earthscan.

Munanura, I.E. K.F. Backman, E. Sabuhoro, et al. (2018). The perceived forms and drivers of forest dependence at Volcanoes National Park, Rwanda. *Environmental Sociology* **4**: 343–357.

Murphree, M. (2000). Community-based conservation, old ways, new myths and enduring challenges. Paper delivered at a Conference on African Wildlife Management, Mweka, Tanzania.

Musika, N.V., J.V. Wakibara, P.A. Ndakidemi and A.C. Treydte (2021). Spatio-temporal patterns of increasing illegal livestock grazing over three decades at Moyowosi Kigosi Game Reserve, Tanzania. *Land* **10**(12): 1325.

Musika, N.V., J.V. Wakibara, P.A. Ndakidemi and A.C. Treydte (2022). Using trophy hunting to save wildlife foraging resources: a case study from Moyowosi-Kigosi Game Reserves, Tanzania. *Sustainability* **14**(3): 1288.

Nachihangu, J., K. Kiondo and J. Lwelamira (2018). Community participation in resident hunting in southwest Rungwa Game Reserve. *Journal of Scientific Research and Reports* **18**: 1–15.

NACSO (2021). www.nacso.org.na/resources/game-count-data

Naidoo, R., L.C. Weaver, R.W. Diggle, et al. (2016). Complementary benefits of tourism and hunting to communal conservancies in Namibia. *Conservation Biology* **30**: 628–638.

NAPHA (2021). Age Related Trophy (ART) Measurement System Manual. Working Group for the Erongo Verzeichnis for African game animals. Namibian Hunting Trophy Measurement System (napha-namibia.com).

Nda, N.F., E.A. Tsi, C. Fominyam, et al. (2018). Status of bushbuck (*Tragelaphus scriptus*) and buffalo (*Syncerus caffer*) in the north and southeastern parts of the Kimbi-Fungom National Park, northwest region of Cameroon. *International Journal of Forest, Animal and Fisheries Research* **2**: 1–25.

Nel, L. (2021). Sustainability in wildlife-based enterprises. The conservation of biodiversity and landscapes: is sustainable use an option? WESSA Lowveld Conference, 4 September 2021.

Nelson, F., R. Nshala and W.A. Rodgers (2007). The evolution and reform of Tanzanian wildlife management. *Conservation and Society* **5**(2): 232–261.

Ndibalema, V.G. and A.N. Songorwa (2007). Illegal meat hunting in Serengeti: dynamics in consumption and preferences. *African Journal of Ecology* **46**: 311–319.

Nieman, W.A., A.J. Leslie and A. Wilkinson (2019). Traditional medicinal animal use by Xhosa and Sotho communities in the Western Cape Province, South Africa. *Journal of Ethnobiology and Ethnomedicine* **15**(1): 34.

NORAD (2008). *Results Management in Norwegian Cooperation: A Practical Guide.* Oslo: Norwegian Ministry of Foreign Affairs.

Norton-Griffiths, M. (1978). *Counting Animals. Handbooks on Techniques Currently Used in African Wildlife Ecology*, 2nd ed. (ed. J.J.R. Grimsdell). Nairobi: African Wildlife Leadership Foundation.

Norton-Griffiths, M. (2008). How many wildebeest do you need? *World Economics* **8**: 41–64.

Nyamayedenga, S., C. Mashapa, R.J. Chateya and E. Gandiwa (2021). An assessment of the impact of the 2014 US elephant trophy importation ban on the hunting patterns in Matetsi Hunting Complex, north-west Zimbabwe. *Global Ecology and Conservation* **30**: e01758.

Oberem, P. and P. Oberem (2016). *The New Game Rancher.* South Africa: Briza Publications.

Oduntan, O.O., A. Akinyemi, O. Ojo, et al. (2012). Survey of wild animals used in zoo-therapy at Ibadan, Oyo State, Nigeria. *International Journal of Molecular Zoology* **2**: 70–73.

Ogutu, J.O., H.P. Piepho, M.Y. Said, et al. (2016). Extreme wildlife declines and concurrent increase in livestock numbers in Kenya: what are the causes? *PLoS One* **11**(9): e0163249.

Ouedraogo, A. (2018). Campagne d'exploitation faunique 2017–2018: accroître la contribution du secteur faunique à l'économie nationale. *Faso Actu* 10.01.2018, Ouagadougou, Burkina Faso.

Packer, C., H. Brink, B.M. Kissui, et al. (2011). Effects of trophy hunting on lion and leopard populations in Tanzania. *Conservation Biology* **25**(1):142–53.

Parker, K., A. De Vos, H. Clements, et al. (2020). Impacts of a trophy hunting ban on private land conservation in South African biodiversity hotspots. *Conservation Science and Practice* **2**: e214.

PNP (2018). Saison cynégétique 2017–2018. Août 2018, Parc National de la Pendjari, Bénin.

PNP (2019). Saison cynégétique 2018–2019. Septembre 2019, Parc National de la Pendjari, Bénin.

PNW (2018). Rapport de fin de saison touristique et cynégétique 2017–2018. Août 2018, Parc National du W, Bénin.

PNW (2019). Rapport de fin de saison touristique et cynégétique 2018–2019. Juin 2019, Parc National du W, Bénin.

Poshiwa, X., R.A. Groeneveld, I.M.A. Heitkönig, H.H.T. Prins and E.C. van Ierland (2013). Reducing rural households' annual income fluctuations due to rainfall variation through diversification of wildlife use: portfolio theory in a case study of southeastern Zimbabwe. *Tropical Conservation Science* **6**(2): 201–220.

Prins, H.H.T. (1996). *Ecology and behavior of the African buffalo − Social Inequality and Decision Making.* Dordrecht: Springer.

Prins, H.H.T. (2020). Preserving nature: artificial intelligence against green violence. Farewell address upon retiring as Professor of Resource Ecology at Wageningen University. Wageningen University Press, Wageningen.

Prins, H.H.T. and J.G. de Jong (2022). The ecohistory of Tanzania's Northern Rift Valley − can one establish an objective baseline as an endpoint for ecosystem restoration? In C. Kiffner, M.L. Bond and D.E. Lee (Eds.), *Tarangire: Human−Wildlife Coexistence in a Fragmented Ecosystem.* Ecological Studies, vol. 243. Cham: Springer.

Richards, W. (1980). The import of firearms into West Africa in the eighteenth century. *The Journal of African History* **21**(1): 43–59.

Rigava, N, R. Taylor and L. Goredema (2006). Participatory wildlife quota setting. *Participatory Learning and Action* **55**: 30–36.

Robertson, K. (1996). *Nyati, The Southern Buffalo*. Harare: Mag-Set Publications (Pvt) Ltd p. 4.

Rogan, M.S., P.A. Lindsey, C.J. Tambling et al. (2017). Illegal bushmeat hunters compete with predators and threaten wild herbivore populations in a global tourism hotspot. *Biological Conservation* **210**: 233–242.

Roosevelt, T. (1910). *African Game Trails: An Account of the African Wanderings of an American Hunter-Naturalist*. London: Murray's Imperial Library.

Rovero, F., A.S. Mtui, A.S. Kitegile and M.R. Nielsen (2012) Hunting or habitat degradation? Decline of primate populations in Udzungwa Mountains, Tanzania: an analysis of threats. *Biological Conservation* **146:** 89–96.

Rowland Ward (2020). *Rowland Ward's Records of Big Game*. 30th ed. Huntington Beach, CA: Rowland Ward.

Ruark, R.C. (1987). *Horn of the Hunter*. Long Beach, CA: Safari Press, p. 285.

Russo, I.-R., S. Hoban, P. Bloomer, et al. (2019). 'Intentional Genetic Manipulation' as a conservation threat. *Conservation Genetics Resources* **11**(2): 237–247.

SCI (2022). Big Game Hunting Records – Safari Club International online record book. (www.scirecordbook.org).

Sansom, B. (1974). Traditional economic systems. In W.D. Hammond Tooke (Ed.), *The Bantu Speaking People of Southern Africa*. London: Routledge and Kegan Paul.

Saayman, M., P. van der Merwe and A. Saayman (2018). The economic impact of trophy hunting in the south African wildlife industry. *Global Ecology and Conservation* **16**(2018): e00510.

Scholte, P., O. Pays, S. Adam, B. Chardonnet, et al. (2021). Conservation overstretch and long-term decline of wildlife and tourism in the Central African savannas. *Conservation Biology* **36**(2), e13860.

Selier, S.A.J. and E. Di Minin (2015). Monitoring required for effective sustainable use of wildlife. *Animal Conservation* **18:** 131–132.

Selier, J., L. Nel, I. Rushworth, et al. (2018). An assessment of the potential risks of the practice of intensive and selective breeding of game to biodiversity and the biodiversity economy in South Africa Scientific Authority Report 2018. www.iucn.org.

Siege, H. and L. Siege (2020). *Die Sache mit der Auslandsjagd*. Melsungen: Neumann-Neudamm, p. 289.

Skikuku, K.R., P. Makenzi and P. Muruthi (2018). Poaching in the Mount Elgon Transboundary Ecosystem. *UNESCO Biosphere Reserves* **2**: 1–14.

Snyman, S., D. Sumba, F. Vorhies et al. (2021). *State of the Wildlife Economy in Africa*. Kigali: African Leadership University, School of Wildlife Conservation.

Sodeinde, O.A. and D.A. Soewu (1999). Pilot study of the traditional medicine trade in Nigeria. With reference to wild fauna. *TRAFFIC Bulletin* **8**: 35–40.

Somers, M.J., M. Walters, J. Measey, et al. (2020). The implications of the reclassification of South African wildlife species as farm animals. *South African Journal of Science* **116**(1–2): 1–2.

South African Professional Hunters statistics (2019). *Game and Hunt Daily*. South African Professional Hunting Statistics – Game & Hunt Daily (gameandhuntdaily.co.za).

Southern Africa Trust (2019). Declaration – Voices of the communities: A new deal for rural communities and wildlife and natural resources. www.southernafricatrust.org/2019/06/25/declaration-voices-of-the-communities-a-new-deal-forrural-communities-and-wildlife-and-natural-resources/

Spenceley, A. (2005). Nature-based tourism and environmental sustainability in South Africa. *Journal of Sustainable Tourism* **13**(2): 136–170.

Spenceley, A. (2021). *The Future of Nature-Based Tourism, Impacts of COVID-19 and paths to sustainability*. Gland: Luc Hoffmann Institute.

Spinage, C.A. (2003) The great African rinderpest panzootic. In *Cattle Plague*. Boston: Springer. https://doi.org/10.1007/978-1-4419-8901-7_22

Steel, L., A. Colom, F. Maisels and A. Shapiro (2008). *The Scale and Dynamics of wildlife Trade Originating in the South of the Salonga–Lukenié–Sankuru Landscape*. WWF Democratic Republic of Congo.

Strong, M. and J.A. Silva (2020). Impacts of hunting prohibitions on multidimensional well-being. *Biological Conservation* **243**: 108451.

TAWA (2019). *Review of Trophy Hunting in Tanzania. The Case of Selous Game Reserve, Buffer Zones and Selous–Niassa Corridor*. Morogoro, Tanzania: TAWA.

Taylor, R.D. (1988). Age determination of the African buffalo, *Syncerus caffer* (Sparrman) in Zimbabwe. *African Journal of Ecology* **26**: 207–220.

Taylor, R.D. (2001). Participatory natural resource monitoring and management: implications for conservation. In D. Hulme and M. Murphree (Eds.), *African Wildlife and Livelihoods: The Promise and Performance of Community Conservation*. Oxford: James Currey.

Taylor, R.D. and C.S. Mackie (1997). Aerial census results for elephant and buffalo in selected Campfire areas. *CAMPFIRE Association Publication Series* **4**: 4–11.

Taylor, W.G. (2005). *The influence of trophy measurement on the age of sport hunted buffalo, Syncerus caffer (Sparrman), in the Zambezi valley, Zimbabwe, and its implications for sustainable trophy hunting*. Unpublished undergraduate dissertation in Environmental Biology, Oxford Brookes University.

Taylor, W.A., P.A. Lindsey and H. Davies-Mostert (2015). *An Assessment of the Economic, Social and Conservation Value of the Wildlife Ranching Industry and its Potential to Support the Green Economy in South Africa*. Johannesburg: The Endangered Wildlife Trust.

Taylor, W.A., P.A. Lindsey, S.K. Nicholson, et al. (2020). Jobs, game meat and profits: the benefits of wildlife ranching on marginal lands in South Africa. *Biological Conservation* **245**: 108561.

't Sas-Rolfes, M., R. Emslie, K. Adcock and M. Knight (2022). Legal hunting for conservation of highly threatened species: the case of African rhinos. *Conservation Letters* **15**: e12877.

US Fish and Wildlife Service (2022). Endangered Species Act. www.fws.gov/law/endangered-species-act.

Van der Hoeven C.A., W.F. de Boer and H.H.T. Prins (2004). Pooling local expert opinions for estimating mammal densities in tropical rainforests. *Journal for Nature Conservation* **12**: 193–204.

Van Houdt, S., R.P. Brown, T.C. Wanger, et al. (2021). Divergent views on trophy hunting in Africa, and what this may mean for research and policy. *Conservation Letters* **14**(6): e12840.

Van Velden, J., K. Wilson, K. and D. Biggs (2018). The evidence for the bushmeat crisis in African savannas: a systematic quantitative literature review. *Biological Conservation* **221**: 345–356.

Van Vliet, N. and P. Mbazza (2011). Recognizing the multiple reasons for bushmeat consumption in urban areas: a necessary step toward the sustainable use of wildlife for food in Central Africa. *Human Dimensions of Wildlife* **16**: 45–54.

Van Vliet, N., J. Muhindo, J. Kambale Nyumu, et al. (2018). Mammal depletion processes as evidenced from spatially explicit and temporal local ecological knowledge. *Tropical Conservation Science* **11**: 1–16.

Walpole, M.J. and C.R. Thouless (2005). Increasing the value of wildlife through non-consumptive use? Deconstructing the myths of ecotourism and community-based tourism in the tropics. In R. Woodroffe, S.J. Thirgood and A. Rabinowitz (Eds.), *People and Wildlife: Conflict or Coexistence*. Cambridge: Cambridge University Press, pp. 122–139.

Western, D., S. Russell and I. Cuthill (2009). The status of wildlife in Protected Areas compared to non-protected areas of Kenya. *PLoS One* **4**(7): e6140.

Whiting, M.J., V.L. Williams, T.J. Hibbitts, et al. (2011). Animals traded for traditional medicine at the Faraday market in South Africa: species diversity and conservation implications. *Journal of Zoology* **284**: 84–96.

White, P.A. and J.L. Belant (2015). Provisioning of game meat to rural communities as a benefit of sport hunting in Zambia. *PLoS ONE* **10**(2): e0117237.

WCS and MINFOF (2018). *Aerial Survey of Wildlife and Human Activity in the BSB Yamoussa Landscape, Cameroon, Dry Season 2018.* New York: Wildlife Conservation Society, Ministry of Forestry and Wildlife. Funded by the KfW.

Wilkie, D.S. and J.F. Carpenter (1999). The potential role of safari hunting as a source of revenue for protected areas in the Congo Basin. *Oryx* **33**: 339–345.

Wilkie, D.S., E.L. Bennett, C.A. Peres and A.A. Cunningham (2011). The empty forest revisited. *Annals of the New York Academy of Sciences* **1223**(1): 120–128.

Winterbach, C.W., C. Whitesell and M.J. Somers (2015). Wildlife abundance and diversity as indicators of tourism potential in northern Botswana. *PLoS One* **10**(8): e0135595.

WWF (1997). *Quota Setting Manual*. Wildlife Management Series of Guideline Manuals. Harare: WWF Zimbabwe Programme Office.

WWF (2000). *District Quota Setting Toolbox*. Wildlife Management Series of Guideline Manuals Harare: WWF Zimbabwe Programme Office.

Yasuda, A. (2011). The impacts of sport hunting on the livelihoods of local people: a case study of Bénoué National Park, Cameroon. *Society and Natural Resources* **24**(8): 860–869.