

Full Length Research Paper

Insights of Legal and illegal wildlife hunting in Selous and Rungwa Game Reserves in the South-East and Central Tanzania

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Received 3 June, 2020; Accepted 23 July, 2020

There is a lack of consensus among conservationists regarding the association between trophy hunting and wildlife poaching. Anti-hunting groups argue that trophy hunting is against animal welfare and contributes to wildlife population decline so it must be refuted. On the other hand, pro-hunting groups for advocate regulated hunting as an essential tool for supporting habitat protection and reducing crimes. Regulated hunting creates incentives for conservation through direct and indirect methods and reduces wildlife poaching in areas where ecotourism cannot be practically viable. We used fifteen years' trophy hunting and poaching of African elephant (*Loxodonta africana*), lion (*Panthera leo*), Cape buffalo (*Syncerus caffer*), Common Zebra (*Equus quagga*), hippopotamus (Common *Hippotamus amphibious*) and Greater kudu (*Tragelaphus strepsiceros*) from Selous and Rungwa game reserves in Tanzania. The results showed that there is no evidence of influence of regulated hunting on poaching rate for all species with exception of African elephant. Poaching rate of African elephant was found to be higher than the rate of regulated hunting because of limited number of quota set by Convention on International Trade in Endangered Species (CITES) and international restriction of elephant hunting imposed by the International Union for Conservation of Nature (IUCN). The study suggests that the contentions to stop trophy hunting because of an increase in poaching incidents have no empirical justification. Thus, more effort should be on anti-poaching activities ensuring the adherence to legal hunting regulations.

Key words: Poaching, hunting, trophy, conservation, biodiversity.

INTRODUCTION

There is a current debate around the world that legal trophy hunting of wildlife for various purposes is the driver of poaching (Harris, 1995; Wood, 1997; Finch, 2004;

Loveridge et al., 2007b; Broad et al., 2014; Di Minin et al., 2016).

Poaching involves unlawful killing, trophy hunting is

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regulated by the law basing on the population estimates of the animals, and through this, the government can earn income (Broad et al., 2014). While trophy hunting (hereafter referred to regulated hunting seems to have an insignificant impact on wildlife population decline, illegal hunting, on the other hand, has been reported to possess direct and indirect implications on hunted and non-hunted species (Mayaka et al., 2005; Lindsey et al., 2012). The debate about legal offtake and other forms of utilization of wildlife like ecotourism has resulted in protectionist and/or animal welfare activists referred here as anti-hunters and proponents of sustainable uses of wildlife referred to as pro hunters.

Pro-hunters have thought that hunting provides resources for conservation and a feasible way of regulating wildlife populations while anti-hunters advocate for banning hunting. It believes that it influences poaching and causes negative ecological impacts on species and ecosystems (Bennett et al., 2002; Badenhorst, 2003). This contention is refuted by the fact that regulated trophy hunting earns substance income that can be invested back to conservation and outweigh the challenges of ecotourism (Barnes and Novelli, 2007; Wilkie and Carpenter, 1999). If well managed regulated trophy hunting can avoid its currently perceived operational weaknesses and be used to conserve wildlife while avoiding negative ecological impacts (Loveridge et al., 2007b). Pro hunters insist further that in areas where legal hunting is taking place, there is also poaching taking being practiced just as those areas where non-consumptive utilization is practiced; giving clue that poaching is not geared by the existence of regulated trophy hunting (Baker, 1997; Eliason, 1999).

On the other hand, protectionists argue that hunting of any form is the main driver of wildlife extinction. They also emphasize ecotourism as feasible means of generating income from wildlife and has proven successful in creating income from and for several major national parks and privately-owned land (Barnes, 2001; Kiss, 2004). In their view, they hold that nature should not be interfered within any way (WWF, 1999). Some protectionists draw their argument from animal welfare perspectives, claiming that killing an animal is immoral (Jessup, 2004; Paquet and Darimont, 2010; Board, 2016). Other cases are overexploitation of wildlife (Baker, 1997; Rija, 2009; Lindsey et al., 2013).

Regulated hunting and poaching has a long history in the world of conservation. Illegal hunting has been formally known since the establishment of wildlife laws in the twelfth century (Lueck, 1998; Eliason, 1999). Since laws restricted hunting to whoever was hunting without conforming to the laws, those who went contrary were regarded as poachers. Currently, hunting that abides by

law takes subsistence, market or commercial, and sport or trophy hunting. The General Assembly of Conservation Union described this kind of hunting in 1990 as sustainable use of wildlife (Miller, 1991).

In Africa, poaching and regulated hunting is practiced in both protected areas and open areas. Poaching has existed from when the wildlife laws were enacted before which African societies were coexisting with wildlife and poaching was not defined. Since the continent is endowed with wildlife, which is confined in wilderness areas where photographic tourism is difficult, most African countries practice both consumptive and non-consumptive wildlife utilization. Therefore, African countries are recipients of the pressures from both pro-hunters and protectionists because they practice both forms of wildlife utilization. In various times, several countries have changed their conservation laws and policy to either banned hunting and/or keep on practicing both types of utilization (Lindsey et al., 2007b; Mbaiwa, 2018). For instance, Kenya banned trophy hunting from 1973 to date (Child et al., 2000). Tanzania kept both forms of utilization, stopping hunting only for a short period in 1973 through 1978 due to political reform. After the political change in 1978, legal hunting continued to be practiced in game reserves and game controlled areas.

In Tanzania, legal hunting is mainly through trophy hunting by tourists for sport and as resident hunting for bushmeat upon securing a permit issued by the director of wildlife as stipulated in The Wildlife Conservation Act of 2009 and its regulation (Wilfred and MacColl, 2014). Over a century, trophy hunting has been a significant revenue source for conservation and development (Hurt and Ravn, 2000; Baldus and Cauldwell, 2004). For instance, the wildlife sector's overall contribution for 2015 is estimated to contribute about 2% of the country's Gross Domestic Product (GDP) (Revelian, 2016). Also, the 2013-2015 report from the hunting advocacy group "Conservation Force" shows that 27 hunting safaris exploiting 12,400 km² spent US\$6.70 million in anti-poaching and habitat protection. During this period, 1409 poachers were arrested, 171 firearms confiscated, and 6,223 snares were amassed. Besides that, about US\$3.13 million was spent in community development initiatives. These contributions justify the potential of the sector in conservation and the national economy at large.

While laws regulate hunting, poaching is the major challenge in areas practicing either consumptive or non-consumptive utilization in Tanzania. Poaching of iconic game species such as elephants, rhino, and some primates has been reported to be the leading pressure in wildlife management in Tanzania (Loveridge et al., 2007a; Kideghesho, 2016). Poaching has been a significant challenge facing wildlife conservation in Tanzania

(Mackenzie et al., 2012) and it ranges from poaching for the pot to commercial poaching that focuses on the rare and endangered species such as elephants and rhinoceros (Malembeka, 2013). Different protected East Africa countries have found overexploitation of wildlife species as major challenge and significant amount of money has always been spent in wildlife law enforcement every year (Peter Lindsey et al., 2013; Loveridge et al., 2007a; Palazy et al., 2012).

Poaching is the result of many factors and complex motives that require different responses (Von Essen et al., 2014). The main driving force at the local scale in Tanzania is poverty, where communities hunt for pot or hunt to be paid to sustain daily life (Duffy et al., 2016; Twinamatsiko et al., 2014). For charismatic species like elephants, rhinoceros, and lion, their poaching has been associated with big businesses and wealthy people (Kideghesho, 2016). The motivation for poaching is based on geographic, economic, social and psychological context, but is found to be highly ranked with commercial and food benefits (Mancini et al., 2011; Kahler and Gore, 2012). Other reasons stated by wildlife stakeholders are related to retaliatory killing and protection of life and property (Kahler and Gore, 2012; Muth and Bowe, 1998). Although the most motivation for poaching is related to the economy, ignorance of conservation laws is also mentioned as a driver of poaching (Raichev and Georgiev, 2012). Conservation regulations and policies are also implicated in exacerbating poaching and thus act to increase the drivers of poaching. Examples of policies that ban hunting might increase the demand for wildlife and expand poaching (Challender and MacMillan, 2014).

Several initiatives are in place to address poaching problem including, community based wildlife management, intensification of wildlife law enforcement through patrols but also having community hunting schemes where people get meat to supplement protein (Waltert et al., 2009; Challender and MacMillan, 2014; Holden et al., 2019). Public support for illegal hunting has also increased in a sophisticated context in which conservation policies are seen as unfair and lacking legitimacy (Pohja-Mykrä and Kurki, 2014; Von Essen et al., 2014; Peltola and Heikkilä, 2015). The complete elimination of poaching hunting seems to be a challenging task, thus devising strategies to minimize this problem seem to be a practical solution. This is because illicit trading of wildlife and their products is a form of organized crime that stems from the third most valuable illegal market after illicit drugs and firearms (Ayling, 2013). Community conservation, legal subsistence, and trophy hunting are among such devised strategies that were planned to involve communities and generate conservation revenues. Legal hunting has less ecological

impacts and requires relatively less investment (Di Minin et al., 2016; Lindsey, 2008; Lindsey et al., 2006; Lindsey et al., 2007). Trophy hunting generates more significant net profit than ecotourism because it requires less investment (Lindsey et al., 2013). A ban in trophy hunting has been suggested to accelerate biodiversity loss (Mbaiwa, 2018; Lindsey et al., 2007a). This is because it accounts for a significant contribution of money for conservation particularly for developing countries, as well as reducing ecological impacts' related to mass tourism (Di Minin et al., 2016).

Conservationists have polarized legal wildlife hunting, ranging from absolute opposition by protectionists to those who see legal hunting as a practical means of creating incentives for conservation (Zinn et al., 1998; Hutton and Leader-Williams, 2003; Lindsey et al., 2007b; Hutton et al., 2009; Di Minin et al., 2016). Protectionists contend that trophy hunting cannot be differentiated from poaching in areas where control is weak with trophies' persistent black market. At the same time, advocates of sustainable utilization believe that wildlife has to pay for their conservation through regulated hunting in areas where infrastructure for photographic tourism is inadequate. It is argued that hunters in their hunting blocks have the equipment and human capital to control poaching through revenues accrued because of hunting activities (Bennett et al., 2002).

In recent decades the debate of whether legal hunting increases or decreases rates is intensifying, bringing decision challenges to conservation managers and policymakers of whether trophy hunting and ecotourism can coexist as viable forms of wildlife utilization. Some countries have opted to ban hunting as a strategy to reducing poaching (Table 1), it is still unknown if this is a viable decision. So far there is no empirical evidence that hunting influences poaching rates (Leader-Williams et al., 2001; Croes et al., 2011; Conrad, 2012).

The study hypothesized that no relationships between legal in Selous and Rungwa Game reserves. We used the available data for teprted poaching and regulated hunting of these species. The numbers of individual of each species hunted were correlated with their poaching rate to explain the anecdotal information that regulated hunting contributes to poaching and uncovered the current debate.

MATERIALS AND METHODS

Study area

The study was conducted in the Selous and Rungwa Game reserves. These two reserves are among the most popular destinations for trophy hunting in Tanzania. They also account for

Table 1. Records of trophy hunting ban and reasons in some African countries.

Country	Date legal hunting stopped	Reason	Conservation status after the ban
Kenya	1978	Poor controls and ethics on the hunting industry (Otuoma, 2004; Leader-Williams and Hutton, 2005)	Wildlife population declined (Child, 2000, 2005)
Uganda	1979	Hunters were exceeding their allowances (Lamprey and Mugisha, 2009) reinstalled in 2001 after reviewing of regulations	Hunting for meat continued (Hill, 2018)
Botswana	2014	Wildlife decline (Mbaiwa, 2018)	Led to an increase in poaching (Onishi, 2015)
Malawi	2017	Administrative weakness (Price Waterhouse, 1996)	Poaching relatively high (Emslie and Knight, 2014)
Angola	-	Administrative weakness (Price Waterhouse, 1996)	Poaching still a problem (Svensson et al., 2014)
Côte d'Ivoire	-	Low chances of success (Casparly, 1999)	Poaching still happening (Niamien et al., 2015)
Somalia	-	Administrative weakness (Price Waterhouse, 1996)	Poaching and illegal trade is a current concern (Amir, 2006)

the highest number of hunting blocks (URT 2013) with prominent records of poaching activities. However, the Tanzania Wildlife Management Authority (TAWA) plays a significant effort in curbing criminal activities, including poaching, a commonplace in the area. It is, therefore, for these reasons; this study was conducted in these areas. The Selous Game Reserve is in east-southern Tanzania at 9.0000° S, 37.5000° E, and covers about 50,000 km² (Figure 1). It is amongst the largest protected areas in Africa and is relatively undisturbed by humans. Selous harbors one of the most significant concentrations of elephant, cheetah, giraffe, hippopotamus, and crocodile, just to list a few. The reserve also has an exceptionally wide variety of habitats, including the Miombo woodlands, open grasslands, riverine forests, and swamps, making it a valuable laboratory for on-going ecological and biological processes. The Selous Game Reserve has appropriate legal protection, and a management plan has been developed. A small area (8%) of the reserve in the north (Kingupira) dedicated to photographic tourism, while most of the property is managed as a hunting reserve. Rungwa Game Reserve is in central Tanzania at 7.1987° S, 33.9750° E, and covers an area of 9,000 km² (Figure 1). The reserve is composed of hills mixed with forest patches along the streams and the Mpera River valley, which provide water in the dry season (July to November). The reserve extends to Ruaha National Park, the second largest wildlife area in Tanzania after the Selous Game Reserve. The reserve consists of essential game species, including lions' leopards, Cape buffaloes, elands, sables, Greater kudus, Hartbeests, Liechtenstein's, Impala, Zebras, Hippopotami, Crocodiles, and Bush pigs. It is also among protected areas with the largest concentration of bird species feeding themselves in Usangu valley, one of the largest hunting areas.

Data collection

The study involved correlational design in which changes in the rate of illegal offtake corresponded to the changes in the rate of legal offtake. This study used secondary data obtained from the Wildlife Division under the Ministry of Natural Resources and Tourism. Wildlife Division - WD (now Tanzania Wildlife Management Authority - TAWA) is mandated to oversee wildlife utilization as well as combating poaching in game reserves and game-controlled areas in the country. We obtained record African elephant, African cape buffalo, Lion, Greater kudu, Hippopotamus and zebra hunted in Selous and Rungwa game reserves for the past fifteen years. Both hunting and poaching incidences are primarily reported to the base stations by the wildlife rangers who assume a leading role during trophy hunting and anti-poaching operations. The choice of the species to include in the study was based on the reason that they highly poached and at the same time legally hunted.

Data analysis

To examine the influence of regulated hunting on poaching of the studied species in the two reserves, we used a generalized linear model with Poisson model distribution error (GLMp). Hunting rates were taken as the number of animals killed by the two forms of offtake per year. The comparison of trends of animals killed in the two forms of offtake was made using the time Series R package. To test if there is a significant correlation between hunted and poached rates of each species a Spearman rank correlation correlation was used. All statistical analyses were performed by R 3.5.2 (R Core

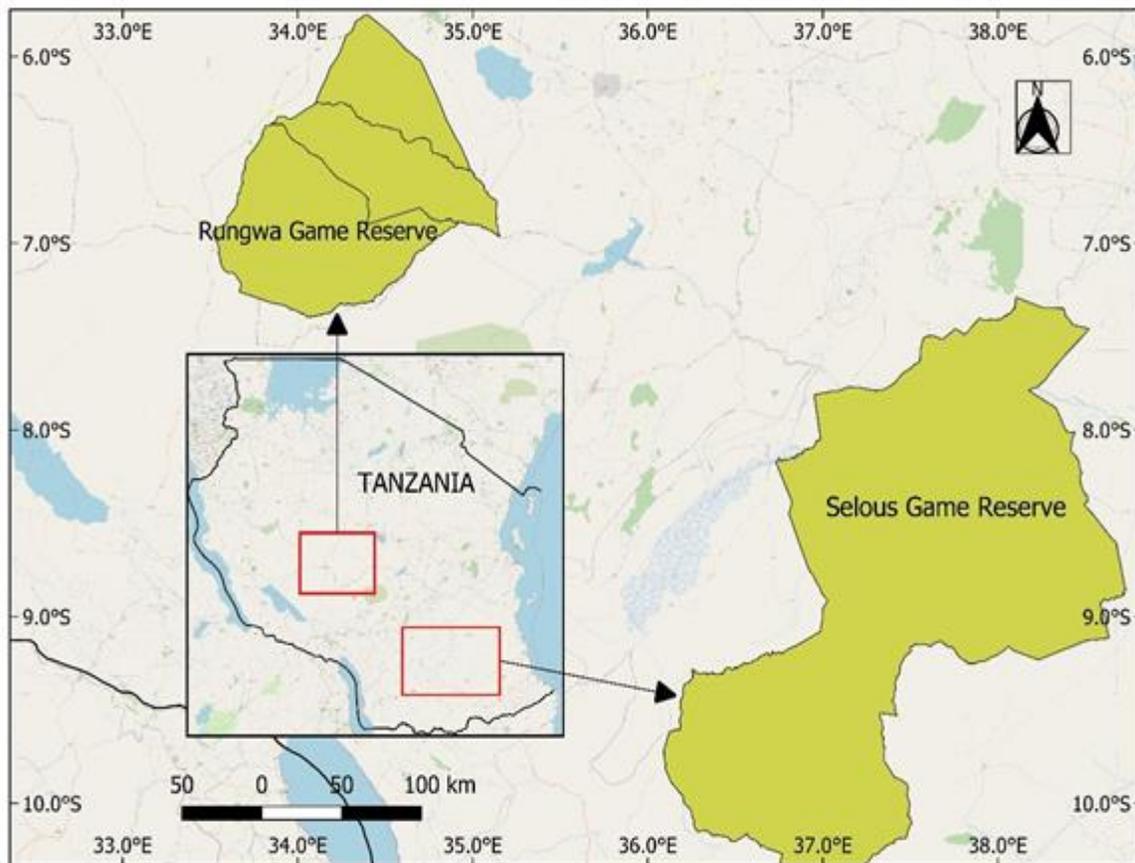


Figure 1. Map study areas.

Team, 2019)

RESULTS

The rate of regulated legal hunting was found to be 14% higher than poaching incidences for the period between 2002 to 2016, with an average of 200 animals hunted in Rungwa and 400 animals hunted in Selous Game reserves. Further results shows that an average of 75 poaching incidences in both reserves (Figure 3). Results also indicated a gradual decline in number of hunted individuals for trophy for the study period, while poaching depicted no consistent pattern (Figure 1). African elephant and Africa lion showed an exceptional pattern of regulated hunting and poaching. African elephant poaching incidences were higher than numbers taken through regulated hunting for the period under study (Figure 2). The trend of hunted Lions was found to decrease with increasing time and were relatively higher

than the reported poached lions (Figure 2). Selous have less numbers of animals taken through regulated hunting and less poached as that of wildlife offtake as compared to the Rungwa game reserve (Figure 4). Results from GLMp showed strong evidence that the number of animals killed varies significantly with the site ($P < 0.001$) as well as the type of offtake (either legally hunted or poached) ($P < 0.001$). A Few elephants were legally hunted, and there were fewer incidences of poaching of buffalo, greater kudu, hippopotamus lion, and zebra in Selous as compared to Rungwa (Table 2)

DISCUSSION

Our data showed that rates of trophy hunting were higher compared to poaching incidences, and that regulated hunting did not influences poaching rates. These findings are consistent with those obtained by Matthias (2009) in

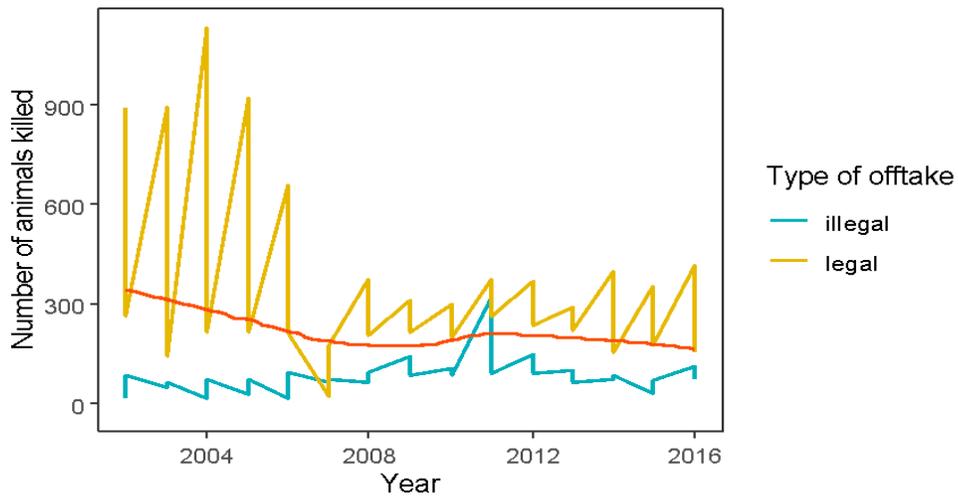


Figure 2. Trend of the number of animals hunted legally in Selous and Rungwa Game reserves between 2002 to 2016. Blue solid line show the trend of animals poached and the green, number of animals hunted legally.

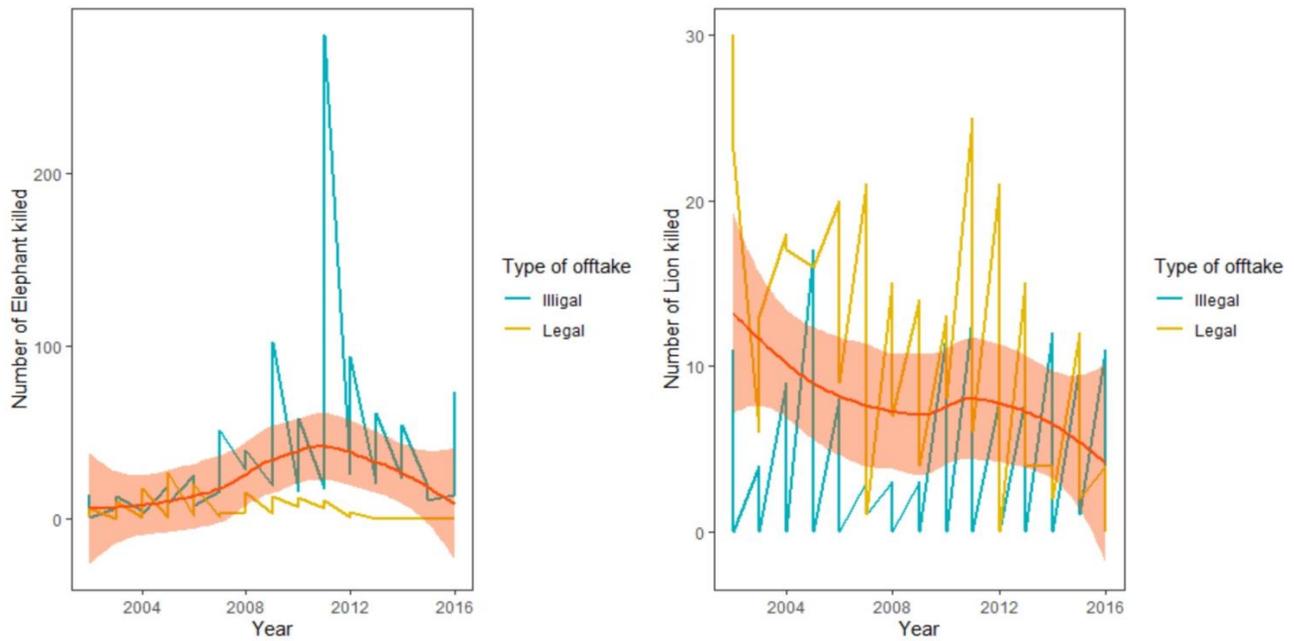


Figure 3. Trends of elephants and lions were killed both legally and illegally in Selous and Rungwa Game Reserves from 2002 to 2016.

their study conducted in Rukwati game reserve; however, there was no evidence of the influence of regulated hunting to poaching incidences. Most concerns about hunting were found to be flaws associated with the ways in which hunting expeditions are conducted and how the

quotas are set rather than the intensity of poaching (Di Minin et al., 2016). These findings provide first-hand evidence that poaching rate is minimal as compared to rates of regulated hunting.

Therefore, trophy hunting can still be regarded as a

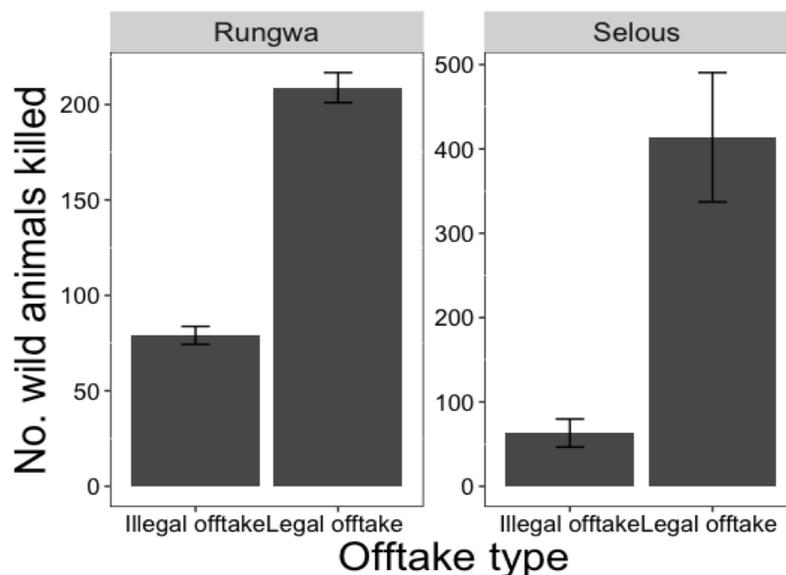


Figure 4. Comparison of legally hunted and poached animals between Selous and Rungwa Game Reserves from 2002 to 2016. Barplot with standard error bars (mean \pm sd) illustrating variation animal harvested in the two reserves.

Table 2. Yearly off-take rates of game species and price for legal their harvest.

Illegal	African elephant	Buffalo	Greater kudu	Hippopotamus	Lion	Zebra
Rungwa GR	18	12	14	8	9	20
Selous GR	41	2	1	2	1	1
Legal						
Rungwa GR	2	101	19	5	21	64
Selous GR	8	111	5	28	7	37
Game Fees (\$)	15,00	1,900	2,200	1,500	4,900	1,200

GR=Game Reserve.

conservation tool (Hurt and Ravn, 2000; Cooney et al., 2017). It is undeniably that trophy hunting provides an incentive for conservation if hunting operations are well-regulated (Lindsey et al., 2006). Hunting regulatory frameworks need to consider proper administration of expeditions, scientific monitoring of the population estimates of the game animals as well as controlling poaching. Other things include equitable distribution of benefits with the communities, scientifically calculated quota, minimization of corruption in the industry, and adherence to the quota provided (Baker, 1997; Mayaka et al., 2005). Harris (1995) also argued that trophy hunting tourism avoids most ecotourism problems because hunting can offer substantial financial inputs to specific

areas with little need for infrastructure. However, this does not undermine wildlife viewing in conservation, especially in areas where there is political stability, less remote, and plenty of wildlife to attract tourists (Western et al., 2009; Selier and Di Minin, 2015).

Because of increasing poaching incidences in most African countries, substantial investment for resources to combat poaching is inevitable. One of the practical way to finance anti-poaching efforts in game reserves especially those which cannot finance themselves through photographic tourism, regulated trophy hunting can be the main source of funding to support conservation efforts, the amount ploughed back for such activities is still small because the money goes to central government and its

allocation always go through the treasurer

Several studies favoring anti-hunting schemes insist on the effects of regulated trophy hunting on the populations of the hunted species neglecting what they can contribute to conservation (Packer et al., 2011). This might be true, mainly if trophy hunting is conducted in an uncontrolled manner. In our results, game species of higher trophy demand such as elephant and lions had higher rate of poaching; despite the high demand for such trophies IUCN considers trophy hunting to possess minor effects to their populations of animals in Africa (Cooney et al., 2017) Trophy hunting is either to directly finance anti-poaching activities or reduce poverty and thus minimize human dependency on consuming wildlife (Makuyana, 2018). Waltert et al., 2009 study in Western Tanzania also found no evidence to justify that trophy hunting in Katavi_Rukwati National park and Game Reserve system accelerates species decline of hunted species. This suggests that the species decline in Africa might be driven by other factors such as poaching, habitat loss, drought, climate change, alien invasive species, and human encroachments compared to regulated trophy hunting. Poverty has been reported as the main contributing factor for poaching in most African countries (Duffy and John, 2013; Knapp et al., 2017).

Our results showed that there was also a continuous decline in the trophy hunting rate over the years for the period under the study. This is evidence that anti hunter's campaigns are gaining prosperity with several countries banning sport hunting while trophy markets countries are banning the importation of trophies (Mbaiwa, 2018; Mkono, 2018; Dickman et al., 2019). The campaigns are mostly advocated through media to the public by giving out the negative side of trophy hunting, such as the one publicized after killing Cecil the Lion (Konisky and Carpenter, 2017). International pressure on trophy hunting has resulted in a ban of trophy hunting by many countries as a strategy to curb poaching. However, this situation has been viewed by pragmatic conservationists as among drivers that exacerbate biodiversity loss as the case taken by CITES banning ivory trade (Lemieux and Clarke, 2009). The ban has reduced revenue for antipoaching but also elevated ivory prices in the plack market and therefore increases in poaching at local scale. Although there are varied moral, ethical, and biological standpoints on trophy hunting, the reality remains that Tanzania's game reserves needs both well-managed hunting which mainly finance conservation.

Without such self-financing mechanisms for game reserves, it is likely that large tracts of land and wildlife will be lost due to increased poaching, intensified human-wildlife conflicts, habitat loss and fragmentation. Similarly, without community benefits because of banning hunting

will heighten the level of negative attitude, a situation which will engender hostility against conservation.

The decline is also being suggested because trophy hunting is geared by key game species in which a ban or change in hunting policy in one of these species has a significant impact on the industry (Humavindu and Barnes, 2003; Lindsey et al., 2012). For instance our results showed a decline of hunting of African lion and African elephant in the two game reserves from 2007 to 2015 which is probably due to quota limitation imposed by CITES ,failure to attract customers or failure to locate the animals during hunting expedition. The changes of national trophy sustainability for trophy hunting particularly with regard to quota setting may also be factor for observed declines.

Due to the absence of influence of regulated hunting on poaching suggested by our data, it becomes viable to have an integrated policy that allows wildlife viewing and sustainably managed trophy hunting as the existing situation in Tanzania. There needs a compromise between the conservation benefits accrued from trophy hunting and the adverse effects of trophy hunting, particularly in developing countries where financial resources for conservation are scarce. Our study found that trophies cannot be justified as a reason to accelerate poaching. Thus, poaching and trophy hunting are two forms of offtake that are independent. Efforts to minimize poaching should take its course of action, while policies and regulations to keep sound trophy hunting operation for conservation benefit also be considered positively. A poorly managed trophy hunting can cause the decline of the population, the same as uncontrolled poaching. The integration has been successful in countries like South African, Botswana, Zambia, and Namibia (Naidoo et al., 2016). Some scholars advocate the combined use of consumptive and non-consumptive utilization while emphasizing better management of sport hunting (Chanteloup, 2013). Revenues from trophy hunting can be generated from a low volume of people with less environmental impacts (Goessling, 2000). Trophy hunting can also benefit the use of remote areas where infrastructure development is limited, rendering the areas unprofitable (Woodroffe et al., 2005). Wildlife viewing on the other hand is suitable in an area with a high density of wildlife and where infrastructures are developed to access the areas.

The results also showed that reserves with more hunting blocks had fewer incidences of reported poaching cases. Selous is famous for trophies having more hunting blocks than Rungwa and reported a low poaching rate. Some studies have shown that hunting companies punch some of the benefits to communities, thus increasing their willingness to conserve and therefore causing a decrease

in poaching (Baldus and Cauldwell, 2004). This might be because block owners also conduct anti-poaching activities and thus discourage poaching (Baldus and Caudwell, 2004; Njau, 2013). According to the hunting regulations in Tanzania, block owners are obliged to contribute about 5,000 USD for block development as well as supporting communities close to their hunting blocks (RT, 2019). This is meant to involve communities in the move to reduce poaching through support to social services and development activities in the local context (Lindsey et al., 2007).

Our results showed that African elephants were highly hunted illegally than legally for the period under study. This is because of its legal restrictions resulting from the ban on ivory trade by CITES in 1989. CITES banned trade in ivory in 1989 and imposed more restrictions on African elephants (Padgett, 1995; Stiles, 2004) in Tanzania and other African countries. The ban increased the elephant population in the Selous game reserve (Siege and Baldus, 2000). It is a great effort to protect elephants from poaching with both government and non-government conservation organizations, particularly in the Ruaha and Ruvuma landscape, thus recording most incidences of elephant poaching (Lotter and Clark, 2014). Following this specific target on an elephant, most anti-poaching activities were biased toward collecting poaching frequencies of elephants with several programs and organizations being established for elephant conservation such as the Southern Africa elephant program, PAMS Foundation, and WSC Tanzania.

The overall wildlife conservation in Tanzania is governed by the National Wildlife Act No 5 of 2009, which stipulated the management strategies in this article. Under this act, all wildlife is state-owned. Among other things, it allows consumptive utilization as a management tool. Selous and Rungwa Game Reserves are under Tanzania Wildlife Authority (TAWA) and involve a management approach in which legal hunting is allowed under permissions. Selous is also an area where community involvement in managing wildlife is highly practiced around (Hahn and Kaggi, 2001). Financial values are attached to wildlife to fulfill the slogan that wildlife should pay for their existence, and this is where ecotourism and sport hunting takes its stake (Higginbottom and Tribe, 2004). Since legal offtake is allowed as management tools, revenues that accrued from hunting are used for conservation, including paying law enforcement personnel and supporting the community around the Reserve to sensitive them on the importance of conservation.

Conclusions

The perceived influence of regulated sport hunting and

poaching seems not existing in Tanzania. This suggests that poaching should be dealt with separately from regulated hunting in wildlife conservation. Integrating legal markets with increased local control of wildlife and punitive law enforcement strategies may be the most effective and efficient means of reducing poaching rates of wildlife. At the same time, regulated trophy hunting must be emphasized in areas where photographic tourism cannot be practiced. Unlike Tanzania National parks which are financed by photographic tourism, game reserves will rarely sustain without trophy hunting because most of them cannot feasibly implement photographic tourism. There is a need for more studies regarding the cost-benefits and community approval of the two forms of wildlife utilization (ecotourism and trophy hunting) in Tanzania. Development of either hunting or ecotourism industry or instead combining the two in the country's conservation policy should be viewed as a temporary bridge based on the local acceptance. It is also essential to study when and where trophy hunting could be beneficial. Any decision to indulge in either wildlife viewing, or hunting should solely be based on science and social, economic studies. Although we could get a clear comparison between regulated hunting and poaching in the two study sites, the data on poaching gave less confidence in generalizing our results because they are being collected on haphazard basis. We recommend future study that will employ use of the use of data collected from different places in different conservation ecosystems to get a broader scenario for generalization of the results.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The authors thank the College of African Wildlife Management, Mweka, for funding and all logistic support for this study. Furthermore, they appreciate the support from Tanzania Wildlife Management Authority for supplying the data, which makes this analysis a success. Three anonymous reviewers provided insightful comments which significantly improved the manuscript.

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