Contentious conservation: Understanding the socio-ecological impacts of trophy hunting in sub-Saharan Africa

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‘I, Helen Muller, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.’

Thesis abstract

Trophy hunting is one of the most contentious practices in conservation, with increasing calls for a global ban. Despite a long history in Africa, the contribution of trophy hunting to conservation on the continent is a matter of intense debate. Proponents consider well-managed trophy hunting to be a reasonable conservation tool due to the positive impacts it can have on biodiversity and local communities. However, positive outcomes are not guaranteed, and their extent and the contexts under which they arise are unclear. With growing lobbying against the activity, this thesis adds to the evidence-base for decisions on trophy hunting's future. I follow a mixed methods approach to explore trophy hunting's socio-ecological impacts and the conditions under which they arise, using evidence synthesis on the sub-Saharan African trophy hunting industry and a case study on Botswana.

I find that evidence on trophy hunting is biased towards Southern Africa and Tanzania, with gaps in West and Central Africa. Whether trophy hunting changes human behaviour or leads to conservation outcomes, and how it affects local well-being is also under-researched. Trophy hunting can deliver positive socio-economic outcomes, boost economic welfare in communities, and improve attitudes towards wildlife, though benefits are often too few or unevenly distributed to achieve this. Positive outcomes are more likely where devolution of rights and community participation in decision-making are extensive, and where participation and benefit distribution are equitable. The trophy hunting moratorium in Botswana was unpopular and negatively impacted many dimensions of well-being in communities. A loss of animal control may be over-looked in discussions of trophy hunting's value. Remote sensing offers an under-explored avenue to examine trophy hunting's impacts on ecosystems when used in rigorous study designs, and can complement improved wildlife monitoring, particularly by local communities, to better understand impacts of trophy hunting on conservation.

Impact Statement

This thesis contributes to the evidence-base for decisions on a highly complex and contentious topic for conservation: trophy hunting. Findings are relevant to a range of audiences and across many scales: from policy makers to the general public who they are answerable to, from village leaders discussing opportunities in their local areas to international decisions on trophy export regulations. While scientific evidence is only one aspect for consideration in policy-making, objective assessment on the role trophy hunting plays in African conservation serves as a firmer foundation for the complex and multi-faceted management and policy-decisions that need to be made.

The results of this thesis have been disseminated in various ways and efforts are ongoing to improve its impact.

Public engagement

Throughout the course of my PhD, I participated in a range of public engagement activities. I wrote a blog for my CASE partner, the International Institute for Environment and Development (IIED), on community perspectives on the Botswana hunting moratorium. Results from my systematic map were used in a film by *The Economist* on how trophy hunting protects Africa's wildlife. I took part in Soapbox Science London 2021, producing a YouTube video on lessons from the Botswana hunting ban and taking part in an hour long discussion with audience questions. I have engaged regularly on Twitter about my and related work. Finally, I presented my work to the Broadly Scientific talk series organised by the London NERC Doctoral Training Partnership.

UK policy engagement

I submitted evidence to the Department for Environment, Food and Rural Affairs' Call for Evidence on the scale and impacts of the import and export of hunting trophies in February 2020 and to the Environment, Food and Rural Affairs Commons Select Committee's inquiry on the Animals Abroad Bill in September 2021.

Engagement in Botswana

I submitted reports on my fieldwork to the Botswana Government. They will also receive a copy of my thesis, a summary report on the findings, and copies of all publications arising from the work. I also wrote reports on population censuses conducted in case study villages. These were submitted to the village traditional authorities and local councillors to update figures on population demographics. Summary reports of key thesis findings will also be submitted to the Community Trusts, local authorities, and tourism enterprises involved.

Scientific output

I have drafted manuscripts of my first two chapters for submission to People and Nature and Biological Conservation. I plan to submit manuscripts for my remaining chapters in due course. I have presented the work in three conferences: *Engaging Sustainability: The Joint DTP Conference 2020*, *The ZSL Science Conference 2020*, and *the 30th International Congress for Conservation Biology 2021*. I have also given numerous departmental presentations in both the Institute of Zoology and the Human Ecology Research Group in the Anthropology Department.

Collaborations

Through my CASE partnership with the IIED, my work has contributed to an ongoing situational analysis on trophy hunting being conducted by the International Union for the Conservation of Nature Sustainable Use and Livelihood Specialist Group.

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1 Introduction

Trophy hunting has played a role in African conservation for decades, yet it remains one of the most contentious conservation practices on the continent. It takes place under diverse conditions and so, its impacts on the ecosystems and people involved varies, giving both sides of the debate practical examples to support their views. Advocates justify well-managed trophy hunting as a conservation tool which can extend the land and actors involved in conservation, and lead to positive biodiversity and social outcomes. Critics point to varied outcomes, particularly for the wildlife species involved (Buckley and Mossaz, 2015, Muposhi et al., 2017), corruption and limited funds reaching local communities (Leader-Williams et al., 2009), as well as ethical and moral problems with the activity itself (Nelson et al., 2016, Batavia et al., 2019b, Ghasemi, 2021). A lack of synthesised evidence on the ecological, social, and economic impacts of trophy hunting however, make it difficult to objectively assess the role it plays in conservation on the continent.

The dynamics of the debate have changed over the last decade, with international and social media bringing it to the attention of a wider audience (Hart et al., 2020), affecting policy decisions at a range of scales (Roe and Cremona, 2016, DEFRA, 2019). The international, typically western, uproar following events like the killing of “Cecil” the lion and several other notable trophy hunts has led to growing pressure to ban hunting globally (Di Minin et al., 2016, Ghasemi, 2021, Lindsey et al., 2016). The combination of public pressure on western governments and concerns over the sustainability of the industry have already led to increased import restrictions on trophies (Lindsey et al., 2016) and bans on the entry of legally acquired trophies into key consumer countries (Wanger et al., 2017, DEFRA, 2021). Trophy hunting bans imposed internally by national governments and international bans on importing trophies may all affect conservation and socio-economic conditions on the ground. In light of these pressures, there is a need to synthesise existing evidence on trophy hunting’s impacts and gather evidence on the potential impacts of hunting bans to inform future decision-making. This will help to ensure outcomes are more likely to be accepted, and do not have unintended adverse effects.

Conservation itself has also changed over recent decades. With increasing recognition that many people’s lives and livelihoods are inextricably linked to their natural environments, modern conservation often has social as well as environmental goals (Roe et al., 2009, Milner-Gulland et al., 2014, McKinnon et al., 2016, Law et al., 2018). There are ethical motivations for increasing local community involvement in conservation and making conservation more equitable and just, as well as practical reasons: such interventions are more likely to succeed, be supported, and be sustainable (Ban et al., 2013, Dawson et al., 2021). Conservation decision making is, therefore, paying increasing

attention to meaningful stakeholder involvement, being respectful of different world views, and fairly distributing costs, benefits, rights and responsibilities (Law et al., 2018).

Understanding local community interactions with trophy hunting is therefore highly relevant to decisions on its future. Many African communities have been involved in trophy hunting activities for decades, through community-based natural resource management (CBNRM), or similar programmes (Roe et al., 2009). Even more are affected by the industry through changes in land and resource access and its labour needs (Yasuda, 2011, Brandt and Spierenburg, 2014). While substantial research has been conducted on trophy hunting's ecological impacts, with a focus on species ecology, far less is known about how trophy hunting affects the well-being of local communities who are involved with, or impacted by, the industry or its impacts on the broader ecosystem (Di Minin et al., 2021). There is also limited research on the conditions under which positive outcomes of trophy hunting arise, and factors restricting trophy hunting's contribution to conservation.

Given that numerous communities are affected by trophy hunting in Africa, and their significance to conservation on the continent, it is concerning that their voices are typically missing from trophy hunting debates (Chaukura et al., 2020, Houdt et al., 2021). Despite being most heavily impacted by decisions on trophy hunting, local communities are rarely included in the policy and decision-making processes that take place at national or international levels (Madzwamuse et al., 2020). Increasingly influential campaigns by western animal welfare organisations on social media are further undermining the ability of rural Africans to participate in such processes. This threatens conservation objectives and undermines the rights of African citizens to participate in policy processes that affect their lives and livelihoods (Madzwamuse et al., 2020). More silent still, are the indigenous, marginalised groups within participating communities who have had their livelihoods restricted, been excluded from participation in local decision-making, and had limited access to the benefits generated (Martin et al., 2013, Martin et al., 2016). As conservation strives to become more effective, equitable and just (Vucetich et al., 2018), increased consideration of the social impacts of trophy hunting is essential in decisions on its future, and voices of rural Africans need to be placed at the centre of decisions.

As an African country that has recently undergone a five-year moratorium on hunting, Botswana provides a good case study to gather evidence to help guide such decisions, by examining the impacts of the moratorium on conservation and society. Understanding the impacts that the moratorium has had on communities and their perceptions towards conservation, as well as its impacts on the broader ecosystem, would help to provide evidence of its impact on conservation. Exploring impacts on community well-being, a multi-faceted measure, recognises the complexity of people's lives,

motivations, actions, and relationships with their natural environments. Communities are often treated as homogenous entities, which in most places is far from the case, so understanding the differentiated nature of participating communities, and the implications for the excluded and marginalised groups, is critical in evaluating the impacts of the moratorium on society as a whole. Communities in Botswana, like many places elsewhere in Africa, participated in trophy hunting and conservation through CBNRM (or similar schemes). Understanding how these CBNRM institutions operate and interact with broader socio-politics and with the trophy hunting industry is therefore also relevant, as these institutions provide the link between communities, conservation, and the trophy hunting industry.

1.1 Aims, objectives and research questions

The overall aim of the study is to improve the evidence-base for decisions on trophy hunting. I aim to advance our understanding of whether, and under what conditions, trophy hunting is an effective tool for conservation, and, through programmes like CBNRM, rural development. This is achieved through extensive evidence synthesis of existing research highlighting its distribution, gaps, and trends, and through the use of an in-depth case study. Using the 2014-2019 hunting moratorium in Botswana as a study system, I provide an understanding of the social and ecological impacts of removing trophy hunting as a tool, and the broader conditions affecting those impacts.

1.1.1 Objectives and research questions:

1. Determine the extent of the available evidence of the socioeconomic, ecological, and land use impacts of the Africa-wide trophy hunting industry to identify spatial and topical gaps and explore how outcomes have been studied.

   Question: Where does trophy hunting take place and what is the evidence on these activities, what outcomes of trophy hunting are being reported, how are outcomes studied, and where are the gaps in knowledge?

2. From the available evidence, review the social and ecological outcomes of trophy hunting and the factors that affect them.

   Question: What are the social and ecological impacts of trophy hunting in Africa? Under what contexts do they arise? And where are the gaps in our understanding of how trophy hunting contributes to socially just conservation?

3. Determine how trophy hunting was conducted in Botswana with a focus on the CBNRM institutions, their unique socio-political history, and the broader national politics which will

have influenced decisions around the moratorium and shaped how communities were impacted by it.

Question: What is the national and local history and social-political context of trophy hunting in Botswana that might have shaped how communities were impacted by the 2014-2019 trophy hunting moratorium?

4. Determine how community well-being was impacted by the trophy hunting moratorium and whether the moratorium has impacted perceptions towards conservation and wildlife.

   Question: What were the impacts of the 2014-2019 trophy hunting moratorium on multi-dimensional well-being in Phuduhudu and Ditshiping communities? How did an ability to shift activities to photographic tourism influence these impacts?

5. Explore the potential of using accessible and long-term remote sensing data to understand the impacts of trophy hunting on broader ecosystems by examining whether the Botswana hunting moratorium has had an impact on vegetation greenness and heterogeneity.

   Question: Was there an impact of the 2014-2019 trophy hunting moratorium on remotely sense NDVI?

   Hypothesis: NDVI would differ across hunting/non-hunting landscapes as a result of the hunting moratorium's impact on elephant distribution, with reduced average NDVI and increased heterogeneity in NDVI in hunting areas versus non-hunting areas after the moratorium.

1.2 Defining the scope of hunting under consideration

There are many forms of hunting and the scope of what is, and is not, included in this project is detailed below.

Several terms are used to describe the hunting which this PhD relates to: trophy hunting, safari hunting, sport hunting, and recreational hunting. Recreational hunting is defined by Leader-Williams as "hunting where the hunter or hunters pursue their quarry for recreation or pleasure" (Leader-Williams, 2009). Trophy hunting adds the explicit aim of targeting individuals with specific desirable attributes (e.g. large tusks, horn, body or skull size) typically with the intent of retaining these attributes as a keepsake (Lindsey et al., 2007, Roe and Cremona, 2016). Trophy hunting is a legal and regulated activity that takes place through, and is organised by, government wildlife agencies, local community organisations, private landowners or conservation organisations (Roe and Cremona,

2016). This study focusses on trophy hunting of mammals in Africa as this is the most contentious and debated (Batavia et al., 2019b, Bichel, 2021). For this study, we define trophy hunting as the legal and paid for selective recreational hunting of nonhuman animals with specific desired characteristics, where a part of the animal, for example the head, horns or skin, is usually retained by the hunter and taken home as a trophy (Roe and Cremona, 2016, Ghasemi, 2021). We refer to the activity as it is practised by the Western world, where it is considered to contribute to conservation (Ghasemi, 2021).

Within this broader definition of trophy hunting, this thesis restricts its extent to the trophy hunting of mammals. While the hunting of other animals, e.g. birds and fish, would fall under the definition above, these are rarely included in discussion and debate on trophy hunting which implicitly (Ghasemi, 2021, Roe and Cremona, 2016, Lindsey et al., 2007), or explicitly (Batavia et al., 2019b), refers to mammals. While bird shooting does get some degree of attention (Thompson, 2021), it is nowhere near as contentious, widely condemned, or hotly debated as trophy hunting of mammals (Humphreys, 2010). As the aim of the thesis is to improve the evidence-base of the ongoing debate and associated decision-making, focussing on the most contentious and public-facing component of the activity seems prudent given the constraints of PhD research.

As a component of this study examines the socio-ecological impacts of the hunting moratorium in Botswana, it necessitates some discussion on legal and illegal hunting for subsistence, hunting to supply the illegal wildlife trade, and hunting for the commercial wild meat trade. Botswana is one of the few countries for example, which has allocated substantial quotas for legal hunting by citizens, as well as foreign tourists (Barnett and Patterson, 2005), and this will also be discussed.

This research does not discuss or examine “canned” hunting where animals are captive-bred and hunted either in enclosures they are unable to escape from, or when they have recently been released specifically to be hunted (Roe and Cremona, 2016, Di Minin et al., 2016). It will also only briefly discuss animal rights and ethics of trophy hunting as a full review is beyond the scope of this work.

1.3 Thesis structure

As introduction to all of this work, Chapter 2 starts with a brief background on trophy hunting and conservation in sub-Saharan Africa to give an overview on the historical and socio-political context of the activity, and of conservation more generally. I also outline the arguments used in the ongoing debate on trophy hunting’s role in modern conservation.

In Chapter 3 I detail the methods used in the study, including a description of the case study of Botswana. In this section I give a brief overview of the history and context of trophy hunting and

conservation in Botswana and details of the two case study communities explored in chapters 6 and 7.

In Chapter 4 I conduct a systematic mapping exercise on the evidence of trophy hunting's social, economic, ecological, and land use impacts in sub-Saharan Africa. This chapter highlights the geographical and topical extent of the evidence-base, highlights key gaps, and explores how trophy hunting has been studied.

In Chapter 5 I dig deeper into the existing evidence and conduct a systematic narrative review of the evidence on trophy hunting's social and ecological outcomes. I explore trends and factors affecting them.

In Chapter 6 I turn to the case study of Botswana and, using a combination of primary and secondary data with a political ecology lens, explore the history and politics of trophy hunting and CBNRM in Botswana and the case study communities.

In Chapter 7 I detail the results of six months ethnographic fieldwork spent in Botswana in two case study communities and explore the impacts of the trophy hunting moratorium on community well-being. I also examine community perceptions towards the moratorium.

In Chapter 8 I explore a novel method of assessing trophy hunting's impacts on the broader ecosystem, a key gap identified in Chapters 3 & 4. Using remotely sensed data I explore the impact of the trophy hunting moratorium on vegetation greenness and heterogeneity in Ngamiland, Botswana.

The thesis conclusion in Chapter 9 discusses the evidence on trophy hunting and key lessons from the Botswana hunting moratorium. I also discuss how my results contribute to the ongoing discussions of trophy hunting's place in the modern world and the importance of ensuring community voices are at the forefront of these discussions.

2 A brief history of conservation and trophy hunting in Africa

Hunting is arguably one of the most influential activities which has shaped and continues to shape conservation in Africa. Illegal hunting is a significant threat to the persistence of many species and legal trophy hunting is one of the most divisive practices in the field, with strong advocates for and against the principle of sustainable use, dividing nations as well as the international community. One cannot appreciate the conservation landscape of Africa today, and trophy hunting's role in it, without first looking to the past and exploring the intertwined history of hunting and conservation on the continent. I begin by outlining hunting in the pre-colonial era and the changes brought by early European explorers; this is followed by discussion of hunting and the establishment of fortress conservation in colonial times. I will then extend the discussion to the post-independence era and modern day, highlighting the rise in participatory approaches and its critiques. Following this, I will expand on the state of the trophy hunting industry as last reviewed and elaborate on the arguments for and against the industry.

2.1 History of hunting and conservation in sub-Saharan Africa

2.1.1 Pre-colonial hunting and early European exploration

Hunting in Africa is as old as the people who inhabit it, and it has played an important role in human interactions, movements, and trade across the continent. Turning points however, came with the early European explorers and colonialism, which fundamentally changed the relationship between Africans and the continent's natural resources (Sowman and Wynberg, 2014).

In pre-colonial Africa, hunting performed multiple functions in societies. It was an important source of meat, particularly when other forms of subsistence failed, as well as a source of domestic commodities such as skins, clothes, ornaments, receptacles, and tools. It was a source of trade goods and provided a means of accessing an extensive trade network that spanned the continent. It also was used to protect people, crops, and livestock from harm. Finally, it fulfilled important social and political functions, often around differential access to wildlife. Hunting prowess provided a means of social ascension, and large communal hunts affected intra-community power dynamics (MacKenzie, 1988). Hunting, and resource use in general, was actively regulated by traditional authorities, social structures, and taboo, and more passively by low population densities and low-technology hunting techniques (Scanlon and Kull, 2009).

Two important changes came with the early European explorers: one was an expansion of African trade networks through the introduction of a more accessible and insatiable European market, and

the second was the arrival of new and far superior weapons. Many of the early European explorers were hunters but they also traded extensively with Africans, though rarely on equal terms. The growing European demand for goods such as ivory, skins and feathers, together with new hunting technology, fuelled a relentless onslaught on wildlife by Europeans and Africans alike, and a rampant trade of Africa's natural resources developed (MacKenzie, 1988). The new trade routes facilitated the spread of European weapons and other new 'luxury items' like tobacco, tea, and sugar throughout Africa, transforming power dynamics and relations between African people groups. Those nearer trade routes had increased access to goods, including "instruments of power, e.g. guns and horses" (Wilmsen, 1989), and higher bargaining power over those who were further away, leaving those more remote increasingly marginalised, substantially altering power dynamics between African communities (Wilmsen, 1989).

Ivory was the prized resource and was critical in enticing, and then supporting, the European advance across the continent. Starting with individual European hunter-traders who sold ivory to fund their expeditions, ivory exploitation went on to subsidise prospecting, gold mining, missionary activities, and commercial and colonial administrative expansion across the continent. The retreat of elephants that accompanied the early stages of European advance was followed rapidly by the disappearance of other game through a combination of hunting for hides and trophies to support the European settlers, and hunting by Africans (MacKenzie, 1988).

While ivory was an obvious source of funds, meat (from elephants as well as other game) was also an important and often underappreciated subsidy. Everyone who came hunted: explorers and missionaries, pioneers, settlers, and colonial administrators (MacKenzie, 1988). For the hunter-traders, meat was used to feed themselves and their entourage, as well as gain favour, safe passage, and a supply of new labour in the areas in which they travelled. For the European travellers, missionaries, and pioneer settlers, game meat formed a vital support system: it kept them and their followers alive, it paid for labour, it was traded for other necessities, and it was a means of enticing Africans to their audience (MacKenzie, 1988).

With European introduction of firearms, medicine, and transport infrastructure, the extensive hunting for trade, nation-building, and sustenance of Africans and Europeans took their toll (Child, 2009b). By the late 19th century, in the absence of institutions controlling resource use, and in combination with rinderpest outbreaks and the clearance of land for agriculture, wildlife populations suffered devastating declines (Child, 2009b). The substantial impacts on wildlife populations led many to recognise that the remaining populations needed protection (Adams, 2004). As the transition period

between early exploration and colonial expansion and settlement in Africa came to an end, measures were put in place to curb hunting and conserve the wildlife that remained (MacKenzie, 1988).

2.1.2 Rules, fences, and fines

Starting with standardised game legislation across colonial Africa, the colonial powers radically changed the political economy of wildlife in the early 20th century by regulating hunting, restricting the carrying of weapons by Africans and by establishing game reserves (Adams, 2004, Child, 2009b). The combination of retreating and declining game across large parts of the continent, imposition of colonial game legislation, attempts to separate animal habitats and human settlements, loss of rights, land, and the means of production these generated, and the subsequent reduction in a range of African occupations because of increased agricultural specialisation and migrant labour, all led to a decline of hunting as a significant sector in the African economy. Further, the usurpation of and legal restrictions upon African hunting rights by Europeans had a significant effect on diet, economic and social relations, recreation, and the association with the natural world of many African peoples (MacKenzie, 1988).

A system of national parks was established across Southern and East Africa where areas were set aside to protect wildlife and ideals of pristine and people-free environments (Fabricius et al., 2004). Forced removal and/or deprivation of resource access of the previous and neighbouring residents were typically the first steps in their establishment (Brockington and Igoe, 2006, Child, 2009c). Centralised western institutions and practices, such as courts of law, fines, and fences replaced traditional institutions that previously governed natural resource use (Fabricius et al., 2004). The new regime criminalised long-standing livelihood strategies, and hunting for subsistence became poaching; many African cultures were permanently altered (Adams, 2004).

A driving force behind much of the legislation came from the European hunting and natural history elite. While hunting had been critical for the survival of early settlers and for empire building in the recent past, as colonies became more established, the hierarchy and ritualised practices around 'The Hunt' that had long been in place in European societies were brought to the continent (MacKenzie, 1988). Access by indigenous Africans was restricted as hunting for subsistence was demonised as being savage and criminalised. Access by lower European classes followed suite as access to animals and hunting became a source of pride, prestige, and power reserved for the colonial administrators, scientists, and visiting European and settler elites. Their hunting, with an elaborate code of conduct, was considered to be both noble and sustainable. In a few short decades, hunting had transformed from being an economic requirement to being a luxury full of cultural symbolism (MacKenzie, 1988).

Not only were hunters some of the main advocates for protecting the continent's wildlife, safari hunting was also seen as an important mechanism of funding the new conservation estate and bringing income into the colonial exchequer (Adams, 2004). Since the 1890s wealthy and titled Europeans have been visiting Africa on safari hunts, particularly in East Africa. Indeed, many of the early game regulations were designed to encourage hunting by the elites as it generated significant revenue. Many national parks flourished and gained fame through 'big game' hunting and tourism. By the 1920s, safaris were extremely popular among wealthy Europeans and Americans. Throughout, notions of sportsmanship dominated, justifying successive generations of "elite hunter-conservationists" (Adams, 2004). Big game hunting continued throughout the century, though with advances in camera technology, photographic tourism gained prominence from the 1930s, particularly in East Africa, and started to replace hunting as the dominant means of obtaining 'trophies' (Adams, 2004). Trophy hunting was soon primarily viewed by most westerners in the same vein as commercial trade: a wanton and destructive approach to other species. Though big game hunting continued, it was no longer linked to public ideas of conservation (Adams, 2009).

2.1.3 The move to sustainable use and community-based approaches

Around the mid-20th century, problems with the preservationist mode of conservation started to arise (Child, 2009b). There was increasing realisation that parks alone were insufficient to conserve nature and that wildlife and natural habitats outside of protected areas also needed to be preserved. As wildlife could not be owned and had no commercial value, natural habitats outside protected areas were being converted for agriculture or livestock farming to support the growing human populations. Furthermore, under these forms of land use, wildlife was considered harmful as it competed with or killed livestock, harboured disease, and damaged crops (Prins and Grootenhuis, 2000). Over several decades, a new conservation narrative took shape, starting in Southern Africa - that of sustainable use. It focussed on the careful use of land and resources over the conservation of wilderness or single species and arose out of the neo-liberal idea that wildlife could not survive outside of protected areas unless it had an economic value for landowners. Starting in the 1960s policies were developed under this narrative, devolving wildlife management and use rights to private landowners in several Southern African countries (Child, 2009b).

On the back of this, a second paradigm arose in the late 1970s and 1980s, that of community-based conservation (CBC). Hulme and Murphree (1999) argue that there were three main strands of reasoning behind this 'new conservation'. The first was that conservation should shift from being a state-centred activity to one which was participatory and included society, particularly at the local, 'community', level. These ideas of participation first emerged in the rural development arena following the disenchantment with large-scale, top-down development interventions which were

failing to benefit their target audiences. If views at the community level were considered, policies and projects would fit more appropriately into socio-economic reality and might better reflect their interests and needs (Little, 1994). It rejected previously held ideas that rural Africans were degraders of the environment and recognised their understanding of environmental processes. Instead, resource degradation was seen to be the result of the centralised management by African states which were essentially open access regimes. By transforming these into common property regimes in which local users were given rights to manage, use or own resources, it was thought that degradation could be remedied (Nelson and Agrawal, 2008). Alongside these was the recognition of the damaging impacts on human well-being that preservationist and coercive approaches to conservation had entailed, and the subsequent hostile views and rebellions of local communities towards conservation (Child, 2004, Fabricius et al., 2004). More practically, with the structural adjustment policies of the time, developing countries were facing significant financial cut-backs, reducing their capacity to effectively manage protected areas and prevent resource degradation (Fabricius et al., 2004). Conservationists and governments began to realise that they would need the support and assistance of communities neighbouring state protected areas to achieve their goals.

The second strand of reasoning involved a shift in the concept of conservation itself, with a change from preservationist approaches to the concept of sustainable development, whereby conservation and development could be achieved simultaneously. This conceptual shift arose due to a variety of factors. One was a fundamental shift in ecological thinking away from climax, equilibrium, and static ecosystems towards thinking of nature as dynamic and complex socio-ecological systems in which disturbance and change are the norm (Berkes, 2004). Within this was a recognition that many 'pristine' or 'natural' environments, especially in the pastoral and grazing lands of Africa, were a fallacy as they had been shaped by human activities for millennia (Neumann, 1998). There was also the recognition that western conservation goals could not be prioritised over the much needed socio-economic development in Africa (Hulme and Murphree, 1999).

The third strand of reasoning behind community conservation lay in the rise of the neo-liberal thinking and the combination of market-based incentives, decentralisation, and property rights (Nelson and Agrawal, 2008). With this rose the concept of 'use it or lose it'. Unless wildlife has an economic value, land will be converted to alternative uses, like agriculture or livestock keeping, which do (Hulme and Murphree, 1999). A consequence of this neo-liberal agenda, has been that many CBC initiatives tend to focus on economic incentives through promoting private sector ecotourism and commercial wildlife use, rather than a devolution of property or land rights (Murombedzi, 2010). Often a key premise was that unless communities have an economic incentive to tolerate wildlife and the costs of living alongside it, they will have no reason to protect and manage it and its habitat. Though photographic

and ecotourism are also mechanisms of generating economic incentives, trophy hunting was one of the key areas where such arguments were presented, and this continues today (Child, 2009b).

Various combinations of these strands gave rise to a range of approaches such as integrated conservation and development projects (ICDPs), community-based conservation, and community-based natural resource management (CBNRM). Collectively they could be regarded as a set of transformational institutional arrangements hoping to tackle the dual goals of improving human well-being, most commonly in the form of socio-economic development, and conserving biodiversity, particularly outside of more formal, state-protected areas (Galvin et al., 2018). CBNRM was the most common of these approaches to be established in sub-Saharan African. Under a broad definition, CBNRM is an institutional mechanism in which participating communities decide how best to manage their natural resources, including their use. The process of which is meant to improve social equality, reduce livelihood vulnerability and improve conservation (Dressler et al., 2010). A fundamental premise is the decentralisation of authority over natural resources and land to local actors, and the benefits this generates (Nelson and Agrawal, 2008). Due to the varied ways in which the conceptual shift of community-based approaches was converted into policy and applied in practice, the term CBNRM is used to describe different ideas in different areas often with subtly, but crucially, different goals.

2.1.4 Critiques and shortfalls of CBNRM

Dressler et al. (2010) argues that CBNRM is experiencing a crisis of purpose and identity. Despite their promise, the performance of community-based conservation programmes has fallen far below expectations, with, at best, mixed reviews as to their efficacy, leading to debates over the concept's merits (Berkes, 2004). Many argue it is improper implementation, particularly in the devolution of rights and responsibilities, that is undermining the value of the concept, attracting academic criticism, and discouraging donor support (Berkes, 2004, Nelson and Agrawal, 2008, Dressler et al., 2010, Galvin et al., 2018). The underlying assumption that improvements in livelihoods and human well-being will lead to reduced pressure on biodiversity has also been questioned (Hughes and Flintan, 2001), as has the apolitical nature of most CBNRM pretext and discussions (Murombedzi, 2010).

Galvin et al. (2018) conducted a systematic review of the social and ecological outcomes of CBNRM in Africa which provides a good summary of its performance across the continent. They found that while the establishment of CBNRM programmes had led to generally positive ecological outcomes, they had led to either negative or a mixture of positive and negative social outcomes. Though relatively few, studies measuring ecological outcomes tended to measure wildlife population trends, with CBNRM resulting in population increases or stabilisation of rates of decline, in some cases resulting from

reduced poaching (Scanlon and Kull, 2009). Others showed improvements in productivity and soil nutrient contents (Galvin et al., 2018). Examples of positive social outcomes predominantly related to financial capital gains and improvements in human well-being, while cases of negative outcomes often related to reduced social capital and unequal distribution of benefits (Galvin et al., 2018). Issues of elite capture were common and have been a point of broader criticism in that, in many cases, CBNRM assumes a homogenous and undifferentiated 'community' with aligned aims, interests, and equal power (Murphree, 1994). Breakdown of social capital, in the form of eroded community trust, changes to and reductions of traditional rules of use, and a breakdown of traditional networks and institutions, showed how relational well-being had been negatively impacted (Galvin et al., 2018).

In addition to the mixed outcomes, much of the criticism towards CBNRM has been around the extent to which the institutional reforms, required for effective CBNRM, have taken place. The extent of reforms has been highly dependent on the interests of central government actors and governance norms within countries (Nelson and Agrawal, 2008). Where there was extensive government control over commercial wildlife use and the benefits this generated on communal land, there was little incentive for governments to relinquish this control. The size and nature of a country's trophy hunting industry played a significant role in this (Nelson and Agrawal, 2008). In countries like Tanzania and Zambia, the commercial use of wildlife had always been centrally controlled, and both countries had well developed trophy hunting industries, mostly on communal land, with substantial revenues accruing to state authorities. As a result, CBNRM reforms in these countries have been limited. By contrast in Namibia, CBNRM was initiated before there was any revenue accruing to central government from wildlife use on communal land, and there have been relatively extensive institutional reforms (Nelson and Agrawal, 2008). The extent of CBNRM reforms has also been influenced by the more general state and norms of a country's governance. Beyond this, in countries with high degrees of corruption, nepotism, and weak rule of law, the devolution of valuable natural resources to the local level is at odds with the interests and incentives that control governance processes and so, is unlikely to be meaningful (Nelson and Agrawal, 2008).

Linked to some of the negative outcomes, and the limited institutional reforms, is the additional criticism that CBNRM programmes and narratives in many African cases are distinctly apolitical (Murombedzi, 2010). Not only does this exclude the broader political motivations driving or impeding the reforms, but it also fails to capture the local level politics and interactions across scales. This links again to the challenges inherent in treating rural people as a generic 'community'. CBNRM has failed to adequately address differentiated local rural tenure demands, or the broader land reform challenges faced in much of Africa today. It has also failed to identify the struggles that particularly marginalised groups in society have faced in making land access and ownership more equitable, and

improving their participation in local governance (Murombedzi, 2010). In some cases, CBNRM has only extended state control over land and decision making in rural areas, with community livelihoods and individual autonomy being more restricted after CBNRM was introduced (Hill, 1996).

2.2 Trophy hunting in Africa

2.2.1 Scope of African trophy hunting industry

The scope of the trophy hunting industry in Africa today is extensive. Not only does it make important financial contributions to national economies and conservation budgets across the continent, it also contributes vast amounts of land to the conservation estate, including state, private, and communally-owned land. When last extensively reviewed in 2007, trophy hunting was officially taking place in 23 countries across the continent, covering an area of over 1,394,000 km^2, and generating at least US$ 201 million per year from over 18,500 clients (Lindsey et al., 2007). The largest industries are in Southern Africa, though there is a substantial industry in Tanzania. It occurs to a lesser extent in Central African Republic, Cameroon, Burkina Faso and Benin (Lindsey et al., 2007).

Countries vary in terms of which animals are hunted and most are from more common, less valuable species such as kudu (*Tragelaphus strepsiceros & imberbis*), impala (*Aepyceros melampus*), and warthogs (*Phacochoerus africanus*) (Lindsey et al., 2007). However, most of the revenue comes from a handful of species with very valuable trophies. These typically include large and charismatic species like elephant (*Loxodonta africana*), lion (*Panthera leo*), leopard (*Panthera pardus*), buffalo (*Syncerus caffer*), rhino (*Ceratotherium simum* & *Diceros bicornis*), and hippopotamus (*Hippopotamus amphibius*) (Di Minin et al., 2016). However, the hunting of these species is also the most controversial, particularly when they are threatened and illegally traded (Buckley and Mossaz, 2015).

Communities are involved in trophy hunting, in varying degrees, in parts of Botswana, Namibia, Mozambique, South Africa, Tanzania, Zambia, and Zimbabwe through CBNRM. Similar programmes, typically focussed on revenue sharing, have been developed in West and Central Africa (Lindsey et al., 2007). However, in most cases, communities living alongside wildlife rarely benefit sufficiently from trophy hunting activities (Lindsey et al., 2007), though it is also worth noting that not all trophy hunting directly involves local communities and much takes place on state or private land.

2.2.2 Arguments for hunting

Many reasons have been put forward as to why trophy hunting has a large potential to contribute to conservation in Africa. The main contributions are through the substantial revenue it generates and the subsequent extension of the area under which conservation would be a viable land use. Conservation, by way of setting aside large tracts of land, maintaining the natural habitat, and

protecting wildlife, is a considerable cost for African governments, many of which are already struggling financially and have many competing demands on resources (McCarthy et al., 2012, Lindsey et al., 2018). Trophy hunting enables a wider range of actors to engage in conservation by making wildlife production and use a viable land-use option that would be attractive to both private landowners and communities on communally-owned lands (Bond et al., 2004). The extension of conservation onto private and communal lands in Southern African countries since the 1960s, for example, has more than doubled the area under conservation management, without adding the extra financial burden of maintaining it onto the state (Leader-Williams, 2009).

The revenue trophy hunting can generate is also an important component of many CBNRM initiatives across the sub-continent. Many of these programmes were established around more formal state protected areas either to create 'buffer zones' of low human occupation where land use is restricted to wildlife-friendly means of production, or to help ameliorate the costs that living alongside wildlife entails, or both. The typically impoverished rural communities in these settings suffer high levels of human-wildlife conflict (HWC) and receive little to no benefits from the presence of the reserves. In many cases, they (or their ancestors) would have also lost their land and had their livelihoods restricted through their formation. Revenue generated from trophy hunting in these areas can be used as an incentive for local communities to tolerate the presence of wildlife and the costs this entails (Selier and Di Minin, 2015). This, in turn, may reduce the number of retaliatory killings and the incentives to hunt illegally for wild meat (Lindsey et al., 2007, Selier and Di Minin, 2015). Namibia, through its CBNRM programme, is the best-known example of the mutual benefits to communities and conservation that can arise from trophy hunting. Angula et al. (2018) interviewed communities involved in CBNRM in Namibia on what they thought about trophy hunting and how they would feel about a ban. There was an almost unanimous positive view of trophy hunting because of the revenue and community benefits it generates; all were against the idea of a ban. However, Namibia is an exception rather than the norm, as outlined in some of the criticisms to CBNRM earlier. More specific critiques to community involvement in trophy hunting are outlined in the following section.

Many of those against trophy hunting suggest that photographic tourism provides sufficient mechanisms to fund and incentivise conservation. In this context, an additional argument put forward for trophy hunting, is that while photographic tourism can also help generate income for conservation, benefit communities, and increase the land under conservation management, it is more restricted as to where it can work. In areas of political instability, areas which are very remote, or places with low wildlife densities or few charismatic species, photographic tourism is often financially unviable and unreliable (Leader-Williams, 2009, Di Minin et al., 2016). The impact of trophy hunting on the overall environment is also usually lower than that of photographic tourism. The financial returns per person

generated from recreational hunting are substantially higher than those of photographic tourism, making the environmental footprint of the industry smaller in terms of the number of people, carbon emissions and infrastructure required (Leader-Williams, 2009, Di Minin et al., 2016). To provide sufficient funding to meaningfully support conservation over the large areas, it is considered by many conservationists advocating sustainable use that both consumptive and non-consumptive uses of wildlife will be required (Di Minin et al., 2016). For example, Naidoo et al. (2016) found that in Namibia, restricting wildlife as a land-use option to either hunting or photographic tourism only reduced the value of wildlife as a competitive land-use option. Being restricted to relying on photographic tourism alone would leave some governments unable to adequately protect their biological resources (Lindsey et al., 2006, Selier and Di Minin, 2015). Even in popular tourism destinations, like South Africa and Tanzania, there are often insufficient photographic tourists to cover the costs of all national parks (Lindsey et al., 2007).

Trophy hunting can also be compatible with multiple forms of resource use on the same land. In some CBNRM hunting areas, local communities are allowed to graze cattle, collect firewood, and, in some cases, hunt for subsistence on the land. It can therefore be more in line with local livelihood objectives unlike the exclusionary restrictions of national parks and even most photographic tourism (Lindsey et al., 2007). Hunting could also theoretically be used as a tool for problem-animal control and a survey of hunters found they were willing to pay more to do so. However, in practice this is rarely done as problem-animals do not necessarily make desirable trophies, there is a mismatch in timing between hunters' visits or the hunting seasons and when animals might be deemed 'problematic', and the system may be open to exploitation. If solutions could be found for these problems, trophy hunting could bring in revenue from animals that would be killed anyway, and could potentially reduce revenge-killings (Lindsey et al., 2007).

2.2.3 Arguments against hunting

Many of the arguments against trophy hunting relate to ethical and moral concerns around the practice and these topics are beginning to be explored in more depth (Nelson et al., 2016, Dellinger, 2018, Batavia et al., 2019b, Ghasemi, 2021). Increasing attention, particularly from the Western public, is being paid to the animal welfare and rights considerations (Wallach et al., 2018). The morality of killing animals for pleasure and conquest (Dellinger, 2018), and the chauvinistic, neo-colonial, and anthropocentric undertones of trophy hunting as an activity are also being increasingly questioned and explored (Batavia et al., 2019b).

Consequentialist and utilitarian reasoning is typically used for justifying trophy hunting's role in conservation, where "the ends justifies the means" (Nelson et al., 2016, Ghasemi, 2021). However the

merits of these versus other ethical viewpoints are being increasingly questioned (Nelson et al., 2016, Batavia et al., 2019b, Ghasemi, 2021). Shortcomings of the consequentialist and utilitarian ethical schools of thought include whether the killing of trophy animals is indeed justifiable under any circumstances, whether the acquisition of a trophy is an appropriate motivation to kill an animal, particularly one that is endangered or rare (Dellinger, 2018, Batavia et al., 2019b), and whether we can accurately predict that the 'ends´ i.e. conservation is actually being achieved by the means (Nelson et al., 2016), as this is far from guaranteed to be the case (Ghasemi, 2021). There is also questioning of the appropriateness of this form of 'engagement' more generally with non-human animals and the lack of respect and objectification that collecting body parts of animals for trophies affords (Batavia et al., 2019b). The activity is argued to have strong connotations of colonisation, exploitation, and chauvinism, where wildlife is conquered and subjugated by man, as well as anthropocentrism as though humans have the unquestioned right to treat other non-human animals this way (Batavia et al., 2019b).

Beyond these concerns, further criticisms of trophy hunting relate to the inadequate political, legal, and governance structures of much of the industry, which undermine its potential to contribute to conservation and which are amplified by its lucrativeness (Di Minin et al., 2016). Some of the biggest issues the industry faces involve its transparency and accountability. In most cases this has left the industry open to corruption, which occurs at multiple levels in many countries and is one of the most prevalent arguments against the practice (Lindsey et al., 2007, Leader-Williams et al., 2009). Corruption within the industry impacts the effectiveness of conservation by reducing the available funds, increasing incentives to over-exploit resources or manage them for personal means, and/or encouraging poor law enforcement (Leader-Williams et al., 2009).

In terms of the industry's long-term sustainability, some of the most significant threats are the failure to address issues of inequitable distribution of hunting revenues, the limited and unequal involvement of local communities, and the disaggregated distribution of income that does end up in communities (Lindsey et al., 2007, Selier and Di Minin, 2015). There are many causes for the inadequate inclusion of local communities. These include the failure of national governments to transfer ownership of wildlife to communities, the syphoning off of income at various levels of administration, inadequate legislation to support and implement community involvement, and a lack of capacity among communities to run hunting operations independently or negotiate better terms with operators (Lindsey et al., 2007, Nelson and Agrawal, 2008). While a few examples in the industry have revenues directed to communities, e.g. communal conservancies in Namibia, in most places the extent to which this happens is minimal (Di Minin et al., 2016). In Cameroon, for example, less than 3% of hunting

revenue reaches local communities in what are supposedly community-based efforts (Lindsey et al., 2007).

An additional challenge to its sustainability is linked to land use, land tenure, how concessions are allocated, and quota setting (Lindsey et al., 2007, Crosmary et al., 2015). In some countries leases are too short, reducing the willingness of operators to reinvest in sustainable wildlife management and community relations (Nelson et al., 2013, Crosmary et al., 2015). In most countries concessions are leased through a tender process and based on market-principles. In others, e.g. Tanzania, concessions are leased at the discretion of individuals and so are open to corruption and nepotism (Lindsey et al., 2007). The Wildlife Department of Tanzania has complete control over the Tanzanian hunting industry with limited transparency and no upward accountability. It has favoured a select group of hunting operators who are given concessions at rates below the true market value, which results in substantial loss of income to the state. It has also often excluded local communities who are the legitimate holders of the land on which hunting occurs (Baldus and Cauldwell, 2004).

Finally, there are concerns over trophy hunting's ecological impacts. In many places, there is considerable uncertainty as to whether offtake rates are sustainable. Most state wildlife departments lack the funds to adequately monitor wildlife populations, so quotas and offtake rates are not based on scientific assessment (Lindsey et al., 2007, Buckley and Mossaz, 2015). Moreover, without monitoring population trends there is also no way of determining whether the trophy hunting is fuelling wildlife declines, or contributing to conservation. As trophies generate high incomes, the pressure to issue unsustainably large and increasing quotas remains. Tanzania again has examples of this. The Wildlife Department, which accrues most of the revenue from hunting, also sets the quotas. With a focus on increasing revenue generation, it subdivided hunting blocks while keeping the quotas in each new block the same as the original, likely contributing to the observed wildlife declines (Sachedina, 2008). Even where appropriate quotas do exist, many state wildlife departments do not have the resources to enforce them (Lindsey et al., 2007).

Beyond quotas, there are also concerns around the demographic and genetic implications of the selective removal of predominantly male trophy individuals on the long term viability of the rest of the population (Harris et al., 2002, Leader-Williams, 2009). Further concerns surround the trophy hunting of advanced social species, like elephants where the loss of larger older individuals may result in a disruption of social knowledge transfer (McComb et al., 2001), and those where infanticide occurs (Packer et al., 2011). Further, the removal of keystone species, like apex predators and megaherbivores, is particularly contentious as they tend to be charismatic and hold particular interest and affection to the general public (Carpenter and Konisky, 2017, Batavia et al., 2019b, Bichel, 2021),

and their removal may have disproportionate impacts on the wider ecosystem that may not always be anticipated or immediately apparent (Bond, 1994, Guldemon et al., 2017). The desire to obtain diverse arrays of wildlife to maximise profit opportunities meanwhile, has led to frequent introductions of non-native species, e.g. blesbok and nyala to Namibia (Bond et al., 2004, Lindsey et al., 2007). Species may also be hybridised or genetically manipulated to create unique trophies (Lindsey et al., 2007) and improved habitats are not guaranteed, as mismanagement through overstocking wildlife can also occur (Bond et al., 2004).

3 Study methods

3.1 Introduction

The field of conservation has been criticised in the past as having a lack of synthesised evidence to help inform decisions (Sutherland et al., 2004). While attempts have been made to address this over the years (Sutherland et al., 2019), the evidence of trophy hunting's impact in Africa is lacking recent appraisal, a gap which this thesis aims to address. Beyond evidence synthesis, an understanding of the impacts of trophy hunting, and indeed many conservation decisions, is hampered by a lack of studies with rigorous designs and suitable comparators that are able to address the complex confounding factors that may be affecting the outcomes observed (Woodhouse et al., 2015). The 2014-2019 hunting moratorium in Botswana offers an opportunity to examine the impacts that trophy was having on local communities and ecosystems by investigating what happened after it was removed. It also offers the opportunity to explore some of the potential impacts of trophy hunting bans and thus forms the central case study of this thesis.

This study uses several approaches to appraise and add to the evidence on trophy hunting using a combination of evidence synthesis and a case study of Botswana to evaluate some of the impacts of the hunting moratorium. Chapters 4 and 5 detail a systematic mapping and review exercise conducted on the existing evidence of trophy hunting in sub-Saharan Africa. Attention is then turned to the case study of Botswana. In Chapter 6, using a political ecology lens, I start by examining the complex socio-political contexts which set the scene for how the two case study villages experienced the hunting moratorium. The moratorium's impacts on community well-being is assessed in Chapter 7, using in-depth ethnographic methods from two case study villages against a pre-determined, and community-tested, theory of change. In Chapter 8, I go on to explore some of the ecological impacts of the moratorium across hunting and non-hunting areas in a quasi-experimental before-after control-impact framework using widely accessible remote sensing data.

This chapter begins with a brief description of the study area and case study sites. I then go on to discuss the mixed methods research approach, including some of the practical details involved in carrying out fieldwork in Botswana such as research permissions, researcher positionality, and ethics. I go on to describe the methods used across multiple chapters in the thesis. Details of methods specific to individual chapters are introduced here with further detail provided in the respective chapters.

3.2 Study area

3.2.1 Sub-Saharan Africa

While extensive hunting takes places across North America and Europe (Di Minin et al., 2021), it attracts far less public attention than the trophy hunting of large charismatic African mammals which are at the centre of much of the ongoing debate (e.g.Vucetich et al., 2019, Batavia et al., 2019b, Bichel, 2021). Some of the most iconic and world renown African animals form part of the 'Big Five': lions, elephants, rhino, leopard and buffalo – a term derived from historic trophy hunting as they were the most dangerous to hunt (IUCN/PACO, 2009). These animals appear extensively in popular culture and their fascination and appeal with the general global public continues to make them prime targets for photographic and hunting tourism alike. They remain among the most sought after and highly-valued trophies, and bring in substantial proportions of the total hunting revenue despite there being relatively low off-take (Lindsey et al., 2007). The hunting of these species also attracts considerable backlash and is often the focus of public outcry when trophy hunting makes the news (Di Minin et al., 2016). Only sub-Saharan African countries offer these trophies as the animals' ranges are now restricted there. Past reviews on the subject have also found few studies on trophy hunting outside the region (in North Africa) (Lindsey et al., 2007, Di Minin et al., 2021). As such, the review exercises conducted for this study limit their scope to sub-Saharan Africa.

When last reviewed, trophy hunting was permitted to take place in 23 sub-Saharan African countries (Lindsey et al., 2007), though there is uncertainty whether this remains the case (IUCN/PACO, 2009). The extent of the activity and hunting governance, including the extent of community participation, varies considerably (Table 3.1). Namibia, South Africa, and Zimbabwe (prior to land reforms) differ from many countries in the extent of private landownership and devolution of hunting management and wildlife use rights to landowners, which has created significant private hunting industries in those countries (Barnett and Patterson, 2005). Here, community participation is minimal and passive, with local people being occasionally provided with meat or jobs. In most countries, hunting is predominantly on state or communal land, with central governments retaining management and use rights over wildlife - setting quotas, choosing hunting operators, and receiving income from hunting. Local communities tend to be passive recipients of discretionary portions of hunting income and have no involvement in management decisions, despite policies in some countries supporting devolution, e.g. Tanzania and Botswana (Nelson and Agrawal, 2008, Roe et al., 2009). Only in Namibia is there broad and active participation with extensive devolution of wildlife use and tourism development rights to communities (Nelson and Agrawal, 2008). This spectrum of community involvement sets the scene for how trophy hunting achieves conservation and development goals.

Table 3.1: Hunting governance arrangements in a selection of sub-Saharan African countries where this information was found, including land and wildlife tenure, community involvement in decisions, and revenue directed to communities

Country	Land tenure of hunting areas	Wildlife tenure	Community involvement in decisions	Revenue received by communities	Sources
Benin	State & communal, unknown amounts	No information	Co-management areas exist, but unclear community involvement	30-70% to Village Committees	Roe et al. (2009); IUCN/PACO, (2009)
Botswana	Mostly state & communal, very small private	State owned; use-rights head-lease to communities that form 'Trusts'*; rights sub-leased to hunting companies	Medium: communities choose how to use quota and spend money, and have final choice in partnering hunting company*	100% retained directly, though they need to pay for head lease*	Barnett & Patterson (2005); Nelson and Agrawal (2008)
Cameroon	Mostly state, some communal	State owned; use rights leased to hunting companies	Co-management areas and community concessions exist, but unclear community involvement	10-100% of area rent and 0-50% of hunting fees to community commissions	Yasuda (2012), Lescuyer et al. (2016)
Central African Rep.	State	State owned, some community rights over wildlife recognised	Co-management areas exist, but unclear community involvement	50-70% to communities	Lindsey et al. (2007), Roe et al. (2009), Bouche et al. (2010)
Ethiopia	State	State owned; use rights leased to hunting companies	None, only revenue sharing scheme	30% to communities	Yitbarek et al. (2013)
Mozambique	Mostly state, some communal & private	Communities can apply for use rights for wildlife, but application is ambiguous. Otherwise, state owned; use rights leased to hunting companies	Very varied, largely minimal	Varied	Norfolk & Tanner (2007); Nelson & Agrawal (2008); Lindsey et al. (2013)
Namibia	Mostly communal, 25% private, some state	Communities and private land owners have broad use rights over common game and conditional use rights over rarer species; communities and state lease use rights to hunting companies	Extensive, through Communal Conservancies	100% retained directly	Barnett & Patterson (2005), Jones (2009), Lindsey et al. 2013

**Botswana CBNRM has been eroded through various ministerial directives, the situation now varies with fewer decisions, and varied income, to communities (Cassidy, 2021)*

Table 3.1 continued: Hunting governance arrangements in a selection of sub-Saharan African countries, including land and wildlife tenure, community involvement in decisions, and revenue directed to communities.

Country	Land tenure of hunting areas	Wildlife tenure	Community involvement in decisions	Revenue received	Sources
South Africa	Mostly private, some state/provincial, handful of communal areas	Ownership rights to private landowners over non-protected wild animals in fenced areas; conditional rights/permits for protected species; some communities with rights over wildlife	Rare, some co-management arrangements	Rare, varied	Lindsey et al. (2007), Roe et al. (2009)
Tanzania	Even split state game reserves & communal areas - not all are WMAs	State owned - use rights leased to hunting companies. In WMAs communities with "Appropriate Authority" meant to have use rights for three years, but often not the case in practice, control remains with state	Minimal, managed by Wildlife Division	Varied and via Rural District Councils	Nelson & Agrawal (2008), Homewood (2009), Wright (2016),
Uganda	State & private, unknown amounts	State owned; licenced use for hunting companies	Minimal	Some, but unspecified	Ochieng et al. (2018)
Zambia	Mostly communal, some state land with long term private leases	State owned with unclear devolution to communities; no statutory rights to wildlife or decision-making authority over wildlife to communities	Minimal, managed by Zambian Wildlife Authority	50% of fees and 20% of rent to Community Resource Boards. Split between chiefs, village scouts, CRB admin, and community projects	Simasiku et al., (2008); Nelson & Agrawal (2008)
Zimbabwe	State, communal & private - unknown amounts following land reforms	Private land owners and Rural District Councils (RDC) granted "appropriate authority" - given use rights, otherwise state owned; RDC and state lease use rights to hunting companies	Minimal, devolution to Rural District Councils (local government) not lower levels	55% on paper, rarely happens	Taylor et al. (2009), Muposhi et al. (2016)

3.2.2 Botswana

3.2.2.1 Geography, climate, flora, and fauna

The Republic of Botswana is a large, landlocked country in Southern Africa covering 581,730km^2. Botswana is rich in natural resources, with a range of mineral deposits, and a highly diverse and abundant wild flora and fauna. Over 70% of the country is comprised of the Kalahari desert, with deep and fragile sands that limit its suitability for agriculture. The dry desert/semi-desert ecosystems of shrubs and grasses spreads from the south west into arid savanna woodland. In the north of the country, the largely arid environment is disrupted by several wetlands fed by rivers rising in Angola and Zambia. In the north-west, the Okavango River drains inland to form the Okavango Delta before flowing into either Lake Ngami or the Makgadikgadi pans. In the far north along the Caprivi strip, the Kwando/Chobe river and the Linyanti Swamp system drain into the Zambezi system. The eastern side of the country has a comparatively milder climate and more fertile soils with the Shashe and Limpopo rivers running along the Eastern border (Government of Botswana, 1998).

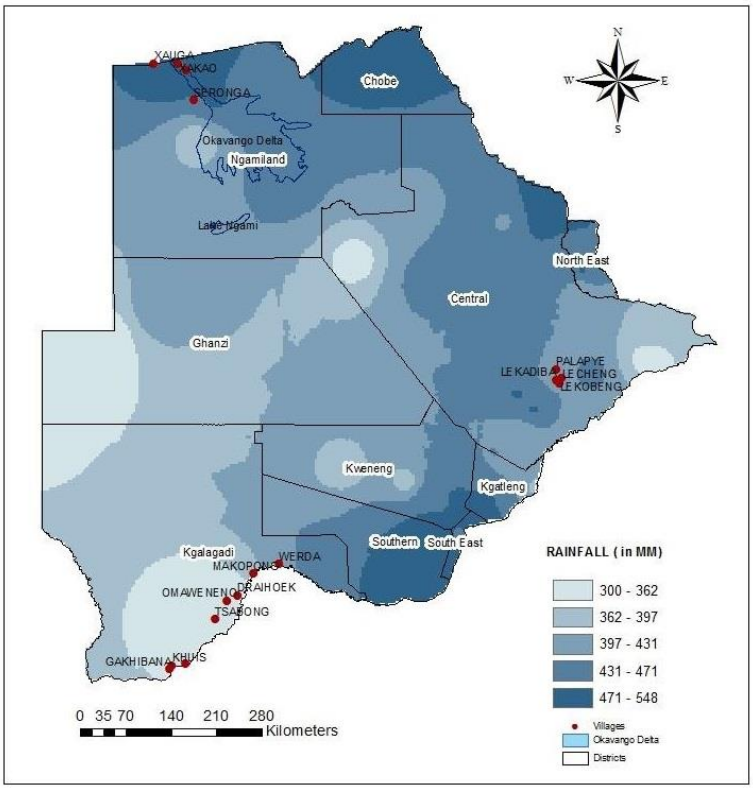


Figure 3.1: Rainfall in Botswana (Pule-Meulenberg et al., 2014)

The climate is largely arid/semi-arid. Mean annual rainfall varies from less than 250mm in the south-west to 650mm in the north east, with higher quantities falling in the south east and lower amounts in the far east (Figure 3.1). Most of the rainfall occurs over summer from October to April, with a May to September dry season. Rainfall is highly variable in space and time and drought occurs regularly.

Average daily maximum temperatures range from 20°C in mid-winter to 33°C in mid-summer, while daily minimums range from 5°C to 19°C. Temperature extremes meanwhile range from below -5°C to over 40°C. Evapotranspiration is high ranging from 1800mm to over 2000mm (Government of Botswana, 1998).

Despite much of the country being desert, floral diversity is relatively high with between 2600 and 2800 species (Government of Botswana, 1998). Diversity hotspots are found around the Okavango and the Chobe river systems. There are twelve major ecosystem types ranging from arid shrub savannas and pans, to wetland/ riparian swamps and seasonal swamp grasslands, to miombo woodlands. The range of habitats supports a highly diverse array of animals with over 150 mammal species, more than 500 birds, at least 40 amphibians and 160 reptiles (Government of Botswana, 1998). Most of the large mammals, and their highest diversity and abundance, are in northern Botswana, and it is this region that forms the focus of this study.

3.2.2.2 Conservation

There has been a strong commitment to conservation in Botswana since the 1960s both inside and outside of more formally protected areas. National parks and game reserves cover approximately 18% of the country and an additional 24% is designated as wildlife management areas (WMAs) (Rozemeijer, 2009). WMAs are divided into a blocks known as controlled hunting areas (CHA), though hunting does not take place in all CHAs. CHAs are a combination of privately-leased tourism concessions, and community-leased concessions, the latter made possible through a substantial Community-Based Natural Resource Management programme which has been growing since the late 1980s. Botswana has followed a sustainable use model of conservation since it formalised conservation in the country, with a hunting programme for citizens and trophy hunting by foreigners in the country dating back to the mid-1960s (Child, 2009d). Trophy hunting was also essential in the establishment of the national CBNRM programme, and was particularly important to it in northern Botswana.

3.2.2.3 People and politics

In addition to its diverse ecosystems, Botswana also has diverse people and a complex socio-political history. The country is sparsely populated with a population of around 2.3 million; however the majority of the population (around 80%) lives in the east of the country in a rapidly-urbanising 50km wide strip along the eastern border (Swatuk, 2005). The dominant ethnic group are the Tswana. Though common ancestry is widely recognised, for centuries the group has been separated into many independent tribes. The eight main Tswana tribes, ordered by size, are the Ngwato, Kwena,

Ngwaketse, Tawana, Kgatla, Lete, Tlokwa, and Rolong[1] (Schapera, 1953). All speak Setswana. According to Nyati-Ramahobo (2008) there are 38 other tribes, which include the Bakgalagadi, Balala, Basarwa/San, Batswapong, Bayei, Herero, Kalanga, Mbukushu, Nama, Pedi, Subiya and Teti[2]. Many of these have their own language, with 26 additional languages spoken in the country (Mompati and Prinsen, 2000). The Government of Botswana considers all people 'Batswana' and downplays issues of ethnicity (Mompati and Prinsen, 2000). It also claims that there are no indigenous minority groups in the country and considers all citizens to be indigenous. It proceeds with this approach in all development and policy decisions (Hitchcock, 2002).

While cattle are a way of life to most Batswana, and prior to independence there was a strong focus on livestock production, most of Botswana's revenue comes from diamonds (Swatuk, 2005).

3.2.3 Case study villages

3.2.3.1 Phuduhudu and the Xhauxhwatubi Community Development Trust

Phuduhudu is a small village on the road between Maun and Francis Town with a population of 564 in the last census (Statistics Botswana, 2012). It lies in the administrative Controlled Hunting Area NG/49, bordering Nxai Pan- and Makgadikgadi National Parks (Figure 3.2). It is located in a Wildlife Management Area which means livestock keeping and agriculture is limited to areas directly surrounding the village, as the assigned land-use is for the area is wildlife and tourism development.

The village was formed in the 1980s by the Government of Botswana to provide social services (water, food rations, and medical supplies) to nomadic hunter-gatherer San groups, and the community today is comprised predominantly of San people (Magole, 2009). The older village inhabitants, and their ancestors, had previously existed across the southern Okavango: occupying and utilising land in the Mababe Depression of Chobe National Park, in the Nxai Pan- and Makgadikgadi Pan National Parks, and in the various surrounding CHAs and WMAs. Their large roaming territories allowed them to follow the seasonally variable wild game and forage (Magole, 2009).

[1] The spelling of many Botswana people groups varies between texts. 'Ba' is a common prefix used across many groups e.g. Ngwaketse is also referred to as Bangwaketse. The prefix 'Bama' is also used in some, e.g. Bamangwato. The spelling used here follows Schapera (1953).

[2] Similarly, with these groups there are various spellings with 'Ba' being used or not. Other letters also vary. E.g. Mbukushu can also be spelled Mpukush or Hambushku, Bayei as Bayeyi or Yei or Wayeyi. The spellings used in text are from Mompati & Prinsen, (2000).

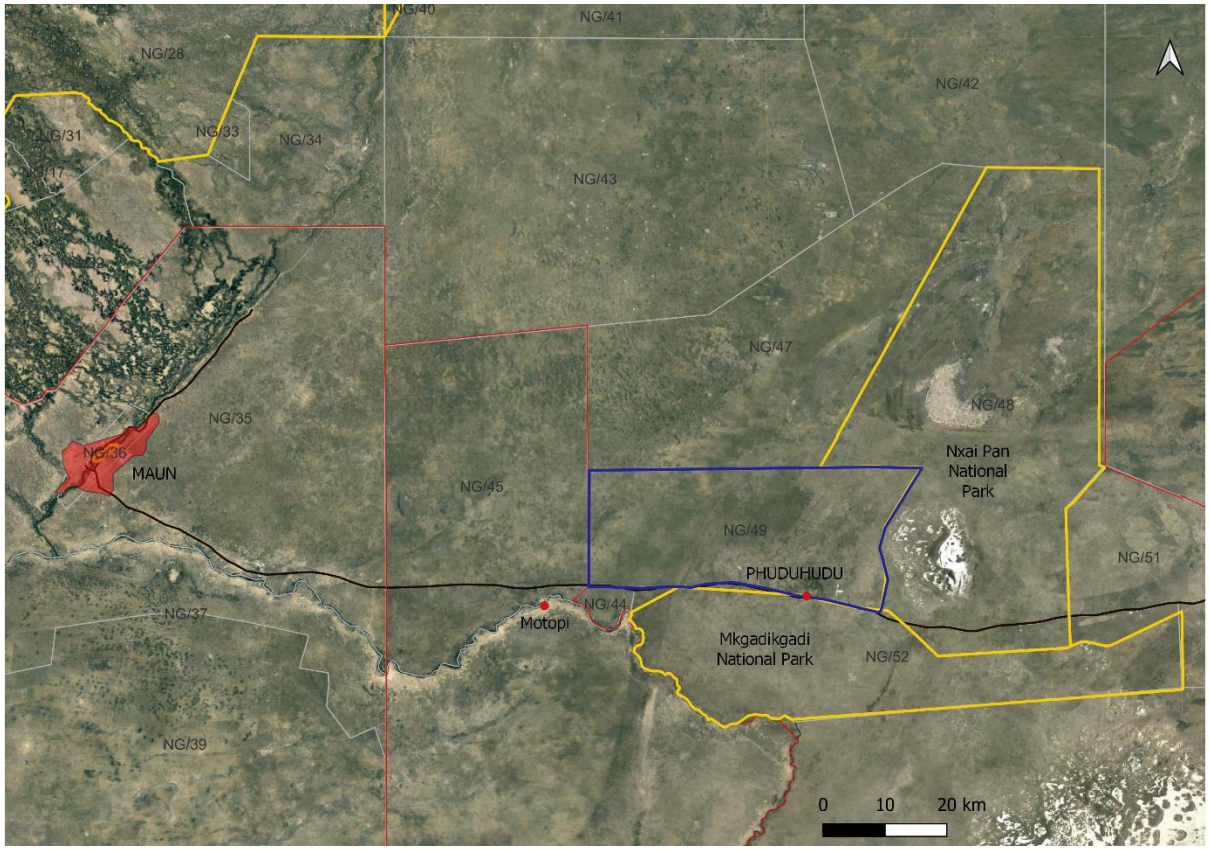


Figure 3.2: Location of Phuduhudu village, NG/49 (concession outlined in blue) and surrounding concessions, and neighbouring Nxai Pan and Makgadikgadi National Parks (in yellow). Veterinary disease control fences are in red

Like elsewhere in southern Africa, the San of Phuduhudu have suffered several injustices at the hands of both the colonial and post-independence governments, and are some of the most marginalised people in Botswana. A key element has been not having their land rights, and land use practices, recognised by governments, which has led to much of the land they used and occupied being designated as national parks, state managed CHAs, or commercial farmland (Magole, 2009). The combination of land use policies restricting access to land, and conservation policies restricting access to wildlife has led to most of their former livelihoods being heavily restricted or criminalised. These have been well summarised by Magole (2009, Table 3.2). More than half of the San in Botswana live below the poverty line. Rates of alcoholism and unemployment are high (Magole, 2009).

Table 3.2: Legal instruments and policies of land management and their effect on San from Magole (2009)

Year	Legal instrument / policy	Proclamation	Main effect on the San
1933	Convention for the Protection of Fauna and Flora	Establishment of game reserves by the colonial administration throughout Africa	Evictions, denial of access to reserve areas
1961	Fauna Conservation Act	Establishment of game reserves in Botswana and anti-poaching laws	Evictions, denial of access, arrests, imprisonment for poaching
1967	National Parks Act	Establishment of National Parks	Evictions, denial of access, arrests, imprisonment for poaching
1968	Tribal Land Act	Establishment of Land Boards to manage tribal land and remove it from *dikgosi*	Exclusion as a tribe as Land Boards were based on tribal territories
1975	Tribal Grazing Land Policy	Establishment of privately owned ranches in communal land and establishment of WMAs	Reduction of access to some resources
1986	Wildlife Conservation Policy	Promotion of commercial wildlife uses in WMAs	Exclusion from commercial wildlife use that favoured large hunting companies
1988	Integrated Hunting Regulations	Hunting licences and hunting season	Issuing of special game licences
1992	Wildlife and National Parks Act	Expansion of parks and gazetting of WMAs	Further reduction of common pool resources as parks were expanded
2002	Draft regulations for WMAs	Centralisation of natural resource management in WMAs on government	Further reduction of access to livelihood resources
2007	CBNRM Policy	Formalisation of a *de facto* CBNRM	Abolition of special game licences

Phuduhudu established the Xhauxhwatubi Community Development Trust (XDT) in 2004, and in doing so, villagers lost their special game licences. XDT was allocated a state owned concession, CHA NG/49 (about 1,113 km^2) through a lease with the Department of Lands (Cassidy, 2000). The Trust was given a quota from the DWNP and over the years sold this through a Joint Venture Partnership with a hunting safari company and via annual auctions. When CBNRM was last reviewed, XDT had not replaced hunting with any other income-generating activities, had lost all of its income, and was no longer distributing benefits to community members (Centre for Applied Research, 2016).

3.2.3.2 Ditshiping and the Okavango Kopano Mokoro Community Trust

Ditshiping is not officially gazetted as a village and is technically a settlement or 'cattle post' as they are known in Botswana. The population was 139 in the 2011 census (Statistics Botswana, 2012), but is highly variable as people move in and out of the village depending on the tourism season. The majority of Ditshiping's inhabitants are Bayei. Ditshiping lies within the NG/32 Controlled Hunting Area and is only accessible on dirt roads using a 4x4 vehicle or by air. It is in a WMA and inside the cattle exclusion zone of the Okavango Delta[3] which severely restricts livelihood options in the village by preventing any animal rearing in the village (Figure 3.3).

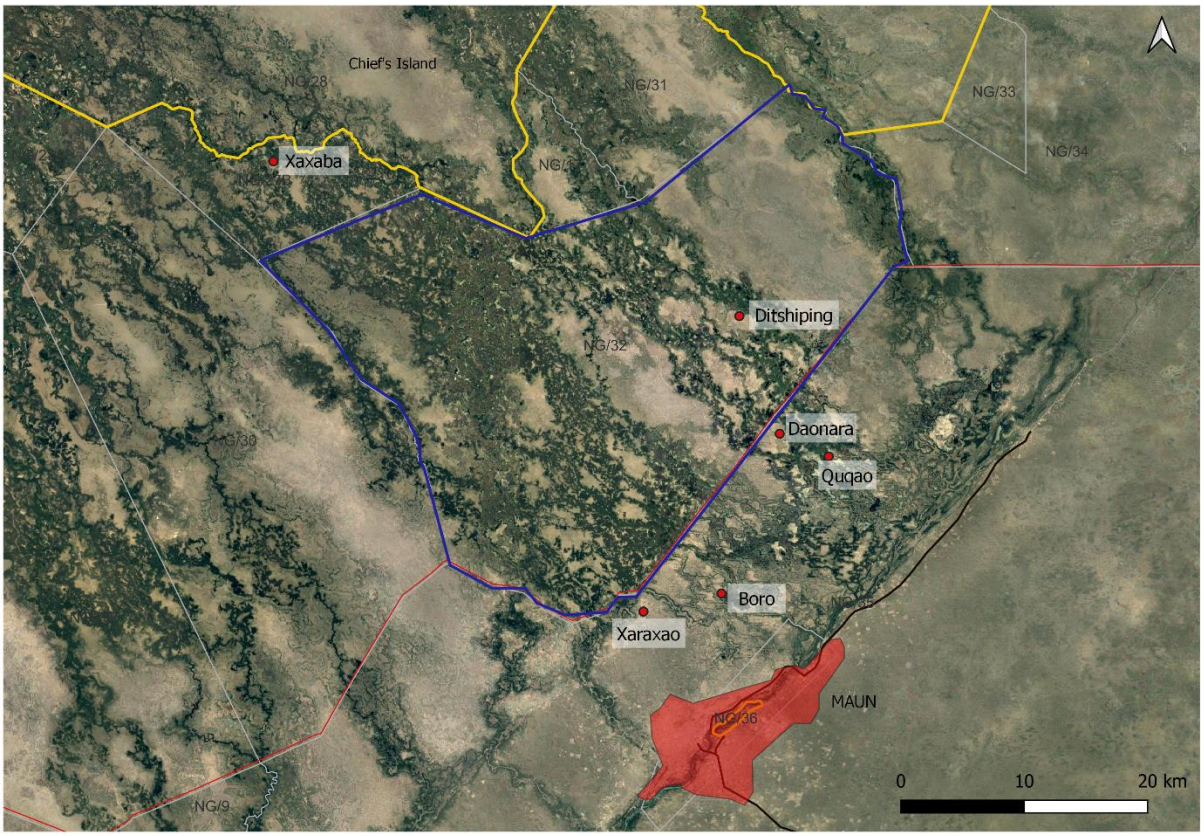


Figure 3.3: Location of Ditshiping and the other five OKMCT villages and NG/32 concession (outlined in blue), showing their relation to Maun, the veterinary cordon fence (in red) which marks the cattle exclusion zone from the Okavango Delta, and the boundary to Moremi National Park (in yellow)

Ditshiping was formed in the late 1970s after Moremi Game Reserve was extended to include Chief's Island. Its ungazetted status means it does not qualify for service provision by the government in the form of roads, health services, water provision, or education facilities. This is in part as it does not

[3] This exclusion zone is enforced by what is called the 'Buffalo Fence' and was put in place predominantly as a disease control measure to prevent foot and mouth spreading from wildlife to cattle.

meet the minimum required population (500 people) and is only considered an informal settlement (Madzwamuse, 2010).

The Okavango Kopano Mokoro Community Trust (OKMCT) was established in 1997. Ditshiping is one of six participating villages with the others being: Boro, Daonara, Qouqau, Xaraxau, and Xaxaba. Combined, the trust has a membership of over 2,400 people (Madzwamuse, 2010), and has been allocated CHA NG/32 by the Tawana Land board (i.e. its on Tribal Land) which covers an area of 1,223 km^2 (Figure 3.3). The Trust is involved in a number of commercial activities which include a community-run enterprise involving tours in punt-like boats called *mokoros*. Prior to the hunting moratorium they also had a Joint Venture Partnership (JVP) with a company called Johan Calitz Safaris, through which they sub-leased the concession area, and sold their hunting quotas.

Since the hunting moratorium and the development of a new management plan, which split the concession into four areas, OKMCT has re-formed a JVP with Johan Calitz Safaris, as well as two new ones (Centre for Applied Research, 2016).

3.3 Research approach

I followed an interdisciplinary mixed methods approach to data collection and research, involving qualitative and quantitative methods across the social and environmental sciences. I used primary and secondary data from across the country, two case study villages, and the Ngamiland district.

3.3.1 Conceptual frameworks

This thesis uses several conceptual frameworks to help explore the complex social, political, historical, ecological systems in which trophy hunting takes place. These frameworks offer fresh perspectives on understanding trophy hunting, as while they are increasingly used in conservation research (Bluwstein, 2018, Dawson et al., 2018, Homewood et al., 2020), they have rarely been used to explore the impacts of trophy hunting and the contexts in which these take place (Bollig and Olwage, 2016).

3.3.1.1 Political ecology

Political ecology explicitly addresses the idea that social and environmental conditions are profoundly and inextricably linked. Furthermore, it stresses that the condition of the environment needs to be understood as the outcome of political processes, and highlights that even the way the environment and nature is understood is shaped by these processes (Adams and Hutton, 2007, Robbins, 2012). Conservation often involves decisions affecting the relationship between people and nature, making it highly political (Adams and Hutton, 2007). This takes many forms from the aspiration to create people-free “wilderness” areas in the form of National Parks, to a dominance of natural science in

conservation prioritisation, and the roles of large multi-national conservation non-governmental organisations.

A central theme in political ecology is power. Power disparities between different actors in conservation are numerous and noticeable: rural people whose livelihoods are dependent on natural resources versus urban decision-makers in government, local traditional versus scientific knowledge holders, the 'global north' versus the 'global south' to name a few. Political ecology is concerned with how these power differentials affect conservation outcomes, and the privileges they afford to different groups (Robbins, 2012, Swatuk, 2005). Critical environmental history is another of the tools used to add temporal depth to understanding the socio-ecological systems in which conservation decision are made. Exploring the history not only helps to understand how these systems have changed over time, but it is also crucial to understanding the present state and ongoing changes (Robbins, 2012).

3.3.1.2 Well-being

Human well-being is a widely adopted measure used in a range of applications from the development sector to economics, and is a national policy target in many countries (Woodhouse et al., 2017). Well-being represents a positive physical, social, and mental state. Ensuring healthy lives and promoting well-being is considered essential to Sustainable Development (SD) with this being reflected in the third SD goal: 'Good health and well-being'. It is suited to the analysis of socio-ecological systems, which most modern conservation systems are, as it can link the natural and social dimensions of these systems as there are widely recognised interactions between human well-being and ecosystems (Millenium Ecosystem Assessment, 2005). Well-being considers the multifaceted components of a good life; accounting for the complexity of people's lives, their incentives, and aspirations which shape and are shaped by their environments (Woodhouse et al., 2017). Such an understanding of incentives can help explain behaviour and responses to interventions. It goes beyond the practical benefits which conservation initiatives, like CBNRM, typically focus on, like economic incentives; acknowledging that people are driven by a range of incentives, norms, and aspirations. A well-being perspective can elicit a more complete understanding of local priorities, the multifaceted incentives of resource-users, and the social impacts of conservation interventions, which ultimately improves their design or advises management (Woodhouse et al., 2017).

3.3.1.3 Equity

Equity and social justice have come into increasing prominence in conservation practice and decision-making in recent years (Friedman et al., 2018, Franks and Pinto, 2021), and are now concepts which are embedded in many international conservation targets, agreements and policies

(e.g. Convention on Biological Diversity, Inter-governmental Panel on Biodiversity and Ecosystem Services, International Union for the Conservation of Nature (IPBES, 2019, IUCN, 2020, CBD, 2021)). Conservation has been criticised in the past for exclusionary approaches which separate people and nature, prioritise dominant worldviews and values, and often threaten community livelihoods, traditional practices and ways of life (Brockington and Igoe, 2006, Duffy, 2014, Friedman et al., 2018). While social justice is not essential for conservation, and it can be achieved without it in the short term (Hoffmann et al., 2010), efforts are more likely to be accepted and sustainable in the long term when issues of equity are considered and local people are included in decision-making (Dawson et al., 2021, Martin et al., 2016). As such, increasing effort has been made to establish fairer and more inclusive conservation approaches (Shoreman-Ouimet and Kopnina, 2015, Büscher and Fletcher, 2019). Examining and adding to the evidence on trophy hunting with a social justice and equity lens aligns with these shifts in international conservation decision-making and policy.

3.4 Methods overview for the following chapters

In the next two chapters (4 & 5), I conduct a systematic evidence appraisal in the form of a systematic map (Chapter 4) and systematic narrative review (Chapter 5) to explore the existing evidence base on trophy hunting's social and ecological impacts in Africa. The contentious nature of trophy hunting demanded rigour and transparency in the synthesis, as such a systematic approach was followed. However, due to the topic's complexity and the resource constraints of conducting the review as a PhD student, ammendments from the 'gold standard' systematic review were required (Collaboration for Environmental Evidence, 2013). The mapping process allowed for an improved understanding of the nature of the evidence base on trophy hunting, highlighting its geographic extent, the types of trophy hunting outcomes reported, and the ways in which trophy hunting has been studied. The narrative review then explored the evidence itself, appraising the existing evidence on the social and ecological impacts of trophy hunting in sub-Saharan Africa. In both chapters, evidence gaps are highlighted in terms of the distribution of the evidence and gaps in our understanding of how trophy hunting contributes to conservation.

In chapter 6, I turn to the Botswana case study and examine how the CBNRM institutions, their unique socio-political history, and broader national politics, have influenced how communities were impacted by the 2014-2019 national hunting moratorium. To do this, I explore how broader historical and political factors have shaped conservation and CBNRM in the country, and how this has impacted the efficacy of trophy hunting as a conservation tool in Botswana. I look at how the two case study trusts were formed, and how local and national politics have affected the Trusts. Decisions around trophy hunting are politically charged due to its controversial nature and pressure from international lobby

groups. In Botswana, the issue was accentuated by the promotion of sustainable use approaches to conservation by the Southern African Development Community, of which Botswana is a member (Barnett and Patterson, 2005). CBNRM in the country was also inherently political, involving the redistribution of management rights and responsibilities, and this was heightened by the inclusion of many of Botswana's ethnic minority groups in programme. The political ecology of Botswana was analysed using literature review, participant observation, interviews, and focus group discussions within case study communities, as well as key informant interviews with broader stakeholders from government, the photographic and hunting tourism industries, NGOs, and researchers. Most of the primary data was collected from two in-depth case studies of communities who were actively involved in the trophy hunting industry prior to the moratorium through CBNRM. The sites represent a dichotomy in the ability of Trusts to diversify revenue from trophy hunting. This allowed me to unpick how trophy hunting compared to other approaches to wildlife-based income generation, and to identify some of the factors affecting a Trust's ability to diversify to alternative income sources.

Chapter 7 of my PhD aims to determine how the moratorium has impacted local human well-being. In doing so, I also hope to demonstrate the contributions of trophy hunting to local communities prior to the ban. A qualitative social impact evaluation was conducted following the framework of Woodhouse et al. (2015). Within this framework, I used a combination of theory-based and participatory designs to evaluate impacts. A theory-based approach compared impacts observed from the moratorium to predictions based on a theory of change. In doing this, I proposed alternative hypotheses for change and discount or confirm them with the evidence collected. The theory of change was developed using available information from the literature. A participatory design was incorporated by having the theory of change critiqued and edited in focus group discussions. Reflexive counterfactuals were used, where participants compared the current situation to what it was like before the moratorium and defined the benefits and costs that were attributed to it. The chapter also assesses people's perceptions towards trophy hunting, CBNRM, and the moratorium. In doing so, I hope to highlight local perceptions on trophy hunting, as their voices are so often left out of debates on its efficacy as a tool. Methods included participant observation, informal, unstructured and semi-structured interviews, focus group discussions, and surveys following approaches set out in Woodhouse et al. (2015).

Chapter 8 aims to determine how the broader Ngamiland ecosystem was impacted by the hunting moratorium using a remotely sensed vegetation index. The moratorium offers the opportunity for using a before-after control-impact framework, assessing impacts across non-hunting and hunting areas before and after the moratorium.

3.4.1 Fieldwork

I conducted a three-week scoping study in August 2018. Two weeks were spent in Maun, the closest major village to the case study villages, and one week was spent in Gaborone, the site of all the main Government offices. During my time in Maun, I established a collaboration with Professor Mbaiwa at the University of Botswana's Okavango Research Institute to act as my in-country supervisor for the work, and provide local insight and legitimacy. As a foreign student, the collaboration was also needed to obtain a research permit. I visited four potential case study villages and met with Trust board members in each. I chose Phuduhudu and Ditshiping with advice from project collaborators and because they had not been the focus of much previous research. After selecting the two villages, I obtained local permissions from the village chiefs (Kgosi's) to conduct research in the two villages and also consent from the Community Trusts. In Gaborone, I obtained a research permit to conduct research in the country (REF: ENT 8/36/4 XXXXIII(67), Appendix 2: Research Permit). In both Maun and Gaborone, I also met with a wide range of stakeholders including conservation researchers, hunting and photographic tourism industry representatives, and Government officials, conducting informal interviews to obtain diverse perspectives on the topic.

The majority of data was collected over approximately seven months spent in the field. I spent most of that time in the case study villages: Phuduhudu from February-April 2019, and Ditshiping from August-October 2019. A week at the beginning and end of each trip, as well as fortnightly visits for a few days to restock food supplies, were spent in Maun where I conducted key informant interviews with other stakeholders. In Phuduhudu I was housed in a Trust office room and in Ditshiping I stayed in the pre-school 'sick bay'/store room.

I followed a similar format in each village. The first three weeks were spent familiarising myself with the village, its inhabitants, and their way of life, conducting participant observation and informal interviews. In the first weeks of each village stay, I was introduced to the communities at *kgotla* meetings. These were attended by approximately 75 and 30 people in Phuduhudu and Ditshiping respectively. The *Kgotlas*, a Tswana traditional meeting, have been adopted in both villages as a way of consulting inhabitants on matters affecting village life. In the meetings I introduced myself and my work, and the communities were given the opportunity to ask questions. I was also officially welcomed into each village. I spent the subsequent two weeks conducting a basic census to get information on the current population size, the number of livestock keepers and farmers, as well as basic livelihood and education information. This also provided me with an opportunity to introduce myself to all villagers as not everyone had attended the *kgotla* meetings. Throughout this time I continued conducting informal interviews. I spent the next month conducting formal semi-structured interviews

with villagers, while the last two weeks were spent conducting focus group discussions with various cross-sections of society, and finishing formal interviews.

A final four month field trip, scheduled from late April to August 2020, to conduct a quantitative survey on the impacts of the moratorium across four former-hunting CBNRM 'impact', and four non-CBNRM 'control', villages was cancelled due to the Covid-19 pandemic.

3.4.2 Ethics and positionality

This project went through various ethics reviews. The overall research plan and methods went through review by the Zoological Society of London's ethics procedure assessing human impacts, and the UCL Anthropology Department (no. 2018/09/PGR/Muller/001). The project was registered in line with UCL's Data Protection Policy (ref No. Z6364106/2019/01/37). Detailed methods and specific research implements were reviewed by the UCL Research Ethics Committee (14637/001) and the University of Botswana (UBR/RES/ACUC/014).

All interviews and focus group discussions were conducted with the participant's consent after they had been informed about the project and its aims. Participants could choose not to speak to me, could choose not to answer any questions they did not want to, and were free to leave the conversation as they chose. Only two people, one in each village, refused to take part in the research, both citing that prior research that had been conducted had not brought any positive changes to the villages. For informal interviews and the village 'censuses', verbal consent was obtained to maintain the more relaxed engagement with people that informal interviews entail and to keep the introductory conversations informal. For formal interviews and focus group discussions, signed consent forms were used, with participants retaining the information sheet along with contact details and a complaints procedure (See Appendix 2: Consent form and participant information sheet). The full forms were read out before each interview/focus group discussion and prior to obtaining consent. Statements included whether the participant/s were willing for the conversation to be recorded, and whether they were willing to have their photograph taken. In all interviews notes were taken, although these were more thorough when participants chose not to be recorded.

All participants were given an ID based on their household number, age, and gender with no names recorded or used when transcribing, analysing, or writing up the research. Key informants were numbered with no names included when writing up.

My position as a white, female researcher, and an outsider coming into these communities, likely had some effects on how data was collected in the field, and the interpretation of results. It is also likely to have impacted the participation of community members. The impacts of an outside researcher

coming in was minimised by the communities being somewhat accustomed to researchers as CBNRM, and the participating communities, have been subject of various reviews and surveys. By living and spending time in the communities to build up trust, introducing myself to the communities through culturally accepted format via the *kgotla* meetings, wearing culturally appropriate clothing, and letting them develop an understanding of my intentions, all helped put people at ease. I made it clear that I was collaborating with the University of Botswana who have been working in and with these communities for years and had some developed rapport. But I was also careful to highlight my independence, and that while I would feed back the outcomes to the government I was not reporting to them. I made sure participants knew the likely outcomes of the research and was careful not to promise anything that could not be achieved.

Being a white person living in the village, particularly in Phuduhudu, meant that I was somewhat of a spectacle. The children would call out '*lekgoa'* to me as I passed, which means white person, and were often either very shy or deeply interested in me. It also gave some people the impression that I had more power to make or influence changes than I actually had, and it placed added responsibility on me to highlight the limits of what my research could achieve. Many people assumed I was associated with the hunting or photographic tourism industry, as that was typically the capacity in which they had met other white people. They also assumed I was rich, which by comparison to them I definitely was, but by comparison to the usual tourists they encountered, I was not (Botswana specialises in exclusive high end tourism). But I do also think that being a white woman made people more willing and curious to speak to me. This in turn put more onus on me to ensure no one felt pressured into speaking to me, and made the process of obtaining free, prior, and fully-informed consent even more important. As a small token of thanks to participants in the formal interviews and focus group discussions, I provided refreshments in the form of some biscuits and juice.

Prior to fieldwork, I spent some time learning Setswana through books and online resources, as I was unable to find any courses for it in London. I gained a basic grasp of the language, was able to hold simple conservations, and importantly, was familiar with all the formal and informal greetings. My abilities were insufficient to conduct my research alone, so I used research assistants/translators from each village to assist me. My basic grasp of the language, in particular the greetings and my ability to pronounce peoples names correctly, and my interest in learning more of it, helped improve my relations with people in both villages, and allowed me to follow the main themes in the interviews and discussions.

I hired research assistants from the each of the case study villages. How they were selected, and their salary, was determined by local leaders. I only stipulated that I would ideally like one male and one

female assistant, and that ideally they knew the local minority languages of Sesarwa and Seyeyi in case this was the preferred language of respondents. In Phuduhudu, I went through a formal hiring process with an advert and interview process which was attended by a panel including a representative from the Trust, the Village Development Council, and the Government. They advised on all the candidates, though I ended up using all four people who applied, at various stages of my research, as two of my translators got other jobs during the period. It was also likely seen as a way of fairly distributing the income. In Ditshiping, I was initially offered two translators, who were selected by the group that greeted me into the village, and who were considered to be the most appropriate candidates. However, the English ability of the young man they selected was rather poor, and insufficient to carry out the work so I only ended up working with one translator in Ditshiping. In retrospect having met all village residents, she was the most suitable candidate as she had a good grasp of English, lived in the village full-time, and was not a *mokoro* poler which meant she was not called away on tours like many others in the village.

3.4.3 Key methods

3.4.3.1 Systematic evidence synthesis

As a policy-relevant and controversial subject, assessing the evidence-base on trophy hunting called for a rigorous approach with accountability in decision-making (Haddaway et al., 2015). While a range of evidence synthesis methods exist, systematic reviews, a mainstay in modern medicine and public health, are increasingly used to improve evidence-based decision-making in conservation policy, practice, and research. However, the rigidity of systematic reviews, focussing on 'inputs' and 'outputs', can make them restrictive and simplistic, as they can fail to account for the processes, context, and complexity which are often critical in understanding conservation systems (Adams and Sandbrook, 2013). Systematic reviews also tend to favour certain types of evidence over others, e.g. quantitative data and experimental designs over qualitative data and ethnographic studies (Adams and Sandbrook, 2013). As such, various sources were used for guidelines on how to conduct the systematic map and narrative review to best guide different elements of the process: searching and selecting literature (Pullin and Stewart, 2006), conducting the process as a PhD candidate (Pickering and Byrne, 2013), appraising the evidence sources (Roe et al., 2015), and appraising and synthesising findings (Popay et al., 2006). The combination of these approaches allowed for rigor and transparency to be maintained, while dealing with the heterogenous studies that conservation research often produces (Haddaway et al., 2015, Haddaway et al., 2018). It also allowed for a deepened understanding of trophy hunting impacts and how they come about (Greenhalgh et al., 2018). The protocol and scoping exercise were assessed during the MPhil to PhD upgrade.

3.4.3.2 Participant observation

Participant observation is a fairly unstructured and interactive anthropological method used to study people's daily lives, interactions, and activities, with an aim to describe how and why people do what they do (Bernard, 2011, Puri, 2011). Important in this, is having people familiar and comfortable enough with your presence, for you to observe and record information about their lives without disturbing or affecting their behaviour. Doing participant observation does not make you a passive observer, but involves immersing yourself in a culture, learning the local language, experiencing the lives of the people you are studying, and gaining their trust (Bernard, 2011) (e.g. Figure 3.4). This detailed observation also allows you to collect information on what people say and what they do with contradictions between the two being of particular interest.

Figure 3.4: Me being taught how to, and assisting a Ditshiping resident in, building a traditional reed fence

Extended periods of time were spent in each case study community with much of the first couple of months in each being spent integrating into the communities. These periods allowed me to develop a deeper understanding of the case study communities, their structure, heterogeneity, culture, and interactions with, and within, the CBNRM institutions, and broader politics (Puri, 2011). Participant observation was conducted throughout fieldwork, and was used to give a more contextual perspective to questions explored in Chapters 6 and 7.

3.4.3.3 Informal, unstructured and semi-structured interviews

During the first two months of fieldwork in the case study communities, much of my time was spent conducting informal interviews with community members as part of everyday interactions with them. Conversations were often noted only after they took place to make them as natural as possible, or notes were taken with a small and unobtrusive notebook (Bernard, 2011). These informal interactions took place throughout both field trips, and added to my knowledge of the communities and study system. After I had spent some time in each village building up rapport with community members, I started unstructured interviews to gain a greater understanding of people's lives, the issues they face, and their opinions towards topics of interest. I then conducted formal semi-structured interviews following an interview guide to steer the conversation to answer pre-determined, but open-ended questions with prompts to ensure I got answers to the questions I wanted to hear about, and flexibility to allow for pursing other topics as they arose (See Appendix 2: Interview Guide). Both the unstructured and semi-structured interviews were used to obtain a deep understanding of these communities, their heterogeneity, individual and group involvement in CBNRM, people's aspirations, views on CBNRM, trophy hunting and the moratorium, and tolerance towards conservation activities and wildlife. To verify data accuracy where possible, I triangulated answers given by different respondents as well as key informants. Recall questions were used to determine conditions before the hunting moratorium (Woodhouse et al., 2015). Though recall can be susceptible to inaccuracies (Papworth et al., 2009), the moratorium was relatively recent, and where possible answers were triangulated with others.

Individuals were selected for participation in informal and unstructured interviews using a snowball sampling technique, and purposive/judgement sampling (Bernard, 2011). Individuals were recruited for formal interviews using a random selection of households, after which individuals were purposively selected to ensure even spread of respondents across age and gender categories (Table 3.3).

*Table 3.3: Number of individual interview participants across age and gender categories in Phuduhudu and Ditshiping villages. Numbers in brackets show total number of village residents in each age/gender category. *Counts include people working in Trust lodges*

	Ditshiping		**Phuduhudu**	
Age	**Female**	**Male**	**Female**	**Male**
18-35	9 (36*)	10 (31*)	19 (83)	13 (70)
36-64	11 (38*)	6 (25*)	14 (54)	11 (55)
65+	4 (13)	4 (11)	3 (20)	4 (23)
Total	24	20	36	28

3.4.3.4 Focus group discussions

Focus group discussions are essentially qualitative group interviews. These were conducted with groups of individuals (typically 6-10), differentiated by age, gender, livestock/farm ownership, village (in the case of OKMCT), and whether they were members of the Trust Board to determine disaggregated views, and examine how intersectionality operates across the communities (Table 3.4-11). I also interviewed groups of staff at the OKMCT lodges. These discussions allowed contrasting views to be expressed and explored, encouraged reflection, and produced in-depth explanations of the reasoning behind views that were expressed (Newing et al., 2011) (See Appendix 2: Group Discussion Guide). These groups were also used test the theory of change developed from the literature. These discussions were used to determine key aspects of importance to sub-groups within the communities and gather in-depth insight on issues raised in interviews. They were also intended to inform the design of a questionnaire to be carried out in a final field trip.

Table 3.4: Break down of focus groups across the two Trusts: multi village Okavango Kopano Mokoro Community Trust (OKMCT), and single village Xhauxhwatubi Development Trust (XDT)

OKMCT	**XDT**
Quqao village	Men 65+
Morutsa settlement	Men 18-25
Daonara village - Men	Men 36-64
Daonara village - Women	Women 65+
Daonara village - polers	Women 18-25
Boro village - Elders	Women 36-64
Boro village - Youth	Field owners
Xaxaba village - Elders	Livestock owners
Xaxaba village - Youth	Trust Board
Xaraxao village - Elders	
Xaraxao village - Youth	
Stanley's Lodge staff	
Baine's Lodge staff	
Gomoti Lodge staff	
Qorokwe Lodge staff	
Trust Board	

Table 3.5: Gender and age of focus group participants in discussions about the Trust Boards in OKMCT and XDT

	Women		**Men**	
	18-35	**36-64**	**18-35**	**36-64**
OKMCT	1	1	2	4
XDT		1		2

Table 3.6: Gender and age of focus group participants across Phuduhudu and OKMCT Villages and lodges

	Women			Men		
	18-35	**36-64**	**65+**	**18-35**	**36-64**	**65+**
OKMCT Villages	16	33	20	34	39	15
OKMCT Lodges	11	9	0	6	6	0
Phuduhudu	5	8	7	5	11	8

3.4.3.5 Questionnaire

From the knowledge gained during the first two field trips, a questionnaire survey was designed to collect quantitative data on the well-being impacts of the moratorium on communities based on issues highlighted by communities in the case study villages (Bernard, 2011). The plan was to carry out the survey across eight villages in Ngamiland, with half being 'intervention' villages which had been involved with CBNRM and hunting tourism prior to the moratorium, and half being 'control' villages in close proximity to Wildlife Management Areas which were not involved in CBNRM. This did not take place due to the Covid-19 pandemic.

3.4.3.6 Key Informant Interviews

I conducted key informant interviews with conservation practitioners and researchers, representatives from the hunting and photographic tourism industries, community leaders, and local and government officials within the DWNP and other departments which influence CBNRM, e.g. District Councils, Land Boards, BTO, etc. to gain a wider perspective on issues raised by communities, and opinions on the broader politics from different perspectives (Table 3.7).

Table 3.7: Number of key informant interviewees conducted across different CBNRM and tourism stakeholder groups

Stakeholder group	**Number of interviewees**
Photographic Tourism	10
Hunting	5
Conservation/NGO	5
Consultants	2
Local government/council	7
Researchers	4
Local villages	12

3.4.3.7 Remotely Sensed Vegetation

To assess the impact the hunting moratorium was having on the broader ecosystem, I used a widely available and readily accessible remote sensing product, the normalised difference vegetation index (NDVI) in a before-after-control-impact (BACI) modelling framework. Remote sensing and GIS are useful tools to gather information on biodiversity, and the NDVI, in particular, is being increasingly

being used to answer a wide-range of conservation and ecological questions (Pettorelli, 2013). Remote sensing products, which have been collected in various resolutions over the past decades, can be used to assess changes in vegetation over time including in remote settings. This study offers a new application by examining the impacts of trophy hunting on the broader ecosystem in a rigorous BACI design.

3.4.4 Data analysis

3.4.4.1 Thematic analysis

Qualitative data collected in participant observation, interviews, and focus group discussions were analysed in several ways. I used narrative analysis to examine commonalities, and differences, in narratives of how participants recounted how they were impacted by the moratorium and CBNRM, and their understandings of the broader contextual factors affecting these data (Bernard, 2011). Interpretive analysis was used to combine the broader context of the knowledge I gained, and the experiences from spending time in case study communities, with coding to help interpret or pick out themes emerging from the data (Bernard, 2011). A grounded-theory approach was used for thematic coding to generate themes which emerge from the data to form a picture of shared experience (Bernard, 2011, Woodhouse et al., 2015). Transcripts were coded for themes within a well-being framework, and then analysed in relation to the theory of change models developed from the literature and critiqued by communities (Woodhouse et al., 2016, McKinnon et al., 2016). Exemplar quotes were drawn out to provide examples of themes. Throughout, I explore how these disaggregate with subgroups in the communities.

3.4.4.2 Quantitative analysis

Quantitative data were analysed through descriptive statistics to describe basic trends in data (Woodhouse *et al.*, 2016). In the case study comparison, while I was able to identity differences and similarities between the two communities, I was unable to rigorously test casual links as I could not control for all the potential confounding factors, e.g. broader changes to CBNRM that have affected how impacts of the hunting moratorium were felt (Newing et al., 2011). Instead, I highlighted potential confounding factors that may be affecting trends and was explicit about the limitations.

3.4.4.3 General linear mixed effects models

To understand the impacts of the hunting moratorium on NDVI, a general linear mixed effects model approach was used (Bates et al., 2015). A post-hoc before-after and control-impact (BACI) design was followed using areas where only photographic tourism took place as the control.

4 What do we know about trophy hunting's impacts in sub-Saharan Africa? A systematic map of the evidence

4.1 Abstract

Trophy hunting is a contentious practice in conservation, with increasing calls for it to be banned. It has been argued that well-managed trophy hunting can be justified by positive impacts on biodiversity and local communities, yet there have been no systematic examinations of the evidence on these outcomes to inform the debate and policy decisions. This chapter presents a systematic map of the evidence on the ecological, socio-economic, and land use outcomes of trophy hunting in sub-Saharan Africa. It aims to examine the extent of available literature, identify gaps both spatially and topically, and assess how outcomes are studied.

One-hundred and eighty-eight (188) relevant studies containing evidence on trophy hunting's outcomes were identified from the literature. Evidence spanned twenty-four African countries, but there were strong geographic biases. Most studies were conducted in southern African countries and Tanzania, with research gaps in West and Central Africa. Six additional countries with potential trophy hunting industries were found to have no evidence on outcomes. More evidence was found for socio-economic outcomes than other types, but evidence was dominated by national or community-wide measures and measures of economic or material well-being, while impacts at the household and individual level, and broader multi-dimensional well-being outcomes are less well studied. Studies on whether trophy hunting influences human behaviour are limited, as are studies exploring its wider ecosystem and conservation impacts. Although many primary studies on trophy hunting exist, the subject has few impact evaluations which can attribute causal effects or identify the contexts under which positive outcomes are achieved.

4.2 Introduction

The contribution of trophy hunting to African conservation is contentious and unclear, and there is growing pressure to ban the activity across the continent (Di Minin et al., 2016, Lindsey et al., 2016, Dickman et al., 2019). While much of the controversy around trophy hunting is rooted in ethical and moral considerations, debate also remains around the ecological impacts, socio-economic contribution, and management issues of the practice (Ghasemi, 2021). While scientific evidence is only one component of policy-making (Adams and Sandbrook, 2013, Batavia et al., 2019a), objective assessment of the role trophy hunting plays in African conservation will serve as a firmer foundation for the complex and multi-faceted conservation management and policy decisions that must be made in light of these growing calls to end the practice.

Support for decision-making in conservation management and policy in general has been criticised as being poor (Pullin and Knight, 2003), with the field said to be "based upon anecdote and myth rather than upon the systematic appraisal of the evidence" (Sutherland et al., 2004). While there has been growth in evidence-based approaches in conservation, much of the evidence is geographically, topically, and taxonomically biased, limiting its quality and relevance (Christie et al., 2021, Spooner et al., 2015, Christie et al., 2020). Additionally, for many conservation approaches and interventions, evidence to effectively support decision-making is either lacking or remains in an unwieldy and disparate format (Crooke et al., 2017, Christie et al., 2020, Adams and Sandbrook, 2013). Systematic reviews and evidence synthesis methods can support decision-making in such situations by accessing, appraising, and synthesising scientific information and identifying knowledge gaps (Collaboration for Environmental Evidence, 2013, Pullin and Stewart, 2006).

While various reviews of the African trophy hunting industry have been conducted over the last two decades (Lindsey et al., 2007, Loveridge et al., 2007a, IUCN/PACO, 2009, Leader-Williams, 2009, Economists at Large, 2013, Muposhi et al., 2017, Murray, 2017), none have followed a systematic approach, and only two were peer-reviewed, reducing their transparency and objectivity. Additionally, most of the reviews are over a decade old, therefore the current extent, coverage, and quality of the contemporary evidence on trophy hunting's impacts is largely unknown. There have also been no attempts to highlight where research is most needed. A recent overview of the literature on all recreational hunting globally explored the topics studied, and the literature's taxonomic and geographic focus (Di Minin et al., 2021). They found that most literature was published on North America, Europe, and Africa. Much of the recreational hunting literature focussed on species ecology, animal behaviour and population dynamics and management, though in Africa, there was substantial focus on socioeconomic and ethical dimensions. However overall, there was less focus on where and how recreational hunting contributes to conservation.

With this chapter, I extended the work of Di Minin et al. (2021) and conducted a systematic map of the evidence on how trophy hunting contributes to socially just conservation in sub-Saharan Africa. Specifically, I aimed to determine the extent and distribution of evidence documenting trophy hunting impacts on communities, economies, ecosystems, and the area of land managed for wildlife or biodiversity in sub-Saharan Africa. I aimed to determine where trophy hunting takes place and the evidence on these activities, what outcomes of trophy hunting are being reported, how outcomes are studied, and where the gaps in knowledge are.

4.3 Methods

4.3.1 Search strategy

Comprehensive searches were performed in two peer-reviewed publication databases: Clarivate Analytics' Web of Science and SciVerse's Scopus, and in Google Scholar (www.scholar.google.com) to obtain an unbiased sample of both published and grey literature. Literature published until the end of 2019 was considered. The search terms used included multiple terms for the activity of trophy hunting: "trophy", sport", "safari", "recreation*" and "touris*". These were used individually with the terms "hunt*" and "Africa" using the AND operator. A final search phrase of "sustainable" "wildlife" "use" "Africa" was used, again with the AND operator. Each search phrase was used separately to generate maximum returns. Due to the volume of articles returned and time constraints, only the first 250 entries returned by each search phrase were examined. The search terms were developed from a sample of articles on trophy hunting (Lindsey et al., 2007, Roe and Cremona, 2016, Booth, 2010, Leader-Williams, 2009), and trialled for relevance in a scoping exercise. Searches were performed from June to July 2018 for the scoping exercise and December 2019 to March 2020 for the full review, with a final search in January 2021 to ensure outstanding studies from 2019 were included. Bibliographies of studies which passed to the full text screening stage were also examined for potentially relevant articles.

4.3.2 Inclusion criteria

Search results were compiled, and duplicates were removed prior to a screening process based on pre-established inclusion criteria. All non-duplicate search results were screened for relevance using abstracts and titles. All studies which passed title and abstract screening were reviewed in full. Where abstracts were not clear and alluded to potential information on trophy hunting, a "find text" search was performed on the full document and articles which referred to hunting were also reviewed in full. Original articles, book chapters, reviews and proceeding papers, as well as reports and policy statements were all included. Whole books were excluded due to time and resource constraints. Reporting followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines in Moher et al. (2009).

Studies were included in the systematic map database if they met the following criteria:

1) The study was published in the peer-reviewed or grey literature and was accessible online.
2) The study provided information on a region, country, or area in sub-Saharan Africa in which trophy hunting was conducted, or on a community-based natural resource management programme which engaged in trophy hunting as an income source. Where more than one

acceptable article referred to the same area, articles were only excluded when they repeated information on outcomes.

3) The study included information on at least one outcome of interest: wildlife population or behaviour trends, or dynamics (or their proxies, e.g. trophy quality or offtake rates); ecosystems or vegetation in hunting areas; community, household, or individual development, benefits, income, well-being, attitudes or behaviour; area of land under conservation management; or economic contribution of the sector, revenue to governments or landowners. Studies were not included if outcomes were only theoretical or entirely modelled.
4) They were published in English.
5) Reviews were only included when they contained novel data on outcomes and the original source could not be accessed.

4.3.3 Data extraction strategy

Data were extracted from all studies that met the inclusion criteria using a standard coding protocol (Appendix 1: Systematic map and review data search protocol). Data were extracted at the country rather than the study level, with some studies containing data for multiple countries. Data were considered unique and included if they were for a new area, outcome, or time frame. For example, if a study reported on income from trophy hunting for the same community and time frame as another, the study with the longer time series was retained. However, if in addition to income the study reported on other impacts that were not recorded elsewhere, for example, community income and other livelihood impacts like access to healthcare, then the study would be retained but only the latter non-duplicate impact would be included. All duplicate data were excluded. Data extraction categories were determined a priori and were divided into four sections:

- bibliographic information
- basic study details, e.g. topic, scale, location
- information on trophy hunting outcomes, e.g. type (Table 4.1) and summary of findings, and factors affecting them
- basic information on study design and methods, including data type, confounding factors, comparators

Table 4.1: Types of outcomes assigned to outcome dimensions: ecological, national economics, land area and local socio-economics

Dimension	Type of outcome
Ecological	- Population or density trends - Behavioural responses - Vegetation responses - Trends in trophy quality or harvest rates - Trends in poaching/wild meat hunting - Trends in environmental degradation e.g. extent of settlement, farming, etc.
National / private sector economics	- Total revenue; species revenue; revenue/km - Trophy hunting contribution to gross national product (%) - Relative profitability of trophy hunting vs. other land uses - Revenue to government - Jobs created nationally
Land area	- Area or proportion of land on which trophy hunting takes place
Local socio-economics	- Income to communities, households, or individuals - Jobs created in local communities - Other benefits or outcomes, e.g. meat or development as a result of community income - Behaviour or attitude change - Changes in land and resource access, levels of human wildlife conflict - Changes in other metrics of multi-dimensional well-being (McKinnon et al., 2016)

4.3.3.1 Methodology assessment

Given the broad scope of the map, which gathered economic, ecological and social, quantitative and qualitative data, individual articles were not critically appraised for quality as is standard in systematic maps (Pullin and Stewart, 2006, Collaboration for Environmental Evidence, 2013). Instead, the designs and methods of studies were assessed and discussed to explore how trophy hunting outcomes are studied and the extent to which reported outcomes could be attributed to the activity (Table 4.2). In particular, I was interested in the number of impact evaluations: experimental or quasi-experimental designs measuring the intended and unintended causal effects of trophy hunting on social and

ecological conditions (McKinnon et al., 2016). I was also interested in the number of qualitative and ethnographic studies which may shed more light on contexts and complexities of outcomes (Adams and Sandbrook, 2013). The assessment of methodology was not intended to infer quality, as studies had varying aims and not all were evaluative; it was conducted to group studies based with similar designs to explore how trophy hunting's impacts have been studied (McKinnon et al., 2016). This meant that any grey literature that passed the initial inclusion criteria could be included in the map.

Aspects under consideration were whether methodology was detailed, the study design: e.g. non-experimental, review, or quasi-experimental, the data type: primary or secondary, and qualitative, quantitative, or mixed, whether comparators were used, and whether the study accounted for confounding factors.

Table 4.2: Description of study types and sub-types included in the review

Study type	**Description**
Quasi-experimental	- Primary research with a stated aim to assess impacts of trophy hunting- or related decisions, e.g. effectiveness of CBNRM programme which relies on hunting revenue - Had a comparator, e.g. hunting versus non-hunting area, or before-after comparison - Studies which examined trophy hunting as one of a suite of potential explanatory variables with no specific hypotheses or question about trophy hunting, were considered non-experimental
Non-experimental	- Primary research with various aims and methodology Sub-types: - Statistical: interrogated data with statistics and/or models - Ethnographic: ethnographic data collection and analysis - Economic analysis: cost-benefit or other economic analysis or model - Descriptive: described characteristics of populations or areas studied - Conceptual/theoretical: interrogated or assessed data according to concept/theory
Non-systematic review	- Secondary research with aim to review existing studies but no systematic data collection
Unspecified	- Studies with minimal description or no methods specified

4.3.3.1.1 Data synthesis and analysis

Descriptive statistics based on numbers of studies were used to analyse the overall body of evidence and synthesise study characteristics including geographic and temporal extent of the evidence, outcomes studied, and evidence quality. It is important to note that reporting on the number of studies does not account for the varying quality of the data, however, this metric enables an understanding of the distribution of the evidence base geographically and topically which was then further explored in the next chapter with appraisal on study quality. Well-being outcomes were explored and defined using domains in McKinnon et al. (2016).

The geographic extent of the evidence was compared to countries which were known to have, or reported to have, trophy hunting industries. These countries were determined using a four-step process:

1. Previous reviews: Countries were obtained from reviews of the African trophy hunting industry conducted by Lindsey et al. (2007) and IUCN/PACO (2009).
2. CITES trade database: CITES database (trade.cites.org) was downloaded from 1990-2019 and filtered for sub-Saharan African countries that had listed exports as 'hunting trophies'. Records from 2010 onwards were considered for this purpose to cover the most recent decade not covered by the reviews.
3. Africa Hunting website: A search of the forum on www.africahunting.com. A question from late 2016 asked, "how many countries in Africa can you hunt in?" (AfricaHunting.com, 2016). Countries with reported industries were cross checked with other posts on the forum.
4. Google of remaining unreported countries: A final google search was conducted for the remaining African countries to confirm there were no references to trophy hunting taking place in those countries.

Data were sorted and compiled into an interrogable database using 'tidyrverse' and 'dplyr' in R version 4.0.4 (R Development Core Team). Spearman's rank correlations were used to test whether there was a relationship between the number of studies found for a country and the following estimates of industry extent: recent estimates of gross income from trophy hunting, estimate of income of communities, land area used for hunting, and the sum of trophy exports in the CITES database. Most visuals were made using package 'ggplot2'. A structural matrix between outcomes and countries was visualised as a heat map using the package 'pheatmap'.

4.4 Results

4.4.1 Number and types of studies

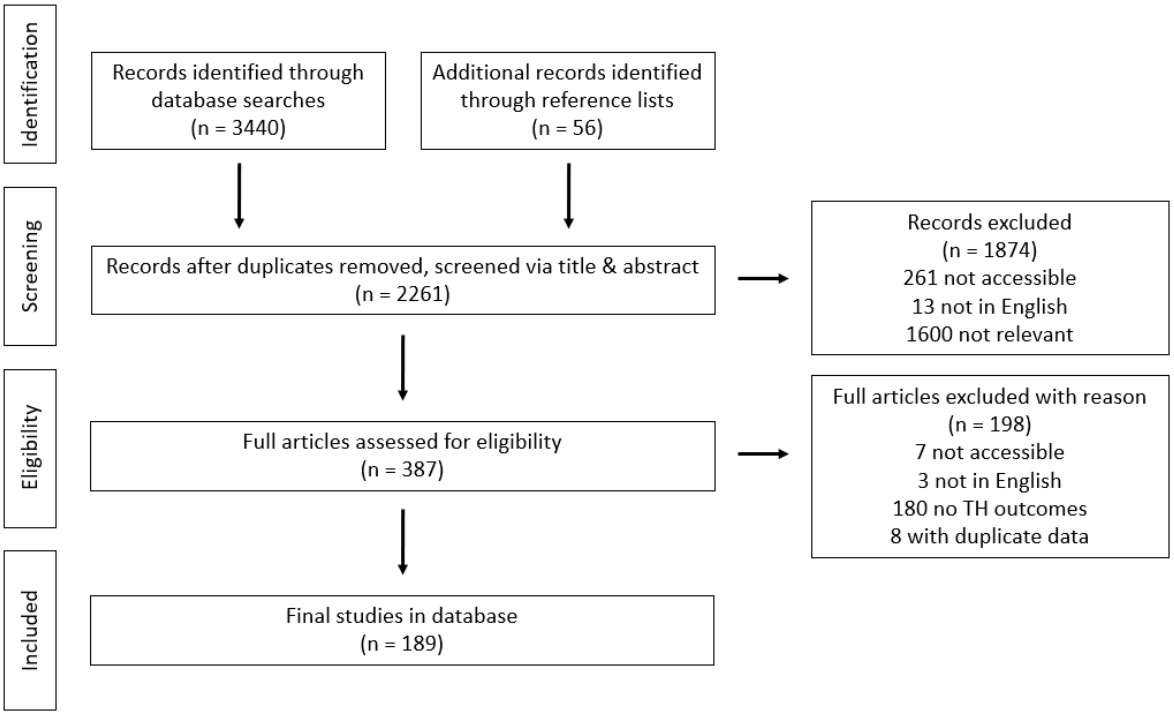


Figure 4.1: Flow diagram illustrating articles found in initial search and articles included following subsequent screening and full text assessment. Adapted from PRISMA guidelines (Moher et al., 2009)

Out of 2261 non-duplicate studies resulting from the various searches, 189 met all criteria and were included into the final database and map (Figure 4.1). A bibliography of all included articles and articles excluded at the full text assessment stage are listed in a dataset online (https://figshare.com/s/176865826310301a205d). Sixteen studies were not in English. For three, available translations of titles and abstracts suggested they contained information on trophy hunting outcomes.

Articles which reported trophy hunting outcomes utilised a range of study designs (Figure 4.2). Overall, the ability of the studies to attribute specific outcomes to trophy hunting was low. No studies used experimental methods to assign treatments to different groups or sites, or had a full Before-After, Control-Impact (BACI) design that accounted for confounding factors (McKinnon et al., 2016). Most studies reported primary research, though only 11% had a quasi-experimental framework (n = 20) that was designed to examine the impact of trophy hunting on ecosystems or communities against a comparator (Figure 4.2). Of these, only two comprehensively identified and accounted for confounding factors in their methods.

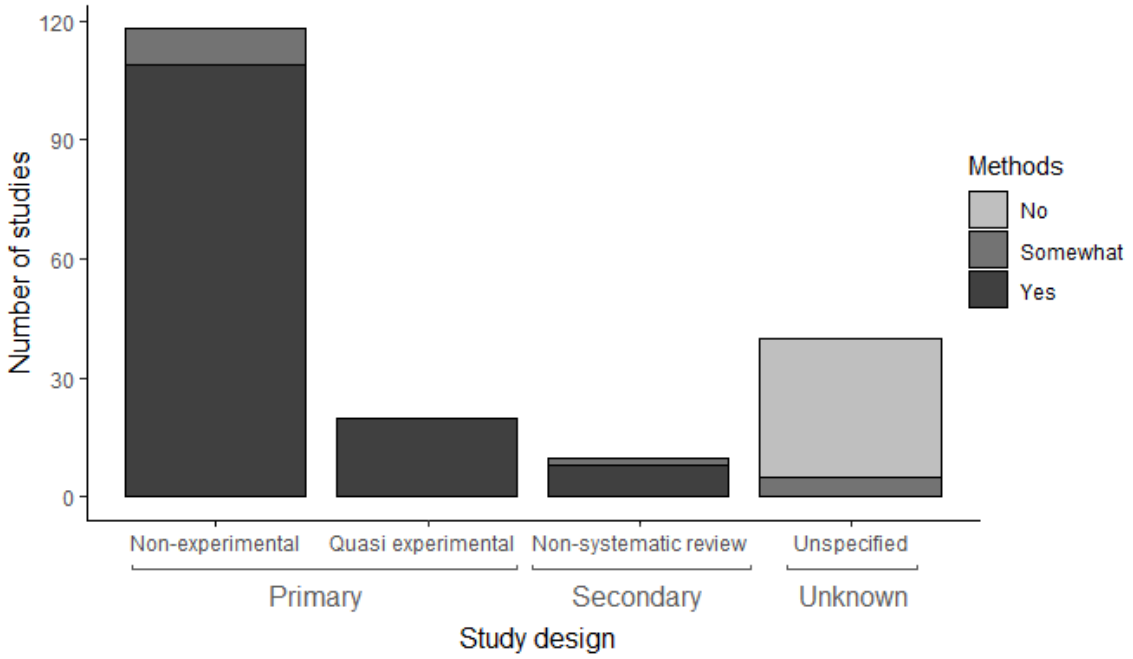


Figure 4.2: Study design and whether methodology was detailed for studies included in the map

Most studies used a non-experimental framework (n = 119, 63% of all studies, Figure 4.2). These used various methods and did not always aim to assess or describe the impact of trophy hunting, despite containing information on outcomes in trophy hunting systems (Figure 4.3). Of these studies, 39 mentioned potential confounding factors, though only five made attempts to assess the impacts of some of these factors. Thirteen studies were ethnographic, examining the political ecology, contexts, and mechanisms by which trophy hunting may affect communities. Nine studies statistically assessed the impacts of trophy hunting as one of a suite of potential factors affecting observed outcomes. Of the remaining studies, 5% were non-systematic reviews, and 21% were unspecified reviews, reports or reflections; most of these gave no details on how they obtained the information they reported on (Figure 4.2).

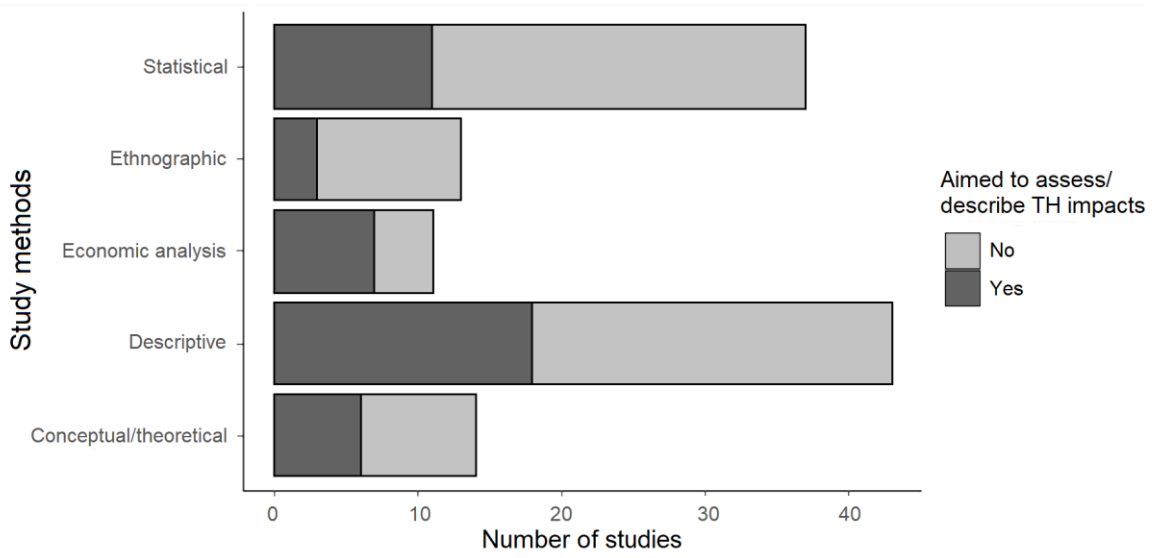


Figure 4.3: Methods used by non-experimental studies and whether they aimed to assess trophy hunting impacts

Studies across all types used a variety of comparators when examining or reporting outcomes of trophy hunting (Figure 4.4). Over half however, 56%, were non-comparative. Comparison groups, e.g. non-hunting areas or non-CBNRM villages, and assessing or reporting change over time were the most common comparators used (16% of studies each). Only two studies examined or reported change over time (rather than before and after introducing/stopping hunting) in a hunting and comparison group, and of these only one explicitly aimed to assess impacts of trophy hunting.

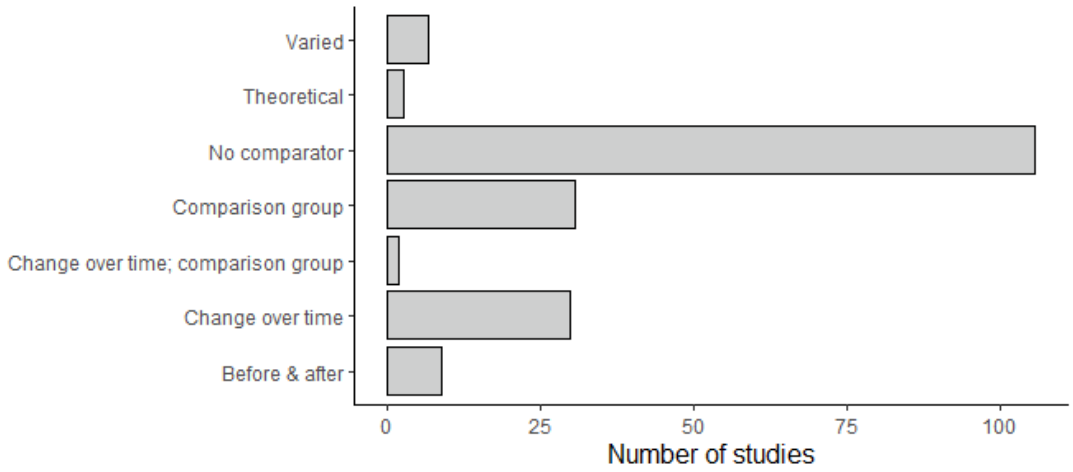


Figure 4.4: Frequency of comparators used by included articles

4.4.2 Geographic trends in studies and outcomes

Studies with data on trophy hunting's impacts were found for 24 African countries, though amounts varied considerably across the continent (Figure 4.5). There was a strong bias towards southern African countries and Tanzania. Central and west African countries, with the exception of Cameroon, were less well researched with most countries only having data from one dated secondary source.

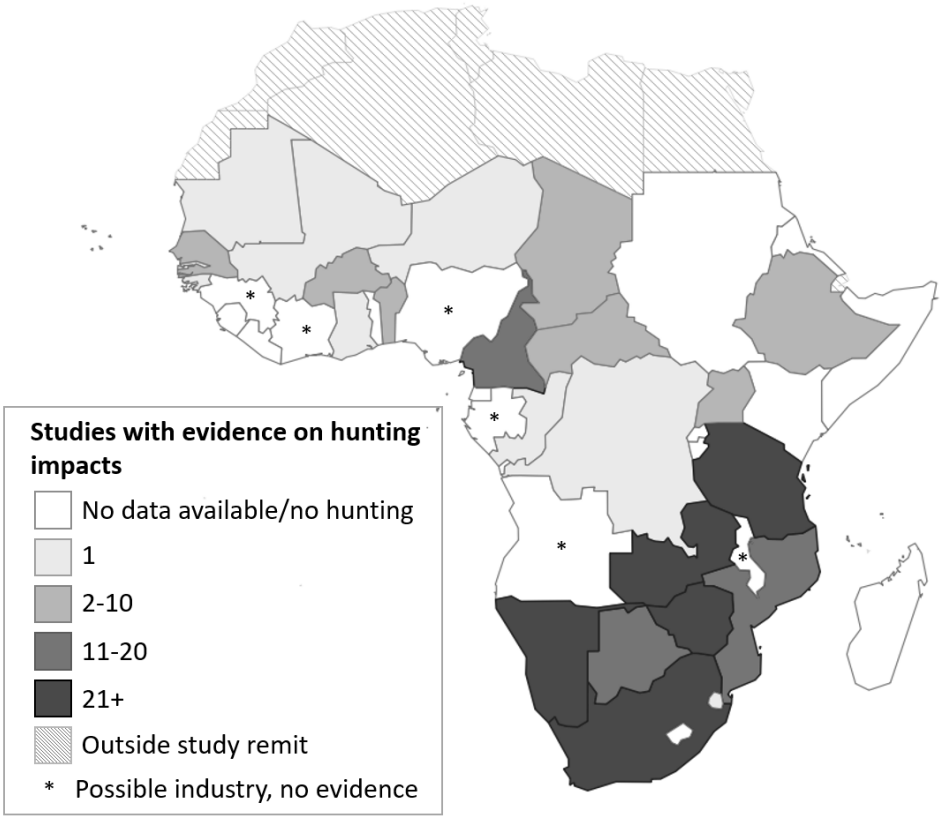


Figure 4.5: Distribution of studies found with evidence on the impacts of trophy hunting in sub-Saharan Africa

There are an additional six countries which have references to trophy hunting industries, but where no evidence was found on outcomes (Figure 4.5; Table 4.3; Table 4.4). Guinea was reported to have a trophy hunting industry in both studies (Lindsey et al. (2007) and IUCN/PACO (2009)), but was not mentioned as a destination on AfricaHunting.com's forum and has no recent trophy exports in the CITES database, suggesting hunting may no longer take place there. Liberia, meanwhile, has the largest number of CITES exports and export records for 2018. IUCN/PACO (2009) suggests that big game hunting at least was stopped in Liberia in 2000 and the CITES exports since then supports this with trophy exports only of small animals: duikers and pangolins (Table 4.4).

Table 4.3: Countries in Africa where no evidence on trophy hunting was found in published and grey literature, but in which trophy hunting may take place according to Lindsey et al. (2007), IUCN/PACO (2009), the CITES trade database (dark shading: since 2010; light shading: pre-2010) and the forum on www.africahunting.com. Shaded cells show countries with mentions of an industry

Countries	Lindsey et al. (2007)	IUCN/PACO, (2009)	CITES	Forum
Angola				"May not be open internationally"
Gabon		Hunting pilot	6 recent, 41 total, Latest 2018	
Guinea	Elephant and buffalo quota	Under development, not offered yet	5 total, Latest 2007	
Liberia		No big game hunting since 2000	100 recent, 131 total, Latest 2018	Listed as hunting destination
Malawi		Hunting pilot from 2009	12 recent, 19 total, Latest 2014	"Not sure if still open"
Nigeria		No big game hunting	2 recent, Latest 2016	Listed as hunting destination

Table 4.4: Species recorded as trophies in the CITES trade database from 1990-2019 for countries with references to trophy hunting but no evidence on impacts found.

Species	Common name	Year of last export				
		Gabon	Guinea	Liberia	Malawi	Nigeria
Caracal aurata	African golden cat			1999		
Cephalophus dorsalis	Bay duiker	2018		2017		
Cephalophus ogilbyi	Ogilby's duiker			2017		
Cephalophus silvicultor	Yellow-backed duiker	2018		2018		
Cephalophus spp.	Unspecified duiker	2002				
Cephalophus zebra	Zebra duiker			2018		
Civettictis civetta	African civet			1999		
Crocodylus niloticus	Nile crocodile				2013	2012
Equus grevyi	Grévy's zebra	2002				
Hippopotamus amphibius	Hippopotamus		2007		2013	
Hyemoschus aquaticus	Water chevrotain			2000		
Loxodonta africana	African elephant	2005				
Manis gigantea	Giant ground pangolin			2014		
Manis tricuspis	White-bellied pangolin			2013		
Panthera leo	Lion	2002			1994	
Panthera pardus	Leopard				1994	2016
Perodicticus potto	Mount Kenya potto			2017		
Philantomba monticola	Blue duiker	2018		1999		
Python sebae	Southern African rock python	2003	2006			
Tragelaphus eurycerus	Bongo		2006			
Tragelaphus spekii	Sitatunga	2004				

The number of studies found per country with evidence on hunting outcomes was significantly positively correlated with a country's most recent estimate of gross income from trophy hunting ($P=0.851$, $p < 0.05$), the land area used for hunting ($P=0.73$, $p < 0.05$), and the total number of trophy exports since 1990 in the CITES trade database ($P=0.95$, $p <0.05$) (See Appendix 1: Additional results for figures). Countries with larger hunting industries by these measures were more studied. There was no correlation between the number of studies a country had and the income that reaches communities ($P=0.51$, $p = 0.11$). The extent of national trophy hunting industries was not always possible to determine, as estimates of gross national income, income to communities, and the area of land under hunting management were not found for all countries and many estimates were dated; estimates for West and Central Africa were particularly scarce (Appendix 1: Additional results).

The number of studies reporting different types of outcomes also varied between countries (Figure 4.6). No evidence was found on the ecological or local socio-economic outcomes of trophy hunting in ten of the countries in which it supposedly takes place, mostly in West and Central Africa. For seven countries, the only evidence available on trophy hunting's impacts was the area of land used for hunting and most estimates are over a decade old (Lindsey et al., 2007).

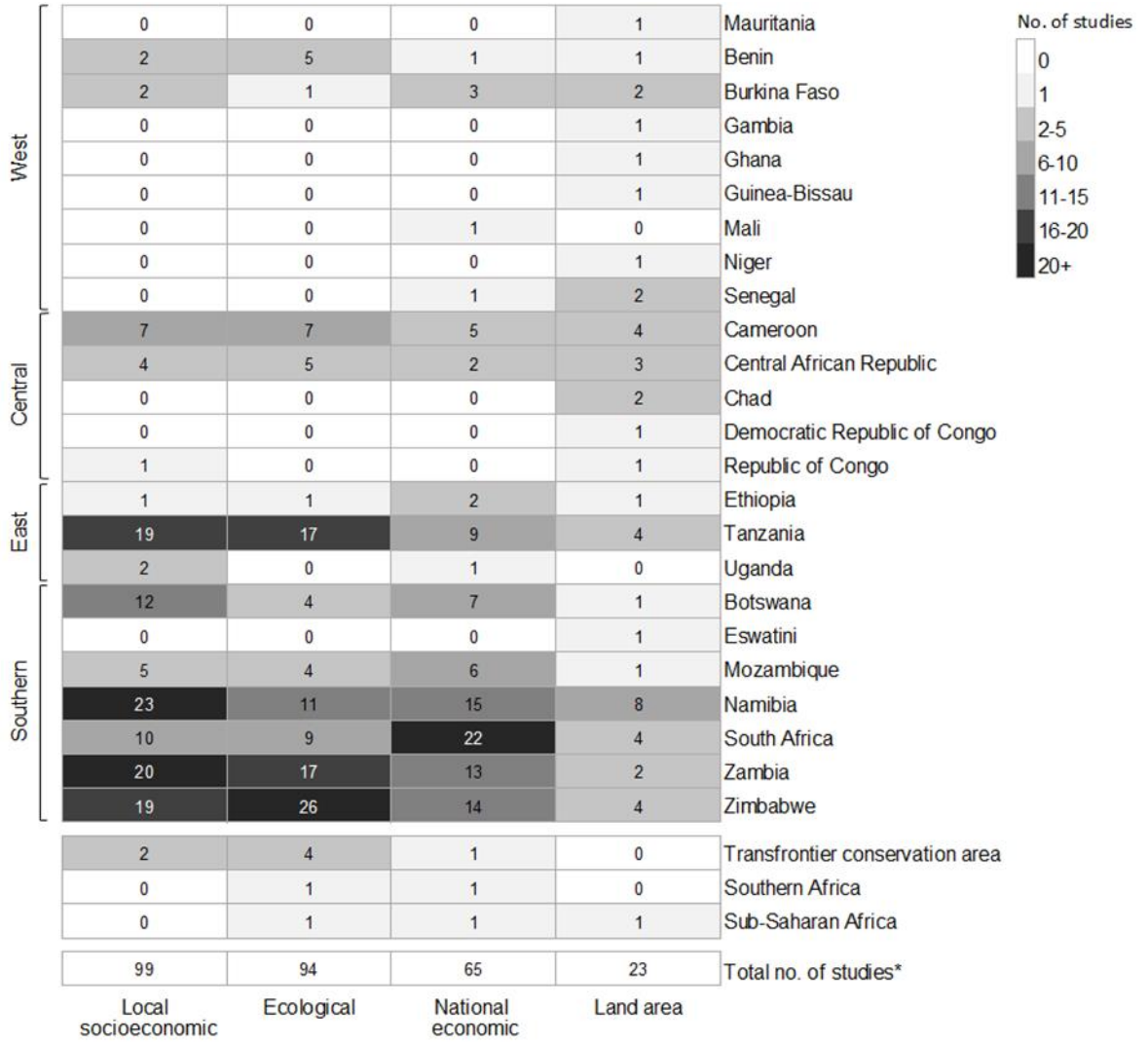


*Figure 4.6: Number of studies with local socio-economic, ecological, national/private sector economic and land outcomes extracted by country grouped by African Union Regions and the total number of studies reporting different outcome types. *Not the total of country estimates as some studies report on multiple countries*

Even in countries with a larger number of studies there were differences in the types of trophy hunting outcomes studied. Evidence on trophy hunting's local socio-economic outcomes was most prevalent for Namibia, Tanzania, Zimbabwe, and Zambia, which all have prominent national CBNRM programmes. Meanwhile, studies on trophy hunting in South Africa have focussed on national and provincial economic impacts of the industry, while far fewer studies contained data on local socio-economic and ecological outcomes in the country.

4.4.3 Trophy hunting outcomes

Exploring outcomes in more detail highlights the wide variety of local socio-economic, ecological, and national/private sector economic outcomes of trophy hunting reported in studies (Figure 4.7). Overall, income to communities was the most commonly reported outcome in included studies, reported in 58 studies overall. It was followed by gross income from trophy hunting, and reports of some sort of community development, e.g. building schools or health care facilities, each of which were reported in over 40 studies. Other widely reported outcomes included jobs created in communities, meat received by communities from trophy hunting, changes in attitudes towards wildlife and conservation, broad trends in wildlife populations, anti-poaching efforts or poaching levels, and abundance trends of individual species. Many of the most commonly reported local socio-economic outcomes were at the community level, e.g. community jobs, income, and 'developments' (Figure 4.7 B). Household income by contrast was reported in 19 studies overall, only 9 of which were recent primary studies. Among the least commonly reported outcomes are impacts on ecosystems, and outcomes for non-target species which are only explored in two and three studies respectively. Negative ecological impacts of inbreeding and exotic species introductions were also rarely reported (Figure 4.7 A).

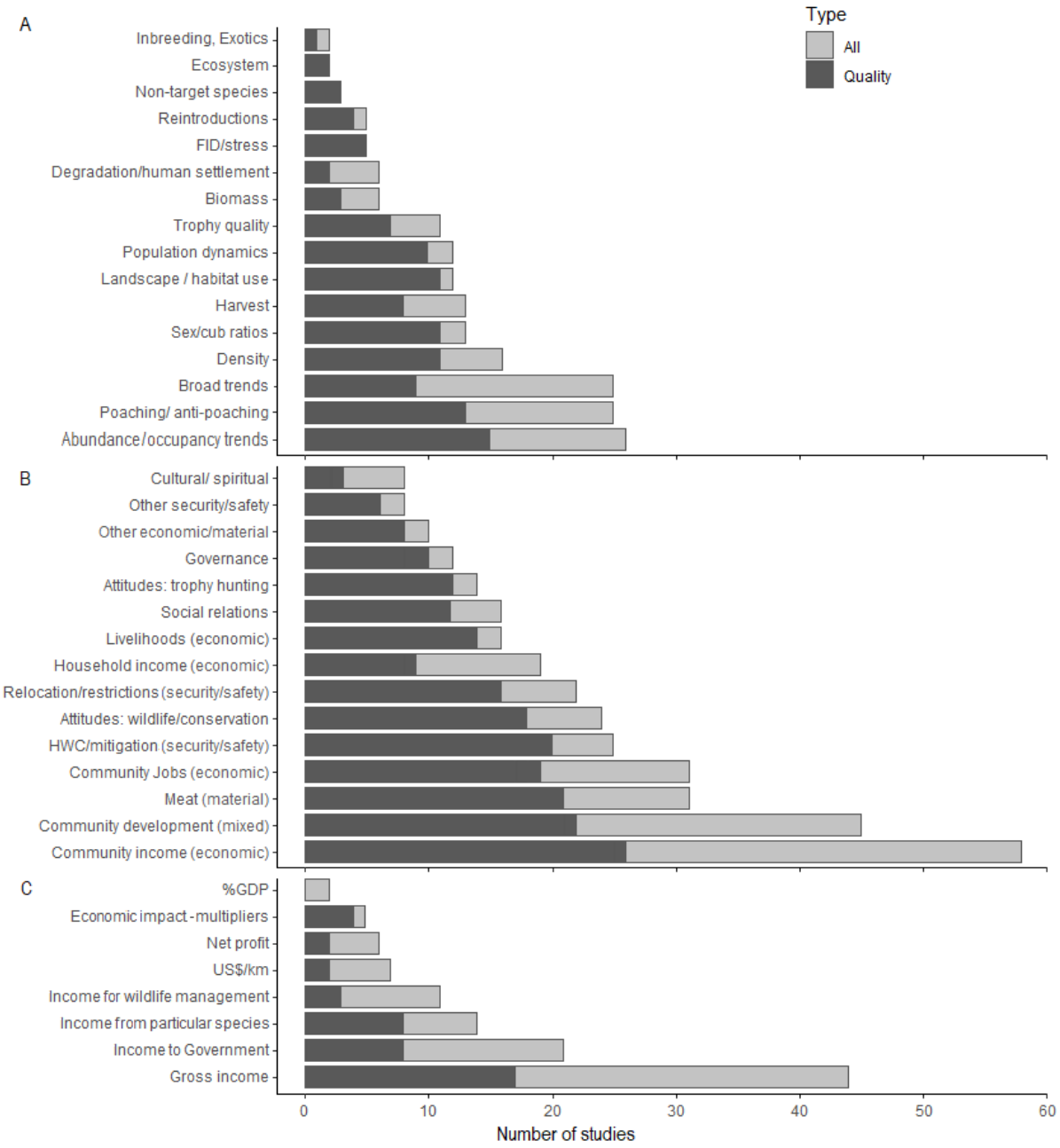


Figure 4.7: Number of studies reporting different outcomes of trophy hunting grouped by A) ecological, B) local socio-economic and C) national/provincial economic outcomes

Trophy hunting's impacts on various domains of well-being were reported across many studies (Table 4.5), with many reporting across multiple domains (n = 49 studies). Eighty-two studies reported on trophy hunting's impact on economic or material well-being. However, only three of these studies had rigorous quasi-experimental designs that accounted for confounding factors and assessed impacts of trophy hunting-based CBNRM on household income and per capita household spending, measures of economic well-being. Most studies reporting economic or material well-being outcomes suggested that impacts were positive, though a number of studies reported negative impacts, such as reduced meat access (3), livelihood options (4) and food security (1).

Table 4.5: Number of studies which reported well-being outcomes of trophy hunting or trophy hunting based CBNRM. Domains from McKinnon et al. (2016)

Well-being Domain	Outcomes	No. of studies All	Primary	Direction
Economic/ Material	Jobs	31	19	Positive
	Meat access	31	21	Mixed
	Household income	19	9	Positive
	Livelihoods	16	14	Mixed
	Economic welfare	8	6	Positive
	Food security	4	4	Mixed
Security/ Safety	Human wildlife conflict/mitigation	25	20	Mixed
	Restrictions/relocations	22	16	Negative
	Tenure security	6	5	Negative
	Resilience	3	2	Positive
Social relations	Social conflicts	13	11	Negative
	Connectivity/belonging	3	1	Positive
Governance/	Capacity building, empowerment, autonomy	12	10	Mixed
Cultural/ spiritual	Sense of ownership/pride	7	3	Mixed
	Cultural connection	3	3	Positive

Impacts on security and safety domains of well-being were also relatively commonly reported (44). Most of these were negative, with many studies reporting problems with human wildlife conflict (25), relocations or restricted land and resource access (22), and tenure insecurity (6). Fewer studies reported other dimensions of well-being such as social relations, governance and cultural or spiritual well-being impacts. No studies reported on health and education impacts of trophy hunting beyond brief statements that trophy hunting income, or the operators themselves, had contributed in various ways to schooling and health care facilities. It is worth noting that only six studies specifically reported or discussed outcomes in relation to well-being. There were no studies that explicitly explored the impacts of trophy hunting on multi-dimensional well-being.

4.5 Discussion

Studies on trophy hunting varied considerably in their aims, designs, and disciplinary perspectives. This map highlights trends and identifies gaps in three key aspects which should be used to shape future research to improve the evidence-base for trophy hunting decisions: the geographic distribution of the current evidence, the types of outcomes studied, and study designs used.

4.5.1 Geographic distribution of evidence

Although over 180 studies were found, the evidence-base is dominated by a handful of countries which are most often used in examples: Namibia's communal conservancies and Zimbabwe's CAMPFIRE that bring income to rural communities and extend the area of land used for conservation; trophy hunting on private land in South Africa and Namibia, which has helped wildlife populations increase and facilitated species recoveries, for example the white rhino; and the income from trophy hunting which goes to governments for wildlife management, for example in Tanzania (e.g. Roe and Cremona, 2016). While at least one piece of evidence was found on trophy hunting's social, ecological, economic, or land area impacts for 24 African countries, for many, the amount and type of evidence available was minimal. For seven countries, evidence of trophy hunting's impacts was limited to dated estimates of the land area used for hunting, and for a further six countries with potential industries, there is no evidence at all. Indeed, the few studies containing more recent estimates of land under hunting management suggested land coverage had changed since Lindsey et al. (2007), producing a slightly lower total estimate of 1,379,387 km^2 than that found by Di Minin et al. (2021). Only nine countries had evidence on ecological, economic and/or social outcomes of trophy hunting from multiple primary studies which were conducted this century.

There is a considerable geographic bias in the evidence available towards countries in southern African and Tanzania, while the evidence available for most West & central African countries is minimal. For some countries, such as the Gambia, Ghana and Guinnea-Bissau, this may be because trophy hunting activities are limited, with no big game hunting areas classified and only small game hunting of birds, warthogs and limited smaller mammals allowed (IUCN/PACO, 2009). However, the land used for trophy hunting in these regions can be quite substantial, with over 320,000 km^2 of land, an area larger than Poland, used for hunting in West and Central Africa (according to the most recent available estimates, see Appendix 1: Additional results for land area estimates). Despite this, only Benin, Cameroon, and the Central African Republic have multiple primary studies conducted since 2000 with data on the impacts of trophy hunting activities. The lack of evidence on trophy hunting in these regions is of particular concern due to the high levels of wild meat hunting that takes place in these areas (Bennett et al., 2007). Wild meat hunting not only impacts trophy hunting's profitability and

potential (Lindsey and Bento, 2012), but it undermines trophy hunting's sustainability if not properly accounted for in quota setting (Bunnefeld et al., 2013). The lack of data may be due to relatively small hunting industries as a result of wildlife depletion across much of the region (Bauer et al., 2021).

Geographic biases in conservation evidence have been reported in a range of studies (Di Marco et al., 2017, Christie et al., 2021, Roberts et al., 2016), with Africa as a whole often under represented. Di Marco et al. (2017) found only 10% of studies on conservation science carried out between 2011-2015 were conducted in Africa, suggesting the continent as a whole is under-studied despite being highly biodiverse (Pimm et al., 2014). The lack of locally relevant evidence on trophy hunting's impacts for more than half of the countries it takes place in is a real challenge for making evidence-based recommendations to decision-makers (Christie et al., 2021). Given how varied African countries are, ecologically, politically, and socially, and how varied hunting governance is (Lindsey et al., 2007), the comparability of outcomes in countries with and without evidence seems low (Bauer et al., 2021). The variance also suggests a nuanced approach will likely be needed when making decisions on the activity.

Beyond this, there is a need to confirm which countries trophy hunting takes place in, with Angola, Gabon, Guinea, Liberia, Malawi, and Nigeria all having reports of potential trophy hunting activities with no evidence found. Even for countries where some evidence on trophy hunting impacts does exist, such as the Republic of Congo and Democratic Republic of Congo, the state of these industries is uncertain. IUCN/PACO (2009) reports that hunting in the DRC was theoretically open with classified hunting areas designated, but test-safaris had been unsuccessful due to a lack of game. Similarly, though Lindsey et al. (2007) suggest there was at least one trophy hunting operator in the Republic of Congo, the report by IUCN/PACO (2009) suggest the country's industry has closed. The lack of, or limited, evidence on trophy hunting in these countries warrants further investigation to determine whether industries exist, and ideally what their extents and impacts are. As a minimum, this will provide information on how many countries a continent-wide or global trophy hunting ban would affect.

4.5.2 Types of outcomes researched

Even for countries where there is at least some evidence on trophy hunting's ecological, economic and social impacts, the types of outcomes reported, and methods used vary considerably. Research on South Africa, for example, is dominated by studies on the economic impacts of trophy hunting. In Namibia, by contrast, research seems focussed on trophy hunting's local socio-economic impacts. Meanwhile, Zimbabwe and Tanzania have large numbers of studies reporting on the social and ecological impacts of trophy hunting, but fewer studies on the economic impacts of their industries.

These nuances show that even for countries where a large number of studies exist, key impacts of trophy hunting at a national or sub-national level might be under-studied or unknown.

4.5.2.1 Local socio-economic impacts of trophy hunting

Much like Di Minin et al. (2021), more evidence was found on local socio-economic outcomes of trophy hunting than other outcomes. Despite this, most of the older reviews of trophy hunting focus on its economic and ecological impacts (Lindsey et al., 2007, Loveridge et al., 2007a). While systematic reviews and assessments of community conservation programmes more generally do exist (e.g. Brooks et al., 2013, Roe et al., 2015, Nelson and Agrawal, 2008), none to date have specifically focussed on programmes that rely on revenue from trophy hunting. Indeed, there has been no synthesis on the social impacts of the industry. Given that many of the arguments around trophy hunting tend to focus on its impacts on hunted wildlife populations and how much income it generates (Lindsey et al., 2007, Loveridge et al., 2007a), particularly in public discussions on the subject, this may be expected. However, concerns over its social impacts are growing (Ghasemi, 2021). At least fourteen countries have community-based programmes or projects which involve trophy hunting (Roe et al., 2009), suggesting this lack of evidence synthesis on trophy hunting's social outcomes represents a substantial gap. While concerns have been raised in the past that much of the evidence on trophy hunting is in grey literature (Lindsey et al., 2007), I found sufficient recent primary studies on community conservation, and trophy hunting's social impacts, to attempt such a synthesis (See Chapter 4).

Social outcomes reported in studies comprised a range of different measures at different scales, though outcomes at the community level were the most often reported. Far fewer studies reported outcomes at the individual or household scale, particularly when considering only recent primary studies. This has implications for understanding issues of equity and how impacts of trophy hunting are distributed (Friedman et al., 2018, Law et al., 2018). A problem with CBNRM in general relates to the scale at which benefits and costs are experienced: costs from CBNRM are largely borne at the individual or household scale, such as crop damage or livestock loss (Kahler and Gore, 2015), while many of the benefits from CBNRM programmes are for the community at large (Jones and Weaver, 2009). Reporting the amount of income that reaches communities or developments, such as building a school or a borehole, does not necessarily shed light on whether CBNRM or trophy hunting has made a meaningful impact on a community if information on how the income is distributed, the population size, issues of access, etc. are not considered (Scanlon and Kull, 2009, Suich, 2013).

Trophy hunting's impacts across multiple dimensions of well-being are also under-studied. While numerous studies report on outcomes that form part of human well-being, few explore or examine

these outcomes within a well-being framework and many domains are under-studied (Woodhouse et al., 2017). Much like McKinnon et al. (2016), who explored effects of nature conservation on human well-being, I find that economic and material impacts of trophy hunting have been most commonly reported. More primary studies, from a wider range of countries, that assess multiple aspects of individual or household level outcomes are needed to better understand how trophy hunting impacts communities. More in-depth ethnographic methods meanwhile, would allow for context, distribution, and equity issues of social outcomes to be better understood. They would also improve understanding of the processes of change. More robust impact evaluations with quasi-experimental study designs or at least designs which take into account confounding factors meanwhile, would allow the attribution of outcomes to trophy hunting to be plausibly made (McKinnon et al., 2016).

4.5.2.2 Attitudes towards trophy hunting

A considerable number of studies reported on people's attitudes; these were separated into attitudes towards wildlife and conservation, and towards trophy hunting as an activity. Though seemingly similar, the distinction between these outcomes is important. Veríssimo (2013) suggests that changes in attitudes are often used as indicators for behaviour change. This was the context in which studies in this map were framed: trophy hunting was improving people's attitudes and thereby improving their actions towards wildlife and conservation. However, attitudes do not necessarily result in behaviour change (Waylen et al., 2009), with a range of barriers that limit change, including social, economic, and physical factors (Veríssimo, 2013). If behaviours like cessation of wild meat hunting or retaliatory killing were the intended behaviour changes associated with trophy hunting-based CBNRM programmes (Roe and Cremona, 2016), then more nuanced research measuring actual behaviour change in response to trophy hunting is needed.

Studies assessing or reporting on local community attitudes to trophy hunting, by contrast, offer interesting comparisons to global attitudes towards the activity. Taking heed of local views on this complex issue has been increasingly called for in trophy hunting debates (Dickman et al., 2019). Though a number of studies report on this, the geographic scope is limited to a handful of countries. This suggests a broader scale assessment of local communities' views is needed. Such studies should be targeted to affected, typically rural, communities rather than more general views. Even studies on general public views in countries where trophy hunting takes place (e.g. Mkono, 2019) may not be adequate, as views in rural versus urban areas will likely differ (Bandara and Tisdell, 2003).

4.5.2.3 Ecological and national economic impacts

When it comes to ecological and national economic outcomes of trophy hunting, the evidence-base becomes biased to an even smaller number of countries. Ecological outcomes from Zimbabwe,

Tanzania and Zambia make up more than half of all reports on these outcomes, while South Africa dominates studies reporting on the economic impacts of trophy hunting. South Africa has by far the largest hunting industry, with estimates of gross income being more than three times that of Tanzania, the next largest. Unlike many African countries, South Africa has a large and well-established private game farm industry (van Hoven, 2015), which many of the studies focus on (e.g. van der Waal and Dekker, 2000, Cloete et al., 2007, Cholo et al., 2017). However, for the industry's size, there are surprisingly few studies reporting on the social and ecological impacts. While a small number of studies have started looking into the social impacts of the conversion of livestock farms to game farms (e.g. Snijders, 2012, Brandt and Spierenburg, 2014), the impacts of the few community conservation projects that exist are largely unknown. Further, despite concerns over the introductions of exotic and extra-limital species, and in-breeding to create new trophies (Cousins et al., 2008, Leader-Williams, 2009), there are few studies reporting the industry's broader ecological impacts.

While a wide range of ecological outcomes of trophy hunting are studied, the claim that trophy hunting achieves conservation by maintaining land as natural habitat (Di Minin et al., 2016), is rather poorly evidenced. Indeed, one of the key gaps in research on trophy hunting is understanding the impacts it has on broader ecosystems, non-hunted species, and biodiversity conservation objectives. Trophy hunting's impacts on ecosystems is only explored in two studies, one of which examines links between trophy hunting on private land in South Africa and broader conservation objectives (Cousins et al., 2008). Similarly, while numerous studies reported the link between trophy hunting and increased anti-poaching efforts, and some suggested efforts were improving wildlife population trends (e.g. Scholte et al., 2017), there were no studies which empirically evaluated this. Similar gaps were observed in research on global recreational hunting (Di Minin et al., 2021).

4.5.3 Methods and designs used

Overall, research on trophy hunting's outcomes would be improved by conducting more impact evaluations, an approach considered under-utilised in conservation research (Baylis et al., 2016, Schleicher et al., 2020). While the majority of studies included in this review collect primary data, suggesting there is sufficient evidence to conduct a systematic review of the evidence gathered thus far, a meta-analysis of trophy hunting's impacts would not be possible due to the lack of rigorously designed evaluations. Even in the 11% of studies with quasi-experimental designs, most simply compared hunting to non-hunting areas or CBNRM and non-CBNRM villages. A challenge with such comparisons is that causal attribution to trophy hunting is not possible without knowing and accounting for other factors that might be affecting the snapshot. Very few of the studies found for this map accounted for confounding factors and most did not even acknowledge factors that might be affecting findings. Studies with simpler designs, such as comparison groups, or before-after

comparisons, have been shown to produce less accurate results than more complex and robust designs such as before-after, control impact (BACI) or randomised control trails (Christie et al., 2019). Studies with more robust designs are needed to understand trophy hunting's intended and unintended causally induced social and ecological impacts in more detail (Mascia et al., 2014). There were also relatively few studies with in-depth evaluations, using qualitative and ethnographic methods, which explored the contexts under which trophy hunting outcomes arose to better understand how to improve positive impacts (Adams and Sandbrook, 2013)

Despite decades of conservation action, biodiversity loss continues. It is increasingly apparent that to change this trend and determine which conservation actions are working and why, conservation science needs to take impact evaluations more seriously (Baylis et al., 2016, Schleicher et al., 2020), particularly high-quality assessments, and ones that investigate not only if interventions are working or not, but how (Wiik et al., 2020). For trophy hunting, as an intervention whose merits are under increasing public scrutiny, the need for such approaches becomes even more apparent. In particular, we need studies with mixed methods approaches which combine quasi-experimental impact evaluations to understand impacts, and ethnographic research to understand mechanisms of how, and contexts in which impacts of trophy hunting arise. When it comes to improving assessments, conservationists need not start from scratch as there is much to learn from other fields. Examples include: publishing pre-analyses plans, using theories of change and carefully considered counterfactuals or other mechanisms of making causal inference, better integration of qualitative methods into these processes, and planning of evaluations alongside interventions, amongst others (Schleicher et al., 2020).

4.5.4 Limitations

One of the key limitations of this assessment was that only English language studies were assessed. This may have introduced bias as English is the dominant language of the countries where the most data was found. Crucially, studies on Francophone West & Central Africa may have been missed. There were at least three studies with translated titles and abstracts which suggested they contained data on trophy hunting outcomes for these regions. English only reviews, a necessity for this study due to resource constrains, risk missing evidence published in other languages and risk biasing meta-analyses and evidence syntheses (Konno et al., 2020, Walpole, 2019, Amano et al., 2016, Amano et al., 2021). Future reviews would benefit from collaborations with non-English speakers or using emerging translation tools to allow for searches and inclusion of non-English studies (Walpole, 2019, Konno et al., 2020). However, a lack of data from West and Central Africa may also be due to wildlife depletion in those regions which make them less suitable for extensive hunting industries (Bauer et al., 2021).

Another limitation is the restricted amount of searching for extra data that was possible in the time frame. Specialist searches of the grey literature might have improved the amount of evidence available, for example, through websites of key donors, implementers, and research organisations, and stakeholder engagement (Roe et al., 2014). Indeed, Lindsey et al. (2007) suggested that most information on African trophy hunting occurs in the grey literature. The inclusion of grey literature in evidence syntheses comes with challenges, however, as much of the grey literature included in this map had unspecified methods which make assessments of its reliability impossible. Including evidence from key donors and implementers may also present issues with objectivity, particularly if programmes' longevity and future funding depend on their reported success (Koot et al., 2020).

5 Understanding the social and ecological impacts of trophy hunting in sub-Saharan Africa: a systematic review of the evidence

5.1 Abstract

Trophy hunting in sub-Saharan Africa takes place under diverse conditions producing a variety of consequences for the ecosystems and people involved. To date there have been no systematic reviews of the social and ecological impacts trophy hunting has, and the contexts under which they arise which restricts an understanding of where, and how, trophy hunting is having positive impacts. Here I present a systematic narrative review of the social and ecological outcomes of trophy hunting and the factors which affect them.

Eighty-five suitable studies spanning twelve countries and three transfrontier conservation areas were included in the review. I found that trophy hunting can deliver positive social outcomes, boost economic welfare in communities, and improve attitudes towards wildlife and conservation. However in many areas, benefits to communities and households are too few and too unevenly distributed to achieve this. Positive outcomes are more likely where there is equity in community involvement: where there is recognition and devolution of rights to communities, where decision-making and management procedures have extensive and equal community participation, and where distribution of benefits and costs are equitable. Trophy hunting's impacts on wildlife populations are varied with no clear trends across countries or species. However, evidence suggests interventions such as short-term moratoria and lowering of quotas can reverse effects of over-hunting when it occurs. Ecological outcomes are highly influenced by governance issues such as quota setting, wildlife regulations, and effective enforcement.

5.2 Introduction

The effectiveness and suitability of trophy hunting as a conservation tool is the subject of intensifying debate (e.g. Dickman et al., 2019, Nowak et al., 2019, Di Minin et al., 2016, Nelson et al., 2016). It takes place across sub-Saharan Africa under diverse ecological, social, and political conditions, producing a range of outcomes which give both sides of the debate practical examples to defend their views (Buckley and Mossaz, 2015). The contention around trophy hunting's efficacy as a conservation tool is exacerbated by a lack of synthesised evidence on its social and ecological impacts. While uncertainty remains around the varied impacts that trophy hunting can have, particularly on the wildlife species it targets (Buckley and Mossaz, 2015, Muposhi et al., 2017), there are also growing concerns around trophy hunting's contributions to, and impacts on, local livelihoods and well-being (Di Minin et al., 2021).

It is widely recognised that people's lives are intricately linked to their natural environments and that natural resources are critical for many rural people's livelihoods (Roe et al., 2009, Milner-Gulland et al., 2014). As such, many conservation interventions now involve social as well as environmental objectives (Law et al., 2018, McKinnon et al., 2016). Not only are interventions with local involvement and support more likely to be successful and sustainable (Ban et al., 2013), but there are important ethical and equity reasons for such approaches that are now enshrined in international conservation objectives, in addition to being desirable in their own right (Martin et al., 2016, Schreckenberg et al., 2016). Fair distribution of costs, benefits, rights and responsibilities, meaningful involvement of relevant stakeholders in decisions, respect of different world-views and customs, and recognition of contexts are increasingly being promoted in conservation decision making (Law et al., 2018, Vucetich et al., 2018); trophy hunting is no exception. Many communities across the African continent are involved with the industry through community-based natural resource management programmes which aim, amongst various objectives, to involve communities in natural resource management decisions, and to direct benefits from trophy hunting, such as revenue, employment, and meat, towards communities (Roe et al., 2009). Even without CBNRM initiatives, communities may also be affected by changes in land and other resource access, human wildlife conflict, and labour requirements of trophy hunting (e.g. Yasuda, 2011, Brandt and Spierenburg, 2014). In line with conservation striving towards becoming more effective and socially just, the social impacts of trophy hunting need to be carefully considered in decisions on its future and when considering its efficacy.

A recent overview of the literature on all recreational hunting examined the main topics of research on the subject, as well as its taxonomic and geographic focus (Di Minin et al., 2021). They found that while extensive research exists on some topics, such as species ecology, evidence to answer pressing questions on where and how recreational hunting contributes to just and sustainable conservation is lacking. While reviews focussing on the economic and ecological impacts of trophy hunting in Africa have been conducted (Muposhi et al., 2017, Lindsey et al., 2007), none have followed a systematic approach to gathering evidence, reducing their transparency and objectivity. There have also been no reviews on the social impacts of trophy hunting that go beyond simple and one-dimensional socio-economic considerations such as the income reaching communities or the number of jobs that trophy hunting creates (IUCN/PACO, 2009, Muposhi et al., 2017). These represent substantial gaps in our understanding, considering the dual social and ecological goals of modern conservation, and broad recognition of the need to understand how conservation interventions affect linked socio-ecological systems and multi-faceted issues, like human well-being (Agarwala et al., 2014). Finally, a synthesis of the contexts under which different trophy hunting outcomes arise is also missing, despite recognition of how varied and important these contexts are (Buckley and Mossaz, 2015, Di Minin et al., 2021).

I conducted a systematic narrative review of the evidence to address these knowledge gaps. Specifically, I aim to answer the following questions: What are the social and ecological impacts of trophy hunting in Africa? Under what contexts do they arise? And where are the gaps in our understanding of how trophy hunting contributes to socially just conservation?

5.3 Methods

5.3.1 Search for data

All studies found and included in the systematic map in Chapter 4 were considered for the review. Studies were included if they met the following criteria:

1) The study was published in either the peer-reviewed or grey literature and was accessible online.
2) The study provided information on a region, country or area in sub-Saharan Africa in which trophy hunting was conducted, or on a community-based conservation programme which engaged in trophy hunting as a primary income source. Where more than one acceptable article referred to the same area, articles were only excluded when they repeated information on outcomes.
3) The study included information on at least one outcome of interest:
    a. Ecological: wildlife population or behaviour trends or dynamics, or their proxies, e.g. trophy quality and offtake rates; ecosystems or vegetation changes, e.g. trends in extent of natural habitat/settlements/farming; anti-poaching monitoring or enforcement efforts;
    b. Local socioeconomic: community, household, or individual income, benefits, development, changes in attitudes or behaviour; changes in other metrics of multi-dimensional well-being (McKinnon et al., 2016).

    Studies were not included if outcomes were only theoretical, entirely modelled or regional/national economic assessments.
4) They were published in English.
5) They were primary studies which had been conducted since 2000 with specified data sources.

Data were extracted from all included studies using a standard coding protocol (Appendix 1: Data Extraction Template). Extraction categories were determined a priori and included: bibliographic information, basic study details, information on trophy hunting governance arrangements, outcomes, and factors affecting outcomes, and basic information on study methods and designs. The nature of the research question, and heterogeneity and nature of studies (descriptive rather than evaluative),

precluded the use of existing critical appraisal tools, e.g. the Cochrane risk-of-bias tool (Sterne et al., 2019). An adapted approach following guidelines in Roe et al. (2015) was used, where studies were scored based on their timeliness, relevance, reliability, clear and repeatable methodology, and appropriateness of methods to answering the review question. Studies of with low overall scores were excluded.

5.3.2 Data synthesis

To extract and make sense of the data contained in included studies, Excel was used to tabulate and group key study characteristics. NVivo 12 Pro (released in 2018) was used to further classify themes from extracted data (QSR International Pty Ltd., 2018). Well-being domains and definitions from McKinnon et al. (2016) were followed. Equity dimensions follow Schreckenberg et al. (2016) and definitions in Friedman et al. (2018).

Data on outcomes were synthesised and compared to theories on how trophy hunting achieves socially just conservation to test assumptions within the theories, and identify key evidence gaps. The theories were developed using arguments from review studies on the subject (Loveridge et al., 2007a, Lindsey et al., 2007, Roe and Cremona, 2016). Results are discussed in relation to the evidence available for direct outputs, assumptions on how trophy hunting achieves socially just conservation, and the factors which affect outcomes.

5.3.2.1 Theory of how trophy hunting achieves socially-just conservation

Trophy hunting takes place under a range of conditions and involves a wide variety of stakeholders who have different motivations and goals for the activity. Thus developing a single meaningful theory is challenging and will necessarily be a generalisation. Three broad governance systems were identified for simplification purposes for this study which influence the theories of how trophy hunting achieves conservation. These vary in who owns the land and/or has rights over wildlife use, who takes part in decisions, and who are the main beneficiaries of trophy hunting activities. These are: private concessions/hunting on private land, hunting on state land with limited/no community involvement, and hunting on state or communal land with community involvement which varies from passive to active (Figure 5.1). It is important to note that this is simplified schematic and levels of community benefit, involvement in decisions and wildlife-use rights holders might vary.

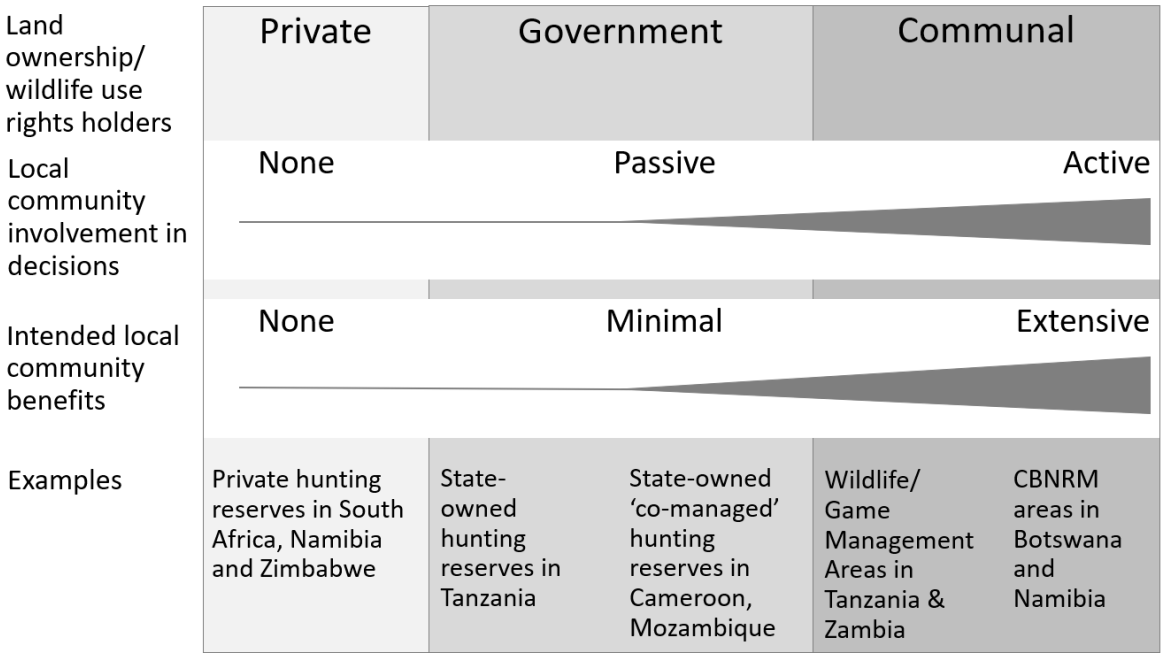


Figure 5.1: Scheme showing different hunting governance systems with varying landownership/wildlife-use rights holders arrangements and different levels of local community involvement in decisions and intended benefits.

Trophy hunting's key outputs are revenue, meat, and jobs and these flow to the landowners or inhabitants in various ways depending, in part, on the hunting governance system. I identified levels of community involvement and intended community benefits as the critical factors in separating out theories of change and identified two broad theories for this work (Figure 5.2 & Figure 5.3).

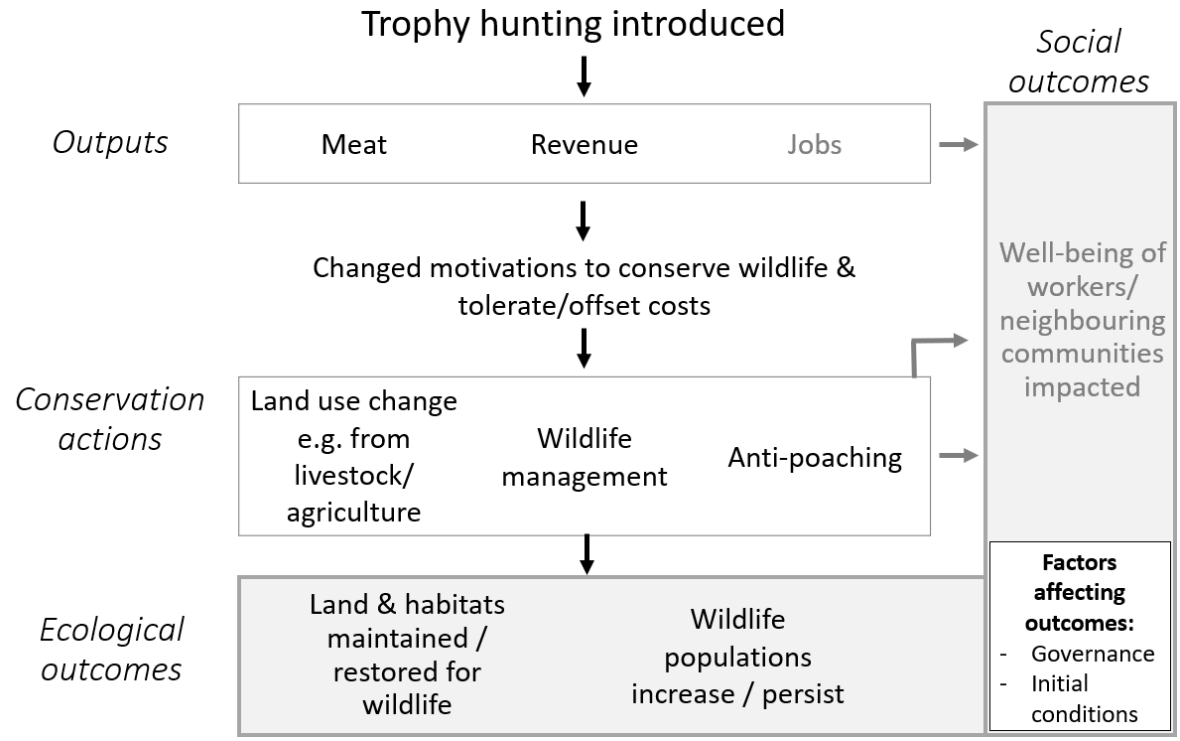


Figure 5.2 Theory of how trophy hunting contributes to conservation when there is no direct community involvement or intentional community benefits, e.g. on private and some state land.

In systems where there is no community involvement in decisions or purposeful community benefits, the main outputs of interest are revenue and to a lesser extent, meat from the hunted animals (Figure 5.2). This would be the case on most private concessions/privately owned land as well as state hunting reserves with no direct community engagement. Jobs however, are still created producing some social outcomes, though these would not necessarily be directed towards local communities. In these systems, the revenue from trophy hunting is the motivator for conservation actions and/or the mechanism through which they are achieved. The revenue from hunting may incentivise land owners to change land use from agriculture or livestock farming to wildlife-based land uses, and it can fund wildlife management and anti-poaching enforcement and monitoring. In well managed systems, these actions should lead to the ecological outcomes of land and habitats being maintained or restored and wildlife populations increasing or persisting. These actions however, also often have social outcomes, though these may or may not be intentional. The initial conditions and hunting governance will impact the outcomes.

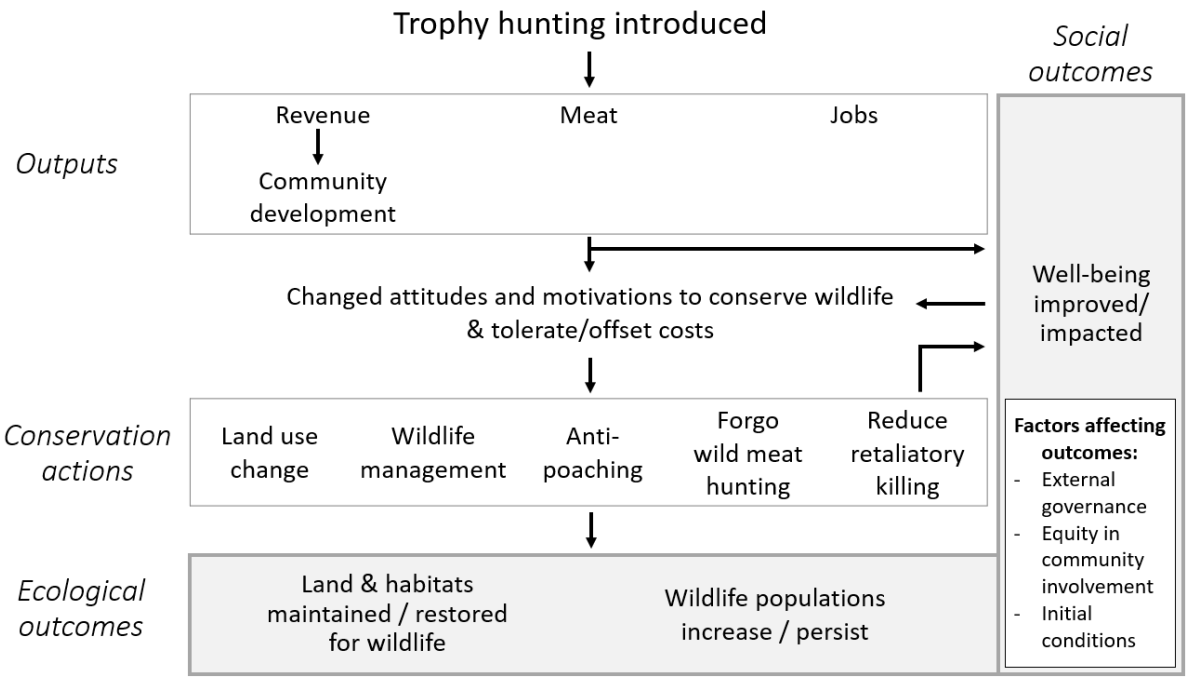


Figure 5.3: Theory of how trophy hunting contributes to conservation and community development on state or communal land with some, although varying, level of community involvement.

In systems where communities are involved, the outputs from trophy hunting are directed to varying degrees towards communities: the revenue received may be used for community developments, like improved clinic, or school infrastructure, the meat from the hunted animals goes or is sold to local communities, and local people are employed or at least have preferential access to the jobs created. These outputs are intended to produce the social outcomes of diversified and improved community livelihoods, and ultimately, improved well-being.

Trophy hunting's outputs, both directly and indirectly, are meant to positively change attitudes towards wildlife, and motivate local people to conserve their environments and tolerate the costs associated with living alongside wildlife. Local people will be motivated to engage in a range of conservation actions, like converting or setting aside land to be used for wildlife instead of agriculture or livestock farming, monitoring for poaching, forgoing any wild meat hunting themselves, and reducing retaliatory killing of wildlife that has caused damage. These actions in turn bring about ecological outcomes of land and habitats being maintained or restored, and wildlife populations (both hunted and non-hunted) increasing or persisting.

As much of the focus of this thesis is on how trophy hunting contributes to socially-just conservation, which is thought to be more likely to be successful and sustainable in the long term, this chapter will focus on systems with some level of community involvement (those that fall on the right half of Figure 5.1 and with theory following Figure 5.3). However, ecological outcomes can still be achieved without direct involvement (Figure 5.2) and this will also be discussed.

For both theories, there are various assumptions that are required for them to work:

1) Outputs from trophy hunting are sufficient to improve well-being
2) Trophy hunting's outputs directly, or via improved well-being, change attitudes and motivations
3) Changed attitudes and motivations to conserve wildlife, and tolerate costs, lead to conservation actions
4) Conservation actions lead to ecological outcomes of land and habitats being maintained or restored for wildlife and that wildlife populations increase or persist

There are also many factors that may affect trophy hunting in all systems and how it achieves its goals. These can be broadly classified into three categories: 1) issues of external governance, such as hunting regulations, and the extent of recognition and devolution of rights to communities; 2) issues of procedural and distributional equity in community involvement, and 3) the attributes or initial conditions of the system, like wildlife abundance, and existing human pressures, like population size and reliance on wild meat (Loveridge et al., 2007a, Lindsey et al., 2007, Roe and Cremona, 2016). Community involvement in trophy hunting falls on a spectrum from minimal participation, e.g. on private or state land where communities may be passive recipients of some meat and jobs, or may be affected by conservation actions taken by the landowners, to extensive and active participation where wildlife use and management rights are devolved to local community organisations, who have substantial input in decisions and are recipients of all hunting outputs.

5.4 Results

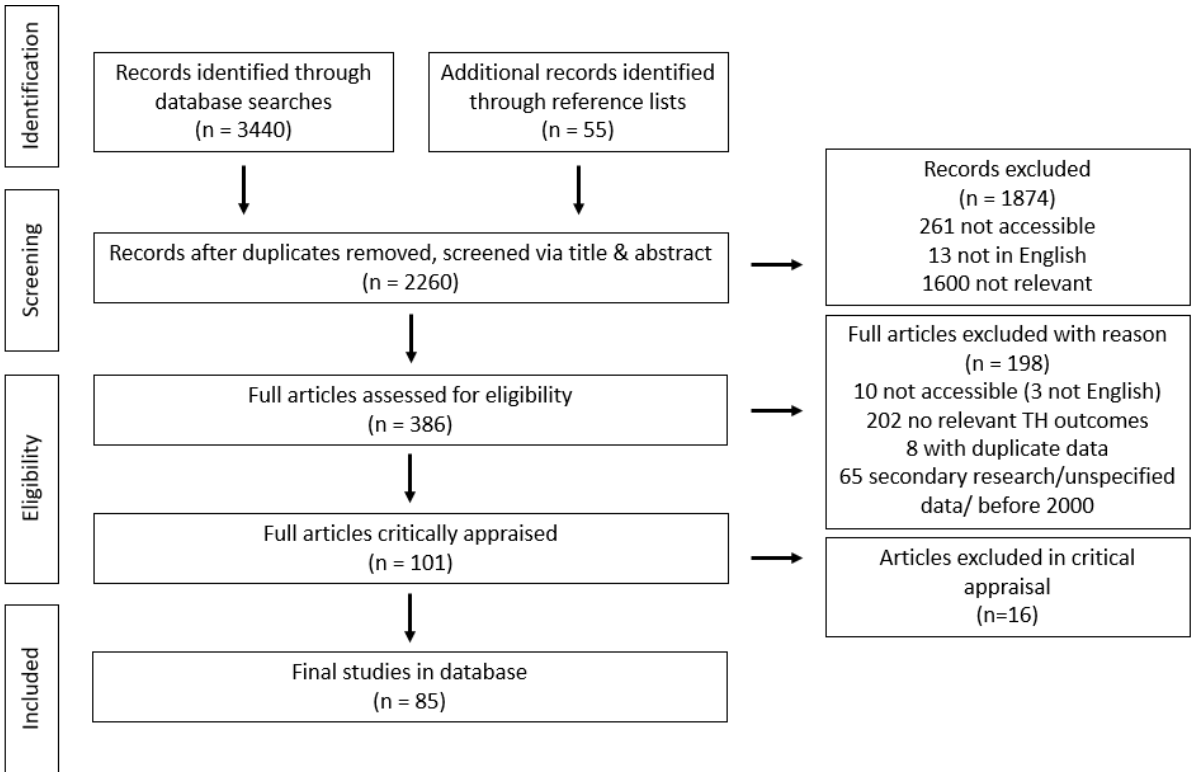


Figure 5.4: Flow chart identifying the number of studies excluded from the review at different stages

Of the 2260 studies which passed the initial screening, 85 studies were included in the review (Figure 5.4). Thirty-eight studies reported only socio-economic outcomes, forty-one reported ecological outcomes, and six reported both. Studies spanned twelve countries and three trans-frontier conservation areas (Figure 5.5); more than half were from Zimbabwe, Tanzania, and Namibia.

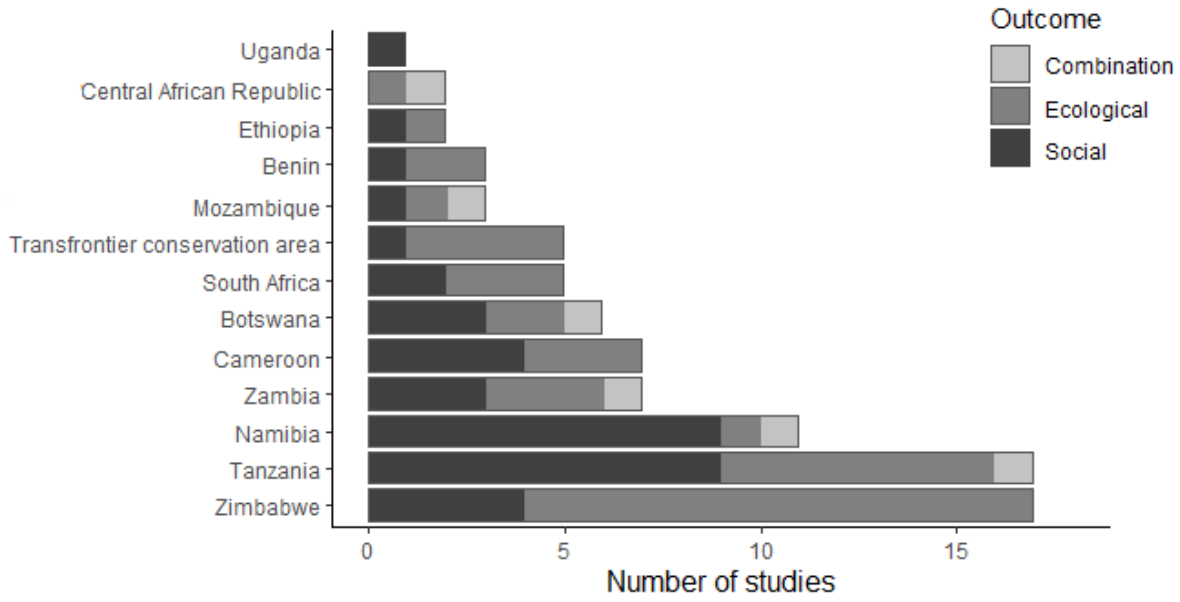


Figure 5.5: Number of studies included in the review with social and/or ecological outcomes of trophy hunting by country

5.4.1 Outputs of trophy hunting

5.4.1.1 Revenue and community development

Income to communities was reported in half of the studies that examined social outcomes (n=21). Many reported amounts that communities or community organisations had received over various time periods (Table 5.1). In some countries, such as Namibia and Botswana, income reaching communities from trophy hunting was quite substantial (Table 5.1). Elsewhere, this was not the case. For example, in the Debub Omo revenue-sharing scheme in Ethiopia, the overall amount of revenue reaching the scheme was so small, communities received funds on rotation or it would be too little to do anything with (Yitbarek et al., 2013). Variation within countries was also substantial, which limits the relevance of national averages. In Zambia's 36 GMAs, for example, community resource boards earned US$ 1.64 million in 2012, on average equalling about US$ 456,000 per GMA. However, only half of them generated income from trophy hunting while the rest earned nothing (Lindsey et al., 2014).

Fewer studies reported income reaching more meaningful levels, such as individuals or households. Where possible, theoretical average income per person was calculated (Table 5.1). Estimates varied substantially, from around a dollar per person per year in Cameroon and some Zimbabwean communities, to over US$ 500 per person per year in a few of Botswana's Community Trusts. However, few community organisations distribute income in this way, and when they do it is rarely the full amount they received from trophy hunting (Bandyopadhyay et al., 2004, Mbaiwa and Stronza, 2010).

Table 5.1: Annual average income to villages or communities, community organisations, and national CBNRM programmes from trophy hunting and their sources (Area). Where possible, estimates of annual returns per person were calculated (pp.). When reported in local currencies, amounts were converted using the World Bank Official Exchange Rate. k = thousand, m = million

Country	*Location*	*US$/year*		*Year*	*Source*
		Area	*pp.*		
Income to villages/communities/hunting areas					
Botswana	Sankuyo	226.4k	608.00	2000-2007	Mbaiwa & Stronza (2010)
	Mababe	180.2k	200.49	2000-2007	"
	Khwai	171k	589.79	2000-2007	"
	OKMCT	160k	155.06	1999-2003	Mbaiwa (2004)
	Cgaecgae Tlhabololo	31.3k		1999-2003	"
	OCT	170k		1999-2004	"
Namibia	Nyae Nyae	100.6k	21.52	2000-2010	Koot (2019)
	Bwabwata	173.7k		2006-2007	"
	Wuparo	56.8k*		2010-2008	Kahler & Gore, 2015
Zambia	Average of 36 Game Management Areas	45.6k		2012	Lindsey et al. (2014)
CAR	Average of 6 north eastern community hunting areas	28.3k		2003	Bouché et al. 2010
Tanzania	Simanjiro District Council	20.7k		2005-2008	Snyder & Sulle (2011)
Zimbabwe	Chibwedziva	20.7k	1.83	2000-2010	Gandiwa et al. (2013)
	Chizvirizvi	4.8k	1.59	2004-2010	"
	Mahenye	28.3k	8.08	2002-2010	"
	Mtandahwe	4.4k	0.38	2000-2010	"
	Mutombo and Hlarweni		56.00	2008-2009	Poshiwa et al. (2013)
Cameroon	North province	29.2k		2008	Yasuda et al. (2011)
	Bénoué NP Community commission for 6 villages	1.9k	1.09	2007	"
Mozambique	Coutada 9	11.6k		2009	Lindsey et al. (2011)
Ethiopia	Murulle CHA villages	2k		2007-2011	Yitbarek et al. (2013)
	Wolishet Sala CHA villages	863		2007-2009	"
Income to national CBNRM programmes					
Botswana		3.4m		2011/12	Mbaiwa (2017)
Namibia		3.5m		2013	Naidoo et al. (2016)
Income to governments					
Tanzania	Simanjiro District	250k		1997-2002	Sachedina & Nelson (2010)
Benin	Pendjari complex	170k		2011	Henschel et al. (2016)
Cameroon		1.2m		2008	Yasuda (2012)
Zambia		4.24m		2012	Lindsey et al. (2014)
South Africa		133m[+]		2008	Snijders (2012)

**Income from trophy hunting of buffalo, elephant, kudu, and hippo only. [+]Income from unspecified 'daily hunting fees', so possibly trophy & other recreational hunting.*

For many households, reported income from trophy hunting is minimal (e.g. Snyder and Sulle, 2011, Yasuda, 2012), particularly by comparison to other livelihood activities, like agriculture (Poshiwa et al., 2013). Even in Namibia, where all income from tourism activities goes to communities, relatively few

households – between 0 and 30% across seven surveyed conservancies – gained sufficient income from trophy hunting for it to make significant contributions to household finances (Bandyopadhyay et al., 2004).

As income from trophy hunting is insufficient to make meaningful contributions at the household level, it is often invested into community infrastructure, support, or 'development'. Examples include infrastructure and other funding for schools, clinics or health centres, farming, roads, water provision, and communal buildings (e.g. Bouché et al., 2010, Kangalawe and Noe, 2012, Suich, 2013). In some places funds are used for community enterprises, transport, scholarships, pensions, funerals, or other social support (Mbaiwa and Stronza, 2010, Koot, 2019). However, whether people link these developments to trophy hunting is unclear, and poorly evidenced or understood (Angula et al., 2018).

It is worth noting that revenue from trophy fees is only one of the income sources that trophy hunting generates. Revenue can also come from land leases, for example in Botswana's CBNRM. Few studies in this review examined the broader income streams that hunting safari's generate, for example through taxidermy, souvenirs, etc. As this review focussed on the social and ecological outcomes of trophy, these streams may have been reported in studies which explored economic outcomes, but it was beyond the scope of this study to include these.

5.4.1.2 Meat

Meat from trophy animals is widely stated as a benefit of the sport by its proponents, and was reported in many studies, predominantly from southern Africa. Studies suggested it is an important benefit in local communities, and one that is clearly linked to trophy hunting by the local community (Mbaiwa, 2004, Angula et al., 2018). It can be particularly significant in areas which do not otherwise have ready and legal access to fresh meat (Mbaiwa, 2004). It is also mostly distributed in winter, the peak hunting season, when people are most likely to be food insecure (White and Belant, 2015).

Amounts distributed to communities can be substantial (Naidoo et al., 2016, Mbaiwa, 2017), but they depend on an area's wildlife abundance and the local human population. For example, rural communities in Zambia's GMAs with more abundant wildlife received over 6 tonnes of meat each year, while those in depleted areas receive less than 1 tonne (White and Belant, 2015). In the five years prior to the 2014 hunting moratorium in Sankuyo, Botswana, approximately 154 tonnes of meat from elephants alone went to the community of roughly 370 people each year (Mbaiwa, 2017).

5.4.1.3 Employment

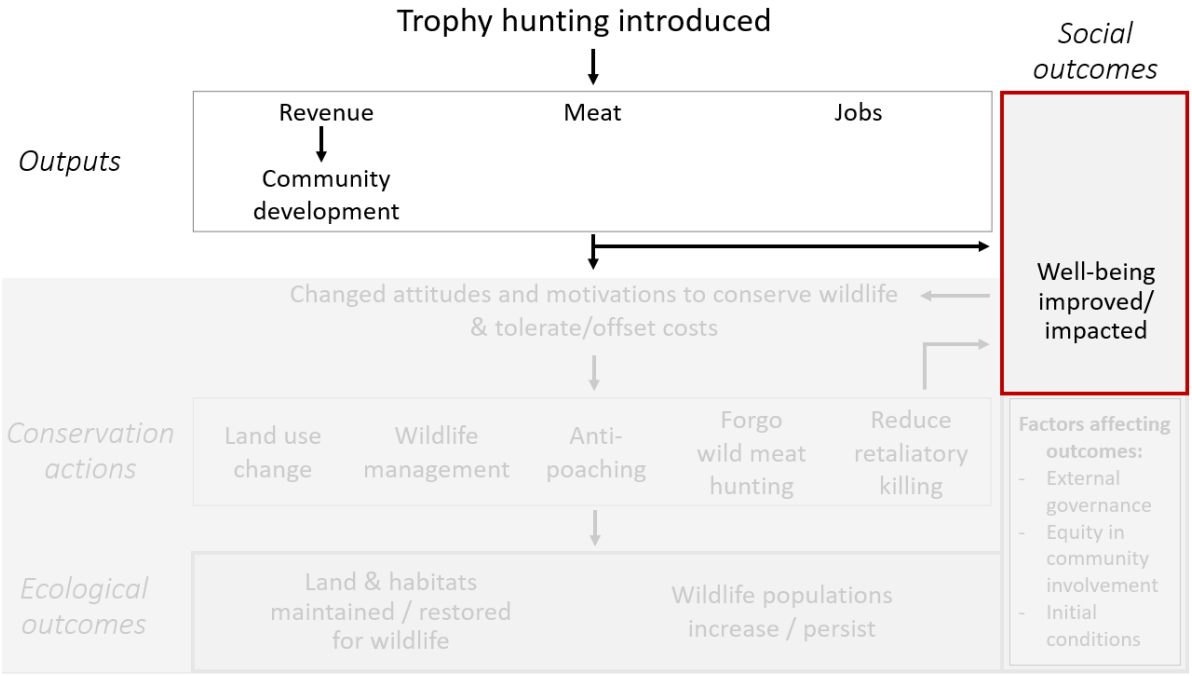
It is fairly clear that trophy hunting generates at least some employment in rural areas where few other income-generating opportunities typically exist; 20% of studies mentioned this output. In some

areas, jobs may reach substantial proportions of the local populations (e.g. Mbaiwa and Stronza, 2010), while in others there might only be a marginal gain in the numbers employed (Mutandwa and Gadzirayi, 2007). However, employment is often one of the greatest sources of 'benefit' from trophy hunting (e.g. Zafra-Calvo and Moreno-Peñaranda, 2018), so even small gains should not be discounted. Around Benoué National Park in northern Cameroon, for example, US$ 60,000 was paid in wages in the year 2000 for local labour, while community payments were only US$ 3,000 (Mayaka, 2002). However, the jobs created by trophy hunting, and wages received, are varied, and unclear descriptions of 'numbers of people employed' can mask this. Most hunting takes place seasonally, so people are rarely employed all year round. People doing jobs like tracking and skinning work for the whole hunting season and can earn substantial amounts, but others who are employed short-term and casually earn less (White and Belant, 2015). In a Cameroon village, 40% of men of working age were employed by the hunting operator, but only 7% received wages that contributed substantially to annual household income (Yasuda, 2012). Wages varied from US$ 68 dollars for one month's work to US$ 829 over five months, yet when described as '22 men employed by the hunting operator' these differences are masked.

5.4.2 How trophy hunting outputs lead to socially just conservation

While trophy hunting does seem to generate revenue, meat, and jobs for communities, albeit to varying extents, it is less clear whether these are sufficient to impact livelihoods and well-being, change attitudes, and motivate people to carry out conservation actions. It is also unclear whether, in turn, these actions lead to thriving wildlife populations or conserved habitats. Evidence for these assumptions is discussed below.

5.4.2.1 *Assumption 1: Outputs from trophy hunting are sufficient to improve livelihoods and well-being*



Well-being, is a multi-faceted concept and measure, comprising multiple domains and metrics. While income and employment are measures of economic well-being, and meat provision contributes to food access and availability, a measure of material well-being, various other measures and domains of well-being were reported in relation to trophy hunting across thirty-four studies from eight countries.

More nuanced measures of economic well-being were assessed in several studies included in the review. Three of these explored impacts of trophy hunting-based CBNRM on household economic welfare in Zambia and Namibia, with rigorous comparative designs that addressed confounding factors, lending some weight to their findings. All found welfare improvements, although effects were not always evenly distributed (Bandyopadhyay et al., 2004, Bandyopadhyay and Tembo, 2010, Richardson et al., 2012). In Zambia, households in Game Management Areas with abundant wildlife saw significant welfare gains, while those in areas with less wildlife showed no significant improvement (Richardson et al., 2012). Further, improvements were not always even within communities. In Zambia, welfare gains were mostly accrued by those already relatively well-off in communities (Bandyopadhyay and Tembo, 2010, Richardson et al., 2012), though in a sample of Namibia's communal conservancies, welfare gains were poverty neutral in one region and pro-poor in another (Bandyopadhyay et al., 2004). However, a later study examining multiple dimensions of poverty in one of the previously surveyed Namibian conservancies, found no positive impacts of

conservancies in randomly selected households, but positive financial impacts in purposively sampled households: those in conservancy management or who were known to have benefitted (Suich, 2013).

A study from Sankuyo village in Botswana suggests there have been improvements in subjective well-being: 93.5% of households surveyed felt that their livelihoods had improved and diversified since 1996 when the trophy hunting-based CBNRM programme began (Mbaiwa and Stronza, 2010). However, in other areas, for example in Mozambique and Tanzania, trophy hunting's outputs appear to have had minimal impacts on self-assessments of poverty alleviation, and between 40-60% of respondents felt benefit sharing/CBNRM schemes had failed (Suich, 2013, Kangalawe and Noe, 2012). In one Tanzanian village, people believed trophy hunting was even jeopardising well-being (Wright, 2016).

Studies from Botswana, Namibia, and Tanzania reported improved social relations, governance and empowerment, and security and safety. These improvements were not necessarily through trophy hunting directly, but through the community institutions that formed to facilitate engagement with the trophy hunting industry. These included enhanced social capital and connectivity, establishments of new actor networks and local institutions, retaining youth in rural areas, development of skills, and improved relationships with government and the private sector (Mbaiwa and Stronza, 2010, Wright, 2016). There were also reports of improved land access and security (Hausser et al., 2009, Wright, 2016), improved social security through job creation (Mbaiwa, 2004) and improved food security through meat provision (White and Belant, 2015). Störmer et al. (2019) meanwhile found that the majority of people in surveyed Namibian conservancies were happy and proud of having wildlife in their land again. They were pleased that wildlife was being preserved for future generations, and thought it played a cultural role as part of people's tradition and heritage (Bollig and Olwage, 2016). Some people also drew artistic and spiritual inspiration from wildlife, while others thought they played important roles in the overall ecosystem (Störmer et al., 2019, Koot, 2019).

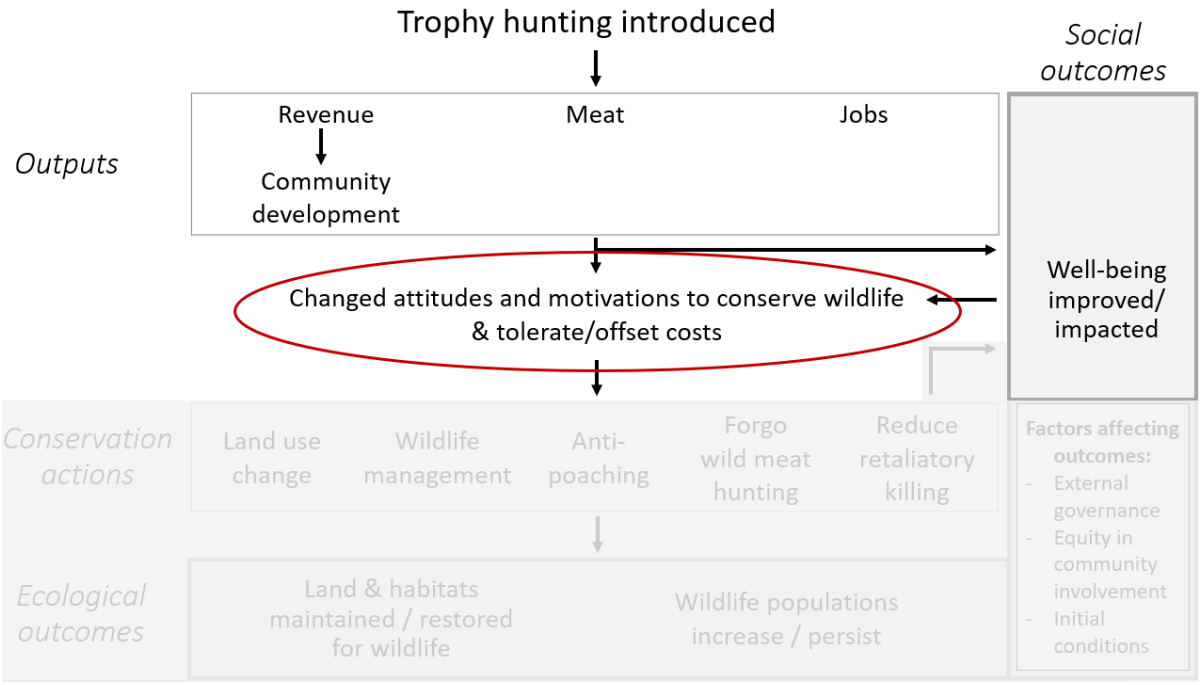
There were also negative outcomes or costs associated with trophy hunting as a land use, which have negative effects on well-being. These were reported in a third of all studies across nine countries. Even where some domains of well-being improved, these rarely came with no costs or negative impacts on other well-being domains.

Most of the studies reported wildlife costs, such as livestock loss, crop damage, or disease risks to cattle, which harm material well-being as well as security and safety. Where quantified, levels ranged from 50%-92% of respondents reporting some form of wildlife-related damage (Bandyopadhyay et al., 2004, Granados and Weladji, 2012, Suich, 2013). Sometimes these costs could be outweighed, at least theoretically, by income generated from trophy hunting, e.g. in Tanzania (Zafra-Calvo and Moreno-

Peñaranda, 2018), but in Mozambique income from sport-hunting was insufficient to compensate for the economic costs of livestock losses at the household level (Jorge et al., 2013, Zafra-Calvo and Moreno-Peñaranda, 2018). Sogbohossou et al. (2011) meanwhile, found that trophy hunting might even be exacerbating levels of livestock depredation in the Pendjari Biosphere reserve complex in Benin. There are also psychological costs, with fear associated with living alongside wildlife being reported (Rust and Marker, 2013).

There were also issues of restrictions on resource use and access (e.g. Hausser et al., 2009, Snijders, 2012), evictions (e.g. Igoe and Croucher, 2007, Yasuda, 2012), and the loss of autonomy, responsibility, and rights over land (e.g. Kangalawe and Noe, 2012, Bamford et al., 2014). Even in Namibia, where devolution of wildlife-use rights is quite extensive and communities have a quota for their own use, hunting for household meat consumption is no longer socially acceptable and is criminalised, despite some quotas being left underutilized (Bollig and Olwage, 2016). There were also reports of weakened social relations, particularly in Tanzania. Conflict was reported around access rights and land use, e.g. for cattle grazing, local hunting, ecotourism, and natural resource use, with conflict being between locals and the hunting operators or the Wildlife Division anti-poaching units (e.g. Hausser et al., 2009, Sachedina and Nelson, 2010). Conflict was also linked to corruption (Wright, 2016). Issues were also raised about power dynamics and uneven relations between hunting operators, NGOs and communities (Snyder and Sulle, 2011, Koot, 2019), game farm owners and their labourers in South Africa (Snijders, 2012, Brandt and Spierenburg, 2014), and relations within and between communities and local government (Dube, 2019, Kangalawe and Noe, 2012).

5.4.2.2 Assumption 2: Trophy hunting outputs directly, and/or via improved well-being, change attitudes and motivations

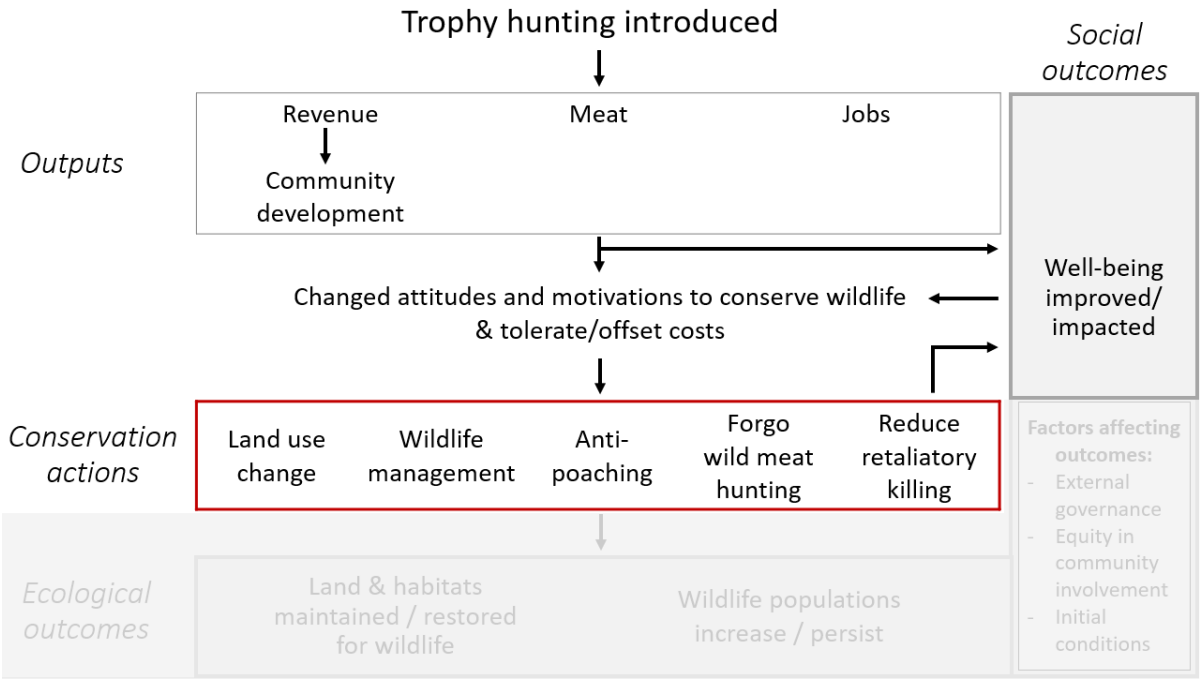


Ten studies reported on attitudes towards wildlife and conservation. Six studies found improved or positive attitudes towards wildlife and conservation as a result of the various trophy hunting-based CBNRM programmes in Botswana, Namibia, and Zimbabwe (e.g. Mbaiwa, 2005, Mutandwa and Gadzirayi, 2007), though other studies from Zimbabwe reported contrasting findings (Gandiwa et al., 2013, Dube, 2019). Störmer et al. (2019) found that two thirds of people in Namibia's conservancies had positive attitudes towards wildlife, with trophy hunting being more likely than photographic tourism to improve attitudes because of meat distribution and the killing of dangerous damage causing animals. Other reasons behind positive attitudes were that wildlife could generate income and development opportunities (Rust and Marker, 2013, Kahler and Gore, 2015), and for aesthetic and cultural reasons (Bollig and Olwage, 2016). By contrast, the four studies reporting on mixed, unchanged, or worsened attitudes gave reasons of limited trophy hunting income to communities, uneven benefit distribution, and continuing wildlife costs (e.g. Bamford et al., 2014, Ochieng et al., 2017).

A similar number of studies reported on attitudes towards trophy hunting as an activity or towards hunting companies. Many of these studies were from Tanzania and reported negative views towards the industry, associated with a lack of benefits received by communities, limited community involvement, corruption in the industry, concerns over wildlife depletion, and a range of other issues (e.g. Igoe and Croucher, 2007, Wright, 2016). Studies from Namibia by contrast, reported that community members were happy with trophy hunting, because of the income, employment, and

opportunities it generated (Bollig and Olwage, 2016). Support was high as 90% in one survey (Angula et al., 2018). In a series of studies in Cameroon, attitudes towards trophy hunting around Bénoué National Park improved since it was introduced, because the activity was perceived to be conserving wildlife and creating employment (Weladji et al., 2003, Granados and Weladji, 2012).

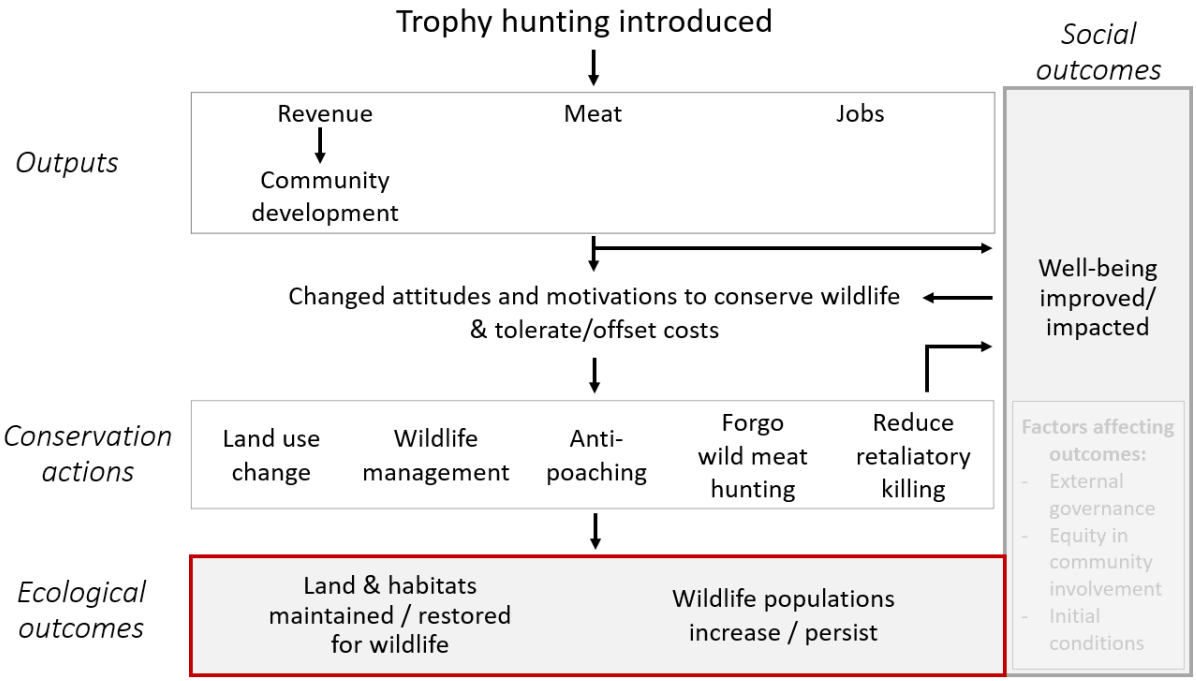
5.4.2.3 Assumption 3: Changed attitudes and motivations to conserve wildlife and tolerate costs lead to conservation actions



Studies examining whether trophy hunting leads to conservation actions are limited in both number and in the types of conservation actions covered. Trophy hunting's effects on anti-poaching are most commonly documented. Eight studies reported that trophy hunting increases or funds anti-poaching monitoring and enforcement efforts, and that this in turn was helping wildlife populations (e.g. Croes et al., 2011, Lindsey et al., 2012, Atickem et al., 2011). However, whether trophy hunting leads to less wild meat hunting or poaching from happening in the first place is less clear and poorly researched. Mutandwa and Gadzirayi (2007) reported that communities felt that the rate of poaching had declined and that the number of animals had increased due to Zimbabwe's CAMPFIRE programme. Mbaiwa (2005) also suggests that Botswana's CBNRM programme had led to reductions in poaching in the area. Other studies however, found that poaching and other illegal activities continued (Wilfred et al., 2019, Yasuda, 2011), largely due to negative views towards wildlife and minimal benefits from the trophy hunting (Dube, 2019). Despite these anecdotes, no studies empirically explored whether changed attitudes resulted in changes in levels of illegal hunting, nor whether it was the communities illegally hunting in the first place. Only one study, by Sachedina and Nelson (2010), assessed trophy hunting's impact on land use change in Tanzania, and found no instances of communities setting aside

land for wildlife conservation as a result of trophy hunting income. No studies explored whether trophy hunting impacted retaliatory killing.

5.4.2.4 Assumption 4: Conservation actions lead to ecological outcomes



5.4.2.4.1 Land & habitats maintained or restored for wildlife

Trophy hunting's contribution to land and habitats conservation is widely claimed, yet there are few studies that empirically explore this; most simply state the area of land used for trophy hunting. One study suggested trophy hunting can have positive impacts on habitats. Banda et al. (2006) assessed the role of different forms of protection on vegetation structure and composition in Tanzania. They found that Game Controlled Areas, which allow trophy hunting but prevent human settlement, agriculture and grazing, had the highest mean stem density and density of larger trees, significantly higher tree basal area and species richness, and more unique species than the National Park which does not allow hunting. It also outperformed a forest reserve and an area which allowed human settlement in most of these measures. They concluded that a combination of protection strategies was likely needed to conserve the greatest tree diversity.

Studies also reported private landowners converting land use from livestock farming to wildlife-based or mixed land uses (e.g. Lindsey et al., 2013, Snijders, 2012), and communities zoning land and setting some aside for wildlife conservation in Namibia, Mozambique, Tanzania, and Zimbabwe (Mutandwa and Gadzirayi, 2007). How effective these mechanisms are in conserving areas, and whether the zoning plans are enforced is less clear. In a study on livelihoods in the Kilombero Valley, Tanzania, Bamford et al. (2014) found that trophy hunting meat distribution to communities had stopped

because the community had failed to meet their obligations to protect the community wildlife management area, suggesting it was an insufficient mechanism to stop the agricultural frontier extending into the area. In Zambia, where it is unclear whether land needs to be set aside, Lindsey et al. (2014) found that habitat loss and human encroachment was increasing, while wildlife biomass was declining.

5.4.2.4.2 Wildlife populations increase or persist

The impact of trophy hunting on wildlife population density and abundance was reported in twenty-three studies (Figure 5.6). These spanned eleven countries and one transfrontier conservation area, making the sample size per country small. No clear trends were evident, either overall or for particular countries, with various studies reporting positive, negative, mixed, and no impacts. The mixed results within countries and studies, suggest that species and areas are unlikely to be uniformly impacted by the activity (Packer et al., 2011). Even though trophy hunting's impacts on wildlife populations seem unclear, three studies demonstrate that short-term moratoria and/or quota reductions allow populations to recover from over-hunting when it does occur (Loveridge et al., 2016). Trophy hunting was also reported to incentivise species reintroductions (Bollig and Olwage, 2016, Lindsey and Bento, 2012), and has led to substantial increases in wildlife populations on private land in Namibia and South Africa (Lindsey et al., 2013) and communal land in Namibia (Störmer et al., 2019).

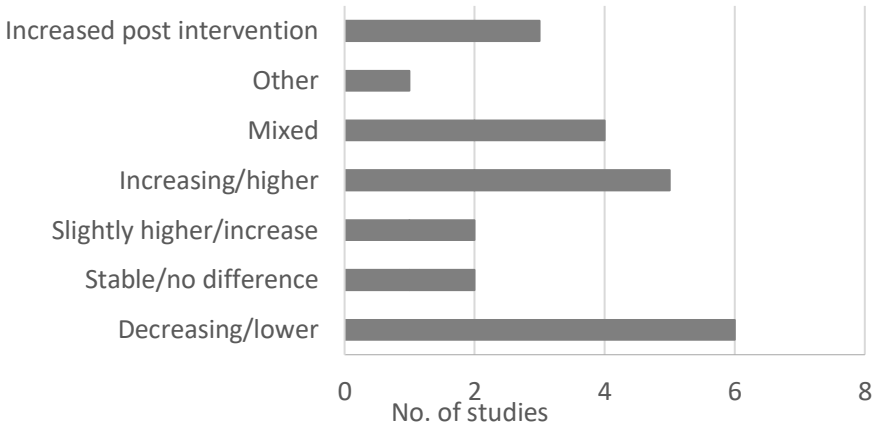


Figure 5.6: Direction of trends in wildlife density and abundance impacts of trophy hunting by country

A further eight studies reported on trophy quality and/or harvest trends (Figure 5.7). These are considered proxies for abundance trends as hunting companies put considerable effort into finding quality trophies, so changes in underlying populations are assumed to be reflected in the numbers hunted and trophy quality (Muposhi et al., 2016a, Brink et al., 2016). Here, too, the sample size was small, and outcomes were varied across species and countries.

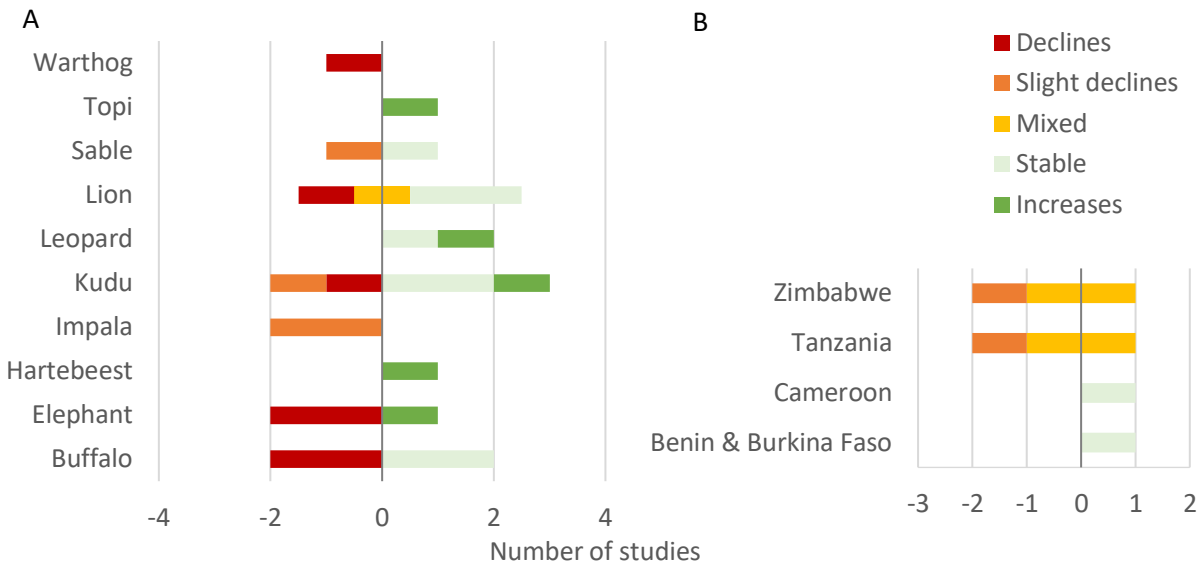


Figure 5.7: Number of studies by A) species and B) country reporting trends in trophy quality and/or harvest rates

A further twenty-four studies reported on wildlife population dynamics and behaviour, covering a range of topics (Figure 5.8). There seemed to be no consistent findings across countries, or population dynamics and behaviours studied. An equal number of studies reported negative impacts of trophy hunting, such as: skewed sex ratios (e.g. Loveridge et al., 2007b, Becker et al., 2013), increased mortality (Loveridge et al., 2017, Brandlová et al., 2018), changes in flight response (e.g. Ndiweni et al., 2015, Muposhi et al., 2016b), and changed habitat use (Selier et al., 2015), and mixed outcomes, where some aspects measured were negatively impacted, while others remained unchanged. No studies went on to examine whether these altered population dynamics or behaviours went on to impact population trends, or whether they had long-term detrimental effects on wildlife populations. There were also no studies which examined the impacts of trophy hunting on non-hunted species population trends, though two studies explored health and behaviour impacts of trophy hunting on non-target scavenger species (Garbett et al., 2018, Cozzi et al., 2015).

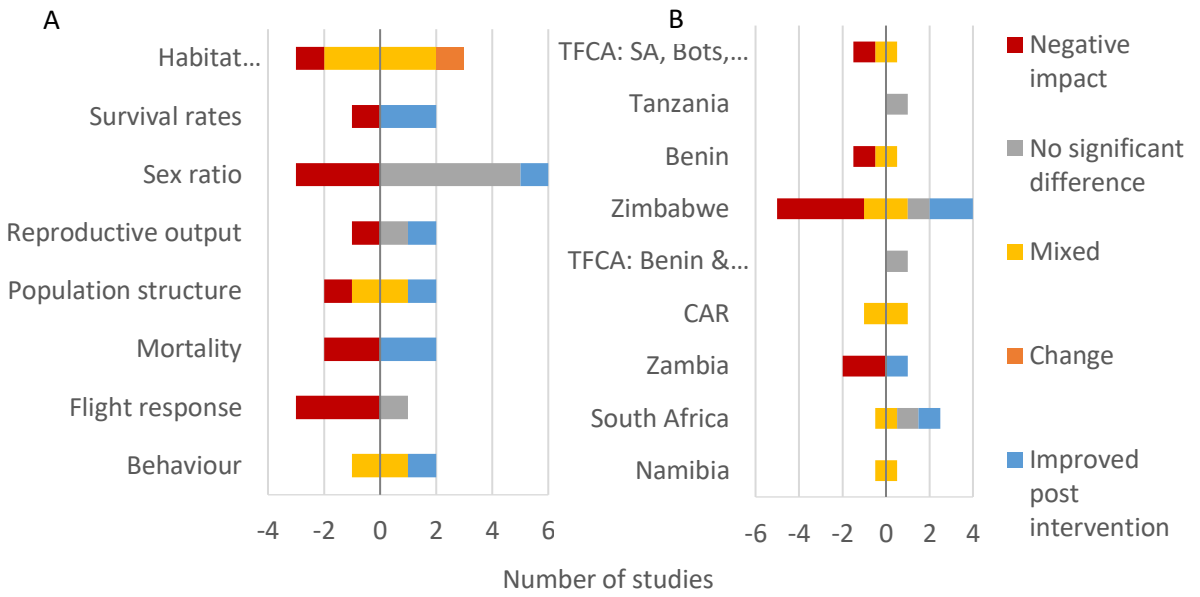
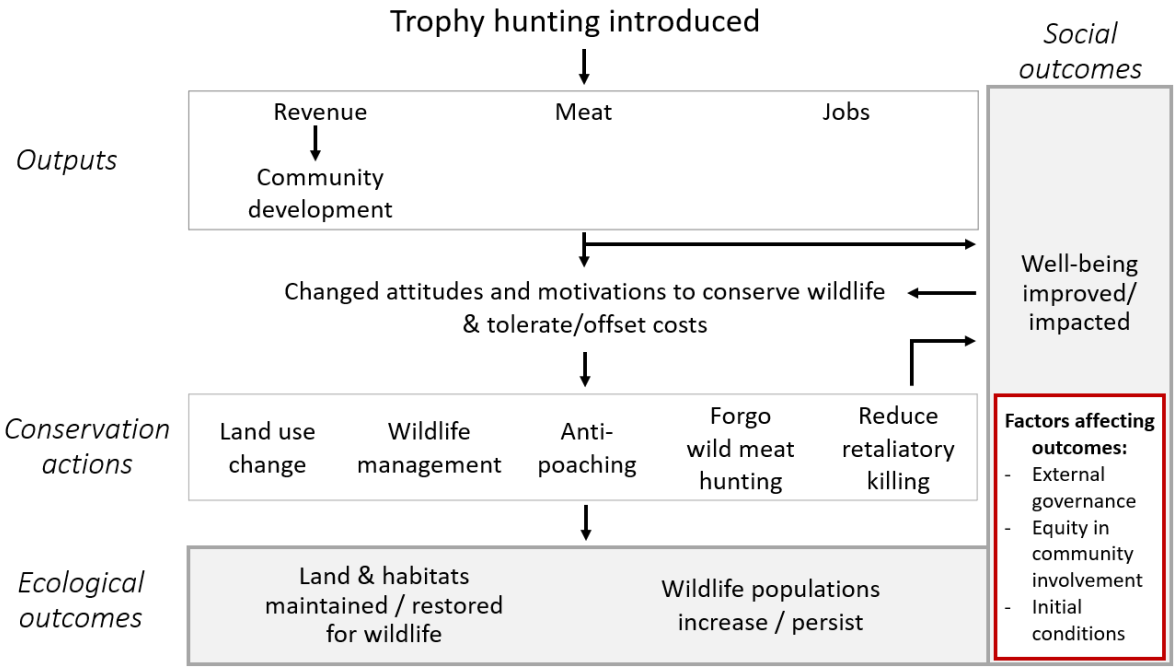


Figure 5.8: Number of studies reporting outcomes of trophy hunting on A) various wildlife behaviours and population dynamics and B) across countries

Another consideration in interpreting these results is that few of the study designs accounted for confounding factors, which makes it difficult to attribute causation. Indeed, several studies stated that declining trends or altered dynamics or behaviours were more likely to be caused by factors other than trophy hunting – such as habitat availability/preference (Waltert et al., 2009), illegal wild meat hunting (Bouché et al., 2010, Caro, 2008), or retaliatory killing (Williams et al., 2017). The prevalence of the latter two does suggest that trophy hunting might not have been creating sufficient incentives to stop these practices. Only one study examined and compared trends between a hunting and non-hunting area over time (Crosmary et al., 2015). They found that herbivore densities were generally not lower in hunting areas, and concluded that, when well-managed, trophy hunting may be relevant conservation areas for large herbivores (Crosmary et al., 2015).

5.4.3 Factors affecting outcomes



The variable social and ecological outcomes of trophy hunting reported, across and within countries, reinforce claims of how context specific outcomes are. Indeed, 80% (n=67/85) of included studies discussed at least one factor that affected trophy hunting's social and/or ecological outcomes they reported. Considerably more studies, across all countries except Namibia and Cameroon, reported factors which hampered positive trophy hunting outcomes (Figure 5.9).

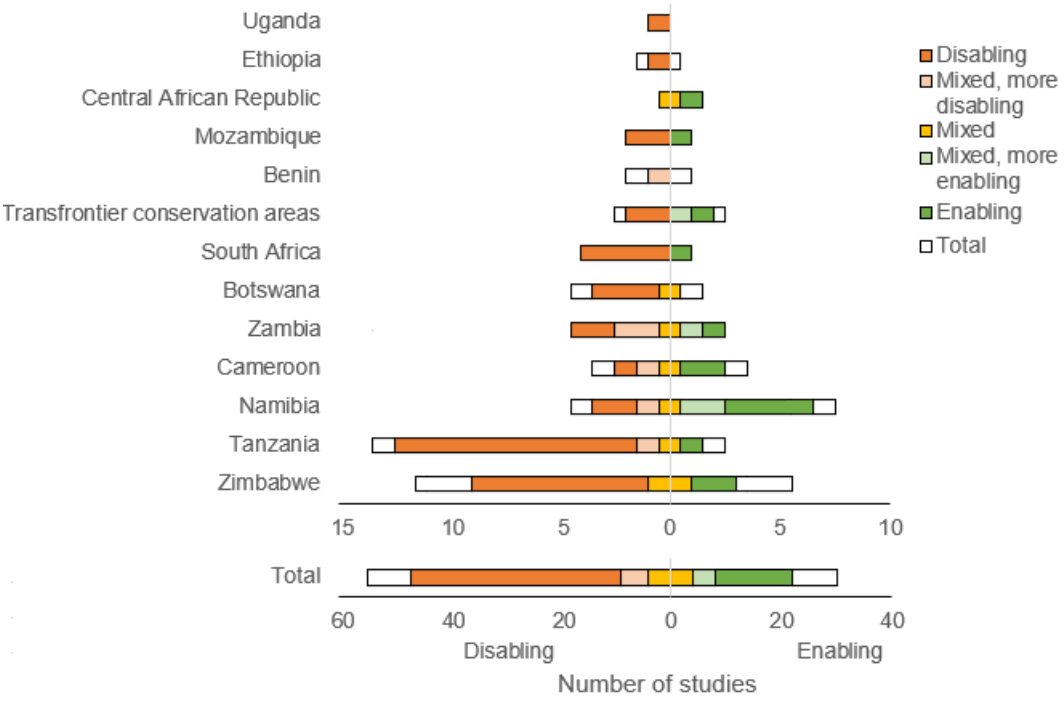


Figure 5.9: Number of studies reporting enabling and/or disabling factors which affect trophy hunting outcomes

5.4.3.1 External governance and support

Contexts relating to external governance were among the most commonly reported factors affecting trophy hunting's social and ecological outcomes. Decisions, policies, and actions by national governments, in particular, were commonly reported (Figure 5.10), though non-governmental organisations (NGOs) and the private sector were also reported to influence trophy hunting outcomes. All three were reported to both positively and adversely affect trophy hunting outcomes in different ways.

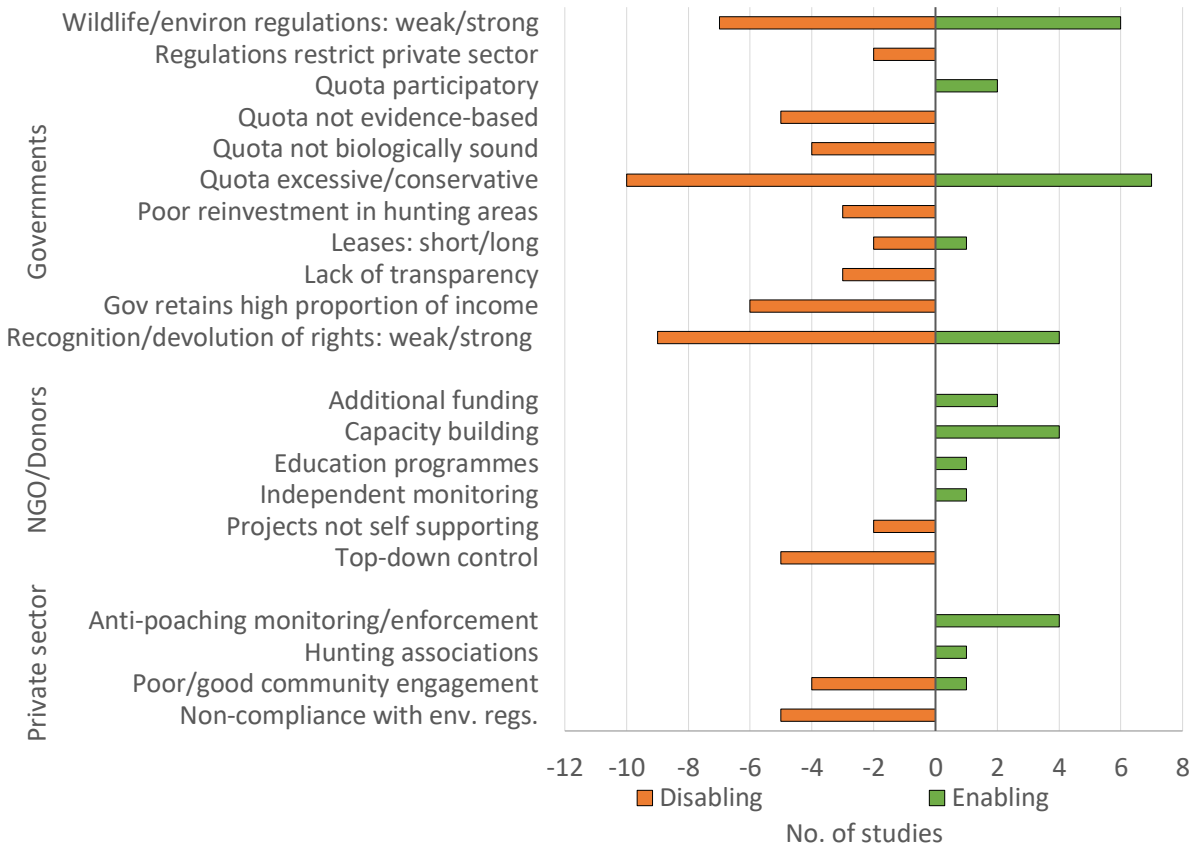


Figure 5.10: External governance and support influences on trophy hunting outcomes

5.4.3.1.1 National governments

Over half of all included studies reported that government policies and practices affected trophy hunting outcomes (n = 44 of 85); these spanned a range of issues that positively and negatively affected outcomes (Figure 5.10). Factors that enabled positive outcomes from trophy hunting included governments setting conservative quotas, participatory quota setting with stakeholder engagement (e.g. Naidoo et al., 2016), and the setting and enforcing of regulatory policies that manage hunting offtake, such as introducing age limits (e.g. Bouché et al., 2016, Begg et al., 2018), or instigating moratoria (e.g. Loveridge et al., 2016, Mweetwa et al., 2018). Such measures help ensure that trophy hunting is sustainable and that declining populations are given chance to recover. Policies which devolve wildlife use rights and management to communities, such as the CBNRM legislation in

Namibia (e.g. Bollig and Olwage, 2016, Störmer et al., 2019), are also linked to positive social and ecological hunting outcomes, along with long-term leases for hunting operators, which encourage environmental stewardship (Brink et al., 2016).

Thirty-eight percent of studies, however, reported factors which restricted positive trophy hunting outcomes (Figure 5.10). The most prevalent factors related to excessive quotas, poor wildlife regulations, poor recognition and devolution of rights to communities, and high retention of trophy hunting income by governments. Issues with quotas included quotas being set too high, not being evidence-based, and allowing females and sub-adults to be hunted (e.g. Loveridge et al., 2007b, Croes et al., 2011, Sogbohossou et al., 2014). Problems arose when there was no systematic monitoring of wildlife populations or proxies (Mweetwa et al., 2018), when quotas did not account for other sources of mortality, e.g. illegal killing (Williams et al., 2017) and when transboundary populations quotas were set independently for individual countries without consideration for the whole system-scale population (Selier et al., 2014).

Perverse and weak regulations also restricted outcomes. Regulations which penalise companies for using less than a minimum amount of their quota can promote harvesting of immature individuals, particularly if quotas are set too high (Brink et al., 2016, White and Belant, 2015). Imposing fixed quotas, where operators pay animal licence fees before hunting, also promotes the harvesting of wildlife regardless of whether it is sustainable (Lindsey et al., 2014, Muposhi et al., 2016a). Meanwhile, regulations designed to enhance sustainability, such as age limits, are often poorly enforced (e.g. Sogbohossou et al., 2014, Becker et al., 2013), while systems which encourage good performance by hunting operators are lacking (Lindsey et al., 2014). Private sector development is also hampered in various ways, including lengthy administrative processes, short leases, and ownership restrictions on big game (Lindsey et al., 2013, Lindsey et al., 2014).

Outcomes tend to be worse when governments' are over-reliant on hunting income as this increases risks of setting unsustainable quotas to bring in more revenue (Brink et al., 2016, Lindsey et al., 2014, White and Belant, 2015) and reduces the likelihood of meaningful devolution to communities. Insufficient funds being returned to communities (e.g. Kangalawe and Noe, 2012, Yasuda, 2011), weak legislation devolving wildlife use and management rights to communities (e.g. Mbaiwa, 2005, Wright, 2016), and overly complex devolution processes where many decisions ultimately remained in government control (e.g. Igoe and Croucher, 2007), have all been criticised for hampering social outcomes of trophy hunting. There are also issues of a lack of transparency and corruption in processes (Bandyopadhyay and Tembo, 2010, Wright, 2016), and poor reinvestment into hunting areas (Lindsey et al., 2014, Yitbarek et al., 2013) and community capacity building (Mbaiwa, 2004).

5.4.3.1.2 Non-governmental Organisations and donors

Provision of additional funding (Bouché et al., 2010, Henschel et al., 2016), community capacity building (e.g. Mbaiwa, 2005, Suich, 2013), and education programmes (Granados and Weladji, 2012) by NGOs and/or donors were all found to improve trophy hunting outcomes (Figure 5.10). NGOs can also facilitate improved stakeholder collaboration and hunting practice, and act as an independent auditors (Begg et al., 2018). However, their involvement was also criticised for being top-down: driving decisions and policies which governments are not fully committed to, communities are not meaningfully involved in, and where the institutions created are complex, weak and reliant on donor funding and input (e.g. Igoe and Croucher, 2007, Hausser et al., 2009, Dube, 2019).

5.4.3.1.3 Private sector

The private sector's involvement with, and investment into, anti-poaching monitoring and enforcement is commonly reported to improve ecological outcomes, with private companies often being better equipped than national parks (e.g. Croes et al., 2011, Scholte et al., 2017) (Figure 5.10). Some companies also help develop infrastructure in the area more generally (Brink et al., 2016), and hunting associations can play a positive role, e.g. by increasing the minimum safari length and package price (Bouché et al., 2016). However, several studies also highlight non-compliance with environment regulations and harmful ecological practices, such as: luring animals outside national parks (Loveridge et al., 2007b), hunting in prohibited zones neighbouring national parks (Jeke et al., 2019), and targeting under-sized trophies to fill quotas (Wilfred, 2012). There are also issues on private game farms of intolerance towards predators, and game fences preventing migration and increasing risks of overstocking (Lindsey et al., 2013). Poor community engagement, for example, not recognising community rights or negotiating land use with communities, also inhibits positive outcomes (Bamford et al., 2014, Sachedina and Nelson, 2010). It is important to note that hunting operators/companies vary, and so do their impacts on hunting outcomes. In Nyae Nyae Conservancy in Namibia, for example, one hunting operator was criticised heavily for poor community engagement and working conditions, while the second operator was well liked, sought the community's advice on how to improve their relationship, and treated local workers well (Koot, 2019).

5.4.3.2 Equity in community involvement

While external governance factors affect both social and ecological outcomes and include one dimension of equity, recognition, factors relating to equity in procedure and distribution are particularly important for enabling social outcomes and were frequently reported (Figure 5.11).

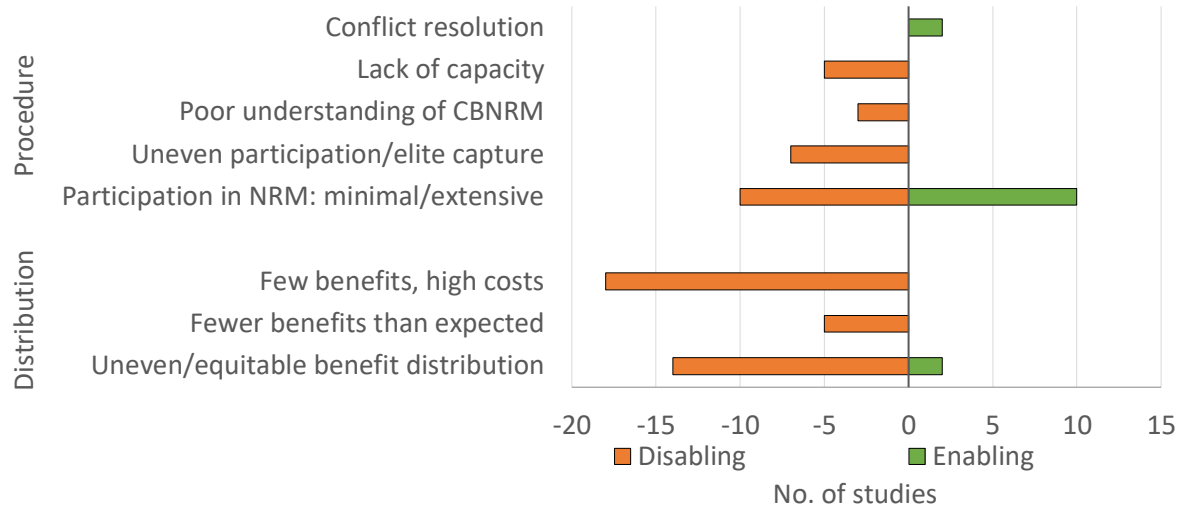


Figure 5.11: Procedure and distribution equity factors affecting trophy hunting outcomes

5.4.3.2.1 Equity in procedure

The extent of community participation in natural resource management and decision-making was raised in twenty studies (Figure 5.11). When communities were involved in managing, monitoring, benefiting-from, and making-decisions about their natural resources and land use, social as well as ecological trophy hunting outcomes were more positive (e.g. Naidoo et al., 2016, Bouché et al., 2016, Richardson et al., 2012). Recognition of ownership, and subsequent extensive devolution of use rights and management responsibility in Namibia, for example, have enabled communities to manage their wildlife and other natural resources, zone their land for different uses, and benefit from hunting and other tourism developments, leading to many examples of positive outcomes for communities and wildlife (e.g. Bandyopadhyay et al., 2004, Bollig and Olwage, 2016). Participation in decision-making and wildlife management can also lead to improvements in human-wildlife conflict and can help resolve conflicts over land and resource use (Hausser et al., 2009, Wright, 2016). Minimal community participation in decision-making and wildlife management meanwhile, was linked to fewer benefits to communities from trophy hunting (e.g. Mutandwa and Gadzirayi, 2007, Kangalawe and Noe, 2012, Yitbarek et al., 2013), and conflicts (Sachedina and Nelson, 2010).

Inequitable participation was also commonly reported and, in some cases, led to conflict. CBNRM decision-making and institutions can be less accessible to marginalised groups, e.g. women or ethnic minorities (Mutandwa and Gadzirayi, 2007), or open to corruption, elite capture and power abuse by traditional authorities or more affluent community members (e.g. Bandyopadhyay and Tembo, 2010, Lindsey et al., 2014, Dube, 2019). A lack of community capacity, in terms of legal, entrepreneurial, managerial, or financial skills, can also restrict positive outcomes (e.g. Lindsey et al., 2014, Bollig and Olwage, 2016). It can limit community involvement in the tourism sector, and can lead to misappropriation and mismanagement of funds (Mbaiwa, 2004, Bandyopadhyay and Tembo, 2010).

A lack of knowledge within communities of their rights and entitlements within CBNRM legislation also hinders equal participation (Bandyopadhyay and Tembo, 2010, Snyder and Sulle, 2011), while a lack of transparency and formality of some revenue-sharing agreements can restrict community-derived benefits from trophy hunting arrangements (e.g. Kangalawe and Noe, 2012).

5.4.3.2.2 Distribution equity

Issues around benefit distribution also affected trophy hunting outcomes and were raised in twenty-eight studies (Figure 5.11). The most widespread issue was that benefits from trophy hunting were few, rarely reached communities, and did not out-weigh the costs associated with living alongside wildlife or restrictions on livelihoods (e.g. Kangalawe and Noe, 2012, Suich, 2013, Lindsey et al., 2014). There seems to be a mismatch between the household-level costs, and benefits from trophy hunting only reaching community, regional, or national levels (e.g. Yasuda, 2012, Gandiwa et al., 2013). Uneven benefit distribution is also pervasive and was raised in most countries, with far fewer reports of equitable benefit sharing. Elite or political capture of benefits, and limited access by marginalised and poorer groups within communities, were reported in many countries in relation to all outputs of trophy hunting (e.g.Bandyopadhyay and Tembo, 2010, Zafra-Calvo and Moreno-Peñaranda, 2018, Ochieng et al., 2017). Only in Namibia were benefits found to be shared reasonably evenly across households (Suich, 2013, Bandyopadhyay et al., 2004), but even there, benefits were not always sufficient to positively affect poverty levels for most people (Suich, 2013), and equitable distribution was not always the case (Kahler and Gore, 2015, Koot, 2019).

5.4.3.3 Initial conditions

Only a handful of studies reported how initial conditions affected trophy hunting outcomes, though all the factors raised restricted positive outcomes. They include several factors relating to communities: heavy reliance on natural resources and wild meat (Croes et al., 2011, Yasuda, 2012, Wilfred et al., 2019), existing inequalities in power, access and wealth (Bandyopadhyay and Tembo, 2010), and disparities across ethnic groups within communities (Mbaiwa and Stronza, 2010). Political instability was also raised as an issue, with inflation reducing income to communities in Zimbabwe (Gandiwa et al., 2013). Meanwhile, the uneven distribution of wildlife across landscapes, both in numbers and species, limits the amount of hunting that can take place and, in turn, the potential outputs to communities. Some communities can generate substantial income from trophy hunting, while for others it is negligible, with no positive financial impacts on households in these areas (Richardson et al., 2012, Bollig and Olwage, 2016). High levels of illegal hunting, through international intrusions from unstable neighbouring countries (Bouché et al., 2010), for the wild meat trade (Lindsey and Bento, 2012), or in retaliation to wildlife damage (Williams et al., 2017), also restrict the extent

and sustainability of trophy hunting, and are not always accounted for in quota-setting (Waltert et al., 2009).

5.5 Discussion

Trophy hunting's social and ecological outcomes are considerably varied, both within and between African countries. They are also influenced by a wide range of extrinsic and intrinsic factors which operate at various scales. The combination makes outcomes hard to generalise, and makes the context of how they came about particularly important to consider in discussions on trophy hunting's efficacy as a conservation and development tool.

5.5.1 Trophy hunting outputs and outcomes

The direct outputs from trophy hunting, both to governments and communities, can be substantial. When communities are the sole beneficiaries of income and have exclusive or preferential access to jobs and meat, for example in Namibia and Botswana, these outputs have led to improvements in various dimensions of well-being, e.g. economic, subjective, social relations, and in community attitudes towards wildlife and conservation. In Botswana, CBNRM has led to anecdotal decreases in poaching, while in Namibia, wildlife has increased substantially across communal areas since the CBNRM programme began and expanded (Roe et al., 2009, Bollig and Olwage, 2016). Trophy hunting played key roles in both of these programmes (Mbaiwa, 2017, Naidoo et al., 2016). In Namibia, it was particularly important for quickly generating benefits in fledgling conservancies, and it continues to be the dominant income source in more recently established conservancies (Naidoo et al., 2016).

Elsewhere, community income from trophy hunting is more often minimal than substantial, particularly at the household level, and, when used at the community level, e.g. on community infrastructure, it is unclear whether or how well-being is impacted (Bandyopadhyay and Tembo, 2010). Though jobs created through trophy hunting can be important to a few within communities, they often have limited reach, and the impact of meat from hunted animals is highly dependent on the community population size and wildlife abundance. With all of these outputs, equal access within communities is not guaranteed. This variation sets the scene for highly variable social and ecological outcomes, such as improvements in human well-being, attitudes towards wildlife, and a slowing of the agricultural frontier. Overall, countries with more reports of meat, employment opportunities, and higher income to communities, reported more positive attitudes towards wildlife despite similar reports of wildlife costs. By contrast, countries where income to communities was lower, with fewer studies reporting on jobs and meat, attitudes towards wildlife and hunting were less positive. This suggests the assumption that trophy hunting outputs can improve attitudes towards wildlife is reasonable and that these improvements can still take place even with ongoing wildlife costs.

However, it also suggests that this assumption is dependent on benefits received by communities being sufficient. Further, changes in attitudes towards wildlife is less important than changes in behaviour. People can still feel anger towards wildlife costs and refrain from hunting or resorting to retaliatory killing if their livelihoods are secure, they feel suitably compensated and fairly treated, and they want CBNRM schemes to be successful.

One of the challenges is the mismatch between where benefits from trophy hunting reach, and where costs are faced. Outputs from trophy hunting are often only at the community level or are unevenly distributed to a few fortunate households. Yet, it is households that bear the costs of living alongside wildlife. Wildlife costs were widely reported, and in most cases, were not outweighed by the limited household level benefits that trophy hunting brought. A recent study found that even in Namibia, where trophy hunting benefits are amongst the most extensive and relatively evenly distributed, wildlife costs are not always offset by trophy hunting alone (Drake et al., 2020). This suggests that a range of wildlife-based strategies are likely to be needed to achieve socially-just conservation and adequately compensate for the costs borne by local communities.

Compensating costs is only one component, however, and focussing only on economic benefits limits a broader understanding of why, where and how trophy hunting is delivering positive social and ecological outcomes. One of the unanticipated outputs of trophy hunting, is that at least in some contexts, not only does it generate benefits, but it is also perceived to be addressing wildlife costs by killing dangerous and damage-causing animals (Störmer et al., 2019). Understanding whether this is a broader phenomenon will be important when considering the suitability of trophy hunting versus other forms of wildlife-based land uses in improving attitudes towards wildlife. Impacts of trophy hunting on well-being beyond economic aspects, e.g. health, social relations, security, and governance, meanwhile, are also poorly understood and understudied. This has been found for nature conservation interventions more generally (McKinnon et al., 2016). Yet, these can be important in the success and sustainability of conservation efforts and also warrant further research.

Whether outputs from trophy hunting, improvements in well-being, or improved attitudes towards wildlife actually lead to conservation actions is also poorly understood and is one of the weakest assumptions in the theory of how trophy hunting achieves conservation. There are suggestions that programme design is important to ensure conservation actions occur. In Zambia, for example, despite households in Game Management Areas (GMAs) being marginally better off on average than matched non-GMA counterparts, wildlife in most GMAs continues to decline while the area of land used by humans increases (Lindsey et al., 2014). Sachedina and Nelson (2010) also found no instances of community land being set aside for trophy hunting where donations from hunting companies are

made with no conditions for conservation by the community. In Namibia, by contrast, to establish a conservancy and gain rights to wildlife and benefits it can generate, land needs to be specifically zoned by the community for different uses, with core conservation areas designated (Bollig and Olwage, 2016). Sachedina and Nelson (2010) also found that other initiatives, like direct payments for habitat conservation or community tourism schemes where the community is obliged to comply to a land zoning plan, did lead to land conservation by the community. This suggests a need for clearer links between the benefits created by such initiatives and the desired conservation actions, which has important implications for designing such initiatives. Sachedina and Nelson (2010) suggests initiatives should strive to develop direct incentives based on conditional negotiated agreements. A change in focus to studying behaviours instead of attitudes as indicators of success has also been suggested for conservation research more generally, as attitudes do not always translate into behaviour (Nilsson et al., 2020).

5.5.2 A need for improved and more equitable governance

Equity in community involvement in trophy hunting has broad reaching enabling or restricting effects on the social outcomes of trophy hunting. One of the key factors affecting social outcomes of trophy hunting relates to the recognition of community ownership and rights over wildlife resources, and the devolution of use and management rights to communities. Not only does recognition and devolution facilitate positive trophy hunting outcomes, but it also delivers a wide range of positive well-being outcomes in its own right, e.g. empowerment, social relations, governance, and security, among others (Wright, 2016, Mbaiwa and Stronza, 2010). While incomplete devolution does not preclude positive outcomes from trophy hunting, it does limit them. In Zambia, for example, devolution of rights and responsibilities to communities is minimal, yet improvements in economic well-being were seen in some GMAs (Bandyopadhyay and Tembo, 2010). In Botswana, similarly, there were numerous studies demonstrating positive outcomes for trophy hunting-based CBNRM programmes, despite devolution of rights being restricted. However, weak legislation has recently led to the further erosion of what limited control communities did have over resources (Cassidy, 2021), and the five-year trophy hunting moratorium has led to some positive outcomes being reversed (Mbaiwa, 2017).

Poor recognition of community ownership, and limited devolution of rights and responsibilities over natural resources, however, is a broad failing of many African CBNRM programmes, despite it being a key concept behind the initiatives (Galvin et al., 2018). This study finds similar mixed social outcomes from trophy hunting-based CBNRM to other studies examining all CBNRM, though less clearly positive ecological results (Galvin et al., 2018). This suggests that the limited social outcomes from trophy hunting are a flaw of the CBNRM systems, or institutions, rather than trophy hunting itself. This implies that without institutional reforms that adequately recognise and respect communities' rights and

ownership over land and wildlife, CBNRM will continue to deliver limited improvements to local communities regardless of the type of land use, e.g. photographic or hunting tourism.

Procedural and distributional equity issues were also found to affect the social outcomes of trophy hunting, with reports of unequal participation and unfair benefit distribution limiting outcomes in numerous studies. These have been found to constrain socially-just conservation globally (Brooks et al., 2013, Galvin et al., 2018, Oldekop et al., 2016). While participation in natural resource management and decision-making is constrained by devolution, equity issues extend beyond this, pervading what little participation communities have in decision-making and affecting benefit distribution. Existing and arising unequal power dynamics within communities are widespread, and even in programmes with extensive devolution, equity in participation and benefit distribution needs to be improved to overcome these disparities (Sullivan, 2018, Koot, 2019). Improved understanding of existing power relations in communities is essential in designing new initiatives, and improving understanding of equity issues and how they influence success or failure in existing programmes will be key to improving outcomes (Klein et al., 2015). There are now tools to facilitate this understanding and improve practice e.g. IIED's site-level assessment of governance and equity (SAGE), governance at protected and conserved areas (GAPA) and social assessment for protected and conserved areas (SAPA) (Franks and Pinto, 2021).

Ecological outcomes meanwhile were impacted most strongly by government policies and regulations, particularly around quota setting. Setting sustainable quotas has been long been recognised as an essential component of the industry (Leader-Williams et al., 1996), but one that has proved elusive for many countries (Lindsey et al., 2007). Despite governments earning varying amounts of income from trophy hunting, the African protected area estate is severely underfunded (Lindsey et al., 2018), and hunting income is rarely reinvested into hunting areas alone. Regular and rigorous monitoring and evaluation of wildlife in the vast hunting estates and the suitability of quotas is beyond the resource capacity of many wildlife departments, which leads to many quotas being based on guess work (Lindsey et al., 2007). This is particularly problematic for out-dated estimates where populations have been substantially reduced and quotas become difficult to meet, which has happened in numerous places for large carnivores (e.g. Packer et al., 2011). Some wildlife departments are also highly dependent on funding from trophy hunting, which disincentivises devolution to communities and encourages governments to set unsustainable quota setting. Devolution of management and monitoring to communities can be a powerful tool here, as is evidenced in Namibia where communities are involved in regular game counts and participate in quota setting (Stuart-Hill et al., 2005).

What is encouraging is that negative outcomes of trophy hunting seem to be reversible, with improvements reported following moratoria and conservative quota setting (Loveridge et al., 2016). Hunting associations can also help ensure good practice and improve outcomes from the private sector (Lindsey et al., 2007, Bouché et al., 2016). Collaborations between governments, the private sector, and NGOs can also achieve this, and NGOs can play key roles in facilitating and sparking such engagement (Begg et al., 2018). NGOs and donors can also support positive social outcomes from trophy hunting and CBNRM programmes in general, particularly through long-term funding for support and capacity building (Kalvelage et al., 2020). However, it is important that they facilitate genuine community involvement and do not perpetuate a different form of top-down control where external views are imposed on communities (Marks, 2009). Governments also need to be fully behind community-based initiatives, or NGOs and donors risk wasting valuable time and resources on efforts which are unlikely to be more than window dressing to receive donor funding (Hausser et al., 2009).

Finally, the impact of initial governance conditions on trophy hunting outcomes, and the trade-offs between and merits of photographic and trophy hunting tourism requires more examination. Only one review study on Zimbabwe reported that outcomes were adversely affected by political instability. However, that trophy hunting can operate more successfully than photographic tourism in areas with low political stability and conflict is an argument often used by its proponents (Di Minin et al., 2016, Lindsey et al., 2007). Greater understanding of these dynamics and whether trophy hunting can indeed operate sustainably in high conflict areas, given all the other pressures on biodiversity warrants more attention (Bauer et al., 2021).

6 Trophy hunting and CBNRM in Botswana: past and present

6.1 Abstract

Conservation decisions and interventions do not take place in a vacuum, but in complex socio-ecological systems, shaped by their history and politics. To contextualise the 2014-2019 hunting moratorium in Botswana, and how it might have impacted communities and ecosystems, I explore the history and politics that affected the policy shift: first at a national level, and then for the two case study communities, Phuduhudu and Ditshiping. I used literature review and primary data collected during six months' ethnographic fieldwork the country to do this.

I examine the history, and inter-relations, of Botswana's tribes, with a focus on the Tswana, San, and Bayei people living around the Okavango Delta, and how power dynamics between groups have evolved to shape modern Botswana. I then explore the evolution of hunting, its intertwined history with the country's conservation movement, and the early development of the country's community-based natural resource management programme – intended to devolve power over natural resource management to rural communities. I highlight the extent to which this actually happened, focussing on the recentralisation that took place through the 2007 CBNRM policy, and how this was exemplified by the top-down instigation of the moratorium. I then shift focus to the local level, discussing how CBNRM evolved in the two case study villages. I show how the more diverse Bayei livelihoods and scenic location of Ditshiping village, versus the hunter-gatherer lifestyle of the San and remote location of Phuduhudu village, set the two villages on different trajectories for how they engaged with CBNRM and tourism. These different settings in turn shaped how the villages faced the moratorium within the boundaries set by national level politics.

6.2 Introduction

Conservation is an inherently socio-political process, impacted by the past as well as the present (Adams and Hutton, 2007, Robbins, 2012). Priorities are shaped by diverse and often competing interests, and they vary over time (Mace, 2014). Priorities are also addressed in numerous different ways from limits on individual actions, to community relocations, from local decisions about individual species, to national land use plans or hunting bans. Most of these decisions impact people's lives and livelihoods, particularly in rural areas where dependence on natural resources is high. What is done in the name of conservation, and how it plays out on the ground, is shaped by power relations operating at different scales, often with marginalised groups being most impacted by decisions but having little voice.

To adequately understand the impacts of the 2014-2019 hunting moratorium on community well-being in Botswana, it is important to understand the social and political context in which the decision came about. The decision to instigate a hunting moratorium in a country which has followed a utilitarian approach to conservation since its inception, and where hunting is deeply imbedded in numerous cultures, was bound to be controversial. When situated in a global debate on trophy hunting's role in modern conservation it becomes even more so, particularly when local and global views on the subject, and worldviews and values in general, differ. Power differences between local, national, and global actors compound these contestations, and highlight the multiple scales at which conservation politics operates.

In Botswana, decisions around trophy hunting inevitably affect the country's CBNRM programme, as it is the predominant mechanism through which rural communities are involved with trophy hunting, and CBNRM itself is fundamentally political. CBNRM is promoted as mechanism through which power over natural resources can be redistributed, typically away from central government, with the stated intent of empowering local actors to control, and make decisions over, the resources they use. The politics of CBNRM in Botswana is complicated by the history of its people, and its government. Many of the communities involved are comprised of ethnic minority groups, who are amongst the most marginalised and deprived in the country. CBNRM was partly seen as a way for people to regain their collective rights over land and natural resources (Hoon, 2014). Indeed, some of the most contentious conservation issues in Botswana today relate to the status and rights of indigenous and minority groups (Hitchcock, 2002).

With a political ecology lens, this chapter starts with a brief history of Botswana's various people groups, their interrelations, and their politics. It then discusses the development of conservation and CBNRM in the country, the current state of national CBNRM, and instigation of the hunting moratorium. From the national context I then move to an overview of local dynamics which are discussed for the two case study communities, and how these shaped trophy hunting's impacts on local well-being. I aim to highlight how this background situates the extent to, and limitations in, which trophy hunting, and indeed CBNRM more broadly, was able to affect community well-being. In doing so, I highlight how the political ecology of trophy hunting, and the mechanisms like CBNRM which enable it, deserves more attention in analyses of trophy hunting's effectiveness as a conservation tool.

6.3 Methods

This chapter is informed by a combination of literature review and primary data. Primary data were collected from two case study villages, Ditshiping and Phuduhudu, both of which had CBNRM projects that, prior to the moratorium, had derived all or some of their income from trophy hunting. Ditshiping village was one of six villages to form the Okavango Kopano Mokoro Community Trust (OKMCT), while Phuduhudu alone formed the Xhauxhwatubi Development Trust (XDT). Both villages were comprised of ethnic minority groups, with Ditshiping being a predominantly Bayei settlement and Phuduhudu being a predominantly San settlement.

Data were collected during two three-month field trips, predominantly spent living in Phuduhudu and Ditshiping villages, from February-April and August-October 2019 respectively. I conducted participant observation, informal, semi-structured, and key informant interviews, and focus group discussions with community members from both villages and the other five villages that form the OKMCT. Sixty-four semi-structured interviews were conducted in Phuduhudu and 44 in Ditshiping. Nine focus group discussion were conducted with residents of Phuduhudu, and sixteen with residents of the OKMCT villages. I also made regular trips into Maun, the nearest Town to both villages, to restock supplies and conduct key informant interviews (n = 34) with other CBNRM and trophy hunting stakeholders, e.g. government, tourism industry, and research.

Topics asked in interviews related to the establishment of the trusts, community perceptions of how the trusts were working, local livelihoods, how trophy hunting and CBNRM worked in the country, and understanding of the justification for the moratorium (See Appendix 2: Group discussion guides). The chapter also relied on participant observation, and sitting in on community meetings and discussions.

6.4 National history and politics: people, hunting, and conservation

6.4.1 History of Botswana's people and politics

Despite the Botswana Government's claims that no specific ethnic groups of Botswana are indigenous (Hitchcock, 2002), it is widely recognised that the first inhabitants of the area that is now Botswana were ancestors of the Khoi and San people, known collectively and widely as Basarwa[4]. Numerous other groups moved into different areas over time, with the most significant migration being the ancestors of the Tswana tribes who moved into and spread across the area that is now Botswana. In northern Botswana, and the areas around the Okavango Delta, the first inhabitants were ancestors of

[4] The term '*Basarwa*' is considered contentious by some, with derogatory Tswana origins of meaning 'someone whose behaviour is unacceptable' (Swatuk, 2005). However, it was also the preferred term used by respondents to identify themselves, and their ethnicity, and as such, I use it here.

the Basarwa, referred to as BaNoka: people of the river (Boggs, 2000). They lived through hunting and foraging, nomadically moving throughout the delta and surrounding savannah. Into this region, there were three major historical migrations, all from Bantu-speaking groups. The first were the Bayei, who emigrated to the Okavango Delta around the year 1750, from east of the Chobe River. They were followed by the Hambukushu who came from the Kwando valley in Zambia. Both groups were considered 'riverine people', whose livelihoods largely involved fishing, hunting, and agriculture, and, to a limited extent, pastoralism. The final group to immigrate were the Tawana, of Tswana origin, who moved from the central district of Botswana in the early 19th century. They were largely sedentary communities who relied on agriculture and pastoralism, but also hunted for meat (Boggs, 2000).

The arrival of the Tawana into the region had a radical impact on the social structure of northern Botswana which the former two migrations did not. Before the Tawana arrived, there was no unitary control over society, with groups being relatively autonomous and existing as independent settlements. Basarwa social structure was organised around kinship, with people existing in semi-nomadic family groups led by a skilled hunter (Boggs, 2000, Hitchcock, 2002). The Bayei and Hambukushu, meanwhile, were matrilineal societies organised around extended family groups (Boggs, 2000, Larson, 1970). The Tawana, by contrast, like the rest of the Tswana tribes, had a high level of socio-political organisation, with a patrilineal and very hierarchical society that was ordered into households and wards, all ruled by the chief who had absolute power (Gillet, 1973, Hitchcock, 1990, Boggs, 2000).

When the Tswana first moved into Botswana, they formed mutual relationships with other tribes, recruiting self-sufficient foragers into hunting to supply them with trade goods like ivory and feathers, and having resident pastoralists look after the Tswana cattle (Wilmsen, 1989, Wilmsen, 2002). However, from the mid-nineteenth century, expanding trade with Europeans resulted in power concentrating in the hands of a few Tswana chiefs, enabling them to assert dominance over other tribes (Wilmsen, 1989). The Tswana chiefs took control of the trade routes, regulating the flow of goods, most importantly, the weapons, horses, and other instruments of power, brought by the Europeans. Direct force was increasingly applied to extract ever-larger tolls in the form of feathers, tusks, skins, livestock, and labour from the other, increasingly dispossessed, non-Tswana peoples (Wilmsen, 1989, Wilmsen, 2002). Simultaneously, the class ranking systems, already inherent in Tswana social structure, expanded, with local Tswana elites given direct economic, and administrative, control over the lower classes in their areas of assigned responsibility, including people from other ethnic groups (Wilmsen, 1989, Wilmsen, 2002). In this way, the productive capacity of the land and the labour of its earlier inhabitants was expropriated, and ethnic minority groups, particularly the

Basarwa, were increasingly forced into varying degrees of serfdom, or driven into the more arid areas of the Kalahari (Wilmsen and Vossen, 1984, Wilmsen, 1989).

When the British came, and formed the British protectorate of Bechuanaland, they ruled all native inhabitants indirectly through the Tswana chiefs, cementing the Tswana hegemony over other ethnic groups (Gillet, 1973). It was also only the eight Tswana tribes who were designated land as 'Tribal Reserves' by the British administration, leaving other ethnic groups without claims or autonomy over the land they resided on or used (Ng'ong'ola, 1997). All other ethnic groups living on tribal land were placed under the domain of the Tswana chiefs, while those on Crown, or the small amount of freehold, land were left to seek service with the new landowners, or were not consulted on, nor compensated for, any changes in land use that led to their removal (Ng'ong'ola, 1997).

The control of the Tswana chiefs was only altered with the country's independence from the British protectorate, as powers over social and economic life were transferred from the eight Tswana chiefs to the newly formed Botswana Government. The government took over tax collection, and had power over state land. Legislation also progressively shifted most of the chiefs' former power over local life to elected Local District Councils. However, it was not an absolute loss of power. The Tswana chiefs, sub-chiefs (of smaller villages), and elite members of society became ex-officio members of the new organisational structures at national and local levels (Gillet, 1973). The Tswana chiefs also maintained their political power, as they remained the economic and educational elite, with considerable electoral, and general, influence over their constituents. They also had collective influence on government decisions through the House of Chiefs, established in the constitution in 1965 as the upper chamber of the National Assembly (Gillet, 1973). They are consulted on matters affecting the well-being of their people, can advise parliament on tribal matters, and are consulted on new legislation. Only the eight Tswana chiefs have this level of recognition while chiefs from ethnic minorities are not recognised in this way by government (Nyati-Ramahobo, 2008).

The result of Tswana control throughout Botswana's history, and current government, is that legislation and development in the country has left people from most other ethnic groups with the least access to land, the least secure tenure, little to no voice in court or public policy discussions, and with the poorest access to education and health services (Nyati-Ramahobo, 2008, Sapignoli and Hitchcock, 2013). While the country is heralded as one of the best examples of democracy in Africa, it has also been argued that a better description is of an 'authoritarian liberal' state, governed by a few elite, predominantly from the Bangwato tribe (Swatuk, 2005). Ngamiland in northern Botswana is one of the few districts where the majority of the population are from ethnic minority groups and, as a result, it has more limited health services, some of the lowest education standards, and the poorest

infrastructure, particularly in the smaller, and more rural, villages where the non-Tswana mainly reside (Nyati-Ramahobo, 2008).

6.4.2 History of hunting and conservation

Historically, hunting was an extensive practice for many of Botswana's people, with customary institutions and traditions managing wildlife resources (Mbaiwa and Darkoh, 1998). Much like elsewhere in Africa, colonisation, which in Botswana's case took the form of the British Protectorate, brought about substantial changes in the relationship between people and wildlife (Chapter 2), and the situation arguably worsened after independence (Mbaiwa and Darkoh, 1998).

Early colonial-era conservation concerns in Botswana centred on over-hunting and wildlife declines (Gupta, 2013). A combination of visiting white hunting parties from Europe and South Africa and the extensive trade in wildlife products fuelled by European traders led to intensive exploitation of wildlife, particularly in the southern regions, by the mid-19th century (Mbaiwa and Darkoh, 1998, Gupta, 2013). By the time the area came under British rule in 1885, the trade in wildlife products had all but collapsed from the combination of over-exploitation and drought. The disappearance of game, particularly from southern areas of the country, led the British administration to introduce game laws from 1891 aimed at curbing wildlife trade. These were applied directly to all foreigners (Europeans), and indirectly to all Batswana[5], through customary law and the indirect rule the British administration had through the Tswana chiefs (Gupta, 2013). These hunting restrictions remained the primary instrument through which wildlife conservation was pursued in the country throughout most of the colonial period. Despite these restrictions, Batswana retained the rights to hunt for subsistence on tribal land (with permission from the chief). In remote areas however, where Tswana chiefly authority was less strong, local people hunted relatively freely (Hitchcock, 1998). Indeed, elderly residents of Phuduhudu village speak of this period, "the time of Queen Elizabeth" (in Setswana to them, *Mma Msadinyana*), as being the best in their memory as they were able to hunt freely. This contrasts with many other African countries whose inhabitants experienced increasing hunting restrictions during colonial rule.

Though there were suggestions to establish reserves in the wildlife-rich Chobe area as early as 1932, the importance of cattle to the country's economy impeded the reserve's establishment until 1960. Cattle rearing and wildlife conservation were deemed incompatible, due to disease risk and competition for grazing (Campbell, 2004). Most of Botswana's parks and reserves were only formed in the 1960s and 1970s, shortly before, and after, the country's independence in 1966 (Child, 2009d).

[5] Used in the broader sense of all native people in the country.

This was partly due to the discovery of diamonds, which shifted the economy's reliance from cattle, but also due to broader-scale changes taking place across the continent at that time. Big conservation groups in Africa, like the Fauna and Flora International, and the newly formed, International Union for the Conservation of Nature, were intensifying their campaigns for protecting African wildlife, targeting newly decolonised countries and their new leaders (Adams, 2004). Zoologists, travellers, and big game hunting clubs alike, produced extensive propaganda, particularly around the formation of national parks, proclaiming their potential to attract foreign tourists, and protect the grazing and migration of wildlife. Many new African leaders accepted responsibility for wildlife conservation, and emphasised the important opportunities that tourism would generate in their new states (Bolaane, 2005).

In the year Botswana gained independence (1966), a National Conservation Policy was prepared, highlighting the need to conserve wildlife, not only for its aesthetic value, but also as an economic commodity. A goal was to create large wildlife reservoirs, in strictly protected national parks and game reserves, which would provide annual spill-over into surrounding areas for both trophy, and subsistence, hunting (Campbell, 2004). Quite uniquely, Botswana was one of the few southern African countries to take people's needs into account in their wildlife policy from its inception, with legislation allowing people to use some species for subsistence (Child, 2009d). The land outside parks and reserves, was divided into 40 hunting blocks with an aim to manage citizen hunting, and facilitate trophy hunting tourism (Swatuk, 2005, Child, 2009d, Gupta, 2013). These blocks, known as Controlled Hunting Areas (CHAs), supported a three-tiered hunting programme: for local individuals living in a hunting block, for all other residents of Botswana, and for foreigners. Licence fees, and the areas where hunting was allowed, differed between these tiers, with fees for foreign trophy hunting being substantially higher (Child, 2009d). Residents had preference to hunt in some, non-concession, CHAs, while the remainder were leased to safari operators. Quotas for each hunting block were set by the central government, with the revenue shared between government, and the relevant local district councils, when hunting was on tribal land. By the mid-1960s, the trophy hunting industry had been firmly established, setting the tone for conservation in the newly independent state (Child, 2009d). Much like elsewhere in the region, lucrative trophy hunting by foreigners, which required minimal capital, and less abundant wildlife, facilitated the development of photographic tourism in suitable areas (Child, 2009d).

The National Conservation Policy necessitated, and was strengthened by, a change in land use zoning throughout the country. A combination of habitat simplification, through over-grazing and bush-encroachment, and reducing productivity of the livestock industry, encouraged diversification of the economy and the setting aside of land for conservation (Child, 2009d). For example, land degradation was used to justify the Tribal Grazing Land Policy (TGLP) of 1975, which sought to promote more

formal and exclusive land rights on communal land. It also aimed to restrict the expansion of cattle farming, and protect grazing resources for wildlife. The TGLP zoned tribal land into three categories: commercial, where groups were given exclusive rights over specific areas for use as livestock or game ranches; communal, in which traditional tenure systems would be continued; and Reserved Areas, which would be left unallocated, intended initially for use as safety nets for the poorer members of society, and for wildlife (Swatuk, 2005, Gupta, 2013). Many of the Reserved Areas of the TGLP, along with areas of State Land, became Wildlife Management Areas (WMAs) under the Wildlife Conservation Policy of 1986 which promoted wildlife as the primary form of land use (Barnett and Patterson, 2005). These WMAs were intended to form buffer zones of low human habitation around more formal protected areas, where land use was restricted to those compatible with wildlife. The intent was to prevent the expansion of cattle rearing into the wilderness areas of the Okavango Delta. They were designed to be multi-use areas where self-sufficient, and sustainable, rural economies could be developed alongside wildlife conservation; this paved the way for the country's CBNRM programme (Gupta, 2013).

Though many of the above developments would be considered 'wins' in the name of conservation, many were associated with costs to local people, particularly those from ethnic minorities. In the formation of the national parks and reserves, people were moved off their land and had their livelihoods restricted. While these relocations typically included a resettlement process, planners focussed on the loss of residence rather than the loss of people's means of production, especially land, grazing resources, and wild resources on which people depended for income and subsistence (Hitchcock and Vinding, 2004). Many developments also put people at increasing risk from crop raiding and livestock attacks (Gupta, 2013). Though people were not forced to move from WMAs, their livelihood options were severely restricted, with the intention of replacing cattle-based livelihoods with wildlife utilization and tourism (Gupta, 2013). However, these restrictions did not account for the different values of cattle which extend beyond economic terms to local culture and identity (Gupta, 2013).

6.4.3 The development of CBNRM in Botswana

CBNRM in Botswana, emerged in the mid-1980s, as ideals of decentralised control, and sustainable use, spread throughout the sub-continent (Rozemeijer, 2009). The establishment of CBNRM in Botswana, however, differed quite substantially from other southern African countries, for various reasons. Unlike elsewhere in the region, there was no political upheaval that created the conditions for CBNRM, as in neighbouring countries like Zimbabwe or Namibia which gained independence in the 1980s and 1990s. It also did not have the large differences in communal and private white-owned land, as the majority of land was either tribal or state owned (though it did have large inequalities

between different tribes). Further, the process was largely driven by external donors and NGOs trying to replicate experiences with CBNRM in Zimbabwe and elsewhere, in particular WWF and USAID (Nelson and Agrawal, 2008). Finally, it also differed from elsewhere as a primary motive was conservation (the need to combat over-grazing and reduce human-wildlife conflict), rather than the need for rural economic development or social empowerment (Cassidy, 2000), though it was also seen as a way of reducing poverty and dependence on handouts (Rozemeijer, 2009).

CBNRM in the country started with a pilot project, in 1989, in the Chobe Enclave of northern Botswana, an area bordered by the Chobe National Park and the Chobe River. The initial success of the project provided incentives for government to develop a full CBNRM programme with nation-wide coverage (Thakadu, 2005). The programme has expanded in the country ever since, largely due to the popularity of the economic development, and financial opportunities, the concept generated (Cassidy, 2000).

CBNRM in Botswana was funded by the Botswana Government and USAID, and was implemented by the Department of Wildlife and National Parks (DWNP), with the support of a large number of NGOs, researchers, and consultants. They acted as the facilitators within the communities to mobilise support for CBNRM, and ensure compliance with the suite of conditions required to establish the necessary institutions. The minimum requirements were: 1) the formation of a legal, representative and accountable entity, these took the form of Community Trusts (Trusts), 2) a constitution, and 3) by-laws for resource governance, that typically took the form of a formal, and government approved, Land Use Management Plan (Thakadu, 2005). Once these were formed, communities could apply for a 'head lease' for the Controlled Hunting Area which they were on, or near, so they could establish tourism or hunting activities, in line with their land use plan. Some Trusts, which were allocated leases to multi-use concessions, were also allowed to apply for wildlife quotas from the DWNP (Jones, 2002). In this set up, the government gave use and management rights over natural resources within the designated areas to local communities through 15-year leases (Rozemeijer, 2009). Not all Trusts, however, were allocated leases for concession areas (CHAs), substantially restricting their activities (Centre for Applied Research, 2016). CHA leases were typically given to the communities living in, or next to, Wildlife Management Areas (WMAs). Many of these were comprised of ethnic minority groups, and so CBNRM was seen partly as a way of regaining their collective rights over land and natural resources (Hoon, 2014).

Though communities could apply for a head-lease for a particular CHA, they were not necessarily granted one, or the ones they wanted, or in the ways they would have preferred. The final decision and allocating power was retained by the government, even though the land, in most cases, was held in customary tenure by the Tribal Land Boards. Ditshiping for example, tried to form a single-village

Trust and apply for the head-lease for CHA NG/32 in which the village was located. This was refused, but the community went as far as forming, and drafting a constitution for, their own village Trust, called the Honey Guide Trust. In order to benefit from CBNRM, and have any rights over the land they lived on and or resources that surrounded them, Ditshiping instead was forced to form a multi-village Trust, with six other settlements, in order to get the head-lease for NG/32. However, when the OKMCT lease came up for renewal in 2013, ongoing discontent, and the original draft constitution, meant the Honey Guide Trust applied again for exclusive lease of the areas, which has led to ongoing disputes in court over Ditshiping's rights to NG/32. Villagers feel they should have the whole areas as they are the only ones actually living in it, are prevented from livelihoods like cattle-rearing (at least near the village), and are facing extensive human wildlife conflict which prevents them from successfully farming.

One of the most lucrative CBNRM activities was subleasing land and wildlife quotas to the private sector through joint venture partnerships (JVPs) (Rozemeijer, 2009, Mbaiwa, 2017). These were predominantly with the commercial safari hunting industry and the revenue they generated was critical to the newly formed Trusts. The early CBNRM legislation (established in sections of Wildlife Conservation Policy and Tourism Policy) ensured that all revenue generated through CBNRM went to the Trusts (Arntzen, 2003). It was meant to be used to improve the living conditions of people within the community, to compensate those affected by wildlife, to be re-invested in natural resource management, and to be invested in projects to strengthen and diversify income streams to communities (Thakadu et al., 2005). In some cases, the intended benefits were realised through local development initiatives, such as water provision, building of sanitation facilities, scholarships for youth, and supporting orphans and the elderly (Thakadu et al., 2005, Mbaiwa and Stronza, 2011). The JVPs also generated employment opportunities, and the meat from trophy hunting was distributed to communities. Studies of CBNRM of that time found that these benefits had helped to improve attitudes towards wildlife and conservation, that some wildlife populations had increased, and that illegal hunting had declined (Thakadu et al., 2005, Mbaiwa, 2005).

However, the nature of CBNRM, and its by-laws, meant restrictions on individual autonomy by way of reduced access to and stricter management of local natural resources, as has been widely reported elsewhere (e.g. Hill, 1996, Nelson and Agrawal, 2008, Dressler et al., 2010). These individual costs, particularly when combined with costs from HWC, were rarely outweighed by community level benefits (Rozemeijer, 2009). Unfair benefit sharing, and mismanagement of funds were some of the most widespread, and critical, issues in the programme (Mbaiwa, 2011). Trusts were also constrained by a lack of capacity in marketing and entrepreneurial skills which meant an over-reliance on hunting operators and donor agencies (Mbaiwa, 2005, Lindsey et al., 2007). The format of the JVPs meant that

there was no requirement to transfer the skills which would have enabled communities to participate more actively over time (Thakadu et al., 2005).

Additionally, despite one of the tenets of CBNRM being devolution of rights and responsibilities over natural resources to communities (Nelson and Agrawal, 2008, Child, 2009a), devolution of meaningful power over decision-making, and responsibility, to communities in Botswana was relatively minimal (Demotts and Hoon, 2012, Cassidy, 2021). Instead, CBNRM in Botswana involves decentralisation of management, rather than devolution of power and rights (Swatuk, 2005). The majority of decisions and responsibilities, e.g. land rights, quotas, and land use, remain vested in the control of the Botswana Government and its subsidiaries. A Technical Advisory Committee (TAC) formed from district-level representatives of various Government departments, including the DWNP and Department of Land, supports Trust activities, overseeing and implementing central government directives. Communities, meanwhile, were given rights to choose whether or not to use their hunting quota, had the final say on which JVP operator to partner with, and decided how to spend the income they received (Cassidy, 2021). Despite having the option to spend the money on community specific needs, many used the income in similar ways, such as funeral assistance, houses and support for the elderly. This was in part due to a need for this in most communities, but also because advice on spending was given by the TACs with certain forms of spending deemed more acceptable than others.

A further criticism of the programme, was that there was a substantial delay in implementing a CBNRM policy, resulting in inconsistencies, and ambiguities, in government decisions around CBNRM (Thakadu et al., 2005). A policy was first drafted in 1997, and was intended to provide the legal framework to develop guidelines and procedures to address some of the issues and concerns that had been raised. The long delay between when the CBNRM policy was first drafted, and its introduction, left many wondering whether there was sufficient political will to firmly establish the country's CBNRM programme in legislation to ensure its continuity (Thakadu et al., 2005). Given that many of the communities engaged in CBNRM at this point were from ethnic minority groups, and the move would mean a reduction in Tswana hegemony, this was unsurprising, particularly when the external donor funding for the programme started to dry up (Arntzen et al., 2006). The government's reluctance to finalise the policy even contributed to USAID ending its support for the programme (Swatuk, 2005).

6.4.4 The 2007 CBNRM policy: a recentralisation of control

"CBNRM in Botswana is neither fully politically accepted nor institutionally imbedded." (Rozemeijer, 2009)

Prior to 2007, the legal basis for CBNRM was in two separate policies: the Wildlife Conservation Policy of 1986 and the Tourism Policy of 1990 (Mbaiwa, 2005). After nearly a decade of discussions and

stalling, a CBNRM policy was passed in 2007 and it was profoundly different from the original intent of CBNRM (Hoon, 2014). The revised policy aimed to address some of the criticisms, and challenges, CBNRM was facing, for example, community mismanagement, by reconcentrating power in the central government. They also hoped to spread the revenue gained from wildlife-rich areas more equitably across Botswana's population (Chevallier and Harvey, 2016): it recentralised 65% of the revenue Trusts generated into a government-managed 'National Conservation Fund', leaving the remaining 35% for the Trusts. There were also conditions for additional central government and District Council oversight (Hoon, 2014). The extent to which this happened in practice is unclear, with only some Trusts being subjected to this new arrangement.

An additional change to CBNRM was the creation of the Botswana Tourism Organisation (BTO) in 2009, which was a state-owned entity aiming to improve the marketing of tourism in Botswana. Its initial remit expanded to include formulating the tendering process and mediating arrangements between JVPs and Community Trusts (Chevallier and Harvey, 2016). The arrangement was intended to address capacity issues faced by the Trusts and facilitate more effective and equitable engagement with private sector operators. It was also intended to improve transparency as Trust board members were previously at liberty to choose their own JVPs, and thus be potentially subject to extortion and bribery (Mogende and Kolawole, 2016). However, the BTO, and through them central government, took increasing control of the tendering process of JVPs, going so far as to decide on some partnerships without the Trusts involvement. Beyond this, when most of the leases between Trusts and the Tribal Land Boards came to an end in 2014, the BTO signed many of the leases on behalf of the Trusts both with the Land Boards for the head leases, and the sub-leases with the JVPs, totally excluding Trusts and local people from this process (Mogende and Kolawole, 2016). For those community members who knew about this change (surprisingly few and typically only current or previous board members) this was lamented and criticised as another action that the government had taken to reduce communities' autonomy.

The combination of recentralising revenues, and removing communities' involvement in JVP decision-making, revoked what little power and autonomy communities had gained through CBNRM in the country. These changes also undermined the sustainable development principle which calls for community inclusion in decision-making processes (Mogende and Kolawole, 2016). The substantial barriers to forming a Trust also suggest a lack of meaningful support for the programme. Forming a legally registered Trust is fraught with red tape. Even with substantial external support, rural communities face an uphill battle to form them, and the process can take years (reported by several key informants). The changes, and barriers, highlight the precarious nature of CBNRM in Botswana,

and its vulnerability to shifts in government views on decentralisation. It also highlights the limited power that was actually devolved to communities in Botswana's original CBNRM model.

6.4.5 Modern CBNRM: the 2014 -2019 hunting moratorium and beyond

An additional change to CBNRM, which further highlights communities' lack of meaningful power over natural resource management and decisions, was the decision to impose a nationwide hunting moratorium across all state and communal land. The moratorium covered commercial trophy hunting by foreigners, all citizen hunting, and initially even the killing of problem animals as a mitigation against human wildlife conflict. It did not apply, however, to the small number of private game ranches which were able to continue small game hunting.

The 2014 moratorium followed a gradual shift, in central governments' stance, against hunting, which took place over the last decade (according to key informants from various sectors). As the various commercial and communal hunting CHA leases started coming to an end between 2008 and 2014, many were not extended and the concessions were either closed or repurposed for photographic tourism. Hunting quota allocations for most species were also reduced, to the point where elephant trophies comprised 90% of the hunting quota in 2013 (Keakabetse, 2016), as they were the most lucrative, and there remained concerns over the size of their population (Skarpe et al., 2004). In late 2012, the full hunting moratorium was announced by the then President of Botswana, Sir Seretse Khama Ian Khama[6], at a public meeting in the village of an Ngamiland Community Trust (Mbaiwa, 2017). While there were subsequent public meetings and workshops across the country informing the public about the moratorium, the decision had already been taken and there had been no participation or consultation with communities, Trusts, or the industry. During my fieldwork, this lack of prior consultation was raised in ten interviews and four group discussions across the two communities, as well as in numerous key informant interviews, with people across the stakeholder spectrum lamenting their exclusion from such a critical decision. It was perceived to go against the 'Botswana Way' because in Botswana they "*believe in consulting*" and it is very much engrained in Tswana, and now non-Tswana, culture. Some claimed it was the former President's military background that was a reason for his move away from this traditional, consultative Botswana governance style.

The moratorium was instigated through a condition in the Wildlife Conservation and National Park Act that allowed the Minister for Environment to: "*suspend, restrict or limit the application of any provisions of this Act… for such period and subject to such conditions as he deems fit*" (Wildlife

[6] Known as Ian Khama. President of Botswana from 2008-2018.

Conservation and National Parks Act, 2002, Chapter 38:01, Part XIV 90). In his State of the Nation address in 2013, the former President stated that the decision was based on wildlife populations declines outlined in a report published by the NGO Elephants without Borders (EWB) [7](Mogende and Kolawole, 2016, Mbaiwa, 2017). The report showed that 11 wildlife species had experienced considerable declines since the last surveys in the 1990s (Chase, 2011). The President, and Ministry of Environment, then headed by Tshekedi Khama (II, the former President's brother), blamed these declines on the issuance of hunting licences, which they claimed fuelled poaching and prevented sustained growth in the tourism industry (Mbaiwa, 2017). The report by EWB, however, cited a twenty-year drought beginning in the 1980s as one of the most likely causes of the declines, compounded by other factors such as competition from an increasing elephant population. It also mentioned higher levels of threats to species that migrated outside of national parks and reserves, from hunting, veterinary fence related mortalities, and habitat fragmentation, but it did not distinguish whether the hunting was legal or illegal. A later report, publishing results from the subsequent 2014 survey, stated more clearly that wildlife populations outside reserves were exposed to higher threats of poaching and other factors (Chase et al., 2015). Opinions in the villages, and of various key informants, also contradicted claims that wildlife had been declining prior to the moratorium.

Despite wildlife declines being cited as the justification for the decision, pressure and influence from animal rights groups and individuals with vested interests in the photographic tourism sector were reported as alternative reasons for the decision (according to several key informants)(Newel, 2019, Mogapi, 2013). Following the moratorium, all CHAs were converted to non-consumptive tourism land uses only. Prior to the hunting moratorium there were 15 Trusts which had leases for multi-use concessions and were granted a wildlife quota. The 2015/2016 review of CBNRM reported a loss of income to all 15 of the former-hunting Community Trusts. Five of these had lost all income streams and had not been able to diversify activities since the moratorium (Centre for Applied Research, 2016).

There have been significant changes since the start of this project, which have impacted, and continue to affect, the future of CBNRM and trophy hunting in the country. In April 2018, President Ian Khama retired after ten years in office, and handed over the presidency to the former vice-president Mokgweetsi Masisi. As soon as Masisi gained power there were increasingly vocal calls to reinstate trophy hunting, primarily as a means of mitigating the widely reported increases in human elephant

[7] There has been criticism of the 2010 EWB report findings as the methodology differs from previous DWNP aerial surveys from which wildlife numbers had previously been estimated. These methodological differences were not accounted for in the reported trends. Subsequent reports have not made such direct comparisons.

conflict. In June 2018, a motion was raised in parliament to lift the moratorium, which started a consultation process to consider the implications (Somerville, 2018). The committee that conducted this consultation recommended that hunting be reinstated (making the international news (e.g. Leithead, 2019)), and in May 2019 the Botswana Government announced that it would lift the hunting moratorium (again, causing much of a stir in the international press (BBC News, 2019)). Initially only citizen hunting was reinstated, with strict rules to be followed and a protracted hunting season from September to November 2019/January 2020 depending on the concession (Statutory Instrument No. 101 of 2019). The Covid-19 pandemic then restricted its full opening in 2020. A less publicised, but none-the-less important, change was that many of the Trusts whose leases had been taken over by the BTO had their head-leases returned in 2019, including the OKMCT.

6.5 Local contexts: background to Phuduhudu, Ditshiping and their Trusts

The history of local tribes, and their relations with national power structures, as well as the evolution of the national conservation agenda from colonial times to modern day CBNRM, have shaped how local communities engaged with CBNRM and the trophy hunting industry. While the national level structures place top-down constraints on well-being outcomes, I now explore how the bottom-up and community-level processes, and contexts, which have also shaped how the moratorium impacted outcomes, and community members' interpretations of them.

In contrast to the nature in which CBNRM was executed in the country, with considerable outside influence by NGOs and foreign donors, it was community members in both villages who worked together to establish their respective Trusts. Despite the promising grass-roots beginnings of both Trusts, a range of local factors, both inherent and external, have shaped how these Trusts navigated the national framework, engaged with CBNRM, and were able to deliver well-being outcomes to residents from tourism development.

6.5.1 Phuduhudu

6.5.1.1 Phuduhudu community dynamics

As a predominantly San/Basarwa community in a remote area, the residents of Phuduhudu have been provided with a range of government support under various programmes rolled out since the mid-1970s (Magole, 2009). Despite having a small population (total of 814 in 2019), the village has been gazetted since the 1980s and as a result, has a clinic, tribal administration offices, a police station, a social workers hub, and a primary school. Secondary schooling is available in nearby larger towns of Motopi and Maun. All schooling is free for most of Phuduhudu's residents as part of a government support programme for Basarwa. Children also have school uniforms and toiletries sponsored by government.

Despite government support for schooling since the village formed, the vast majority of adults had not successfully completed a full 12 years of school (86% of resident adults) with over a quarter having not attended school. Most people in the village could not speak English at all, or with any level of fluency, a basic requirement for many jobs in the country. Unemployment rates in the village were very high with only 24 of the 262 working age adults resident in Phuduhudu (excluding government workers who were not from the village) formally employed. The majority of people in the village were dependent on government support to make ends meet. Further details on population dynamics and livelihoods in 2019 can be found in Appendix 3.

6.5.1.2 The Xhauxhwatubi Development Trust

Family and cultural connections with San communities in villages on the edge of the Okavango Delta, which were among the first to establish CBNRM in the district (Khwai, Mababe, and Sankuyo), first brought awareness of CBNRM to residents of Phuduhudu village. They recognised its potential in being a means of gaining autonomy over community improvements. While the central government was already providing extensive support to the village, a Trust would allow the community to generate independent income that they could use, as they saw fit, for developments tailored to the village. A group of individuals, inspired by this potential, went to the chief and asked for a *kgotla* to be called to speak to the rest of the community about setting up a Trust in the village. With support of the village, they went to the DWNP to ask for help in setting up a Trust and drafting a constitution. After several years work, the Xhauxhwatubi Development Trust (XDT) was established in 2002, and started operating in 2004. Despite being instigated from the bottom up with broad support from most in the community, CBNRM was never particularly successful in Phuduhudu with misfortune, mismanagement, and internal conflicts limiting its ability to provide for its members.

In the first year of operating, the Trust's hunting quota was sold for trophy hunting by auction, as the Trust Board and Technical Advisory Committee (TAC) attempted to find a suitable Joint Venture Partner (JVP). Setting up a JVP was a preferable arrangement as fees would be obtained for the concession sub-lease as well as for the hunting quota. JVPs also set up more permanent camps thereby generating employment opportunities to which villagers had preferential access. There was tension from the beginning of this process, as two competing safari companies were vying for the area, and they divided the community with the decision and their lobbying. The older generation wanted a company called Hakuna Matata to be granted the concession, as they had hunted there in the first year through the auction and were a known entity. The younger generation meanwhile, were swayed by a company called Out of Africa, headed by a South African Professional Hunter called Dawie Groenevald. Eventually, a JVP with Out of Africa was formed in 2005, but the Trust struggled to get full payments for the quota and lease fees.

In the second year, half of the community wanted to revert to selling the quota by auction, while the rest wanted to keep working with Out of Africa. After much disagreement, with the issue eventually settled in court, and the concession was granted to Out of Africa again. Unfortunately, Dawie[8] was by all accounts an unscrupulous operator. It later transpired that he had been banned from operating trophy hunting safaris in both Zimbabwe and Namibia because of malpractice. In NG/49 (Phuduhudu's concession), he was reported to have over-shot his quota, brought in a lot of labour from outside, hunted the entire quota in as short a time as possible thereby limiting the months he employed villagers, and eventually left after only 3 years without paying the Trust the fees for the last hunting season, nor any of the staff wages. Despite advertising interest to form a new JVP in subsequent years, no one expressed interested to form one. So, after their unfortunate initial experience, in the years preceding the hunting ban, the quota was once again sold by auction only. This limited the income to the Trusts, as only the quota was sold, reducing the resources it had to spend on community improvements. It also limited the employment benefits, as no extra jobs were created, and only a small number of Trust staff and the Community Escort Guides could be funded, with the latter only hired for the hunting season. The Trust retained, and continued to pay, some staff to varying extents until 2015 despite there being no income coming in. The combination of these, and other ongoing costs, left the Trust bankrupt and in debt.

From what I could gather, there have been three Trust boards since the XDT started operating. The first was from 2004-2006, as the board terms before the 2007 CBNRM policy change were two years, the second from 2007-2010, and then from 2011 onwards it had been the same board. There also hadn't been an election or AGM since 2013. Despite this limited turnover, people generally felt content with their participation in the Trust (when it was operating that is). When asked whether they felt they had a say in Trust decisions, many people felt they could take part in decisions on how to spend the income the Trust received, as this was discussed at *Kgotla* meetings (n = 29). Only 8 respondents felt they were not listened to. Others chose not to take part, did not feel confident to speak (mostly younger women/men), or were physically unable to attend the meetings (elderly and those who spent most of their time at cattle posts).

After the moratorium was instigated, a photographic tourism-based Land Use Management Plan was drafted to enable the Trust to change activities to photographic tourism. However, the draft was never approved, and I was unable to gain a clear picture as to what went wrong. Members of the board were under the impression it was halted by central government, while other key informants suggested the BTO was responsible (though arguably this may have been due to central government). After several

[8] This was how the community referred to him.

years of no information, the community was told there were some issues that needed to be addressed, including boundary coordinates, and how the tourism carrying capacity was calculated. Unfortunately, by this time, the consultant who had drafted the initial plan had left the country, leaving no documents showing how the original draft was made, which meant they would have to restart the process from scratch. In addition to the lack of a management plan, there was also limited interest by tourism companies to start operating in the area. There was general agreement from key informants, in and out of the photographic tourism industry, that the NG/49 concession was not suited to photographic tourism due to insufficient wildlife densities, and bushy and bland scenery (Figure 6.1). On a four-hour drive I did in the area with one of the former escort guides, we only saw a handful of steenbok, a few elephant at a great distance, one small family of giraffe, and a small herd of oryx on the boundary with Nxai Pan National Park. Indeed, the low wildlife densities were blamed for the low interest in establishing a hunting JVP in the area.

Figure 6.1: Scenery in NG/49, the CHA concession granted to Phuduhudu's Xhauxhwatubi Development Trust

6.5.1.2.1 'Community development' by the Xhauxhwatubi Development Trust

Despite limited success in its tourism enterprises, most community members interviewed felt that when the Trust was operating it had done something to support the community as a whole or had helped others in the village, with 80% of interviewees mentioning at least one way in which the Trust provided support for the community (Figure 6.2), e.g. through building houses, creating jobs, etc (Figure 6.3). By contrast, only 40% of interviewees reported direct household support from the Trust.

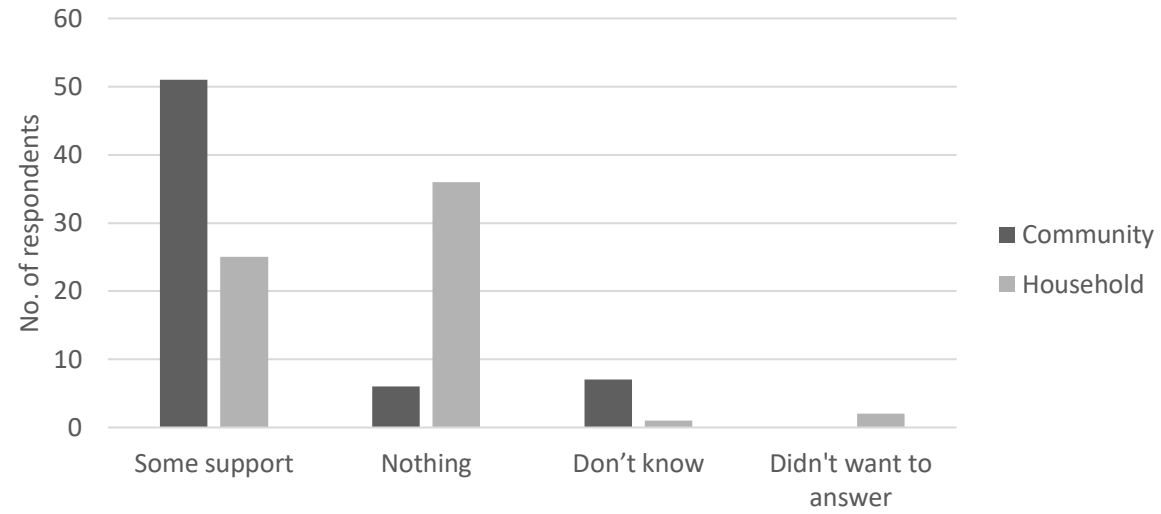


Figure 6.2: Perceptions from interviews with Phuduhudu residents (n = 64) of whether the Xhauxhwatubi Development Trust had supported the community and/or the interviewee's household directly

In the few years when the JVP with Out of Africa worked, the Trust built six one-roomed concrete brick houses and pit latrines for elderly village members. This activity was by far the most commonly reported form of Trust support, raised in 75% of interviews (Figure 6.3). Other reported ways in which the Trust supported the community were jobs, funeral support, transport, training, support for the school, funding for village celebrations, and piecework (temporary jobs). In terms of household support, few respondents reported that their households had directly benefited from the Trust, with 12 reporting household jobs, and 8 mentioning houses built for parents or grandparents. A few others mentioned that it provided them with meat.

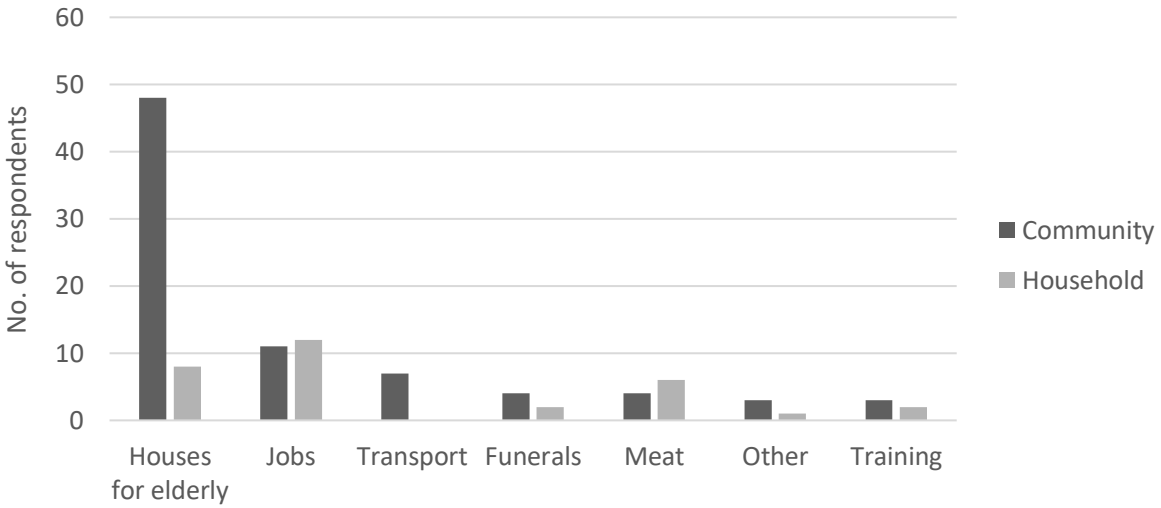


Figure 6.3: Ways in which Phuduhudu residents (n= 64) felt the Xhauxhwatubi Development Trust had supported the community and/or the individuals interviewed directly

6.5.1.3 Phuduhudu livelihoods in 2019

Livelihoods in Phuduhudu had shifted considerably since people settled in the village, and their hunter-gather ways of living were increasingly restricted by various government directives. Subsistence hunting without a licence is illegal and no one reported doing the activity. Key informants suggested levels of subsistence hunting were low, as there is a Department of Wildlife and National Parks (DWNP) base at the entrance to Makgadikgadi National Park, about 15 minutes' drive from the village, and that their presence acted as a deterrent. The DWNP do patrols themselves and they hire people from the village to look for snares.

Though subsistence hunting no longer forms significant parts of livelihoods, many people still gathered wild fruit, either to eat themselves or to sell, with 61% of those interviewed (39 people) collecting the berries, 22 of whom sold them to supplement income. A further 12 collected some sort of leaf vegetables called *thepe*, *rothwe*, and *leketha*, collectively termed *merogo* which just means vegetable, to supplement their diets. People also went into the veld to collect firewood, which most household relied on for cooking. It was predominantly poorer village households who relied on harvesting wild fruit, and all the poorer households exclusively used firewood.

Only about 7% of people in the Phuduhudu are formally employed, and about 15% are either self-employed or do piecework (Figure 6.4). The vast majority of people in the village, are reliant on government support in one form or other, with most relying on a public works programme called *Ipelegeng* (See more detail in Appendix 3).

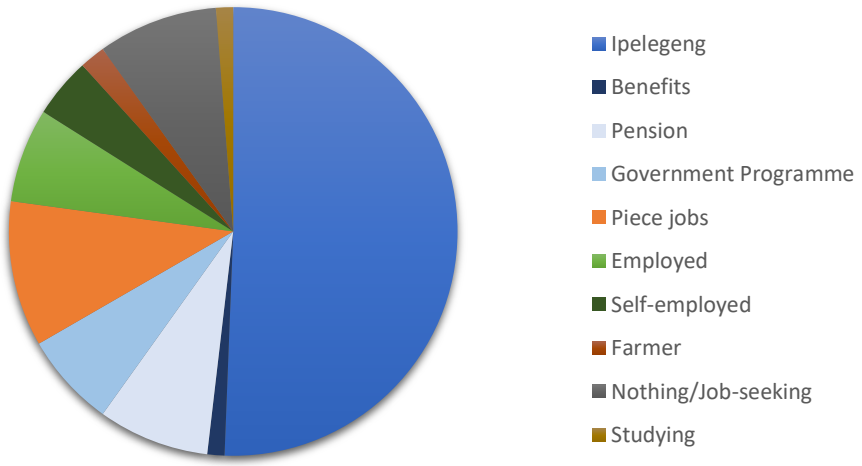


Figure 6.4: Dominant livelihoods in Phuduhudu village. Sectors in blue are all sponsored by the Botswana Government

About half of the households in the village had ploughing fields and half kept livestock. Many of the households with livestock had been given a small number of individuals through various government programmes, though in terms of absolute numbers more livestock had been privately bought by the

few wealthy households with larger herds. Households given livestock by government received a small amount of training on animal husbandry and most were kept in kraals overnight. However, despite strong links to cattle as a means for storing and displaying wealth, herding does not seem to be part of Tswana custom. The same appears the case for minority groups and if there was advice on herding in the training, it was not adhered to. For most households, it was the older generations who farm, with fewer young people taking up the activity. People who farmed or collected wild food or firewood all spent time in the veldt surrounding the village, exposing them to the wildlife there. However, with most people relying on various forms of government support, and firewood accessible in close proximity to the village, fewer people ventured far out of the village than in Ditshiping, and it was most often the poorest.

6.5.2 Ditshiping

6.5.2.1 Ditshiping community dynamics

Despite having a remote, ethnic minority (predominantly Bayei) population, Ditshiping village was never formally gazetted under the relaxed population size requirements of the Remote Area Dwelling Programme. This had substantial impacts on local community dynamics. As an ungazetted settlement, there was no government primary school, and few other government services in the village. As a result, the village had a very variable population with more than half of Ditshiping's adults spending most of their time outside the village. While the total population was found to be 554 people (including resident and non-resident adults and children from Ditshiping), most people spent more time out of the village than inside it due to a lack of schools and employment opportunities. The resultant resident adult population was about 127. However, a pre-school had been recently built in the village by one of the Trust Joint Venture Partners, as part of community outreach. All but one household in the village had property in Maun as well as a homestead in Ditshiping to facilitate sending children to school, and to access formal land tenure which was not available in the village due to its ungazetted status.

Schooling attainment in the Ditshiping was very low with more than half of adults (52%) having never attended school and a further 40% having not completed a full 12 years of school. Though formal employment was relatively low (only 8 residents were formally employed), only 24% of the resident population could be considered to be unemployed, with more than half of the population working informally (see Figure 6.9 and Table 6 in Appendix 3). Further details on Ditshiping population dynamics and livelihoods in 2019 can be found in Appendix 3.

6.5.2.2 The Okavango Kopano Mokoro Community Trust

While it is true that villagers in Ditshiping came together to form a Trust, as mentioned earlier, they did not initially hope to form the OKMCT. After seeing nearby villages around the Delta getting involved in CBNRM, residents of Ditshiping got together in 1996, drafted a constitution, and formed a Community Trust called the Honey Guide Development Trust without any government support. They had hoped to be granted the lease for NG/32, the CHA concession that Ditshiping is located in, as people felt a strong sense of ownership over the area. Many of Ditshiping's families had historically lived on Chief's Islands, even deeper in the delta. In 1976 Moremi Game Reserve was extended to include Chief's Island, which required the relocation of a large number of, predominantly Bayei, people who were living on it. Many of those people moved to various large villages, like Maun and Seronga, but some moved to Ditshiping, and formed a settlement there, with the promise that if they did, the government would provide them with services. Though fewer services arrived than they'd hoped, there was a strong sentiment that Ditshiping residents should have preference over the CHA. However, when the government refused to give the Trust to only Ditshiping, residents were forced to compromise, follow government recommendations, and group together with other villages to form the OKMCT.

The government's grouping of the villages to form the OKMCT was not informed by an understanding of how the communities related to each other in terms of resource use, access, and rights; but was based on proximity to the CHA they were jointly assigned (Madzwamuse, 2010). This lack of appreciation for the diverse communities led to mistrust, complaints over unequal participation and access, and tensions between members of the various villages and settlements. In Ditshiping, residents felt they faced unique challenges, that were different from the others outside. They could not keep cattle near the village, nor gain legal ownership over fields, which precludes them from government compensation if/when these are damaged. However, in a multi-village Trust where decisions are taken by vote, they feel outcompeted by the voices of other villages who do not share these problems. The combination of six villages also means that the population that the Trust needs to support is substantially larger, and spread across multiple settlements, reducing its reach in individual settlements.

Despite these issues, tourism development in the concession area, CHA NG/32, has been very successful. When initially formed the Trust quickly signed a JVP with a hunting safari operator, Johan Calitz Safaris, sub-leasing tourism development rights of the area, and selling them the wildlife quota. From most accounts, about 18 people from the villages were employed by the safari company, with people typically working for the 6-8 month hunting season. NG/32 is a stunning area with impressive wildlife, lots of water, and beautiful scenery, bringing with it considerable potential for photographic

tourism (Figure 6.5). This was recognised by the JVP which further sub-leased part of the area to a photographic operator, Sanctuary Retreats (parent company Abercrombie and Kent), which developed two lodges on the north-east side of the concession. While the Trust benefited from preferential employment from these lodges, the sub-lease arrangement was with Johan Calitz Safaris so the Trust gained no direct income from this arrangement.

Figure 6.5: Various scenes of the NG/32 concession on a mokoro trip (left) and the view from one of the lodges (right)

In addition to the JVP, the Trust was also able to capitalise on growing interest in *mokoro* tourism: trips in punt-like boats which were traditionally dug out of large sausage tree trunks, but were now made of fibreglass. While moving around in *mokoros* has long been a mechanism by which the Bayei travelled around the delta, it also proved a lucrative tourism endeavour, where Bayei (and now others elsewhere) punt tourists (one to two per boat) around in *mokoros*. The OKMCT initially started engaging with tourists in this activity by partnering with mobile safaris (smaller tourism operators that drive across various sites in Botswana in open topped game watching vehicles, staying in different campsites or lodges), offering to take tourists on day-long to several-day excursions as part of these tours. While this still remains an important means of custom, tourists can now also book these trips directly through the Trust. All *mokoro* poling trips are organised and co-ordinated by the OKMCT in their office in Maun, while the residents in Ditshiping, and most of the other villages, do the actual trips as the polers. The Trust takes a small fee for its coordinating role and for the permits required to enter the area, while the polers get paid directly for their services after each trip by the clients. Excursions vary in length from one- to multi-day trips. The most common excursion was a two-night/three-day trip. Polers were divided into head and assistant polers. Head polers lead the excursions and act as the guides for the expedition, transporting one set of passengers. Assistant polers, meanwhile, help with the transport additional people and/or their luggage. At the time of fieldwork, head polers were paid BWP200 (approximately US$18) per day, while assistant polers were paid BWP180 (~US$16). A specialist mokoro poling licence is required to conduct these trips which

can be obtained at a cost of BWP 200, after a practical test, from the DWNP. Regulations also stipulate that only fibreglass *mokoros* can be used, which cost about BWP 8,000 (~US$730) to buy (though people without boats could also rent them from others in the village at a cost of BWP 50 per day), and they have to be registered. During my fieldwork, there were 69 mokoros in the village, mostly owned by older members of the community and better off households. Polers also needed a tent to camp in if the trips were overnight.

With some photographic tourism already established in the area, expanding these activities was a natural progression when the hunting ban was instigated. As photographic tourism requires less space than hunting, and as the Trust was no longer getting income from selling the wildlife quota, a decision was made (by the TAC) to divide the area into several zones, and set up multiple JVPs. One of the zones was offered to Johan Calitz, who partnered with Wilderness Safaris to branch out into photographic tourism, establishing Qorokwe Lodge on the site of one of their former hunting camps in the north-west of the concession. A formal partnership was also started with Sanctuary Retreats (/Abercrombie and Kent) so that their two existing lodges, Stanley's and Baines, could continue to operate. A final new partnership was establishing with a company called Silver Spears (a subsidiary of a company called Mochaba), which built Gomoti lodge in the south-east of the area. The remaining south-west quarter was reserved for use by OKMCT for *mokoro* tourism.

While these changes were arguably improvements, with increased number of job opportunities being created, and increased revenue to the Trust, they came with considerable costs, through the top-down national changes which recentralised aspects of CBNRM. When the old lease with Johan Calitz came to an end, instead of the Trust getting a new head lease for NG/32, and signing agreements with the various JVPs, these agreements were signed directly between the BTO and JVPs, cutting out the Trust almost completely. While clauses were still made to preferentially hire people from the OKMCT villages and pay lease fees, the Trust lost what little autonomy it had over the concession area, and became third parties with no power to influence their relationship with JVPs. Despite these profound changes to the community's independence, few residents of Ditshiping were aware of, or affected by these changes, with only four men raising this change in interviews. Those that did, lamented the loss of ownership, power, and autonomy that the Trust had previously given them. Overall, and despite Ditshiping being one of six villages in the Trust, there was quite a strong sense of ownership over the Trust, reported by 17 (of 44) interviewees, as a result of all the help the Trust brings the village.

More than half of interviewees in Ditshiping (n = 24/44) felt content with their participation in Trust decisions. Many residents (64%) felt strongly about their ability to vote for board members to represent them, and the importance of this representation. However, the nature of Trust AGMs,

meant that fewer people felt they could meaningfully take part there. One third of people spoke about some of the challenges of participating in a multi-village Trust, and the limits this placed on taking part in Trust decisions. Trust AGMs, where the Trust Board explained the previous year's spending and collectively decided on what to do the following year, are moved between the villages each year. So, for most of them, only a few representatives from Ditshiping are sent. Several people highlighted how this, and being only of one six villages inside the WMA, limited the ability of Ditshiping residents to influence Trust actions.

6.5.2.2.1 Community development from the OKMCT

The vast majority of people interviewed in Ditshiping felt and/or later acknowledged that Trust had done something for their households and for the community more generally (93 and 97% respectively, Figure 6.6). While all but one interviewee reported some way that the Trust had helped the community at large, 45% of respondents initially said that the Trust had done nothing for them, or their families. However, when probed (asking whether anyone had been sent for training or been employed as a result of the Trust), only 3 did not change their answer. For some, this was because while their family had been helped with training, their relatives had not gone on to get jobs, so the overall feeling was that they had not benefitted. For others, it was because though relatives were working, they were not supporting the family in the village with the earnings. It also seemed to be related to perceptions of fairness, with some feeling that other households had benefitted more than theirs, leaving them feeling like they were not helped by comparison.

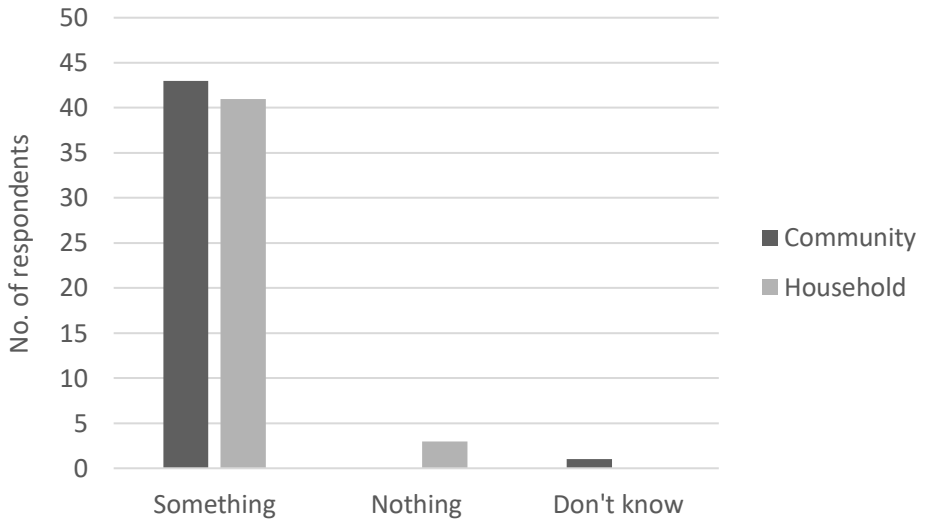


Figure 6.6: Perceptions from Ditshiping residents (n=44) of whether the Okavango Kopano Mokoro Community Trust had supported the community and/or the interviewee's household directly

The most prominent benefits to the community at large were the houses that had been built for some of Ditshiping's elderly residents (Figure 6.7). People valued this as they thought it might come to them at some point, and because they appreciated that maintaining traditional houses (of termite mud,

wooden posts, and thatch roofs) was difficult for the elderly. The main household level benefits meanwhile, were jobs and training. Thirty percent (30%) of interviewees had directly benefited in the past, or were currently benefitting from employment through the Trust, and a further 3% had been sent for some kind of further training, typically in the tourism business, like housekeeping, cooking, guiding, etc. This included a few people working for the Trust directly, and people working at the JVP lodges. Sixty-six percent (66%) said that close relatives had been employed through the Trust, and 57% reported that relatives had been sent for training.

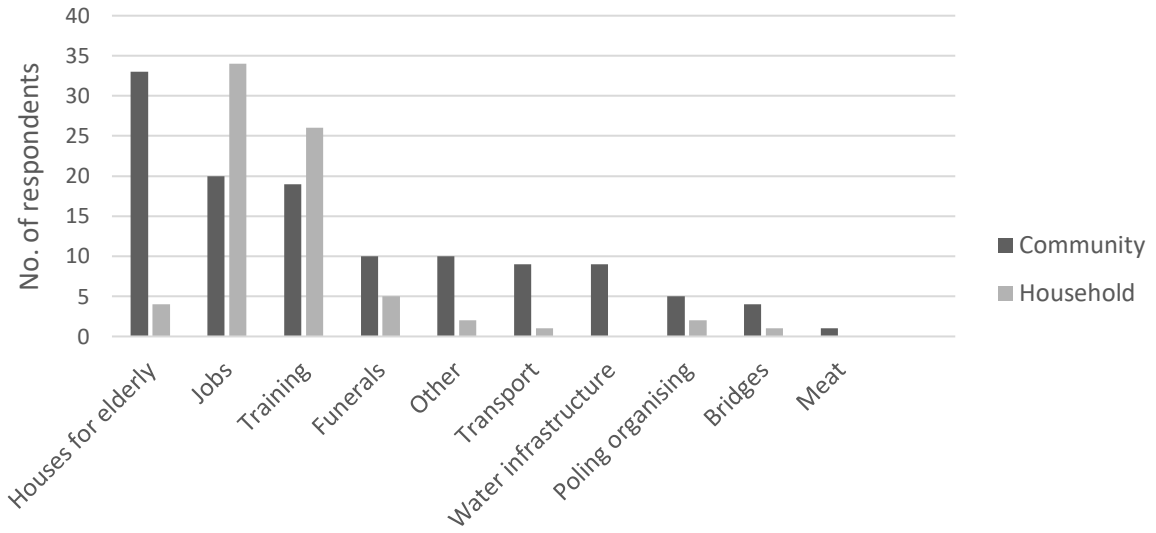


Figure 6.7: Ways in which Ditshiping residents (n=44) felt the Okavango Kopano Mokoro Community Trust was supporting the community and/or the individuals interviewed directly

There were also reports of a range of other support mechanisms that the Trust was involved in, such as: financial support for funerals, transport into Maun, money for celebrations, and other support for the elderly, like food baskets. Due to the village's ungazetted status, the Trust plays a more significant role in supporting the community. It was also able to move more quickly to respond to the needs raised by the community, a point which was praised in several interviews. Despite many in the village doing *mokoro* poling, and its importance for the local economy, surprisingly few people seemed to appreciate the Trust's faciliatory role in organising the activity (Figure 6.8). Relatively few also reported on the Trust's involvement in installing and maintaining the borehole, and taps, that provide water for the village (a joint initiative between the Trust and the local Council), and in building and maintaining the wooden bridges needed to access the village from Maun.

Figure 6.8: Poling station where mokoro trips coordinated by the Trust leave from each morning (left) and bridges built and maintained by the Trust to cross permanent and temporary river channels to reach the village (right)

While the OKMCT clearly contributes quite substantially to the village, this did not always seem to have been the case. In the early days of the Trust, there were accusations of mismanagement of funds with around BWP 120,000 (approximately US$1,200) going missing (Mbaiwa, 2011), and some interviewees complained that it did not do much in the past, with early board members taking the money, or only providing support for their families. However, transparency and operations seem to have improved in recent years, and there was only one complaint of more recent mismanagement (incidentally from one of the early board members).

6.5.2.3 Ditshiping livelihoods in 2019

As Ditshiping is an ungazetted settlement inside the NG/32 concession area, certain livelihoods were restricted. Villagers were prohibited from keeping livestock near the village, and from having formal leases for ploughing fields, as it is inside a WMA. The latter does not preclude villagers from having fields, but it does mean that any wildlife damage that occurs is not compensated by government. Field ownership was common with 76% of households having had fields in the village. Most residents' dominant livelihoods, however, were now in tourism (Figure 6.9), either informally, doing *mokoro* poling, or through formal employment in the Trust lodges, or the Trust itself. A quarter of villagers relied on government support, either in the form of *Ipelegeng,* or pensions. While only two people considered selling natural resources to be their primary economic activity, 31% of villagers collected reeds (n = 47), 23% collected thatching grass (n = 36), and 6% fished. This suggests that while traditional livelihoods, like farming, harvesting reeds and grasses, and fishing, are still being practised, there has been a substantial shift to tourism-based livelihoods.

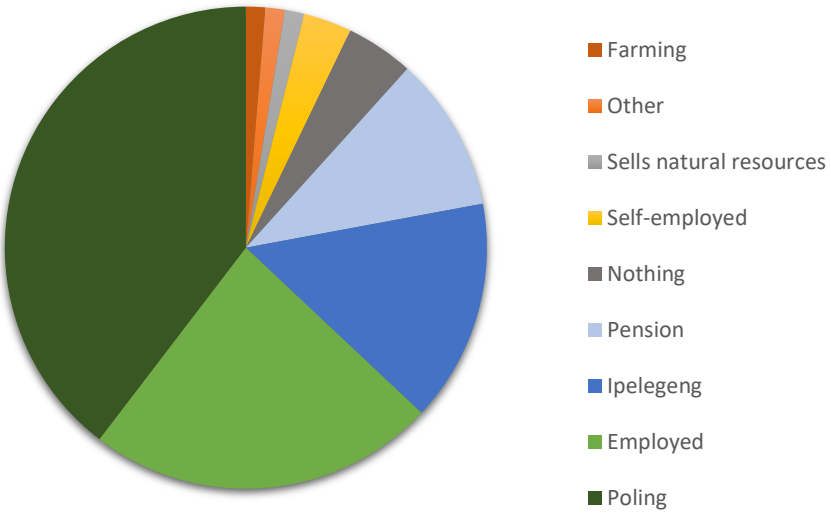


Figure 6.9: Main livelihoods of Ditshiping residents n = 154 (including villagers at OKMCT Lodges). Segments in green are in tourism or a result of CBNRM, while sectors in blue are supported by the Botswana Government.

Livelihoods in Ditshiping however, were very seasonal. The *mokoro* poling peaks with the main tourist season, over winter, with very few tourists over the summer months (November to February). Grass and reed collection is also restricted to the winter months, with DWNP regulations restricting harvesting to June and July. In the summer months, far more people rely on Ipelegeng, or move out of the village to try and find piecework in Maun. Fishing meanwhile, which was once a more prevalent livelihood, has also been restricted by government in recent years, due to concerns about over-fishing. There used to be an extensive trade in dried fish to Zambia, and from there, further into Central Africa, and there were concerns this was being used as a front for other, illegal, wildlife trade. Far fewer people relied solely on government support in Ditshiping than in Phuduhudu. However, while few people relied on *Ipelegeng* as their main income source, it was none-the-less important, particularly for younger women who were too fearful or did not want to learn *mokoro* poling, and for many of Ditshiping's residents outside the tourism season

The livelihoods of Ditshiping's residents also meant that people frequently moved outside the village into their local environments. The *mokoro* poling station was a 20-minute walk from the village, and it was a route many people did on a daily basis. People also spent significant time in the veldt gathering reeds, grasses, and firewood, fishing, and farming. There were also many more animals in close proximity to the village. All of these factors meant that most of Ditshiping residents where highly exposed to the wildlife they share their concession with.

6.6 Discussion: From past to present – how contextual factors impacted CBNRM and the ability of trophy hunting to affect village life

Starting from the position where both villages mobilised to form Community Trusts and tried to take advantage of the country's CBNRM programmes, it is striking to see the differences in how the two Trusts evolved, and were impacting livelihoods in the two villages by 2019. At a shallow glance, one could easily assume the difference lies in the ability of the Trusts to convert from hunting to photographic tourism, and this does play a role. However, such a view also hides the substantial contextual factors which have played out over different scales and time-frames, deeply affecting how people in both villages were able to engage with CBNRM, and the trophy hunting industry, and how in turn they were affected by the hunting moratorium.

Taking an historical perspective, the predominantly San population in Phuduhudu were always going to be more impacted by whatever forms conservation took over the decades, than the Bayei people of Ditshiping. The San of Phuduhudu, with their nomadic hunter-gatherer lifestyles, whose land rights were never recognised, and who had been more marginalised and repressed for generations under Tswana rule, were bound to be more disenfranchised by national conservation policies made by central government, in the form of land being set aside, and wildlife access being restricted. As the San were required to settle, and live sedentary lifestyles, so the government could provide services for them; their traditional livelihoods were restricted, and, with little to replace them due to Phuduhudu's remoteness, people became increasingly dependent on government support. The Bayei, with a more sedentary traditional lifestyle and more diverse traditional livelihoods, meant that while they, too, suffered relocations and resource access restrictions, they did not lose all means of production, with fishing, agriculture, and pastoralism, which were all part of their customary activities, able to continue. Introducing CBNRM into these settings restored some autonomy and recognition of land ownership to both groups. However, while it brought an additional livelihood option in the form of tourism to the Bayei, it could have been a lifeline for the villagers of Phuduhudu, and an opportunity to become more self-sufficient. The limited impacts the Xhauxhwatubi Development Trust had in Phuduhudu when it was operating sets the foundation for how community well-being was impacted by the moratorium.

Another difference between the two case studies relates to the timing of when the Trusts were established in relation to the hunting moratorium, and the length of their JVPs. Trusts take time to set up and start generating income (Mbaiwa and Stronza, 2010, Mbaiwa, 2011). OKMCT had started earning substantial income by 1999, while the first income Phuduhudu generated was only in 2005. OKMCT had a long-term partnership with Johan Calitz Safari's that lasted more than a decade before

the moratorium, and continued after it. By the time the hunting moratorium was instigated it had been earning a steady stream of around BWP 2 million (approximately US$ 200,000) per year for over a decade (Mbaiwa, 2011). Phuduhudu, meanwhile, had three years of a far from ideal JVP, with an income of around BWP 1.5 million (~ US$ 150,000) each year, but for the remainder of the time it earned roughly half that from auctions, most of which went to covering operating costs. Only less than a decade of this rocky start, the moratorium was instigated, cutting off the Trust's only income source.

In addition to these differences, the physical settings of the villages also played (and continue to play) a huge role in the extent to which CBNRM can, and does, contribute to village life. Phuduhudu, and the NG/49 concession, while close to two national parks, offers little appeal as a tourist destination itself. The concession is far from major settlements and has relatively dull scenery, only some seasonal natural water, and consequently low wildlife densities, with most wildlife being migratory, only moving through the area to get to permanent water. Even as a hunting destination, it was not the most sought after, with the Trust struggling to form a JVP due to lack of interest from companies, suggesting photographic tourism was never likely to be a realistic viable alternative (Lindsey et al., 2006, Winterbach et al., 2015). Ditshiping, and NG/32, by contrast, is on the edge of the world-renowned Okavango Delta, a prime photographic tourism destination. Even before the moratorium, the OKMCT had its own community-run photographic tourism activities, and the hunting JVP had established a collaboration with a photographic tourism enterprise in recognition of the area's potential. These existing partnerships paved the way for an expansion into exclusively photographic tourism operations after the moratorium. Indeed, OKMCT is not interested in reverting to hunting activities due to the success it is having with its photographic tourism activities, and the current leases with the new photographic JVPs in fact preclude the Trust from bringing back trophy hunting into the concession.

While purported to devolve power and decision-making over natural resources to communities in Botswana, the retention of, and in some cases reversal to, government control over wildlife and land, undermines and restricts the ability of CBNRM, and subsequently trophy hunting, to deliver positive well-being outcomes in local communities. Despite many people across both villages feeling like they could take part in decisions taken by the two Trusts, the extent of meaningful community participation in natural resource management and tourism development decisions, was substantially curtailed by the nature of CBNRM programme (Hoon, 2014). At the village level, community participation in Ditshiping was curtailed by the multi-village structure of the Trust. In both villages it was, at times, curtailed by top-down decisions taken by the Trusts Boards who had the ultimate say in what they spent money on. At the broader scale, none of Botswana's Community Trusts had extensive control over natural resource management, or tourism development, in their concession areas (Hoon, 2014,

Cassidy, 2021). Most decisions are taken by the central government. For example, while communities can ultimately choose which safari companies to partner with, the district-level government body, the Technical Advisory Committee, does the initial sift and presents only a limited selection of options to communities. Indeed, as the tide had already turned against hunting by the time Phuduhudu and XDT started to look for a new JVP in 2010, there may have also been little government will to actively find a replacement JVP. Finally, the top-down nature of the hunting ban itself, with the moratorium instigated in the absence of community consultation, exemplifies how little power communities actually had over tourism development in land that they supposedly had rights over.

7 Social impacts of the Botswana hunting moratorium

7.1 Abstract

Trophy hunting has long been one of the most contentious practices in conservation. Much of the debate is rooted in ecological, governance, moral, and ethical concerns, typically around animal welfare and rights, but less attention has been focused on its impacts on people. Yet, with growing calls to ban the practice globally, it is local communities involved with the industry who are most likely to be affected by such decisions, the impacts of which are largely unknown. After decades of including trophy hunting in their conservation toolbox, the government of Botswana set a nation-wide hunting moratorium from 2014-2019. The five-year hiatus created a natural experiment for adding to the evidence-base on the efficacy of trophy hunting as a conservation and rural development tool, as well as an opportunity to understand what some of the consequences of hunting bans might be for the local people involved.

This chapter uses a theory-based, participatory evaluation in two case study communities to explore how local well-being was impacted by the hunting moratorium. Results are from six months of ethnographic fieldwork conducted in two former-hunting villages in Botswana: one successfully converted to photographic tourism activities, the popular alternative to hunting, and one did not. A theory of change was developed from the literature and tested and critiqued by communities. Key impacts in both villages were the loss of wildlife control, game meat, and jobs. A loss of income to community organisations was less commonly mentioned. These lost outputs affected multiple dimensions of well-being. While some households' economic well-being improved in the community which expanded photographic tourism, other dimensions of well-being worsened. Overall, more households across both villages faced reductions in economic and material living standards, security, health, and subjective well-being, largely as a result of increases in human-elephant conflict that was attributed to the moratorium.

7.2 Introduction

For many people, concerns around trophy hunting involve animals and not people. Yet, trophy hunting, and the regulations that shape and regulate it, have affected people in countless ways for hundreds of years. From the 11th century, rural people in Europe were removed from large swathes of land, and prohibited from hunting themselves, to enable sport hunting and recreation for society's elites (MacKenzie, 1988). In many pre-colonial African societies, too, traditional regulations and beliefs restricted or placed conditions on the hunting of particular species, with certain body parts, such as elephant tusks and leopard skins, reserved as offerings for chiefs (Mbaiwa and Darkoh, 1998,

Manyanga and Pangeti, 2017). Interventions to facilitate trophy hunting, and conservation more generally, continue in various forms today, rippling through societies in different ways, often with those most dependent on wild resources, like hunter-gatherer communities, most impacted and often powerless to prevent or affect change (e.g. Hitchcock and Vinding, 2004, Awuh, 2015).

Despite growing recognition of the effects of conservation interventions on rural societies (McKinnon et al., 2016, Franks and Small, 2016), and the importance of involvement of these same communities for achieving sustainable and just conservation (Ban et al., 2013, Dawson et al., 2021), trophy hunting's impacts on people involved in, or on the periphery of, the industry have not been extensively explored. While community-level socioeconomic effects of trophy hunting, and the programmes that facilitate local people's involvement, have been reported on, few studies have explored multi-dimensional well-being impacts of the activity on individuals (Chapter 3: Systematic review). In particular, few studies have systematically and intentionally examined diverse social impacts to ensure that they have not been mis-understood or missed (Woodhouse et al., 2015). With trophy hunting's role in conservation being increasingly questioned, understanding how the activity impacts individuals in communities will help to mitigate any unintended consequences that may adversely or unintentionally affect them, and conservation aims, if the activity is stopped.

Understanding the impacts of trophy hunting, or its absence, on multi-dimensional well-being is important for moral reasons, but it is also important to understand whether communities are likely to support or retaliate against changes in decisions around the activity. Well-being is defined as a positive physical, social, and mental state. It is also a primary driver of people's decision-making (Woodhouse et al., 2015). Exploring multi-dimensional well-being necessitates developing an understanding of local objective economic and material circumstances such as housing, income, health & environment; social and cultural aspects like community networks and cultural preferences; and a subjective component of an individual's own assessment of their circumstances (Woodhouse et al., 2015).

The 2014-2019 hunting moratorium in Botswana offers an opportunity to examine the well-being impacts of trophy hunting on rural communities by exploring what happened after it was removed. The moratorium creates a unique opportunity to explore both the impacts of the activity and the impacts of restrictions placed on it, like hunting bans. This chapter evaluates the social impacts of the hunting moratorium by asking the following questions: How has multi-dimensional well-being in CBNRM communities been affected by trophy hunting? And, how does a Trust's ability to convert to photographic tourism affect these outcomes?

7.3 Methods

7.3.1 Evaluation Framework

I followed guidelines in Woodhouse et al. (2015) and Woodhouse et al. (2016) to explore the impacts of CBNRM-facilitated trophy hunting, and the 2014-2019 moratorium on local well-being in Botswana. The evaluation was conducted using a combination of three evaluative designs to identify outcomes and attribute them to the interventions: theory-based, case-based, and participatory (Woodhouse et al., 2016). A theory of change was developed a-priori based on the literature's reported outcomes of trophy hunting (theory-based) using studies on Botswana's CBNRM programme and trophy hunting more broadly (e.g. Thakadu et al., 2005, Rozemeijer, 2009, Mbaiwa and Stronza, 2010, Mbaiwa, 2017). The theory of change was then tested in the field where elements were critiqued and confirmed in focus group discussions in the two case study communities. This added a participatory element to the design to ensure the outcomes examined were locally relevant and appropriate. It also allowed for exploration into how participants attributed the changes they were experiencing. The case-based design compares various features of the two villages, predominantly being able to convert to photographic tourism or not, and the affects this had on how communities were impacted by the hunting moratorium. It allowed for further identification and triangulation of causal factors that can help to explain the social impacts (Woodhouse et al., 2016). The combined methodology also allowed for exploration into how community perceptions varied within and between communities, and compared to other forms of evidence (Bennett, 2016). The outcomes and indicators used were based on qualitative research through literature reviews and informal interviews from a scoping study. Multiple outcomes were selected and examined with predominantly qualitative and a small amount of quantitative data, such as frequency of meat consumption (Table 7.1).

Table 7.1: Domains and definitions of well-being outcomes from trophy hunting and the CBNRM programmes that facilitate it, adapted from McKinnon et al. (2016) for local context based on literature and informal interviews during the scoping study

Outcome domain	**Definition**
Economic living standards	Income, employment, employment opportunities, diversified livelihoods
Material living standards	Food availability and security, meat access, food preference (e.g. game meat vs. beef), crops, livestock, shelter
Education/Health	Health/education facilities provided/supported by CBNRM
Social relations	Cohesion, shared voice
Security and safety	Personal safety and security

Empowerment	Involvement in decision-making, trust in government, autonomy
Subjective	Perceptions of happiness, quality of life, or satisfaction
Cultural/Spiritual	Cultural identity and heritage, traditional values of natural resources, sense of place, spiritual beliefs
Freedom of choice and action	Able to pursue and do what you want, and go where you choose

The initial aim of the study was to then complement these predominantly qualitative findings with more extensive quantitative data collected in a before-after-control-intervention design across multiple former hunting and non-CBNRM villages. However, this did not take place due to the Covid-19 pandemic.

7.3.2 Data

The majority of data used in this chapter were collected through interviews with individuals living in Phuduhudu and Ditshiping villages, and were supplemented by data collected through a census questionnaire, focus group discussions, and key informant interviews. Ditshiping was one of six villages of the Okavango Kopano Mokoro Community Trust (OKMCT) which had successfully extended photographic tourism development after the hunting moratorium. Phuduhudu's Xhauxhwatubi Development Trust meanwhile, had been unable to develop photographic tourism enterprises and had largely ceased operating after the moratorium (See Table 7.2 for detail of key differences).

Table 7.2: Key characteristics of the two case study villages.

Characteristics	Phuduhudu	Ditshiping
Village size		
Number of households	112	42
Total population*	814	554
Total adult population	457	317
Resident adult population**	305	127
Working age resident population	262	103
Dominant ethnicity	San	Bayei
Education		
% resident adults with <12 years of school	86	92
% with no school	29	52
Unemployment rate (%)	79	24
Gazetted settlement	Yes	No
Converted to Photographic tourism	No	Yes

* Total village population including resident and non-resident adults and children
** Resident adults re those who spend the majority of their time in the village

Data were predominantly collected during two field seasons from February-April and August-October 2019, in Phuduhudu and Ditshiping villages respectively. The first month in each village was spent learning about village life through participant observation and informal interviews. A three-week scoping study spent in Maun and Gaborone in August 2018 conducting informal interviews, was used to develop outcomes and indicators. Almost all community interviews and focus group discussions were conducted in the presence of a translator/research assistant hired from the local community and most conversations were translated between English and Setswana. There were a few exceptions where interviewees or focus group participants were fluent in English where conversations were all in English.

To take into account heterogeneity within communities, households were selected at random from a list of households generated during the village censuses; participants were then purposively sampled from households to ensure proportional representation across age and gender categories in the communities. Focus group discussions were also conducted with different groups, e.g. women and men in different age groups, farmers, livestock keepers, and people in the other OKMCT villages (Boro, Xaxaba, Xaraxao, Quqao, and Daonara), and staff working at the OKMCT lodges.

Semi-structured interviews were conducted with 108 individuals across the two villages (Table 3.3), sampling roughly 20% and 30% of each gender and age group category in Phuduhudu and Ditshiping respectively. The semi-structured tool allowed for the impacts of key outputs of trophy hunting to be explored across both populations while allowing for nuanced follow-up questions to account for the variation in context and individuals' experiences.

Information was gathered on a range of well-being outcomes and on community perceptions towards the trophy hunting moratorium and wildlife. Recall questions were used to determine conditions before the hunting moratorium (Woodhouse et al., 2015).

7.3.3 Data analysis

Household interviews were transcribed and then coded using NVivo 12 Pro (released in 2018) to classify themes around outcomes of interest. It was also used to identify relationships and similarities across different villages, and age and gender categories. Well-being domains and definitions from McKinnon et al. (2016) were followed. Key outcomes were tabulated in Excel and used to generate descriptive statistics. Data were explored against the theory of change on how trophy hunting impacts local well-being in Botswana. Contextual and confounding factors were highlighted.

7.4 Results

7.4.1 Theories of change

7.4.1.1 CBNRM introduced to communities

When CBNRM was introduced, communities were able to form Community Trusts and some were granted lease rights over concession areas and wildlife quotas from the government, allowing them to develop tourism in their areas (Figure 7.1). Trusts with wildlife quotas in multi-use concessions could conduct both hunting (through Joint Venture Partnerships or auctions) and photographic tourism (through Joint Venture Partnerships or community-run enterprises). These tourism developments brought income to the Trusts through lease and quota fees (used for community development), generated employment in the communities, and, in the case of hunting, generated meat for the community. All of these outputs were documented in the literature. A further output of trophy hunting raised by study participants was animal control. Across individual and key informant interviews, and focus group discussions, study participants reported that trophy hunting had previously been controlling the wildlife population, particularly the elephant population. In turn this controlled human wildlife conflict (HWC) at tolerable levels. Together, and to various degrees, the outputs from tourism development led to a range of positive well-being outcomes in communities. The formation of the Trusts themselves, meanwhile, led to governance/ empowerment well-being outcomes.

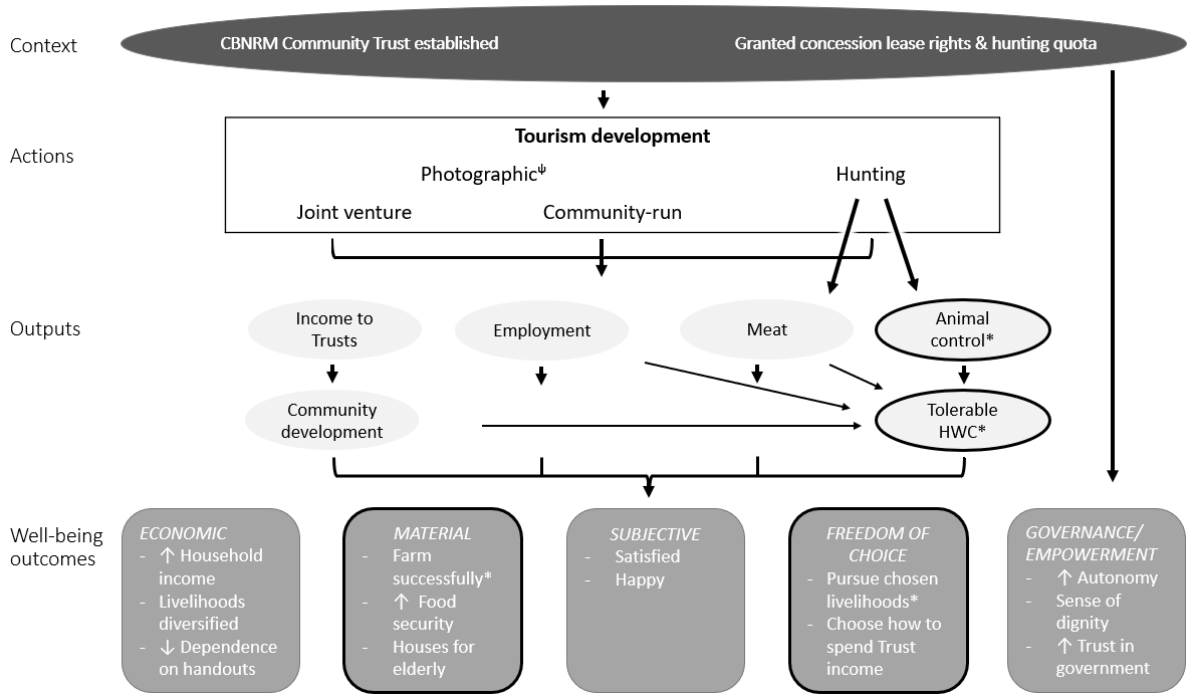


*Figure 7.1: Theory of change for how CBNRM and subsequent photographic and hunting tourism development impacts well-being outcomes in communities. $^{\psi}$ If established, * Participatory from fieldwork/not in literature with affected domain boxes outlined in black*

7.4.1.2 Hunting moratorium instigated, communities focus on photographic tourism

When the hunting moratorium was introduced, those communities which were able to, developed or increased their photographic tourism endeavours (Figure 7.2). This led to similar, if not more, income going to the Trusts, and it generated more community employment. The conversion to purely photographic tourism, however, meant that the outputs directly from trophy hunting, of meat and animal control, were stopped. Meat was no longer distributed freely or cheaply to community members, and the loss of animal control led to higher levels of HWC. These changes led to a mixture of positive and negative well-being outcomes, with differential impacts across individuals in the community. For example, increases in HWC meant people were unable to farm successfully (a preferred livelihood) and dependence on government handouts increased. The top-down way in which the hunting moratorium was instigated meanwhile, reduced some of the positive governance and empowerment outcomes CBNRM had brought.

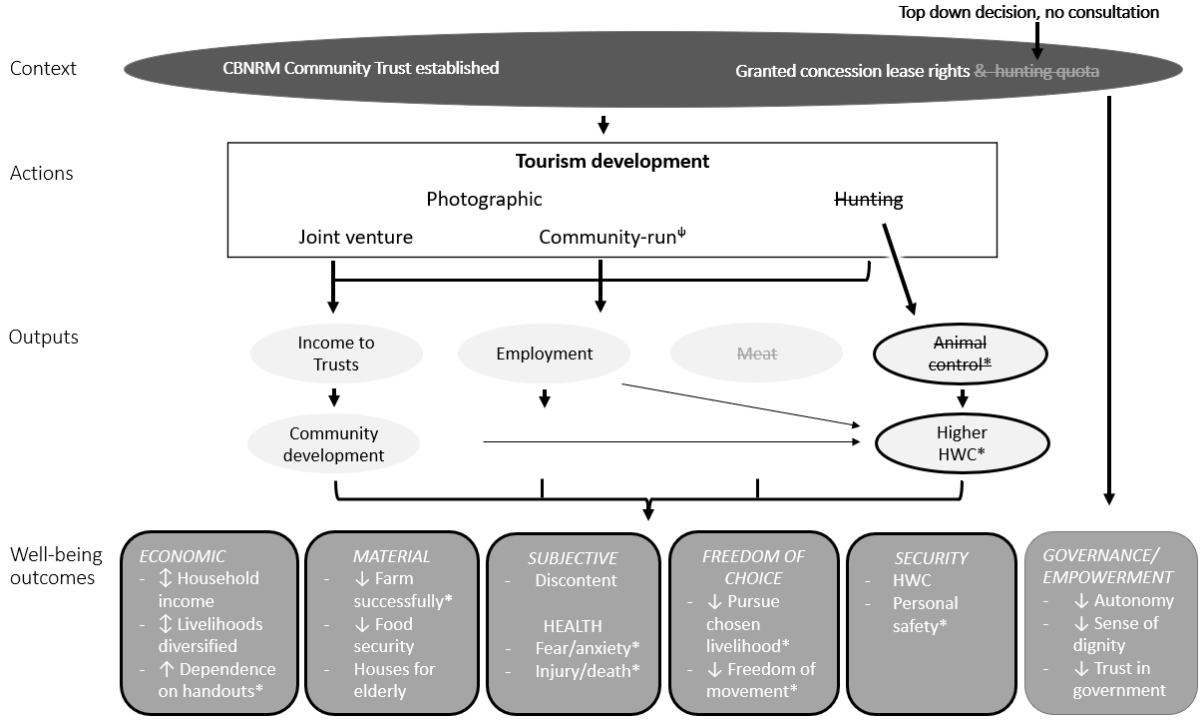


*Figure 7.2: Theory of change for how instigation of the hunting moratorium impacts well-being outcomes in CBNRM communities if photographic tourism is developed/continued. $^{\psi}$ If established, *New from fieldwork with affected domain boxes outlined in black*

7.4.1.3 Hunting moratorium instigated; communities unable to establish photographic tourism

For those Trusts which were not able to establish any photographic tourism, all tourism activities stopped after the hunting moratorium along with all of their outputs (Figure 7.3). The cessation of hunting in these communities, loss of all tourism outputs, and way in which the hunting moratorium was instigated, negatively affected a range of well-being measures.

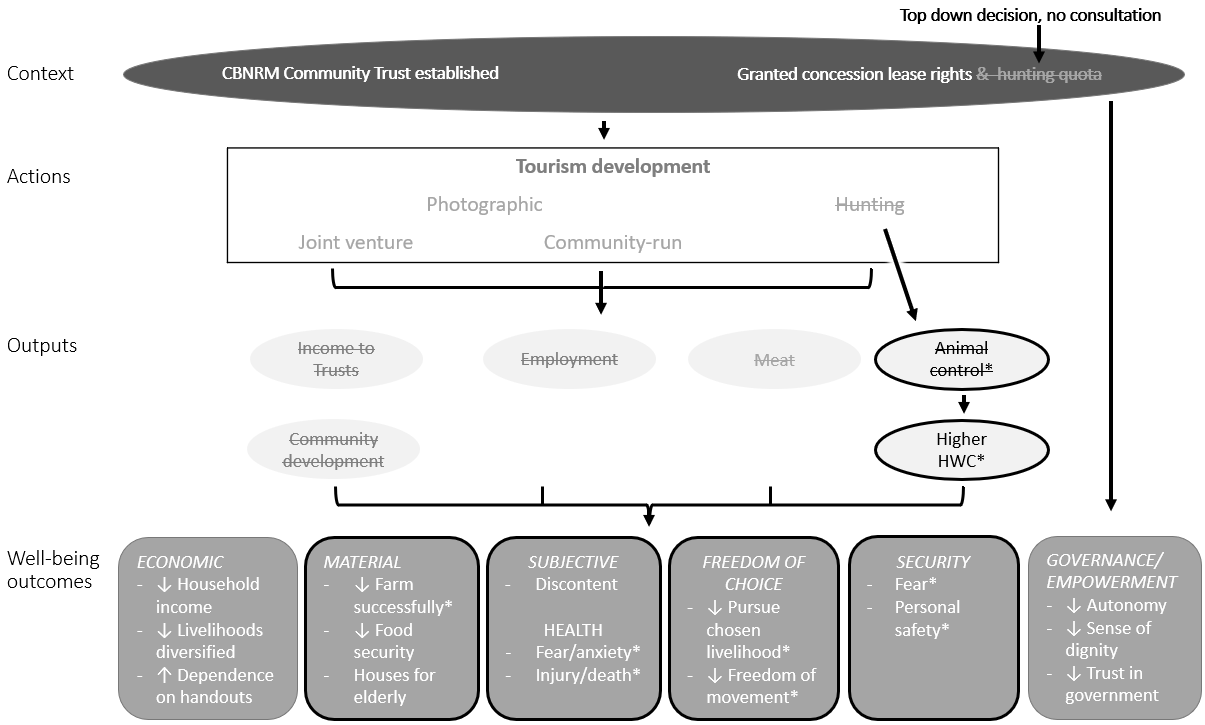


*Figure 7.3: Theory of change for how instigation of the hunting moratorium impacts well-being outcomes in CBNRM communities if no photographic tourism is developed. * New from fieldwork , with affected domain boxes outlined in black*

7.4.2 Moratorium impacts on tourism development outputs

The key impacts of the moratorium in order of the prevalence in which they were reported were: a loss of animal control, a loss of meat, a loss of jobs or job opportunities (predominantly in Phuduhudu), and a loss of income to Trusts or Trust support (Table 7.3).

Table 7.3: Reported impacts of the 2014-2019 hunting moratorium in Botswana by Ditshiping (n = 44) and Phuduhudu residents (64)

Output	Total Prevalence	Raised first
Loss of animal control	103	52
Loss of meat	75	29
Loss of jobs/job opportunities	54	18
Loss of trust income/support	31	6
Lost leases/no consultation*	11	1
Don't know	2	2

* Technically not an impact of the moratorium but broader governance changes, the rest of the impacts were attributed to the moratorium.

Despite not being considered in the literature on trophy hunting, by far the most prevalent impact of the trophy hunting moratorium was the loss of animal control, which was lamented by 95% of interview respondents and raised in 80% of focus group discussions (Table 7.3). Somewhat surprisingly

perhaps, a loss of income to the Community Trusts was only reported by 29% of respondents despite this being reported most commonly in the literature as one of trophy hunting's local socio-economic impacts (Chapter 3). The only people who said they did not know whether the moratorium had affected their lives were two young women in Phuduhudu. Both did however think that there were too many elephants and one said this was affecting human safety. While not strictly an impact of the moratorium, two people first commented on the removal of leases from community control and the lack of consultation when asked about their views on the trophy hunting moratorium.

The prevalence of reports on the key impacts of the hunting moratorium differed between villages (Figure 7.4) and is discussed in more detail below.

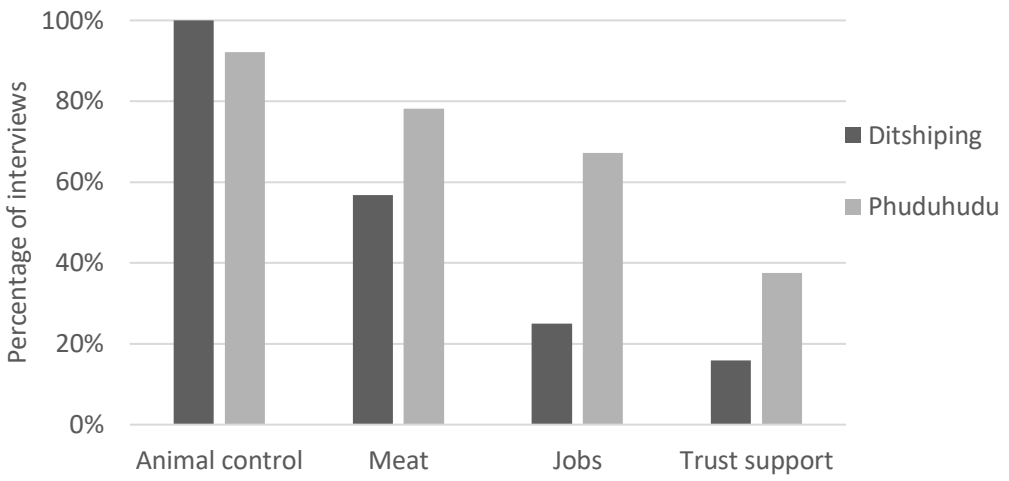


Figure 7.4: The prevalence of key impacts of the hunting moratorium as reported by Ditshiping (n = 44) and Phuduhudu (n = 64) residents

7.4.2.1 Animal control and human wildlife conflict: "We can't plough for elephants"

Contrary to what I was expecting to find based on the literature, in both villages the most commonly reported impact of the hunting moratorium was the loss of animal control (Figure 7.4). It was also raised in all focus group discussions and was a widespread view amongst key informants from diverse backgrounds including photographic and hunting industry representatives, conservationists, researchers, and government officials. While there was disagreement on whether numbers had increased, a controversial 2018 aerial survey suggests otherwise (Chase et al., 2018), by all accounts the distribution and range of elephants in particular had expanded (Thouless et al., 2016).

In Ditshiping, animal control was mentioned by every respondent as an impact when asked about the hunting moratorium. In Phuduhudu, by contrast, trophy hunting's impacts on animal control were more frequently raised later when discussing views on wildlife. Almost all of Phuduhudu respondents reported that animal numbers had increased and/or their behaviour had changed (n=60), with the vast majority (n=59) attributing this change to the hunting moratorium. A loss of animal control was

also raised by 44% of respondents (n=28) from Phuduhudu when asked about the moratorium's impacts.

In both villages the majority of people felt that there were now too many animals (94-97% in Phuduhudu and Ditshiping respectively), with most reporting a change in behaviour as well as number (55% in Phuduhudu and 75% in Ditshiping). People felt animals, particularly elephants, were now coming much closer to (and even into) the villages (Figure 7.5), and that they were harassing people more than before. In Ditshiping 32% of respondents suggested that elephants were causing more problems since the hunting moratorium because they were no longer scared of humans.

> "*In the past, elephants were afraid of guns and people. Today they are not and now they are in the village… When they stopped hunting the animals started to come near the village because they are not even scared by anything. There was nothing that scared them away. That's why we used to plough here, because by that time [before the moratorium] the animals were not near the village*" 36-64 woman from Ditshiping.

Figure 7.5: Male buffalos resting in the grass on the outskirts of Ditshiping village, less than 50m from a set of houses. Also visible in the foreground are metal sheets used to attempt to scare animals away

The removal of animal control was reported to have various effects on lives and livelihoods, with the key concerns being that the increase in animals was now affecting human safety and causing increasing, and often intolerable, levels of crop damage. Human safety concerns were reported in 77%

of interviews in Phuduhudu and 93% of interviews in Ditshiping, while crop damage was reported in 63% and 61% of interviews in the respective villages.

> "*We do not plough now, because it is only for the elephants. We are not providing anything for the family from the fields like before*." Phuduhudu woman, 65+

Increased trouble with animals, predominantly elephants and buffalo, reportedly started shortly after the hunting ban was lifted.

> "*Elephants have always been there, but their damage increased immediately after the hunting ban. That's when we started to experience more damage from elephants. When the elephants visit now you are going to get out there empty handed."* Phuduhudu woman, 65+

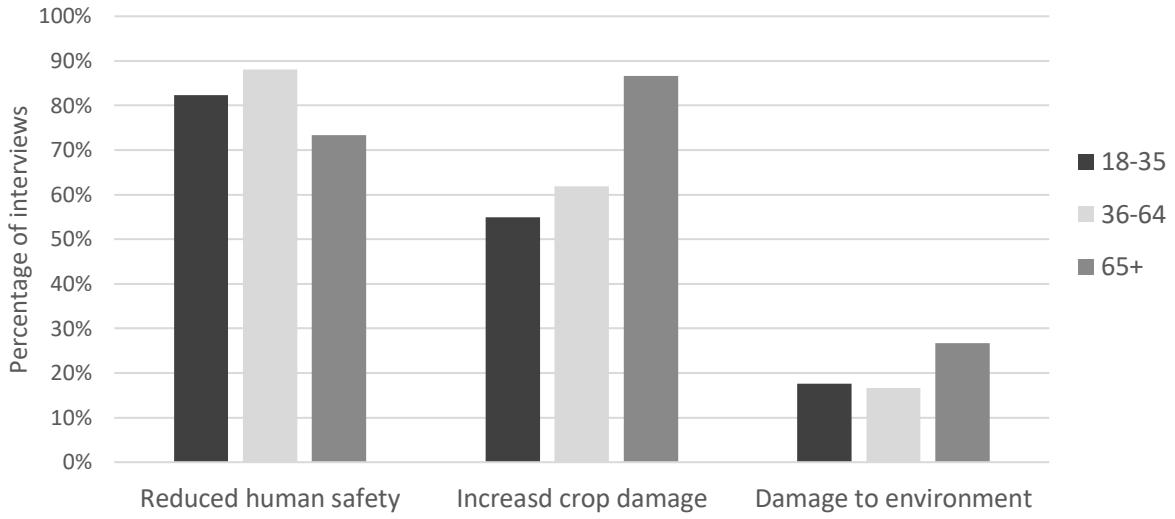


Figure 7.6: Views on how the Botswana hunting moratorium's removal of wildlife control had affected life in Phuduhudu and Ditshiping villages across different age groups

While a reduction in human safety was reported relatively evenly across age groups, reports of increased crop damage were more prevalent in older generations (Figure 7.6). This matches the demographic of people who were actively involved in farming and owned fields which was mostly older adults. There were no trends in human safety or crop damage concerns across gender. Across all respondents, 66% reported crop damage either that they themselves had experienced or that others in the village were experiencing. Many of the households with fields had stopped farming because of previous years' experiences with crop damage (n=16/24 in Phuduhudu and n=21/27 in Ditshiping). In terms of human safety, many people mentioned this in general terms, but 20% of respondents specifically raised concerns of animals now killing people.

A number of people across all age groups also reported increased damage to the wider environment, and to trees in particular (n = 19, Figure 7.7 shows elephant tree damage immediately behind the

building I was staying in. I was lucky enough to be separated by a large fence and in one of the few concrete brick buildings in the village, so was in no actual danger, but there were still sleepless nights). This was also mentioned more widely in focus group discussions across OKMCT villages, with the loss of larger shade trees particularly lamented.

Figure 7.7: Elephant tree damage in Ditshiping. The picture on the left is after one night of foraging and the picture on the right is after the return visit on the second night

7.4.2.2 Meat

The loss of meat from trophy hunting was the second most widely reported impact of the moratorium, though it was more prevalent in Phuduhudu than Ditshiping (Table 7.3, Figure 7.8). More women (the main cooks of the households) mentioned it in Ditshiping than men, while the reverse was the case in Phuduhudu, although this difference was slight. In Ditshiping, people in both interviews and focus group discussions noted that while some meat was received from trophy hunting, because the meat produced by trophy hunting needed to be split between the six OKMCT villages, the amounts reaching individual Ditshiping households were small.

The main meat to reach both villages from trophy hunting was elephant as they are so large and formed a significant part of both areas' quotas (each had 20 elephants per year). While other game animals were hunted, they were more limited in size and number, and most of the meat was kept in the hunting camps. In both villages, though slightly more in Ditshiping, there were some people who did not eat elephant meat (8% of respondents in Phuduhudu, 15% in Ditshiping). Some did not like the taste, while others had elephants as their totem. Some also did not eat it for religious reasons as elephants were thought to think like humans.

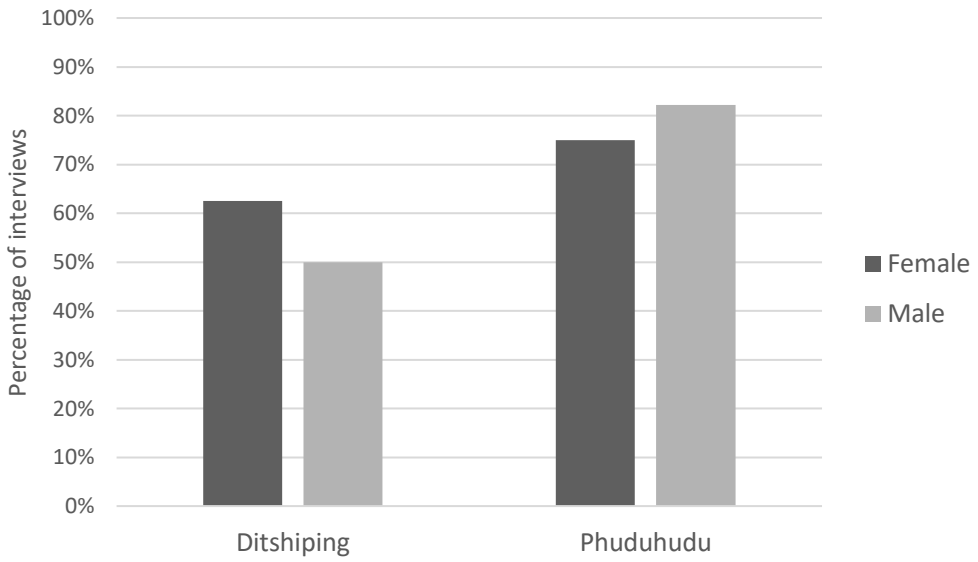


Figure 7.8: Frequency at which the loss of meat was reported by men and women in Ditshiping (n=25/44) and Phuduhudu (n=50/64) as an impact of the Botswana hunting moratorium

7.4.2.3 Jobs

The loss of jobs or job opportunities caused by the hunting moratorium was reported by a quarter of respondents in Ditshiping (n = 11) and two thirds of respondents in Phuduhudu (n = 43) (Table 7.3). In both villages more men than women reported a loss of jobs or job opportunities as an impact of the moratorium (Figure 7.9). While some women were employed in the hunting camps as housekeepers and cooks, more roles were labour intensive and reserved for men like maintenance around the camp, clearing roads, and skinning.

Overall, though 11 people mentioned job losses as an impact of the moratorium in Ditshiping, many of those working for the hunting company were actually re-hired in their new photographic tourism enterprise. It was only a few of the older skinners who lost their jobs in the transition. The number of employment opportunities available in the village actually ended up increasing after the moratorium as two new lodges were developed. Despite this, only 7 respondents suggested that numbers of jobs available had increased and one thought the number of jobs had declined.

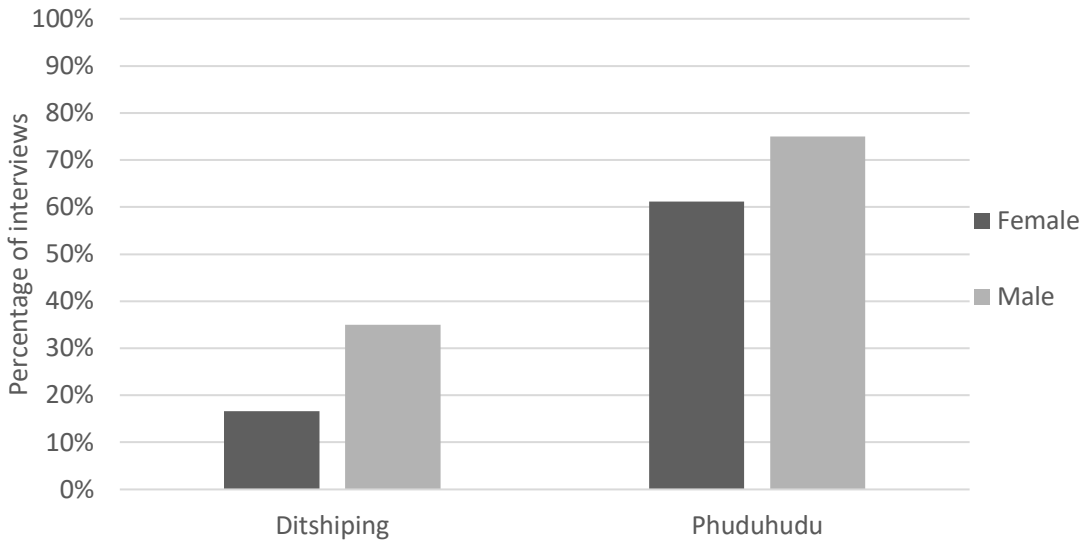


Figure 7.9: Prevalence at which job loss or lost job opportunities was reported by men and women as an impact of Botswana's hunting moratorium by respondents from Ditshiping (n=11/44) and Phuduhudu (n = 43/64) villages

In Phuduhudu, the impact of job losses or lost job opportunities was felt all the more strongly as there were very few alternative opportunities in or near the village. A working Trust in conjunction with the Joint Venture Partnership had created about 30 local job opportunities, more than doubling the number of jobs available at the time of fieldwork. An added importance of these local job opportunities was that not all of them required people to have completed school nor speak fluent English, both of which were substantial obstacles to those looking for work.

> "*They have killed us. We could have been getting a living, we could have been employed, either at the Trust or the Safari company but now there is nothing."* Phuduhudu man, 18-35

It is interesting to note that while job losses and lost opportunities were widely mentioned, by the time the moratorium was instigated only about 6 community escort guides and a Trust manager were being employed, with the escort guides only working during the six-month hunting season. Many people were recalling the jobs lost in the dissolution of the JVP, or the potential that a new JVP might have generated had the hunting moratorium not occurred.

7.4.2.4 Trust support

The final output of trophy hunting that was raised by respondents was the lost income to the Community Trust, or a loss of Trust support in community development (Table 7.3). A loss of Trust support or income was raised in 38% of interviews in Phuduhudu. After the hunting moratorium, the Xhauxhwatubi Development Trust (XDT) largely collapsed as it was no longer generating any income from tourism, and so was unable to support the community in the way it had in the past.

"*We are so affected by the ban in the village. We have been affected because of Trust doesn't have money, even us we are not working, even the elephants now they are roaming around in the village compared to the time when the hunting was being done. When the trust was still working it was helping the village, like with funerals, the trust was helping. If the trust was operating it could have built houses for the needy, but now we don't get anything, you can't see anything.*" Phuduhudu man, 18-35

Far fewer residents of Ditshiping reported this outcome as the Trust had successfully formed JVPs with several photographic operations and had a community-run enterprise; and so was still generating substantial income from tourism and in turn, supporting the community in various ways (Chapter 6: Community development from the OKMCT). However, a loss of certain kinds of Trust support was reported by 6 residents of Ditshiping, including assistance with transporting harvested reeds and grass, and assistance with ploughing. These activities were actually carried out by the Joint Venture Partner. Despite the same JVP now operating one of the photographic lodges this support did not continue after the moratorium. I could not determine whether these activities were a formal component of their lease agreement, or as a good will demonstration to ensure the community continued their lease and partnership with the JVP. Either way the loss of this support was somehow a result of the leases not being signed by the community rather than the moratorium per se.

7.4.3 Well-being outcomes

The loss of the four outputs from trophy hunting affected various dimensions of well-being in the two villages in different, uneven, and often unexpected ways.

7.4.3.1 Economic living standards

Despite the loss of jobs being widely mentioned, the direct impact the hunting moratorium had on household income from jobs in Phuduhudu was actually relatively minimal, as by the time the moratorium was instigated only the manager and a few escort guides were being seasonally employed. What the moratorium did do was reduce the number of job opportunities and the potential for generating employment in the Phuduhudu which was sorely missed. The lost hope for both individuals and the prospects of others in the village was widely reported.

"I was hoping for more, expecting more from trophy hunting. I was hoping even some of my children would work for the safari company." Phuduhudu woman 35-64

In Ditshiping meanwhile, overall impacts of the moratorium on household income from employment was positive as more people were being employed by the two new lodges which were built in the area. However, improvements in household income were not realised by all households. Some people

lost jobs with the move from hunting to photographic tourism, particularly the elderly who might have had a few years of work left, but not long enough to be worth re-training. Further, not all households had new people employed. Twenty-five people from Ditshiping were working for the two new lodges, with 21 of Ditshiping's 32 households benefitting from these positions. However, while it's understood to be a household benefit, the extent to which income was sent back to support those in the village varied between households. While some of those employed made regular contributions of support for those in the village, not all did, and amounts varied from occasional support to regular contributions of sometimes more than half their monthly salary. Additionally, not all of the newly created positions went to households which had not previously benefited from other employment through the Trust, with some of the more marginalised missing out on this benefit.

While changed employment conditions might have affected household income for those who gained or lost jobs, it was also negatively affected in both villages by the other changes in tourism outputs. In Phuduhudu, and to a lesser extent in Ditshiping, household income of many took a double hit as a result of the hunting moratorium. Firstly, people were having to buy more food in general as a result of crops failing, which was reported by farmers in both villages, and secondly, people were having to buy meat which they had previously accessed for free. Having to buy more food either meant less food and reduced food security in worse off households, or less money for other things like clothes.

> "*Before [the hunting moratorium] there was food from our fields and the meat, now we depend only on Ipelegeng. Before, money that I got from Ipelegeng was used to build houses knowing we could get food from the fields."* Young Phuduhudu woman.

> "*Now that we can't farm it is hard. Some other things we can't do, like buying clothes or something for the house, the money, much money goes to food."* Ditshiping woman, 36-64.

Beyond household income, the livelihood diversity of many people in both villages was restricted as a result of the moratorium due to the loss of animal control and its impacts on farming success. More people felt they had to rely more on *Ipelegeng* after the moratorium, with reports of an increased reliance on government handouts even in Ditshiping, where the Trust was able to convert to photographic tourism. In addition to reduced economic well-being, the impacts this had affected a range of other well-being measures with people's autonomy, self-sufficiency, and subjective well-being negatively affected.

> *"It was better when I had my own fields. Right now I am based on only poling or from Ipelegeng. I have given up on my fields." Ditshiping woman, 35-64*

7.4.3.2 Material living standards

Material well-being was largely impacted by the moratorium through the loss of meat and through the changes in people's ability to farm, both of which had substantial impacts on household food security, particularly for the poorer members in the village.

Sixty-four percent (64%) of people in Phuduhudu and 39% in Ditshiping reported that they ate more meat before the moratorium. In Phuduhudu this was sometimes a substantial change in meat consumption with 28% of people reporting a reduction of daily meat consumption prior to the moratorium to now only being able to eat it on a fortnightly or monthly basis. While meat was only available during the hunting season, most people received such large quantities they dried it to preserve it, making '*segwapa*', and were able to eat meat throughout the remainder of the non-hunting season. Even in Ditshiping, where households received less meat from the hunting, reduced household income as a result of crop failure meant people had less money to buy meat than before the moratorium. Meat was important not only for food security reasons but also for health and cultural reasons, particularly in Phuduhudu.

> "*The trust was providing us with meat when there was hunting. It was important because we used it as our side dish. Now we eat pap with no meat. But this is not good. We eat meat because we are Basarwa, we are used to it."* Phuduhudu woman, 65+

> "*We are meat eaters. We grew up in the bush. Our lifestyles, history, tradition and customs are wholly dependent on wildlife for our lives and livelihoods."* Phuduhudu man 36-65

Health concerns around beef were raised in several interviews and focus group discussions in Phuduhudu. Worries around cattle being vaccinated and beef causing gout were both raised as concerns over this enforced dietary shift. Even in Ditshiping, while meat was more readily consumed because of greater cash flow in the community, people lamented the loss of game meat, as hunting was the only way to access it legally.

> "*All wild meat is better than cattle because wildlife is not vaccinated. It's healthy."* Phuduhudu man, 18-35

The increased crop damage suffered by farmers in Phuduhudu and Ditshiping had substantial impacts on food security. Nine people in each village reported increased hunger or that they were starving as a result of the moratorium's impacts on food access. The increased number of animals also restricted harvesting of wild food, with implications for both household food access and household income as some people used to sell wild harvested food for additional income.

"*Elephants are the main problem now. I can't plough. Without my fields I will die of hunger."* Phuduhudu man, 65+

"*When there was hunting we had fields. From the fields we could feed our own family. Now because of elephants we have no fields. We also used to get meat. It was easier to get food because we had fields and there was meat. Now we are hungry."* Ditshiping woman, 65+

In both villages prior to the moratorium, and continuing after the moratorium in Ditshiping's case, the Trusts provided a range of social support for the villages such as houses for the elderly, transport, and funeral assistance. In Phuduhudu most of these activities stopped before the moratorium when the JVP came to an end, while in Ditshiping they continued after the moratorium. Arguably, the hunting ban had little impact on these, however, as the statement below highlights, the lost hope of potential support weighed heavily.

"Our wishes were high, so I would say I've personally been affected by the hunting ban because my wishes are now turned down." Phuduhudu woman, 36-64

7.4.3.3 Freedom of choice

In both villages, there were reports of lost freedom of choice to pursue their preferred. Around 35% of people in Phuduhudu and 44% of people Ditshiping reported being unable to pursue farming livelihoods, lost autonomy (and forced increased reliance on government support), and reduced ability to support and feed oneself and one's family.

"*We used to plough because by that time [before the moratorium] animals were not near the village. When you have fields you can get food for yourself to eat but also take some to sell and you'd get money. I didn't do the poling to get money as we had food from the fields. Now when there are not tourists it's only Ipelegeng."* Ditshiping woman, 35-64.

"*Now we have to buy more food. We are forced to buy food, even sorghum we have to buy, things that we are not supposed to or used to buying. Things we used to grow now we have to buy them. Before we didn't need to work for Ipelegeng, we were only using our fields to get food."* Phuduhudu woman, 35-64

"*Even as farmers we would be getting something from our fields. Nowadays we are just scrambling at Ipelegeng because of the hunting ban."* Phuduhudu woman, 35-64

In both villages, an ability to support oneself and provide for one's family were locally reported measures of someone who is successful or leading 'a good life'.

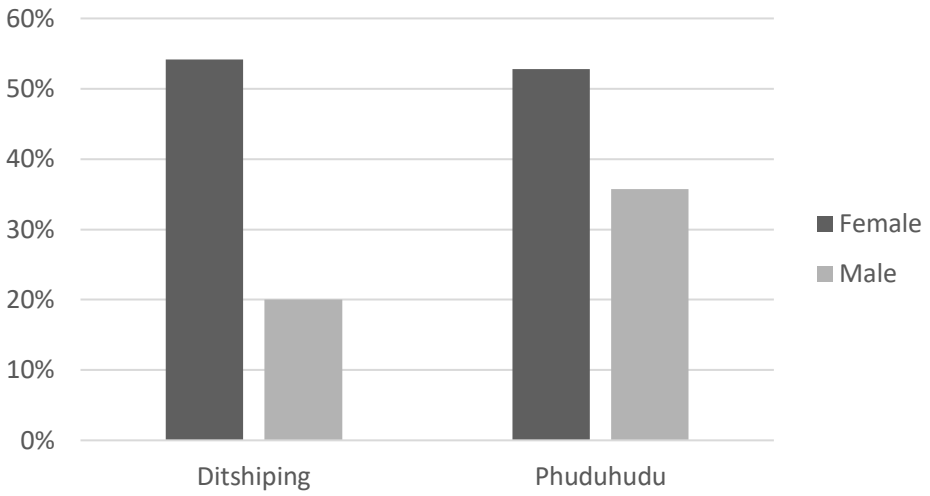


Figure 7.10: Gender differences in the frequency of reporting restricted freedom of movement as a result of the hunting moratorium's impact on animal control reported by residents in Ditshiping and Phuduhudu

People also reported restrictions in their freedom of movement, with women in both villages being more heavily impacted (Figure 7.10). More than half of women interviewed felt their movement was being restricted by wildlife with many no longer going out at all or as far to collect natural resources they used as part of their livelihood strategies, or they were restricted to going out in groups.

7.4.3.4 Health and Security

An increase in fear was reported by 58% of all respondents. Sixty three percent (63%) of women and 52% of men across the villages reported an increase in fear since the moratorium as a result of increased wildlife populations close to the village.

> *"Now the elephants are destroying us. We are afraid of moving in the bush because of elephants."* Phuduhudu woman, 18-35

Even more people reported reductions in personal safety, with 71% of respondents raising concerns for theirs and others safety in interviews.

7.4.3.5 7.4.3.5 Subjective and cultural well-being

More than half of respondents in both villages felt the hunting moratorium had negatively impacted life in the villages. In Phuduhudu in particular, a third of people specifically stated that their lives were better before the moratorium than now.

> "*Life was better, people were working for themselves and were able to help their families."* Phuduhudu woman, 36-64

> " *The animals are too many now, we are not happy living with them here as they have started to kill people."* Ditshiping woman, 36-64

A loss of hope was also reported in Phuduhudu: lost hope for employment, that the Trust might help their families or that that Trust might continue to benefit the village.

Finally, people in Phuduhudu also raised losses in cultural well-being from two sources. The first was the loss of meat, which many considered to be part of San culture. Another aspect was around the loss of jobs which hunting created which used traditional skills like tracking and skinning. Being able to do these activities legally and have a reason to have them passed on to future generations was raised in a number of interviews and several focus groups.

7.4.3.6 Empowerment

A final impact on well-being, caused not of the moratorium itself, but by the lack of participation in the decision to instigate the moratorium, and the broader national changes in CBNRM that coincided with it. Both communities experienced reduced autonomy and reduced trust in government and governance processes due to the top-down nature of the decision which was taken without any of the traditional consultation. In Ditshiping there was further erosion of community power through the loss of the head leases over their concession areas which were now signed directly between the Botswana Tourism Organisation (a central government subsidiary) and the Joint Venture Partners. Five people in Ditshiping spoke about the loss of community power, autonomy, and influence as a result of the change in lease structure, with the JVP leases now not directly involving the Trust. As mentioned earlier, this had ramifications on some of the support delivered to the community as the Trust no longer had any leverage in asking for additional community support from the JVPs. In Phuduhudu, meanwhile, the loss of all income to the Trust meant that the community no longer had a mechanism through which they could control their own development and choose projects to fund.

Seven people across both villages discussed the way in which the moratorium was instigated with the lack of community consultation being wrong and against tradition. One of the aspects of Tswana culture which was appreciated in both the communities was the consultative format in which decisions were normally made. That the hunting moratorium was implemented without consultation went against this and left people feeling disempowered and disenfranchised.

> "*Our people in Botswana are different from other countries because we believe in consulting. A Kgosi [or others with authority] can't do anything in Phuduhudu without first consulting the people. That is what we believe."* Phuduhudu man 36-64

There was also growing sentiment, raised in a number of interviews and focus group discussions, that the Government of Botswana no longer cared for its people or cared more for animals than people.

"*If an elephant is poached you get helicopters and maybe ten vehicles, I'm giving you an example of the response. But if a person is killed by an elephant, the person can stay the whole day lying there in the sun, with the response from Maun being that 'we're still trying to source a car from another department.' This is now making people think, but how important is that animal [compared to] a person"* Male Morutsa resident group discussion

Some also felt disempowered by the international nature of conservation and the anti-hunting lobby:

"*It's pressure from organisations of countries that come here and admire the wildlife, not thinking of the problems that the people on the ground are facing… Why should the animals have rights? Why are the animals more important than people?"* Male 35-64 from Ditshiping

"The international community should come here and experience what it is like and then choose to say elephants should not be hunted" Phuduhudu man, 18-35

7.5 Discussion

Prior to the moratorium in Botswana, the trophy hunting's outputs were delivering a range of well-being outcomes to communities in Botswana that were involved in its CBNRM programme. Some of these were widely recognised, like livelihood diversification through new employment opportunities in tourism, the game meat communities now had free or affordable legal access to, and the development assistance provided by the Community Trusts through CBNRM (e.g. Jones, 2002, Mbaiwa and Stronza, 2010). Indeed, based on documented impacts of CBNRM and trophy hunting in the literature, two starkly different pictures would have arisen from the moratorium depending on whether or not Trusts were able to convert to photographic tourism activities (Mbaiwa, 2017). Where Trusts were unable to convert to photographic tourism, one would have expected community well-being to have declined due to the loss of hunting's outputs. By contrast, well-being in the Trusts which had successfully converted to photographic tourism would have generally been expected to improve, as the loss of meat from hunting may have been mitigated by the increased number of jobs created through photographic tourism. As I have demonstrated, this was far from the case; multiple dimensions of well-being were impacted, often negatively, by the moratorium in both villages, with far more similarities in community impacts than was predicted by the literature.

The loss of animal control was by far the most widespread effect of the hunting moratorium and one which had not been predicted in the literature on CBNRM and trophy hunting, suggesting it was an unanticipated outcome of the moratorium. Despite some studies showing the effects that hunting can have on elephant distribution (Selier et al., 2015), the substantial effects trophy hunting seemed to have on animal distribution, at least in Botswana, seems to be an under-appreciated and under-

researched impact of the activity. While the concept of 'buffer zones' around national parks is well established, and they are often considered desirable locations for CBNRM projects (Swatuk, 2005, Leader-Williams, 2009, Mbaiwa and Stronza, 2010), the concept mostly seems to refer to transition zones between predominantly wildlife and predominantly human land uses. They are areas with lower wildlife densities and some human settlement that can act as wildlife corridors, or areas where communities can benefit from wildlife (Barnett and Patterson, 2005, Kangalawe and Noe, 2012). There are no reports, at least in the literature, of these areas acting as mechanisms for keeping most of the animals inside national parks or at least away from the more human-dominated landscapes beyond them. How transferable this experience might be is unclear as Botswana is quite unique in its large elephant population, which were the main cause of concern.

The loss of animal control had wide-ranging and almost exclusively negative impacts on well-being in both villages, with economic and material well-being impacts, as well as impacts on freedom of choice, health, security, and subjective well-being, which are all under-explored aspects of conservation's social impacts (McKinnon et al., 2016). The impacts of the loss of other hunting outputs were more varied. While many of the youth in Ditshiping benefited from increased employment opportunities, the elderly lost out as they were not hired in the new photographic ventures. In Phuduhudu, economic well-being impacts from job losses and material support from the Community Trust were relatively minimal as they did not have an established JVP when the moratorium was instigated, but the lost hope of future employment or Trust support, and lost meat access were keenly felt. In both villages, those more dependent on natural resources which had to be sourced from their environments were more at risk from wildlife encounters, had their livelihoods and movement more curtailed, and/or felt more fearful going about their normal livelihood activities. This affected almost all of Ditshiping's residents, and the poorer households in Phuduhudu. This analysis highlights the varying impacts that the trophy hunting moratorium had on individuals in communities, and the value of exploring multiple dimensions of locally relevant well-being. For example, even where photographic tourism replaces hunting and economic well-being improves, other aspects such as fear for one's own safety or one's family, or the ability of the wider household to feed themselves were negatively impacted.

This work also highlights how trophy hunting outputs are perceived and felt at the community versus household level. While a commonly documented impact of trophy hunting (Chapter 3: Systematic map) and an argument often used against trophy hunting bans (Di Minin et al., 2016, Dickman et al., 2019) is that it can generate revenue for local communities, a loss of revenue or Trust support was the least commonly reported impact of the moratorium. While this was to be expected in Ditshiping as the Trust was receiving as much if not more revenue than before, in Phuduhudu it was more surprising. One of the reasons for this could have been the Trust's limited support in the village at the household

level (Figure 6.3), with more than half of those interviewed reporting no household benefits. The unsuccessful JVP, which limited community income and benefits, might be one reason for this. It may also have been a symptom of failings in CBNRM more generally which is that wages from employment form the main contribution to reductions in household poverty, while community level developments have limited impact at the household level (Scanlon and Kull, 2009, Suich, 2013). While community level benefits from CBNRM stayed broadly similar in Ditshiping and disappeared in Phuduhudu, household costs in both villages increased. Issues of unequal distribution of Trust support and mismanagement of resources were also reported in both villages and likely contributed to the limited Trust support at the household level in Phuduhudu, and may have contributed to reports of limited benefits in Ditshiping.

In many cases, the multi-scale benefits from CBNRM do not outweigh costs individuals face from human wildlife conflict (Jorge et al., 2013, Khumalo and Yung, 2015, Zafra-Calvo and Moreno-Peñaranda, 2018) and forgoing livelihoods (Strong and Silva, 2020), and ultimately have limited and uneven effects on well-being (Pailler et al., 2015, Homewood et al., 2020). Even in Namibia, where all income is retained by communities, economic and non-material costs of human wildlife conflict were not offset by CBNRM (Khumalo and Yung, 2015, Drake et al., 2020). While failings in distributional equity are reported widely in CBNRM, the balance of costs and benefits is likely to be even worse where participation in decision-making and management, and recognition of rights over natural resources, are lacking (Chapter 4: Systematic review) (Klein et al., 2015).

The importance of equity in the success of conservation is increasingly appreciated, and research into the subject is expanding, with three enabling dimensions: distribution, procedure, and recognition, identified (McDermott et al., 2013, Schreckenberg et al., 2016, Friedman et al., 2018). While CBNRM in Botswana attempts to address issues of distributional equity in the conservation of the country's wildlife (unsuccessfully as this work shows), the limited participation of communities in decisions around conservation and natural resource management, and the lack of recognition of their rights to land and resources (Chapter 6; (Cassidy, 2021), also point to limited equity in procedure and recognition (Schreckenberg et al., 2016). These limitations place the largest barriers on any kind of tourism-based livelihoods and determine the extent to which activities like trophy hunting or photographic tourism development might benefit well-being. Without first improving these structures, and developing locally relevant and appropriate opportunities to develop natural resource-based livelihoods, removing trophy hunting will do little to improve the well-being of local people and may indeed harm them, particularly if the decision to implement a hunting ban is externally imposed.

8 Exploring impacts of the Botswana hunting moratorium on vegetation in Ngamiland

8.1 Abstract

Trophy hunting's suitability and efficacy as a conservation tool is hotly debated, and key gaps exist in the understanding of how the activity contributes to conservation. One of these gaps is research on the impacts that trophy hunting has on the ecosystems in which it takes place. Field-based methods have been the dominant mode for collecting ecological data on trophy hunting's impacts, but these are costly, temporally limited, and time-consuming to conduct. Remote sensing offers an under-utilised mechanism through which to explore the impacts of trophy hunting on the broader ecosystem.

In this chapter, I present the first application of using remote sensing products to explore whether the 2014-2019 hunting moratorium in Botswana, and the changes in elephant distribution it was reported to have caused, impacted vegetation greenness in the Ngamiland District. I used a generalised linear mixed effects modelling framework to explore changes in the Normalised Difference Vegetation Index (NDVI) across hunting and non-hunting areas before and after the moratorium. Results suggest that in the hunting and mixed-use areas where elephant populations were found in lower densities prior to the moratorium, there was a slight but significant positive change in NDVI and a slight increase in heterogeneity that may be linked to increased elephant presence in those areas. Beyond this, I demonstrate the potential of remote sensing products to provide evidence for trophy hunting's impacts on the broader environment. Exploring land cover change and NDVI at finer spatial resolutions in conjunction with spatial estimates of elephant density are key next steps. Particularly in data poor contexts, developing relevant, remotely-sensed metrics of ecological condition could be an important tool for monitoring the broader ecosystem impacts of trophy hunting, and other conservation management and policy decisions.

8.2 Introduction

Trophy hunting, one of conservation's most controversial practices, has faced criticism in the past for lacking reliable data on how it contributes to conservation (Lindsey et al., 2007). While evidence on the activity has grown in the years since, key gaps remain in several areas (Chapter 4 & 5, Di Minin et al., 2021). Much research on recreational hunting has focussed on species ecology and behaviour (Di Minin et al., 2021). Research into trophy hunting's ecological impacts in sub-Saharan Africa, for example, has focussed on population dynamics, and the behaviour of hunted species (Chapter 4). However, far less is known about the impacts that trophy hunting is having on non-target species and

the broader ecosystem, representing a substantial gap in our understanding of its contribution to conservation.

In Botswana, discussions around trophy hunting, and the 2014-2019 hunting moratorium, centred on elephants (e.g. Kgosiemang, 2018, Burke, 2019). Botswana holds the world's largest population of African elephants and it has grown considerably since the 1990s (Thouless et al., 2016). Current estimates suggest the population is between 120,000-130,000 (Thouless et al., 2016, Chase et al., 2018). Elephants are keystone megaherbivores, and have large and disproportionate impacts on the ecosystems they inhabit (Bond, 1994). They have considerable impacts on vegetation structure and composition, with tree structure and abundance being particularly negatively affected (Teren and Owen-Smith, 2010, Guldemon et al., 2017). Numerous studies have explored the impacts of Botswana's growing elephant population on vegetation, in particular, around water sources, with reports of increased tree damage, changes in plant species composition, decreases in woodlands, increases in shrubs, and an overall simplification of the ecosystem (e.g. Ben-Shahar, 1996, Ben-Sahar, 1998, Skarpe et al., 2004). While elephants seem to have a largely negative impact on vegetation when at high densities, their actions have varying impacts on the rest of the ecosystem (Guldemon et al., 2017) and on vegetation when they are at lower densities (Guldemond and Van Aarde, 2008). The changes in tree species which they facilitate, influences leaf litter amount and quality, affecting nutrient cycling, and resource distribution (Skarpe et al., 2004). They can also affect other herbivores. Elephant increases were thought to have facilitated increases in impala and kudu, but negatively affected populations of browsers and mixed-feeders, like bushbuck, due to declines in habitat condition (Skarpe et al., 2004).

Following the moratorium, an increase in elephant numbers was widely reported in former hunting areas (Chapter 7: Social Impacts, Dikobe, 2016), and their range across the country is reported to have expanded (Figure 8.1, Thouless et al., 2016). Aerial surveys conducted by Elephants Without Borders suggest there may have been a change in elephant population density across the region, though reported density scales, the areas surveyed, and survey intensity changed with each survey making direct comparison challenging (Figure 8.2) (Chase, 2011, Chase et al., 2015, Chase et al., 2018). Densities are widely reported to be highest in national parks and concessions around the Okavango Delta and Chobe/Linyanti River system which matches findings in Figure 8.2. Winterbach et al. (2015) found similar trends based on wildlife biomass and diversity from 1994-1999 with low wildlife density and abundance in former hunting and mixed use areas.

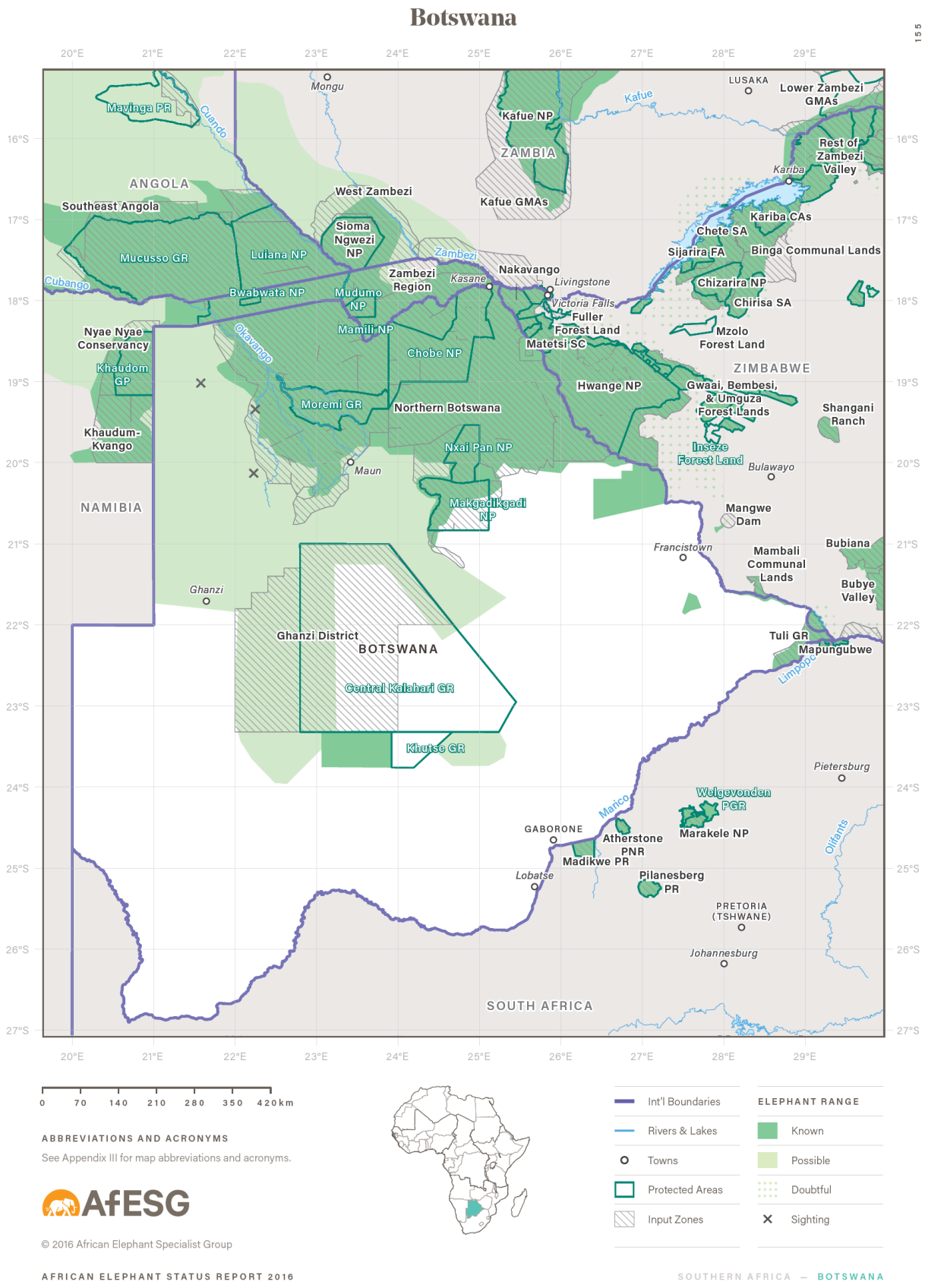
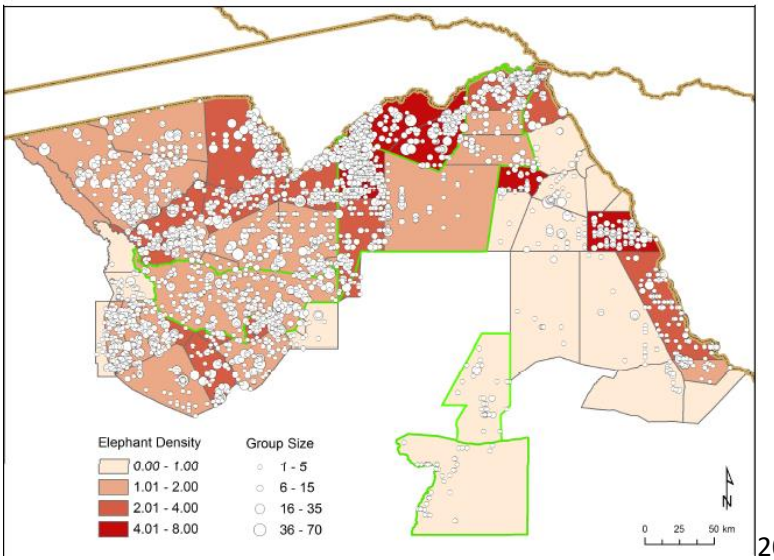


Figure 8.1: African Elephant known (dark green) and possible (light green) range in Botswana From the African Elephant Status Report (Thouless et al., 2016)



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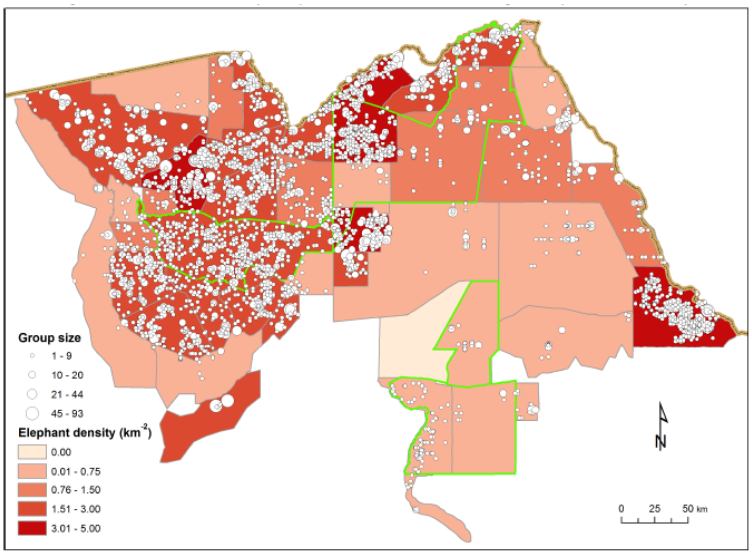

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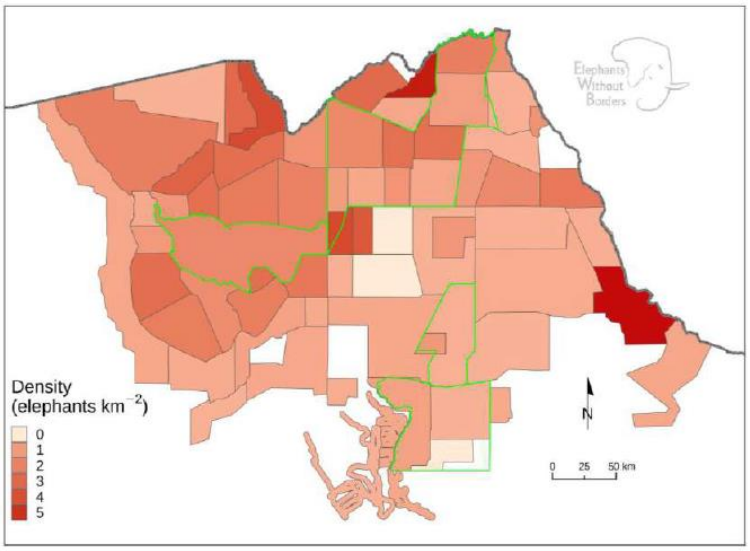

2018

Figure 8.2: Density of elephants in northern Botswana from 2010, 2014 and 2018 dry season aerial surveys conducted by Elephants Without Borders (Chase, 2011, Chase et al., 2015, Chase et al., 2018). Note the density scale and survey coverage changes so comparison of colours across years is not direct.

Hunting has been shown to affect elephant distribution, with elephants avoiding hunting areas at the landscape scale (Selier et al., 2014, Selier et al., 2015). An elephant range expansion into former hunting areas, and beyond, is consistent with these findings, and was supported by community observations (Chapter 7: Social Impacts, Dikobe, 2016). In line with increasing elephant populations, an increase in elephant damage to vegetation was also reported by communities, and signs of elephant tree damage in Ngamiland were extensive (Figure 8.3). Exploring potential elephant-induced changes to vegetation following changes in trophy hunting policy would provide useful insights into some of the unintended consequences of trophy hunting bans. It would also shed light onto some of trophy hunting's impacts on the broader ecosystem.

Figure 8.3. Tree damage by elephants showing them knocking over and tearing down trees (top images) and debarking (bottom images). Damage in the top right picture was caused over just two nights on the outskirts of Ditshiping village

8.2.1 Using remote sensing approaches to explore hunting impacts

Field-based methods have been the dominant mode of collecting data on trophy hunting's ecological impacts, and these studies have shed important insights into some of trophy hunting's impacts on target species (e.g. Caro et al., 1998, Loveridge et al., 2007b, Begg et al., 2018) and, to a lesser extent, the broader environment (Banda et al., 2006). While these studies are valuable, they are time-consuming, and costly to conduct (Pettorelli, 2013, Nkosi et al., 2019). Further, unless past data exists for comparison, impacts can only be studied from the present onwards, limiting the opportunity to explore past decisions and longer term ecosystem changes, or to conduct studies with a quasi-experimental design that explore change over time across hunting and non-hunting areas. Remote sensing approaches can overcome some of these barriers (Pettorelli, 2013, Nkosi et al., 2019), offering a mechanism to explore the potential impacts of trophy hunting on the broader ecosystem over a variety of time frames and areas.

Remote sensing methods have been used to collect evidence to answer a wide range of conservation questions, such as the effects of climate change on ecosystem functioning (Pettorelli et al., 2012), the success of land restoration interventions (Meroni et al., 2017), and extent of land use change in protected areas (Mtui et al., 2017). In Botswana, remote sensing has been used to assess ecological conditions of the Okavango Delta (Ringrose et al., 2003), vegetation degradation (Ringrose et al., 1997), and various wildlife-vegetation interactions, such as habitat suitability (van Bommel et al., 2006, Verlinden and Masogo, 1997) and condition (Hamandawana, 2012). Studies have also used remote sensing to explore the impacts of elephants on vegetation (Robinson et al., 2001, Hamandawana, 2012, Fox et al., 2017). Increasing elephant populations were thought to explain reductions in vegetation condition in Moremi Game Reserve (Hamandawana, 2012), and were found to impact remotely sensed vegetation heterogeneity (Robinson et al., 2001).

This study aims to determine the effects of the 2014-2019 trophy hunting moratorium on the broader ecosystem, using the remotely sensed Normalised Difference Vegetation Index (NDVI), with the assumption that the hunting moratorium impacted elephant distribution which had knock-on impacts on vegetation. We analyse trends in NDVI to explore whether the moratorium impacted vegetation greenness and/or its heterogeneity. I tested two hypotheses:

1) NDVI in hunting areas, and to a lesser extent mixed use areas, would be lower than in photographic areas after the moratorium, due to increased elephant presence and their associated damage to vegetation.
2) Vegetation heterogeneity would be higher in hunting and mixed use areas, due to increased elephant presence caused by the hunting moratorium and associated damage to vegetation.

8.3 Methods

8.3.1 Study Area

This study focuses on Ngamiland District in northern Botswana, which is home to high densities of Botswana's big game species (Winterbach et al., 2014), and covers a large portion of the country's confirmed and potential elephant range (Figure 8.1)(Thouless et al., 2016). The district is estimated to have around 75,000 (±3000) elephants (Chase et al., 2018). The area is highly diverse, with a combination of sandveld, covering much of the south and west area, as well as wetland around the Okavango Delta, and mopane dominated areas (Figure 8.4). The delta floods annually, with its pattern and extent varying considerably each year (between 4,000 km^2 and 13,000km^2), depending on a range of factors including the previous year's conditions, incoming flood waters from the Angolan highlands, and local rainfall (McCarthy et al., 2005, Vanderpost et al., 2015). Most rain falls from November to April (van Bommel et al., 2006), with annual averages ranging from 350mm to 600mm (Kujinga et al., 2014, Basupi et al., 2019). Rainfall is erratic and variable with high evapotranspiration rates (Kujinga et al., 2014). Maximum monthly temperatures range from 22-34°C (Mazvimavi and Mmopelwa, 2006). Summer maximum temperature can reach around 40°C while winter minimum temperatures are around 7°C (Basupi et al., 2019).

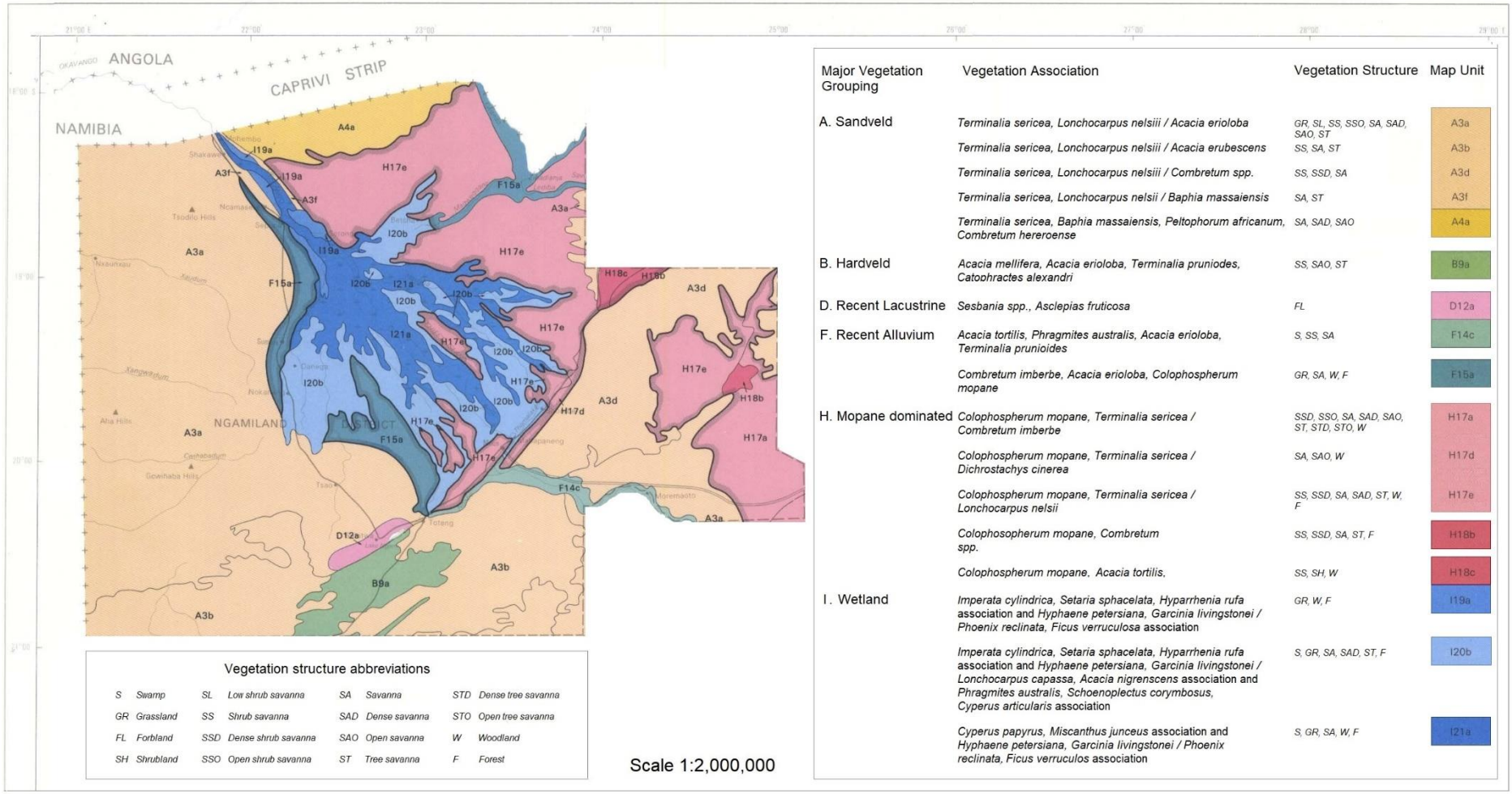

Figure 8.4: Vegetation map of Ngamiland cropped from the Vegetation Map of the Republic of Botswana from the Soil Mapping and Advisory Services Project AG:DP/BOT/85/011, 1991 (Bekker et al., 1991)

Ngamiland is a major tourism destination due to its 'pristine wilderness', abundant wildlife, and the UNESCO World Heritage Site: the Okavango Delta (Vanderpost et al., 2015). Land-use is varied with the district divided into 'Controlled Hunting Areas' (CHAs), determining their land use. There are a range of community and commercial photographic tourism and mixed-use tourism concession areas, as well as farms/ranches, mixed-used pastoral, arable and residential areas, game reserves and national parks (Figure 8.5; Table 8.1).

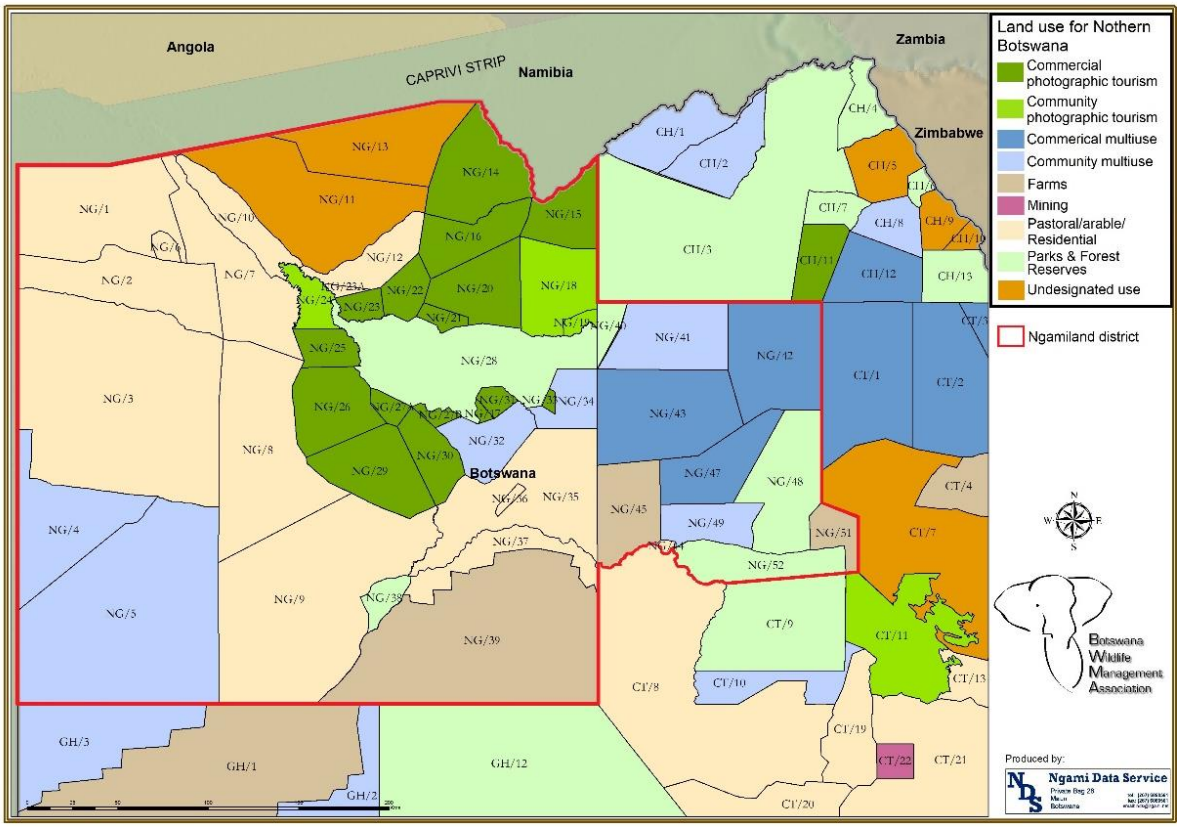

Figure 8.5: Land use in northern Botswana. The red border around concessions beginning with NG shows the Ngamiland District (Botswana Wildlife Management Association, 2011)

Prior to the 2014-2019 hunting moratorium, trophy hunting predominantly took place on commercial and community multiuse concessions. Quotas for a variety of species were set by the Department of Wildlife and National Parks and allocated to CHAs (Barnett and Patterson, 2005, Rozemeijer, 2009). Prior to the moratorium there was a quota for around 200 elephants. Trophy hunting also occurred, on an ad-hoc basis by auction, in mixed-use pastoral, arable and residential, and undesignated areas (BWMA, 2019 pers. comm.). After the hunting moratorium, only photographic tourism was allowed. Trophy hunting of 'plains game' was also permitted on a small number of game ranches in NG/39 (Boast, 2014), and this was not restricted by the 2014-2019 hunting moratorium which only affected tribal and state land.

Table 8.1: Land uses in Controlled Hunting Areas across Ngamiland

Land use	Official designation	Description
Hunting	Commercial multiuse, Community multiuse	Wildlife Management Area designated for tourism use only, with a combination of hunting and photographic tourism permitted
Photographic	Commercial photographic tourism, Community photographic tourism, Parks & Forest Reserves	Wildlife Management Areas designated for tourism, Game Reserves, and National Parks, with only photographic tourism allowed
Mixed Use	Pastoral/arable/residential, Undesignated use, Farms/ranches	A variety of land uses including residential, pastoral and arable land, as well as fenced livestock and game ranches. Trophy hunting took place in these areas on an ad-hoc basis by auction (BWMA, 2019 pers. comm.) and on some game ranches.

8.3.2 Materials used to explore vegetation impacts of the hunting moratorium

The Normalised Difference Vegetation Index (NDVI) is one of the most widely studied and used vegetation indices, used as a measure of vegetation cover, biomass, and net primary productivity, and as an indicator of ecosystem functioning (Pettorelli et al., 2012, Wegmann et al., 2016). It is obtained from the ratio of the amount of red (RED) and near infrared (NIR) light reflected by vegetation and captured by satellite sensors, NDVI = (NIR-RED)/(NIR + RED). Values range from -1 to +1. Green leaves, with higher photosynthetic activity, absorb high-levels of visible light and reflect high levels of near-infrared, producing higher NDVI values close to 1. Unhealthy, older vegetation and non-vegetated areas tend to have values around 0, while negative values usually indicate water, snow or clouds, as these have higher near-infrared absorbance (Pettorelli et al., 2012, Wegmann et al., 2016).

8.3.2.1 Normalised Difference Vegetation Index Data

For this study, pre-processed temporally smoothed eMODIS AQUA NDVI data were obtained from United States Geological Survey (USGS) Earth Resources Observation and Science Centre via the USGS

FEWs NET Data Portal for Southern Africa from 2004-2018. These were 10-day maximum-value composite NDVI images at 250m spatial resolution, which were temporally smoothed to correct for molecular scattering, ozone absorption, and aerosols using MODIS Science Team algorithms (USGS FEWS NET, 2017). The USGS eMODIS NDVI data are stored in a linearly stretched format so final NDVI values were calculated using the following formula: NDVI = (value – 100) / 100 (USGS FEWS NET, 2017). Various measures of NDVI were explored from the 250m resolution images (Table 8.2). NDVI values equal to, or below, zero were excluded as they contain no meaningful information about vegetation. These are typically caused by cloud contamination, water bodies, or missing data (Wegmann et al., 2016).

To explore heterogeneity in NDVI, as well as its overall level, 250m resolution pixels were aggregated to 1km^2 with mean and standard deviation calculated. Data were clipped to Ngamiland District, Botswana, based on boundaries obtained from the Okavango Research Institute GIS Laboratory.

8.3.2.2 Factors affecting NDVI

In addition to the moratorium and land use, the impacts of a range of temporally varying and static factors on NDVI were explored (Table 8.2).

8.3.2.2.1 Varying factors

To account for climate impacts on NDVI, monthly average precipitation, and minimum- and maximum-temperature data were obtained at a spatial resolution of 2.5° (~21km2) from 2000-2009 and 2009-2018 from CRU-TS 4.03 (Harris et al., 2014), downscaled with WorldClim 2.1 (Fick and Hijmans, 2017). To account for the impact of fires, data on monthly burned area was obtained from USGS AppEEARS using the Combined MODIS Burned Area product at 500m resolution MCD64A1.006 from 2004-2018. Data were simplified to presence/absence of fires.

8.3.2.2.2 Static factors

Controlled hunting area boundaries designating hunting, non-hunting, and mixed use areas for Ngamiland were obtained from the Okavango Research Institute GIS Laboratory, along with vector data on roads (lines) and settlements (points). Annual data on roads and settlement extent were not available. Polygons were drawn around all settlements and farmed areas in QGIS to capture their spatial extent using the most recent Google Satellite images for the area (Google Map Satellite, Accessed December 2021). Google Satellite images are composite images at higher resolutions, and available maps varied in when the images were taken ranging from 2013-2018. Despite this variation, these were considered the best available estimates of human impact over the time period studied. Buffers of 100m were added around each settlement to account for the impact that people have on vegetation by way of gathering firewood and building material, and clearing areas for farming and

settlement. Additional roads were also added from the satellite image which were visible at a scale of 1:75,000, and a 100m buffer was added as the potential area of impact around these as roads, mostly from clearing vegetation as a fire break.

To account for the impact of the Okavango delta and rivers on NDVI, data on the extent of surface water was obtained from the Food and Agricultural Organisation of the United Nations Map Catalogue (FAO Map Catalogue, 2009). The shapefile was edited for accuracy based on Google Satellite images, and a 100m buffer was added around rivers to account for changes in river channels and riparian vegetation.

Table 8.2: Measures of NDVI and factors affecting them, which were explored in this analysis, with justification for their use and description of how they are calculated

Name	Calculation	Justification/predicted effect
Response variables		
Mean annual NDVI	Mean calculated across 36 images per year from January-December for 2004-2018 at 250m^2 resolution. Aggregated to 1km^2 by calculating mean of 250m^2 pixels	Widely used metric of NDVI. Mean NDVI expected to be lower in hunting than photographic after the moratorium areas due to increased elephant damage to vegetation
Median dry season NDVI	Median calculated across 15 images per year from May-September for 2004-2018 at 250m^2 resolution. Aggregated to 1km^2 by calculating mean of 250m^2 pixels	Refined NDVI metric, less impacted by extremes, requiring fewer cloud cover corrections, and where trees show greatest contribution to reflectance (Heiskanen et al., 2017). Median NDVI expected to be lower in hunting than photographic areas after the moratorium due to increased elephant damage to vegetation
Std Dev Median NDVI 1 km^2	Standard deviation of median dry season NDVI 250m^2 pixels at 1km^2 resolution	Measure of vegetation heterogeneity at same spatial scale as median NDVI. Heterogeneity expected to increase in hunting areas after the moratorium due to increased elephant presence
Std Dev Median NDVI 15 km^2	Standard deviation of median dry season NDVI 250m pixels at 15km^2 resolution	Measure of vegetation heterogeneity at larger scale of the final analysis (15km^2). Heterogeneity expected to increase in hunting areas after the moratorium due to increased elephant presence
Climate variables		
Rainfall (annual)	Mean rainfall calculated across 12 images from Jan-Dec for mean annual NDVI, and from Oct-Sept for median dry season NDVI at 2.5°	Rainfall known to have positive impact on NDVI (Kalisa et al., 2019, Yang et al., 2019)

Tmax (annual)	Mean maximum temperature calculated across 12 images from Jan-Dec for mean annual NDVI, and from Oct-Sept for median dry season NDVI at 2.5°	Negative correlation between NDVI and temperature (Yang et al., 2019)
Tmin (annual)	Mean minimum temperature calculated across 12 images from Jan-Dec for mean annual NDVI, and from Oct-Sept for median dry season NDVI at 2.5°	Negative correlation between NDVI and temperature (Yang et al., 2019)
Geography variables		
Settlements	Polygons around all settlements and farmed areas in Ngamiland	Human settlement and disturbance expected to have negative impact on NDVI
Roads	Lines shapefile of large roads in Ngamiland likely to be used for regular transport	Road clearance and access to firewood expected to have negative impact on NDVI
Delta and rivers	Polygons around the delta and lines along rivers with a 100m buffer	Delta and rivers expected to have positive impact on NDVI
Burnt area	Binary data on whether or not the pixel had any burned area, based on sum calculated across 12 images from Oct previous year -Sept year of assessment for median dry season NDVI at 500m resolution	Fires have a negative impact on woody vegetation (Fox et al., 2017)

8.3.3 Modelling framework

The impacts of the hunting moratorium on NDVI across different land use types was explored using Generalized Linear Mixed Effects Models with a Gaussian error structure. All models were fitted using the package 'lme4' (Bates et al., 2015) in R version 4.1.1 (R Core Team 2021). Pixels were 'sampled' using a 15km grid, extracting single pixels at each grid node to address processing limitations (the dataset was too large to run the analysis on the available computer hardware) and issues of spatial autocorrelation when using the full dataset (detected in model residuals by calculating Moran's I (Dormann et al., 2007) using the package 'moranfast' (mcooper, 2020)). This reduced the dataset from 1,541,985 datapoints to 6975.

Modelling followed a 'before-after and control-impact' design, exploring NDVI before (2004-2013) and after (2014-2018) the moratorium across hunting, photographic, and mixed use land uses. By exploring the interaction of the moratorium and land-use, I tested the hypothesis that NDVI in hunting areas, and to a lesser extent mixed use areas, would be lower than in photographic areas after the moratorium, due to increased elephant presence and their damage to vegetation. I also tested the

hypothesis that vegetation heterogeneity would be higher in hunting and mixed use areas, due to changes in elephant distribution caused by the hunting moratorium.

Four NDVI measures were explored as response variables, while climate and geography variables, the moratorium, and land use were fitted as fixed effects (Table 8.2). Climate variables were fitted as continuous variables, and were scaled to improve model fit (Schielzeth, 2010). The moratorium and burned areas were fitted as binary variables. The rest of the geography variables, were expressed as the proportion of $1km^2$ pixels containing the feature of interest, e.g. settlement, roads or the delta. As data were temporally and spatially replicated, with multiple NDVI measures for the same pixel across the time series (2004-2018), and with pixels nested within controlled hunting areas, models were fitted with pixel ID, controlled hunting areas, and year as random effects. Model selection was performed using Akaike Information Criterion (Burnham and Anderson, 2004). The package 'ggpredict' was used to extract probabilities, and their uncertainty, from the GLMMs for plots to show effect sizes (Lüdecke, 2018).

8.4 Results

8.4.1 Trends in vegetation greenness

Average NDVI for Ngamiland District was around 0.344 ± 0.01 (p= 0.00) (Table 8.3), which is typical of areas with sparser vegetation, such as sandveld, which covers much of Ngamiland (Figure 8.4).

Table 8.3: Estimates of the best model explaining median dry season NDVI in Ngamiland

	Estimate	**s.e.m.**	***d.f.***	***t***	***P***
Intercept	0.344	0.013	60	27.40	< 0.001
After moratorium	0.024	0.010	15	2.28	0.038
Land use: hunting	-0.036	0.019	38	-1.92	0.063
Land use: mixed	-0.020	0.016	40	-1.26	0.215
Settlements	-0.045	0.016	368	-2.76	0.006
Roads	0.021	0.024	367	0.89	0.374
Delta	0.028	0.006	409	4.74	< 0.001
Fire	-0.004	0.001	6493	-3.32	0.001
Rainfall	-0.002	0.001	6355	-1.95	0.052
Maximum temperature	-0.029	0.003	1591	-11.46	< 0.001
Minimum temperature	0.037	0.003	1584	12.60	< 0.001
Hunting areas after moratorium	0.013	0.002	6467	6.33	< 0.001
Mixed land use areas after moratorium	0.011	0.002	6440	6.31	< 0.001
Random Effects					
Pixel	0.03				
Controlled Hunting Area	0.04				
Year	0.02				
Residual	0.03				
Marginal/conditional R^2	0.32/0.87				

Climate variables were scaled for better comparison. Variation and standard deviation of the random effects of the controlled hunting area, pixel, and year are shown. Marginal R^2 (variation explained by fixed effects) and conditional R^2 (fixed and random effects) are also given.

A range of factors were found to impact median dry season NDVI; the model including an interaction between land use and the hunting moratorium, and all climate and geographic factors performed best (Table 8.4).

Table 8.4: Comparison of Akaike weights of models including different factors used to explain median dry season NDVI in Ngamiland

Model	Model parameters	AIC	Delta AIC	*Log likelihood*
Full model with moratorium and land use interaction	17	-28454.05	0.00	14244.07
Moratorium, climate and geography	13	-28409.8	44.30	14217.91
Climate and geography	12	-28404	50.07	14214.01
Land use, climate and geography	14	-28402.7	51.38	14215.37
Climate only	8	-28370.6	83.50	14193.29
Geography only	9	-28233.4	220.63	14125.72

Overall, dry season vegetation was slightly greener on average after the moratorium (β = 0.024, S.E. 0.010, p= 0.04, Table 8.3), but this trend was more pronounced in mixed use and hunting areas than photographic areas (hunting areas after the moratorium: β = 0.013, S.E. = 0.002, p = 0.00, and mixed use areas after moratorium: β = 0.011, S.E. 0.002, p = 0.00, Table 8.3, Figure 8.6). The Okavango Delta, and higher minimum temperatures, both had slight positive effects on NDVI, while settlements, fires, and higher maximum temperatures negatively impacted greenness (Table 8.3). Similar trends were observed for mean annual NDVI (Appendix 4).

Though statistical significance was found in the interaction between the moratorium and land use, the differences in effect sizes are very small with wide overlapping confidence intervals (Figure 8.6). There was no indication that vegetation greenness in former hunting areas had been adversely affected by the moratorium with a slightly positive impact on vegetation greenness observed in hunting and mixed use areas.

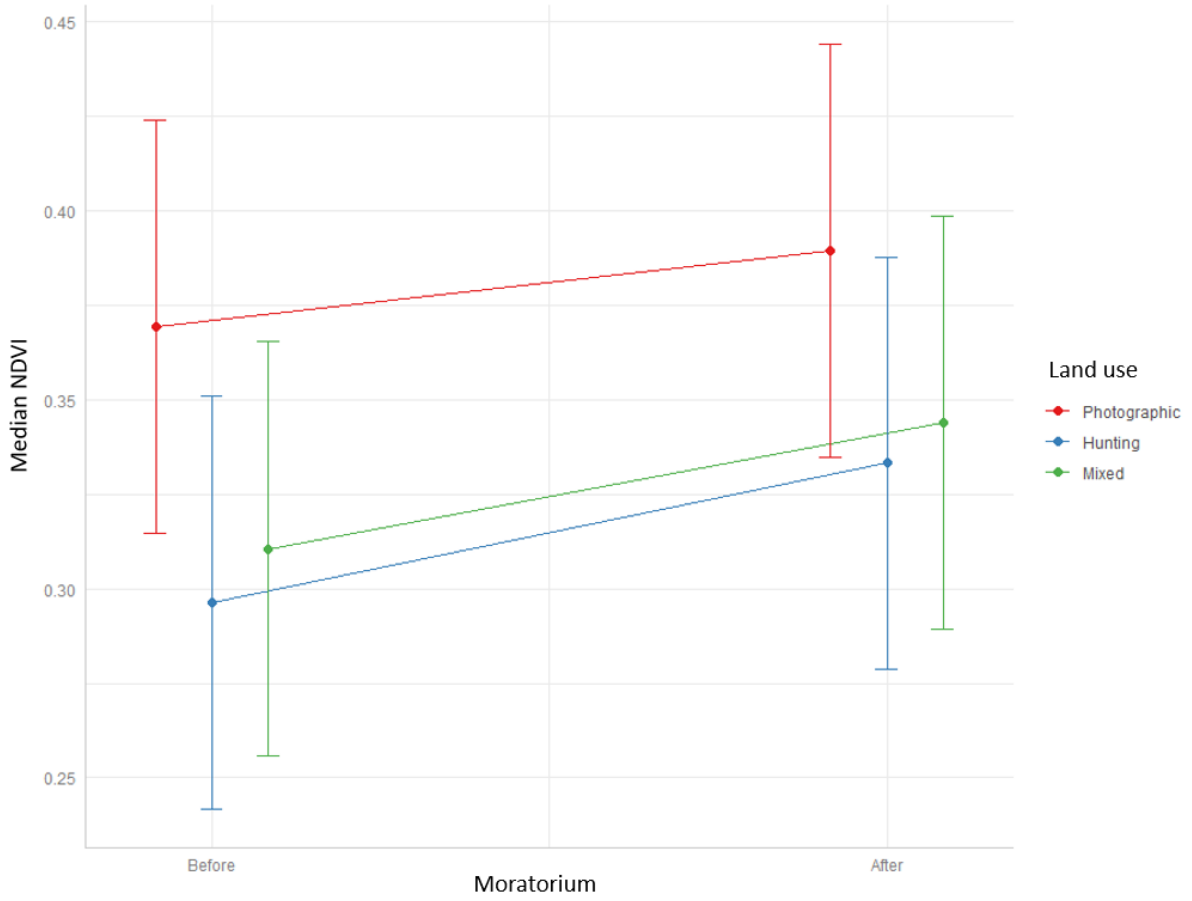

Figure 8.6: Differences in median dry season NDVI before and after the moratorium across different land uses

8.4.2 Trends in the heterogeneity of vegetation greenness

Vegetation heterogeneity was also best explained by a model with an interaction between land use and the moratorium, and all climate and geography variables (Table 8.5). However, the fit of the model was not strong with residuals displaying non-normal characteristics, and slightly heterogenous variance (Appendix 4), suggesting other factors need to be examined to improve model fit. This was true for heterogeneity over 1km and 15km (1km results in Appendix 4).

Table 8.5: Comparison of Akaike weights of models including different factors used to explain standard deviation in median NDVI across 15km.

Model	Model parameters	AIC	Delta AIC	*Log likelihood*
Full model with moratorium and land use interaction	17	-47727.8	0	23880.9
Moratorium, climate and geography	13	-47679.3	48.5	23852.7
Climate and geography	12	-47676.6	51.2	23850.3
Land use, climate and geography	14	-47676	51.8	23852
Climate only	9	-47636.1	91.7	23827.1
Geography only	8	-47597.9	129.9	23806.9

The Okavango Delta had the largest effect, increasing vegetation heterogeneity (Table 8.6). Heterogeneity was also slightly higher in photographic areas than in hunting areas, though it increased significantly more in hunting and mixed use areas after the moratorium (hunting areas after the moratorium: β = 0.004, S.E. = 0.001, p = 0.00, and mixed use areas after moratorium: β = 0.003, S.E. 0.001, p = 0.00, Figure 8.7, Table 8.6). Rainfall also had a small significant positive effect while maximum temperature had a small negative impact.

Table 8.6: Estimates of the best model explaining standard deviation of 250m resolution pixels of median NDVI across 15k in Ngamiland

	Estimate	**s.e.m.**	***d.f.***	***t***	***P***
Intercept	0.040	0.003	64	13.50	< 0.01
After moratorium	0.001	0.001	16	0.40	0.70
Land use: hunting	-0.010	0.005	43	-2.12	0.04
Land use: mixed	-0.003	0.004	45	-0.85	0.40
Delta	0.017	0.002	484	9.53	< 0.01
Fire	0.000	0.000	6546	1.38	0.17
Settlements	-0.002	0.005	419	-0.31	0.75
Roads	0.012	0.007	418	1.59	0.11
Rainfall	0.001	0.000	2452	2.08	0.04
Maximum temperature	-0.002	0.001	2057	-2.40	0.02
Minimum temperature	0.004	0.001	819	5.34	< 0.01
Hunting areas after moratorium	0.004	0.001	6541	6.67	< 0.01
Mixed land use areas after moratorium	0.003	0.000	6519	6.40	< 0.01
Random Effects					
Pixel	0.010				
Controlled Hunting Area	0.011				
Year	0.002				
Residual	0.007				
Marginal/conditional R^2	0.26/0.86				

Climate variables were scaled for better comparison. Variation and standard deviation of the random effects of the controlled hunting area, pixel, and year are shown. Marginal R^2 (variation explained by fixed effects) and conditional R^2 (fixed and random effects) are also given.

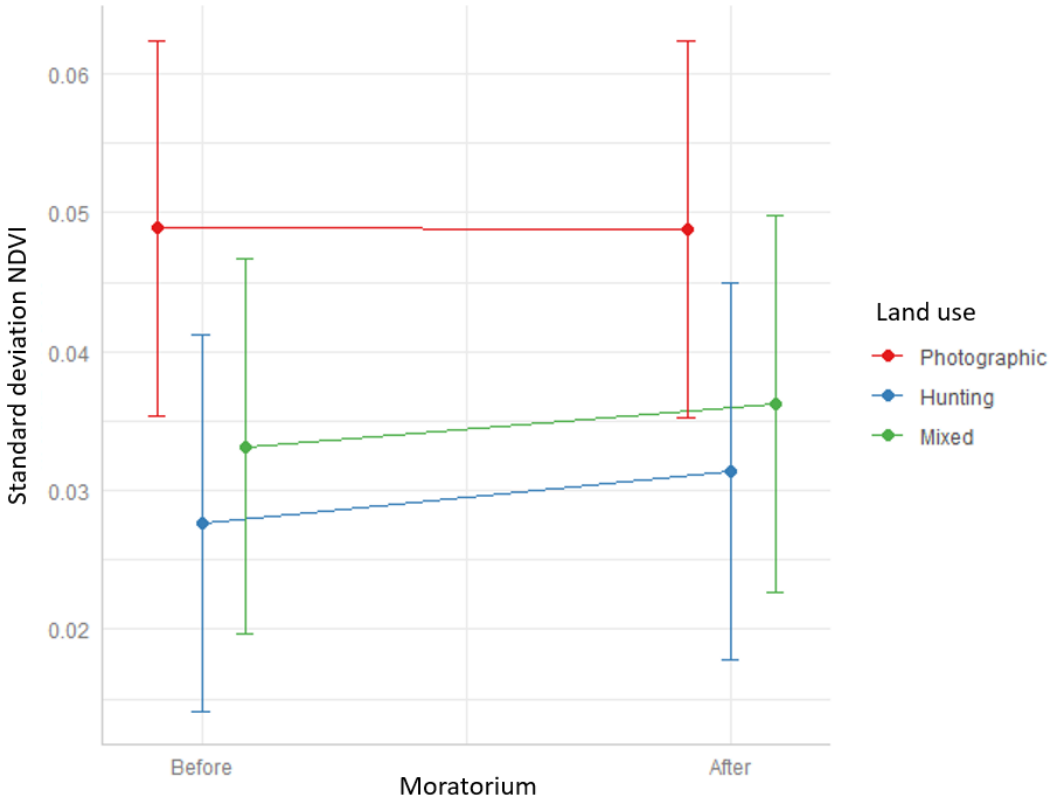

Figure 8.7: Differences in standard deviation of NDVI across 15km^2 before and after the moratorium across different land uses

8.5 Discussion

Overall, the analysis suggests the trophy hunting moratorium had a slight positive effect on vegetation greenness and increased vegetation heterogeneity in hunting and mixed-use areas in Ngamiland using NDVI at a resolution of 250m. However, the effect sizes were very small with large and overlapping confidence intervals. These results contradict the hypothesis that the moratorium might have had a negative impact on vegetation greenness but support the hypothesis that the moratorium might have led to an increase in vegetation heterogeneity.

Studies on the impacts that elephants have on their environments report mixed results, with findings being impacted by a range of factors including elephant densities and the ecosystems they occur in (Guldemond and Van Aarde, 2008). Where elephant densities are high, for example where they congregate along riverfronts or where fences artificially restrain their distribution, they have a largely negative impact on vegetation (e.g. Ben-Sahar, 1998, Ihwagi et al., 2010). However, where elephant densities are low they have been found to lead to both negative and positive vegetation responses (Guldemond and Van Aarde, 2008). While increased tree damage was visible to communities and the reported increase was attributed to changes in elephant distribution, at the landscape scale, results suggest this may have been associated with an increase rather than decrease in vegetation greenness. There are several possible explanations for these results.

Elephant browsing does not necessarily kill trees and can result in coppicing, with only secondary growth inhibited, and a change in tree structure and abundance (Hamandawana, 2012, Guldemon et al., 2017). Further, while elephant tree damage may have increased, other plant species, less prone to herbivory, may have replaced them. Both of these may have resulted in the slight increase seen in hunting and mixed areas after the moratorium, as well as the observed increase in vegetation heterogeneity (Skarpe et al., 2004, Hamandawana, 2012). For example, browsing by increased elephant populations was thought to be an explanation for the increase in mixed bush seen in Moremi Game Reserve in the 1990s (Hamandawana, 2012). As mature trees were damaged by debarking, and being knocked over, the vegetation was succeeded by bushy shrubs. This resulted in an increase in overall greenness, but a degradation of ecological condition towards less palatable species, reducing the ecosystems' ability to support wildlife (Hamandawana, 2012). High resolution images would help to determine the nature of succession in vegetation. Further research, using a wider range of remote sensing products, such as land cover change (Fox et al., 2017), in combination with ground-truthing, would be needed to gain a better understanding of elephant's impact on vegetation greenness and its interplay with vegetation structure.

Further understanding may be gained by examining the effects at different spatial scales and in conjunction with elephant densities which could not be obtained at the spatial granularity required this study. Past studies on elephant impacts on vegetation have focussed on areas around water sources, where elephants congregate in the dry season and are found in high densities (Robinson et al., 2001, Skarpe et al., 2004). Robinson et al. (2001), using images with pixels at 660m, found increased vegetation texture around water sources where elephants concentrate. They attributed this increase to the highly variable, and irregular, patterns of elephant induced vegetation-damage. Across larger landscapes, where elephants distribution are more dispersed and they are found at lower densities, their impact on vegetation may be more variable, particularly across larger spatial scales (Guldemond and Van Aarde, 2008). While damage to individual trees may occur, it may be too diffuse to be picked up at the scale of this analysis and may be outweighed by other elephant-induced changes in vegetation that result in an increase in greenness. Exploring NDVI at higher resolutions may produce results that are better able to capture the more subtle changes of diffuse elephant damage and its effects on vegetation greenness. Examination of higher resolution images, alongside elephant densities and in conjunction with ground-truthing, will help to determine the relationship between elephant density, vegetation greenness, plant diversity, and structure. Clear damage to a variety of trees was visible during fieldwork in and around both case study villages, and in the wider areas. However, without the combination of ground observations, and up to date aerial photographs and images, it is difficult to understand how this observed damage might present in NDVI.

As far as I know, this is the first study that attempts to use remote sensing data to explore the impacts of trophy hunting. This method highlights the potential of using remote sensing products, in a BACI framework, to explore impacts of trophy hunting on the broader ecosystem, and serves as a first step for future research. In data poor situations, particularly over large and remote areas where fieldwork may not be possible, measuring and monitoring biodiversity can be challenging (Vanderpost et al., 2015). Remote sensing offers a range of opportunities to overcome some of these barriers. NDVI is a simple yet powerful tool which can be used to assess spatial, and temporal, changes in vegetation dynamics, distribution, and productivity, and is being increasingly applied to a wide range of conservation research (Pettorelli, 2013). Due to the complexity of the vegetation, particularly around the Okavango delta, high resolution hyperspectral images might be better suited to create land classifications for the area (McCarthy et al., 2005), and could be used to examine the impacts of land management strategies in future. Exploring land cover change and NDVI at finer spatial resolutions in conjunction with elephant densities would be key next steps in this work.

Exploration of elephant-vegetation dynamics could be further enhanced through methods being developed to examine elephant populations using remote sensing methods (Duporge et al., 2021). The size of the Botswana elephant population, and its range, is highly contentious (Thouless et al., 2016). Population estimates since 2006 have varied substantially, with interpretability of trends hampered by inconsistent survey methodology (Thouless et al., 2016). The two most recent surveys, conducted using consistent methodology in the 2014 and 2018 dry season, suggest the population is stable (Chase et al., 2015, Chase et al., 2018). The use of satellite images and deep learning to estimate elephant populations would help to verify estimates collected using other methods. Further, such methods would enable better monitoring of the species, which would be of great management significance, particularly for regulating hunting, for example, quota setting. Improved and spatially resolved estimates of elephants would also allow for better exploration of elephant impacts on the broader ecosystem, and the management decisions that might affect them, such as elephant trophy hunting.

Beyond elephant impacts on vegetation, remote sensing approaches could be useful in understanding how trophy hunting helps to conserve ecosystems. Trophy hunting is often thought to protect areas from habitat conversion, but this claim is poorly evidenced (Chapter 4). In Botswana, habitat conversion seems to have been limited as most of the land used for hunting was leased by Tribal Land Boards/ the Government to communities, and commercial operators, with restrictions on the type of use allowed: tourism only. However, in countries or areas where this is not the case, remote sensing methods could be used to track the state of land conversions from hunting to other land uses, or vice versa. Remotely sensed vegetation classifications, and examinations of ecological condition in hunting

areas over time or following changes in management, would also be useful mechanisms of exploring trophy hunting's impacts on the broader environment. Overall, developing relevant remotely-sensed metrics of ecological condition represents an important tool for monitoring, not only the impacts of trophy hunting on the broader ecosystems, but also other conservation management and policy decisions.

9 Discussion

In this thesis, I set out to explore what is known about, and add to the understanding of, how trophy hunting contributes to just, and sustainable, conservation in sub-Saharan Africa. In the context of increasingly vocal, emotive, and often mis-informed international calls to put an end to the practice globally (Hart et al., 2020), as well as growing debate amongst the academic community on its efficacy and suitability (Dickman et al., 2019, Batavia et al., 2019a, Horowitz, 2019), examining and filling gaps in the existing evidence of trophy hunting's impacts in a systematic and objective format, that might aid policy decisions on the subject, is necessary and timely. Important too is the need to explore and emphasize perspectives of local communities, who have historically been most marginalised from, yet most impacted by, conservation decisions (Colchester, 2004, Adams and Hutton, 2007). At a time of ongoing, and accelerating, biodiversity loss and land surface alteration (IPBES, 2019), restricting or omitting a potentially useful tool in conservation's arsenal (Lindsey et al., 2007), should not be a decision that is entered into lightly. It is also one with profound equity trade-offs for the stakeholders involved which requires careful, explicit, and inclusive consideration (Chan and Satterfield, 2007, Law et al., 2018, Raymond et al., 2022).

I start by summarising the key findings of this thesis, and highlighting research gaps for future research. I then move to discuss the efficacy of trophy hunting as a conservation tool, situating issues around trophy hunting within broader considerations of the need to improve equity in conservation, to ultimately help ensure outcomes are more just and sustainable. I conclude by discussing how to proceed with decisions on trophy hunting's future.

9.1 Key findings

9.1.1 Evidence syntheses on trophy hunting

Conservation has long been criticised as a discipline where decisions are based more on anecdote than on systematically gathered and appraised evidence (Sutherland et al., 2004). For trophy hunting, transparent and objective appraisal of the evidence is perhaps even more critical, as the issue is hotly debated, and contrasting practical examples of outcomes are widely reported and used to justify points of view (Buckley and Mossaz, 2015). The systematic map (Chapter 4) and narrative review (Chapter 5) address this gap, and add to the understanding of where and how evidence on hunting outcomes is available, what the evidence shows, and the conditions needed for trophy hunting to contribute to conservation. This exercise comprises the first systematic evidence synthesis on trophy hunting in Africa, the first synthesis on trophy hunting's social impacts, and the first which links

outcomes to factors which affect them. The chapters also highlighted research gaps in some of the key assumptions of how trophy hunting is understood to deliver conservation outcomes.

In the systematic map of the evidence, I found that many countries in Africa are lacking evaluation on the extent, and impacts of, trophy hunting activities. Addressing these gaps is vital to improve the accuracy, and continent-wide relevance, of the evidence-base for decisions. West and Central African countries are most in need of research attention, both in the form of primary research, and multi-lingual evidence synthesis, as English reviews may be missing existing evidence in other languages (Amano et al., 2016, Amano et al., 2021). Even in countries with more evidence, gaps in understanding of particular social, ecological, or economic outcomes still exist. In the review, I found that while trophy hunting can generate positive outcomes to communities, equity issues such as inadequate devolution of rights and responsibility, limited community participation, and unequal distribution of costs and benefits, hamper their extent in most countries. Trophy hunting's ecological impacts meanwhile, are varied within and between countries and species, with outcomes affected by quota setting, wildlife regulations, and effective enforcement.

In both the review and the map, I highlight key gaps in our understanding of whether trophy hunting contributes to just, and sustainable, conservation in Africa. Studies on the social impacts of trophy hunting, that explore multiple dimensions of well-being at the household and individual level, are absent for most countries, limiting understanding of the industry's long-term sustainability (Woodhouse et al., 2015, Woodhouse et al., 2017). More attention is needed to understand the link between changed attitudes towards wildlife and conservation brought about by trophy hunting's outputs, and the desired behaviour changes which foster improved co-existence. While changes in attitudes are reasonably well evidenced, whether these changes influence behaviour is under-researched for trophy hunting, as with many conservation interventions (Veríssimo, 2013). Finally, studies on trophy hunting's impacts on the broader ecosystem, and non-hunted species, are sorely needed to improve understanding of whether the activity achieves conservation goals (Di Minin et al., 2021). Research to fill these gaps ideally needs to be conducted using robust designs where confounding factors are accounted for, direct and indirect impacts can be determined, and causal effects can be attributed (Baylis et al., 2016). Complementing this, ethnographic work which helps to understand the differential impacts of trophy hunting within communities, and the mechanisms behind these impacts, will also improve the evidence-base for future decisions (Adams and Sandbrook, 2013, Woodhouse et al., 2015).

While the systematic map and review in this thesis, along with other reviews (e.g. Lindsey et al., 2007, Leader-Williams, 2009, Di Minin et al., 2021), may help to inform policy-making on trophy hunting in

Africa, it is important to note that policy-making is a complex process, relying on evidence, as well as a range of other considerations (Adams and Sandbrook, 2013, Batavia et al., 2019a). The evidence on trophy hunting found for this study may not be transferable to other areas in which it takes place, in evidence-poor countries in Africa and across the world. Evidence also takes various forms, with local input into decision-making being increasingly recognised as important for efficacy, endurance, and validity of conservation decisions (Lute et al., 2020). The nature of traditional systematic reviews, which are centred on web-based searches, rarely make use of different types of information, such as traditional, local, or indigenous knowledge (Adams and Sandbrook, 2013). This can limit the extent to which they provide accurate syntheses of situations from those perspectives. The syntheses in chapters 4 and 5 are no exceptions. Being a lone PhD student, the time and scope to source, and examine, other forms of evidence was not possible. However, the broad nature of the map and review, the use of published and grey literature, and the inclusion of studies on local attitudes and views, has allowed some local perceptions to be considered. In the thesis more broadly, in depth exploration of local perspectives in Chapter 7 also goes some way to address this shortfall. Syntheses, such as these, also remain valuable, as it is a combination of science, local knowledge, and participatory decision-making, that lead to the most sustainable strategies (Lute et al., 2020).

9.1.2 Trophy hunting and CBNRM in Botswana

The 2014-2019 hunting moratorium in Botswana presented a valuable opportunity to explore some of the impacts, not only of trophy hunting, but also what happens when it is stopped, offering a glimpse into the potential effects of widespread trophy hunting bans. Through the Botswana case study in chapters 6-8, I explored some of trophy hunting's social and ecological impacts, and the context under which they came about. In addition to improving the understanding of the impacts of hunting bans, I also hoped to address some of the gaps identified by the systematic map and review: the local multi-dimensional well-being effects of trophy hunting, and the impacts that trophy hunting can have on the broader ecosystem. I also demonstrate the importance of considering the broader historical, social, and political processes that shape outcomes of conservation decision-making.

Conservation interventions and decisions around natural resource use and access take place within complex socio-ecological systems. As such, the contexts in which decisions are implemented have substantial effects on how they are received, and their outcomes (Adams and Hutton, 2007, Robbins, 2012). In Chapter 6, I explore the political ecology of trophy hunting and CBNRM in Botswana, and the affects this had on how people in Ditshiping and Phuduhudu were impacted by the hunting moratorium. While the ability to convert to photographic tourism played a role in the differences in community impacts, historical differences in how the San and Bayei people were impacted by the dominant Tswana people, their physical settings, and the local and national politics which interacted

at different scales to constrain and shape CBNRM in the country, all influenced how the two communities engaged with CBNRM, and the trophy hunting industry. Exploring these contextual factors, enabled a deeper understanding of how the hunting moratorium's effects rippled through the two villages.

The impacts of conservation interventions are often unevenly felt across the local communities they involve (Peterson, 2015, Oldekop et al., 2016), and increasing attention is being directed towards understanding, and addressing these, and other issues of equity in conservation (McDermott et al., 2013, Schreckenberg et al., 2016, Franks and Pinto, 2021). In Chapter 7, I demonstrate the varied, substantial, and predominantly negative impacts that the hunting moratorium had on multiple dimensions of well-being in Phuduhudu and Ditshiping villages. I show, that despite expansion into photographic tourism in Ditshiping, which improved economic well-being of some individuals and households, material, security, health, and subjective well-being for many more people suffered, predominantly as a result of increased wildlife interactions, which residents attributed to the moratorium. In Phuduhudu meanwhile, though relatively few households were directly negatively impacted economically or materially by a loss of jobs and a loss of community income, the moratorium had substantial negative effects across a range of well-being dimensions, with the most vulnerable, and those most dependent on natural resources, being hardest hit. The comparison between Phuduhudu and Ditshiping allowed for a glimpse into what might happen if trophy hunting is banned globally, and the extent to which converting to alternatives may ameliorate the impacts of such a move. The differences between household and community level wins and losses need to be considered, as do the possibility of unexpected outcomes, such as the increases in human wildlife conflict documented in this study.

The impacts that trophy hunting has on the broader ecosystems and landscapes in Africa in which it takes place is not as rigorously evidenced as its impacts on species populations', ecology, and behaviour (Chapter 4 & 5; Di Minin et al., 2021). While field-based studies have been the dominant mode of collecting evidence on ecological impacts, in Chapter 8 I demonstrate the potential for using remote sensing products to explore how trophy hunting might be affecting ecosystems. In the first study to explore trophy hunting impacts using remote sensing products, I use remotely sensed NDVI to examine differences in vegetation greenness in Ngamiland's hunting and non-hunting areas before and after Botswana's hunting moratorium. The findings suggest a slight positive impact on vegetation greenness and an increase in vegetation heterogeneity that may be linked to elephants' increased presence in hunting and mixed-use areas after the moratorium. The use of remote sensing products in a Before-After and Control-Impact study design offers an under-utilised avenue for exploring, and evidencing, trophy hunting's impacts on ecosystems and land use. These methods, in conjunction with

field, and community-based monitoring or wildlife and vegetation (e.g. Stuart-Hill et al., 2005), would greatly improve understanding the impacts of wildlife management interventions like trophy hunting.

9.2 Trophy hunting's efficacy and evidence

Evidence on trophy hunting shows that it can deliver positive social and ecological outcomes (e.g. Bandyopadhyay et al., 2004, Banda et al., 2006, Bandyopadhyay and Tembo, 2010, MET/NACSO, 2018). That this does not happen everywhere points to problems in its implementation, and the contexts in which it takes place, rather than the concept itself (Nelson et al., 2013). Governance and equity issues restrict or enhance the positive social and ecological outcomes of a range of conservation interventions, including community conservation (Brooks et al., 2013, Brooks, 2017), protected areas (Oldekop et al., 2016), and human wildlife coexistence (Durant et al., 2022). Trophy hunting is no exception, suggesting that in cases where it is not contributing to socially-just conservation, restricting the activity will not necessarily improve outcomes, unless equity in community involvement is addressed, and broader changes to the governance systems are made.

Trophy hunting also makes significant contributions to the total area of land under some sort of wildlife management, with nearly 1.4 million km^2 used for trophy hunting in Africa (Appendix 1.2, (Di Minin et al., 2021)). The current extent of protected areas alone is not sufficient to halt or reverse the rate of global biodiversity loss (Mora and Sale, 2011), nor are they necessarily the most desirable mechanisms to achieve conservation, with notable impacts on the well-being of local people (Brockington and Wilkie, 2015, Oldekop et al., 2016). Indeed, there are plans for increasing the total land area under some sort of protection to address the dual threats of climate change and biodiversity loss (Dinerstein et al., 2019, Roberts et al., 2020, CBD, 2021), though how, and whether, this should be achieved is hotly debated (Büscher and Fletcher, 2019, Agrawal et al., 2021, Waldron et al., 2020, Raymond et al., 2022). In addition, the current protected area estate is already drastically under-resourced, undermining its effectiveness in achieving conservation goals (Lindsey et al., 2016, Coad et al., 2019). Without trophy hunting, the area of land under some form of protection, and the amount of funding for the protected area estate, may well decline rather than increase. The case of Phuduhudu demonstrates that photographic tourism is not viable everywhere (Lindsey et al., 2006, Winterbach et al., 2015), and shows the negative well-being effects that removing hunting, without viable alternatives, can have. The case of Ditshiping meanwhile, shows that even where viable financial alternatives are found, local well-being may be negatively impacted, and a restriction of trophy hunting may be unpopular.

While many positive outcomes of trophy hunting might be equally achieved through photographic tourism, if the appropriate governance systems are in place, I demonstrate through the Ditshiping

case study that this is not always the case. The animal control element of trophy hunting is under-represented in debates on its merits, yet proved one of the most critical ways the hunting moratorium was perceived to be impacting communities in Botswana. It has also been identified by communities as a benefit of trophy hunting in Namibia (Angula et al., 2018, Störmer et al., 2019). There has been some research on the possibility of focussing trophy hunting on problem animals to relieve HWC (Treves and Naughton-Treves, 2005, Lindsey et al., 2006). This found the idea problematic because of difficulties matching hunting effort to conflict in space and time, and because problem animals are not often ideal trophies (Loveridge et al., 2009). However, other aspects of the trophy hunting and HWC link have received less attention. Treves and Naughton-Treves (2005) explored lethal control mechanisms of addressing HWC and highlighted its potential to reduce threats to lives and livelihoods, and placate local citizens. While they did not explore trophy hunting's impacts on HWC specifically, they did call for these potential benefits of lethal control mechanisms to be rigorously evaluated. This has not happened for trophy hunting beyond direct problem animal control.

This study suggests that trophy hunting's control over the distribution of animals and contribution to reducing real, or perceived, levels of HWC, could be an important and over-looked benefit of trophy hunting, which cannot be replaced by a move to photographic tourism. While I was unable to conduct a broader survey which would have also explored the moratorium's impacts in non-CBNRM villages, there were wide-spread reports of increased HWC, and addressing high levels of HWC was ultimately given as the main reason to lift the moratorium (Somerville, 2018, Africa Geographic, 2019, Blackie, 2019). How wide-spread this experience may be warrants further research. It may have been that Botswana is unique in this effect, due to its substantial elephant population. However, the local perception that trophy hunting helps to control HWC seems to be more wide-spread (Angula et al., 2018, Störmer et al., 2019), and has important implications for engagement in conservation and subjective well-being (Bennett, 2016). Further research examining the real world, and perceived, role that trophy hunting plays in controlling animal distribution, and subsequently levels of HWC, is urgently needed, particularly in light of the growing calls to ban the practice.

9.3 Improving conservation governance and equity in Botswana and beyond

Improving equity in Botswana's CBNRM programme is essential for the country to achieve conservation that delivers benefits to local people, and empowers them to look after and manage their local environments sustainably. The recentralization of CBNRM since the 2007 policy, followed by the removal of control over leases, and the trophy hunting moratorium, all demonstrate the limited recognition and participation the Government of Botswana affords its rural communities. Improvements in all areas of equity in Botswana, and elsewhere, are clearly needed for fundamental

reasons: it is the right, fair and moral thing to do (Chan and Satterfield, 2007), and to ensure improved ecological and social outcomes (Law et al., 2018).

While the Botswana hunting moratorium was lifted in 2019 to address issues of HWC, the Covid-19 pandemic put a hold on it delivering any respite to local communities. It also highlighted the precarious nature of tourism-dependent conservation in Botswana, and the rest of the African continent (Lindsey et al., 2020). The pandemic should offer a wake up call to move beyond CBNRM as a means of compensating communities for the costs of living with wildlife (Dressler et al., 2010), to being a mechanism through which communities are empowered to become true custodians, stewards (Bennett et al., 2018, Cassidy, 2021) and shareholders of their local wildlife and environments (Zahia et al., 2019). It should be used as turning point to re-evaluate and broaden the goals of CBNRM, and other conservation initiatives, from largely market-based mechanisms (Fletcher et al., 2016, Davis and Goldman, 2019), and see equity as a goal in conservation, as well as a crucial process for achieving it (Dawson et al., 2018).

9.4 A spotlight on equity for decisions on trophy hunting's future

Trophy hunting has long been one of conservation's most contentious topics (Pacelle, 1998), yet in recent years, opposition has become increasingly vocal and public, with social media facilitating the widespread sharing of simple, inaccurate, and emotive narratives condemning the activity (Lindsey et al., 2016, Hart et al., 2020). As a result, calls to ban the practice globally have grown in many countries, with extensive in-country lobbying to limit the activity undertaken elsewhere by restricting or banning trophy imports and exports (U.S. Congress, 2019, DEFRA, 2021). These international moves, particularly in powerful countries like the U.S.A and U.K., undermine the autonomy and decision-making power of nations in which trophy hunting takes place, and effectively nullify local preferences for how the wildlife, and biodiversity, should be managed and conserved.

Trophy hunting is clearly a complex endeavour, with many varied outcomes, and diverse factors affecting them. This alone cautions against broad-brush approaches and decisions related to the activity. While reforms in some places are clearly needed to improve equity in community involvement, enhance community benefits, and improve hunting practice, blanket approaches risk undermining efforts where trophy hunting is improving lives, and leading to positive ecological outcomes. Such broad approaches may also lead to unintended consequences, like increases in human wildlife conflict. Beyond this, top down or international bans also go against calls for improved equity in the conservation, as they limit local and national options and power in looking after, and managing, their wildlife and environments. Botswana presents a cautionary tale of what can happen when decisions on such matters are taken with no local involvement. Ultimately, decisions little or no

community involvement, like national or international hunting bans, or bans on trophy hunting imports, like the UK is about to instigate (DEFRA, 2021), might well do more harm than good. Instead communities should be empowered to decide for themselves whether they want to use trophy hunting as a mechanism through which they conserve their environments, or at the very least, should be included in any decisions that might affect them.

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Appendix 1

Systematic map and review data search protocol

Objectives

The primary question of the systematic map was:

What is the extent and distribution of evidence documenting trophy hunting impacts on communities, economies, ecosystems and the area of land managed for wildlife and biodiversity in Africa?

The primary question of the systematic review was:

What are the social and ecological impacts of trophy hunting in Africa?

The questions have the following components:

Population:	Areas of land under, or communities involved with, wildlife management
Intervention:	Trophy hunting
Comparator:	Areas of wildlife management in which there is no trophy hunting; or a time before an intervention was put in place; a period in which there was a hunting moratorium; a community which has no involvement in wildlife management
Outcomes:	Outcomes for ecosystems and wildlife, land area under wildlife management, economies, and communities, which includes any behavioural and attitudinal differences of communities

Answers to the following secondary questions were sought:

- Where does trophy hunting take place?
- What outcomes of trophy hunting are being reported?
- Where are the gaps in evidence?
- How are impacts of trophy hunting studied?
- Under what contexts do outcomes arise?
- Where are the gaps in understanding?

Inclusion criteria

- Primary and secondary literature
- Contains information on trophy hunting or CBNRM with trophy hunting in Africa
- Contains information on trophy hunting outcomes
- Published in English
- Quality of evidence: no restrictions (for map)
- Quality of evidence: primary studies since 2000 with specified data source (for review)

Search strategy

Platforms:

- Clarivate Analytics' Web of Science
- SciVerse's Scopus
- Google Scholar (www.scholar.google.com)

Terms used initially:

- Trophy OR sport OR safari OR recreation* OR touris* OR leisure OR foreign AND hunt* AND Africa
- Sustainable AND use AND Africa
- Sustainable AND use AND conservation AND Africa
- Sustainable AND wildlife AND use AND Africa

Terms after scoping exercise:

- Trophy OR sport OR safari OR recreation* OR touris* AND hunt* AND Africa
- Sustainable AND wildlife AND use AND Africa

Data extraction template

Data extraction was done in Excel using the following categories:

Field	Description/categories
ID	Unique identifier for each individual article. Combination of numbers and letters.
	Bibliographic information
Publication type	Journal article, briefing paper, book chapter, bulletin article, conference proceeding, occasional discussion paper, report, other.
Author	Authors of study
DOI	DOI link for article
Year of publication	
Title	
Journal name	
Volume/ issue/ Chapter	
Pages	
Place published	
Publisher	
Lead author affiliation	Lead author only
Affiliation type	Academic, consultant, non-profit, private sector/industry, public sector, research institute, unspecified
Study focus	Brief description of study focus
Number of entries	Data were entered by study site with some studies containing data for multiple studies
	Situation information
Scale of study	Whether the study is a continent/sub-continent review, or based on select case study/studies: case study, case studies, region/province/district, country, multi-country
Scale of data	Scale of data extracted on trophy hunting outcomes: case study, region/province/district, country, sub-continent
Country/region	Select country(s) from UN list organised by major regions
Location	Brief description of location of data are referring to
Land designation	Wildlife management area; protected area; other
Land tenure	State; communal; private; lease or freehold
Wildlife tenure	Who owns the wildlife? State; private; communal; mixed (describe)
Hunting governance	What is the governance structure/arrangement of the hunting operation - joint partnership/lease/agreement
Communities involved	Yes/No
Specific species	If yes, name species; or no.

Quota setting	Government set; Community input; private management
	Outcomes
Dimension of outcome	Outcomes focussed on/reported: community socio-economic (including anthropological), national/regional economic, ecological, land use or combination
Description of outcome type	Brief description of type of outcome reported
Main Findings	Brief description of outcomes measured/reported
	Enabling or disabling Factors
Initial conditions	Intrinsic characteristics of communities, wildlife, or their environments that affect outcomes
Community participation	Extent of community participation, community leadership, community based institutions, rule making/enforcement/monitoring, local control/authority, rights and tenure
Benefit and cost distribution	The costs and benefits themselves and equity and process of their distribution
External governance and support	Private sector, NGO, and government support and conditions, including quota setting
	Study design and methods
Data source	Primary, secondary, unspecified, other (state)
Method specified	Yes/No/Other
Methods (other)	Description of how methods were reported
Study design	Choose from: Experimental; quasi experimental; non-experimental (gathering data/observational); systematic review; non-systematic review; unclear/not specified
Study design extended	Further classification of studies, especially non-experimental
Comparator used	Control/comparison group (without hunting); before & after; change over time; theory; no comparator; other
Comparator description	Description of comparator used
Data type	Quantitative, qualitative, mixed
Confounding factors	Does the methodology identify and account for potential confounding factors? Yes/No
Confounding factors details	Description on whether confounding factors are identified and addressed
Impact evaluation on hunting/CBNRM	Did the study intend to evaluate impacts of trophy hunting/CBNRM or just contain data on outcomes? Yes/No

Additional results

Table: 1 Estimates of gross Annual income, land area under trophy hunting, and total CITES trophy hunting exports from 1990-2019. Estimates since 2010 are in bold

	Country	Income (US$ million)		Land area		CITES
		Gross	Year - Source	Km²	Source	
Southern	Botswana	40	2008 - [3]	133,451	[1]	9112
	Eswatini			46	[1]	3
	Mozambique	5	2008 - [3]	82,250	[1]	5294
	Namibia	44.8	2007 - [1]	162,033	Roe et al. 2016	35852
	South Africa	**180**	2014 - Taylor et al. 2015	220,000	van Hoven, 2015	79835
	Zambia	**16.2**	2012 - Lindsey et al. 2014	170,000	Simasiku et al. 2008	11238
	Zimbabwe	15.8	2007 - [3]	64,945	[1]	27946
East	Ethiopia	1.3	? - [1]	9,600	[1]	947
	Tanzania	56.3	2008 - [3]	210,000	Roe et al. 2016	23791
	Uganda					135
Central	Cameroon	**9.6**	2012 - Lescuyer et al. 2016	57,000	Lescuyer et al. 2016	4463
	CAR	1.9	2006 - [2]	66,000	[2]	2499
	Chad			34,320	[1]	108
	Congo, Rep.			1,510	Wilkie & Carpenter, 1999	33
	Congo, Dem. Rep.			90,362	[1]	7
West	Benin	0.3	2007 - [2]	4,000	[1]	276
	Burkina Faso	2.8	2005 - [2]	9,340	[2]	963
	Gambia			600	[1]	
	Ghana			1,137	[1]	4
	Guinea-Bissau			8,000	[1]	
	Mali			15,280	[2]	3
	Niger			9,169	[1]	
	Senegal	0.8*	1999 - Sène-Harpera & Séye, 2019	24,344	[1]	5
	Mauritania			6,000	[1]	
Total		375.4		1,379,387		

Common sources: [1] Lindsey et al. 2007, [2] IUCN/PACO, 2009, [3] Booth, 2010

Table 2: Most recent available estimates of trophy hunting income to communities. Estimates since 2010 are in bold

	Country	Community income (US$ million)	Year - Source
Southern	Botswana	**3.27**	2012 - Mbaiwa, 2018
	Eswatini		
	Mozambique	**0.32***	2010 - Jorge et al. 2013
	Namibia	**2.88**	2017 – MET /NACSO 2018
	South Africa	**0.11***	2014 - Cholo et al. 2018
	Zambia	**1.64**	2012 - Lindsey et al. 2014
	Zimbabwe	2	2006 - Taylor, 2009
East	Ethiopia	**0.062***	2010 - Yitbarek et al. 2013
	Tanzania	0.07	2007 - Roe et al. 2009
	Uganda	0.022*	2005 - Booth, 2010
Central	Cameroon	0.029*	2008 - Yasuda, 2011
	CAR	0.25	2006 - Booth, 2010
	Chad		
	Congo, Rep.	0.001	1998 - Wilkie & Carpenter, 1999
	Congo, Dem. Rep.		
West	Benin	0.088	2007 - Booth, 2010
	Burkina Faso	0.099	2005 - Booth, 2010
	Gambia		
	Ghana		
	Guinea-Bissau		
	Mali		
	Niger		
	Senegal		
	Mauritania		
Total		10.84	

* Site based/minimum estimate

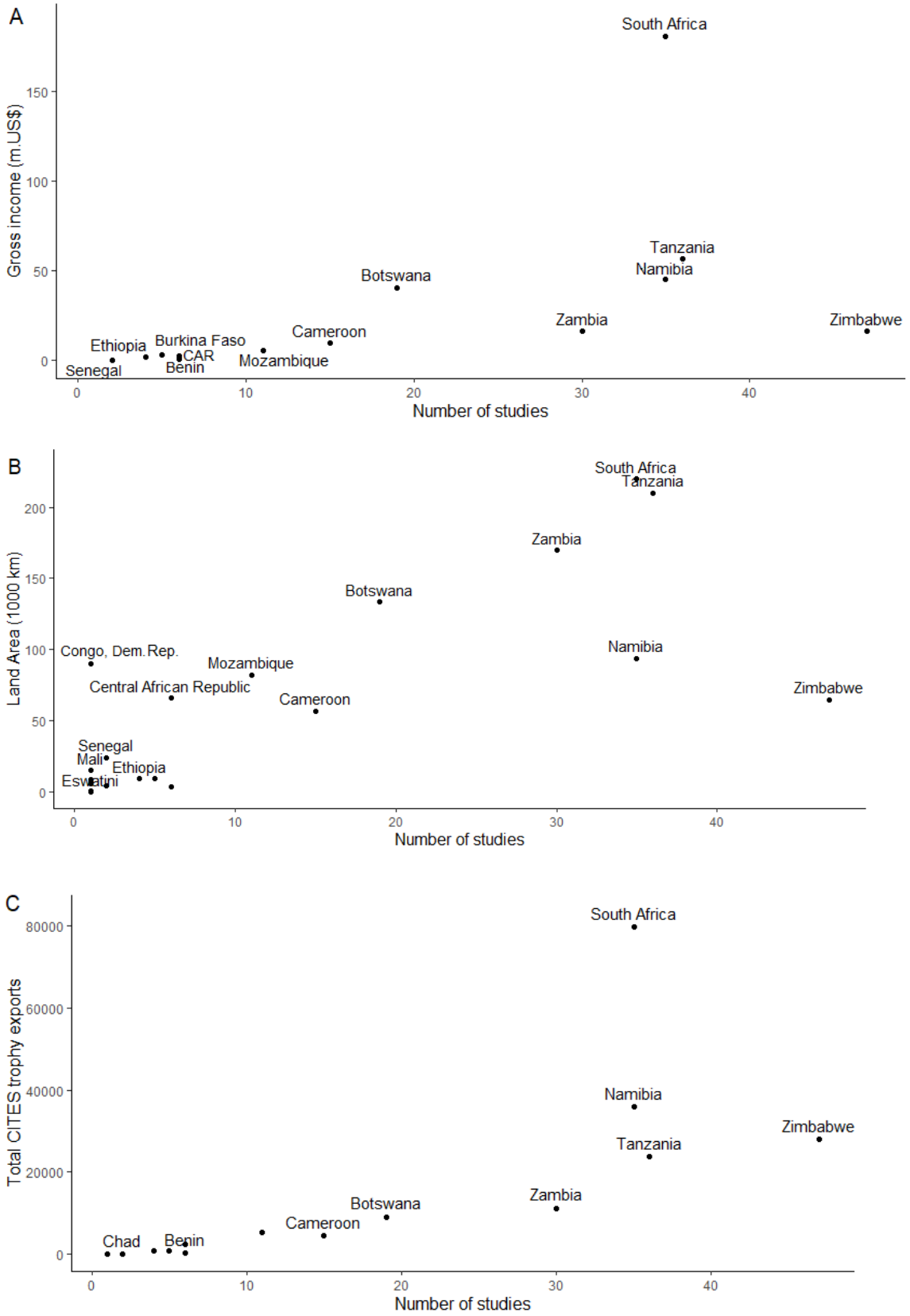

Figure 1: Relationship between the number of studies with evidence on hunting outcomes and latest estimates of A) gross income generated from trophy hunting, B) area of land used for hunting, and C) total number of CITES trophy exports since 1990

Appendix 2

Research Permit

TELEPHONE: 3914955
TELEGRAMS: MENT
TELEX:
TELEFAX: 3951092
REF: ENT 8/36/4 XXXXIII (67)

REPUBLIC OF BOTSWANA

MINISTRY OF ENVIRONMENT, NATURAL RESOURCES CONSERVATION & TOURISM
PRIVATE BAG BO 199
GABORONE
BOTSWANA

ALL CORRESPONDENCE MUST BE ADDRESSED TO THE PERMANENT SECRETARY

Ms Helen Sefadi Muller
[redacted]

email:- [redacted]

31st August 2018

Dear Sir/ Madam,

RESEARCH PERMIT: HELEN SEFADI MULLER

We are pleased to inform that you are granted permission to conduct research, for a study entitled **"Understanding the socio-ecological impacts of the hunting moratorium in Botswana."**

The research will be conducted around - **Ngamiland, Chobe, Central Districts Botswana in and around the Community trusts e.g Chobe Enclave, Mababe Zokotsama, Okavango Kopano Mokoro, Sankoyo tshwaragano, Xhauxhwatubi), Wildlife Management Areas.**

This permit is valid from the **01st September 2018 to 31 August 2020**

This permit is granted subject to the following **conditions:**

1. The permit does not give authority to enter premises, private establishments or protected areas. Permission for such entry should be negotiated with those concerned.

2. You conduct the study according to particulars furnished in the approved application and / or proposal.

3. Government of Botswana shall be duly acknowledged in all research outputs.

4. Copies of research outputs from the study shall be deposited directly with the Department of Tourism and Ministry of Environment, Natural Resources Conservation & Tourism HQ.

5. Failure to comply with any of the above conditions may result in the immediate cancellation of this permit.

6. This permit is **not transferable**.

Yours Faithfully,

[redacted]

MINISTRY OF ENVIRONMENT, NATURAL RESOURCES CONSERVATION & TOURISM
RESEARCH & DEVELOPMENT UNIT
31 AUG 2018
TEL: +267 3914955
PRIVATE BAG BO 199, GABORONE

FOR / PERMANENT SECRETARY

cc. Regional Wildlife Officer – Ngamiland & Central
Director, Department Of Wildlife National Parks
Director, Okavango Research Institute, Maun

Our Mission: *To protect the environment; Conserve the country's renewable and natural resources; Derive value out of environment for the benefit of Botswana*

BOTSWANA

Consent form and participant information sheet

UCL - DEPARTMENT OF ANTHROPOLOGY
14 Taviton Street
London WC1H 0BW

CONSENT FORM FOR ADULT PARICIPANTS IN RESEARCH STUDIES

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: Understanding the social and ecological impacts of the trophy hunting moratorium in Botswana

Department: Anthropology

Name and Contact Details of the Student:

Helen Muller, email: helen.muller.17@ucl.ac.uk;
UK mobile no: [redacted]
Botswana mobile no: [redacted]

Name and Contact Details of Student's supervisor

Emily Woodhouse, email: e.woodhouse@ucl.ac.uk
UK work number: +44(0) 207 679 8620

Name and Contact Details of the UCL Data Protection Officer: Lee Shailer, l.shailer@ucl.ac.uk

This study has been approved by the UCL Research Ethics Committee: Project ID number: 14637/001

Thank you for considering taking part in this research. The student organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the student before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time. The student will retain a copy of the form

I confirm that I understand that by ticking/initialling each box below I am consenting to this element of the study. I understand that it will be assumed that unticked/initialled boxes means that I DO NOT consent to that part of the study.

		Tick Box
1.	I confirm that I have read and understood the Information Sheet above. I have had an opportunity to think about the information and what will be expected of me. I have also had the opportunity to ask questions which have been answered to my satisfaction and would like to take part in the interview.	
2.	I understand that my participation is voluntary, that I am free to withdraw at any time without giving a reason and that I will be able to withdraw my data up to four weeks after my interview.	
3.	I understand that my personal information on my name, location, age, gender or ethnicity will be used in the ways explained to me. I understand that according to data protection legislation, the lawful basis under which personal data will be processed will be for the public good and improved policy making.	
4.	I understand that: all personal information will remain confidential, used as little as possible and that all efforts will be made to ensure I cannot be identified; information will be stored anonymously and securely using password protected software. It will not be possible to identify me in any publications.	
5.	I consent to my interview being audio recorded and understand that the recordings will be destroyed immediately following transcription.	
6.	I confirm that I have agreed to having my photo taken for the purposes explained to me.	
7.	I am aware of who I should contact if I wish to lodge a complaint.	
8.	I voluntarily agree to take part in this study.	

Name of participant: _____ Date: _____ Signature: _____

Name of researcher: _____ Date: _____ Signature: _____

UCL

DEPARTMENT OF ANTHROPOLOGY

14 Taviton Street

London WC1H 0BW

Participant Information Sheet for group discussions

UCL Research Ethics Committee Approval ID Number: 14637/001

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

Title of Study: Understanding the social and environmental impacts of the trophy hunting moratorium in Botswana

Department: Department of Anthropology, University College London and Institute of Zoology, Zoological Society of London

Name and Contact Details of the Researcher(s):
Helen Muller, email: helen.muller.17@ucl.ac.uk;
UK mobile no: [redacted]

Name and Contact Details of the Principal Researcher:
Emily Woodhouse, email: e.woodhouse@ucl.ac.uk

UK work number: +44 (0) 207 679 8620

You are being invited to take part in a PhD research project. Before you decide if you'd like to participate, it is important for you to understand why the research us being done and what participation will involve. Please take time to read/listen to the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide if you wish to take part. Thank you for reading/listening to this.

This project aims to understand the impacts that the 2014 hunting moratorium (ban) has had on community well-being in Botswana. We are also interested in understanding the broader social, historical and political factors that have affected how these impacts were felt. The project will run from January 2019 to December 2021 with 10 months spent in Botswana conducting research.

To help with this research, we would like to have a group discussion with you all to find out about your lives, your involvement in CBNRM and trophy hunting, and your thoughts on CBNRM, trophy hunting, the moratorium, wildlife, and conservation, before the moratorium and now. We also are interested in your understanding of how local and national politics are affecting your village, CBNRM, conservation and trophy hunting.

We are interviewing you because you are adult members of the Community Trust and that we want to learn about your experiences living in this community. We will be carrying out individual interviews and group discussions with men and women in this village and other villages like yours which have formed community trusts.

You can decide whether participating in this research will be damaging to you or your interests. It is totally up to you whether you take part or not. If you do decide to take part we will need to get recorded consent from you. You can withdraw at any time without giving a reason, and you can decide what happens to the information you have given us.

The discussions are unlikely to take more than 1-2 hours and you will be given refreshments. We will endeavour to anonymise the personal data you provide and will minimise the processing of personal data wherever possible.

Please note that confidentiality will be maintained as far as it is possible, unless during our conversation I hear anything which makes me worried that someone might be in danger of harm. You will not be able to be identified in any ensuing reports or publications.

For interviews that are being recorded:
We would like to record the discussion to allow us to translate it more accurately later. Once we have done that the recording will be deleted. Only the researchers on our team will have access to the recording. [If anyone in the interview doesn't want to be recorded it can go ahead without recording]. Any photos taken will be done so with express permission and will be used for illustration in conference presentations and lectures. No other use will be made of them, and no one outside the project will be allowed access to them.

Personal data arising from interviews will be anonymised. Personal data will be deleted no longer than 2 years after the study ends. Interview transcripts with anonymised data will be stored securely to allow for future work building on the PhD thesis.

There will be no disadvantages or risks of taking part in this study. Everything you say will be anonymous with no way of tracing statements back to you. Should you feel uncomfortable at any time, please let us know. Please consider what kind of information you want to give to other people as this is a group discussion.

Whilst there are limited immediate benefits for those people participating in the project, it is hoped that by participating in this research your answers will be used in a report to policy-makers detailing the impacts that trophy hunting bans can have so future decisions have a better evidence-base to use. As such it is an opportunity to have your voices heard by national and international policy makers. It also provides a platform to discuss your thoughts and feelings on CBNRM, trophy hunting, wildlife and conservation.

Results of the study will also be published in a PhD thesis and scientific publications. Copies will be sent to the University of Botswana and the Department of Wildlife, Natural Resources and Tourism Botswana. More practical reports of the results will also be compiled for the community trusts. If funding permits, Helen Muller will return to all communities researched and disseminate key findings in a presentation at the Kgotlas in person. Failing this, attempts will be made to have the research assistant or project collaborators present these findings verbally to your communities.

You do not have to participate in this study if you don't want to, and you may stop participating at any time. You may decline to answer any question that you don't want to answer or discuss. If you have any questions about this research, or about your rights as a participant in this study, we will be happy to try to answer them now, or you may contact the researchers by telephone:

Helen Muller**:** +267 73 382 326 (phone call/text); +44 75 570 17151 (WhatsApp);

Research Assistant: TBD

Should you have any complaints regarding your treatment in this research please contact Emily Woodhouse with the details provided above. If you do make a complaint and feel it has not been handled satisfactorily, you can contact the Chair of the UCL Research Ethics Committee – ethics@ucl.ac.uk .

Data protection privacy notice:

The data controller for this project will be University College London (UCL). The UCL Data Protection Office provides oversight of UCL activities involving the processing of personal data and can be contacted at data-protection@ucl.ac.uk. UCL's Data Protection Officer can also be contacted at data-protection@ucl.ac.uk.

Your personal data will be processed for the purposes outlined in this notice. The legal basis that would be used to process your personal data will be your consent to participate in the research. The legal basis used to process special category personal data will be for scientific and historical research and statistical purposes.

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Many thanks for reading or listening to this information sheet and for considering to take part in this research study.

Census data collection sheet

Translator:	**HH No.:**	**Head of Household:**			**Date:**
Compound details:					
No. used buildings:	No. used for sleeping:_____ Material of sleeping room:	Wall	Roof	Floor	No. unused buildings:

Resident household member details (adults):					
Name	Age	Relation to head	Education status achieved	Main economic activity	Searching for work Y/N
1					
2					
3					
4					
5… 10					
Non-resident household member details (adults):					
1					
2					
3					
4					
5…10					

Names of resident and non-resident Children 0-17					
Name	**Age**	**HH. Parent**	**Residence location**	**Care taker**	**Education level**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Language most spoken at home:			**Language spoken by parents:**			
Does anyone in the household own any of the following: **Where?**			Cows	Goats	Donkeys	Goats
Does anyone in the household own any fields: Y/ N **If yes, where?** **If no, in the past?**			**Did you plant this season?** **Stopped when and why?**			
Did anyone plant any:	Maize	Sorghum	Beans	Melons	Millet	Other
How does the household get water?			**What do household members use for a toilet?**			
How does the household get light at night?			**What duel does the household use for cooking?**			

Interview Guide

Q1. Could you describe what you do on a normal day?

Q2. How many meals does the household have in a day?

Q3. How many people help to put food on the table?

Q4. How many times in a week or month do you eat meat?

Q5. What is important to you in your life? e.g. kids, family, money, work…

Q6. How would you describe someone in the community who is doing well? (Prompts: leading a good life, wealthy)

Q7. What has the Government or District Council done for you or for your family? And for the community?

Q8. What has the Community Trust you and your family? And for the community? (prompts: has anyone in the household found work through the Trust, or been sent for training)

Q9. Have you heard about the trophy hunting ban? What do you think about it?

Q10. Has the ban affected your life and how?

Q11. What do you think about wild animals?

Q12. Have the numbers of behaviour of wild animals changed over time?

Q13. Do you feel you can take part in decisions that affect village life or raise concerns and how?

Q14. When the Community Trust was operating, did you feel that you could take part in decisions that were made about what activities the Trust was doing or how money was spent and how?

Group discussion guides

Groups of men and women

Q1. What are the benefits of living in the village, why do you choose to live here?

Q2. What are the main challenges to life in the village?

Q4. What do you understand the role of the Community Trust to be?

Q5. Was the Trust working well and listening to the community? Did you feel a sense of ownership over the Trust?

Q6. How has the hunting ban affected life in the village?

Q7. Could you comment on the Theory of Change?

For those of working age

Q8. What are the challenges to finding employment?

Trust Board members

Q1. What do you understand the role of the Community Trust and CBNRM to be?

Q2. What do you understand your role as board members to be?

Q3. What are the main challenges you face on the board?

Q4. What support do you have or would you like?

Q5. Why has the Trust been unable to convert to photographic tourism?

Field owners

Q1. What are the main challenges and barriers to growing crops/owning a field?

Q2. What are the motivations for growing crops?

Q3. What mitigations against human wildlife conflict are practised?

Q4. How does the compensation scheme work? What are the challenges and are there any suggestions for improvement?

Livestock owners

Q1. What are the main motivations for keeping cattle/goats?

Q2. What are the main challenges to keeping cattle/goats?

Q3. What do people do to mitigate against livestock loss?

Q4. How does the compensation scheme work? What are the challenges and are there any suggestions for improvement?

Appendix 3

Additional population and livelihood dynamics of case study villages from ethnographic fieldwork

Phuduhudu: 2019 population dynamics and livelihoods

At the time of fieldwork, there were 112 households in Phuduhudu village, with a total adult population of 457 people[9]. Of these however, only 305 adults spent most of their time living in Phuduhudu ('residents', Table 1). A further 152 adults spent most of their time outside the village but were still considered members of Phuduhudu households (non-residents) and supported families in the village to varying degrees. There were also 344 children from the village, with 297 living and schooling in Phuduhudu, and 60 predominantly living outside the village, mostly as boarders at secondary school. The total village population of all resident and non-resident adults and children from Phuduhudu was 814 people. As a gazetted settlement, the village has a clinic, tribal administration offices, a police station, a social workers hub, and a primary school. For junior secondary school most children go to boarding school in Motopi, the nearest larger village, and to senior secondary school in Maun or further afield.

Table 1: Number of resident adults in different age groups determined by government programmes targeting youth: 18-35, and pensioners 65+

Gender	**Age group**			**Total**
	18-35	36-64	65+	
Female	83	54	20	157
Male	70	55	23	148
Total	153	109	43	305

All schooling is free for most of Phuduhudu's residents as part of a government support programme for Basarwa. They also have school uniforms and toiletries sponsored by government. Despite government support for schooling since the village formed, the vast majority of adults had not successfully completed a full 12 years of schooling (Table 2). Almost half, 43%, had only completed junior secondary school, this included 60% of the village youth. Most would have been unable to continue to their final two years of senior secondary school because they did not pass. The majority of the older village residents (56% of those aged 36 and older) had not attended school. Most people in the village could not speak English at all, or with any level of fluency, a basic requirement for many jobs in the country. Interestingly too, very few could speak Sesarwa, the traditional language of the

[9] Only people who were from the village were included in this total. I did not include government employees who had been stationed temporarily in the village as they did not consider themselves residents and would not have been members of the Trust.

San, with the language now only being spoken by a small number of elderly residents. Everyone else spoke only Setswana.

Table 2: General schooling attainment of resident adults in Phuduhudu. Primary school, years 1-7, (Primary School Leaving Certificate in Education, PSLE), Junior secondary school years 8-10, (Junior Certificate, JC), Senior secondary school years 11-12 (Botswana General Certificate of Secondary Education, BGCSE)

Age	Gender	Schooling attainment				
		None	Primary	Junior Sec.	Senior Sec.	Other
18-35	Female	2	8	57	14	2
	Male	1	14	42	12	1
36-64	Female	26	9	15	2	2
	Male	17	11	16	4	7
65+	Female	20				
	Male	22		1		
Total	305	88	42	131	32	12

Unemployment rates in the village were very high (Table 3). Of the 262 adults of working age (18-65) living in Phuduhudu (excluding government workers not from the village), only 24 were formally employed, mostly in government jobs in the village or at the village co-operative. The remaining 91% of the working age population of Phuduhudu residents were not formally employed, with 79% being unemployed[10]. Of the non-resident Phuduhudu household members 41% were formally employed, 14% self employed, 13% were studying, and 25% were unemployed, while the remainder either did informal work or their family members were not sure what they were doing.

Table 3: Economic activity sectors of Phuduhudu residents

		Formal	Self employed	Informal	Youth programme	Unemployed	Retired
18-35	F	5	1		9	68	
	M	5		2	6	57	
36-64	F	5	6			43	
	M	9	3	3		40	
65+	F						20
	M						23
Total	305	24	10	5	15	208	43

The majority of people in the village were dependent on government support to make ends meet. All those over 65 were given a monthly pension of P530, though many saved this for 'funeral insurance'. Many were also deemed 'destitute' and received monthly food rations. The dominant support mechanism, which was the main income source for more than 67% of the population (203 people, including 30 pensioners), was a public works programme called *Ipelegeng*.

[10] I deviate from the technical Government definition of unemployment which includes 'actively looking for work', which very few people in the village were doing.

Ipelegeng, which means self-reliance, started in 2008 as a drought relief programme to support people across the country when crops failed, and it had expanded into a general poverty reduction programme. It offers a certain number of places per month for people to do 'community development projects' (Nthomang, 2018). In Phuduhudu, work involved manual tasks like weeding roads, paths and communal areas, clearing bushes, and picking up rubbish. Most villages have places for about 20 people each month. In Phuduhudu, it started with 50 places when it was first introduced, and by 2019, had expanded to accommodate 142 people each month. Of those, 12 were 'foremen' and received BWP 651 (approximately US$ 60) each month while the rest of the 'labourers' receiving BWP 567 (~US$ 52). *Ipelegeng* work ran from Monday to Friday starting at 7am and going until about 2-3pm. There was a break at 10am and participants were given a small meal/snack, typically of maize and a bean stew.

In addition to *Ipelegeng,* there are various Government Youth Programmes, including internship type positions called 'Clusters' at the Police and Wildlife Departments, and a programme called *Tirelo Setshaba*, which means 'to work for the community'. The allowance/wage for these was the same as *Ipelegeng*, with the only difference being that the income was guaranteed each month rather than dependent on there being space (as 203 relied on *Ipelegeng* and there were only 142 places).

Another government service, known as the Poverty Eradication Programme, has also supported villagers. This too was a nation-wide initiative where people could apply and be given initial support in starting various livelihood activities. These ranged from being given a small number of livestock, like cattle, goats or chickens, catering, bakery, leather work and sewing, to name a few. With these, people were given some training and supplies to start them off. People could choose from a list of what to do, though, as a national programme, not all of the options were suitable for the village. The livestock scheme for example, had been largely unsuccessful due to the village's proximity to two national park. Levels of HWC were high and many, after receiving their animals and having them eaten by predators, could not buy more. Another example of poor execution was where a handful of people chose projects requiring larger and more expensive equipment, e.g. a kiln for making clay pots, or machinery for tyre repair, where there were too few on the project for the government to actually provide the equipment in the village.

While some in the village owned livestock through the Poverty Eradication Programme, others had bought it themselves as a livelihood (and wealth storing) strategy. Livestock owned in the village were chickens, cattle, goats and donkeys. Forty households kept chickens, 28 each kept goats and cattle, and 13 had donkeys. Eleven had cattle and chicken, while 9 had cattle and goats. Only 7 households had substantial, and independently obtained, herds of cattle. Other livelihood activities in the village

involved arable farming, and gathering wild food. Half of the households (55) had ploughing fields, but of those only 11 had ploughed in the 2018-2019 growing season and only 4 considered themselves farmers. Most people, when they did plant their fields, grew a combination of crops including beans, maize, melons, sorghum, millet, and sugar cane. Finally, while only three people relied on harvesting wild berries, called *moretwa,* as a dominant livelihood strategy, it was a wide-spread activity, with many people collecting them to eat and to sell on the road side for extra income.

On top of livelihood support, the government provided health services in the form of a clinic, and had built houses for a large number of destitute people in the village (the elderly, orphans, etc). Indeed, most of the 'modern'/cement brick houses in the village were built by the government. Elements of these too were good examples of poorly thought through, top down initiatives that were not necessarily best suited for the local situation. The more recently built houses had 'flushing toilets', as this was thought preferable and more modern, while older ones had pit latrines. None of the houses however, were actively connected to the water mains as people could not afford to pay for water so the flushing toilets were unusable. Most people collected water from a few free taps in the village (when initially installed they had meters but this was quickly abandoned), with the exception of a few households which had private taps to the yard and in even fewer cases into houses. While pit latrines are not as modern, they were more suited to local circumstances which the government did not consider in these newer housing builds.

Ditshiping: 2019 population dynamics and livelihoods

Ditshiping village had 42 households, and had a total adult population of 317. By contrast to Phuduhudu, more than half of Ditshiping's adults spend most of their time outside the village, and overall, the population was very dynamic. The number of people in the village at any one time varied considerably, with many people being out on poling trips in the height of the poling season, and more frequent visits to Maun. One hundred and twenty-seven (127) people spent most of their time in the village (residents, Table 4), and 190 meanwhile spend most of their time outside the village but are considered members of Ditshiping households. There were 39 children living in the village, all under the age of 7, while a further 198 children spent most of their time in Maun at school. The total village population of all resident and non-resident adults and children from Ditshiping was 554 people. However, most people spend more time out of the village than inside it due to a lack of schools and employment opportunities. As an ungazetted settlement, there were few government services in the village. A pre-school had been recently built in the village by one of the JVPs, as part of community outreach, which explained why many young children now stay in the village. The rest of the children only come to the village during school holidays and otherwise stay with a parent or adult relative in

Maun to go to school. All but one household in the village had property in Maun as well as a homestead in Ditshiping to facilitate sending children to school, and to access formal land tenure which was not available in the village due to its ungazetted status.

Table 4: Number of resident adults in different age groups in Ditshiping

Gender	**Age group**			**Total**
	18-35	36-64	65+	
Female	26	32	13	71
Male	25	20	11	56
Total	51	52	24	127

Schooling attainment in the village was very low. More than half of residents (52%) had not attended any school, and only 5% had completed all 12 years of school and attained their Botswana General Certificate of Secondary Education (BGCSE) (Table 5). Schooling attendance was poor across all age groups, including the youth. Low pass rates and high drop out rates were blamed on limited parental support or adult supervision as many children were often looked after by one adult who stayed in Maun while the rest tried to earn a living in Ditshiping or elsewhere. Despite not completing school, 10 people in the village had gone on to do some sort of tertiary training, predominantly in the form of short courses in tourism and other industries, often funded by the OKMCT. A further 29 people from the village, who mostly lived elsewhere, also had some sort of further education certificate. Twenty-seven (27) of these were sponsored by the Trust.

Table 5: General schooling attainment of resident adults in Ditshiping. Primary school, years 1-7, (Primary School Leaving Certificate in Education, PSLE), Junior secondary school years 8-10, (Junior Certificate, JC), Senior secondary school years 11-12 (Botswana General Certificate of Secondary Education, BGCSE)

Age	**Gender**	**Schooling attainment**							
		None	Some primary	PSLE	Some junior	JC	Some senior	BGCSE	Unknown
18-35	Female	3	2	1	5	11	1	3	
	Male	3	6		4	8		4	
36-64	Female	23	4		1	2			2
	Male	13	4	1		1			1
65+	Female	13							
	Male	11							
Total	127	66	16	2	10	22	1	7	3

There were 290 people of working age from Ditshiping, 103 of whom, spent most of their time living in the village. Across all residents and non-residents, 42% of men and 28% of women of working age were formally employed. Three quarters of people from Ditshiping who were formally employed worked in the tourism industry (n = 70). Only 8 of Ditshiping's full time residents were formally employed either by the Trust directly or in the preschool funded by a Trust JVP. A further 29 were

employed through the Trust JVPs though, as a result, they spend most of their time out of the village. Sixteen of these had not finished school. An additional two villagers were on the Trust board receiving a monthly allowance of P2000. In total, 39 people from Ditshiping were employed or had a stable income stream as a result of the Trust, comprising 13.5% of the total working age village population.

*Table 6: Primary economic activity sectors of Ditshiping residents. Residents working at Trust lodges in brackets. * some pensioners considered mokoro poling not their pensions to be their primary income source*

		Formal	**Self employed**	**Informal**	**Unemployed**	**Pensioners**
18-35	F	3 (18)	1	8	14	
	M	1 (1)		15	9	
36-64	F	2 (13)	2	23	5	
	M	2 (5)	1	14	3	
65+	F			2		11[ψ]
	M			3		8[ψ]
Total	127	8*(27)	4	65	31	19

More than half of Ditshiping's residents were informally employed, with the vast majority (n = 61) engaging in *mokoro* poling (Table 6). *Mokoro* poling was also done by a further 12 people who did poling to supplement their income. Overall, 57% of Ditshiping's residents relied on this activity, which was organised by the Trust, for income. A quarter of villagers meanwhile, were unemployed, with 23 relying on the village's *Ipelegeng* programme, despite there only being 12 places per month. While only a quarter of residents relied on *Ipelegeng* as their primary income source, far more did *Ipelegeng* to supplement income, particularly in the 'low season' when there were fewer tourist. A further 53 did *Ipelegeng* as a supplementary activity in the low season to make ends meet. Other income generating activities in Ditshiping included selling natural resources: predominantly reeds and thatching grass and handmade crafts, which 43 people did to supplement their income.

Despite living inside the NG/32, a WMA concession which restricts livestock keeping, 18 households owned livestock. All kept their livestock at cattleposts outside the buffalo fence, and had them looked after by non-resident household members. The majority of Ditshiping's households had ploughing fields either inside or outside the village (76%, n=32), and farming was considered part of Bayei culture. Eighteen had fields only in Ditshiping, 9 used to have fields in Ditshiping but had since moved them to outside the buffalo fence at the family cattlepost, and 5 only ever had fields outside the buffalo fence. Maize, melons and beans were the most commonly planted crops, though some also planted sorghum, pumpkin, sugar cane, and palm cane. Of the 27 households which at some point had fields in Ditshiping, only 6 were trying to farm in the year I was there.

In terms of other government support, the ungazetted status of Ditshiping means that there is substantially less support than in Phuduhudu. By comparison to the 142 places in Phuduhudu's *Ipelegeng*, there are only 12 places available each month in Ditshiping. The government also provided a mobile clinic which was meant to visit the village on a monthly basis, however this depends on the road access being maintained by the Trust and the District Health Department's access to vehicles.

Appendix 4

Additional results from Chapter 8

Generalised mixed model results showing exploration into factors affecting mean NDVI which shows a full model including an interaction between land use and the moratorium has the best fit (Figure 1, Tables 1 & 2).

Table 1: Comparison of Akaike weights of models including different factors used to explain mean dry season NDVI in Ngamiland

Model	**Model parameters**	**AIC**	**Delta AIC**	***Log likelihood***
Full model with moratorium and land use interaction	17	-28355.88	0	14194.99
Land Use, climate and geography	14	-28279.67	76.22	14153.86
Climate and geography	12	-28278.81	77.07	14151.43
Moratorium, climate and geography	13	-28276.98	78.91	14151.52
Geography only	9	-28211.37	144.51	14114.70
Climate only	8	-28193.69	162.19	14104.86

Table 2: Estimates of the best model explaining mean dry season NDVI in Ngamiland

	Estimate	**s.e.m.**	***d.f.***	***t***	***P***
Intercept	0.450	0.015	50	30.06	< 0.001
After moratorium	-0.003	0.017	15	-0.19	0.851
Land use: hunting	-0.037	0.019	39	-1.96	0.057
Land use: mixed	-0.038	0.016	42	-2.42	0.020
Settlements	-0.056	0.017	351	-3.23	0.001
Roads	0.029	0.025	349	1.19	0.234
Delta	0.029	0.006	389	4.75	< 0.001
Fire	-0.009	0.001	6464	-7.59	< 0.001
Rainfall	-0.006	0.001	6660	-5.85	< 0.001
Maximum temperature	-0.013	0.003	1798	-5.23	< 0.001
Minimum temperature	0.010	0.003	2318	3.52	< 0.001
Hunting areas after moratorium	0.019	0.002	6452	9.12	< 0.001
Mixed land use areas after moratorium	0.010	0.002	6417	5.39	< 0.001
Random Effects					
Pixel	0.001				
Controlled Hunting Area	0.002				
Year	0.001				
Residual	0.001				
Marginal/conditional R^2	0.14/0.86				

Climate variables were scaled for better comparison. Variation and standard deviation of the random effects of the controlled hunting area and pixel and year are shown. Marginal R^2 (variation explained by fixed effects) and conditional R^2 (fixed and random effects) are also given.

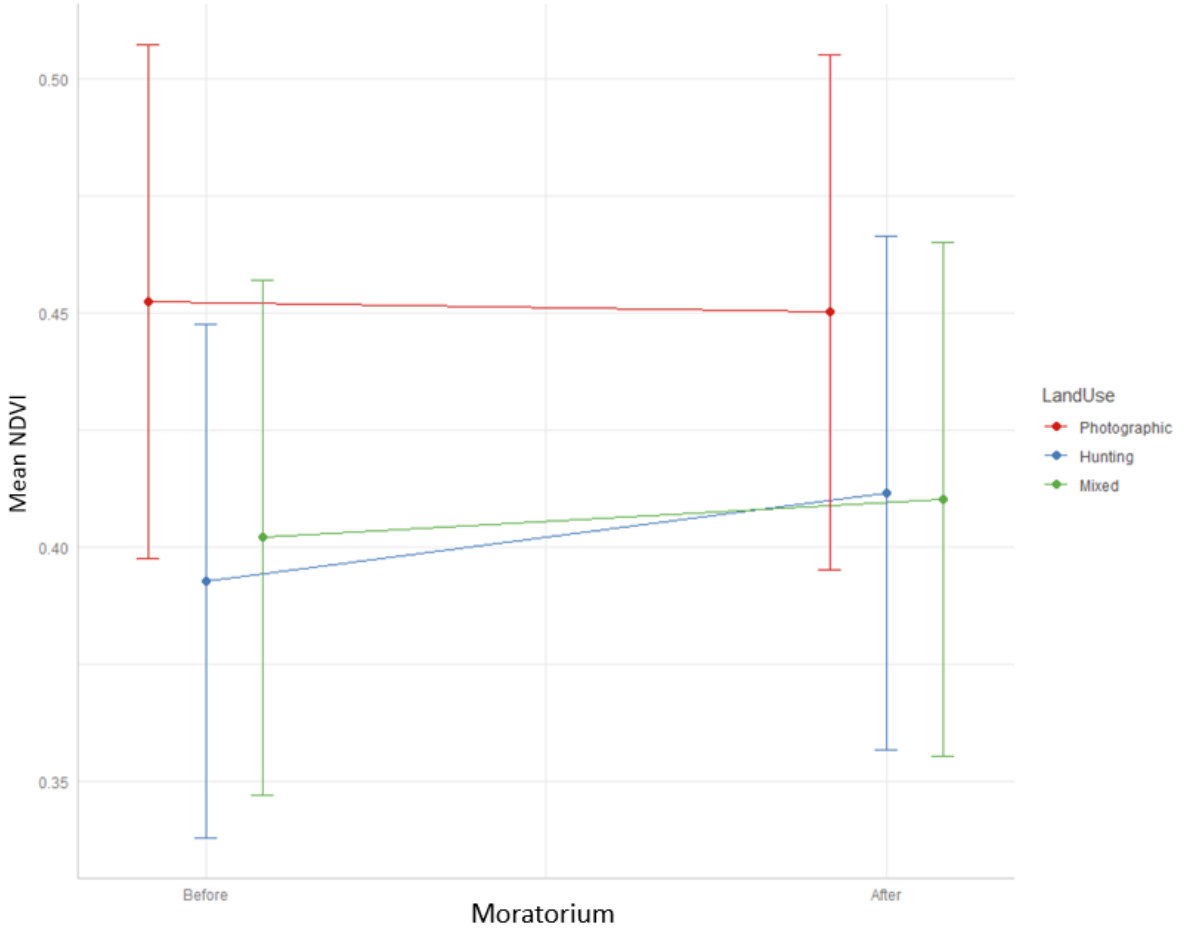

Figure 1: Differences in mean dry season NDVI before and after the moratorium across different land uses

Generalised mixed model results showing exploration into factors affecting standard deviation in NDVI at 1km scale which also shows a full model including an interaction between land use and the moratorium has the best fit (Figure 2, Tables 3 & 4).

Table 3: Comparison of Akaike weights of models including different factors used to explain standard deviation in median NDVI with random 1% of pixels

Model	Model parameters	AIC	Delta AIC	*Log likelihood*
Full model with moratorium and land use interaction	17	-47436.9	0	23735.5
Moratorium, climate and geography	13	-47424.1	12.8	23725.0
Climate and geography	12	-47423.8	13.1	23723.9
Land use, climate and geography	14	-47420.2	16.7	23724.1
Geography only	8	-47396.9	40	23707.4
Climate only	9	-47391.9	45	23704.0

Table 4: Estimates of the best model explaining standard deviation in 250m resolution pixels of median NDVI across 1km in Ngamiland

	Estimate	s.e.m.	*d.f.*	*t*	*P*
Intercept	0.016	0.001	72	11.24	< 0.01
After moratorium	0.000	0.001	17	0.13	0.90
Land use: hunting	-0.001	0.002	42	-0.30	0.76
Land use: mixed	0.000	0.002	46	0.18	0.86
Delta	0.007	0.001	497	5.93	< 0.01
Fire	0.000	0.000	6626	0.42	0.67
Settlements	0.005	0.004	447	1.47	0.14
Roads	0.010	0.005	442	1.81	0.07
Rainfall	0.000	0.000	1221	0.84	0.40
Maximum temperature	-0.003	0.001	794	-4.74	< 0.01
Minimum temperature	0.003	0.001	440	4.70	< 0.01
Hunting areas after moratorium	0.002	0.001	6548	4.43	< 0.01
Mixed land use areas after moratorium	0.002	0.000	6526	3.41	< 0.01
Random Effects					
Pixel	0.007				
Controlled Hunting Area	0.033				
Year	0.002				
Residual	0.007				
Marginal/conditional R^2	0.15/0.62				

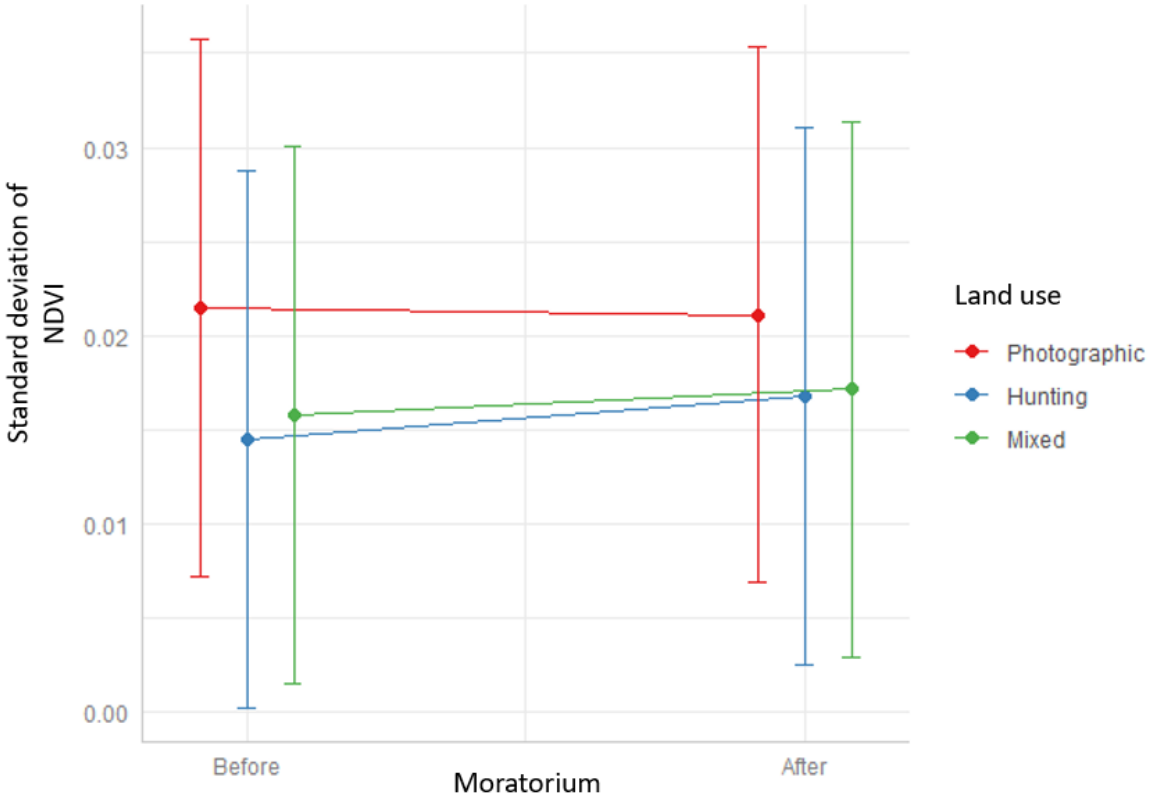

Figure 2: Differences in standard deviation of NDVI at 1km resolution pixels before and after the moratorium across different land uses

Figure 3: Model residuals and diagnostics for GLMMs of standard deviation of NDVI at 15km resolution pixels before and after the moratorium across different land uses.