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Research article

Stakeholder perceptions of solutions for sustainable management of the African elephant, *Loxodonta africana*

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Sustainable coexistence with wildlife is essential for life on earth but is challenging particularly when dealing with large mammals. The numbers of African elephants, *Loxodonta africana*, in the Hwange National Park in Zimbabwe have exceeded the management goal of 5–10 000 to current estimates of 45 000. As a result, elephants leave the park in search of food, causing interactions with the local community such as damages to crops, traffic incidents and mutual aggression. We suggest management options that could support sustainable coexistence between people and elephants as well as other species by assessing the opinions among stakeholders in and around the Hwange National Park. The objective is to ensure the long-term survival of elephants while balancing other interests. The thematic analysis of interviews and questionnaires highlighted 1) stakeholder insights into different management methods, 2) desire for increased CITES export quotas, 3) increased rights for local communities to derive benefits such as meat and tourist exploits. Both culling and hunting along with derived benefits should be considered to establish a sustainable elephant management strategy in Zimbabwe, and for large wildlife species in general.

Keywords: conservation, hunting, local participation, meat, regional development, resource

Introduction

Coexistence with large mammal as the African savanna elephant, *Loxodonta Africana*, can be a considerable challenge. Human wildlife relations, including conflicts, are common, and typically wildlife suffer immense losses (Almond et al. 2022). In the search for sustainable solutions for coexistence, the interest of local stakeholders is often overlooked (Benjaminsen et al. 2013, Bunnefeld et al. 2013, Eskew and Carlson 2020), as manifested by recent relocations of elephants in Malawi (Greenfield 2024) and ongoing debacle on trophy imports to Great Britain and Germany (Howard 2024). The disregard of local perspectives may lead to negative reactions such as poaching or overexploitation (Warchol 2004, Benjaminsen et al. 2013, Tickle and von Essen 2020).

The elephant is a keystone species and an ecosystem engineer with importance for biodiversity on the African continent (Western 1989, Bond 1994). Owen-Smith (1987) even suggested that the extinction of large herbivores (animals above 1000 kg), such as elephants, at the end of the Pleistocene led to the collapse of mammalian diversity in Europe and the Americas. Large mammals, including elephants, are also important for climate mitigation (Schmitz et al. 2023). The International Union for the Conservation of Nature (IUCN) lists elephants as endangered species (Gobush et al. 2022).

Numbers of African elephants in Hwange National Park (HNP), Zimbabwe, is currently estimated at three individuals per square kilometer and is, together with the adjacent population in Botswana, the largest known population in Africa (Blanc et al. 2007, Musengi 2022, Africa Geographic 2023). The Zimbabwe National Elephant Management Plan (2021–2025) provide a management goal of 5–10 000 elephants for the larger Northwest Matabeleland which includes Hwange. Armbruster and Lande (1993) suggestion of a carrying capacity of 1, 2 elephants km^{-2} would give an estimate of 17 520 elephants for Hwange National Park (size of 14 600 km^2). Both numbers are exceeded by the estimated Hwange elephant populations size of 45 846 based on surveys conducted in 2014 (Dunham et al. 2015 in Zimbabwe National Elephant Management Plan (2021–2025), Zhongming et al. 2018). In addition, there is an estimated increase by around 500 elephants annually (Cumming and Jones 2005). The population size along with the need for water and extensive amounts of forage, up to 150 kg per day, can drive elephants on a relentless search for food and water that expose them to humans and human interests in the landscape. An elephant can, for example, destroy an entire season of crops in a single night (Nyirenda et al. 2018). The overpopulation may lead to interactions that are detrimental to both human and animal welfare, health, safety and generate economic- and social costs (Ogada et al. 2003, Nyirenda et al. 2018). For instance, 60 people were killed by elephants in Zimbabwe in 2022, and an estimated 72 in 2021 (Musengi 2022). These fatalities risk lower tolerance towards elephants amongst local communities and in inhabited areas around the park.

Figure 1 provides a brief overview of the suggested solutions to the overpopulation and the subsequent interactions with humans which includes surface water management (Owen-Smith et al. 2006, Chamaillé-Jammes et al. 2007), translocations (Lebas 2002, Van Aarde and Jackson 2007, Tiller et al. 2021), habitat expansion and corridor creation (Van Aarde and Jackson 2007, Druce et al. 2008, Henley et al. 2023), contraception (Delsink et al. 2006) and culling (McNeal 1998), tourism and hunting permits (Freeman and Wenzel 2009, Bunnefeld et al. 2013). In addition, farmers have tried

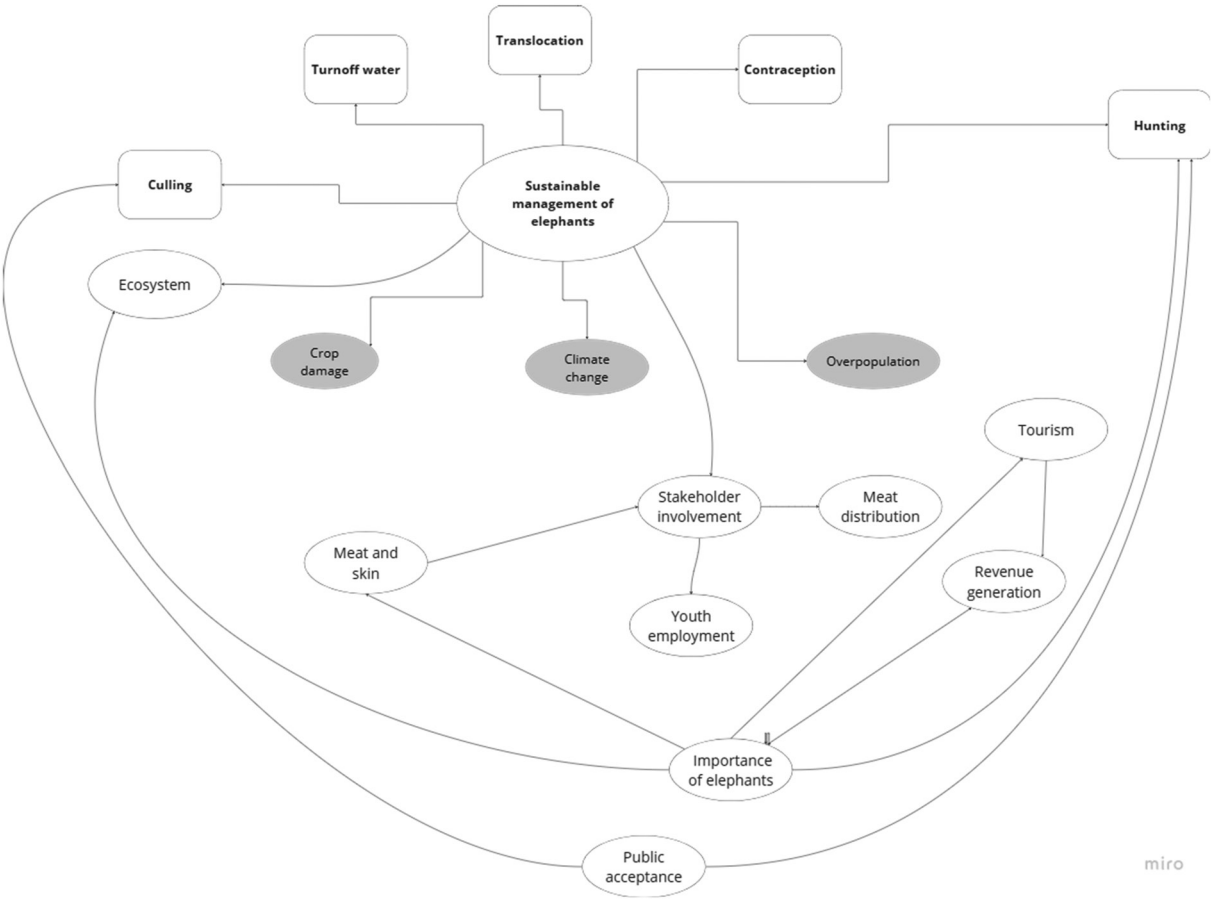

Figure 1. Conceptual mind map showing the assessed solutions, problems and suggested solutions.

to use bees (King et al. 2017) and chili peppers (Chang'a et al. 2016) as means to protect crops.

Adaptive management, on the other hand, is a circular approach that includes regular self-assessment based on systematic, scientific evaluation that constantly improve the management efforts taken (Enck et al. 2006). It may offer solutions to difficult management conditions and problems by including a learning process that facilitate better practise (Lancia et al. 1996). Adding a social science dynamic to wildlife management plans can assist us to understand the attitudes, beliefs, and behaviours of the local communities towards elephants. By understanding this, wildlife managers can develop strategies and interventions that minimize conflicts and promote coexistence between humans and elephants. Qualitative methods such as interviews and questionnaire surveys can assist researchers and managers evaluate the effectiveness of management practices. The acquired information can be used to improve and refine management practices over time.

As part of an adaptive management plan, assessing the perspectives of those in direct contact with elephants in HNP, and especially cooperation with local communities in the vicinity of HNP, is essential (Warchol 2004, Benjaminsen et al. 2013, Redpath et al. 2013, Tickle and von Essen 2020). In the case of the Maasai in Tanzania, their long history of being alienated from local lands by conservation efforts in the Serengeti, and Ngorongoro Conservation area, leading to distrust in authority initiatives (Benjaminsen et al. 2013). This can inform the situation in HNP and the necessity for carefully considering approaches to elephant management.

The Zimbabwean government have an ongoing CAMPFIRE (Communal Areas Management Programme for Indigenous Resources; Taylor 2009) programme aimed at decentralising management, utilisation, and benefits of natural resources (Taylor 2009). Its strategy is an integrative approach that includes wildlife, humans, and agricultural practices to promote governance and livelihoods based on sustainable utilisation. These national programs adhere to CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), or the Washington Convention, a voluntary international agreement that aims to ensure legal, sustainable and traceable trade of threatened species through permits, limits and certificates (UNEP/CITES 2019).

The optional use of hunting tourism (such as the CAMPFIRE initiative) or hunting by locals to limit elephant numbers can provide an option for limiting and sustainably managing elephant populations and conflicts. Although hunting as an activity raises criticisms, tourism through directly sold permits by indigenous and local communities to tourists have proven a successful regulatory model for large fauna (Freeman and Wenzel 2009, Lovelock 2015). However, the potential for corruption among stakeholders and chances of unsustainable practices and even trauma within affected elephant groups from hunting are a risk (Shannon et al. 2013, Tickle and von Essen 2020).

Culling, as opposed to hunting by locals or by tourists, is implemented by employed professionals who in smaller numbers take on the often, challenging task of killing a multitude of elephants. Mass culling of certain animals is considered a tough and desensitising job often likened to tasks such as 'waste disposal' (Crowley et al. 2018, Emond et al. 2021), affecting the potential for a sustainable relationship between people (especially locals) and wildlife. Nonetheless, culling is a common option in dealing with perceived overpopulation or other issues such as invasive species, with varying levels of success (Emond et al. 2021).

Using inquiries and interviews with community-based stakeholders in the Hwange area with first-hand experience of elephants, this research explores management methods that could facilitate a sustainable coexistence between elephants and humans. The stakeholder responses to adaptive management strategies focus on culling, culling limits and local hunting programs alongside some alternative strategies. The results and discussion converge towards a best practice for sustainable elephant management in general, and in HNP in particular. The guiding aim is to ensure the long-term survival of elephants by balancing this with other stakeholder interests.

Material and methods

Zimbabwe is a landlocked country in southern Africa known for its stunning landscape and diverse wildlife, much of which is protected within parks, reserves, and safari areas. The number of residents was approximately 16 million in 2016, with an estimated increase to over 22 million until 2030 (Nyoni and Bonga 2017). Hwange National Park covers 14 600 square km at the northwest border of Zimbabwe (19°00′S, 26°30′E). The vegetation is typical of southern African dystrophic wooded savannas with patches of grassland (Valeix et al. 2007). Surface water becomes scarce during the dry season, as the river network and most natural pans dry up (Valeix et al. 2007). In addition to the few natural water holes retaining water throughout the dry season, approximately 50 artificial water holes can maintain water availability year-round through ground water pumping (Valeix et al. 2011). It should however be noted that the number of watering holes in HNP is not static due to a combination of environmental factors, park management strategies, sustainability considerations, and resource limitations.

A total of 44 interviewees, including 11 only responding to the questionnaire, were identified through hunting organizations and the snowballing method (Gabriel 2020). Data collection was qualitative and was conducted in iterative stages that started with a questionnaire to collect information from the stakeholder, followed by semi-structured face-to-face interviews lasting about 30 minutes (Barriball and While 1994). We used the combination of questionnaires and semi-structured interviews to get a comprehensive understanding of the research topic and facilitate more robust and reliable results.

The interviewees belonged to six groups: 1) local community members in the village of Dete, right outside of the HNP, which consists of about 3000 persons that suffer seasonal crop losses due to elephants (Local Person), 2) tourism managers and guides responsible for organizing hunts and safaris on behalf of clients that could be professional hunters or ordinary tourists without hunting licenses (Tourism Manager), 3) Wildlife and Parks Management employees, an official governmental organisation that issue hunting licenses and permits and responsible for the maintenance and management of HNP (Park Ranger), 4) village heads, that act as a critical link between the community and the government and thus play a significant role in the conservation and management (Village Head). 5) paying wildlife spotting tourists (Tourist) and 6) researchers involved in wildlife research with particular focus on elephants (Researcher).

With the intention to extract preferred solutions from disparate groups of interviewees, the questionnaire was in the form of binary 'yes' or 'no' answers, with ticking options in boxes and the possibility to add short statements. An in-depth, semi-structured interview with the selected respondents was conducted a day after the questionnaire. The inquiries and interviews were based on the following six plausible predefined long-term solutions, as suggested by the respective authors, presented to the interviewees:

1. Introducing a quota hunting system based on adaptive management and hunting, which include local control and -benefit of the ecosystem services provided (Willebrand 2009).
2. Periodic culling to regulate predefined excess numbers in a systematic and central organized manner, typically carried out by wildlife managers or government officials (McNeal 1998).
3. Regulate water supply to direct elephant movements and cut down on their resources (Chamaillé-Jammes et al. 2007).
4. Contraception to reduce birth rates without adverse effects on the elephants (Whyte et al. 1998, Delsink et al. 2006).
5. Translocation to areas with fewer elephants.
6. Combined approach, including the above-mentioned methods and/or additional suggestions revealed by the inquiries and interviews.

At first, a paper questionnaire was distributed to all interviewees as part of a pilot study to investigate the premise and lay a contact foundation for the interviews. The interviews, however, compose the main dataset for the results of the study and were documented on notepads and with voice recorders. As part of the analytical process, a mind map was created to frame and connect themes in the interviews (Byrne 2022). Later, a thematic analysis of the interviews was used to explore the collected information and to identify codes and themes present in the data (Braun and Clarke 2006). The semi-structured interviews and open-coding allowed for unconsidered topics to emerge where relevant in the context of the presented methods of elephant management (Byrne 2022). The themes identified through the coding of the responses concerned aspects such as the sharing of meat and the representation of local people in conservation plans. These themes are present and discussed in relation to each of the management methods and presented in the following results. This structure allows for a clear representation of responses to each of the management methods which are subsequently synthesised into a discussion and conclusion of the emergent themes to represent the situation in HNP. The methods used focused on qualitative in-depth data collection to gather stakeholder perspectives vital to the understanding of wildlife–human conflicts (Purdon and van Aarde 2017).

Results

In total there were 44 interviewees (including those only responding to the questionnaire), consisting of a cross-section of people with a direct relationship with the elephants. Although the sample size is limited, due to restrictions in time, logistics and funding, it manages to represent a wide variety of views. A total of 12 local people and one village head responded to both the interview and questionnaire request along with seven HNP rangers, three researchers, five tourism managers and five tourists (33 in total; Table 1). Additionally, three local people, three tourists and five tourist managers responded to the questionnaire (Table 1).

Culling and/or hunting

Almost all interviewees (37 out of 44) conceded that a hunting quota or culling need to be reintroduced to sustainably manage the elephant population at HNP (Table 2). Here, a problem for CITES is the regional differences of population development, for instance 'CITES should not only consider the numbers of elephants in Africa when determining the numbers that should be kept but rather be country-specific because when looking at Africa as a continent, the number of elephants is decreasing. However, in the case of Zimbabwe as a country, there is an increase in numbers of elephants.' (Researcher 1). The benefits of the actual elephant culling quotas need to accrue the local community rather than HNP organisations and authorities, which is clearly emphasised by two respective park rangers, who stated that 'There are

Table 1. Categories and numbers of respondents for questionnaires and semi-structured interviews.

	Number of respondents	
Stakeholder	Questionnaire	Semi-structured interviews
Park rangers	7	7
Local persons	15	12
Village head	1	1
Tourism managers	10	5
Researchers	3	3
Tourists	8	5
Total	44	33

Table 2. The expressed opinions on the six suggested solutions for elephant management by combined respondents to the questionnaire and interviews (n = 44).

Suggested solution	Support	Oppose
Hunting quota	37	7
Culling	37	7
Artificial boreholes	1	43
Contraception	41	3
Translocation	16	28
Combined approach	44	0

hunting concessions which are issued out every year under the quota system and 500 elephants are targeted for hunting, this exercise is controlled by CITES. These quotas are mostly used by foreign tourists' (Park Ranger 1) and 'The animals killed are used for supplying rations for ZimParks staff. The meat is also supplied to vulnerable communities such as old people in old people's homes. The meat is also used for government functions' (Park Ranger 2). In addition, one researcher stated that 'Quota system is not effective as it is governed by CITES, only 500 elephants are allowed to be hunted each year and the recommendation is that the allocation should be increased from 500 to at least 1000 elephants each year as there is a 5% increase of elephant population every year' (Researcher 1). Thus, CITES regulation seem counterproductive in terms of both export quotas and local community, and in the end the elephants themselves.

Alternative views were also emphasized, for instance 'Killing elephants is inhumane and unethical' (Tourist 1), 'Culling causes unnecessary pain and suffering to the animals' (Researcher 2) and 'Elephants attract tourists from around the world and so culling should be avoided but rather use other control strategies' (Tourism Manager 4).

Artificial boreholes

As outlined by park rangers, artificial watering holes are facilitating the increase in elephants and in turn causing side effects due to imbalances in local capacity. One ranger suggested to 'Turn off some of the boreholes so as to promote trans-boundary movement of elephants to avoid the effects of habitat destruction through overgrazing' (Park Ranger 3) whilst another outlined that '… elephants are dominant animals and therefore will occupy the remaining watering holes thereby depriving other animals of water' (Park Ranger 2). However, all five tourism managers and five tourists mentioned that turning off the artificial water supplies would have a negative effect in tourism as it would decrease potential elephant sightings.

Contraception

Despite majority support (41 out of 44 respondents, Table 2), no interviewee expressed how contraception could be implemented as it has never been tried in HNP before. One researcher suggested that 'At Kruger National Park, they use the vaccine PZP (Porcine Zona Pellucida) which works by stimulating the production of antibodies that prevent sperm from fertilizing the egg, thus preventing pregnancy in elephants' (Researcher 1). Another researcher counteracted this statement with scepticism as 'The prolonged use of contraceptives could have negative impacts on elephant behaviour and social structures' (Researcher 1). Park rangers appeared supportive of contraception since 'The use of contraception can reduce population growth rates and reduce the risks of overgrazing and habitat destruction' (Park Ranger 3). Yet, Park Ranger 1 reflected over the expense of contraceptives and the subsequent need for external funding for such an endeavour.

Translocation

Translocation was, as contraception, cited as extremely expensive by several park rangers: 'Translocation of elephants is an expensive exercise, animal rights groups and CITES should help with funding of such activities' (Park Ranger 4), and had in general poor support (16 out of 44 respondents, Table 2). The need for external funding is therefore a reoccurring idea amongst the park rangers and appears to be a primary consideration for HNP employees. Researchers were more considerate of various ecological and biological consequences of elephant translocation, for instance 'Translocation can also help promote genetic diversity to other areas and elephants can also occupy new habitats' (Researcher 1) whilst simultaneously admitting that translocation can have negative individual impacts for elephants such as: 'Separation from families can affect the social hierarchy of the elephants resulting in stress and trauma' (Researcher 1). The spread of infectious disease was mentioned by Researcher 2. Although the translocation of elephants would lead to less damage to local crops (as voiced by Local Person 7), reflections of other stakeholders were in line with a statement by Tourism Manager 2, who argued that: 'It is better to deal with the root cause of overpopulation rather than transfer the problem to other areas'.

Combined approaches

Alternative or combined methods were mentioned by all respondents as a supported mean to deal with the 'root cause' of elephant overpopulation (Table 2). Researcher 1 voiced that 'There is need to consider contraception, culling and translocation at the same time, this might help in reducing the elephant population', although this would still carry some of the previously mentioned side effects. However, more local stakeholders, meaning park rangers and local communities, are already heavily engaged finding tactics to coexist with elephants such as encouraging communities 'to plant peppers during the growing season so as to deter the elephants from eating their crops' (Park Ranger 4). Another initiative is 'ZimParks in collaboration with IFAW and local people have an ongoing beehive project to help keep the elephants from straying from the Park's boundary' (Park Ranger 4). A local interviewee suggested that employment by the parks would secure income which '…might help in stopping poaching

activities' of elephants and other wildlife (Local Person 6). As other local interviewees express it 'We are not benefitting anything from these quota systems and asked for the relevant authorities to advocate for us so that we directly benefit from the sale of hunting concessions' (Local Person 1) and 'We get meat when there is a problem animal control exercise, however most of the meat is taken by police officers, ZimParks officers and members from the forestry commission' (Local Person 3). Thus, there is a need to better involve the local communities in the wildlife management in general, and the elephant management in particular. Therefore, for local people, the elephant conflict is a pressing issue affecting their everyday which is clear in their call that 'ZimParks rangers should promptly attend to human-animal conflict' (Local Person 4).

Discussion

There is an annual increase of the Zimbabwean elephant population of 5% (Foley and Faust 2010) that currently translates to about 2500 elephants, which means an annual population increase of 2000 elephants year^{-1} if the hunting quota of 500 is fulfilled (Ndlovu 2015). The questionnaire and interviews reveal emerging issues in the form of themes connected to the various methods of management that were raised in the interviews, These themes were; support for immediate elephant reduction schemes and particularly the organised culling and/or hunting by locals, the dispersal of money and meat as indicators of corruption, lack of inclusion and benefits to local populations in management decisions, ecocentric and biocentric ethical orientations with regards to methods of management and the interests of respondents.

The analysis of Interviews and questionnaires highlighted a wish for increased CITES export quotas and increased benefits for local communities such as meat and tourist exploits. However, the derived benefits of culling need to be considered to establish a sustainable elephant management strategy in Zimbabwe. To facilitate an adaptive management that includes regulated elephant hunting in benefit of the local community the role of CITES has to be clarified, or elaborated to include an adaptation to 1) actual elephant numbers and demography, 2) carrying capacity (thus, ecological impact) and seasonal abundance of elephants (migratory patterns, Tshipa et al. 2017) both within and beyond HNP and 3) stress levels on local communities and areal land use around HNP inflicted by elephants that search for food and water beyond park borders.

We would suggest that the CAMPFIRE program be opted to facilitate this process. While CITES does not decide on culling but suggest participating parties on number of trophies that may be exported under the convention, the CAMPFIRE has strong links to consumptive and non-consumptive use of large mammals. Thus, the CAMPFIRE initiative appears as a better platform to regulate culling and distribute derived benefits therefrom than CITES.

As a result of current strategies, local Dete stakeholders seem to be suffering direct losses because of conflict with elephants and simultaneously benefitting very little from their presence according to responses referencing the lack of benefits in meat or money. An upscaled adoption of a hunting quota system that involves, and benefits, local communities through sharing meat and regulating hunting to prevent over-harvesting, can create a sense of cooperation and shared responsibility for the sustainable management of the park (Freeman and Wenzel 2009, Ljung 2014, Lovelock 2015, Mkono 2019). Furthermore, hunting permits may generate significant revenue for both government and local communities and can be used for conservation efforts such as wildlife research and management, but also protective measures for the local communities such as water supply, fencing, and remedies. Corruption may however obstruct the process (Benjaminsen and Svarstad 2010, Benjaminsen et al. 2013).

Corruption is an issue that has been highlighted widely in human–wildlife conflicts, especially concerning conservation efforts that alienate local populations leading to unsustainable relations and significant declines in wildlife through poaching, illegal trafficking and exploitation (Benjaminsen and Svarstad 2010, Moorhouse et al. 2017, Tickle and von Essen 2020). Unemployment and poverty are main drivers of illegal trafficking and poaching (Warchol 2004, Lowassa et al. 2012, Hansen and Cox 2015). Hence, engaging the local community living near HNP should be essential to sustaining elephant management in the park, a desire voiced by 'Local Person 6'.

Sustainable and adaptive management aims to encourage local communities to champion elephant conservation while also benefitting from community-based tourism (Munyanyiwa 2019) and other incentives, such as bee-keeping (King et al. 2017) that can help sustain living conditions as well as preserve crops, natural resources and wildlife that surround their area. Currently, local communities do not sufficiently benefit from the presence of elephants, both in terms of consumption and financial gain. It is therefore important to establish a sustainable relationship framework to ensure they derive tangible benefits from the local elephant populations. 'Local Person 1 and 3' voicing that they are not benefitting from the elephants is a significant finding as it reveals issues in distribution and the potential 'exclusion of' or 'disregard for' the essential local communities in the HNP elephant dilemma. Answers by locals in the results may indicate corruption within the current management system, an issue worth further investigation.

Park rangers, on the other hand are shown to voice the need for funds to implement management strategies whilst tourism operators are more concerned with the impact on their guests visiting HNP. Park ranger's responses indicate towards different priorities as opposed to the other stakeholder groups. As official employees of the park, their perspectives on elephant management included both the maintenance of park interests, such as healthy ecosystems, and the costs of management schemes. Park rangers likewise operate as government representatives, hence as middlemen often mediating the distribution of elephant resources such as the meat which local respondents said they were not receiving their share of.

Park rangers and locals are both proponents of more immediate elephant reduction schemes as they see it would benefit

both parties since the park would experience less environmental degradation and conflicts through the destruction of crops. Hence culling was a popular solution along with translocations to a lesser degree due to scepticism about success rates. The issue of culling elephants in Zimbabwe is controversial (Shannon et al. 2013) and the interviewed stakeholders had different views and opinions. In addition, there are potential legal issues regarding the ethics of culling, as indicated by Slotow et al. (2021) and Lubbe et al. (2023). An argument for culling elephants is that it is necessary to control their population in areas with limited resources such as HNP to avoid ecological imbalances (Gillison 2015). Therefore, culling could help to minimize human–wildlife conflict and prevent habitat destruction through the controlled reduction of numbers. However, culling along with translocation and similarly disturbing intrusions have significant side effects such as disrupting decision-making abilities in elephants and disrupting their complex social patterns (Shannon et al. 2013). The perspective that killing is inhumane and should be avoided, partially emphasized by interviewees, is indicative of a classical urban/rural and mutualistic/utilitarian perspective difference that influences killing (Bjørkdahl 2005).

Researcher respondents proved to have either ecocentric or biocentric perspectives of various management methods, consistent with other studies (Bjerke and Kaltenborn 1999, Taylor et al. 2020, Dressel et al. 2021). Out of all the stakeholder groups, researchers would have more consequentialist thinking relating to benefits to the environment and/or animal welfare in their considerations of sustainability (Senecah 2007, Kotcher et al. 2017, Stuart 2022). Although views generally clash within academic communities (Kotcher et al. 2017), and was reflected in the interviews, priorities within their answers were more focused towards their environmental and ecological expertise.

Some researchers (along with park rangers) consider the option of temporarily turning off artificial water sources in the park to manage elephant population density by limiting their access to water and their mobility within the park. Here an ecocentric perspective prevailed as cutting off water could reduce overgrazing around watering holes and restoring some of those environments. Others within the same stakeholder groups voiced the biocentric view, highlighting the immense stress and suffering the sudden limitation of water would cause to ¨individual elephants who would be forced to migrate or risk dehydration. Forced migration of elephants through lack of water could encourage transboundary migration of elephants (Purdon and van Aarde 2017). A limitation of the water supply would, in addition, likely cause ethically dubious consequences such as stress and suffering following dehydration among elephants (and potentially other wildlife) (Chamaillé-Jammes et al. 2014).

Tourist operators showed a more varied role in their considerations of management methods and ideas of sustainability, as they both consider their own interests but also those of visiting tourists (Cederholm et al. 2014). Hence, suggested management methods such as culling elephants were argued to be unethical and inhumane. Claiming (along with some researchers) that culling can cause immense pain and suffering for the elephants, and negatively impact their social behaviour and family dynamics (Shannon et al. 2013). Furthermore, they contended that it is more effective to use alternative methods such as contraception or translocation to manage population growth.

Tourism managers criticised the idea of turning off artificial water arguing that it is a harmful tactic that would leave elephants in distress or accelerate their migration to other regions where they are likely to face extirpation. They further contend that this approach could negatively impact tourism, an essential source of revenue for the park and local communities. Although there may be some relevance to these reflections, we do however need to be aware that tourists may be motivated by selfishness rather than a general concern (Tickle and von Essen 2020).

Conclusion

Each of the stakeholders expressed priorities that affected their opinions of management methods, whether economic possibilities, conservation, or survival/personal provision. Varied perspectives means that there is not only a conflict between humans and elephants, but disagreements likewise arise as to how wildlife-management should be carried out, the benefits of elephants as a resource or even the immediacy with which change needs to happen. Therefore, as with most wildlife-management situations, the question becomes about the management of human interests rather than the wild animals in questions (Dressel et al. 2021).

The methods outlined have supporters and opposition in lieu of their implementation and consequences. When stakeholder perspectives clash, more work is needed to clarify the issues, shared ideas and provide empirical-based solutions to current situations (Hansen and Cox 2015). In the case of HNP, wildlife management methods need to be found that are more considerate of the situation of local communities, in this case the Dete, and avoiding corruption (Benjaminsen et al. 2013, Redpath et al. 2013).

Any decision to use integrated management should aim to consider the views of all stakeholders and proactively work to address their concerns while ensuring the well-being of the elephants, balanced environmental impact and the economic development of local communities. Nonetheless, to implementation of management methods need a clear initiative, one where both the effective management of elephants in HNP is possible, alongside facilitating stable population numbers that live in sustainable coexistence with stakeholders.

A simple conclusion would be that current methods are not enough and that new solutions would be complicated but are needed to deal with the overabundance of elephants in HNP. However, considering the overall decrease in elephants across the rest of the African continent (Bennet 2015) this becomes a unique situation that needs careful consideration both for the sake of stakeholders as well as the continued survival of the African Savannah elephant. We encourage further research into these solutions and the development of an adaptive management system for elephants in HNP.

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Author contributions

Lara Tickle: Conceptualization (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Project administration (equal); Supervision (equal); Validation (equal); Writing – original draft (equal); Writing – review and editing (equal). **Varwi Jacob Tavaziva**: Conceptualization (equal); Data curation (equal); Formal analysis (equal); Funding acquisition (equal); Investigation (equal); Validation (equal); Visualization (equal); Writing – original draft (equal); Writing – review and editing (equal). **Carl-Gustaf Thulin**: Conceptualization (equal); Methodology (supporting); Project administration (equal); Supervision (equal); Writing – original draft (equal); Writing – review and editing (equal).

Transparent peer review

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/wlb3.01150.

Data availability statement

The data that support the findings of this study were collected by Varwi Jacob Tavaziva in Zimbabwe. and are available on request from the corresponding author, The data are not publicly available due to their containing information that could compromise the privacy of research participants.

References

Africa Geographic. 2023. KAZA's elephant survey – the results are in. – Africa Geographic News Desk, https://africageographic.com/stories/kazas-elephant-survey-the-results-are-in/#:~:text=Across%20the%20KAZA%20TFCA%2C%2058,in%20Zambia%20and%20Angola%20combined.

Almond, R. E. A., Grooten, M., Juffe Bignoli, D. and Petersen, T. 2022. Living Planet Report 2022 (No. 1). – WWF.

Armbruster, P. and Lande, R. 1993. A population viability analysis for African elephant (*Loxodonta africana*): how big should reserves be? – Conserv. Biol. 7: 602–610.

Barriball, K. L. and While, A. 1994. Collecting data using a semi-structured interview: a discussion paper. – J. Adv. Nurs. 19: 328–335.

Benjaminsen, T. A. and Svarstad, H. 2010. The death of an elephant: conservation discourses versus practices in Africa. – Forum Dev. Stud. 37: 385–408.

Benjaminsen, T. A., Goldman, M. J., Minwary, M. Y. and Maganga, F. P. 2013. Wildlife management in Tanzania: state control, rent seeking and community resistance. – Dev. Change 44: 1087–1109.

Bennett, E. L. 2015. Legal ivory trade in a corrupt world and its impact on African elephant populations. – Conserv. Biol. 29: 54–60.

Bjerke, T. and Kaltenborn, B. P. 1999. The relationship of ecocentric and anthropocentric motives to attitudes towards large carnivores. – J. Environ. Psychol. 19: 415–421.

Bjørkdahl, K. S. 2005. The wild ember within: a study of the hunting ethos in Norway and the USA. – PhD thesis, Univ. of Oslo, Norway.

Blanc, J. J., Barnes, R. F. W., Craig, G. C., Dublin, H. T., Thouless, C. R., Douglas-Hamilton, I. and Hart, J. A. 2007. African elephant status report 2007: an update from the African elephant database. – Occasional Paper of the IUCN Species Survival Commission 33, p. 175.

Bond, W. J. 1994. Keystone species. – In: Schulze, E.-D. and Mooney, H. A. (eds), Biodiversity and ecosystem function. Springer, pp. 237–253.

Braun, V. and Clarke, V. 2006. Using thematic analysis in psychology. – Qual. Res. Psychol. 3: 77–101.

Bunnefeld, N., Edwards, C. T. T., Atickem, A., Hailu, F. and Milner-Gulland, E. J. 2013. Incentivizing monitoring and compliance in trophy hunting. – Conserv. Biol. 27: 1344–1354.

Byrne, D. 2022. A worked example of Braun and Clarke's approach to reflexive thematic analysis. – Qual. Quant. 56: 1391–1412.

Cederholm, E. A., Björck, A., Jennbert, K. and Lönngren, A.-S. 2014. Exploring the animal turn: human-animal relations in science, society and culture. – The Pufendorf Institute of Advanced Studies, Lund Univ., Sweden.

Chamaillé-Jammes, S., Fritz, H. and Murindagomo, F. H. 2007. Detecting climate changes of concern in highly variable environments: quantile regressions reveal that droughts worsen in Hwange National Park, Zimbabwe. – J. Arid Environ. 71: 321–326.

Chamaillé-Jammes, S., Valeix, M., Madzikanda, H. and Fritz, H. 2014. Surface water and elephant ecology: lessons from a waterhole-driven ecosystem, Hwange National Park, Zimbabwe. – In: Elephants and Savanna Woodland Ecosystems, John Wiley & Sons Ltd, pp. 118–31.

Chang'a, A., de Souza, N., Muya, J., Keyyu, J., Mwakatobe, A., Malugu, L., Ndossi, H. P., Konuche, J., Omondi, R., Mpinge, A., Hahn, N., Palminteri, S. and Olson, D. 2016. Scaling-up the use of chili fences for reducing human–elephant conflict across landscapes in Tanzania. – Trop. Conserv. Sci. 9: 921–930.

Crowley, S. L., Hinchliffe, S. and McDonald, R. A. 2018. Killing squirrels: exploring motivations and practices of lethal wildlife management. – Environ. Plan. Nat. Space 1: 120–143.

Cumming, D. H. and Jones, B. T. 2005. Elephants in southern Africa: management issues and options. – WWF – SARPO Occasional Paper Number 11.

Delsink, A. K., Van Altena, J. J., Grobler, D., Bertschinger, H., Kirkpatrick, J. and Slotow, R. 2006. Regulation of a small,

discrete African elephant population through immunocontraception in the Makalali Conservancy, Limpopo, South Africa. – S. Afric. J. Sci. 102: 403–405.
Dressel, S., Sjölander-Lindqvist, A., Johansson, M., Ericsson, G. and Sandström, C. 2021. Achieving social and ecological outcomes in collaborative environmental governance: good examples from Swedish moose management. – Sustainability 13: 2329.
Druce, H. C., Pretorius, K. and Slotow, R. 2008. The response of an elephant population to conservation area expansion: phinda Private Game Reserve, South Africa. – Biol. Conserv. 141: 3127–3138.
Dunham, K. M., Mackie, C. S., Nyaguse, G. and Zhuwau, C. 2015. Aerial survey of elephants and other large herbivores in north-west Matabeleland (Zimbabwe): 2014. – Great Elephant Census, Vulcan Inc.
Emond, P., Bréda, C. and Denayer, D. 2021. Doing the "dirty work": how hunters were enlisted in sanitary rituals and wild boars destruction to fight Belgium's ASF (African Swine Fever) outbreak. – Anthropozoologica 56: 87–104.
Enck, J. W., Decker, D. J., Riley, S. J., Organ, J. F., Carpenter, L. H. and Siemer, W. F. 2006. Integrating ecological and human dimensions in adaptive management of wildlife-related impacts. – Wildl. Soc. Bull. 34: 698–705.
Eskew, E. A. and Carlson, C. J. 2020. Overselling wildlife trade bans will not bolster conservation or pandemic preparedness. – Lancet Planet Health.
Foley, C.. and Faust, L. 2010. Rapid population growth in an elephant *Loxodonta africana* population recovering from poaching in Tarangire National Park, Tanzania. – Oryx 44: 205–212.
Freeman, M. M. R. and Wenzel, G. W. 2009. The nature and significance of polar bear conservation hunting in the Canadian arctic. – Arctic 59: 21–30.
Gabriel, Y. 2020. The SAGE handbook of qualitative business and management research methods: methods and challenges. – SAGE Publications Ltd, pp. 63–81.
Gillson, L. 2015. Biodiversity conservation and environmental change: using palaeoecology to manage dynamic landscapes in the Anthropocene. – Oxford Academic Press.
Gobush, K. S., Edwards, C. T. T., Balfour, D., Wittemyer, G., Maisels, F. and Taylor, R. D. 2022. African savanna elephant *Loxodonta africana* (amended version of 2021 assessment). – The IUCN Red List Threat. Species 2022, p. e. T181008073A223031019.
Greenfield, P. 2024. Death toll rises to seven in Malawi elephant relocation project linked to Prince Harry NGO. – The Guardian, https://www.theguardian.com/environment/2024/feb/16/prince-harry-malawi-elephant-relocation-project-dead-aoe.
Hansen, A. and Cox, R. 2015. The Routledge handbook of environment and communication. – Routledge.
Henley, M. D., Cook, R. M., Bedetti, A., Wilmot, J., Roode, A., Pereira, C. L., Almeida, J. and Alverca, A. 2023. A phased approach to increase human tolerance in elephant corridors to link protected areas in southern Mozambique. – Diversity 15: 85.
Howard, J. 2024. Botswana threatens to send 20,000 elephants to Germany. – BBC News, https://www.bbc.com/news/world-68715164.
King, L. E., Lala, F., Nzumu, H., Mwambingu, E. and Douglas-Hamilton, I. 2017. Beehive fences as a multidimensional conflict-mitigation tool for farmers coexisting with elephants. – Conserv. Biol. 31: 743–752.
Kotcher, J. E., Myers, T. A., Vraga, E. K., Stenhouse, N. and Maibach, E. W. 2017. Does engagement in advocacy hurt the credibility of scientists? Results from a randomized national survey experiment. – Environ. Commun. 11: 415–429.
Lancia, R. A., Braun, C. E., Collopy, M. W., Dueser, R. D., Kie, J. G., Martinka, C. J., Nichols, J. D., Nudds, T. D., Porath, W. R. and Tilghman, N. G. 1996. Arm! For the future: adaptive resource management in the wildlife profession. – Wildl. Soc. Bull. 24: 436–442.
Lebas, N. R. 2002. Mate choice, genetic incompatibility, and outbreeding in the ornate dragon lizard, *Ctenophorus ornatus*. – Evolution 56: 371–377.
Ljung, P. E. 2014. Traditional use of wildlife in modern society: public attitudes and hunters' motivations. – PhD thesis, SLU, Sweden.
Lovelock, B. 2015. Consumptive and non-consumptive tourism practices: the case of wildlife tourism. – In: Hall, C. M., Gossling, S. and Scott, D. (eds), The Routledge handbook of tourism and sustainability. – Routledge, pp. 63–73.
Lowassa, A., Tadie, D. and Fischer, A. 2012. On the role of women in bushmeat hunting – insights from Tanzania and Ethiopia. – J. Rur. Stud. 28: 622–630.
Lubbe, W. D., Alberts, R. C., Robinson, J. A., Rushworth, I., Jeanetta Selier, S. A., Tanneback, L. and Ferreira, S. M. 2023. 'Could culling of elephants be considered inhumane and illegal in South African law?': a response and further thoughts. – J. Int. Wildl. Law Policy 26: 1–21.
McNeal, A. 1998. Elephant culling: why is it the best strategy to reduce overpopulation in South Africa? – Kellogg Honors College Capstone Project, https://www.cpp.edu/honorscollege/documents/research-posters/AG/avs_mcneal.pdf.
Mkono, M. 2019. Positive tourism in Africa. – Routledge.
Moorhouse, T., D'Cruze, N. C. and Macdonald, D. W. 2017. Unethical use of wildlife in tourism: what's the problem, who is responsible, and what can be done? – J. Sustain. Tourism 25: 505–516.
Munyanyiwa, T., Nyaruwata, S. and Njerekai, C. 2019. How community-based tourism can survive in turbulent environments The Mahenye CAMPFIRE project, Zimbabwe. – In: Positive tourism in Africa. Routledge.
Musengi, K. 2022. Zimbabwe's ballooning jumbo herds a growing threat to humans. – Phys.org, https://phys.org/news/2022-05-zimbabwe-ballooning-jumbo-herds-threat.html#:~:text=At%20least%2060%20people%20have,of%20heightening%20jumbo%2Dhuman%20conflict.
Ndlovu, P. 2015. Elephants hunting quota set at 500. – The Chronicle, https://www.chronicle.co.zw/elephants-hunting-quota-set-at-500.
Nyirenda, V. R., Nkhata, B. A., Tembo, O. and Siamundele, S. 2018. Elephant crop damage: subsistence farmers' social vulnerability, livelihood sustainability and elephant conservation. – Sustainability 10: 3572.
Nyoni, T. and Bonga, W. G. 2017. Population growth in Zimbabwe: a threat to economic development? – DRJ-JEF 2: 29–39.
Ogada, M. O., Woodroffe, R., Oguge, N. O. and Frank, L. G. 2003. Limiting depredation by African carnivores: the role of livestock husbandry. – Conserv. Biol. 17: 1521–1530.
Owen-Smith, N. 1987. Pleistocene extinctions: the pivotal role of megaherbivores. – Paleobiology 13: 351–362.
Owen-Smith, N. G. I. H., Kerley, G. I. H., Page, B., Slotow, R. and Van Aarde, R. J. 2006. A scientific perspective on the management of elephants in the Kruger National Park and elsewhere: elephant conservation. – S. Afric. J Sci. 102: 389–394.
Purdon, A. and van Aarde, R. J. 2017. Water provisioning in Kruger National Park alters elephant spatial utilisation patterns. – J. Arid Environ. 141: 45–51.

Redpath, S. M., Young, J., Evely, A., Adams, W. M., Sutherland, W. J., Whitehouse, A., Amar, A., Lambert, R. A., Linnell, J. D. C., Watt, A. and Gutiérrez, R. J. 2013. Understanding and managing conservation conflicts. – Trends Ecol. Evol. 28: 100–109.
Schmitz, O. J., Sylvén, M., Atwood, T. B., Bakker, E. S., Berzaghi, F., Brodie, J. F., Cromsigt, J. P. G. M., Davies, A. B., Leroux, S. J., Schepers, F. J., Smith, F. A., Stark, S., Svenning, J.-C., Tilker, A. and Ylänne, H. 2023. Trophic rewilding can expand natural climate solutions. – Nat. Clim. Change 13: 324–333.
Senecah, S. L. 2007. Impetus, mission, and future of the environmental communication commission/division: are we still on track? Were we ever? – Environ. Commun. 1: 21–33.
Shannon, G., Slotow, R., Durant, S. M., Sayialel, K. N., Poole, J., Moss, C. and McComb, K. 2013. Effects of social disruption in elephants persist decades after culling. – Front. Zool. 10: 62.
Slotow, R., Blackmore, A., Henley, M., Trendler, K. and Garaï, M. 2021. Could culling of elephants be considered inhumane and illegal in South African law? – J. Int. Wildl. Law Policy 24: 181–206.
Stuart, M. T. 2022. Scientists are epistemic consequentialists about imagination. – Philos. Sci. 90: 518–538.
Taylor, R. 2009. Community based natural resource management in Zimbabwe: the experience of CAMPFIRE. – Biodivers. Conserv. 18: 2563–2583.
Taylor, B., Chapron, G., Kopnina, H., Orlikowska, E., Gray, J. and Piccolo, J. J. 2020. The need for ecocentrism in biodiversity conservation. – Conserv. Biol. 34: 1089–1096.
Tickle, L. and von Essen, E. 2020. The seven sins of hunting tourism. – Ann. Tourism Res. 84: 102996.
Tiller, L., King, L., Lala, F., Pope, F., Thouless, C., Wall, J. and Douglas-Hamilton, I. 2021. The outcome of an elephant translocation from Isiolo to Tsavo East National Park, Kenya. – Pachyderm 63: 91–98.
Tshipa, A., Valls-Fox, H., Fritz, H., Collins, K., Sebele, L., Mundy, P. and Chamaillé-Jammes, S. 2017. Partial migration links local surface-water management to large-scale elephant conservation in the world's largest transfrontier conservation area. – Biol. Conserv. 215: 46–50.
UNEP/CITES. 2019. Convention on international trade in endangered species of wild fauna and flora. – UN, https://cites.org/sites/default/files/I/Brochure_UNEP_CITES_eng.pdf.
Valeix, M. 2011. Temporal dynamics of dry-season water-hole use by large African herbivores in two years of contrasting rainfall in Hwange National Park, Zimbabwe. – J. Trop. Ecol. 27: 163–170.
Valeix, M., Fritz, H., Dubois, S., Kanengoni, K., Alleaume, S. and Sonia, S. 2007. Vegetation structure and ungulate abundance over a period of increasing elephant abundance in Hwange National Park, Zimbabwe. – J. Trop. Ecol. 23: 87–93.
Van Aarde, R. J. and Jackson, T. P. 2007. Megaparks for metapopulations: addressing the causes of locally high elephant numbers in southern Africa. – Biol. Conserv. 134: 289–297.
Warchol, G. L. 2004. The transnational illegal wildlife trade. – Crim. Justice Stud. 17: 57–73.
Western, D. 1989. The ecological role of elephants in Africa. – Pachyderm 12: 43–46.
Whyte, I., Van Aarde, R. and Pimm, S. 1998. Managing the elephants of Kruger National Park. – Anim. Conserv. 1: 77–83.
Willebrand, T. 2009. Promoting hunting tourism in north Sweden: opinions of local hunters. – Eur. J. Wildl. Res. 55: 209–216.
Zhongming, Z., Linong, L., Xiaona, Y. and Wei, L. 2018. Integrated approach to elephant conservation in Zimbabwe: the numbers speak! – WWF, https://wwf.panda.org/wwf_news/?329360/Integrated-approach-to-elephant-conservation-in-Zimbabwe--The-numbers-speak.
Zimbabwe National Elephant Management Plan. 2021–2025. Zimbabwe parks and wildlife management authority, pp. 1–93. – https://www.cms.int/sites/default/files/document/cms_nlp_zwe_plan_elephant_2021.pdf.