

Human wildlife conflicts in Uganda: A Case of Queen Elizabeth National Park

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Abstract

Introduction

The main objective of this study was to assess the impact of HWC in the Ishasha region, Southwestern Uganda. This study was guided by specific objectives, namely, identifying the root causes of HWC, assessing the effects of HWC, and determining the measures to mitigate HWC in the Ishasha region.

Methodology

The study employed a descriptive cross-sectional design utilizing quantitative data collection and analysis methods. Using simple random and purposive sampling techniques, 109 respondents were selected to participate in the study. This study used questionnaires and interviews with key informants to collect data.

Results

The main causes of human-wildlife conflict were found to be the need to meet hunters' personal needs (36.7%), illegally harvested charcoal for commercial production (20.2%), perceived injustice (18.3%), commercial hunting and bushmeat trade (15.6%). And droughts, bushfires, and climate change, 9.2% each. Human-wildlife conflict accounts for 32% of reported human and wildlife deaths and injuries, 28% of agricultural devastation, 24% of poverty, and 16% of human deaths. The study findings revealed that the measures used to mitigate human-animal conflict in the Ishasha region were the use of indigenous knowledge (48.6% of respondents), non-electric fences (33%) and police patrols (18.3% of respondents). The majority of respondents cited human and wildlife death and injury as impacts of human-wildlife conflict in the Ishasha region. Therefore, the local communities use non-electric fences to reduce the impact of animals intruding on people's crops in the area.

Conclusion

Indigenous knowledge is the most effective measure to mitigate HWC in the Ishasha region, highlighting the importance of using traditional practices and community-based solutions.

Recommendation

It is important for the various institutions to assess the effectiveness of existing policies and identify opportunities for policy reform to address the root causes of the conflict and promote sustainable coexistence between humans and wildlife.

Keywords: Human-wildlife conflict, Biodiversity conservation, Illegal wildlife hunting, Illegal charcoal burning, Death of wildlife.

Submitted: September 05, 2025 Accepted: October 18, 2025 Published: October 30, 2025

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Introduction

Human-wildlife conflicts (HWC) pose a significant challenge to conservation efforts worldwide as the growing human population increasingly encroaches on natural habitats, leading to increased interactions and tensions between humans and wildlife. These conflicts manifest themselves in various forms, including crop raids, livestock

looting, and threats to human security, resulting in major socio-economic and environmental consequences. To protect biodiversity and promote peaceful coexistence between humans and wildlife, it is essential to understand the factors underlying these conflicts and develop effective mitigation strategies. Therefore, there is an urgent need for comprehensive research to assess the extent of HWC, identify key drivers, and develop sustainable solutions that

balance the needs of both human communities and wildlife populations. Conflict between humans and animals harms social, economic, and cultural aspects of humans, as well as on species conservation and the environment (Mekonen, 2020).

About 40–50% of the Earth's surface has been modified by human activity; this includes 6-8% of pastureland and 10-15% of agriculture, irrigation, and urban development (Attia et al., 2018). This major human disturbance has severely damaged the planet's livable land. Human activity has changed about three-quarters of the Earth's livable territory, mostly because of the world's fastest-growing population, which is expected to reach 8.9 billion by 2050 from its present 7 billion people (Lautensach & Lautensach, 2020). Despite human activity's significant influence, there remains a study deficit about practical approaches to reducing conflict between humans and wildlife in these increasingly human-dominated environments.

In regions where human and animal habitats overlap, conflict occurs due to direct competition for resources, a phenomenon known as human-wildlife conflict (HWC) (Kolinski & Milich, 2021). This problem is getting worse every year as human populations expand into and exploit wilder areas (Mekonen, 2020). HWC takes diverse forms, including livestock predation and human deaths, and poses a significant threat to both human communities and wildlife populations (Digun-Aweto & Van Der Merwe, 2019). Particularly in areas where communities rely on subsistence agriculture, the consequences of HWC, such as: Some of the impacts, such as crop consumption and damage caused by wildlife, can be devastating and threaten households' main sources of income and food security. Consequently, community members sometimes resort to violent measures, including killing animals, to protect their resources (Kolinski & Milich, 2021).

However, such actions have far-reaching consequences that go beyond the immediate HWC incident, potentially leading to biodiversity reduction and ecosystem disruption. In the adjacent regions of Queen Elizabeth National Park (QENP) in southwestern Uganda, communities face ongoing risk of crop damage from wildlife, including endangered species such as elephants and chimpanzees (Haruna & Rusoke, 2019). The need to constantly protect crops and the resulting economic instability, health risks, and frustration with wildlife are forcing farmers to take drastic measures, including harming or killing animals that eat or damage crops (Lister, 2018). Furthermore, despite numerous studies conducted in southwestern Uganda, there is still no in-depth analysis of human-wildlife conflict in most key protected areas in the Ishasha area. Furthermore, in the Ishasha area of southwestern Uganda, there has never been any documentation about the causes, consequences, or concerns of the local community in dealing with elephant raids. The study focused on the

HWC between elephants and the inhabitants of the Ishasha area.

HWC is a long-standing conservation problem, particularly in Africa (Lister, 2018; Haruna & Rusoke, 2019). In Uganda, efforts to conserve biodiversity and improve livelihoods in riparian communities near protected areas are critical to balancing development and maintaining the rich biodiversity. By responding to the needs of local communities while protecting wildlife, these initiatives aim to balance the often-competing goals of development and biodiversity conservation. Changes in land use through relocation have reduced boundaries between humans and wildlife in Queen Elizabeth National Park (Rossi, 2018). Therefore, the likelihood of contact between communities and wildlife has increased, leading to inevitable conflicts. However, there is little documented evidence on communities' perceptions and attitudes toward these conflicts. In April 2022, an incident in which a man was killed by an elephant on his farm near Queen Elizabeth National Park (QENP) highlighted the urgent need to investigate and address the extent of human-wildlife conflict (HWC) in this region (Wildlife Report, 2023). When wild animals such as elephants, lions, buffalo, and monkeys raid crops or threaten human lives in surrounding villages, it significantly undermines the economy and the sense of security of communities, especially when there is no compensation policy in place. This situation highlights the importance of combating HWC on the edges of protected areas. Implementing measures to curb crop raiding and other conflicts is crucial not only to improve the livelihoods of local communities but also to ensure the conservation of the rich biodiversity of fauna and flora in these regions.

The main objective of the study was to assess the impact of HWC in the Ishasha region, Southwestern Uganda. The study answered the following questions;

- What are the root causes of HWC in the Ishasha region?
- What are the effects of HWC in the Ishasha region?
- What are the measures to mitigate HWC in the Ishasha region?

Material and methods

Area of the study

Queen Elizabeth National Park is 1978 square kilometers located in the western part of Uganda, the nearest town is Kasese, a savannah grassland located between 00°12'S / 30°00'E and 0.200°S / 30.000°E. The National Park includes Maramagambo Forest and borders the Kigezi and Kyambura Wildlife Reserves and Kibale National Park in Uganda, and the Virunga National Park in the Democratic Republic of Congo. The national park has two wet and dry

seasons: October–November and March to May, but peaks in April and October, and the temperatures are relatively pleasant during this time of the year. The dry season is not quite as dry since you can still expect rain now and then. The diversity of the park makes it a pleasant habitat for the carnivorous species. The park is, however, facing challenges due to human-wildlife conflict (Hill et al., 2002). In the early 1980s, the study area was purely savannah grassland, but recently, it has been taken over by alien and invasive species, which has influenced human-wildlife conflict in the surrounding areas.

Research design

The study employed a descriptive cross-sectional design in gathering information about the impact of HWC in the Ishasha region. This design was justified for this study because it provided a systematic description based on facts and accuracy variables of the effects of HWC on the conservation of carnivorous species in QENP. The study utilized quantitative data collection and analysis methods.

Sampling design

The researcher employed both simple random sampling and purposive sampling methods to ensure the selection of the most appropriate and relevant respondents, thereby providing reliable data and information for the study. Simple random sampling was used to give all individuals in the population an equal chance of being selected, which helps to reduce selection bias and ensures that the sample is representative of the broader population. This method enhances the generalizability of the findings. On the other hand, purposive sampling was used to deliberately select individuals with particular knowledge or characteristics relevant to the research topic. This approach ensures that the data collected is rich and directly applicable to the research questions. The novelty in combining these

methods lies in the balance it achieves between representativeness and depth of insight, making the research findings both comprehensive and highly pertinent to the study's objectives.

Study population and sample size determination

The study population of 8,457 people from the Ishasha sector was selected in the study (UBOS, 2014). The Yamane formula of 1967 was used to calculate the sample size.

$$\text{Where: } n = \frac{N}{1 + N(e)^2}$$

n = Sample size
N = Population size
1 = constant
e = Level of precision 10% (0.1)

Therefore
N=8457
1= constant
e= 10%
 $10/100 = (0.1)^2$
=0.01
$$n = \frac{8457}{1 + 8457(0.1)^2}$$

n= 99

Therefore, 99 respondents were selected.

Purposive sampling further selected 9 key informants from the Ishasha sector. These included Head Rangers (03) and Guides (07), as indicated in Table 1. The researcher did this to acquire specific data and information from respondents who were believed to be more knowledgeable and skilled with the content of the study (Table 1).

Table 1. Study population and sample size determination and selection

Category of Respondents	Population	Sample	Sampling Method
Population	8,457	99	Simple Random Sampling
Key informants			Purposive Sampling
Head rangers	03	03	
Guides	07	07	
Total		109	Respondents

Data collection

In conducting this study, three data collection methods were utilized: observation, interviews, and questionnaires. These widely recognized methods were chosen to gather precise information on the impact of HWC in Uganda. The observation method allowed direct witness and record instances of human-wildlife interactions and their effects.

The interviewing method provided in-depth insights from individuals with firsthand experiences and knowledge about the conflicts. The questionnaire method enabled the collection of structured data from a larger sample, ensuring a comprehensive understanding of the issue. By employing these diverse methods, the researcher aimed to obtain accurate and multifaceted data on the HWC in the region. The observation method was used to perceive and

understand the experience of interest to the respondents. It allowed him to see what people do rather than what they say and do. The researcher used the observation method because it helped in observing the impact of HWC. A key informant is a knowledgeable source of valuable information. In this research, the key informants included the Head Rangers and Guides, who provided in-depth insights. An interview guide was prepared in advance, ensuring the questions were clear and easily understandable for the respondents. This preparation facilitated clear, detailed, and passionate responses from the key informants, enhancing the quality and depth of the information collected.

Data analysis

The researcher organized data that was collected in an orderly manner to minimize errors and uphold maximum accuracy. The researcher used descriptive statistics to analyse the data obtained. This involved categorizing according to the variables under investigation, coding, tallying, using frequency tabulation and graphical presentation, and computing data into percentages. The researcher organized data with the study objectives in order to produce coherent meaning. After thorough sorting, the data was entered into the computer for analysis using (R programming language version 4.4.0, a computer-based statistical application program. After data analysis, the study results were presented in tables only for easy

interpretation and discussion. Conclusions and recommendations were drawn based on the study findings in the same order as the study objectives, after descriptive statistics.

Ethical considerations

In this study, participants gave informed consent to ensure that they were fully aware of the nature and purpose of the research, their role in it, and their rights as participants. Informed consent is a crucial ethical practice that respects the autonomy and dignity of participants. The process likely involved the researcher providing participants with detailed information about the study, including its objectives, procedures, potential risks and benefits, and the measures taken to ensure confidentiality and data protection. This information would have been presented clearly and understandably, perhaps through an information sheet or a verbal explanation. Participants then had the opportunity to ask questions and request clarification. Only after they fully understood all aspects of the study did they ask for their consent, typically by signing an informed consent form. This form documented their voluntary consent to participate and ensured that their participation was informed and based on a clear understanding of the research.

Results and discussion

Table 2. Demographic characteristics of the participants.

Demographic characteristics		Percentage (%)
Gender	Male	36.7%
	Female	63.3%
Age	18 - 20	41.3%
	21 - 30	27.5%
	31 – 40	18.3%
	>41	12.8%
Educational Levels	Non-formal	38%
	Primary	11%
	Secondary	46 %
	Institutions	3%
	Others	2%

According to the study findings in Table 2, 36.7% of the respondents were male and 63.3% were female. The majority, 46%, of the respondents had secondary education. This was because most of the respondents were educated. The researcher's main reason for considering the highest levels of education attained by respondents was to

ensure that data collection tools were planned and used appropriately. Also, 41.3% of the respondents surveyed were in the age group of 18-20 years. The study considered the age of respondents to acquire their knowledge based on their lifetime experience with the impact of HWC in the Ishasha region.

Table 3: Causes of HWC

Causes of HWC	Percentage (%)
The need to meet hunters' needs	36.7%
Illegally harvested for commercial charcoal production	20.2%
Perceived Injustice	18.3%
Commercial hunting and trade of bush meat	15.6%
Droughts, bushfires, and climate change	9.2%

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According to the study, 37% of respondents indicated that hunters employ various methods, including dogs, nets, and traps, with wire snares being the most prevalent. These snares are typically set in feeding areas, near watering points, or along game trails due to their low cost, ease of production, and difficulty for rangers to detect, making them particularly attractive to hunters. This aligns with Authority (2017), who observed that while such traps can result in the death of numerous animals, they are highly inefficient and lead to significant wastage when not regularly checked, as some fatally wounded animals may escape. Additionally, 20% of respondents noted that while firewood is often illegally harvested for commercial charcoal production, it is primarily collected for domestic use. In contrast, illegal hunting in QENP is mainly motivated by financial gain, with any meat consumed at home being considered a secondary benefit. This supports the Authority's (2017) assertion that the extent of wildlife offenses driven by subsistence needs varies across resources, contributing to wildlife conflicts. The study also found that 18% of respondents cited perceived injustice as a factor, 15.6% mentioned commercial hunting and the bush meat trade, and 9.2% pointed to droughts, bushfires, and climatic changes as causes of HWC. Seasonal habitat modifications due to rainfall were also noted to impact these conflicts. Anderson and Bausch (2006) highlighted that the destruction of natural vegetation around protected areas, and sometimes the complete loss of buffer zones, forces herbivores to feed in cultivated fields, exacerbating conflicts.

One common driver of wildlife crime is the need to meet basic household subsistence requirements. This can involve obtaining desired resources, such as bush meat, or finding substitutes for unavailable or costly goods, like using grass thatch instead of zinc roof sheets or medicinal plants instead of formal medical care (Haruna & Rusoke, 2019). In the study area, some households rely on wildlife products year-round to meet their subsistence needs, while others use wildlife as a coping strategy during seasonal needs or crises. Authority (2017) notes that the degree to which subsistence needs drive wildlife offenses varies by resource. For instance, while firewood is often illegally

harvested for commercial charcoal production, it is primarily collected for domestic use. Conversely, illegal hunting in Queen Elizabeth National Park (QENP) is mainly driven by financial gain, with consumed meat being a secondary benefit.

Perceived injustice also plays a significant role in wildlife crime. People's attitudes towards protected areas are closely linked to their likelihood of engaging in wildlife crime. Those who feel they do not benefit from revenue-sharing funds or suffer losses due to wildlife are more inclined to hunt illegally. Retaliation for crop raiding is frequently cited by hunters as a reason for their illegal activities despite knowing the legal consequences (Authority, 2017). Currently, the general sentiment of people living near QENP is negative. Most residents feel disadvantaged by their proximity to the conservation area, primarily due to crop raiding, and believe they do not benefit from tourism or revenue-sharing initiatives.

Hunters employ various strategies, including using dogs, nets, and traps, with wire snares being the most prevalent method. These snares are typically set in feeding areas, near watering points, or along game trails. Their appeal lies in their low cost, ease of production, and the difficulty ranger's face in detecting them. Although wire snares are effective in killing a large number of animals, they are highly inefficient and result in significant wastage when not regularly checked, as fatally wounded animals may escape capture (Authority, 2017). Hunters also often combine traps with fire settings to promote regrowth that attracts animals. Firearms are rarely used for hunting bush meat due to the difficulty in accessing guns and the fear of being caught with one (Ahmadi et al., 2018). During the dry season, hunters prefer to hunt because it allows them to see rangers from a distance, leave fewer tracks, and concentrate their efforts in areas where animals gather. Hunting near the boundaries of protected areas minimizes travel time for checking traps and transporting meat, reducing the risk of detection by patrols. However, this strategy also increases the likelihood of rangers discovering traps, as boundary areas tend to be more heavily patrolled.

Table 4: Effects of HWC conflicts

Effects of HWC Conflicts	Percentage (%)
Human and wild animal deaths and injuries	32.1%
Destruction of crops	27.5%
Poverty	23.9%
The death of people	16.5%

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Among the effects of HWC in the Ishasha region were human and wild animal deaths and injuries, as represented by 32.1%, followed by the destruction of crops at 27.5%. It was also found out that some of the respondents, 23.9% mentioned that due to crop animal raiding, local communities had faced the challenge of poverty due to lack of food, and lastly, 16% of the respondents mentioned deaths among local communities as animals enter into the farmlands looking for food. The cruelty of HWC is underscored by the significant but less frequent occurrence of human death and injury compared to crop damage. Despite being less common, these outcomes represent the most severe manifestations of HWC. In response to incidents of conflict, the killing of wild animals as retaliation is a prevalent reaction among affected

communities. However, accurately identifying the true culprit responsible for the conflict is often challenging, as highlighted by Gulati et al. (2021). This challenge is especially pronounced for predator species but also extends to other wildlife species. Consequently, the indiscriminate killing of wildlife as a form of retaliation exacerbates the already complex dynamics of HWC, with potential repercussions for biodiversity and ecosystem stability. Due to the continued depredation of domestic animals by carnivorous predators, 11 lions were killed by poisoning at Hamukungu fishing village inside QENP. The poisoning of a pride of 11 climbing lions at Hamukungu fishing village was the third incident since 2007, when 13 lions were poisoned. Later in 2010, eight lions were also poisoned, all in the same park.

Table 5. Respondents' understanding of the measures to mitigate HWC

The role of folktales	Percentage (%)
Indigenous knowledge	48.6%
Non-electric fencing	33.0%
Law Enforcement Patrols	18.3%

Indigenous knowledge, non-electrified fences, and police patrols are mentioned as key measures. Indigenous knowledge likely includes traditional practices that make it easier for communities to coexist with wildlife, while non-electrified fences serve as a physical barrier to prevent crop raids. Police patrols are crucial to preventing illegal hunting and protecting wildlife, although resource limitations in places like QENP can present a challenge. Massé (2020) points out that there is a need to strike a balance in investments between direct measures to combat wildlife crime and addressing the root causes that lead individuals to commit crimes. This means that alongside law enforcement efforts, there is a need for initiatives that address the underlying factors that contribute to human-wildlife conflict, such as poverty, competition for resources, and lack of alternative livelihoods for communities living near protected areas.

Indigenous knowledge has been used extensively in the protection of crops from wildlife damage. These include farmers and communal groups (Osei-Owusu, 2018) to guard fields on a rotational basis from a network of built watchtowers. When wild animals are spotted, locals can be outfitted with powerful lights and tin drums to scare them

away (Virtanen et al., 2021). Along the front lines of farms, they can even ignite fires and keep them going late into the night (Horgan & Kudavidanage, 2020). These techniques have been frequently used in Sub-Saharan Africa along the agriculture-wildlife interface (Kate, 2012), but quantitative data on great apes are limited (Muthee et al., 2019). Non-electric fencing: It was found that local agricultural farmers are currently utilizing non-electrified fences to restrict wild animal movements in order to decrease crop raiding by animals (Amara et al., 2020). Wooden or steel poles pushed vertically into the ground are commonly used to construct these barriers (Mukeka et al., 2018), and between the poles, heavy-gauge wire is strung and drawn tight. Elephants, mountain gorillas, and other wild animals have been deterred by chemical compounds with possible deterrent properties, either as an unpleasant or painful odor or as a targeted substance, such as a hormone, that induces fear (Osborn & Anstey, 2002). The chili bricks only use simple, locally available materials and work on the same grounds that *Capsicum* repels elephants (Osei-Owusu, 2018). Farmers in the area dry chili and combine it with elephant or animal dung before compressing it into bricks (Mallya, 2017). The bricks are then sun-dried and burned near the fields' edge. The bricks burn slowly and produce a

spicy cloud of smoke, which has been widely used in Zimbabwe (Palminteri, 2016).

In summary, the research identified the main causes of human-wildlife conflict in the Ishasha region as the need for charcoal (37%), illegally harvested charcoal for commercial production (20%), perceived injustice (18%), commercial hunting and charcoal trading, where bushmeat is represented at 16% and droughts, bushfires and climate change are represented at 9%. It was also found that the impacts of human-wildlife conflict in the Ishasha region included: human and wildlife deaths and injuries 32%, crop destruction 28%, poverty 24% and human deaths 16%. The research findings revealed that the measures taken to mitigate inter-human conflict in the Ishasha region included the use of indigenous knowledge (49%), non-electric fences (33%), and police patrols (18%), according to respondents.

Conclusion

The need to meet basic human needs such as food and income has been identified as a fundamental driver of conflict. This need often leads to the use of traps, wire snares, and other hunting methods that are difficult for rangers to detect, resulting in the killing of wild animals. Second, most respondents cited human and wildlife deaths and injuries as the main impacts of HWC in the region, mainly due to crop damage. Additionally, wildlife retaliation further exacerbates the conflict, although it is difficult to accurately identify the true culprit. Indigenous knowledge is the most effective measure to mitigate HWC in the Ishasha region, highlighting the importance of using traditional practices and community-based solutions. Indigenous knowledge includes a deep understanding of local ecosystems, wildlife behavior, and sustainable resource management techniques, and is therefore well-suited to culturally appropriate management of conflict. By integrating indigenous knowledge into conservation and conflict mitigation strategies, communities can develop holistic approaches that promote coexistence between people and wildlife while addressing underlying socio-economic needs.

Areas for further research

Three key areas for further research could be explored: examining the effectiveness of community-based approaches to mitigating HWC, including participatory decision-making processes, community-led conservation initiatives, and the role of local institutions in conflict resolution. Discover the use of advanced technologies such as drones, camera traps, and remote sensing to monitor wildlife movements, detect illegal activities, and implement early warning systems to prevent conflict in the Ishasha region. Assess the effectiveness of existing policies and identify opportunities for policy reform to better

address the root causes of conflict and promote sustainable coexistence between people and wildlife.

List of abbreviations

HWC: Human-wildlife conflict

QENP: Queen Elizabeth National Park

Source of funding

The study received no funding.

Conflict of interest

The authors declare no conflict of interest.

Data availability

Data is available upon request from the corresponding author.

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