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Rural women vulnerability to human-wildlife conflicts: Lessons from villages near Mikumi National Park, Southeast Tanzania

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Human-wildlife conflicts (HWC) remain a serious conservation problem in Tanzania, particularly for rural communities near national parks. Despite this prevalence, research on rural women's experiences with human-wildlife conflicts is limited. To address this research gap, this study examined the impacts of HWC on rural women from two villages neighboring Mikumi National Park (MNP) in Southeast Tanzania. A total of 20 adult female victims of human-wildlife conflicts (HWC) were purposely selected and interviewed to understand the impacts of human-wildlife conflicts in their lives. Findings indicate that loss of grassland and water within MNP borders exacerbated by climate change are pushing wild animals from MNP to seek food in nearby villages, causing frequent human-wildlife tensions. Crop damages, livestock killings, household food insecurity, and fears for physical safety were found to be significant impacts of HWC increasing rural women's vulnerability to poverty. Despite these conservation threats, most interviewed HWC victims receive very little support from conservation authorities threatening the survival of wild animals from MNP. For peaceful co-existence, the study recommends empowering rural women with conservation training on HWC prevention and investment in the large-scale restoration of degraded lands and water sources to reduce competition over natural resources between humans and wildlife.

Key words: Human-wildlife conflict, rural women, Mikumi National Park, Tanzania.

INTRODUCTION

Over the years, the government of Tanzania has implemented several conservation programs to mitigate potential conflicts resulting from increasing human-wildlife interactions. Despite the efforts, the government interventions have not yielded any significant results. It is estimated that annually about 100 rural residents in Tanzania lose their lives due to wildlife-related killings, with large animals, such as lions (*Panthera leo*), hippos (*Hippopotamus amphibius*), and elephants (*Loxodonta africana*), among the primary cause of these fatalities (Eustace et al., 2018; Kushnir and Packer, 2019; Linuma et al., 2022). With a large chunk of its land reserved as national parks, human-wildlife conflict (HWC) in Tanzania tends to be more intense when communities close to

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protected areas do not see the real benefits of safeguarding wildlife (Andrade and Rhodes, 2012; URT, 2020). Often HWC also results in crop losses, livestock depredation, and property damages, increasing poverty levels for residents living near national parks (Kideghesho and Mtoni, 2008; Linuma et al., 2022). Consequently, victims of HWC develop hate and a negative attitude towards wildlife, which, if unresolved, lead to retaliation killings of wild animals threatening the survival and sustainability of wildlife resources (Frank, 2016; Mariki et al., 2015; Mayengo et al., 2017). To resolve this complex conservation problem, other than enforcing wildlife protection laws, governments in Africa have been urged to engage locals in their conservation efforts, especially in communities that share and compete for natural resources with wild animals (Benjaminsen et al., 2013; Treves et al., 2006). Community-led conservation approaches such as Community-Based Conservation of Natural Resources (CBNRM) have therefore been widely promoted in Tanzania, and several parts of Africa to ensure economic benefits accrued through wildlife tourism trickle down to locals, especially those that reside close to protected areas (Kegamba et al., 2022).

In Tanzania, wildlife management agencies such as Tanzania National Parks Authority (TANAPA) and Tanzania Wildlife Management Authority (TAWA) have been at the forefront in establishing Village Game Scouts (VGS) that, among other things, receive conservation training and work alongside TANAPA and TAWA to prevent potential HWC and ensure sustainable management of wildlife resources in communities they come from (Bluwstein et al., 2018). While some progress has been achieved, rural women's involvement in resolving HWC has been very little and, in most cases, overlooked (Brooks et al., 2012). Rural women's experiences with HWC and the risks posed to them are under-researched and not sufficiently reflected in ongoing conservation strategies in the country (Homewood et al., 2022; Mariki, 2016). This lack of gender integration is very concerning because, as dominant food producers, rural women from communities neighboring national parks are at a greater risk of human-wildlife killings or physical injury when farming or when collecting firewood (Anderson and Mehta, 2013; Matseketsa et al., 2019). As such, ensuring harmony between humans and wildlife demands an understanding of the needs and experiences of everyone that is or may be affected by human-wildlife interactions (Andrade and Rhodes, 2012; Nyhus, 2016). Furthermore, studies have also shown that as primary caregivers in their households, women's inclusion in natural resource management efforts plays a critical role in influencing positive attitudes and conservation knowledge, particularly to children and other family members (Agarwal, 2009; Mwangi et al., 2011). In this regard, interventions to achieve sustainable wildlife management and peaceful co-existence between wild animals and rural communities may have a limited impact if women's voices are excluded or neglected (Homewood et al., 2022; Khumalo and Yung, 2015; Ogra, 2008).

Though conservation challenges emanating from HWC have been extensively researched (Dickman, 2010; Kaswamila, 2009; Kushnir and Packer, 2019; Mayengo et al., 2017) in Tanzania, very little has been explored to understand the experiences of women residing close to less popular national parks. One such community is Kiduhi and Mbamba villages, found less than 20 kilometers from Mikumi National Park (MNP) in Eastern Tanzania. Compared to other high-profile wildlife tourist destinations such as Serengeti and Ngorongoro in Tanzania, MNP has received limited attention from conservation experts within and outside Tanzania partly because of its low tourism potential. For example, between 2012 to 2020, the vast majority of wildlife conservation studies carried out by the Tanzania Wildlife Research Institute (TAWIRI)[1] and its partners were those from Serengeti, Ngorongoro, and Tarangire national parks, and none of these featured or included rural women's experiences with HWC (TAWIRI, 2022). This lack of research has affected the government response, particularly in MNP, where the impact of HWC, threats, and risks posed to rural women remain unnoticed. Focusing on communities residing close to MNP, the objectives of this research were the following: (1) Understand rural women's experiences with human-wildlife conflicts; (2) Examine and document risks and women's livelihoods challenges resulting from HWC incidences, and (3) Highlight gender-inclusive conservation strategies to mitigate HWC in MNP.

MATERIALS AND METHODS

Study area

This study was conducted in Kiduhi and Mbamba villages that neighbor Mikumi National Park (MNP). Located between 7°00' and 7°50'S, and 37°00' and 37°30'E in Morogoro region, Eastern Tanzania, MNP was first gazetted as a national park in 1964 with a land area of 1,070 km^2 and later expanded to 3,230 km2 (TANAPA, 2007). MNP shares one ecosystem with Selous Game Reserve enabling animals to migrate to and from the two protected areas. With a land area of 3,230 km2 (1250 square miles), MNP is also one of the largest national parks in Tanzania, hosting large numbers of wild animals, including Elephants (*Loxodonta africana*), Lions (*Panthera leo*), Buffalos (*Syncerus caffer*), Giraffes *(Giraffa camelopardalis*), more than 300 bird species and over 1200 plant species (TANAPA, 2007). It borders three administrative districts of the Morogoro region: Kilosa, Morogoro, and Mvomero. Its proximity to these districts and the growing human settlements in villages near MNP has become a major source of tensions between wild animals and humans (Mayengo et al., 2017).

In this study, participants were recruited from Kiduhi and Mbamba villages (Figure 1). Kiduhi, a predominantly Maasai village, is found east of MNP and has a population of 893 and 270 households, the vast majority of the Maasai tribe (URT, 2020). Livestock keeping is the primary livelihood activity for Kiduhi residents. Unlike Kiduhi, where livestock keeping is the primary

[1] https://tawiri.or.tz/publication/journal-publication/

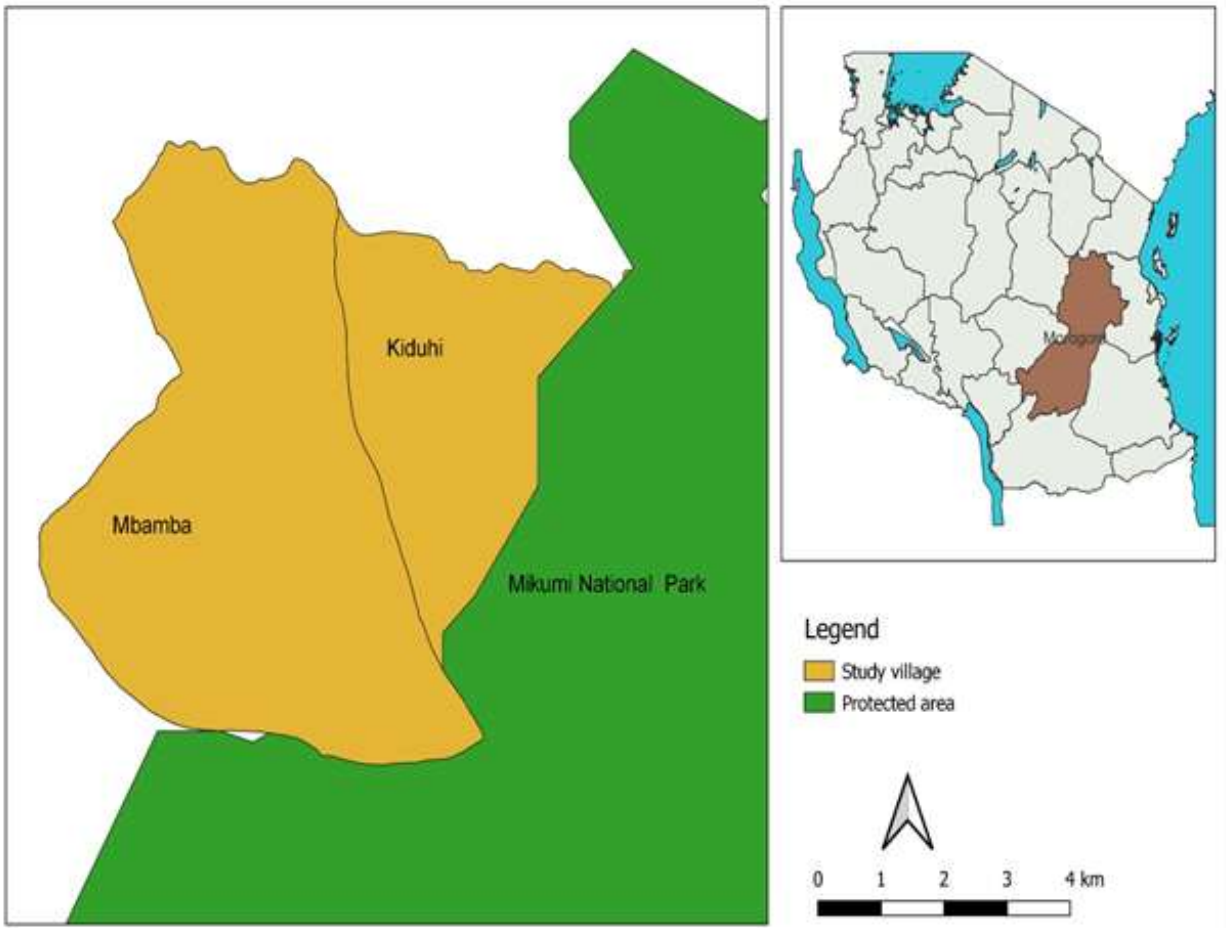

Figure 1. Lower left is the map of the study areas showing sampled villages and the location of Mikumi National Park, which shares a border with the two study sites. Top right is the map of Tanzania; the brown shaded area shows the location of the Morogoro region, which host Mikumi National park southeast Tanzania.
Source: Author

livelihood, in Mbamba, crop farming is the major source of income, with rice, maize, beans, sorghum, cassava, sesame, and sunflower as major food crops (URT, 2020). Located in the south of MNP, Mbamba village has a population of 2485 and 519 households (URT, 2020).

The rationale for selecting Kiduhi and Mbamba was based on the fact that over the last few years, clashes between wild animals from MNP and residents from these villages have been frequently reported hence a suitable site to examine HWC issues. The two villages also share a border and are close to MNP, which exposes and increases their residents' vulnerability to HWC. Additionally, the lack of research regarding women's experiences with HWC made the two villages ideal study sites to document and understand rural women's experiences with HWC. This research gap also aligned well with the researcher's overall intention and the objectives of this study.

Sampling and study population

The target population for this study was victims or survivors of HWC events that occurred between 2016-2022 in Kiduhi and Mbamba villages. Some participants were also involved in the "Larger than Lions: A Community-to-Community Photovoice Project to Protect People and Predators near Mikumi National Park" project implemented from February 2021 to November 2022 in Kilosa district and funded by the National Geographic Society (NGS). In this paper, HWC victims or survivors refer to female individuals that were directly or indirectly affected by HWC incidents such as livestock kills, physical injury, loss of a husband or a loved one, and property damage or crop losses that happened as a result of attacks or raids by a wild animal (s) from Mikumi National Park (MNP).

Due to the nature of this study, participants were purposely recruited through consultations with village government officials, Village Game Scouts (VGS), and influential leaders who had knowledge of female victims and survivors of human-wildlife conflict incidences that occurred in their villages. The researcher did these consultations to inform the community about the study's objective and ensure that only suitable candidates participated and were willing to share their experiences (stories). In general, the main criteria used to recruit participants for this study included being a victim or survivor of the HWC incidence (s) that occurred between 2016-2021, having a close relationship with the victim of HWC (if the prospective interviewee is not the primary victim), and age of the victim (must be older than 21 years old). Using these criteria, 20

Table 1. Socio-economic Information of Respondents.

Variable	Data category	Frequency (%)
Age	20-39	8 (40%)
	40-59	11 (55%)
	60+	1 (1%)
Marital status	Single	2 (10%)
	Married	13 (65%)
	Divorced	5 (25%)
Education level	No formal education	8 (40%)
	Primary school education	12 (60%)
Primary livelihood activity	Farming	7 (35%)
	Farming and livestock keeping	13 (65%)
Location of HWC incident	At residence	7 (35%)
	At the farm	13 (65%)
Received compensation after HWC Incident	YES	3 (15%)
	NO	17 (85%)
Received training on HWC mitigation	YES	3 (15%)
	NO	17 (85%)

Source: Author

victims (*n=20*) of HWC participated in face-to-face interviews, with 10 (*n=10*) respondents from each village. In addition to face-to-face interviews with HWC victims, the researcher held consultative meetings with 5 (*n=5*) key informants to gather more information on the state of HWC in Mikumi, present concerns raised by interviewed victims, and establish institutional plans to address the HWC situation. Key informants interviewed included MNP Staff, representatives from Kilosa District Government, and Non-Governmental Organizations (NGOs) engaged in wildlife conservation programs in the Kilosa district and beyond. The selection of these key informants was purposive and considered individuals' knowledge and experience on the matter being investigated and their availability to speak with the researcher.

Data collection and analysis

Face-to-face interviews were conducted with 20 female participants (*n=20*) who consented to participate in the study. Interviews were held in the participants' chosen location, some were held outside participants' residences, and others were held in a place agreed upon by both the researcher and the respondent. Before the interviews, a written consent form (Appendix 1: Respondent Consent Form) that explained the study's objective, interview questions, and respondents' right to withdraw from the interview when they felt to do so; were given to each participant for them to sign. The interview was guided by an interview guide divided into two sections (Appendix 2: Interview Guide Mbamba and Kiduhi Study). Each section had open and closed-ended questions, which included respondent demographic information, their occupation, their perspectives on what drives HWC, when and how they experienced HWC, how HWC affect their livelihood or well-being, and what can be done to prevent HWC in the future.

The interview responses were recorded in a notebook and audio recorded to ensure the researcher captured all responses, avoid data loss, and can retrieve participants' responses during data analysis. In accordance with Tanzania Wildlife Research Institute (TAWIRI) and Tanzania's Commission for Science and Technology (COSTECH) research, ethics permit number 2021-222-NA-2021-078 was obtained before the study began. Participants were also informed that their identity would be anonymous and that their personal information would not be revealed. Most interviews lasted about 90 minutes, with only two respondents going beyond that. Data were collected from June to August 2021.

Data extracted from interviews were analyzed using the thematic analysis approach. In thematic analysis, information gathered from interviews is classified and analyzed based on their reporting patterns (Braun and Clarke, 2006:79). Since the sample for this study was small, the analysis of information gathered from the interviews began by reading and listening to all interview transcripts several times to understand respondents' opinions and experiences with HWC. After listening to the interview responses multiple times, specific codes representing the original meaning of participants' responses were developed in line with the study objectives and research questions. Major themes that emerged from the analysis include *Climate Change as a driver of human-wildlife tensions*, *Risks and Vulnerabilities facing HWC victims*, and *Challenges facing HWC victims in Kiduhi and Mbamba villages*. These themes were further classified and categorized into specific sub-themes that are presented as findings in the Results section (3.2-3.4) responding to primary research questions for this study. To increase the validity of study findings, individual quotes and statements said by respondents are also used to echo participants' voices.

RESULTS

Socio-economic profile of the respondents

Table 1 summarizes the socioeconomic characteristics (age, education, place of residence, source of livelihood,

etc.) of respondents involved in the study. More than half (55%) of HWC victims interviewed were mature adult females aged 40 to 59, with the majority (65%) still married and only a few reported being single or divorced. While villages share, primary and secondary schools established almost three decades ago, more than a third of the participants (40%) had no formal education, and the remaining (60%) had primary school education. Low levels of education among the study participants were found to be significant in Kiduhi compared to their counterparts in Mbamba. In Kiduhi village, a predominant Maasai community, of the 10 participants interviewed, only 2 reported having attended primary school education, while the rest never attended formal schooling. This difference in educational levels for participants in Kiduhi could be attributed to socio-cultural barriers that still exist in most pastoral communities in Tanzania, where girl child tends to be neglected or denied their rights to attend school by their parents. This finding is consistent with previous studies that have indicated that despite the increase in primary and secondary school enrollments in Tanzania, over-engagement of school-age children in taking care of cattle and other household responsibilities has left many youths from pastoral communities with low levels of education when compared to other communities (Ndibalema, 2022; Rweyemamu, 2019; Saruni et al., 2018).

Other studies report that early child marriages and socio-cultural barriers have prevented most girls from the Maasai and other pastoral communities from attending and receiving a formal education (Pesambili and Novelli, 2021; Raymond, 2015; Temba et al., 2013). Parents' lack of knowledge on the significance of formal education in their children's lives and poor educational services has also contributed to educational inequalities and school dropouts among children from pastoral communities (Komba, 2012; United Republic of Tanzania, 2019d; UNICEF, 2018).

Concerning conservation education, the study found that only a few (15%) of the participants received conservation education or attended training on how to mitigate HWC. Respondent's lack of awareness on how to respond when wild animals from MNP attack their cattle or raid their farms is alarming and needs to be urgently addressed before it escalates the HWC problem. In several parts of Africa, conservation education for women has proved to have several long-term benefits, with studies showing that educated women are more likely to be active in the management of natural resources and can play a critical role in issues affecting their livelihoods (Costa et al., 2017; Krietzman, 2019).

Crop farming and livestock rearing are the primary economic activities for all participants. While in Mbamba, almost all respondents were crop farmers, in Kiduhi, some participants reported doing livestock rearing and crop farming. In both villages, maize, rice, and sesame are the major food crops produced for household consumption and commercial sale. Participants were also asked to share how, when, and where the HWC incident occurred. More than half (65%) of the respondents mentioned that the HWC incident happened on their farms, while the remaining (35%) reported that the incident occurred at their residence. Those who experienced the HWC incident at their residence were mostly victims of HWC from Kiduhi village. According to these participants, most predator attacks, especially from Lions and Hyenas, happen at midnight or during dark hours inside cattle enclosures traditionally known as ‘bomas’ located within their residences. Though Tanzania’s 2011 Wildlife Conservation Act demands victims of HWC be compensated for any losses, only a few 3 (15%) of the victims of HWC interviewed reported receiving compensation after the attacks. The vast majority, 17 (85%) of the participants, mentioned that they had not been compensated anything despite filing official claims to the responsible government authorities.

Drivers of HWC in villages near Mikumi National Park (MNP)

Climate-change induced drivers

Interviewed participants identified a number of factors that fuel conflicts between residents of the two villages and wild animals from MNP. In both villages, respondents believed HWC is driven by environmental factors, especially a significant decrease in rainfall and habitat loss, forcing large animals such as Elephants to look for food and water outside MNP. According to victims from Mbamba village, recently, it has become so common to see a group of Elephants roaming in their village with the problem worsening during peak harvest seasons. This concern raised by respondents from Mbamba was also echoed by one of the officials from MNP who was interviewed during data collection.

“As rainfall dries, nutritious grasses and other natural vegetation that antelope, deers, and other herbivores could feed on have also dried up, forcing large herbivores like Elephants to raid farms and water sources outside MNP,” said one MNP park official.

The lack of rainfall has also disrupted the local food chain within the MNP ecosystem. Wildlife authorities from MNP interviewed in this research pointed out that due to prolonged drought conditions, potential prey for lions such as deer, wildebeest, and others migrate and move to far distances in search of areas with enough grassland and water. To survive, lions and other carnivores resort to goats and cows; they can easily prey in villages that neighbor MNP. In Kiduhi, a predominantly Maasai community where livestock keeping is a primary source

of livelihood, hyena attacks and killings of goats were reported by HWC victims to be so frequent, endangering the lives of Maasai men and women.

"In February 2021, a lion attacked my boma and killed eleven goats but ended up eating just one goat. Though the attack happened at midnight, after the killings, the lion didn't leave immediately; it stayed until early morning. I reported the incident to wildlife authorities, who came and freed the lion." - a Maasai victim of HWC in Kiduhi village.

Another victim from Mbamba believed that the rise of the elephant population in MNP is a problem that causes tensions. According to her, in the past, Elephants could still be seen roaming in their village; however, what has changed is a large number of Elephants that flock and raid their farms, frequently damaging and causing substantial crop losses. In Kiduhi, some HWC victims believe the village's proximity to MNP is a major contributing factor to the frequent attacks they experience from wild animals from MNP. Unlike Mbamba, Kiduhi village shares a border with MNP, and due to the nomadic lifestyle of Maasai pastoralists, in some cases, the Maasai negligently allows their cattle to roam inside MNP. The encroachment of cows, goats, and sheep inside MNP reserve areas has been reported by wildlife authorities to attract most predators, including lions and hyenas, who find it easy to prey on cattle in Masai residences. Overall, respondents' experiences with HWC suggest that climate change and variability in weather conditions could be one of the driving forces for human-wildlife tensions in Kiduhi and Mbamba villages. When asked, most victims claimed that frequent wild animal attacks are fueled by shortages of food and water that have become scarce within the MNP, forcing elephants and other wild animals to seek these resources outside the MNP.

HWC risks and vulnerability- A woman's perspective

Food insecurity

In both villages, participants reported that due to HWC, their lives and livelihoods are vulnerable and exposed to several risks. In Mbamba, almost all respondents mentioned experiencing significant losses of their maize, cassava, and other crops because of Elephants. Crop losses due to human-elephant conflicts have a devastating impact on the Mbamba community because the vast majority of Mbamba residents are small-scale farmers, with rice, maize, cassava, sesame, and sunflower as major food crops they produce. Unfortunately, most of these food crops are Elephants' favorite meals (said one victim I interviewed), which also fuels the conflict between local farmers and Elephants from MNP.

"*For me, it happens almost every year; they raid and eat all the crops, especially maize and cassava. I have now accepted that when I grow maize, I also grow for Elephants because they come every season"- A female farmer, a victim of human-wildlife conflict in Mbamba village.*

Interviewed participants also mentioned that HWC tends to be intense between May and August because it is a peak harvest season for most village community members. According to HWC victims in Mbamba, during this period, Elephants raids tend to happen almost every day, and because Elephants roam in groups, the damage they cause is substantial; they can wipe out a few acres in a matter of hours, says another victim of human-elephant conflict in Mbamba village. As a result of crop losses, some households have become food insecure, needing more maize and other food crops for consumption before the next farming season. Consistent crop losses due to human-wildlife conflicts also affect their income. The little they produce is damaged by Elephants and other wild animals, including wild pigs, leaving them with no surplus to sell.

Fear of life and death

In Kiduhi, it is not just that the livelihoods are at risk; HWC is also putting the life of Maasai women in danger. As most attacks happen in dark times and, in most cases, at midnight, Maasai men and women in Kiduhi risk their lives by embarking on regular night patrols to chase away hyenas and lions to protect their cattle. Those married and with husbands present at home are at lower risk. The husband takes on the responsibility of protecting cows and goats at night. However, singles, divorced, or widowers sometimes have to risk their lives and protect their cattle from potential attacks.

"Hyenas come here every day. You cannot sleep; the moment it gets dark, you hear them. Sometimes you wake-up and just put on the torch (flashlight), it scares them away, they are so scared of light, so they run away"- HWC victim in Kiduhi village.

Many of the victims in Kiduhi recounted a number of occasions where they felt their life was in danger due to the number of times hyenas were present and the frequency of hyena attacks in their village. One victim mentioned that, though she heard hyenas screaming outside, she could not go out because her Boma was far from her residence. It was also unsafe for her to go out. And when she woke up that morning, she found that her sheep and goats had been killed by hyenas that night.

Others mentioned it is hard to stay out at night because it is very dangerous as the village is close to the MNP; not just hyenas can attack them, but sometimes lions and other dangerous animals tend to show up in their village.

Figure 2. Small Solar Light installed outside Maasai Boma to scare away potential predators.
Source: Author

Since going out at night is unsafe and the entire village is off-grid and lacks electricity, it was interesting to note that some victims' have become creative by installing solar lights outside near the bomas and in front of their residences. When asked, respondents mentioned that when it gets dark, the solar lantern is left ON the whole night to scare aware hyenas and other potential predators that regularly roam the village. Due to the cost of solar lighting devices, only a few victims were noted to have access to or have installed solar lighting outside their residences. Figure 2 shows the small solar light installed outside Maasai Boma to scare away potential predators.

Challenges facing victims of HWC

Lack of financial compensation

Interviewed victims of HWC in both villages reported facing several challenges when seeking support from responsible wildlife and government authorities. A major challenge that was consistently mentioned by respondents is the long delays or the lack of financial compensation to them even when they report the HWC incidents with evidence to the local government office. For many victims, poor government response and unnecessary compensation delays indicate that the government does not care about their lives and livelihoods. In Kiduhi, HWC victims interviewed felt that the local government in the Kilosa district and MNP officials had failed them and were not concerned about the livestock losses they experienced from hyena and lion attacks.

"In 2020, I collected all the evidence, including pictures of goats and sheep killed by hyenas, and delivered them to the local government office; nothing has been compensated to me" – HWC victim in Kiduhi village.

Many victims were also noted to feel that the MNP management and officials from the local government in Kilosa district were more concerned with the safety of animals regardless of the damage they cause to humans (them).

Referencing one incident, one victim mentioned that even though MNP officials were present when the lion attack happened in Kiduhi and were the ones that freed the lion. Her family has never heard from an MNP official, and none of the MNP officials visited them after the incident.

Although HWC incidences were noted to be frequent in both villages, it was surprising to note that no revenge killings were mentioned by interviewed victims. For example, even during interviews, no victim from Kiduhi mentioned having thoughts of harming lions or hyenas that consistently attack their livestock. It was later found out that for many victims, the decision not to revenge by attacking or killing the wild animal after the incident is tied to recognizing the economic and social-cultural value of wildlife in Tanzania. While this is encouraging, with limited government support, this level of patience and understanding could quickly fade away, creating a hostile relationship between HWC victims and wildlife authorities and fueling human-wildlife tensions.

No Institutional Support

Long institutional delays for victims' compensation and government prioritizing wild animals over victims' welfare were consistently mentioned to be a significant challenge to HWC victims. In Mbamba, some HWC victims mentioned that they accepted the problem of elephants' raids on their farms and did not feel the need to report to wildlife authorities as no action would be taken despite their efforts. This lack of government support for HWC victims is echoed by these victims' statements.

"When Elephants raid your farm, they destroy the farms and eat everything in the farm, including rice and maize. I usually report to Game Officers; sometimes they come, but most of the time they do not come". – HWC Victim, Mbamba Village.

"I lost 11 goats that a lion killed in February 2021; I have videos and pictures of the whole incident. The wildlife authorities from MNP and Kilosa were here after it happened and saw the damage that was caused, but until today, no shilling has been given to me" – another victim of HWC in Kiduhi village.

Tanzania's 2011 Wildlife Conservation Act demands that any person who has experienced damage, injury, or loss of life due to attack or raid by a dangerous wild animal (s) receive financial payment upon assessment by the wildlife authorities. While such policies exist, only a few of HWC's victims have benefited due to institutional bureaucracies, lengthy and unnecessary payment delays, and budget constraints. Most victims of HWCs in Kiduhi were noted to have lost hope in government support. Despite their quest for compensation, no financial payment has been made. Most respondents mentioned only being given promises that their cases would be resolved soon.

DISCUSSION

The study examined rural women's experiences with HWC and how risks associated with HWC affect their livelihoods. Results indicate that increased HWC incidences are a serious threat to rural women's livelihoods. HWC-related risks revealed by participants included fear of animal attacks, crop losses, and inability to protect their assets (farms and livestock) when encountering wild animals from MNP. While no human death or injury was reported, the frequency of animal attacks has pushed most rural women to risk their lives by doing night patrols to chase away predators and safeguard their livelihoods. These findings demonstrate that unresolved HWCs have much more impact on rural women and their livelihood opportunities, increasing their vulnerability to poverty.

HWC impacts on rural women

As noted in Table 1, reported HWC incidences occurred at victims' farms and in their residences. In Mbamba, some interviewed HWC victims revealed that they had to skip farming for days as they waited for elephants' raids on their farms to slow down. When asked about the impact of crop raids, most Mbamba victims mentioned that almost every season, their maize farms are damaged by elephants from MNP. These frequent crop raids lower their maize yields leading to household food shortages. Due to the subsistence nature of farming for most Mbamba victims, unprevented human-elephant conflicts could increase food insecurity challenges for these women and other community members in Mbamba and other villages neighboring MNP. In Tanzania, crop raids resulting from human-elephant conflicts remain a serious conservation problem threatening the livelihoods of many rural folks, especially those adjacent to national parks (Kaswamila et al., 2007; Malley and Gorenflo, 2023; Mariki et al., 2015).

Over the last few years, due to enhanced wildlife protection, particularly for Elephants who were in great danger due to rampant poaching, Tanzania has witnessed a drastic increase in the elephant population in its several national parks. Several media reports and conservation experts in Tanzania have reported that the increase in the elephant population and other wildlife species could be linked to the improved protection of wildlife enforced by authorities in the country (Al Jazeera, 2019; Independent, 2019; VOA, 2022). While this positive trend is commendable, it presents new conservation challenges that may have been overlooked. As noted by Malley and Gorenflo (2023), due to habitat loss, climate variability, and growing human population near protected areas, tensions between large wild animals such as elephants will likely increase and could be unmanageable hence equipping villagers with friendly and effective conservation practices that limit HWC impacts is necessary.

Furthermore, though under-researched, rural women's vulnerability to HWC has been reported by previous studies (Linuma et al., 2022; Mukeka et al., 2019). For instance, a study by Linuma et al. (2022) in Ngorongoro Conservation Area (NCA) indicated that women in villages neighboring NCA were more likely to interact with wild animals from NCA because of their active engagement in farming and firewood collection. Similar observations have been noted by other studies in Botswana (Mayberry et al., 2017), Kenya (Mukeka et al., 2019), and Namibia (Khumalo and Yung, 2015). Therefore, training rural women and other vulnerable and promoting conservation strategies that enhance peaceful human-wildlife coexistence could be instrumental in reducing the potential impacts of human-wildlife conflicts.

Lack of training increases women vulnerability to HWC

The lack of formal training on preventing conflicts also exposed study participants to potential harm, injury, and even death linked to human-wildlife conflicts. During interviews, it was evident that women in both villages had limited knowledge of mitigating dangerous interactions with wild animals from MNP. Nearly all participants reported having never attended or received training on HWC prevention. Given their proximity to MNP and the frequency of animal attacks, unresolved HWC and endless threats from elephants, hyenas, and lions from MNP may perpetuate negative attitudes and hate towards wildlife. Limited training for rural women on effective countermeasures to avoid HWC could also instigate negative attitudes towards wild animals from MNP resulting in retaliation killings and worsening human-wildlife tensions in MNP.

As noted by studies by Kohi and Lobora (2018) and Mayengo et al. (2017), addressing these tensions is critically important because as the rural population keeps growing paired with increased wildlife incursions to

human settlements, HWC would likely escalate in several parts of Tanzania, with women paying a heavy a price. As such, empowering women with appropriate conservation training to mitigate HWC and promoting alternative livelihoods that minimize their dependence on nature-based incomes will be instrumental in reducing HWC. Rural women's active and meaningful engagement in wildlife conservation programs can also yield significant conservation benefits over the long term (Costa et al., 2017; Krietzman, 2019).

Climate variability fuels HWC

The results of this study also indicate that climate change could be a significant driver of conflicts between wildlife from MNP and humans residing close to MNP. As narrated by the study participants and MNP officials, the lack of rainfall coupled with the shortage of grassland (food) within MNP borders forces large herbivores like Elephants and carnivores (hyenas and lions) to move outside the park in search of food and water. This climate-driven animal migration has serious consequences for residents of nearby villages, especially women whose livelihoods are severely impacted due to crop raids, food loss, and livestock depredation caused by wild animals that invade their farms and residences. The findings also reveal that elephant raids on village farms were more prevalent in Mbamba village, while predation and attacks of goats, sheep, and cows by hyenas and lions were frequent in Kiduhi village, which is home to the Maasai community.

Participants' response on what drives HWC also reveals the devastating impact of climate change on wildlife resources demonstrating how this ongoing environmental crisis could lead to several other complex community problems in Tanzania. In Tanzania, though the effects of climate change on wildlife have been recognized in Tanzania, however, for many years, government efforts to minimize climate risks and its impact on rural communities have concentrated on the agriculture sector, with sectors such as wildlife tourism getting less attention from the policymakers. Consistent with several other studies (Abrahms et al., 2023; Mariki et al., 2015; Mukeka et al., 2019), findings in this study suggest that the ongoing climate crisis could aggravate human-wildlife conflicts in most parts of Tanzania and hence derail conservation progress achieved in the region. With both humans and wildlife species highly threatened by climate variability, understanding, and promoting climate-change adaptation measures that minimize competition over natural resources will be very critical for Tanzania's efforts to conserve its rich wildlife resources and ensure peaceful coexistence between rural communities and wildlife (Kilungu et al., 2017; Mkiramweni et al., 2016). Inadequate policy attention on the increasing threats of climate change to wildlife and biodiversity in Tanzania places rural communities, especially women close to national parks, at more risk and vulnerable to human-wildlife conflicts.

Limited financial and institutional support for HWC victims

Even though the 2011 Wildlife Conservation Act demands that victims of HWC be compensated immediately after filing their claims to wildlife authorities, the study reveals that none of the majority of HWC victims received financial compensation for their losses. As food producers and their significant dependence on natural resources for living, lack of compensation has more devastating consequences for rural women residing close to national parks whose livelihoods are threatened by the presence of wild animals. When asked, many of the victims believed the government is more concerned with the welfare of wild animals because of their economic contribution to the tourism industry and careless of the damage they cause to humans. Like in many other national parks, concerns over lack of financial compensation and poor institutional response to victims of HWC have been widely reported in Tanzania. In Northern Tanzania, studies by Kaswamila (2009) and Mbise (2021) have found that institutional negligence and unnecessary delays to refund victims of HWC have resulted in retaliatory killings of wild animals with several victims not reporting the HWC incidents but revenge for their losses.

Respondents' concerns with poor government support to HWC victims in Tanzania are also consistent with findings from most recent studies by Felix et al. (2022) in Tarangire National Park and Mbise (2021) in Serengeti National Park that also found a similar pattern. According to these two studies, limited support from wildlife authorities to victims of HWC and poor engagement of local communities residing near national parks in government conservation efforts were the primary causes for retaliation killings of several wild animals in Serengeti and Tarangire national parks. These concerns raised by interviewed victims in Mbamba and Kiduhi underscore the need for a more immediate institutional response to financial compensation claims from HWC victims whose livelihoods rely on livestock and farming. Given the critical role of wildlife tourism in Tanzania's economy, more investment and innovative HWC victims support schemes are needed to reduce tensions and enhance peaceful coexistence between humans and wild animals from several national parks in Tanzania.

CONCLUSION AND RECOMMENDATIONS

It is clear that both humans and wild animals from MNP are threatened by changes in weather patterns that are propelled by the climate crisis. As the impacts of climate change in terms of significant loss of rain and habitat loss

for wild animals become intense, tensions between rural communities near MNP and wild animals from the MNP could become unmanageable, making their co-existence more challenging. Countering these climate-induced conservation challenges requires allocating more financial resources to climate-responsive and adaptation strategies that focus on restoring degraded land and water sources to benefit wild animals and humans over the long term while minimizing their competition over natural resources (Kupika and Nhamo, 2016).

Furthermore, since HWC victims in both villages were noted to rely on farming and livestock keeping as their primary sources of income, training and promoting alternative livelihoods for these women could be the most effective way to reduce their vulnerability to poverty when impacted by human-wildlife conflicts. Kiduhi village being a Maasai community and close to Mikumi National Park has a huge potential for cultural tourism activities that will attract local and foreign tourists. Given this potential, TANAPA, MNP management, and other responsible wildlife authorities should provide business-development training to rural women from both villages on establishing a cultural tourism center in Kiduhi. Similarly, to address existing gender-based constraints, innovative and rapid financial compensation schemes should be developed and implemented by TANAPA to ensure that female HWC victims are equally benefiting from such compensation. Finally, while the sample of this study was small, the study offers important highlights on rural women's experiences with human-wildlife conflicts and provides valuable insights into the need for more research to understand the risks and hidden costs of HWC to rural women in Tanzania and beyond.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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Appendix 1. Respondent consent form

Consent to participate in research

Study title: Understanding Rural Women's Experiences and Vulnerability to Human-Wildlife Conflict (HWC): A case of villages near Mikumi National Park, Morogoro, Tanzania.

Hello,

We would like to request your participation in this research. The goal of the study is to examine rural women's vulnerability and responsive mechanism to Human-Wildlife Conflicts in Tanzania. Your participation in this study will help the government of Tanzania develop effective ways to address human-wildlife tension between rural communities living near national parks.

Things to consider

- You are being invited to participate in this research to understand your experiences, regarding your day-to-day interactions with wild animals from Mikumi National Park (MNP). As a resident near MNP your experiences and interactions with wildlife from Mikumi will enrich our research findings.
- A researcher will ask you a few questions regarding your previous and current experiences and interactions with wildlife from MNP.
- The interviewing questioning may last for about 45 minutes. You have a right to withdraw from the interviews if you feel so. The interview will be audio recorded to ensure the researcher is able to capture all the interview conversation. If you wish not to be recorded, you can say so before the interview begins.
- Your participation in this research will help the government, Mikumi National Park Staff and Management, NGOs and other conservation experts working in Tanzania towards establishing sustainable conservation programs to mitigate and end Human-Wildlife conflicts in Tanzania.
- The researcher may ask for photos or videos on when and where the events happen.
- The recorded interview and all the information you provide will be kept in safe place and in computer protected with password only accessible by the researcher. Your name will not be disclosed during data analysis or presentation of research findings.
- The study questions and ethical procedures have been reviewed and approved by Tanzania Wildlife Research Institute (TAWIRI) and the Commission for Science and Technology (COSTECH) with research permit approval number 2021-222-NA-2021-078.

☐ By checking this box, I agree to participate.

…….. …….

Name & Signature of Research Participant **Name & Signature of the Researcher**

Appendix 2: Interview Guide Mbamba and Kiduhi Study

INTERVIEW GUIDE FOR WOMEN PARTICIPANTS ABOUT HWC EXPERIENCES

Mbamba and Kiduhi Villages, Mikumi National Park, Kilosa District, Morogoro Eastern Tanzania

Name of the Respondent: **Village:**

SECTION A: PARTICIPANT INFORMATION

A1. Age of Respondent. **1**. 20-39 years [ ] **2**. 40-59 years [ ] **3**. 60+ years [ ]

A2. Respondent's Marital Status 1. Married [ ] 2. Single [ ] 3. Divorced [ ]
4. Separated [ ]

A3. Respondent's Level of Education. **1.** No Formal Education [ ] **2.** Primary Education [ ]
3. Secondary Education [ ] Other [ ] (Specify)……

A4. Respondent's occupation:

A5. How long have you lived in this village? **1**. 1-3 years [ ] **2**. 3-7 years [ ] **3.** More than 7 years [ ]

A6. Were you born in this Village 1. Yes [ ] 2. No [ ], if NO, when and where did you immigrate from?

A7. Do you own livestock? 1. Yes [ ] 2. No [ ]

A8. If YES, how many Livestock do you own
1. Cattle ……
2. Goats ……
3. Sheep ……..
4. Donkey…….
5. Other ……

A9. Do you own Land 1. Yes [ ] 2. No [ ]

A10. If YES, how many ha of Land do you own **1**. Less than 1ha [ ] **2**. 1-3ha [ ] **3.** More than 5ha [ ]

A11. If NO, how do you get food for consumption?.....

A12. Are you involved in any income generating activity besides farming or livestock keeping?
1. Yes [ ] 2. No [ ]

A13. If YES, which income generating activity are engaged in?.....

SECTION B: HWC Drivers, Experiences, and Perceptions

B5. Since you live near Mikumi National Park, do you think wild animals such as Lions, Elephants, Buffalo are beneficial to you and your community**?** 1. Yes [ ] 2. No [ ] 3. Don't know [ ]

B6. If YES, how are wild animals from Mikumi beneficial to you?.....

B7. If NO, why do you think they are not beneficial?.....

B8. Do wild animals from Mikumi NP raid your residence or farms? 1. Yes [ ] 2. No [ ], if YES, how often and at what time……

B9. Where do you often encounter wild animals? 1. At my residence [ ] 2. At my farm [ ] 3. In the bush when collecting wood [ ] 3. Other (specify)…….....

B10. Which wild animal (s) do you encounter more often 1.Elephants [ ] 2. Lions [ ] 3. Hyenas [ ] 4. Buffalo [ ] 5. Other (specify)……..

B11. What do you think drives or pushes wild animals to raid village residence or farms?
1. Search for food and water [ ]
2. Loss of trees, bushes, and habitat [ ]
3. Overpopulation of wild animals [ ]
4. Natural factors such as drought [ ]
5. Poaching [ ]
6. Other (specify) [ ]

B12. Tell me about your personal experience with Human-Wildlife Encounter…….

B13. When did this happen and what do you think caused the incidence/attack?.....

B14. How were you affected by the incidence/attack?
1. My farms and crops were destroyed [ ]
2. My property (house) was damaged [ ] ***ask for photo on the incidence, gender/age of***
3. I was seriously injured [ ] ***of the victim, # of property damaged or lost***
4. I lost a family member (s) [ ]
5. My livestock were killed [ ]
6. Other (specify) [ ]

B15. Which wild animal was involved in the incidence? 1. Lion [ ] 2. Buffalo [ ] 3. Elephant [ ] 4. Hyena [ ] 5. Other

B16. What did you do after that experience?

1. Reported to Village Government [ ] 2. Report to Park Authorities in Mikumi [ ] 3. Retaliated and attacked the animal [ ] 4. Other (specify)……...

B17. After the incidence did your relationship with wild animals from Mikumi changed?.....

B18. Were you compensated for any loss, damages, or injury you experienced from HWC?

1. Yes [ ] 2. No [ ]

B19. In your opinion, do you think HWC encounters have increased than in the past?

1. Yes [ ] 2. No. [ ], if YES, Why?.....

B20. How has HWC affected your livelihood?.....

B21. What measures do you take to protect yourself and your properties from wild animals' attack or damage

1. Regular patrols with my partner and village members [ ]
2. Use lethal weapons to limit wild animal attacks or damage [ ]
3. Kill dangerous wild animals whenever we encounter them [ ]
4. Report to Mikumi Park Authority/Rangers [ ]
5. Other (specify)…….

B22. In your opinion, do you think women are more vulnerable to HWC than men, and why?.....

B23. What do you think needs to be done to reduce rural women's vulnerability to HWCs?.....

B24. Have you received any conservation education/training to mitigate HWCs? 1. Yes [ ] 2. No [ ]

B25. If YES, who provided the training

1. Part rangers from Mikumi NP [ ]
2. NGOs (names…..) [ ]
3. Village Environmental Committee [ ]
4. Other [ ]

B26. In your opinion, what are the socio-economic benefits of wild animals from Mikumi NP?

B27. Do you think wild animals should be protected against Human attacks or killings, and Why?

B28. What do you think should be done to improve the women-wildlife/villagers' relationship with wild animals from Mikumi National Park?

B29. Can you describe this village community relationship with Mikumi National Park management?.....

B30. What needs to be improved between the village community near Mikumi and Mikumi National Park management?.....