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Wildlife and human safety in the Tarangire ecosystem, Tanzania☆

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ABSTRACT

Coexistence of people and wildlife outside protected areas is of critical conservation importance. However, human-wildlife interactions on shared landscapes can produce negative outcomes for wildlife populations and people. This article focuses on the effects of wildlife on local people's lived experiences of physical safety in the Tarangire ecosystem of northern Tanzania. The Tarangire ecosystem supports a diverse array of wildlife species of global conservation significance, encompassing several national parks, community-based conservation areas, forest reserves, and trophy hunting blocks. From the perspectives of local agropastoral Maasai communities, coexisting with wildlife is a routine part of everyday life, though some species are dangerous and pose threats to physical safety. These human security concerns compound the economic impacts of wildlife on local livelihoods, manifest in the forms of crop raiding, livestock depredation, and property damage. Based on mixed qualitative methods including ethnographic fieldwork (2019–2020; 2022; 2023), participant observation, household surveys (n = 1076), and in-depth interviews (n = 240), this paper identifies the species of particular concern to communities. Elephants, spotted hyenas, buffalo, and lions pose significant threats to human security. Venomous snakes and leopards are also safety concerns, but to a lesser degree. The anthropological dimensions of these threats to physical safety are underrepresented in the literature on human-wildlife conflict. This paper spotlights three recent incidents of people being killed by wildlife (elephant, hyena, and lion) in the area, and the psychosocial consequences that have since rippled across local communities. People expressed feelings of fear, resentment, anger, grief, and insecurity born of their experiences coexisting with large nondomestic mammals. Wildlife attacks on people engender material and emotional impacts with traumatic aftereffects. These human dimensions of wildlife are significant for equity reasons in and of themselves, and also for environmental sustainability as they affect people's tolerance for living with wildlife. Greater attention to the lived experiences of local people is needed to improve conservation practice in northern Tanzania.

Introduction

Globally, wildlife populations are in decline (Wolf and Ripple 2017; Ripple et al., 2016). Anthropogenic land use change driven by political and economic factors has led to fragmentation of ecosystems and loss of natural habitats for wildlife (Pettersson 2022; Boronyak et al., 2022). Protected areas have shown utility in some cases as conservation tools for insulating wildlife from human activities, however, they have produced mixed social and ecological outcomes across the world (Packer et al., 2013; Wuerthner 2015; Smith et al., 2010). Protected areas often encompass insufficient ranges for wildlife (Venumière-Lefebvre et al., 2022) and, depending on their institutions for governance and management, have the potential to dispossess or even displace local human communities (Brockington 2002; Brockington and Igoe 2006; Igoe 2004). Considering these shortcomings of protected areas, wildlife practitioners have begun to consider human-wildlife *coexistence* in rural areas outside formal protected areas as crucially important (Mkonyi 2022; Lamb et al., 2020; Venumière-Lefebvre et al., 2022; Kiffner et al., 2022a). Coexistence scholarship has highlighted the fact that humans and wildlife do not have mutually exclusive environmental needs and can theoretically thrive on shared landscapes with proper institutional frameworks in place for managing land (Hartel et al., 2019). A concerning body of literature on human-wildlife conflict, however, highlights the potential negative impacts of human practices on wildlife dynamics, and conversely of wildlife on the wellbeing of human communities (Hill 2004; Kiffner et al., 2022). Human-wildlife interactions can produce a range of undesirable social outcomes like increased zoonotic pathogen transmission, livestock depredation, crop destruction, damage to property, and emotional distress (Carter and Linnell 2016; Barua et al., 2013; Mayberry et al., 2017). They can also render

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wildlife vulnerable to poaching, retaliatory killings, and habitat fragmentation (Kissui 2008; Felix et al., 2022).

This paper focuses on one key anthropological dimension of human-wildlife conflict—impacts of wildlife on human safety. Wildlife attacks on humans are increasingly being recognized as a key conservation challenge in need of further attention. Existing literature in East Africa on elephants (Thouless 1994; Hoare 2015) and lions (Packer et al., 2005) point to a range of ecological and social factors that influence wildlife attack frequency on humans. This paper contributes to the existing discourse by focusing on people's lived experiences of physical safety in the Tarangire ecosystem of northern Tanzania. It draws from a long-term ethnographic study (2019–2020; 2022; 2023) of human-wildlife interactions across twelve villages located adjacent to conservation areas. The Tarangire ecosystem was selected for this study as part of a large-scale research project on conservation institutions in pastoral areas in northern Tanzania and southern Kenya. The Tarangire ecosystem is well-known for its rich biodiversity, healthy populations of large mammals, and network of protected areas (Kiffner et al., 2022a). There is a rich body of literature on human-wildlife conflict and coexistence in the Tarangire ecosystem, but still much need for further research (Bond et al., 2022; Kiffner et al., 2022a; Kiffner et al., 2022; Kissui et al., 2022; Lohay et al., 2022). Qualitative research that is grounded in the lived experiences of local people is currently underrepresented as compared to quantitative social-ecological analyses (McCabe and Woodhouse, 2022). Using mixed qualitative methods, this paper reveals the wildlife species that regularly threaten the physical safety of local agropastoral communities. Some wildlife species pose significant safety concerns for local people in their lived environments, resulting in many cases in injuries and even deaths. Such a consideration points to a human security issue associated with wildlife conservation that is of great significance for policy makers, not only in terms of human wellbeing, security, and rights, but also as a potential catalyst of retaliatory killings of wildlife, resentment towards conservation initiatives, and alienation of local communities from the central aims of government policy. Addressing wildlife impacts on human safety in northern Tanzania is thus important for both social and ecological reasons.

The 'materials and methods' section of this paper provides background on the Tarangire ecosystem and the local people who inhabit the area. It then outlines the methodology for data collection and analysis. The results section presents mixed ethnographic data identifying the species of particular concern to communities in the context of people's lived experiences of physical safety. In the discussion and conclusion, these findings are situated in relation to existing human-wildlife coexistence scholarship. The key conclusion, drawing from Bencin et al. (2016), is that governance institutions for managing interactions between people and wildlife outside protected areas in the Tarangire ecosystem are currently ineffective, undermining the viability of long-term coexistence. It is suggested that decision-makers focus on devolution of governance institutions to ensure that human dimensions of wildlife management at the community-level are not overlooked by Tanzania's centralized wildlife sector.

Materials and methods

Study area

The Tarangire ecosystem spans approximately 25–40,000 km^2 in northern Tanzania, encompassing Tarangire National Park, Lake Manyara National Park, and several community-based conservation areas. In Tanzania, national parks prohibit all forms of local livelihood activities including livestock grazing, crop cultivation, settlement, and hunting. The community-based areas in the Tarangire ecosystem are multiple-use areas with environmental regulations that vary on a case-by-case basis. The Tarangire ecosystem is mainly covered by *Acacia* and *Vachellia* woodlands (Fig. 1), *Commiphora* bushlands, and grasslands. It supports a wide variety of medium-sized and large mammals of global conservation importance.

Fig. 1. – This photograph shows Makuyuni village with Esimangore Mountain Forest Reserve in the background. The author took the photo in June 2023. As depicted, the area is covered primarily by *Acacia* woodlands. Mountain peaks in the Tarangire ecosystem are covered by *Podocarpus* and *Olea* forests (Prins 1987; Kiffner et al., 2022a).

These include savanna elephants (*Loxodonta africana*), zebra (*Equus quagga*), buffalo (*Syncerus caffer*), wildebeest (*Connochaetes taurinus*), impala (*Aepyceros melampus*), waterbuck (*Kobus ellipsiprymnus*), bushbuck (*Tragelaphus scriptus*), Thomson's gazelle (*Eudorcas thomsonii*), fringe-eared oryx (*Oryx beisa callotis*), gerenuk (*Litocranius walleri*), greater kudu (*Tragelaphus strepsiceros*), lesser kudu (*Tragelaphus imberbis*), eland (*Tragelaphus oryx*), dik-dik (*Madoqua kirkii*), warthogs (*Phacochoerus africanus*), bush pigs (*Potamochoerus larvatus*), and a complete large carnivore guild comprising lions (*Panthera leo*), spotted hyenas (*Crocuta crocuta*), striped hyenas (*Hyaena hyaena*), leopards (*Panthera pardus*), cheetah (*Acinonyx jubatus raineyii*), wild dogs (*Lycaon pictus*), jackals (*Lupulella mesomelas*), civets (*Civettictis civetta*), large spotted genets (*Genetta maculata*), and common genets (*Genetta genetta*) (Kiffner et al., 2022). Seasonally, the landscape transforms with bimodal rainfall patterns that vary between approximately 200 mm of annual rainfall in the lowlands to above 650 mm in the forested highlands. The central part of the ecosystem, for instance, has on average between 434 and 824 mm of annual rainfall (Kioko et al., 2022; Prins and Loth 1988). From June-October, the landscape is dry and dusty, and wildlife stay close to the Tarangire river inside Tarangire National Park, which provides one of the only permanent water sources year-round. From November-December, the ecosystem receives a short rainfall followed by a short dry period from January-February. After this, from March until May, a long rainy season revitalizes the landscape, which turns verdant with colour as water is more evenly distributed across the area. Since national parks are unfenced in Tanzania, wildlife disperse outside Tarangire National Park during the wet seasons in search of forage. Areas adjacent to the park are categorized as village land and are inhabited by local agropastoral communities. Human-wildlife interactions are frequent in these areas, with negative repercussions for both wildlife populations and human wellbeing (Hariohay and Røskaft 2015).

The present study was caried out in twelve administrative villages to the north and east of Tarangire National Park: Makuyuni, Esilalei, Oltukai, Olasiti, Mswakini Chini, Mswakini Juu, Naitolia, Lemooti, Lengoolwa, Nafco, Lolkisale, and Oldonyo. Olasiti village is located in Babati District (Manyara Region), and the rest of the villages are part of Monduli District (Arusha Region). Oltukai and Esilalei are partner villages of Manyara Ranch (Fig. 2), a semi-community-based conservation area managed through a conservation trust by the African Wildlife Foundation in collaboration with Monduli District Government, Honeyguide Foundation, and the two villages (Goldman 2011, 2020). Local livestock-keepers are permitted to graze their livestock on the ranch during the dry season but are restricted from accessing ranch pastures during the wet season. Other resource uses like hunting, settlement, and crop cultivation are prohibited. Mswakini Chini, Mswakini Juu, Naitolia, Lemooti, Lengoolwa, Nafco, Lolkisale, and Oldonyo are member villages of Randilen Wildlife Management Area (WMA), and Olasiti village is a member village of Burunge WMA. Wildlife Management Areas are governed through Authorised Associations comprising village representatives that make governance decisions in collaboration with district government. Land use plans are determined by the Association and involve the designation of some portions of village land as a reserve area, and the enforcement of a multi-use management plan that supports conservation and local livelihoods. Randilen WMA has a zoning plan that includes a photographic tourism and wildlife reserve area, a mixed livestock and photographic area, and areas designated for crop cultivation and human settlement. The twelve villages were selected because they surround Manyara Ranch and Randilen WMA. Together with these conservation areas, the study villages represent an interconnected portion of the Tarangire ecosystem.

The study villages are inhabited primarily by Kisongo Maasai pastoralists and Arusha Maasai agropastoralists (Raycraft 2022a). The Kisongo likely arrived in the area a few hundred years ago and continue to manage pastures through a pastoral mode of production. The Arusha moved into the area in the 1950s-1960s due to land scarcity on Mount

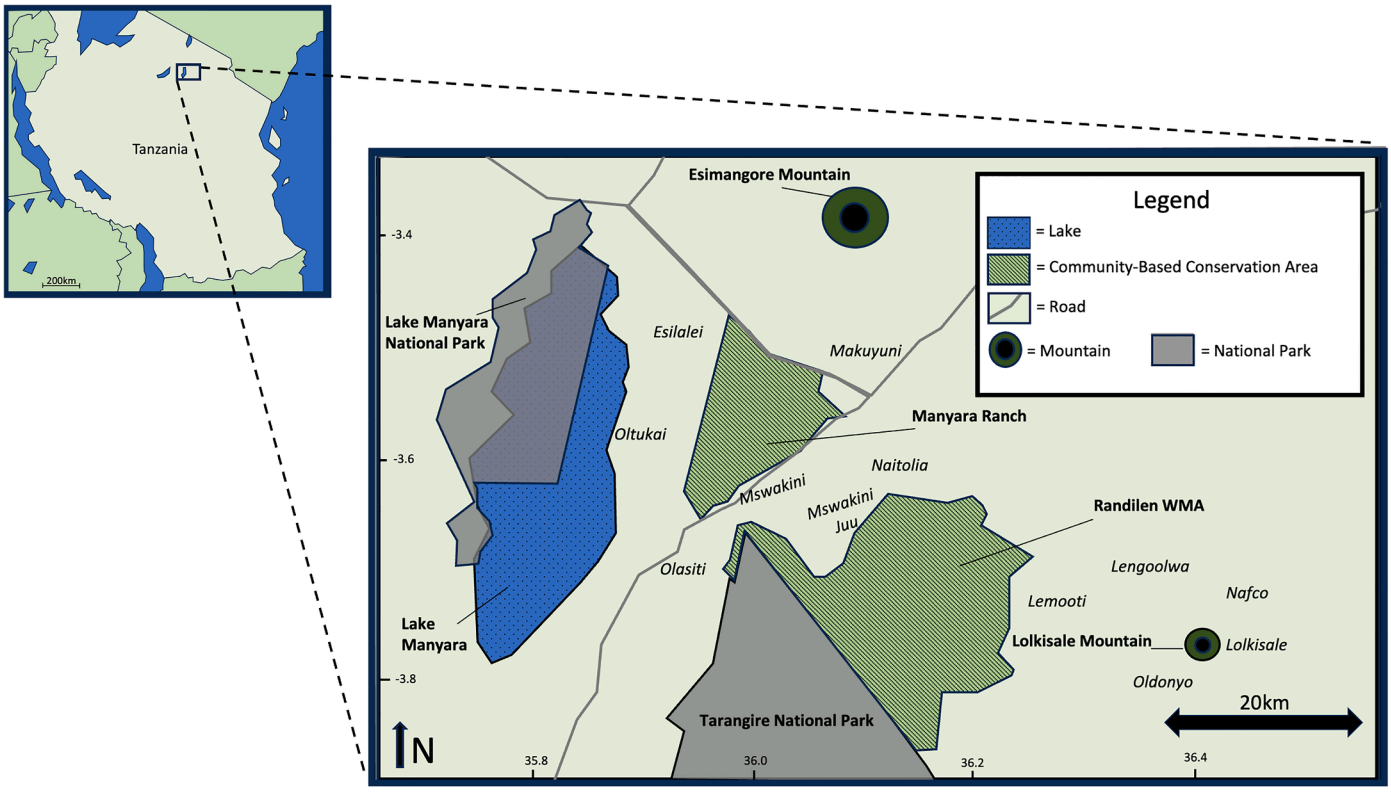

Fig. 2. – This map shows the central part of the Tarangire ecosystem, where the study was conducted. The figure was adapted and redrawn by the author based on (Raycraft 2022b:59). Villages are represented on this map with names to signify their approximate locations, though they are actually administrative political units with clearly defined boundaries.

Meru, with encouragement from colonial administrators, and later the socialist government (Igoe 2010; Bluwstein 2017). Both groups speak Maa, uphold an age-set system, practice a gender-based division of labour, and depend on livestock and crop cultivation for livelihoods. Their societies are interdigitated through shared participation in rituals and intermarriage, though ethnic territoriality is still maintained across sub-villages and villages (Raycraft 2022b). Cattle are central to the social and economic life of the Kisongo, though herders also keep goats and sheep. The Arusha are also livestock keepers in this ethnographic context, but consider themselves primarily cultivators (Spear 1997). Both groups produce maize and beans, and the Arusha also grow a variety of other crops including peas and sunflowers. Makuyuni, Olasiti, and Lolkisale also have town-like sub-villages with people of mixed ethnicities, though the majority of people living across the study area are Maasai.

Though the area is largely dominated by *Acacia* woodlands, the term 'forest' (*Misitu* in kiSwahili; *Entim* or *Osero* in Maa) is locally contentious as it connotes regulations on land uses. Adjacent to the Saburi sub-village of Makuyuni is the Esimangore Mountain Forest Reserve, which is centrally managed by the Tanzania Forest Services Agency. Some parts of Esimangore, on the other side of the mountain from Makuyuni, are managed as a trophy hunting block. Lolkisale mountain is covered by dense forest and is managed through the Lolkisale Village Land Forest Reserve (Mwakalukwa et al., 2023).

Methods for data collection

This study involved ethnographic field research across the twelve study villages in the Tarangire ecosystem. The permit to conduct research in Tanzania was issued by the Tanzania Commission for Science and Technology (COSTECH) as part of the "Social landscapes of livelihood in northern Tanzania" research project (Permit No. 2019–426-NA-2019–299). Letters of support were also provided by Arusha and Manyara regional governments, Monduli and Babati district governments, wards, and local villages. Ethical review for the conduct of research with human subjects was carried out by McGill University in 2019 (REB File #: 479–0419) and the University of Lethbridge via the University of Alberta in 2023 (Pro00130079). Data collection in 2019–2020 included 20 qualitative interviews with household heads in each village ($n = 240$; 50% men; 50% women). Household heads were selected in a semi-random fashion on foot to ensure that interviewees were selected from all sub-villages. Interviewees were asked to describe their interactions with wildlife and which species were associated with benefits and costs. Questions were open-ended and respondents were not prompted to answer in a particular way. Species that were identified as particularly problematic were then included in a household survey that was administered to a randomly selected sample (stratified random sampling) of 1076 individuals across all twelve villages in 2020. To account for gender bias, three categories of respondents were recruited for participation: male household heads, female household heads, and females in male-headed households. Detailed descriptions of inclusion criteria and sampling frames are published elsewhere (Raycraft 2022a, b). This paper presents descriptive results to a question on perceived frequency of wildlife attacks on people by species over the past twelve months. Previous quantitative studies effectively demonstrate correlations between demographic variables and perceptions of conflict with wildlife (Koziarski et al., 2016; Bencin et al., 2016; Mkonyi et al., 2017b; Mkonyi et al., 2017a). In this paper, response frequencies to the survey item on perceived wildlife attacks are presented to triangulate and contextualize the paper's qualitative findings, generated through ethnography (July 2019-July 2020; June-July 2022; April-May 2023). The majority of data presented in this paper were gathered through participant observation of everyday live at the village level, in keeping with the discipline of sociocultural anthropology. Ethnographic observations provide a nuanced account of people's lived experiences of sharing landscapes with wildlife that are otherwise difficult to quantify.

Results

Interview and survey results

A descriptive overview of survey respondent demographics ($n = 1076$) is provided here to contextualize the qualitative data presented in the subsequent sections. Most respondents were Maasai, with 58% identifying as Arusha and 32% self-identifying as Kisongo. A small minority were from other ethnic groups like Iraqw (2%), and Nyaturu (2%), and fourteen other ethnic groups of 1% or less of the total sample. About 41% of respondents were Korianga-aged (29–44), 31% were Landiis-aged (45–55), 12% were Makaa-aged (56–70), 8% were Seuri-aged (71–85), 7% were Nyangulu-aged (18–28), and 2% were Nyangusi-aged (85+). The majority of survey respondents had primary level education (54%), and about 39% had no formal education. A small minority had attended secondary school (5%), and a couple respondents had been to university (1%). Most of the respondents derived the bulk of their income from livestock keeping and crop cultivation (83.6%).

During qualitative interviews across the twelve study villages ($n = 240$), people consistently reported elephants, hyenas, buffalo, lions, and snakes, as significant threats to human safety. This finding corroborates the results of a previous study of local perceptions of wildlife (Bencin et al., 2016). Interviewees volunteered these answers without specific prompting about each species. Elephants were less worrying to people living in Oltukai village and Lolkisale town, but were a concern in the rest of the study villages. Women were especially fearful of elephants and buffalo. Men expressed concern about snakes and large carnivores. Lions in particular were considered especially dangerous. This gendered finding aligns with recent regional literature. Kissui et al. (2022) note that 98% of documented large carnivore attacks in the Tarangire ecosystem are on men. Kissui et al. (2022) reason that this gender discrepancy is due to the fact that men are more involved in herding and reliatory killings of carnivores. Men also generally walk alone at night more often than women. Numerous male interviewees explained that snake bites occur regularly but are usually not lethal. Deaths, however, do occur from black mambas (*Dendroaspis polylepis*), black necked spitting cobras (*Naja nigricollis*), and Egyptian cobras (*Naja haje*), though these incidents are uncommon (Branch 2014). Snake bites from a variety of nonlethal snakes (e.g. ornate and house snakes) are routine parts of everyday life, and were not considered particularly concerning to people. A recent study of snakebites in Tanzania's Maasailand found that men aged 18–60 are more commonly bitten by snakes than women, as men are usually responsible for herding cattle in remote areas in the dry season (Francis et al., 2023). Complicating matters, access to anti-venom medications and trained professionals for administering them are only available at the Meserani Snake Park Clinic in Duka Bovu. Nonetheless, my interviewees explained that snake bites were usually nonlethal. Attacks from elephants, hyenas, buffalo, and lions, however, were often described as potentially deadly.

Based on people's responses, elephant, lion, buffalo, snake, and hyena were included as survey items to establish perceived frequencies of attacks on people by species over a twelve-month period (2019–2020) (Fig. 3). An 'other' category was also included in case there were other problematic species that were not identified during interviews. Overall, people reported that elephant attacks were the most frequent with 24% reporting that elephants attacked very often over the past twelve months followed by hyenas (22%), snakes (12%), buffalo (9%), lions (5%), and other (2%). Notably, leopards were not raised explicitly during in-depth interviews as dangerous to people, though they were noted on numerous surveys in the 'other' category. Leopards are a major concern for livestock keepers living in the five villages surrounding the highland forests of Lolkisale mountain. In these villages, some survey respondents explained that leopards sometimes attack children around dusk if they are left unattended.

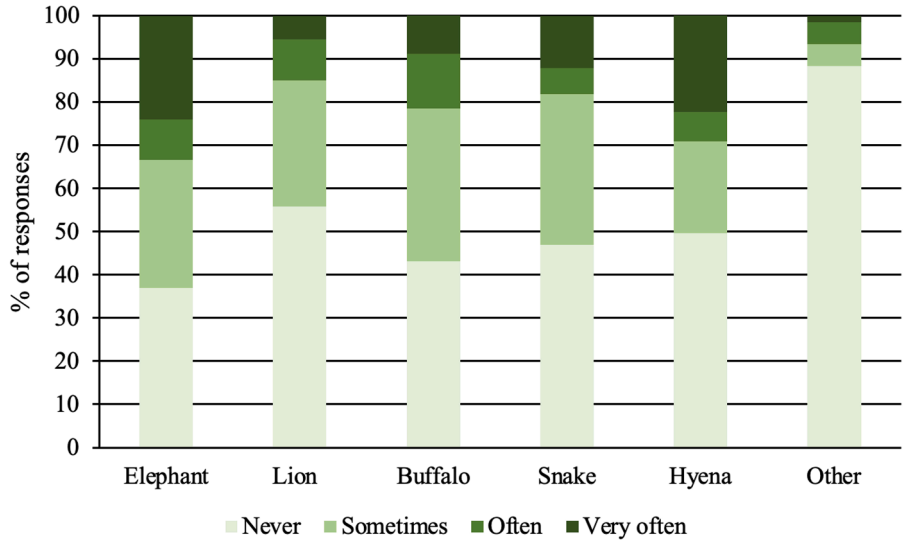

Fig. 3. – This stacked bar chart displays perceptions of wildlife attack frequencies on humans by species over a twelve-month period in 2019–2020 based on a household survey (n = 1076) administered in 2020 across twelve villages in the Tarangire ecosystem. Respondents were selected through stratified random sampling.

Elephants

In early 2020, I visited a middle-aged Arusha man at his homestead in Makuyuni to interview him about his livelihood practices, his thoughts on community-based conservation, and his views on wildlife. When we commenced our interview, the focus of our conversation immediately narrowed in scope to a traumatic incident that had occurred two years prior, in that very same location. As detailed to me by the man, he had been tending to the thorny *acacia* fence around his homestead one evening before retiring to his quarters to sleep when a massive elephant barrelled through the fence and attacked him. The man guided me out to the spot where the incident had occurred and described to me in frightening detail his experience of being unsuspectingly attacked by the largest land mammal on earth, in what he thought was the security of his own home. In the man's description, the elephant had charged through his fence and knocked him to the ground as it trumpeted loudly. In shock, and temporarily winded, the man was unable to flee, and the elephant began stomping on his leg. Though it left soon after, and the man survived, the elephant's tramples had left the man with a complex, compound fracture in his leg for which he was unable to receive adequate medical care. As he led me around his homestead recounting the events, he hobbled with a cane and a significant limp that he had been informed by a physician would likely be permanent. The young man and his family had pled to the district government for compensation for the incident, which had severely hampered the man's abilities to work his farms and provide for his family. Two years later, however, they had still not been offered any compensation due to bureaucratic inefficiencies, limited government funds, and challenges in verifying the exact nature of the event. During our interview, the man explained that he had been left traumatized by the incident, realizing that he and his family were not safe, even within the confines of their own home. He also felt neglected by the government and echoed a sentiment that was conveyed to me on many occasions as I carried out my fieldwork—that the central government cared more about wildlife than it did about the wellbeing of rural communities.

Though highly disturbing, the man's lived experience of sharing a landscape with a large mammal of conservation and tourism significance was far from anomalous. In fact, many of the incidents described to me were much more severe. While carrying out fieldwork in Lemooti village in late 2019, numerous interviewees lamented that elephants were so ubiquitous in their village that people were living in constant fear of dangerous interactions. As described elsewhere, the perceived impacts of elephants on crop production in Lemooti were so significant that many Kisongo Maasai pastoralists living there had largely abandoned farming and returned the land to pasture (Raycraft 2022b). While the impacts on food production were certainly concerning, the threats to safety were even more pressing. On one evening, while taking a motorbike home in the village, a man encountered an elephant after turning a bend. Startled, the elephant struck him off his bike and trampled him to death. Though Tarangire National Park authorities later visited the community to convey their condolences, and the government did make a payment to the family to offset some of their economic hardships, the human cost of living with elephants was severely undervalued from the perspectives of community members. In this case, it had cost a man his life, and the social ripples were felt throughout the household that he had headed.

Further away from the forests of Lolkisale Mountain, in the villages of Naitolia, Mswakini Chini, and Mswakini Juu, Arusha Maasai interlocutors expressed anger about the constant threats of living in an elephant dispersal area. People conveyed that as dusk fell upon their villages, they felt insecure walking around outside their homes out of fear of encountering elephants. Women described the dangers faced by their children on a regular basis in the wet season on their walks to school in the morning. Children often encountered large elephant herds and were forced to wait for hours until the elephants left. Wright (2019) refers to these types of experiences in Tanzania's Maasailand as the "precariousness of living with elephants." During one interview with an elder Arusha man at his home in Naitolia village, he showed us the damage inflicted by elephants the night prior—three trees that had taken years to grow had been knocked down next to his house. He pointed to the remnants of his sisal fence and shrugged his shoulders in frustration. Sisal, used by Maasai communities to demarcate customary tenure of homesteads, is particularly attractive to elephants as a source of food. Ironically, the very plant used to create boundaries and keep intruders out had attracted them to come in.

The problem was not specific to the villages of Mswakini and Naitolia and in fact spanned all the study villages except Oltukai and Esilalei, where Kisongo Maasai pastoralists reported fewer troublesome encounters with elephants in their everyday lives. The dispersal of elephants outside Tarangire National Park in the wet season, particularly to the northeast of the park via Randilen WMA, Manyara Ranch, and Esimangore Forest Reserve makes these areas dangerous for people. When I first arrived in Makuyuni village in September 2019 to commence

fieldwork, my field assistant Edwin Maingo Ole was told by several *boda boda* (motorbike taxi) drivers that they were unwilling to drive him to his extended family's homestead in Saburi sub-village because they were too afraid of encountering elephants along the way. Later, in November 2019, while I helped facilitate a workshop on community-based conservation in Mto wa Mbu, Edwin was unable to leave his homestead in the morning due to a nearby herd of elephants blocking the path to the main road.

Despite the significant threats that elephants pose to human security, government support for local communities in dealing with the conflict is limited. Several interviewees across the study villages articulated the common sentiment that human lives were not valued by the government to the same extent as elephant lives. As one interviewee in Olasiti village explained emphatically, "If someone is killed by an elephant, they will send one vehicle with officials to pass along their condolences. If an elephant is killed on community land, then they will send ten vehicles and a helicopter!" This statement is, of course, an exaggeration, as wildlife authorities in this area do not have funding for helicopters to address human-wildlife conflicts. But the statement nonetheless highlights the local belief that the central government values elephants over people.

The strong government interest in protecting elephants is well justified. Elephants are highly significant sources of safari tourism revenue and are coveted by organized poachers and wildlife traffickers for their tusks, though recent policy reforms in China have resulted in a decline in the Asian market for ivory. In the Tanzanian context, increased political will for enforcement of ivory trafficking during President Magufuli's regime led to the arrests of key actors implicated in the trade. Poaching declined across Tanzania as a result. Elephants are also highly intelligent, social creatures with their own intrinsic right to security. But from the perspectives of local agropastoral communities in the Tarangire ecosystem, the protection of elephants has come at the cost of selectively neglecting the safety concerns of local people. The most promising steps to reduce the impacts of elephants on human security have been spearheaded by the local grassroots non-governmental organization, Honeyguide. In partnership with Randilen WMA, Honeyguide has helped supply Randilen's member villages with high-luminosity battery-powered flashlights, roman candles, and handheld chilli bombs that are distributed to local villages via funding from Randilen WMA's community-based tourism revenue. Honeyguide-supported antipoaching vehicles for the WMA are also repurposed as defences against elephant crop-raiding in the wet season, providing community members with an added sense of security in the harvest season. Local community members very much appreciate these efforts from Honeyguide and Randilen WMA to improve their wellbeing and security. Monduli District game officers are also dedicated to the issue and are well received by the communities for their efforts. District game officers, however, are severely constrained by limited operational funds making it challenging to address the issue on a consistent basis. Despite these local efforts, community members on the whole feel underrepresented by central government policies and formal state institutions for managing wildlife.

Spotted hyenas

Aside from elephants, local agropastoralists must contend with numerous large carnivores that share community land. In mid 2020, while I was visiting Olasiti's village office to meet with the village chair and executive officer, representatives and staff from Tarangire National Park and Burunge WMA showed up in their respective 4 × 4 vehicles. Curious to know what was going on, I struck up a conversation with one of the visitors, who solemnly explained that someone had just been killed by a spotted hyena. The group was heading to the victim's home to offer condolences to the family. Edwin and I decided to join to pay our respects and document the event. We followed the caravan of vehicles to the homestead in Olasiti where we were greeted by the bereaved Arusha Maasai family and an *olaigwenani* (Maasai traditional age set leader) who had been entrusted to oversee the process of paying respects and condolences. Together, we sat in a circle of about twenty of us. The *olaigwenani* opened the meeting with a solemn introduction, followed by individual respects from each person in the circle and a payment to the *olaigwenani* who consolidated all the contributions and handed them to the victim's family in a symbolic gesture. The meeting ended soon after and we asked the family if it would be appropriate for us to return at a later date to discuss and document the incident. Despite their grief, the family members were surprisingly grateful that researchers had expressed interest in hearing their perspectives about the incident. Edwin and I returned a week later, and began to unfold what had happened: a six-year-old boy had been killed by a hyena just outside their family homestead. As recounted by the mother, the boy had been playing in the sand in the afternoon. He was within earshot but out of her line of sight. The mother had been cleaning and doing household chores in the yard when she heard her boy scream. Assuming he had fallen into a hole, she ran over to her son and saw him on the ground covered in blood. Then, seemingly out of nowhere, a hyena appeared and leapt at her. In her description, the hyena knew that someone would be coming to investigate the scream and had hidden in wait for the mother to come for her child. The woman fought with all her strength and reached her arm out in an attempt to push the animal away. In the process, the hyena bit off the last three fingers of her hand. She screamed for help and fought desperately to save her child's life, and within minutes her family members and neighbours arrived and chased off the hyena. Unfortunately, it was too late, and the child succumbed to his injuries.

The mother was rushed to the hospital in Mto wa Mbu for emergency treatment. As we spoke to her following her discharge, she raised her bandaged hand to show us her two remaining fingers. She explained that there were no words that would be able to convey the feelings of pain she was experiencing at the loss of her child. At one point during our conversation, she was understandably overcome with emotions, as was the rest of her family. The violent way the child had been killed within her earshot left her wrestling with feelings of misplaced guilt and shame. These emotional wounds are difficult to quantify through conservation research. Once again, the concept of home—a place that connotes security and comfort across cultures —became the site of violence. On this occasion, it had cost a young boy his life, and inflicted emotional trauma on his mother and her family.

Though the community initially assumed that the hyena had been rabid, national park staff allegedly found and tested the animal afterwards and concluded that it did not have rabies. Park staff were somewhat unsure as to why the hyena would attack a person in broad daylight, though hyena attacks had been on a sharp rise in 2019–2020 when I conducted my doctoral fieldwork (Kissui et al., 2022, 14). On one occasion, when I was interviewing the management staff of Lake Manyara National Park in 2020, the head ranger received a walkie-talkie report that a person had just been attacked by a hyena in Karatu. When I asked him about the incident, the ranger conceded that hyenas were becoming a serious problem for people living adjacent to protected areas and he was not sure why they were increasing their attack frequency on people. While carrying out emplaced fieldwork in Oltukai village in 2019, hyenas visited our boma nightly. In an attempt to document and observe these dynamics up close, I camped in a fly tent just outside the livestock kraal. In Oltukai, there is no outside homestead fence to deter predators, as local Kisongo Maasai feel that hyenas are more put off by the aesthetic of Maasai huts. On the first night at my post, a large spotted hyena appeared at about 3am a few feet from my tent and began digging to get into the livestock kraal. I yelled at it to go away and its snarl in response was somewhat frightening, as I realized that the hyena could have easily torn through the fly cover and bitten me. People laughed at first when I told them the story the following day. They considered the act of defending livestock from predators to be my rite of passage to becoming *mwanajami* (a community member). However, elders later

advised me sternly to not lie out in the open at night because hyenas had been known to attack people. On one occasion, a rabid hyena had even broken down the door of someone's hut and attacked a man in his sleep.

Lions

Lions are also problematic for local communities. When I carried out my doctoral fieldwork in 2019–2020, most interviewees respected the threat that lions posed to safety, but were quick to point out that issues with lions were nowhere near as frequent as they were with hyenas. During interviews, people suggested that lions had learned to fear people and would "lie down in the grass" if people approached to avoid encounters altogether. These sentiments were mirrored in the survey results, which suggested less frequencies of attacks on humans overall. When I returned for follow-up fieldwork in 2022 to provide feedback on my findings with local stakeholders, however, the narrative had changed drastically. Earlier that year, in March, a lioness (named "*Namasa*" by the communities) had attacked three people in Mswakini Juu and the community swiftly killed it in response. Tensions over lions escalated to a boil following an incident that occurred on Manyara Ranch during my fieldwork in June 2022. While bringing cattle to the river to drink, a young herder was ambushed and killed by a lioness. Uncharacteristically for lion attacks on people, the lioness ate the herder. The event was possibly related to the severe and prolonged drought that lasted the entirety of 2022, limiting available forage for wild ungulates and thus affecting large carnivores in turn. But a lion targeting a herder, rather than the cattle he was tending, was uncommon. Some members of the local community assumed that the young herder must have been cursed, considering that he was not only killed, but eaten. My conversations with conservationists, however, revealed that this lioness had gone 'rogue' and had begun to attack cattle and herders alike. My interlocutors suggested that once a lioness had "switched" to attacking people and livestock, it was very difficult to change its behaviour and it either had to be put down or relocated.

From the perspectives of local Kisongo Maasai herders in Oltukai and Esilalei, the incident was outrageous because the Maasai have been banned from killing lions, a practice that has historically been a significant cultural rite of passage. Kisongo Maasai do not actually dislike lions, though they despise hyenas. They in fact greatly respect lions as semiotic reference points in their cultural lives (Goldman et al., 2010). But as Kissui (2008) points out, when lions attack people or livestock in Tanzania's Maasailand, they are often disproportionately affected by retaliatory killings as opposed to hyenas. One reason, as Kissui describes, is that retaliatory killings of lions in effect kill 'two birds with one stone,' —Maasai herders leverage the material consequences of lion attacks as justification for transgressing the prohibitions on their cultural rite of passage. While hyenas have much larger impacts on the livestock economy, they carry little to no cultural significance (except amongst the *Laitayok* Maasai section, which totemically identifies with them) and thus killing them does not generate any social capital within Maasai society (Kissui et al., 2019). Another reason, raised by one of the anonymous reviewers of this article, is that lions tend to defend their kills, which makes them vulnerable to human spear attacks. By contrast, hyenas usually flee when people arrive, and are quick to get out of spear and arrow range.

Conflicts between lions and Kisongo Maasai in Oltukai, Esilalei, and Saburi are also symbolic of larger political tensions over conservation dynamics (Goldman 2011, 2020). When local communities were particularly unhappy with ranch governance in the early 2000s, for instance, they killed lions with greater frequency to communicate their discontent to authorities. As the dust settled with ranch politics and everyday management settled into a herder friendly model, lion killings largely subsided. When events like the lioness attack of 2022 occur, they catalyse strong emotional responses from the communities, as they dredge up past feelings of exclusion and neglect, and serve as a reminder that local pastoralists often bear the costs of wildlife conservation, while receiving few of the tangible benefits. In this case, the communities of Oltukai and Esilalei were enraged and a party of twenty warriors was sent to retaliate. The ranch manager, a Maasai man himself, made a valiant attempt to de-escalate the situation. He offered support to the affected families and spoke earnestly about the importance of not killing the lioness in response. The group of warriors initially implied that they would not strike back after visiting the location where the rangers were stationed. In reality, they had tricked the manager by creating a diversion. Simultaneously, the communities sent a group of twenty warriors to kill two lions in a different location. The irony was that the warriors killed two male lions that were not responsible for the event in the first place. The reason, however, was that the large maned males carried more cultural significance and generated more social capital for the young warriors (Kissui 2008). Realizing at that point that the lion pride was under serious threat, the ranch manager in collaboration with Tanzania Wildlife Management Authority (TAWA) staff and members of the Tarangire Lion Project acted swiftly to relocate the responsible lioness and her cubs to Burigi-Chato-National Park in northwestern Tanzania, near the Rwandan border. Relocating the lions was a major logistical challenge that saw ranch staff catch two cubs and their mothers at midnight with tranquilizers, load them into crates in the backs of pickup trucks, and send them on their way the following day. Managing the emotional response from the communities, however, was likely the most challenging part. People were angry and upset and these feelings were only exacerbated by the government response. As several community members once again lamented to me: "when the herder was killed, two vehicles came. But when the lions were killed in response, fifteen showed up."

Buffalo

In December 2022, at the height of the extreme drought, a deaf child at Lowassa Secondary school in Saburi sub-village of Makuyuni was charged by a lone male buffalo just outside the school grounds and severely injured. Male buffalo often leave their herds as they mature and come to live solitary lives. This particular male was notably aggressive. Following the attack, the child was taken to Arusha Hospital and survived without lasting injuries. Other children at the school, which supports students with special needs, were extremely frightened by the event and fearful of going outside immediately afterwards. TAWA officers responded quite swiftly to the incident and came to chase away the buffalo, rather than put it down. The buffalo, however, held its ground and attacked one of the TAWA rangers, piercing the man's neck with its horn. The officer was immediately taken to hospital with critical injuries, but survived. The second attack heightened the students' fears about the dangerous buffalo that lurked somewhere near their school. This buffalo, they began to think, was so strong that even well-armed government rangers could not stop it from injuring people. The following day, TAWA rangers flexed their muscles by returning and killing the buffalo. By that point, the problem animal had still not left the area, and thus posed an ongoing threat to local people. As a gesture of good faith to try to placate the worried children, TAWA rangers butchered the buffalo carcass and fed the meat to the children at the school—a material perk for hungry children, but more importantly, a symbolic gesture to convey to the children that TAWA had eliminated the threat.

The circumstances around the buffalo attacks were not unique, but there were a few context-specific factors that might be of significance. The initial attack had occurred during the extreme drought, during a time when even the highlands of Esimangore forest had limited sources of water. It is possible that the buffalo had wandered down from the forest into the community in search of grass and water, though Manyara Ranch has resident buffalo as well. Generally speaking, buffalo attacks on the open plains are infrequent because people and buffalo can exchange eye contact and keep their distance. However, in this case, it is possible that drought stressed the status quo.

Drought also has the added consequence of forcing local herders higher up into the forest highlands of Esimangore, where they often graze livestock in the severe dry season. However, local herders are wary of trekking up into the mountains because lone male buffalo in the forests are extremely dangerous. Several Kisongo Maasai pastoralists explained to me that lone males in the mountain forests will charge at herders through the bush, potentially causing serious injury or death. In late 2022, a local herder from Saburi ventured up into the forest highlands in search of dry season pasture and was charged by a buffalo. The young herder was terrified but managed to escape without serious injuries, as it was only a glancing blow. He was taken to hospital where doctors gave him a clean bill of health, but he was notably shaken by the event and unwilling to return to the forest for some time.

The fear of buffalo in the forests has become totemically integrated into everyday discourse since it is such a ubiquitous threat. As a measure of a warrior's physical strength, people often remark: "this man could fight a buffalo." When people are less convinced by someone's strength, it is framed as more of a question: "Could you not fight a buffalo?" Both sentiments are, of course, jokes as no one is actually expected to fight a buffalo. They are, however, idiomatic references to a very real danger that bears on people's everyday lives. In cases where emotions might otherwise run high, the phrase is sometimes mobilized to playfully make light of a challenging situation. This was the case in early 2020 when I was carrying out fieldwork in Oldonyo village. As I sat with the village chair, an Arusha woman came into the office and explained exasperatedly that there was a buffalo in her farm. The buffalo had wandered down from the highland forests of Lolkisale mountain and was grazing on her crops. In response, the village chair offered up with a half-smile: "Okay, can you go push it out for us while we finish talking?" The woman began to laugh, and I could see the worries she carried with her into the office begin to melt away. The chair's joke had signalled to the woman that she need not worry and that things were not as grave as she was fearing. While it was possible in this case for the village chair to make light of the threat of a buffalo in the lowlands adjacent to Lolkisale Mountain, the prospect of a lone buffalo in the highland forests is no laughing matter. This became abundantly clear to Edwin and I while we carried out fieldwork in Lolkisale village on my birthday. I had decided that to celebrate I wanted to climb Lolkisale mountain, which overlooked the villages, and Edwin was happy to accompany me. But in starting our ascent, several villagers approached us and cautioned that our plan was very dangerous due to buffalo on the mountain. Perhaps overconfident, I did not pay them much heed until about an hour into our trek up through the dense forest cover, did we come across fresh buffalo droppings. The snap of a twig about a stone's throw from us was enough to seriously worry Edwin and instill in me a caution that I perhaps should have had from the outset. As we continued on with greater care, Edwin told me a story of his rite of passage experience when he and a group of *ilmurran* had ventured into the forest in search of a lion. When they arrived in the forest, however, they were met by an angry buffalo, which, in Edwin's description, pierced his brother's lower gut so severely that his intestines were hanging out of his body while they carried him back to the village. Fortunately, they were able to rush the young man to the hospital, and he survived. I could tell from the manner in which Edwin told the story that he was genuinely traumatized from this experience. Buffalo in the mountain forests are certainly to be heeded, as visibility is obscured by trees and buffalo can attack through the bush with little notice.

Discussion and conclusion

Living with the "big four"

The imperative to promote ecological connectivity outside protected areas poses significant conservation management challenges as dispersing wildlife and human communities come into contact with each other. In the Tarangire ecosystem of northern Tanzania, seasonal patterns of wildlife movement outside Tarangire National Park into adjacent villages engender a range of economic costs for local agropastoral communities in the forms of crop raiding, livestock depredation, and damage to property. While these socioeconomic impacts of human-wildlife conflict are well-established (Mkonyi et al., 2017a), the effects of wildlife on people's lived experiences of physical safety have thus far been poorly documented. Findings from this mixed-methods ethnographic study reveal that local Maasai (Kisongo and Arusha) consider elephants, spotted hyenas, buffalo, and lions to be particularly dangerous animals to share landscapes with. These large mammal species severely injure and kill people on a regular basis, though incidents are underreported by official outlets. While venomous snakes and leopards also attack humans in this area with regularity, local agropastoralists consider them less concerning than the "big four" mentioned earlier in terms of their overall threats to human security.

The dangers of living with wildlife merit further attention by conservationists. Threats to physical safety are human security concerns as people ought to have the right to feel safe in their own homes and communities. Thus, there is a significant social justice issue at stake in northern Tanzania that is currently being inadequately addressed by conservationists and government policy makers. Wildlife attacks on humans are associated with surface-level tangible costs in the forms of injuries and deaths, and also produce a range of hidden costs (Mayberry et al., 2017; Barua et al., 2013). An anthropological approach to research reveals that such incidents bring about feelings of fear, grief, anger, stress, and sadness. Wildlife attacks on people inflict deep psychological wounds with lasting traumatic aftereffects. These costs of wildlife conservation initiatives are difficult to quantify through ecological approaches to wildlife-related research, suggesting that greater attentiveness to the human dimensions of wildlife management is needed in this ethnographic context.

Implications for wildlife management

The social implications of wildlife attacks on people are significant from an equity perspective, but also in terms of environmental sustainability. At stake from a conservation standpoint is the long-term viability of wildlife management initiatives that prioritize dispersals of wildlife onto human-dominated landscapes outside protected areas. A growing body of research shows that human-wildlife coexistence on shared landscapes is largely dependent on the question of whether people *want* to live alongside wildlife (Martin and Cole Burton 2022; Expósito-Granados et al., 2019; Inskip et al., 2016). That is to say, if people are tolerant of the costs of sharing landscapes with wildlife, then large mammal populations are much more likely to persist outside protected areas (Dorresteijn et al., 2014). Frequent and often-lethal wildlife attacks on people in the Tarangire ecosystem have made people feel resentful towards wildlife, sentiments which could affect their willingness to support wildlife management initiatives in the future. These feelings are compounded by a conservation policy landscape that generally prioritizes the generation of tourism revenue for central coffers through state-private partnerships and foreign investments over the wellbeing and livelihood security of local communities (Nelson et al., 2007; Brockington 2008; Gardner 2016). Wildlife attacks are interpreted by local agropastoralists as part of the broader institutional apparatus of state governance that maximizes central benefits while distributing the brunt of conservation costs to local communities. Community-based conservation has thus far produced mixed results in offsetting some of these costs of wildlife at the local level, with the most promising example being Randilen WMA. With support from the Honeyguide Foundation, Randilen WMA has garnered local support for conservation by redistributing the benefits of wildlife management initiatives to its member villages (Raycraft 2022a). These developments are a step in the right direction, but greater capacity for livelihood-orientated models of community-based conservation are needed to ensure that people continue to look past the threats that wildlife pose to human security.

Importantly, documentation of wildlife attacks on people in the Tarangire ecosystem should not be taken as evidence in support of the claim that humans and wildlife cannot coexist in this region. Humans have coexisted with wildlife in East Africa for hundreds of thousands of years, albeit with appropriate levels of conflict to maintain ecological niches as necessary. The ethnographic findings presented in this paper should not be appropriated by government officials and conservationists to justify further displacements of people from wildlife-rich areas in northern Tanzania. I argue here that such an interpretation of these findings would be a gross misrepresentation of a textured ethnographic reality. Local agropastoralists are remarkably tolerant of living with large mammals provided that their livelihoods are secure, they are treated with respect by governing authorities, and their dignity and right to a good life are not considered by conservationists to be less important than the preservation of wildlife populations. These asks put forth by local people are modest in comparison to the benefits generated by the central government through wildlife-related tourism. As things currently stand, however, local agropastoralists in the Tarangire ecosystem (outside Randilen WMA) are largely being forced to deal with the costs of living with wildlife while receiving few of the benefits, and this is a major issue for both equity and sustainability reasons.

Though this paper has highlighted several incidents of wildlife attacks on people, it is important to mention that wildlife generally do not attack people without provocation. The vast majority of lion attacks on humans in the Tarangire ecosystem have historically occurred in the context of human attempts to kill lions, either as a rite of passage, or in retaliatory response to livestock depredation events (Kissui et al., 2022). Lion attacks generally occur more in areas with fewer sources of prey other than bushpigs and increase around harvest season (Packer et al., 2005). Hyena attacks seem to be a different story. A recent study found that 31% of people who were attacked by hyenas in the Tarangire ecosystem were either in their home or walking at night (Kissui et al., 2022). Thus, they did not occur in the context of attempted retaliatory killings and could warrant further attention from wildlife authorities.

Furthermore, in the context of elephant crop-raiding, the aggressive and noisy tactics used by farmers to defend their crops are meant to aggravate and disturb elephants with the hope of motivating them to leave. A recent study has found that elephants in the Tarangire ecosystem react significantly more aggressively to audio recordings of people than they do to cattle or wildlife, suggesting that humans have a significant role to play in expressions of elephant aggression (Kioko et al., 2022). Elephants are highly intelligent animals with excellent memory, and they learn to associate aggressive behaviour with humans in general, in turn responding violently to encounters with people to reduce perceived threats. The fact that people are often involved in provoking wildlife suggests that a nuanced perspective on human-wildlife conflict is necessary in this context. While the incidents of wildlife attacks on humans I have foregrounded in this paper are tragic, they are likely symptomatic of multi-scalar sociopolitical dynamics.

It is obvious that there is an issue at stake in this social-ecological context that is undermining the viability of human-wildlife coexistence. At the same time, painting wildlife attacks on people exclusively in terms of human rights glazes over the environmental complexities that make this scenario challenging to address from a conservation perspective. Land use changes around Tarangire National Park have fragmented crucial wildlife habitat and reduced ecological connectivity outside the park. These patterns of enclosure have deeply embedded political and economic roots that stretch back historically to the colonial and socialist periods. The entrenched nature of fragmentation in the Tarangire ecosystem, as well as the political assemblage of stakeholders implicated in the governance of resources in the area have created a complicated political-ecological arena that frames interactions between people and wildlife outside Tarangire National Park. The notion that wildlife must be managed to reduce impacts on human wellbeing is a somewhat misguided anthropocentric premise (cf. Washington et al., 2021) as wildlife dynamics are governed naturally by ecological principles. Wildlife management is at its core an issue of social and political institutions, which should ensure that human society is managed in an effective and sustainable way.

Existing literature on human-wildlife coexistence offers some ideas for the way forward. Carter and Linnell (2016) present a particularly useful definition of coexistence in this regard. In their description, coexistence constitutes a dynamic yet sustainable state of co-adaptation that enables wildlife and people to share landscapes through well-tailored institutions for managing human-wildlife interactions. To foster coexistence, human-wildlife management should allow wildlife populations to thrive, while simultaneously respecting the wellbeing of people and cultivating tolerance towards wildlife. Building from this definition, it would seem based on the ethnographic data presented in this paper that governance institutions are currently ineffective for managing human-wildlife interactions in areas outside Tarangire National Park. Targeted efforts to streamline land use planning and address the safety concerns of local agropastoral communities will likely have dual benefits for wildlife populations and human wellbeing.

Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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