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EDITED BY

Christian Kiffner,
Leibniz Center for Agricultural Landscape
Research (ZALF), Germany

REVIEWED BY

Courtney Hughes,
Government of Alberta, Canada
Stijn Verschueren,
Cheetah Conservation Fund, Namibia

*CORRESPONDENCE

Kelly W. Jones

✉ kwjones@nmsu.edu

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Attitudes, norms, and beliefs of pastoralists toward cheetahs in the Horn of Africa

Kelly W. Jones^{1,2*}, Paul Evangelista², Sarah M. Durant^{3,4},
Nicholas E. Young², Redae T. Tesfai², Abdullahi H. Ali⁵,
Patricia Tricorache², Nicholas Mitchell^{3,6}, Tomas Maule⁷,
Mowlid Hassan Abdilahi⁸, Aden Hussein Edin⁹, Sangale Edwin⁵,
Mohamed Hussein⁵, Ahmed Mohamud Mohamed¹⁰
and Abdifatah Hassan Musse⁸

¹Department of Fish, Wildlife, and Conservation Ecology, New Mexico State University, Las Cruces, NM, United States, ²Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO, United States, ³Institute of Zoology, Zoological Society of London, London, United Kingdom, ⁴Africa Range-wide Cheetah Conservation Initiative, Zoological Society of London, London, United Kingdom, ⁵Hirola Conservation Program, Garissa, Kenya, ⁶Africa Range-wide Cheetah Conservation Initiative, Arusha, Tanzania, ⁷Torrid Analytics, Nairobi, Kenya, ⁸Biodiversity Development Conservation Directorate, SRS Environmental Protection and Rural Land Administration, Jigjiga, Ethiopia, ⁹Department of Wildlife and Eco-Tourism Management, Jigjiga University, Jigjiga, Ethiopia, ¹⁰Department of Natural Resource Management, Jigjiga University, Jigjiga, Ethiopia

Free-ranging African cheetahs (*Acinonyx jubatus*) inhabit only 13% of their former range. A subspecies of particular conservation concern is the Northeastern African cheetah (*A. j. soemmeringii*), which has a tentative estimate of 500 mature individuals in the wild in the Horn of Africa. Human-cheetah interactions are common in this region, and anthropogenic drivers of cheetah loss include habitat loss, poaching, and the illegal trafficking of live cubs for the international wildlife trade. In this study we explore the human dimensions of human-cheetah interactions and the implications for cheetah conservation in the Horn of Africa. We conducted 222 social science surveys with pastoralists in the Somali Regional State of Ethiopia and Northeastern Kenya on levels of conflict with cheetahs, social norms toward killing and live capture of cheetahs, and attitudes toward cheetahs. We found high levels of livestock depredation, with more than 60% of respondents reporting a cheetah attack in the last year. More than 80% of survey respondents felt it was acceptable to kill a cheetah if it attacked livestock and that killing cheetahs was common in their area. About 30% of respondents reported it was acceptable to capture a live cheetah cub and that live capture occurred in their area. Both killing cheetahs and live capture of cubs were reported as motivated, in part, as a retaliatory response against cheetahs for livestock depredation. About 90% of respondents wanted to see the number of cheetahs decrease, and an ordinal logit regression showed that attitudes toward cheetahs were correlated with emotions, risk perceptions, beliefs about the efficacy of non-lethal mitigation, perceptions of

benefits from cheetahs, and alternative income sources. The results from our study suggest that there is a critical need to co-develop cheetah coexistence strategies in the region that focus on reducing costs and increasing benefits of living with cheetahs; couple improvements in rangeland management with enhanced livelihood sustainability; and strengthen law enforcement.

KEYWORDS

Acinonyx jubatus, carnivore, Ethiopia, illegal wildlife trade, Kenya, poaching, trafficking

1 Introduction

The loss of global biodiversity continues to accelerate, with direct impacts to ecosystem services important to people (Cardinale et al., 2012; IPBES, 2019). Many of the direct drivers of biodiversity loss are anthropogenic, including land use conversion, natural resource exploitation, and climate change (Jaureguiberry et al., 2022). Mammalian carnivores are particularly vulnerable to land use changes and human development pressures, since they require large, unfragmented tracts of land and an abundance of prey (Johnson et al., 2023). In Africa, rapid human population growth, and associated changes in land use, are leading to a rapid decline in carnivores and an increase in conflict between people and wildlife (Bodasing, 2022; Durant et al., 2022). Understanding of human-carnivore interactions and the human dimensions of carnivore conservation is a critical step toward developing successful coexistence strategies. Coexistence with carnivores is defined in this paper as a level of tolerance for wildlife by people, even in the presence of conflict (Fletcher et al., 2023). We regard coexistence as dynamic, reflecting complex and changing relationships between people and carnivores, and between different groups of people who may have competing interests concerning carnivores, all of which may be further modified by a changing environment (Durant et al., 2022).

Human dimensions studies can provide culturally-relevant understanding on people's attitudes and perceptions toward carnivores, which can then inform where conservation coexistence efforts are needed, help design conservation strategies that reflect local contexts, and ultimately, help avoid implementing conservation approaches that fail (Bennett et al., 2017). Recent synthesis studies summarize the high costs people incur when living with carnivores through loss of livestock and sometimes, human lives (e.g., van Eeden et al., 2018; Lorand et al., 2022; Mkonyi et al., 2017; Brackzkowski et al., 2023). A recent systematic review concluded that pastoralists overwhelmingly hold negative perceptions toward carnivores due to conflicts (Corcoran and Fisher, 2022). The perceived risk of future livestock depredation can be equally important, even if this risk appraisal is incorrect (Kahler and Gore, 2015; Newsom et al., 2025). The level of conflict with carnivores plays a key role in determining people's views on

their conservation (Dickman, 2010; Dickman et al., 2014; Jacobsen et al., 2021).

Individual- and societal-level factors also shape people's interactions with wildlife and the views they hold toward carnivores (Dickman, 2010; Dickman et al., 2013). A number of studies have shown that values, attitudes, beliefs, emotions, and social norms, all influence tolerance of and behaviors toward carnivores (e.g., Dickman et al., 2014; Hazzah et al., 2017; Mkonyi et al., 2017; Laverty et al., 2019; Jacobsen et al., 2021; Muneza et al., 2022). Other concepts, such as knowledge of the species (Mkonyi et al., 2017), local importance or value of the species (Kahler and Gore, 2015; Dheer et al., 2021), feelings of control and power to act (Dickman et al., 2013; Bruskotter and Wilson, 2014), and income diversification or wealth (Dickman et al., 2014; Suryan et al., 2023), have been shown to be related to individual views and behaviors toward carnivores. Coexistence is also affected by broader political, economic, and historical factors that shape human-wildlife interactions (Fletcher et al., 2023). Despite the increase in social science studies, there still remain large gaps in understanding the human dimensions of carnivore conservation, especially across parts of the Global South and for medium and small carnivores (Lozano et al., 2019; Venumière-Lefebvre et al., 2022; Corcoran and Fisher, 2022).

The Horn of Africa is one of 36 global biodiversity hotspots, harboring many endemic plant and terrestrial vertebrate species (Habel et al., 2019); it is one of only two hotspots that is arid. The region also boasts high rates of species richness and diversity (Friis et al., 2005; Zhou et al., 2021). Despite its importance for biodiversity, less than 9% of the area is formally protected, and climate and land use pressures continue to threaten remaining species (Habel et al., 2019). A species of conservation concern is the Northeastern African cheetah subspecies (*Acinonyx jubatus soemmeringii*), which was recently assessed as Endangered under the IUCN Red List (Durant et al., 2023). Globally, cheetahs (*A. jubatus*) are confined to 13% of their original range on the African continent (Durant et al., 2017). In the Horn of Africa, reliable population estimates for the Northeastern African cheetah subspecies are difficult to obtain. After previously being listed as possibly extinct (Durant et al., 2022), there have only recently been confirmed sightings of cheetahs in this area (Marker et al., 2023; Murgatroyd et al., 2023; Connolly et al., 2025). The most recent

tentative estimates suggest around 500 mature individuals may remain in the wild across the Horn of Africa (Durant et al., 2023).

Anthropogenic drivers are a key reason for cheetah loss across Africa, including poaching, illegal wildlife trade, habitat loss and fragmentation, and loss of prey (Durant et al., 2017, 2018; Ali et al., 2018). In the Horn of Africa, cheetah primarily co-inhabit lands used by pastoralists, leading to frequent human-cheetah interactions (Durant et al., 2018; Ibrahim et al., 2022; Abdella et al., 2024). Conflicts with cheetah and other wildlife in this region are also affected by long-standing civil conflicts which impede conservation initiatives and natural resource governance systems (Brito et al., 2018; Weir et al., 2024), and increasingly by climate change (Abrahms et al., 2023). These human-cheetah interactions can place a cost on local people through loss of goats and sheep, which are critical for food security, income sources, and cultural status. Human-cheetah interactions, in turn, may directly influence retaliatory or preventative actions by people that threaten cheetah survival and persistence. It is also important to note that this region is a key source location for live trade of cheetah cubs, given its proximity to the Arabian Peninsula, which has high demand for cheetah as pets (Tricorache et al., 2018; Evangelista et al., 2024). There has been very little work done at the community level on live trade of cheetah, and how motivations for trafficking may be related to or different from motivations for poaching or killing.

In this study, we provide empirical information on human-cheetah interactions and the human dimensions of cheetah conservation in the Horn of Africa. This paper uses quantitative data from 222 pastoralists in Northeastern Kenya and the Somali Regional State (SRS) of Ethiopia, to provide a deeper understanding of the attitudes, norms, and beliefs that people hold for cheetahs in this region. The specific research questions answered are: (1) How prevalent is livestock depredation by cheetah? (2) What are the social norms toward cheetah killing and cheetah trafficking?, and (3) What factors explain attitudes toward cheetahs? This research advances knowledge about a region that is ethnically and culturally distinct from many other areas of Africa where cheetahs persist and for an endangered subspecies of cheetah for which there is very little information. At the same time, the concepts and factors used to measure human-cheetah interactions, and the human dimensions of cheetah, reflect those used in similar studies on carnivores, allowing us to compare findings to inform broader lessons on human-carnivore conservation and coexistence.

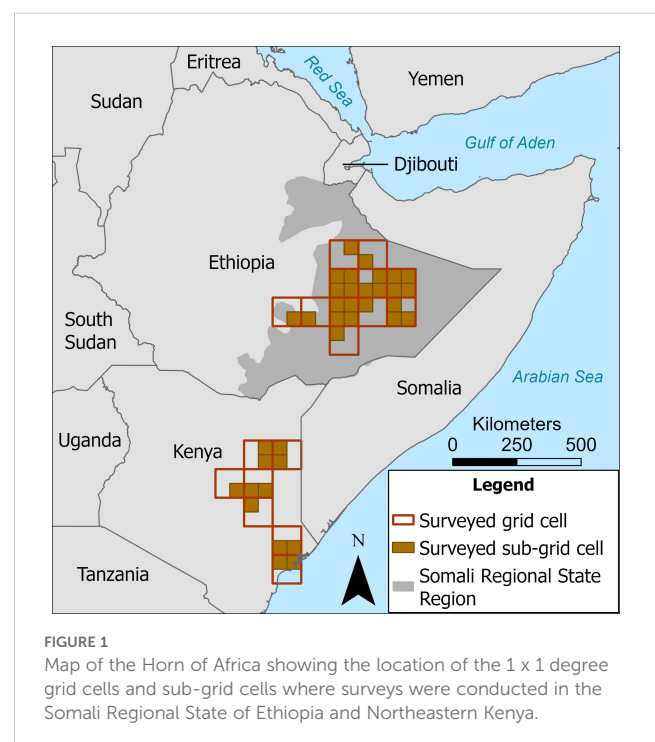
2 Methods

2.1 Study area

The Horn of Africa includes Eritrea, Djibouti, Ethiopia, Somalia (including the self-declared autonomous region of Somaliland and the de facto independent state of Puntland), Northeastern Kenya, and South Sudan. The region is generally characterized as arid or semi-arid, with a bimodal rainfall pattern, and hot conditions,

although differences in elevation influence temperatures across the region. While the people in this region are ethnically and linguistically linked, there exists a wide diversity of cultures and religions in different areas. The majority of rural people are Somali pastoralists or agro-pastoralists, with few non-agricultural income sources outside of urban areas (Yusuf et al., 2024). The region has been subject to civil disputes and internal conflicts in recent decades, which has led to environmental disturbances including wildlife loss (Solomon et al., 2018). Living conditions are also impacted by drought, which is increasing in frequency and intensity due to climate change, disease outbreaks, and market failure. There is a general lack of infrastructural development, such as transportation, water and sanitation, education, or health facilities, in most rural areas. Most countries in the region rank among the lowest on the Human Development Index (UNDP, 2025).

This study included parts of the SRS of Ethiopia and Northeastern Kenya. We developed a 1 x 1 degree (~110 km) grid across the Horn of Africa as part of a larger research effort to advance understanding on cheetah population and drivers of cheetah loss. SRS covers a total land area of about 376,000 km² and was covered by 32 of our study's grid cells. Northeastern Kenya covers approximately 132,000 km² of land and was covered by 10 of our study's grid cells. These grid cells were further divided into four sub-grid cells (0.25 x 0.25-degree cell) to facilitate fieldwork. We worked with wildlife partners in each country to select grid cells, and then sub-grid cells, to conduct social science surveys (Figure 1). Sub-grid cells were selected for each country using the following criteria: (1) cheetah status, prioritizing areas where cheetah were most frequently reported in a previous wildlife



survey (Evangelista et al., unpublished data¹), (2) conservation importance, and (3) safety and accessibility. Twenty-four sub-grid cells within 11 grid cells were selected for SRS, covering 8 zones, 29 districts (local name: woredas), and 143 villages (local name: kebeles). Twelve sub-grid cells within seven grid cells were selected for Kenya that covered one region (Northeast Kenya), two counties, and 19 villages.

2.2 Data collection

2.2.1 Survey instrument

We developed a quantitative survey instrument based on social science theory and human dimensions studies, previous surveys on carnivores (e.g., Dickman et al., 2014; Mkonyi et al., 2017; Western et al., 2019; Jacobsen et al., 2021), and knowledge of cheetah and the study area. Specifically, we drew on key social-psychology frameworks, including cognitive hierarchy theory (e.g., Manfredo, 2008), the hazard-acceptance model (Bruskotter and Wilson, 2014), and a framework specific to addressing conflict with carnivores (Dickman et al., 2013). The cognitive hierarchy links values, attitudes, beliefs, and norms to human cognition and behaviors (Manfredo, 2008). Values are formed early in life and hard to change (Manfredo, 2008), but are important in that they influence the formation of attitudes and tolerance toward wildlife (Laverty et al., 2019). Attitudes measure the positive versus negative assessment of a species or management action, and are closely related to beliefs, which capture what people believe are true (Dickman et al., 2013). Social norms include descriptive norms of what people think others do, and subjective or injunctive norms about how people think others want them to behave. The hazard-acceptance model, in turn, focuses on the tolerance or acceptance of people to wildlife, which is often measured as attitudes toward a species or the acceptability of a species (Bruskotter and Wilson, 2014). This model emphasizes several other important psychological variables, including perceptions of risks or costs of the species, perceptions of benefits of the species, emotions or affect toward the species, and perceptions of personal control to reduce the risks associated with the species, on tolerance toward wildlife. These social and psychological factors are reflected in the framework on factors expected to shape views toward carnivores found in Dickman et al. (2013), alongside personal experience with the species and demographic factors such as wealth, knowledge and education, and age.

Early drafts of our survey were reviewed with wildlife partners in the region and edited to reflect local circumstances. While social science has developed methodologies to reduce bias when asking about illegal or secretive behaviors (e.g., Nuno and St. John, 2015; Solomon et al., 2015; Gavin et al., 2010), discussions with field partners confirmed that these methods would be difficult to implement in this region, and instead, we focused on individual- and societal-level factors that can influence human behaviors like poaching, killing, or live capture of cubs in our survey based on the social-psychology frameworks described above (e.g.,

Manfredo, 2008; Dickman et al., 2013; Bruskotter and Wilson, 2014). We also determined with partners that Likert-scale questions would be difficult for both enumerators and respondents, and so were not used. Instead, question formats were restricted to binary, categorical, or continuous. The survey was pre-tested in each region, went through an IRB approval process (Protocol #4880), was restricted to adults over 18 years of age, and included a verbal consent form. The survey questions were written in English, and enumerators used the local language in each area to verbally administer the survey.

The final survey covered several themes related to human-cheetah interactions based on the social science frameworks and previous human dimensions studies; our survey questions can be found in [Supplementary Material 1](#). We gauged cheetah knowledge by asking respondents to view four photos of large cats—cheetah, leopard (*Panthera pardus pardus*), caracal (*Caracal caracal*), and serval cat (*Leptailurus serval*)—and select which were a cheetah. To understand perceived costs of cheetahs due to livestock depredation, and also experience with cheetahs, respondents were asked about cheetah attacks on livestock, if an attack had occurred, and detailed information on when, where, and what was attacked. We also measured risk perceptions about future cheetah attacks on livestock as another variant of perceived costs; while asked as a categorical variable this was later recoded into a binary response option of concerned or extremely concerned. To measure perceptions of personal control to reduce the risks posed by cheetahs, respondents were asked about their beliefs regarding the outcome efficacy of non-lethal mitigation practices to deter cheetahs and their self-efficacy in implementing non-lethal mitigation practices.

To measure the perceived benefits of cheetahs, we directly asked respondents if they received any benefits from cheetahs and asked respondents whether they perceived that cheetahs were important to people living in the area. To capture emotions, or affect, we asked respondents if they felt fear, anger, or happiness when they saw a cheetah. To get at behaviors toward cheetahs, we measured descriptive social norms by asking respondents whether others in the area killed cheetahs or captured cheetah cubs for the international pet trade, and why. We focused on these two human actions as they were identified as the most important anthropogenic threats to cheetahs; trading of cheetah pelts or other parts is not a primary driver of cheetah killing in the region. We also asked individuals about their personal beliefs on whether they thought it was acceptable or not to kill a cheetah or capture a cheetah cub. These beliefs were followed by additional questions about subjective norms of whether they thought there would be social critique, or whether they thought there would be punishment, for such actions. As a measure of a positive or negative attitude toward cheetahs, we asked respondents if they wanted to see the number of cheetahs in their area increase, stay the same, or decrease. This attitude variable captures tolerance toward cheetah populations.

We collected information on demographics and livelihoods in the survey, including information on gender, age, years living in the area, livestock size and composition, and non-livestock income sources. Livestock size was asked as a relative measure where a respondent compared the size of their herd to others in the area, as smaller, about the same, or larger. Non-livestock livelihoods included whether anyone in the immediate household grew crops,

¹ Evangelista, P. H., Young, N. E., Tesfai, R. T., Ali, A. H., Durant, S. M., Tricorache, P. D., et al. *Wildlife survey population data from the Horn of Africa* (United States: Natural Resource Ecology Lab, Colorado State University).

participated in any small jobs (e.g., business, teacher), or received remittances. These were aggregated into an index of alternative livelihoods ranging from zero to three.

2.2.2 Sampling

Enumerators were selected through wildlife professionals and partners in each country and trained by social science experts. Training covered best practices for data collection, ethics of human subject research, and included pre-testing the survey instrument in the field. In the SRS region, four enumerators were selected from Jigjiga University and the regional Environmental Bureau; they were paired into two teams for field work consisting of one university and one wildlife agency employee. In Kenya, eight local enumerators were selected from the Hirola Conservation Program and paired into two teams. Each team was assigned a team leader who was responsible for coordinating field work and ensuring survey completion before leaving the field.

Each enumerator team was assigned specific sub-grid cells (0.25 x 0.25-degree cell) to sample (Figure 1). Enumerator teams were instructed to try to mimic a random selection of pastoralists within a sub-grid cell, aiming for six surveys per sub-grid cell. Selection strategies were discussed in the enumerator training, along with the importance of reaching a diverse sample. Ultimately, the final decision on how to implement sampling was left to each field team given the substantial logistical challenges in these regions, including security issues in some areas. In both countries, enumerators first contacted local authorities to inform them about the purpose of the survey.

There were no sampling frames for these areas or knowledge about village-level variables on cheetah conflicts *a priori*, and village and respondent selection was implemented to try and reach a representative sample. In SRS, enumerator teams developed a plan for each sub-grid cell on which villages to target to ensure good spatial coverage across the sub-grid cell. At each village, the enumerators worked with a local guide and visited central gathering places, including watering points for livestock and public markets, or found people while traveling along the road, to survey. Respondents were selected to reach different ages and gender, focusing on people that owned livestock. People were screened to ensure they were from the target area before proceeding with a face-to-face interview. In Kenya, villages were first selected based on accessibility and safety within each sub-grid, and then within villages a purposive sampling approach was used. The purposive sampling approach used a distance of about 1 km between each household to increase spatial coverage and provide a representative sample within the village. At the respective household, any eligible adult present was surveyed. The SRS team collected 150 surveys, and the Kenyan team collected 72 surveys, for a total of 222 surveys.

2.3 Data analysis

2.3.1 Summary statistics

We summarized the means and standard deviations for all variables related to human-cheetah interactions and demographics

and livelihoods in the sample (Supplementary Material 2). We used a Wilcoxon rank-sum test to explore differences in median values of variables across the two countries in our study. A Wilcoxon rank-sum test was chosen because it is a non-parametric test and does not require the assumption of normality (McCrum-Gardner, 2008). We calculated statistical significance at a 95% confidence level or higher. Summary statistics are reported to answer research questions one and two.

2.3.2 Regression analysis

To explain attitudes towards cheetahs, we used an ordered logit model to explore factors related to pastoralists' attitudes toward cheetah, defined as the respondent's preference for cheetah numbers in their area to either 1=decrease, 2=stay the same, or 3=increase. To determine the set of independent variables to include, we used theory to select variables that might explain attitudes based on the literature (e.g., Dickman et al., 2013; Bruskotter and Wilson, 2014; Newsom et al., 2025), then conducted univariate correlation tests, using Wilcoxon rank-sum tests for binary variables and pairwise correlations for categorical and continuous variables. We tested for multicollinearity between independent variables to determine which variables could be used in the same regression model and tested alternative model specifications. Based on the univariate correlations and multicollinearity tests, we tested ten independent variables representing demographic and livelihood factors (alternative livelihood index, gender, number of years living in the area, and size of livestock herd), livestock depredation and conflict mitigation (risk perceptions of future attack, attack in the last year, and belief about efficacy of non-lethal mitigation), and emotions and beliefs toward cheetah (fear, anger, happiness, and belief that cheetah are important to people in the area) in regression models.

We used the Bayesian information criterion (BIC) value to select the best fitting regression model. The best fitting regression model included five independent variables (Table 1). This included two measures related to livestock depredation and conflict mitigation: risk perceptions of future cheetah attacks and belief that non-lethal mitigation measures against cheetah are effective. We expected lower risk perceptions of future attacks to be positively correlated with attitudes toward cheetah, and beliefs in outcome efficacy of non-lethal mitigation to be positively correlated with wanting cheetah numbers to stay the same or increase. The best model specification included the emotion of happiness. We expected that respondents who reported feeling happy would have more positive attitudes toward cheetahs. The variable measuring a respondent's belief that cheetahs are important to people in the area was also included. We hypothesized that believing cheetahs are important would be positively associated with attitudes toward cheetahs. Finally, the best model included an index of alternative livelihoods; we hypothesized that people with more alternative livelihood income sources would be more supportive of cheetah numbers as they have more resilience to cheetah attacks on livestock. We also included a country-level dummy variable, to control for differences in attitudes across the two countries not captured by the other independent variables, and

a dummy variable for the enumerator team leads to control for potential bias due to enumerators and sensitive questions. These fixed effects were used to reduce the potential for omitted variable bias. The Variance Inflation Factors (VIF) of the included independent variables showed that multicollinearity was not a concern (Table 1).

The results of this specification are presented in the results section; alternative regression model specifications can be found in [Supplementary Material 3](#). We present regression results using (1) the full sample and (2) a reduced sample that omits any respondent that did not correctly identify the picture of a cheetah in the survey ($N = 10$) in case these individuals were reporting on a different carnivore in the questions that followed. All regression models used cluster robust standard errors, clustering by the 36 sub-grids that defined our sampling strategy. Cluster robust standard errors control for correlation in attitudes within sub-grids. We report odds ratios from regression models: an odds ratio greater than one indicates a positive relationship with the dependent variable and an odds ratio less than one indicates a negative relationship. Statistical significance is reported at a 95% confidence level or higher. We reported McFadden's pseudo R^2 as an indicator of goodness of fit.

2.4 Limitations

We acknowledge that there are potential limitations to our study. First, we relied on a deductive approach using existing social science frameworks and quantitative methods. Mixed methods can provide a number of advantages in human dimensions studies, but due to limited resources, we opted for a quantitative approach given previous experience in the study area and knowledge of human-carnivore interactions in other regions. Qualitative information would have helped contextualize our findings and may have identified factors not included in the frameworks we drew upon. Second, several lead authors and researchers, but not enumerators, involved in this study are from the Global North and have not had the lived experience of coexisting with carnivores. This could have shaped the type of questions asked and the interpretation of results. Third, enumerators, many of which are co-authors on this paper, are nationals of Kenya and Ethiopia employed at universities, government wildlife agencies, and non-governmental organizations. This enabled the strengthening of social science methods in these organizations and minimized logistical and security challenges, but could have led to response bias due to power relations between these organizations and pastoralists. Additionally, many, but not all, enumerators were men, which could have influenced participation by female respondents. Fourth, many of the topics in the survey could be considered sensitive. To minimize bias to sensitive questions in the survey, enumerators were trained in remaining neutral during questioning and were instructed to introduce the survey and project as an international research effort that was not government-affiliated. Fifth, the survey questions were not written in the local languages since it was not known in advance which Somali dialects would be needed. The importance of consistency in question wording was emphasized in the enumerator training, and while all

enumerators spoke fluent English, this could have resulted in slightly different wording being used across enumerator teams.

3 Results

3.1 Demographics and livelihoods

Twenty percent of survey respondents were women, with the Kenyan team surveying a higher percent (41%) of women than the SRS Team (10%) ([Supplementary Material 2](#)). This may be because the Kenyan team went directly to houses and surveyed an eligible adult, whereas the SRS team approached people in public places. While it was emphasized that women should be included to both teams, it is possible that the SRS enumerators—who were all male—were more comfortable approaching men versus women due to cultural norms in the region. About 53% of the sample was younger than 40 years of age. Respondents in SRS had lived an average of 30 years in the survey area, compared to an average of 22 years in Kenya. The average family size was 10 people per family in both areas.

Respondents in both countries were more likely to report that their herd size was similar to others (59%) than smaller (36%) or larger (11%). Almost all respondents kept goats (99%) and sheep (94%), which are the livestock typically attacked by cheetahs. Other types of livestock varied across the two countries, with respondents in SRS more likely to keep camels and donkeys and respondents in Kenya more likely to have cattle.

Income sources other than livestock were low in both study areas. There were similarities in the two areas regarding having a job (e.g., small business, teacher, etc.), but more people in SRS reported growing crops (41% versus 22%), and more people in Kenya reported receiving remittances (38% versus 10%) in the last year. When these three income sources were combined into an index, about 45% of respondents reported no alternative livelihood source, 40% reported one source, 13% reported two sources, and 2% reported all three sources; this was statistically similar across countries.

3.2 Human-cheetah interactions

3.2.1 Cheetah identification

All survey respondents reported that cheetahs were present in their area and over 70% stated they had seen a cheetah within the last month. Respondents could select up to four photos of cats shown to them as representing a cheetah. About 95% of respondents correctly identified the photo of a cheetah as a cheetah ([Figure 2](#)). The cat most commonly mistaken for a cheetah was a leopard, with 20% of all respondents selecting the leopard photo as a cheetah. Less than 5% of respondents selected a serval cat or caracal photo as a cheetah.

3.2.2 Livestock depredation

Most respondents reported conflicts with cheetahs (94% of the sample), with 100% of respondents in SRS and 81% in Kenya stating that their livestock had ever been attacked by a cheetah ([Supplementary Material 2](#)). Sixty-eight percent of people in SRS and 56% of people in Kenya said they had experienced a cheetah

TABLE 1 Summary statistics and variance inflation factors (VIF) for the five independent variables included in the best fitting regression model on attitudes toward cheetah.

Independent variable	Definition and measurement	Full sample		Reduced sample	
		Mean (Std dev)	VIF	Mean (Std dev)	VIF
Happy emotion	Emotion (affect) capturing if they feel happy when they see a cheetah. Binary variable where 1=Yes, 0=No.	0.05 (0.28)	1.05	0.05 (0.22)	1.03
Risk perceptions	Risk perceptions about future cheetah attacks on livestock. Binary variable where 1=concerned, 0=extremely concerned.	0.16 (0.36)	1.04	0.16 (0.36)	1.05
Importance to people	Belief that cheetahs are important to people that live in this area. Binary variable where 1=Yes, 0=No.	0.08 (0.27)	1.06	0.08 (0.27)	1.06
Effectiveness of non-lethal mitigation strategies	Belief that if they use non-lethal mitigation against cheetahs, it is effective. Binary variable where 1=Yes, 0=No.	0.47 (0.50)	1.03	0.47 (0.50)	1.04
Alternative livelihood index	Index of whether they grew crops, participated in any small jobs, or received remittances in the last year. Categorical variable that ranges from 0 (no alternative livelihoods) to 3 (all alternative livelihoods).	0.72 (0.77)	1.06	0.70 (0.77)	1.06
Observations		222		212	

Full sample includes all observations and reduced sample omits respondents that did not correctly identify picture of a cheetah.

attack on their livestock within the last year. These rates were statistically similar. Rates of livestock depredation were similar when respondents that did not correctly identify the photo of a cheetah were omitted (Supplementary Material 2).

Goats were by far the most commonly attacked livestock (92%) followed by sheep (56%), all other livestock were reported as being attacked by less than 1% of respondents. Most of the time the livestock attacked was reported as killed (93%). Respondents identified that cheetah attacks occurred during the day (100%) and while at pasture (99%), which is consistent with cheetah hunting behavior. Most people said the animal attacking was visually seen (92%) and or confirmed through footprints or other signs (15%). However, in the “other” category, several respondents mentioned that children told them about the attack, indicating that it was child herders that witnessed the cheetah attack on livestock and not adults. Risk perceptions about future attacks on livestock from cheetah were high, with 84% of respondents stating they were extremely concerned about a future attack and 16% concerned. These responses were not statistically different across countries.

Despite similar levels of cheetah attacks, there were large differences between the two countries in beliefs about non-lethal cheetah mitigation strategies (Figure 3). In SRS, only 19% of respondents reported they knew how to prevent a cheetah attack without killing the cheetah and 29% believed non-lethal measures of cheetah prevention were effective. In contrast, 93% of respondents in Kenya reported they knew how to prevent a cheetah attack without killing the cheetah and 86% believed non-lethal measures of cheetah prevention were effective. These differences were statistically significant at the 99% level.

3.2.3 Emotions and beliefs

The emotions people experienced when seeing a cheetah were similar across the two study areas. Most respondents feel angry when they see a cheetah (90%) and more than half feel fear

(Figure 4); only 5% of respondents reported feeling happy when they see a cheetah (Supplementary Material 2). More than 90% of respondents reported that cheetahs are not important to the people that live there. Respondents were also directly asked if cheetahs provide any benefits (monetarily or non-monetarily) to their family and only two respondents answered yes.

3.2.4 Social norms

3.2.4.1 Killing a cheetah

Ethiopian and Kenyan respondents held different descriptive norms about whether others in their area were killing cheetahs. In SRS, 95% of people reported that other people kill cheetahs. The main reasons selected for why people kill cheetahs were retaliation for killing livestock (90%) and prevention of future attacks on livestock (99%). About 50% of Kenyans reported that they think other people in the area kill cheetahs, with 97% stating killings were motivated by retaliation and 86% stating killings were to prevent future attacks on livestock.

When asked about their own beliefs about killing a cheetah, 83% of respondents agreed that it was acceptable for someone to kill a cheetah if it attacked livestock (Figure 5). This was slightly higher for respondents from Kenya (92%) than Ethiopia (79%) at a 95% confidence level. Across both countries, subjective norms about killing cheetah were low, with only 8% of respondents agreeing they would be criticized by others for killing a cheetah, 25% stating that it is forbidden to kill a cheetah due to cultural or religious reasons, and 32% of respondents reporting that if you kill a cheetah you will be punished. Beliefs about social critique for killing a cheetah were similar across the two countries, but beliefs related to culture/religion forbidding killing or punishment for killing a cheetah were more commonly reported by Kenyan respondents (Supplementary Material 2).

3.2.4.2 Capturing live cheetah cubs

There were large differences in descriptive norms around live cheetah capture for the illegal wildlife trade. Close to 40% of

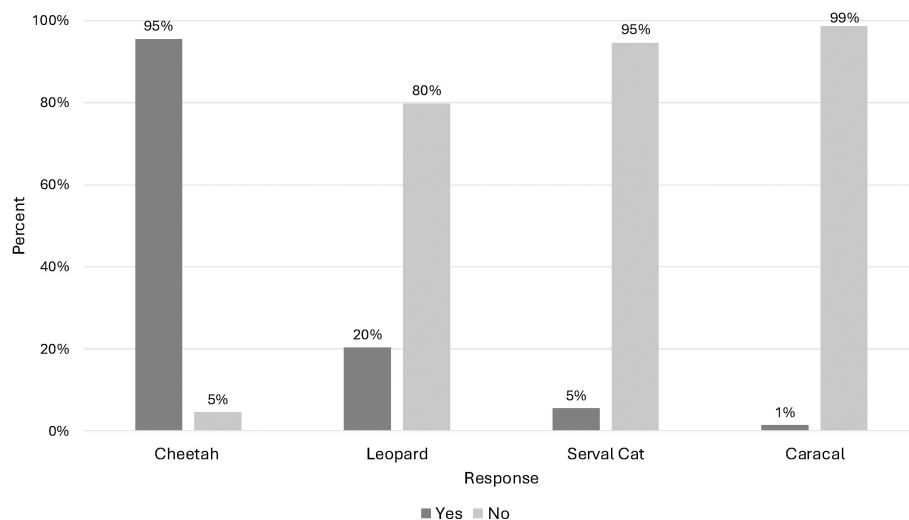


FIGURE 2

Percent of respondents identifying each cat species as a cheetah from a photograph. All 222 observations used in figure.

Ethiopian respondents reported that other people capture cheetah cubs in their area, while no respondent in Kenya reported other people capture cheetah cubs in their area ([Supplementary Material 2](#)). The reasons reported for why people capture cheetah cubs in SRS were diverse, with 66% stating it was because cheetahs kill livestock, 46% stating that it was for money, 39% stating that it was for personal pets, and 34% stating that it was because the cubs were abandoned.

When asked about their own beliefs about capturing a live cheetah cub, 32% of all respondents agreed it was acceptable to capture and sell a cheetah cub for money, 28% reported there would be social critique for capturing a cheetah cub, and 35% believed capturing a cheetah cub results in punishment ([Figure 6](#)). Beliefs regarding acceptability of capturing a cheetah cub were statistically

different across the two countries at the 99% confidence level. In Ethiopia, 47% of respondents felt it was acceptable to capture a cheetah cub for money, and few people felt they would be criticized by others for capturing a cheetah cub (11%) or punished (16%). In Kenya, only 3% of respondents felt it was acceptable to capture and sell a cheetah cub for money. Most respondents in Kenya felt that there would be criticism from others for capturing a cheetah cub (63%) and that it would result in punishment (87%).

3.2.5 Attitudes

When respondents were asked what they would like to see happen to the number of cheetahs in their area, 90% of respondents expressed a desire to have cheetah numbers decrease, 3% wanted cheetah numbers to stay the same, and 7% wanted cheetah numbers

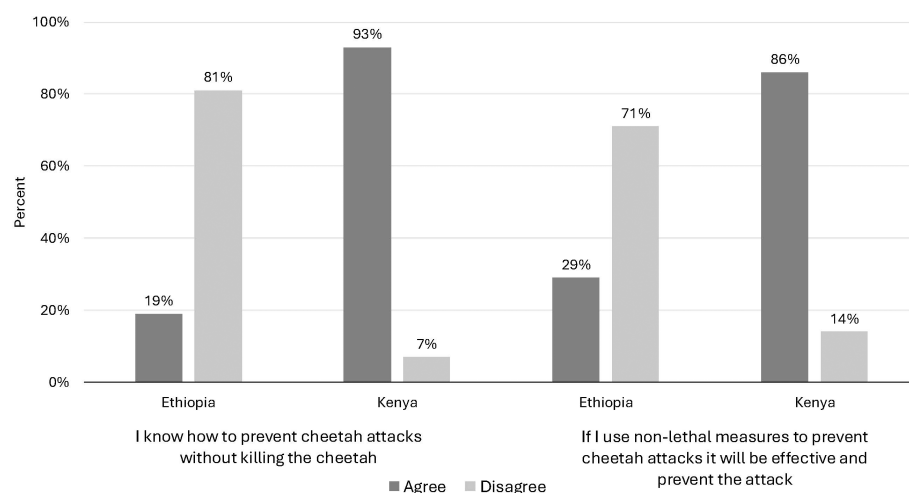


FIGURE 3

Percent of respondents that agree they know how to use non-lethal mitigation strategies (self-efficacy) and that non-lethal mitigation strategies are effective (outcome efficacy), broken out by country. All 222 observations used in figure.

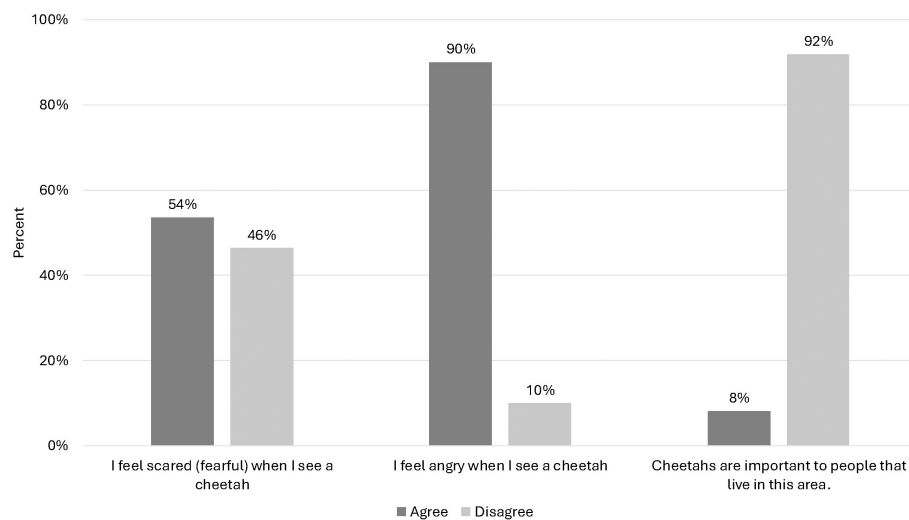


FIGURE 4

Percent of respondents reporting the emotions they feel when they see a cheetah and perceptions on the importance of cheetah to the people that live there. All 222 observations used in figure.

to increase. Positive attitudes were slightly higher in Kenya than Ethiopia at a 95% confidence level in the full sample but were not statistically different in the reduced sample ([Supplementary Material 2](#)).

In the best regression model specification, all five independent variables were statistically significant in both the full sample and the reduced sample that omitted respondents that did not correctly identify the picture of a cheetah ([Table 2](#)). These variables are ordered by the size of their odds ratio, or the relative magnitude of their influence, on perceiving that cheetah numbers should remain the same or increase, versus decrease, in the area.

The largest positive odds ratio was for the happiness variable and this variable was statistically significant at a 99% confidence level. The odds ratio indicates that respondents that feel happy when they see a cheetah are about 18 times more likely to support cheetah numbers remaining the same or increasing in the area. Risk perceptions about future cheetah attacks had an odds ratio close to 12 in the full sample and around nine in the reduced sample and was statistically significant at a 99% confidence level. Thus, respondents that report moderate future risk perceptions, versus extreme risk perceptions, are anywhere between nine and 12 times more likely to support cheetah numbers remaining the same or increasing. The variable measuring beliefs that cheetahs are important had an odds ratio of six and was statistically significant at a 99% confidence level. Thus, holding beliefs that cheetahs are important increased the odds of a respondent wanting the cheetah population to stay the same or increase, versus decrease, by about six times. Believing non-lethal mitigation strategies are effective increased the odds of a respondent wanting cheetah populations to stay the same or increase by about three in the full sample, and five in the reduced sample, and was statistically significant at a 95% and 99% confidence level, respectively. The alternative livelihoods index was statistically significant at a 95% confidence level and had an odds ratio of two. This indicates that for a one unit increase in the

alternative livelihoods index, the odds of wanting cheetah numbers to stay the same or increase is about two times greater. There was no statistically significant difference in attitudes toward cheetah across the two countries (country dummy variable) and the enumerator dummy variables were not statistically significant ([Table 2](#)).

Alternative regression model specifications did not have as good a fit ([Supplementary Material 3](#)), but similar independent variables were statistically significant in these alternative specifications. When the emotion of anger was included, instead of happiness, anger was statistically significant at the 95% confidence level in most models and had an odds ratio of 0.3. This indicates that respondents that reported feeling angry when they see a cheetah were 0.3 times less likely to want to see the number of cheetahs stay the same or increase in the area. We did not find that fear, having experienced a cheetah attack in the last year, gender, number of years living in the area, or livestock herd size, were statistically significant in any of the regression model specifications ([Supplementary Material 3](#)).

4 Discussion

We found high rates of human-cheetah interactions in our study area, which directly influences the human dimensions of cheetah conservation. These reported levels of interactions by pastoralists further supports the recent confirmed presence of the Northeastern African cheetah in the Horn of Africa (e.g., [Connolly et al., 2025](#)), which was once listed as potentially extinct. Our results suggest that cheetah killing, and to a lesser degree, cheetah capture for the illegal wildlife trade, are behaviors that occur and are currently socially acceptable in parts of our study area. Attitudes toward cheetahs, or tolerance for cheetahs, among respondents in our study are overwhelmingly negative, which is common globally among people that face livestock depredation from carnivores

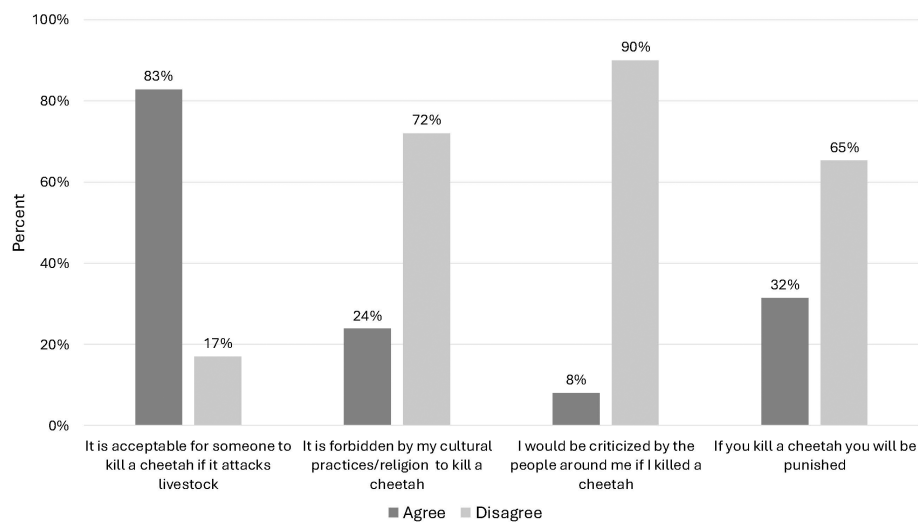


FIGURE 5

Percent of respondents reporting they think it is acceptable for someone to kill a cheetah and associated social norms and beliefs on killing a cheetah. All 222 observations used in figure.

(Corcoran and Fisher, 2022). Below, we discuss these key findings, focusing on the research questions posed in the introduction, and then discuss how these results inform potential coexistence strategies and future research needs around proposed actions.

4.1 Livestock depredation and conflict mitigation

Almost everyone in our study reported a previous attack on livestock by a cheetah. It is possible these numbers are inflated due to the focus of our study and the use of enumerators from organizations with power over human-wildlife interactions.

However, these high rates of conflict reflect other reports on cheetah-livestock conflict from this region (Ibrahim et al., 2022; Abdella et al., 2024) and are similar to other parts of eastern Africa (Dickman et al., 2014; Blair and Meredith, 2018) but higher than what is reported in southern Africa (Marker et al., 2021). While cheetahs prefer wild prey, when wild prey are scarce, cheetah diets have been shown to consist of domestic livestock. Goats were found to be the third most common prey species for cheetah at a study site in eastern Africa (Mutoro et al., 2022). There are no recent studies assessing the status of cheetah prey species in our study area, but trends in the greater region and across Africa point to decreasing antelope and other wildlife populations (Ogutu et al., 2016; Scholte et al., 2022). Cheetah attacks are also influenced by non-lethal

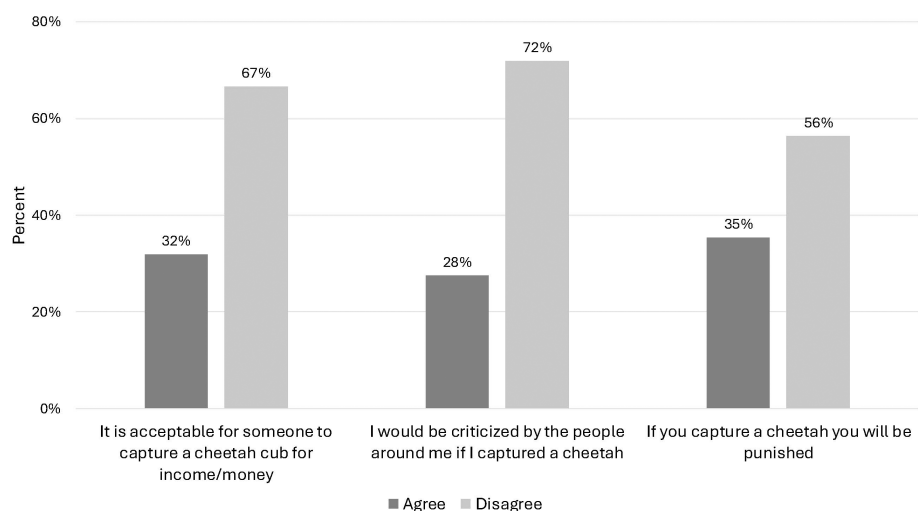


FIGURE 6

Percent of respondents reporting they think it is acceptable for someone to capture a live cheetah cub and associated social norms and beliefs on capturing a live cheetah. All 222 observations used in figure.

TABLE 2 Ordered logistic regression results. Dependent variable is a respondent's attitude about having the number of cheetahs increase, stay the same, or decrease.

Independent Variable	Full Sample	Reduced Sample
	Odds Ratio (Cluster robust std err) [95% confidence interval]	Odds Ratio (Cluster robust std err) [95% confidence interval]
Happy emotion (Binary variable where “No” is reference category compared to “Yes”)	18.39*** (12.03) [5.11, 66.26]	18.91*** (12.96) [4.93, 72.46]
Risk perceptions (Binary variable where “Extremely concerned” is reference category compared to “Concerned”)	11.62*** (8.55) [2.74, 49.17]	8.64*** (6.40) [2.03, 36.86]
Importance to people (Binary variable where “No” is reference category compared to “Yes”)	6.20*** (4.13) [1.68, 22.93]	5.91*** (4.00) [1.57, 22.25]
Effectiveness of non-lethal mitigation strategies (Binary variable where “No” is reference category compared to “Yes”)	3.27** (1.96) [1.01, 10.61]	5.02*** (2.60) [1.81, 13.86]
Alternative livelihood index (Categorical variable where “No alternative livelihoods” is reference category compared to having one, two, or three alternative livelihoods)	2.01** (0.67) [1.04, 3.87]	1.95** (0.62) [1.04, 3.64]
Country dummy variable (Binary variable where “Ethiopia” is reference level compared to “Kenya”)	3.42 (3.29) [0.52, 22.59]	3.25 (3.02) [0.54, 19.97]
Enumerator dummy variables (4 teams)	Included, Not statistically significant	Included, Not statistically significant
Observations	221	211
Pseudo R ²	0.32	0.29
BIC value	165.87	159.08

Odds ratios (>1 indicates positive and <1 indicates negative relationship) and cluster robust standard errors presented. Statistically significant values reported at confidence levels of **<=95% and ***<=99%. Full sample includes all observations and reduced sample omits respondents that did not correctly identify picture of a cheetah.

mitigation actions, with the use of spatial avoidance measures and guarding dogs reducing cheetah predation in parts of southern Africa (Marker et al., 2021). However, these methods are not currently used in our study area.

In general, respondents to our survey reported high rates of livestock predation by multiple carnivore species. About 70% of respondents reported livestock attacks by spotted hyena (*Crocuta crocuta*), black-backed jackal (*Lupulella mesomelas*), and caracal in the last year. This is only slightly higher than the number of respondents reporting cheetah attacks in the last year (64%). However, the number of pastoralists reporting cheetah attacks was higher than the number of people reporting attacks by striped hyena (*Hyaena hyaena*), leopard, and lion (*Panthera leo*) in the last year. While we did not collect information on other drivers of livestock loss in our study area, a recent study in the SRS region found that wildlife attacks were the most commonly reported threat to livestock and ranked as the second most important threat, behind drought (Ibrahim et al., 2022).

Almost all respondents identified cheetah attacks on livestock as occurring during the day and at pasture, which is consistent with known cheetah behavior. However, several people reported that they were told about cheetah attacks from child herders, and

without ground identification of the presence of cheetahs using camera traps, or scat-based diet analysis, we cannot be completely confident that the reported rates of cheetah attacks on livestock are accurate. We also found that risk perceptions regarding future attacks on livestock by cheetahs were extremely high; this is important because risk perceptions, even more than lived experience, can play a large role in motivating behaviors (Kahler and Gore, 2015). Overall, the rates of reported livestock killings and risk perceptions suggest that the perceived costs of living with cheetahs are high relative to income, which is generally low, in this region (Brackowski et al., 2023).

We found large differences between respondents in Ethiopia and Kenya regarding perceptions of their self-efficacy in using non-lethal mitigation approaches, and their belief in the outcome efficacy of non-lethal approaches, in stopping cheetah attacks. Partners in the region suggest these differences might be due to the significant awareness raising effort and trainings on non-lethal mitigation tools that have been made in Kenya by the Kenya Wildlife Service and the regionally-based Hirola Conservation Program. Knowledge of mitigation approaches and belief in their efficacy have been linked to adoption of mitigation actions (Lorand et al., 2022), and in this study, we find that belief in mitigation

efficacy directly influences tolerance toward cheetahs, which is consistent with the hazard-acceptance model that finds that perceptions of control over a species influences perceived risks and thus acceptance (Bruskotter and Wilson, 2014).

4.2 Social norms

Descriptive norms about whether other people kill cheetahs varied between our two study areas, with respondents in Ethiopia reporting higher rates of killing by other people in their area. The reasons respondents reported other people killed cheetahs included both retaliation and also to prevent future livestock attacks. We did not ask about methods for killing cheetahs, but wildlife partners involved in our study reported that poisoning the livestock carcass was the most common method for retaliatory killings, which can have impacts on other wildlife species. Other methods of killing cheetahs include traditional weapons.

Despite differences in descriptive norms about whether other people were killing cheetahs, individual beliefs about whether it is okay to kill a cheetah if it attacks livestock were extremely high across both Ethiopian and Kenyan respondents. Few respondents thought they would be criticized by other people for killing a cheetah. However, more Kenyan respondents than Ethiopian respondents felt that killing a cheetah was wrong for cultural/religious reasons or that you would be punished for killing a cheetah. In Kenya, conservation organizations and community conservancies have raised awareness about wildlife laws and legal enforcement, which may explain the higher perceptions on punishment. While these views about punishment do not appear to influence individual perceptions about killing—since almost all respondents felt it was acceptable—they may help explain differences in reports about whether others are killing cheetahs, which were much lower in Kenya than in Ethiopia.

Differences also existed in social norms around capturing cheetah cubs across our two study areas. SRS in Ethiopia has been reported as a source region for cheetah cubs to the Arabian Peninsula (Ibrahim et al., 2022; Natali, 2024; Abdella et al., 2024; Evangelista et al., 2024). No one in our study from Kenya reported that the people around them were capturing cheetah cubs for the illegal wildlife trade. Informal conversations with wildlife partners in the area suggest that there is a distance threshold from which cubs are trafficked due to cub survival rates (Evangelista et al., 2024), which may explain why Kenyans do not report this activity as occurring in their area. The reasons respondents in SRS reported that people capture live cheetah cubs in their area went beyond money or income (Kassa et al., 2021; Keskin et al., 2023), with two-thirds of respondents linking cheetah capture to retaliation for livestock depredation. Thus, the motivations for both killing cheetahs and capturing cubs appear to be linked to the high economic costs that people perceive from living with cheetahs. Respondents in SRS also reported that people thought the cubs were abandoned. There is often a mistaken belief that cheetah cubs found alone are abandoned because cheetah mothers may leave their cubs in a den or lair when they are very young to hunt, often travelling

over many hours and across long distances from their cubs to find prey (Laurenson, 1993).

Individual beliefs about live cheetah capture being acceptable reflected similar trends, with more respondents in Ethiopia reporting it was acceptable to capture a cheetah cub for money. Few Ethiopian respondents believed they would be criticized or punished for capturing a cheetah cub. Beliefs about social critique and punishment for capturing a live cheetah cub were much higher in Kenya, with the latter potentially explained by outreach and education about the illegality of wildlife trafficking and the stronger presence of law enforcement in the Kenyan region.

4.3 Attitudes

Attitudes toward cheetahs in this study were related to emotions, risk perceptions, beliefs about the efficacy of non-lethal mitigation, beliefs about the importance of cheetahs, and diversity of livelihood sources. Emotions, or affect, are an important determinant of attitudes in other human dimensions studies on carnivores (Bruskotter and Wilson, 2014), with links found between fear and negative attitudes in studies on lions (Dickman et al., 2013; Dheer et al., 2021). We did not find a statistically significant relationship between fear and attitudes in this study, perhaps because cheetahs are unlikely to attack humans and hence are less likely to induce fear than other large cats that have a history of attacks on humans. Instead, we found that happiness and anger were statistically significant with opposite effects. Happiness is likely related to intrinsic value for cheetahs, given the lack of economic benefits from cheetahs reported in the study; it leads to positive attitudes toward cheetah numbers. Anger toward cheetahs may result from livestock depredation, or resentment toward the broader wildlife management system in the region (Fletcher et al., 2023); anger results in negative attitudes toward cheetahs.

Previous experience with and levels of conflict are often related to negative attitudes toward carnivores in other studies (Dickman et al., 2014; Jacobsen et al., 2021). In this study, we did not find a statistically significant relationship between past cheetah attacks and attitudes but did find that higher risk perception about future attacks was statistically correlated with more negative attitudes. Risk perceptions have been shown to influence negative perceptions of carnivores globally (Newsom et al., 2025). Believing in the efficacy of non-lethal mitigation strategies to prevent cheetah attacks had a positive influence on attitudes toward cheetahs in this study, consistent with the hazard-acceptance model (Bruskotter and Wilson, 2014). In other social science studies, perceiving management actions as credible led to positive perceptions of carnivores (Newsom et al., 2025), and people's perceptions of the efficacy of mitigation actions can play an important role in adopting them (van Valkengoed and Steg, 2019).

Believing cheetahs are important was statistically correlated with more positive attitudes toward cheetahs. Few people, however, felt cheetahs were important in our study area. Holding the belief that cheetahs are not important might stem from a lack of feelings of control or power in managing cheetahs (Dickman et al.,

2013), a lack of benefits from the species to local people (Bruskotter and Wilson, 2014; Kahler and Gore, 2015; Dheer et al., 2021), or the broader political and economic realities of wildlife management systems in the region that have historically excluded local perspectives (Fletcher et al., 2023).

Income diversification and wealth are typically associated with more positive attitudes toward carnivores (Dickman et al., 2014; Suryan et al., 2023; Newsom et al., 2025). We find that the number of alternative livelihood sources is statistically associated with more positive attitudes toward cheetahs, probably because having alternative livelihood sources helps buffer against livestock depredation (Salerno et al., 2020). We did not find that other measures of demographic characteristics or livelihoods, including years living in the area, gender, or livestock herd size, influenced attitudes toward cheetahs; these variables have had mixed associations with perceptions of carnivores globally (Suryan et al., 2023; Newsom et al., 2025).

4.4 Coexistence recommendations

Our findings suggest that strengthening law enforcement, especially in the SRS region, might help reduce cheetah loss. This recommendation is based on our finding that few respondents believed there would be punishment for wildlife crimes in our study. However, law enforcement needs to be coupled with complementary approaches, such as demand reduction, in the case of cheetah trafficking, poverty alleviation and income diversification, and reducing livestock depredation (Roe and Booker, 2019; Browne et al., 2021). Strengthening governance and law enforcement is a strategy recommended to address poaching and trafficking of cheetah across Africa (Browne et al., 2021; Durant et al., 2022), and in the Horn of Africa, additional resources and capacity are needed to implement and enforce existing legal regulations that ban wildlife trade or poaching. Regional networks to combat wildlife trade have been established in the region, including the Horn of Africa Wildlife Enforcement Network and the Legal Intelligence for Cheetah Illicit Trade, which could help advance these efforts. Additionally, community outreach and education about existing wildlife laws and penalties might help change perceptions that wildlife crimes are benign (Kassa et al., 2021) but the efficacy of this outreach would need to be tested.

Reducing the costs of living with carnivores, such as cheetahs, is an important action to try and improve attitudes and ultimately coexistence (Durant et al., 2022; Brackowski et al., 2023). Our findings suggest that retaliatory motives influence both killing and cheetah capture such that reducing conflicts with cheetahs could help reduce both anthropogenic drivers of cheetah loss. Non-lethal approaches are considered the most effective conflict management strategy for human-carnivore interactions (Lorand et al., 2022). In our study, knowledge about non-lethal mitigation strategies and perceptions that these strategies are effective were extremely low in Ethiopia, suggesting that there are opportunities to increase outreach and training about non-lethal mitigation. Toolkits and best practices for mitigating conflicts with cheetahs have been

developed for other parts of Africa, with reduced livestock predation found through use of guarding dogs and spatial management (Marker et al., 2021). However, these approaches need to be vetted in the Horn of Africa to reflect social and cultural differences. An additional action, compensation for livestock depredation, has been used in some regions to reduce wildlife damage costs (van Eeden et al., 2017) but has conflicting results in terms of increasing tolerance for large carnivores (Agarwala et al., 2010; Hazzah et al., 2014) and can discourage adoption of non-lethal mitigation practices in some cases (Bauer et al., 2015).

Increasing the benefits to people from living with carnivores can also influence attitudes and coexistence (Bruskotter and Wilson, 2014; Jacobsen et al., 2021; Durant et al., 2022) and could reduce motivations for both killing and trafficking of cheetahs. Respondents in our study that perceived cheetahs to be important to local people or felt happy at seeing a cheetah were more likely to support cheetah conservation. Traditionally, material benefits from carnivores came from ecotourism or job opportunities, but there are increasing opportunities to secure benefits from wildlife through nature-based solutions, ecosystem service payments, or from innovative finance schemes linked to conservation outcomes such as lion bonds (Durant et al., 2022). However, the success of these schemes depends on enabling conditions, including well managed natural resource governance systems, that are able to ensure that those who pay the highest costs from coexistence also receive adequate benefits (Durant et al., 2022). Further research is needed to understand whether these enabling conditions are in place at key sites within the Horn of Africa, and, if not, whether such conditions could be put in place to enable the implementation of these financial instruments.

Non-material benefits are also important, and can come from community empowerment and engagement, which can foster a sense of responsibility and active participation. Community conservancies and community-based management of wildlife in many parts of Africa have been used to promote community participation and improve wildlife and livelihood outcomes (Galvin et al., 2018), but the feasibility for specific contexts in the Horn of Africa would need to be tested. Community education and outreach could also be used to try and increase awareness of the value of cheetah, and to correct mis-information about beliefs such as the abandonment of cheetah cubs when found alone (Marker et al., 2025). A potential avenue in this region could be to engage religious, cultural, or community leaders to use locally-relevant messaging to try and influence attitudes, beliefs, and behaviors (Maheshwari et al., 2024); responses from our study show that most people currently do not think they would be critiqued for killing or capturing a cheetah due to religious or cultural reasons. However, the willingness of leaders to promote these messages, and the effectiveness of such awareness raising on attitudes or behaviors toward wildlife, would need to be tested.

We found a clear link between alternative livelihood sources and positive attitudes toward cheetahs. Poverty is often associated as a driver of the illegal wildlife trade (Natali, 2024), and people who are more dependent on livestock are more vulnerable to livestock

depredation (Dickman et al., 2014; Corcoran and Fisher, 2022). Thus, livelihood diversification and enhancement strategies might help buffer livestock losses and other social-ecological changes that are occurring in the Horn of Africa, particularly if these actions are clearly linked to the continuing existence of cheetahs in these landscapes (Lenaiyasa et al., 2020; Salerno et al., 2021). There are opportunities to learn from successful interventions in other landscapes, which have worked with local communities to develop multi-pronged approaches to enhance local livelihoods and adopt sustainable rangeland management practices which help to increase conditions for pastoralists' livestock and wild prey, which are preferred by carnivores to livestock (Western et al., 2019). In Northeastern Kenya, Somali pastoralists have expressed support for conservation efforts that restore wildlife habitat while also improving rangeland conditions that would improve livelihoods (Ali et al., 2019).

5 Conclusion

Enhanced coexistence between people and cheetahs is needed in the Horn of Africa to improve protection of an endangered subspecies of cheetahs and reduce the costs for pastoralists who already face harsh living conditions and are predominantly dependent on livestock as a livelihood strategy. Long-term insecurity and intermittent political instability complicates the picture in some parts of the Horn of Africa but also provides an opportunity for conservation peace-building strategies that can contribute to conservation, livelihoods, and support the development of a lasting and stable peace (Weir et al., 2024). Understanding the human dimensions of cheetah conservation is an important first step in designing effective and equitable approaches that move toward the coexistence of people and cheetahs. Our findings suggest that many harmful human behaviors toward cheetahs are socially accepted in the region, and that these actions are motivated, in part, by wanting to retaliate for livestock attacks. We also find that attitudes toward cheetah population numbers are overwhelmingly negative in our study area, but might be improved through addressing the costs and benefits of living with cheetahs. The next critical step for this region is to work with local communities and wildlife organizations to verify and implement contextually-grounded actions that are acceptable and feasible, keeping in mind the human dimensions in the Horn of Africa that make this area distinct from other regions where cheetahs are found, and to study the effectiveness of these actions at achieving coexistence.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Colorado State University Institutional Review Board (Protocol #4880). The studies

were conducted in accordance with the local legislation and institutional requirements. The ethics committee/institutional review board waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin because verbal informed consent was obtained because reading and writing are limited in the study area.

Author contributions

KJ: Writing – review & editing, Writing – original draft, Formal Analysis, Conceptualization. PE: Conceptualization, Writing – review & editing, Funding acquisition. SD: Conceptualization, Writing – review & editing. NY: Writing – review & editing. RT: Writing – review & editing, Investigation. AA: Writing – review & editing, Investigation. PT: Writing – review & editing. NM: Writing – review & editing. TM: Writing – review & editing. MA: Investigation, Writing – review & editing. AE: Investigation, Writing – review & editing. SE: Investigation, Writing – review & editing. MH: Investigation, Writing – review & editing. AMM: Investigation, Writing – review & editing. AHM: Investigation, Writing – review & editing.

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Conflict of interest

Author TM was employed by company Torrid Analytics.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcsc.2025.1630140/full#supplementary-material>

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