Possibilities of local people to coexist with large carnivores in the eastern Serengeti ecosystem, Tanzania

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Short Report

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Abstract

Not applicable

Introduction

Because of human-carnivore conflicts, the need for developing good conservation strategies for their coexistence is vital for ensuring sustainable future conservation of large carnivore populations (Dickman, 2010; Gehring et al., 2010; Woodroffe et al., 2005; Woodroffe & Frank, 2005). A harmonic human-carnivore coexistence would therefore sustain the future of large carnivores (Linnell et al., 2001; Woodroffe & Frank, 2005; Yirga et al., 2014). Their coexistence would be encouraged if interdisciplinary strategies, such as combinations of ecological and social approaches, were applied (Treves & Karanth, 2003). For example, if local people's behaviour was directed towards developing a positive attitude toward large carnivores, their willingness to coexist with carnivore species would be improved (Hazzah, 2007; Mbise & Røskaft, 2021). In such conditions, incidents involving the persecution of carnivores would decline (Treves & Karanth, 2003).

When communities coexisting with large carnivores experience an increasing rate of human attacks and livestock depredation, their attitudes toward these species tend to become more negative (Mbise, 2021). These negative attitudes increase the likelihood of humans getting revenge by killing these carnivores (Hazzah, 2007; Lindsey et al., 2013; Linnell et al., 2001). Due to the costs associated with living and interacting with large carnivores, the livelihoods of local people are currently highly compromised (Vedeld et al., 2012). Therefore, human-carnivore conflicts are often severe in communities that share the same landscape with large carnivores (Dickman, 2010). Although livestock keeping brings conflict between carnivores and people, it also offers the best alternative for conservation, especially around protected areas, compared to other land use activities such as farming (Vedeld et al., 2012). Conservationists have dedicated their efforts to ensure that wildlife-based tourism prevails as one of the least invasive land use activities (Walpole & Thouless, 2005).

The correlation between the increase in human population and the extinction of large carnivores is strong in the context of African because the control of human population increase in Africa is low (Linnell et al., 2001). Furthermore, the use of lethal methods for controlling carnivore populations is not supervised, and in many countries, resource exploitation for sustaining people's livelihoods is not well regulated (Linnell et al., 2001). To achieve sustainable conservation of large carnivores, harmonious coexistence between these species and people should be improved (Ronnenberg et al., 2017; Schuette et al., 2013). Despite habitat loss and fragmentation, the main target should be directed towards merging human activities and conservation activities (Treves & Karanth, 2003). If local communities dealing with livestock depredation problems received conservation incentives, the level of their tolerance for carnivores would increase (Yirga et al., 2014). Thus, when communities receive certain benefits related to the presence of large carnivores, their tolerance towards livestock losses is improved. However, it is difficult to find a

solution beneficial for both humans and large carnivores because they share the same landscape and similar resources (Woodroffe et al., 2005).

This study explored the possibilities of the Maasai and the Sonjo tribes, living in eastern Serengeti, northern Tanzania, to live alongside large carnivores while strategic measures to safeguard their livestock against depredation. The study hypothesised that the Maasai tribe would show more willingness to coexist with large carnivores than the Sonjo tribe because the former tribe has a greater number of livestock than the latter as well as because they live closer to the Serengeti National Park (SNP). According to Mbise et al. (2018), even a small livestock loss in the Sonjo tribe would have a large impact on their economy, as livestock depredation costs are much higher here.

Methods

Study area

The Loliondo Game Controlled Area (LGCA) (Figure 1) is located in the northern part of Tanzania. LGCA is not a strictly protected area because it is inhabited by humans (Maasai and Sonjo tribes) (Mbise et al., 2020).

Data collection and analysis

The field work was carried out from September to October 2016. Data were collected using a questionnaire survey with closed- and open-ended questions. The closed-ended question examined the possibilities of Maasai and Sonjo people coexisting with large carnivores in their vicinities. The question asked was: “Is it possible to coexist with large carnivores in your vicinity when proper measures are undertaken?” (Yes/No). In addition, open-ended questions examined the proposed measures for improving such coexistence at the local and government levels (Figure 2). Eight independent variables were used in the questionnaire: age in years, gender, education level, tribe, livestock herd size, number of livestock depredated over the last two years, measures proposed by locals, and measures proposed by government.

The coexistence measures to which locals should adapt were proposed by locals themselves: (I) The majority of the Maasai and Sonjo people keep their livestock in an enclosure commonly surrounded by poles, which makes it easier for large carnivores to sneak in. Therefore, strengthening these poles with wire mesh would make it harder for carnivores to break in. (II) The use of herders in pastoralist communities is a common method to protect livestock against depredation and/or stealing. Herding efficiency increases when adult herders are used compared to that when young herders are used, as they are hardly able to protect a large herd of livestock. (III) Herders would prefer to have helpers, and the use of domestic dogs would be the best alternative for alerting them in case of any nearby predator as well as for helping them to scare the predators. (IV) With pole enclosures reinforced with wire mesh, embedding blinking lights would improves livestock protection at higher efficiency as well as scare predators.

Six villages were randomly selected based on the distance gradient from the SNP boundary. Three villages were selected from the Maasai tribe (Ololosokwan–10 kilometres, Soitsambu–20 kilometres, and Oloipiri–30 kilometres) and three from the Sonjo tribe (Yasimdito–40 kilometres, Samunge–50 kilometres, and Sale–60 kilometres). All necessary permissions were sought from each village chairperson for the purpose of conducting our study. In each village, 30 households were randomly selected, which accounted for 8% of the population. Respondents were above 18 years of age. In the Maasai and the Sonjo tribes, husbands speak on behalf of the family; therefore, wives were only interviewed in their absence. Binary logistic regression (confidence level of 95%, $P < 0.05$) was used to find the best explanatory factors (among the eight factors described above) for the possibility of coexistence with large carnivores in the Maasai and Sonjo tribal lands.

Results

A binary logistic regression with the question "Is it possible to coexist with large carnivores in your vicinity when proper measures are in place?" (Yes = 52%, No = 48%) was statistically significant (Wald X^2 = 68.804, df = 8, $P < 0.001$, $r^2 = 0.424$; accuracy = 78.3%). However, only two variables (tribe and "local proposed measures") were statistically significant in explaining the responses to the question" Is it possible to live alongside large carnivores in the Maasai and Sonjo tribal lands" (Table 1).

The proposed coexistence measures which locals should adapt to and those which government should undertake varied significantly between the Maasai and Sonjo tribes X^2 = 17.014, df = 3, P = 0.001; X^2 = 83.713, df = 4, $P < 0.001$, respectively). Higher share of the Maasai people proposed the use of herders (35%), followed by erecting wire mesh around their bomas (32%), whereas more than half of the Sonjo people proposed the use of wire mesh around their bomas (55%) (Figure 2). Furthermore, the two tribes differed regarding the government proposed measures: the majority of Maasai people proposed that the government should provide conservation incentives (69%) for living alongside large carnivores due to costs associated with sharing the same landscape. On the other hand, the majority of Sonjo people proposed a translocation approach (55%) to eliminate large carnivores from their landscape.

Discussion

When proper and strategic management practices are employed by integrating the knowledge of locals and researchers, the likelihood of fostering human and carnivore coexistence can be enhanced. In East Africa, management efforts are being made to determine how pastoral activities can be performed by locals in the presence of large carnivores and how they can benefit from each other. Local communities engage themselves in livestock husbandry as the only possible way to sustain their livelihoods. When their livestock are depredated by large carnivores, their livelihoods are compromised (Dickman, 2010). For instance, Maasai tribe occupies a larger land size in terms of their density (both human and livestock) than the Sonjo tribe (Mbise et al., 2020); therefore, this tribe is more likely to be willing to live alongside large carnivores.

The incidence of depredation is currently greatly increasing in these communities because the large carnivore habitats have been destroyed and the abundance of their wild prey has extremely declined, worsening human-carnivore conflicts (Mbise et al., 2020). It has been well-established that when the human population increases, wildlife habitats become fragmented, which requires urgent intervention. For instance, in the 1960s, when Tanzania became independent, its population was approximately nine million people. Today, the population of Tanzania is seven times higher than that in the 1960s (NBS, 2020). Due to habitat loss and fragmentation, the carnivore species present in the area frequently tend to come close to residential areas, which mostly results in livestock depredation.

The measures for coexisting with large carnivores proposed by locals seem to favour the Maasai more than the Sonjo people. The Maasai have many livestock; therefore, their willingness to lose a few animals while receiving tangible benefits because of the conservation of large carnivores in their areas is higher than that of the Sonjo tribe, whose people own fewer livestock (Mbise et al., 2018). When carnivores kill livestock, human-carnivore conflict escalates and mutual coexistence is lost, both of which hamper carnivore conservation initiatives (Gehring et al., 2010; Treves & Karanth, 2003).

Both modern and traditional measures can be used to minimise and/or avoid livestock depredation by large carnivores. In the Maasai and the Sonjo tribal lands, many people prefer wired bomas to protect their livestock during the night-time. The communities adjoining the Tarangire National Park in northern Tanzania have recently adopted the use of wired bomas, and this has proven to be successful to some extent. In addition, having adult herders accompanied with domestic dogs in the pastures reduces the incidence of livestock depredation. The use of trained domestic dogs, when done wisely, can and has been successful in Europe and North America as well as in some African countries, including Namibia and South Africa (Gehring et al., 2010), but not in Tanzania (Lyamuya et al., 2016). Furthermore, when wired bomas are used along with blinking lights, livestock protection is improved because blinking lights scare carnivores during the night. In the eastern Serengeti ecosystem, most livestock depredation occurs during the daytime (Mbise et al., 2018), and therefore, employing different strategies proposed by locals could reduce livestock depredation by large carnivores.

Many people from both the Maasai and Sonjo tribes have been urging the government to implement tangible conservation incentives to promote locals' willingness to live alongside large carnivores. Another measurement implementation that these societies need, with the help of the government, is creating a zonation to separate husbandry activities and conservation activities. In the current situation, there are no strict restrictions on settlements that accompany livestock husbandry. In addition, people have been requesting for other measures to be implemented, such as translocating some large carnivores back to SNP, educating the entire communities about the importance of having large carnivores in their areas, and a small proportion of locals proposed fencing the SNP to avoid large carnivore influxes from the park. As hypothesised, the Maasai tribe was more willing to coexist with large carnivores than the Sonjo tribe. The study conclude that, in order to achieve harmonic coexistence between locals and large carnivores, both locals and government measures should be implemented.

Declarations

Ethical Approval and Consent to participate

I obtained permission from relevant authorities in Tanzania (Wildlife Division and Tanzania Wildlife Research Institute) that are responsible for any research that involve interaction between people and wildlife. Respondents were introduced about the study objective and asked if they were ready to participate. All respondents agreed and were assured to hide their identities. According to Tanzanian regulations there is no need of any special ethical permits when people agree, and their identity is not revealed.

Human and Animal Ethics

Not applicable

Consent for publication

Not applicable

Availability of supporting data

Data that support the findings of this study can be requested by contacting the corresponding author.

Competing interests

The author declare no any competing interests.

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Authors' contributions

FPM designed the study, collected data, did statistical analysis, and wrote the manuscript.

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Authors' information

Mbise special research interests fall between human-wildlife interactions. Presently, Mbise is a lecturer in natural resources management and conservation biology at the University of Dodoma, Tanzania.

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Tables

Table 1. Factors that influenced the locals' responses regarding the possibilities of coexisting with large carnivores (Yes/No) as a dependent variable. Significance values are indicated in bold.

Independent variables	*B*	*S.E.*	*Wald*	*df*	*P value*
Age in years	-.020	.014	2.075	1	.150
Gender	.785	.498	2.486	1	.115
Level of education	-.411	.366	1.264	1	.261
Tribe	2.698	.509	28.149	1	**.000**
Livestock herd sizes	-.002	.001	2.411	1	.120
Number of livestock depredated	.012	.008	1.961	1	.161
Local proposed measures	-.368	.172	4.588	1	**.032**
Government proposed measures	-.106	.158	.449	1	.503

Figures

Figure 1

The studied villages in Loliondo Game Controlled Area in the eastern Serengeti ecosystem, northern Tanzania.

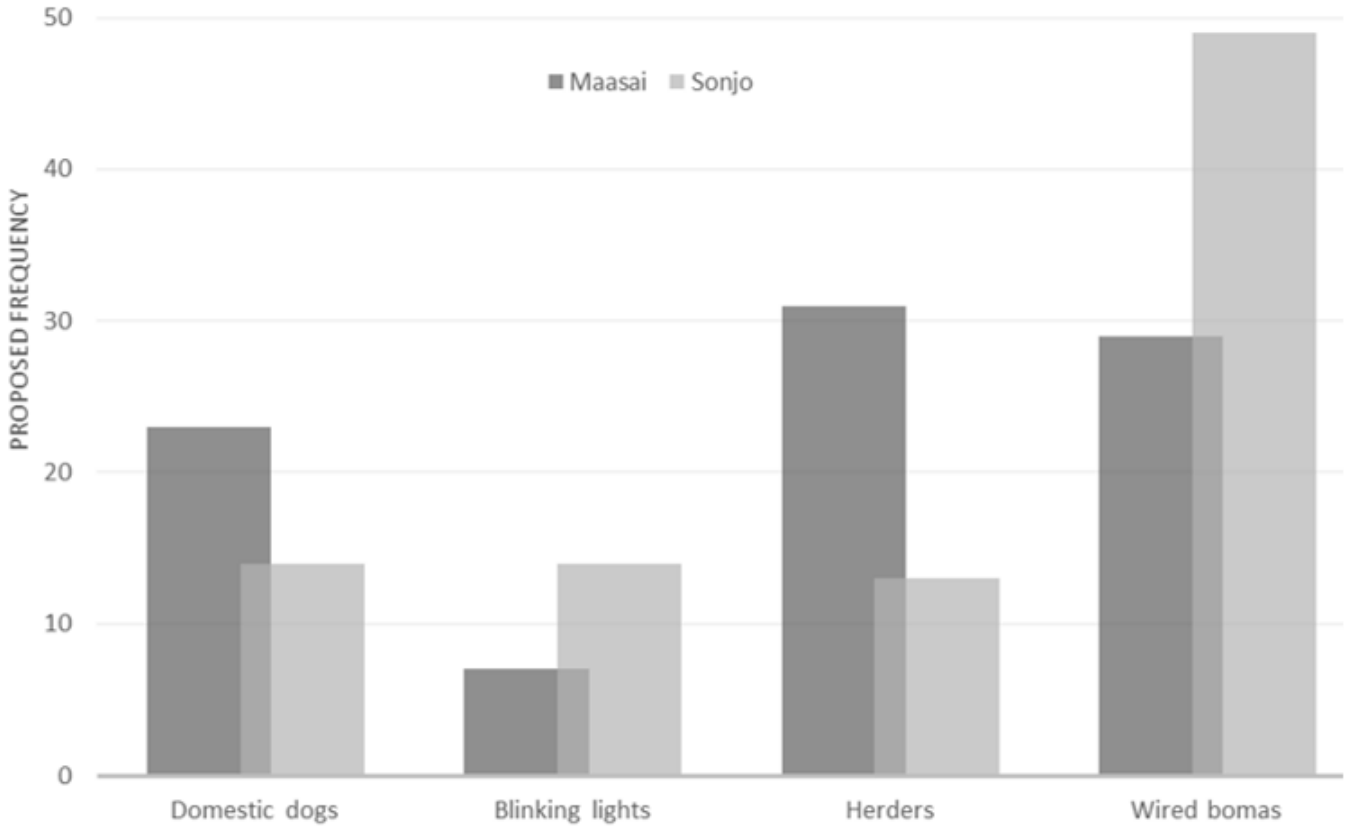

Figure 2

Proposed coexistence measures which locals should adapt to make the paradigm realistic.