

Exploring Human-Carnivore Conflict around the Bouba Ndjidda National Park, North Region, Cameroon

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Abstract

Human-wildlife conflict is a major challenge to conservation efforts in local communities abutting protected and conserved areas. This study was carried out to explore human-carnivore conflict (HCC) around Bouba Ndjidda National Park from April-May 2024 with the objective to gain insight on the interactions between humans and carnivores. Data was collected through focus group discussions organized in 13 villages. Purposeful sampling carried out at the end of each focus group enabled quantification of damage caused by carnivores. A semi-structured questionnaire was also administered to resource persons, nine (9) in total including stakeholders in sectorial Ministries and NGOs involved in conservation of biodiversity. The results revealed two types of HCC including livestock depredation (76%) and human casualties (24%). HCC was associated to poor livestock husbandry practices (35%) and increasing wildlife populations (35%). Livestock depredation was caused most by Hyaena (75%) followed by lion (19%) and civet (6%). Predation by carnivores was reported as the most troubling form of HCC (92%). The main consequence of HCC in the surveyed villages was economic loss (25%) with 5,496,000 FCFA (\$ 9, 791.68 US Dollars) estimated losses linked to livestock depredation.

Keywords

Human-Carnivore Conflict, Wildlife Conservation, Livelihood, Bouba-Ndjidda NP, Cameroon

1. Introduction

The Sudano-savannah ecosystem is a large savannah eco-region in the northern part of Cameroon composed of diverse vegetation; a mosaic of densely wooded areas, steppes, open fields and agrarian ecosystem (Tchoungui et al., 1995; Djiongo et al., 2020). The ecoregion is a high priority landscape for wildlife conservation and supports populations of endangered species such as the elephant (*Loxodonta africana*), lion (*Panthera leo*), giraffe (*Giraffa camelopardalis antiquorum*), spotted hyena (*Crocuta crocuta*), hippopotamus (*Hippopotamus amphibius*), roan antelope (*Hippotragus equinu*), eastern giant eland (*Tragelaphus derbianus*), the Western kob (*Kobus kob*), and korrigum (*Damaliscus korrigum*) (Croes et al., 2011; Gnapou et al., 2023). In this area, traditional farming and transhumance pastoralism are important activities (Djiongo et al., 2020) and play an important role in the economy of the country, contributing to its GDP (Mbanga & Gonne, 2013). Though these activities have fostered social ties and strong economic complementarities between many communities, they have also generated conflicts between humans and wildlife around protected areas (Oladele et al., 2024). The activities have rendered the region increasingly susceptible to drought and desertification, which significantly threaten wildlife species such as elephants, leopards, lions and other large and medium-sized mammals within the ecosystem. Studies have recorded decreased wildlife populations in areas of high conservation value as well as near extermination in some cases (Fa et al., 2003; Raimond et al., 2016; Taiga et al., 2021).

Human-wildlife conflict (HWC) occurs when humans and wildlife compete for the same resources resulting to a negative outcome to both parties (Madden, 2008; IUCN SSC, 2022). Biodiversity loss and significant decline in human well-being, most often for people living near protected areas, have been widely reported (Khan et al., 2018; Tumenta et al., 2026). The continued growth of human populations has intensified Human-wildlife conflict in most African countries (Hanski et al., 2005). Local populations living around protected areas often experience livestock losses to carnivore predation, leading to human-carnivore conflict (HCC) (Gebo et al., 2022). Human-carnivore conflict may result to significant economic losses and can increase intolerance or negative attitudes leading to retaliation against predators (Bauer, 2003; Ogada et al., 2003; Holmern et al., 2007; Tumenta et al., 2013).

In sub-Saharan Africa, there is continuous encroachment of humans on protected areas causing increase proximity and frequent interactions between carnivores and humans. Traditional livestock keeping, mainly extensive and transhumance play a prominent role in the economy of local communities around the Bouba-Ndjidda National Park (BNNP) (Djiongo et al., 2020). In semi-arid tropical areas, water and forage shortages in the dry season cause pastoralists to move their livestock to areas with water or key resources (Boone et al., 2008) including protected areas. In addition, overexploitation of rangelands and continued expan-

sion of livestock herds have been linked to habitat degradation, human-carnivore conflict due to livestock depredation and attacks on humans by carnivores (Lozano et al., 2019).

In Cameroon, large carnivores such as lions (*Panthera leo*), leopard (*Panthera pardus*), and spotted hyaena (*Crocuta crocuta*), are touristic attractions and play important roles in traditions, myths, and religion of local communities. However, these emblematic species are often responsible for livestock predation and attacks on humans (Eyebe et al., 2012; Tumenta et al., 2010, 2026). Preventing and mitigating these conflicts is essential for protected areas and wildlife management. Local communities living around the Bouba Ndjidda National Park have often complained about damages to their livelihood (livestock) caused by HCC. Predation of livestock by carnivores has significant consequences to food security and well-being of local communities. A good understanding and management of human-carnivore conflict in protected areas can enhance the development of strategies and management practices for conserving carnivores and safeguarding human livelihoods. Though few studies have assessed the damage caused by wildlife around protected areas in Cameroon (Weladji & Tchamba, 2003; Bauer & De Iongh, 2005; Tumenta et al., 2013; Tumenta et al., 2026), there is lack of information on human-carnivore conflict and its influence on local community perception of conservation and the long-term future of wildlife. In this context, this study was carried out to assess human-carnivore conflict by exploring the status quo of livestock depredation, identifying drivers, consequences and mitigation measures in the Bouba Ndjidda National Park in Cameroon.

2. Materials and Method

2.1. The Study Area

The BNNP is located in the North Region of Cameroon, mainly in the Mayo-Rey Division. Geographically it lies between latitudes 08°21' and 09°00' north, and longitudes 14°25' and 14°55' east (Figure 1). It has a surface area of 220,000 ha, and its peripheral zone includes seven (7) hunting zones of interest (ZIC). The Bouba-Ndjidda Technical Operational Unit (UTO) made up of the park and its peripheral hunting zones (ZIC), extends over an area of approximately 1,000,000 ha. The BNNP is located in the Sudano-Guinean climatic zone (UNESCO WHC, 2018), characterized by a rainy season of six months from the end of April to mid-October and dry season from November to April. The common woody species in the area are *Piliostigma thonningii*, *Terminalia laxiflora*, *Crossopteryx febrifuga*, *Anogeissus leio carpus* and *Combretum collinum*. For the most recurrent herbaceous species, we have: *Andropogon gayanus*; *Pennisetum unisetum*, *Diheteropogon amplexenset*, *Schizachyrium platyphyllum* (Djiongo et al., 2020).

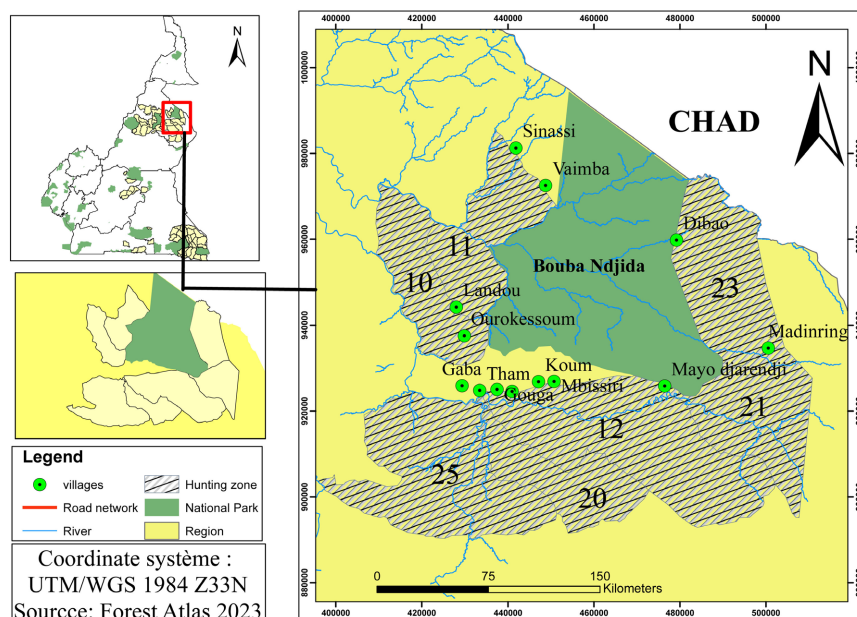


Figure 1. Location of Bouba Ndjida National Park, Cameroon showing surrounding communities and hunting zones.

2.2. Data Collection and Analysis

This study on HCC targeted communities living in the periphery of the conservation landscape of Bouba Ndjida National Park. Key informants for the study included: local administrators, traditional authorities and local population affected by human-carnivore conflict (HCC). Villages were selected on the basis of previous complains of carnivore attacks on livestock as well as, on how safe they were for researcher. The methodological approach adopted was essentially participatory, involving all the socio-demographic and administrative organization of the communities around the BNNP.

Data was collected from April to May 2024 through focus groups discussions. This created a discussion space intended for structured and informal exchanges to investigate the perception of local populations regarding human-carnivore interactions and conflicts as described by Newing (2010). This approach also permitted, the participants to freely express themselves in the group discussion, while the facilitator provided the structure by introducing topics of specific interests (Newing, 2010; Bergold & Thomas, 2012). A total of 13 villages were included in the study and focus group meetings were organized in each village in collaboration with the village chief who mobilized villagers and appointed trusted interpreters to facilitate the discussions (Figure 2).

The total number of focus group participants in all the surveyed villages was 342, with an average of 26 participants per village. Questions were open-ended and focused mainly on human-carnivore conflict in and around the villages. The characteristics of the human-carnivore conflict were discussed, the intensity of conflict in each locality was determined. Direct observations were recorded using a guide inserted into the Kobo collect application. Purposive sampling was used

to quantify the number of livestock killed by carnivores. The survey consisted of visiting all 13 villages to geo-reference the areas of human-carnivore conflict and record the intensity of conflict using a score from 1 - 3 (1 = low, 2 = high, and 3 = very high).



Figure 2. Focus group discussion with the population of Gouga village around Bouba Ndjidda National Park.

In addition, the history and characteristics of human-wildlife conflicts were discussed during community consultations to further identify the types of conflicts, victims, and evaluate the existing control measures in each village. Pictures of carnivores were used to confirm the type of carnivore responsible for attacks on livestock and humans.

Data analysis was carried out using two approaches corresponding to the chosen methodology. Quantitative data was processed using Excel table and Kobo toolbox while the analysis was carried out using the SPSS software. For mapping of conflict hotspots, QGIS software was used. The analyses mainly correspond to descriptive statistics, highlighting numbers, means and frequencies. Descriptive statistics and frequencies were used to present the data in the form of tables and figures. For qualitative data, content analysis techniques were used to describe social representations and environmental dynamics around the area, as expressed by the different stakeholders.

3. Results

3.1. Characteristics of Human-Carnivore Conflict in the Bouba Ndjidda National Park Conservation Landscape

Two types of human-carnivore conflict occurred in the conservation landscape of Bouba Ndjidda National Park namely livestock depredation (76%) and death and injury of humans (24%).

The drivers of human-carnivore conflict within the BNNP conservation landscape were diverse. Results indicate that 35% of discussion groups perceived the

increase in wildlife populations and poor livestock husbandry practices (35%) as the major causes of HCC, followed by seasonal migrations (20%) and presence of saltlicks and water points near villages attracting wildlife (5%) (**Figure 3**).

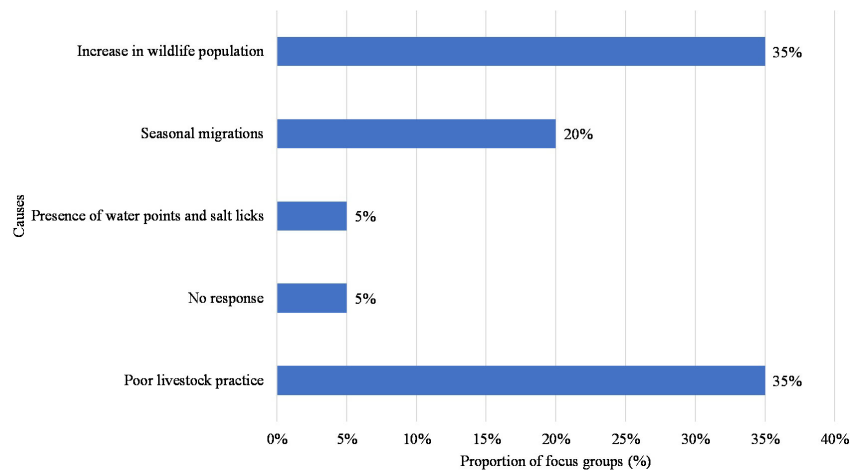


Figure 3. Causes of human-carnivore conflicts around Bouba Ndjidda National Park.

The survey carried out in the BNNP landscape showed that three species of carnivores were responsible for livestock depredation. These include the spotted hyena reported by 75% of the communities, followed by the lion (19%) and the civet (6%). Carnivores preyed on six livestock species including goat, sheep, cattle, donkey, chicken and pig as shown in **Figure 4**. Sheep and goat were the most affected reported by 41% of the focus groups, followed by cattle (9%) donkey (3%), pig (3%) and chicken (3%).

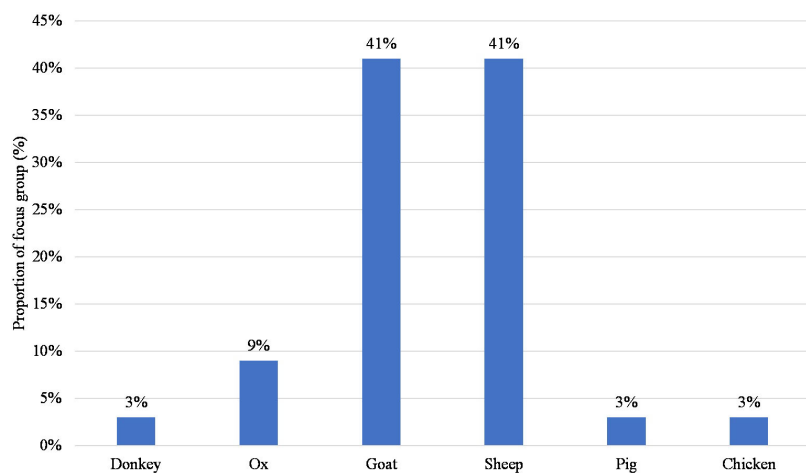


Figure 4. Livestock depredation in the Bouba Ndjidda National Park conservation landscape.

3.2. Consequences of Human-Carnivore Conflicts in the Bouba Ndjidda National Park Conservation Landscape

Several consequences of HCC were identified during this study. About 25% of

focus group reported that the main consequence was economic loss, followed by children not attending school (24%), indebtedness (24%), famine (22%) and other losses (5%) (**Figure 5**). About 92% of the focus groups stated that the intensity of predation on livestock by carnivores was very high.

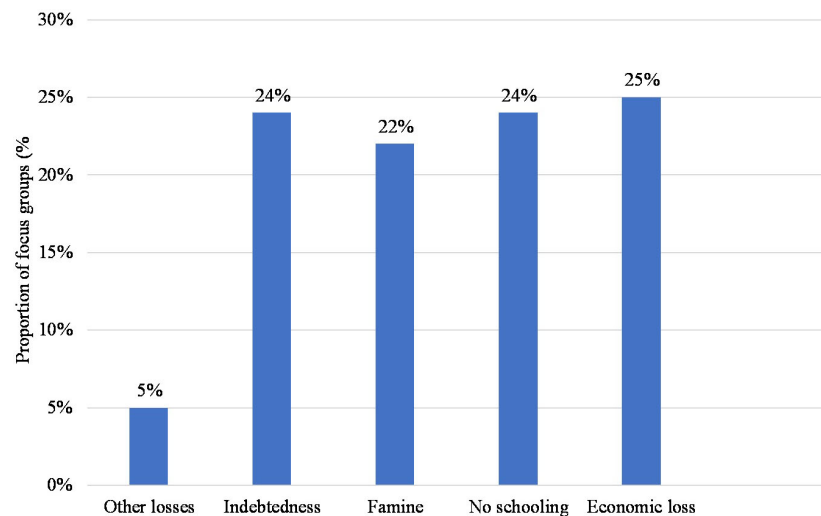


Figure 5. Consequences of human-carnivore conflict in the conservation landscape of Bouba Ndjidda National Park.

3.3. Space and Period Dynamics of Human-Carnivore Conflict in the Bouba Ndjidda National Park Conservation Landscape

Discussions in focus groups revealed that human-carnivore conflict was most intense in the district of Madinring followed by Tcholliré and Rey Bouba (**Figure 6**). According to 35% of the communities, HCC mostly occurred in plantations around villages especially on roads and water points.

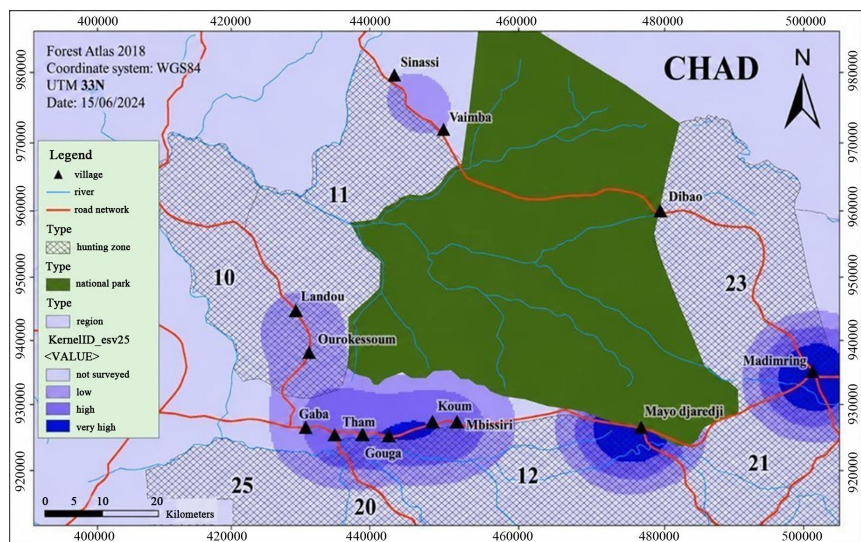


Figure 6. Human-carnivore conflict hot spots in the Bouba Ndjidda National Park conservation landscape.

In all 13 communities, focus groups perceived that predation on livestock by carnivores was increasing. According to 46% of the focus groups, carnivore attacks on livestock was more in the dry season, 46% of the communities equally claimed that the attacks occurred in both dry and rainy seasons while 8% reported that the attacks occur in the rainy season. Concerning the time of the day when attacks occurred, majority of the communities reported that they occurred at night (92%); while 8% the communities reported they occurred at any time.

3.4. Economic Losses to Livestock Depredation in the Bouba Ndjidda National Park Conservation Landscape

All surveyed villages experienced significant economic losses due to livestock depredation. The Tcholliré district was most affected, with 42 animals killed (13 cattle, 13 sheep, and 16 goats), resulting in an estimated loss of 2,530,000 FCFA. Madinring district followed with 35 animals killed (6 cattle, 18 sheep, and 11 goats) for a total loss of 1,530,000 FCFA. Rey Bouba district reported 47 animals killed (3 cattle, 20 sheep, 22 goats, and 2 donkeys), representing a loss of 1,416,000 FCFA. At village level, Koum was the most impacted, with losses of 2,016,000 FCFA, followed by Madinring (1,050,000 FCFA). Vaimba and Mbissiri were the least affected, with estimated losses of 54,000 FCFA (**Table 1**).

Table 1. Economic loss to livestock in the Bouba Ndjidda National Park conservation landscape.

District	Villages	Livestock killed	Number	Unit Price	Total cost (FCFA)
Tcholliré	Koum	Goat	1	18,000	18,000
		Sheep	2	24,000	48,000
		Cattle	13	150,000	1,950,000
	Mbissiri	Goat	3	18,000	54,000
		Goat	6	18,000	108,000
	Tham	Sheep	3	24,000	72,000
		Sheep	5	24,000	120,000
	Gaba	Goat	3	18,000	54,000
		Sheep	2	24,000	48,000
	Managna	Goat	3	18,000	54,000
		Sheep	1	24,000	24,000
Madingring	Mayo-djarendji	Goat	3	18,000	54,000
		Sheep	1	24,000	24,000
	Dibao	Goat	5	18,000	90,000
		Sheep	13	24,000	312,000
	Madinring	Goat	3	18,000	54,000
		Sheep	4	24,000	96,000
		Cattle	6	150,000	900,000

Continued

Rey Bouba	Landou	Goat	4	18,000	72,000
		Sheep	9	24,000	216,000
		Cattle	3	150,000	450,000
	Ourokessou	Goat	7	18,000	126,000
		Sheep	8	24,000	192,000
		Goat	8	18,000	144,000
	Sinassi	Sheep	3	24,000	72,000
		Donkey	2	45,000	90,000
	Vaimba	Goat	3	18,000	54,000
	Total		124		5,496,000

3.5. Measures Practiced by Communities to Mitigate Human-Carnivore Conflict in the Conservation Landscape of Bouba Ndjidda National Park

Local populations developed different methods to deal with human-carnivore conflict and protect their livestock. About 24% used noise to scare away carnivore predators, 14% practiced guarding and used bells (14%), torches (10%), dogs (10%) while 9% used animal enclosures. However, about 14% did not practice any measure to reduce human-carnivore conflicts (Figure 7). Despite the magnitude of HCC in this landscape, 62% of communities had a positive perception of wild-life and the park.

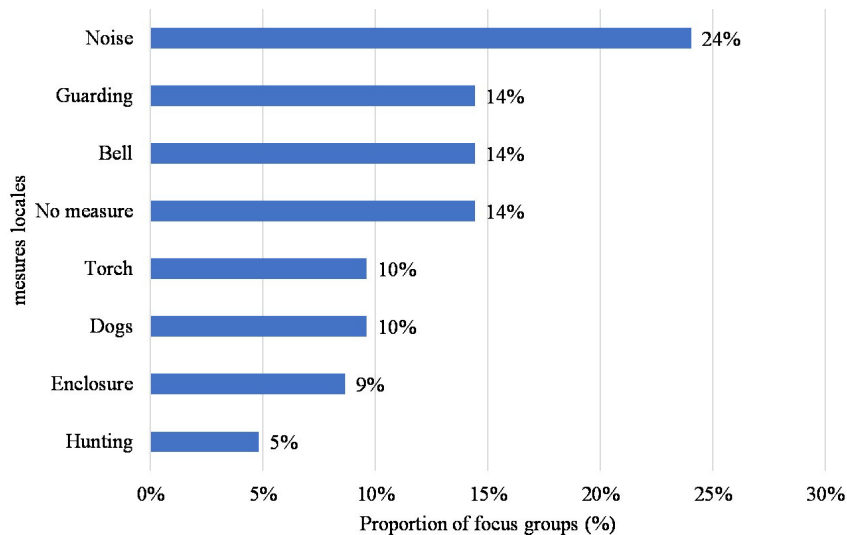


Figure 7. Local measures against human-carnivore conflicts in the conservation landscape of Bouba Ndjidda National Park.

3.6. Human-Carnivore Conflict Management in the Bouba Ndjidda National Park Conservation Landscape

Based on interviews with resource persons, there was lack of a clear strategy for

human-carnivore conflict management within the BNNP conservation landscape. However, it is worth noting that administrative services including the Ministry of Forestry and Wildlife (MINFOF), Ministry of Livestock, Fisheries and Animal Industries (MINEPIA) as well as NGOs stated that they were active in raising awareness and assessing the damage caused by carnivores on livestock in surrounding communities. These efforts they claimed contributed to promoting a more harmonious coexistence between humans and carnivores. Nonetheless, all the Communities perceived that the management of HCC in the Bouba Ndjidda National Park conservation landscape was poor.

4. Discussion

Two types of human-carnivore conflicts were identified in the conservation landscape of Bouba Ndjidda National Park including livestock depredation followed by human death and injury. This result shares similarities with those found on the periphery of the W and Arly National Parks in Burkina Faso where losses of domestic animals and injuries to humans were frequent (Ouedraogo, 2018). On the other hand, they differ from findings in Waza National in Cameroon where predation on livestock was the only form of HCC reported (Bauer & De Iongh 2005; Tumenta et al 2013; Tumenta et al., 2026). Attacks on humans, even though low, compared to the damage on livestock by carnivore predation; constitute the most serious manifestation of HCC in local communities (Bombieri et al., 2023). According to these authors, the occurrence of attacks on humans worldwide is dependent on both ecological and social factors. Records of human deaths caused by carnivores are common in East and Southern African countries notably Tanzania (Packer et al., 2005). Bauer and de Iongh (2005) speculated the possibility of this form of HCC occurring in West and Central Africa due to the closeness of communities to protected areas hosting carnivores.

The study revealed that increase in wildlife population as perceived by focus groups was a major cause of HCC followed by poor livestock husbandry. Conservation efforts in the BNNP landscape have led to increase in wildlife populations. A lioness was identified on Camera trap in the Bouba Ndjidda-Sena Oura transboundary landscape, which was previously deemed to have no lions for over 20 years (WCS, 2023). These results are in line with those reported in the W and Arly National Park (Ouedraogo, 2018) where 73% of respondents stated that predation was linked to increase in the number of carnivores and had observed them more regularly compared to previous years. In addition, Eyebe et al., (2012) stated that the increase in population pressure, practice of cattle and sheep farming near protected areas and interaction between communities and protected areas were the primary causes of human-carnivore conflicts. The breeding of these animals in this area constitutes one of the most important income-generating activities for the populations.

The study shows that three species of carnivores were responsible for predation of domestic animals. The spotted hyena was the main predator followed by lion

and civet. These results agree with those of [Weladji & Tchamba, \(2003\)](#) in Benoue National Park, where lions and hyenas were among the species most often cited by herders. However, smaller carnivores, such as civets, were responsible for attacks on livestock in this study. The same is true of the W and Arly National Park ([Ouedraogo, 2018](#)) where the species responsible for predation were the hyena (51.6%) and lion (45.4%). However, in Tsavo National Park in Kenya, the lion (85.9%) was the predominant predator followed by hyena (9.1%), and cheetah (4.9%) ([Patterson et al., 2004](#)). Similarly, in Waza National Park the lion was the main predator responsible for livestock attacks followed by Jackals and hyenas ([Tumenta et al., 2026](#)).

Several consequences of HCC were recorded in this study with economic loss being the most important. The findings agree with [Tchamba et al. \(2014\)](#), who stated that the main consequence of human-wildlife conflicts was economic loss. Livestock represent food source, savings, financial security and cultural inheritance to local communities. Other studies had demonstrated that losing livestock to carnivore predation lead to reduced livelihood and increase poverty ([Braczkowski et al., 2023](#); [Tumenta et al., 2026](#)). The same was true in ZIC 19 in Tcheboa, where conflicts had serious economic and food consequences ([Djiongo, 2015](#)). Losses related to livestock predation in this study estimated at 5,496,000 FCFA are significant to communities in this landscape. In Waza National Park, economic loss of livestock induced hardship to local communities ([Bauer & De Iongh, 2005](#); [Tumenta et al., 2013, 2026](#)) leading to retaliatory killing of lions. Similarly, in Tsavo National Park in Kenya, the economic loss due to predation reported by [Patterson et al. \(2004\)](#) was \$ 8,749 US dollars per year. Despite losses incurred from carnivore predation on livestock, majority of communities in the BNNP landscape had a positive perception of wildlife. This might be because of the benefits they have due to the presence of wildlife, such as slaughter taxes from legal hunting in the hunting zones, and tourism which contribute to the development of their localities.

Local communities living in the periphery of the BNNP landscape applied some measures to protect their livestock from predation and to safeguard their livelihood. The most practiced being the use of noise, using objects like drums and pot lids to chase away predators. This may temporarily work but could be dangerous depending on the flight distance of the predators. This often led to injuries on humans and severe damage on livestock around protected areas such as observed around Waza National Park (Djafsia Kagalang Pers. Comm.). In the Mpem and Djim landscape, lions killed more livestock than they could consume when chased off their kills ([Kirsten et al., 2020](#)). Barbed wire fences and improved guarding of livestock herds could be effective options to mitigate livestock depredation. The FAO Toolbox for human wildlife conflict, which has had positive effects in Gabon, was not applied in this landscape and the main reason was the lack of knowledge of the existence of this tool.

5. Limitation of the Study

We recognize some limitations of this study, including potential recall bias, consensus effects within focus group discussions, the use of purposive sampling, and the possibility of participant misidentification of carnivore species. One of the major challenges encountered during this study was the prevailing insecurity within the landscape, including threats posed by terrorist activities and kidnappings. Although the researchers initially planned to conduct household interviews, this component of the study could not be implemented due to security concerns and the associated risks. Given the security challenges in the study area, future research should explore alternative and adaptive data collection methods, including collaborations with local community representatives, trained local enumerators, conservation staff, and community-based monitoring networks.

6. Conclusion

Human-carnivore conflicts are difficult issues that impact both conservation and rural communities living around protected areas. Bouba Ndjidda National Park in the North Region of Cameroon is also facing this phenomenon. Two types of human-carnivore conflicts including livestock depredation and, injury and death of humans were observed in this study. Increasing wildlife populations especially carnivores and poor livestock husbandry practices were the major cause of the conflicts. Three carnivore species are responsible for livestock predation namely hyenas, lions, and civets. The livestock species killed in the study were cattle, goat, sheep and donkey. Overall, 124 animals were killed valued at 5,496,000 FCFA (\$ 9,791.68 US Dollars). Despite the losses and frustrations caused by carnivores, 62% of communities had a positive perception of wildlife. Even though there was no clear strategy for managing human-carnivore conflicts in the area, to reduce the negative effects of HCC, the conservation service and their partners are recommended to continue raising awareness, encouraging improved husbandry practices such as enclosing livestock at night.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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