Final Evaluation Report

Your Details	
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Project Title	Human wildlife conflicts in Mara ecosystem
Application ID	38544-B
Date of this Report	7th August, 2024

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Gather a clear understanding of conflict forms in the additionally selected conservancies				Data collection of different conflict types were successfully collected in the 4 additional conservancies, considered in the current phase as: Lemek/Olchoro oirouwa, Enoonkishu, Isaaten, Oloisukut
Monitor the effectiveness of Predator Proof-Kraals/Bomas, Eye Mark Painting on cattle, and **solar flashlight Bomas** in mitigating Human-wildlife conflict				The Solar flashlight Bomas as a livestock depredation mitigation measure was introduced after securing additional project funds from the Explorer Club

2. Describe the three most important outcomes of your project.
a). Carnivores involved in depredation

Our investigations revealed that Lions, Leopards, Hyenas, African wild dogs, cheetahs, and serval cats were involved in livestock depredation. These findings concur with Kissui et al., (2019) and Naha et al.,(2020) on large carnivores being at the core of livestock depredation. Cases of lion attacks on livestock were prevalent in open grazing fields, this could be attributed to the fact that lions choose healthy livestock and therefore during the day they could choose the best. Leopard attacks were high at night more so in the traditional bomas. This was due to the ability of leopards to climb and access the traditional bomas as they are built using twigs and posts. Their nocturnal habits also increased livestock depredation cases at night. Studies by Kissui, (2008) were in line with these findings. In cases where leopards attacked livestock during the day, it was in the grazing fields within the vicinity of thickets of shrubs and forest. This finding agrees with early scholars such Kumbhojkar et al., (2019b) who argued that human-leopard conflicts mostly occurred in areas with thick vegetation. Incidences of hyena attacks on livestock were high in both grazing

fields and traditional bomas. As such, carnivores involved in livestock depredation were dependent on location of the attack.
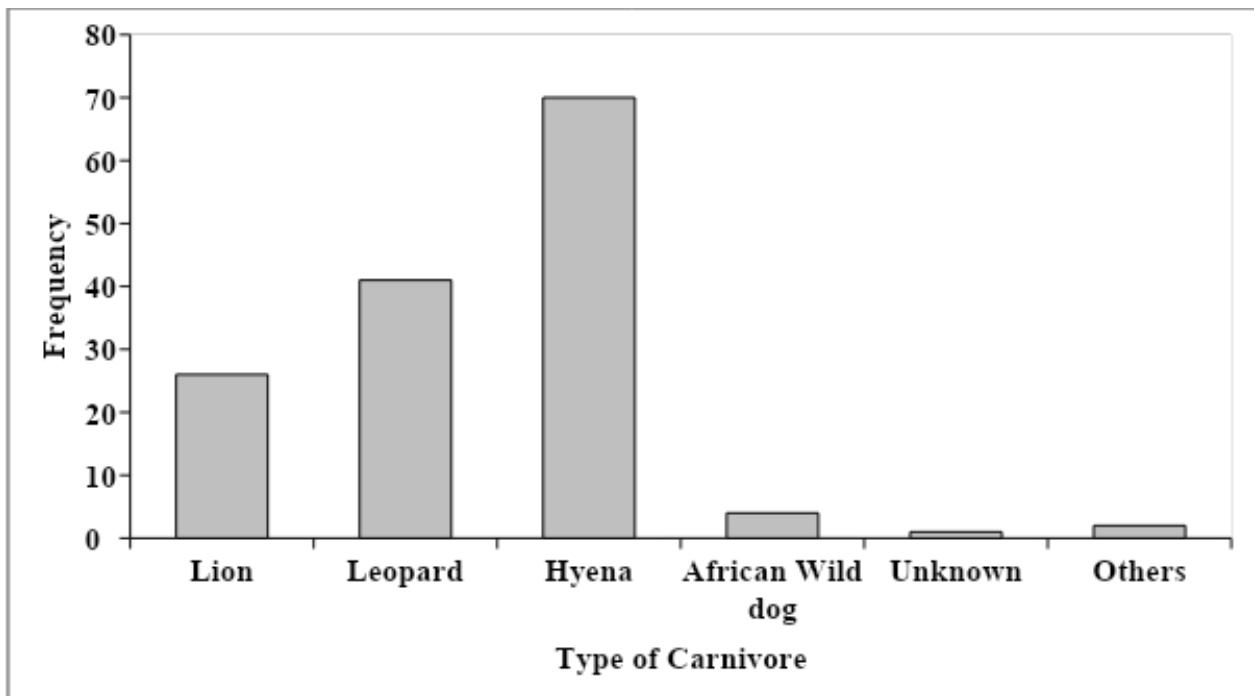

Fig.1: Carnivore involved in depredation

Although lions, leopards, African wild dogs, cheetahs, and serval cats were identified as the problem animals, the most problematic animal in both questionnaire survey, FGDs and daily monitoring was hyena, followed by lions. This could be because hyenas are highly adaptable and opportunistic predators that thrive in various environments, including those close to human settlements (J. K. Young et al., 2020). While lions are powerful predators capable of hunting large prey like cattle. This also conforms with (Kissui, 2008; Loveridge et al., 2017), on hyenas and lion being the most problematic carnivores. Depredation cases by hyenas were high in traditional bomas and open grazing fields. The information gathered during the FGDs conducted during the study stated as

"…Hyenas are high in numbers in the conservancies around this area…. they attack and kill in plenty but only eat a few"

There were cases of livestock depredation involving cheetahs. This could be because cheetahs are less adaptable to environments heavily infested by human activities thus less interaction with livestock. Cheetah hunting behaviour also relies on speed and stealth, making them less likely to engage with larger or well-guarded livestock.

(b) Livestock attacked
Cattle, sheep, goats and donkeys were the commonly attacked livestock. However, sheep were the most vulnerable livestock to depredation, which contradicts the findings by (A. J. Loveridge et al., 2017) in Zimbabwe where cattle were the most frequently attacked. An extract from the FGD conducted at Mara Ripoi Conservancy stated:

"…..Sheep are easily attacked by predators because of their laziness, foolish behaviour and cannot run away from predators. They are easily attacked, …their anti-predatory behavior is very low, they do not smell nor sense danger…..there are also many sheep in this area. "

Goats followed sheep closely in vulnerability to depredation, this could be attributed to goats grazing in rugged terrain where predators can easily ambush them, or the tendency to roam widely increasing their exposure to predators.
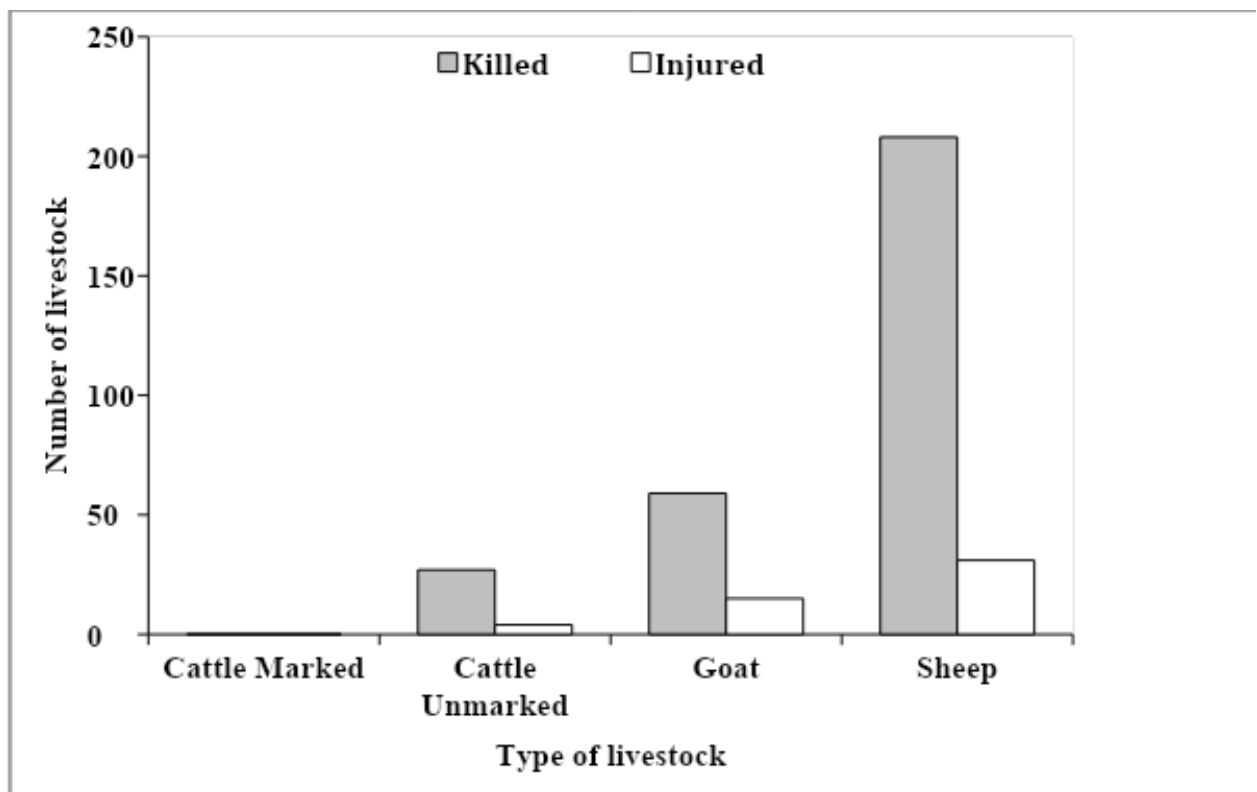

Fig 2: Livestock attacked by carnivores

Regarding marked and non-marked livestock, non-marked cattle were highly attacked by lions: which could be attributed to their size, while cattle with an "eye marked" sign on their hinds had zero attacks by wild animals. This could be because the "eye" mark scared off predators. Sheep and goats were highly attacked by hyenas. In most cases, hyenas killed more than they could eat in a single attack. There was a strong association between the type of livestock attacked and the carnivore involved.

The extent of attack on donkeys was low, this is due to their defensive capabilities, making them less likely to be attacked. Additionally, they grazed by the homestead vicinity and did not join the main herd in grazing fields, as they are used to fetch water, firewood, and carry luggage to nearby shopping centres. The number of livestock killed by carnivores were more, as compared to those injured, none the less the number could be higher as the survival rate of those injured was not guaranteed.

c). Efficiency of LED Solar Flashlight Bomas, Predator Proof Bomas and "Eye" mark Painting innovations in mitigating livestock depredation

Generally, very low percentage of depredation cases (2.3%) occurring under the protection of innovations indicates that these measures are highly effective in deterring predator attacks on livestock. Innovations such as Solar Flashlight Bomas, Predator Proof Bomas, and "Eye" marks painting have proved to be successful in deterring predators and protecting livestock

A slightly higher percentage (6.9%) of cases occurred near innovation bomas, suggesting that while these measures are effective, they do not provide absolute protection and that proximity to protected areas does not eliminate risk. Only 2% of livestock were injured under application of either of these innovations, indicating that the measures not only reduce fatal attacks but also minimise injuries. Reducing injuries is important as it decreases veterinary costs and maintains livestock's overall health and productivity. The effectiveness of each specific innovation is discussed in the following subsections:

I.   Solar Flashlight Bomas,

The very low percentage of livestock depredation incidents (1.3%) inside solar flashlight bomas indicates that these fortified structures are highly effective in curbing predator entry and attacks. This effectiveness suggests that solar flashlight bomas are a valuable tool for protecting livestock, particularly sheep, from nocturnal predators like hyenas and leopards. These findings conform with that Lesilau et al., (2018a), on LED flashlight techniques in reducing depredation by lions. The incidents (4.1%) occurring near but outside the solar flashlight bomas indicate that while the innovation is effective in a confined area, predators may still pose threat in the surrounding vicinity. This suggests the need for additional measures to extend protection beyond the immediate area of solar flashlight bomas, such as increased patrolling or combining different protective strategies.

Plate 1: Distribution of solar lamps to the local community to curb livestock depredation incidences

II. Predator Proof Bomas

The relatively low percentage of depredation incidents (2%) inside the Predator Proof Bomas indicates a high level of effectiveness in preventing predator attacks within these enclosures. This suggests that Predator Proof Bomas are a reliable method for protecting livestock, particularly sheep, from predation, significantly reducing the risk of attacks within their confines. These findings support the study by (Sutton et al., 2017) on the effectiveness of fortified bomas in reducing livestock depredation.

The occurrence of depredation incidents (3.4%) near but outside the Predator Proof Bomas indicates that while the bomas offer substantial protection within, the surrounding areas remain vulnerable to predator attacks. Sheep were the primary livestock attacked within and near the Predator Proof Bomas indicating their vulnerability to predation.

Plate 2: Predator-Proof Boma

III.   "Eye" mark Painting

The fact that no eye-marked cattle were killed or injured by carnivores during the entire monitoring period suggests that eye-marking is an effectual deterrent against predator attacks. This indicates that predators might perceive the eye marks as a threat or a sign of vigilance, thus keeping away from attacking the marked cattle. However, the deaths of 27 unmarked cattle, with 29.6% (8) from control herds in similar environmental conditions as the marked ones, underline the difference in predation risk between marked and unmarked cattle. This disparity highlights the potential protective edge of eye marking and suggests that environmental conditions alone do not account for the difference in attack rates. Eye marking appears to play a crucial role in reducing livestock vulnerability to predators. The higher predation rate on control herds (unmarked cattle) reinforces the hypothesis that eye marking significantly deters predators.

At least one of the innovation types was better at controlling livestock killings than the rest (in a specific setting). "Eye Mark" was better at controlling livestock killings than solar flashlights and predator-proof bomas. However, the limitation of "eye mark" is that it is only applicable during the day when livestock are out in the grazing field, it is also not clear if this innovation can work on sheep and goats.

Plate 3: "Eye" mark on black and white cattle

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

Delays in the release of the first bunch of funds by the receiving organization. There was a lapse of four months due to changes in the leadership at the institution. Since they are the signatories, therefore hampered the financial processing before the changes were effected. However, normalcy ensued thereafter, with no delays experienced.

Extreme weather conditions: Abnormally heavy rains were experienced during data collection period, resulting in flooding incidents that hindered movements within the study site. This was tackled by bringing on board more field research assistants   to reduce movement

4. Describe the involvement of local communities and how they have benefitted from the project.

Community involvement in project activity implementation was as follows:

I.   **Establishment of the Predator Proof Bomas (PPB), installation of Solar Flashlight in the Bomas and painting of " eye" marks.** Local community members took an active role in the entire process of setting up the innovations so that at the end of the project they own it. They participated in the identification of suitable sites, setting up the bomas, Identifying the cattle herds to be painted with eye mark, and monitoring depredation incidences in the bomas.

Local community were willing to provide their cattle as treatment herd for the eye painting experiment

Data Collection: The project selected two local community members to help in data collection through monitoring of depredation incidences and administration of questionnaires. Selected research assistants were also involved in mobilizing local community members to attend sensitization meetings. In some conservancies, the area chiefs were also involved in organising the Focus Group Discussions (FGDs) meetings since local communities had confidence in them.

Awareness: The project team, took the opportunity during Focus Group Discussions to sensitize and create awareness among community members on different ways in which the community could co-exist with wildlife, by highlighting human-wildlife conflict mitigation measures to enable them to manage HWC.

5. Are there any plans to continue this work?

Yes, we envisage proceeding with this work, particularly emphasizing community sensitization on the predator-deterring innovations of eye-making, predator-proof bomas, and solar flashlights. This is to make the community aware of the existing cost-effective options for securing livestock herds from attacks. we would also wish to determine the adoption rate of each of these innovations.

6. How do you plan to share the results of your work with others?

-       Publication of findings on the successes of these cost-effective measures,
-       Produce briefs on these successes and share them with actors on the ground such as Maasai Mara Wildlife Conservancy Association, Mara Predator Research and the Department of Tourism and Wildlife of the Narok County Government.

7. Looking ahead, what do you feel are the important next steps?

-       Setting up more demos on these innovative measures and encouraging the local community members to adopt
-       Intensifying sensitization in all conservancies now on innovative measures to interest more communities to adopt.
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8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Yes: the Rufford Foundation logo was extensively used. For instance on meeting registration forms and payment schedules.

Did the Foundation receive any publicity during the course of your work?

The Foundation was given publicity in that the project team underscored and acknowledged the support provided by Rufford Foundation by funding the project to enable activity implementation. This was done in all the community sensitization and awareness meetings, Focus Group Discussions, and Monitoring of the effectiveness of the innovations, where the local community and respondents were informed about the funding organization of the project the Rufford Foundation. During the setting up of the Demo Predator proof Bomas, distribution of solar lights, and cattle eye painting, the community was also informed about the support provided by Rufford Foundation

9. Provide a full list of all the members of your team and their role in the project.

	Member	Role
1.	Elizabeth Naliaka Wakoli	● Team Leader (Principal Researcher) ● Carry out Focus Group Discussion ● Monitoring of Human Carnivore Conflict (HCC) cases ● Report writing ● Results dissemination ● Coordination during predator-proof Boma Construction, ● Monitoring of Bomas
2.	Dorothy Masiga Syallow	● Researcher ● Community interviews through Questionnaires ● Interviews with Key respondents ● Mapping of conflicts ● Report Writing ● Results dissemination ● Community Sensitization and awareness creation
3.	Robin Njapit: Field Assistant, Lemek/Olchoro oirouwa Conservancy Francis Katuungu: Field Assistant, Oloisukut conservancy	● Help in data collection through questionnaires, (in some areas they did translation of the questions from English into Maa Language) interview guides ● Guided in the field since they understood the terrain so well Recording of HWC incidences on monitoring sheets ● They acted as a link between the researchers and the community members in areas where area chiefs were not readily available thus winning the confidence of the locals ● Monitoring cases of Human Carnivore Conflict in Predator proof Bomas
4.	Elijah Sikona (Research Assistant)	

5.	Simon Sikona: Field Research Assistant, Enoonkishu Conservancy,	
6.	Peter Naurori (Chief)	● They were the link between the researchers and the local communities ● Helped in organizing community barazas for Focus Group Discussions (FDGs),
7.	Johnson Kulet (Assistant Chief)	● Organize the meeting with the key respondents (Village Elders) from the community ● Participate in the identification of sites for PPB construction

10. Any other comments?

Elizabeth and Dorothy extend their sincere gratitude to the Rufford Foundation for providing funds for the third phase (1st Booster grant) of their research. This support allowed them to enhance the initial research by introducing the: "eye" marking technique, which has proven effective in reducing daytime livestock depredation. They are now considering the next steps to create awareness in all conservancies on the adoption of the Predator-proof Bomas, "Eye" Mark painting technique and solar flashlight bomas to address human-carnivore conflict (HCC).