

Community Perspectives on the Use of Recycled Plastic Posts in Mitigating Livestock Predation in Amboseli Ecosystem, Kenya

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Abstract

In the last few decades, the impacts of human activities on ecosystem have rapidly increased resulting to detrimental ecosystem changes. Human-wildlife conflict (HWC) is one of the greatest consequences of human impacts on the environment. Although HWC has been there for decades, its intensity seems to be growing with the spread of human settlements, changes in land use patterns and diminishing suitable natural habitats for wildlife. To mitigate HWC, various strategies have been devised and implemented. This study focused on predator-proof bomas (PPBs) approach that is ongoing in Amboseli ecosystem. The aim was to establish reasons behind the slow adoptions of the recycled plastics poles by owners of PPBs that were constructed using wooden posts between the years 2010 to 2013. Randomly selected 36 PPB homestead owners were interviewed and the physical structures of their PPBs assessed. Results revealed a positive relationship between PPB size and number of poles damaged; and a significant association between the damaged posts and the number of indigenous posts replaced in the three group ranches ($\chi^2 = 34.9331$, $df = 2$, $p < 0.05$). Most of the respondents (89%) cited posts and doors (72%) as the main parts that needed repairs. About 80% of the respondents would recommend the plastic posts for use in constructing new PPBs by other people. Most of the PPB beneficiaries whose PPBs were constructed in 2010-2013 have opted for an “easy” alternative source of posts from the sparsely distrusted trees around their homesteads. It is recommend that an open window period should be tried to entice the wooden post PPBs owners to adopt the recycled plastic posts. This may necessitate upgrading the existing old wooden bomas to a “smart PPBs”. It is suggested that the “smart PPBs” should not only have recycled plastic posts but also “free” energy saving stoves in each household to reduce the level of deforestation.

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Keywords

Human-Wildlife Conflict, Predator-Proof Boma, Recycled Posts, Mitigation, Livestock

1. Introduction

In the last few decades, the impacts of human activities on ecosystems have rapidly increased. Whereas the majority of these can be considered beneficial to human well-being, there is growing evidence of adverse effects [1]. [1] notes that a clear analysis of these undesirable impacts and their consequences for people has been difficult because of the numerous other causes of ecosystem change that operate and interact at different social, geographical, and temporal scales. For some people, especially those buffered by relative affluence, the problem is scarcely visible—or at least accorded low priority. Yet millions of others experience every day the detrimental consequences of ecosystem changes. One such consequences of human impact on the ecosystem, is human-wildlife conflict (HWC). According to [2] humans and biodiversity have conflicting interests—humans are keen to improve their livelihoods against the survival of biodiversity. [2], further observes that biodiversity seems to be losing the battle. HWC is considered to occur when wildlife requirements encroach on those of human populations, with costs both to residents and wild animals [3]. [4] points out that a range of species come into conflict with people. However, [5] singles out the conflict between livestock producers and predators as the most common form of human-wildlife conflict worldwide. The HWC, especially the livestock predations have been attributed to the increase in human population with spread of human settlements, changing land use patterns, and diminishing suitable natural habitats. All of these factors are forcing biodiversity to be restricted into small fragmented patches within the human-dominated landscapes [6]. [7] add that in many parts of the developing world, wildlife inhabits landscapes beyond protected areas where they conflict with the local communities.

Many governments, private sectors and individuals have recognized the treat of HWC, particularly on the treated species such as lions. And as such, they have devised various strategies to mitigate the conflicts. According [8], engagement of local communities is considered as an important part to effective resolution of HWC, and therefore a wealth of community-based interventions have been implemented accordingly such as education and awareness, compensation (for example Big Life in Amboseli ecosystem), translocation of problem animals, controversial lethal control, and the use of enclosures such as the predator-proof bomas in Amboseli ecosystem. Born Free Foundation (BFF) initiated the lion conservation project “PPBs” in 2010 with three model bomas. The initiation of the project was necessitated with the Government of Kenya (GoK) recognition of the decline in lion population in Kenya from about 10,000 lions in 1980’s to just about 2000 individuals in 2008 [9]. Since then, 226 traditional bomas have been upgraded in the community group ranches adjacent to the Amboseli-Tsavvo-West Kilimanjaro landscape (ATWL). The PPBs structure consist of posts (wooden type since 2010-2014, and recycled plastic poles from April 2014 to date), 6 feet high twisted chain-link rolls, flattened oil drum doors and recycled dry thorn shrubs [10]. [10] stresses that:

“When we started the project in 2010, wooden posts were used to construct the PPBs. However despite being chemically treated, the posts did not last long... termites were the major challenge as they chewed the wooden posts... PPBs were still vulnerable to predator at night...”;

The project is implemented on a cost share basis with individual beneficiaries contributing 25% of the overall cost of the boma. In January 2015, the community were given an open window period of three months to contribute 20% of the PPBs cost. This was as a result a prolonged drought in 2014 that reduced the “purchasing power” of the community. In April 2015, the cost share contribution was reverted to 25%. In addition, repairing the old PPBs made of wooden posts was introduced in April 2015 with the community contributing 25% of the cost of repairs. For a period of 12 months, only 7 out of 40 targeted old PPBs had been repaired by replacing wooden posts with ecologically friendly recycled plastic posts. The newly upgraded PPBs within the same period of 12 months were 45. This study sought to find out the reasons behind the very slow adoption of the recycled plastic posts by the old PPBs owners. It was expected that the owners of the old PPB having known the effectiveness of the PPB, they would buy into adoption of the recycled posts and continue protecting their livestock against night time predations by predators such as lions and hyena. Since, the targets had not been attained,

this study was formulated to answer the following questions as part of the project monitoring:

- i) What are the reasons for the slow adoption of the recycled plastic posts with the 75% waiver on the project cost per beneficiary?
- ii) What are the beneficiary's attitudes toward the recycled plastic poles?
- iii) Are the community members well conversant with the recycled posts qualities?
- iv) Are the PPBs beneficiaries replacing wooden posts with those from indigenous tree?

In the wake of evidence-based conservation in recent years, conservation project managers, conservation teams, and organizations find it necessary to demonstrate measurable impacts that can be attributed to their actions. To do so, [11] recommend that three important questions need to be answered: 1) Are we achieving our desired impact? 2) Have we selected the best interventions to achieve our desired impact? and 3) Are we executing our interventions in the best possible manner? [12] summarised it as “how can we learn what works, what does not work, and why and how can we learn from one another?”, while [13] reasons that to judge the effectiveness of the interventions, which by their nature are experiments, monitoring should include to answer the questions: were the interventions put in place planned?, did the level of HWC diminish?, was biodiversity maintained or restored?, and was human welfare improved?

[14] claims that when a monitoring system sends signals that the efforts are going off track (for example, that the target population is not making use of the services, that costs are accelerating, that there is real resistance to adopting an innovation, and so forth), then good evaluative information can help clarify the realities and trends noted with the monitoring system. As such, it is equally imperative for the PPB project to answer such questions before proceeding with the implementation.

2. Methodology

This study was carried out on 22nd to 28th February 2016 in the Amboseli ecosystem. The target population was the 143 homesteads with predator-proof bomas constructed using wooden posts between the periods of January 2010 to December 2013. A list of the homesteads was obtained from the Born Free's lion conservation data base. The study areas was clustered into three major area—OGR, MGR and KGR, based on the group ranches administrative boundaries. In each cluster, homesteads were assigned numbers on a piece of paper, folded and put into a container, thoroughly shaken and each folded paper selected at random until a sample size of 12 homesteads per cluster was obtained (Figure 1).

For each homestead, the head of the homestead was interviewed for a maximum of 20 minutes. Where the heads of homestead were absent, their wives or any other adult (above 18 years) who has lived in the boma for more than two years was interviewed. The interviews were conducted by locally trained enumerators. After the interview, the enumerator asked for a permission from the boma owner to measure the circumference of boma using a 100 meter tape, count the total number of posts, record the damaged (broken, rotten or chewed by termites) and intact posts, take the Global Position System (GPS) coordinates, and number of entrances around the boma. Any replaced posts with an indigenous tree posts were also recorded.

The Microsoft Excel-pivot tables software 2013 and SPSS statistical package version 20.0 were used to process, tally and analyse the data. The chi-square statistic was used to test the connection between damaged posts and indigenous tree posts used, and correlation coefficients used to test the strength and relationship between boma characteristics.

3. Results and Discussions

3.1. Homesteads Characteristics

The mean circumference of the sampled PPBs is 142.97 ± 6.442 m, with the smallest being about 76 m and the biggest 240 m. The average number of people per PPBs stood at 15.78 ± 1.253 , while that of domestic animals were: cattle (78.53 ± 11.039), shoats (207.89 ± 28.89), donkey (2.31 ± 0.432), and dogs (1.61 ± 0.237). The total average number of livestock per wooden post boma was 289, compared to 293 in recycled post bomas [15]. Although the wooden bomas are relatively smaller in size compared to recycled post bomas (237 m), the livestock numbers in both remains high. This can be attributed to the security offered to livestock at night in PPBs compared to the traditional bomas. These findings are comparable to a study by [15] in Amboseli which found a

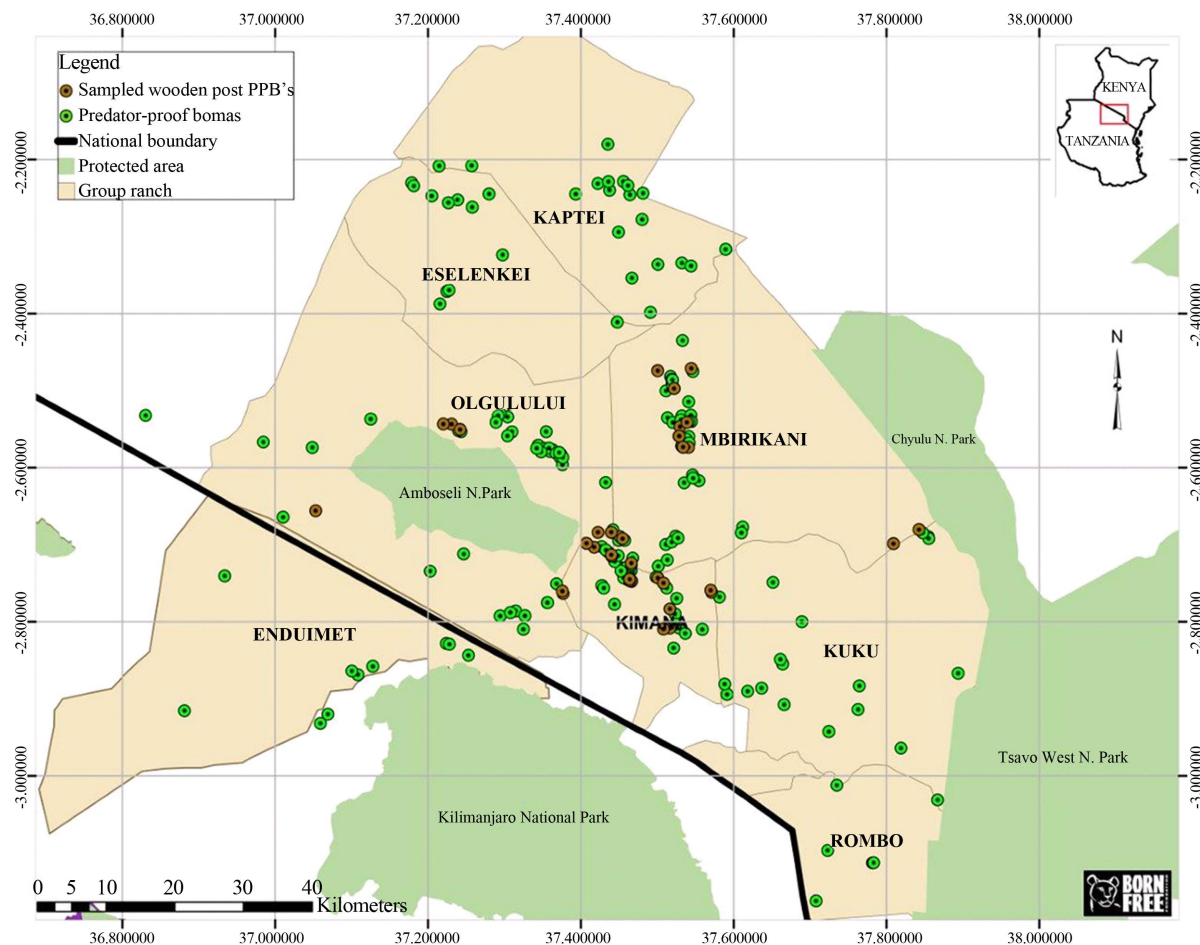


Figure 1. Study area.

significant difference in the size ($t = -2.504, n = 45, P = 0.016$) and number of livestock ($t = -2.253, n = 45, P = 0.029$) in traditional bomas and PPB. The circumference of traditional bomas were found to be smaller in size (128.2 m) and had fewer livestock (192).

The main physical structure of the boma assessed were number of posts (both intact and damaged), indigenous tree posts used, and numbers of doors and their status (Table 1). Generally, 52.48% of the wooden posts were defective, with only about 8.7% having been replaced with indigenous trees posts. Although the wooden post PPBs have been rated by the respondent as 86.11% effective, this is below the recent rating of PPBs by [15] at 91.11%. This explains why about 14.89% of the respondents said they had lost their shoats to hyenas. The comparative “high effectiveness” of the PPBs made of wooden posts can be attributed to presence of an average of about two dogs per boma. [16] studies in Namibia showed that dogs were effective in reducing livestock attacks by acting as an alarm to the herders. A similar study conducted by [17] in Samburu, revealed that trained dogs were effective (95%, $n = 72$) in alerting people on the presence of predators, rather than chasing predators especially at night. These findings are in line with [13] arguments, that implementing two or more interventions which also matches recommendations from recent studies are more credible and that a single intervention rarely works for long.

This study found a positive relationship between the bomas size and the number of posts damaged, although the results were not significant at 95% confident level ($r = 0.2104, n = 36, p = 0.218064$). There is a statistically significant relationship between damaged posts and indigenous tree posts replaced in the three group ranches: OGR, MGR and KGR ($\chi^2 = 34.9331, df = 2, p = 0.00001$). It is therefore imperative for the PPBs with wooden posts to be upgraded with the recycled plastic posts to eliminate the regular replacement with the sparsely distributed indigenous trees. Kenya Wildlife Service (KWS) [18] points out that one of the key threats to the ecologi-

Table 1. Boma parts.

Boma part	Mean \pm S.E
Total No. of treated Wooden posts	48.33 \pm 2.214
Indigenous tree posts	4.19 \pm 0.508
No. of damaged posts around the boma	25.36 \pm 1.960
No. flattened drum doors	1.94 \pm 0.97

cal connectivity of the Amboseli ecosystem is loss of forest cover, with most parts having been turned into farms and peoples settlements. The full adoption of the recycled plastic poles will directly help to maintain the vegetation cover—a key component of livelihood for the community. In addition, recycled posts will complement carbon emission reduction project dubbed “energy saving jikos” that is ongoing in Amboseli ecosystem. It is important to note that Kenya forest cover of 6.99% of the land area is still below the constitutional requirement of 10% [19].

3.2. Community Attitudes and Perceptions

The respondents had varied opinions on the boma repairs, although majority (94.7%) were of the opinion that bomas need repairs. About 89% ($n = 32$) and 72% ($n = 26$) cited posts and doors respectively as parts that required maintenances. Only 2.78% of the respondents thought that the chain-link rolls needed repairs. A large proportion (94.44%) of those interviewed had seen and heard about the recycled posts, with 77.78% saying that they would recommend the posts for boma repairs and construction to their community members. Many of the respondents (66.67%) preferred the recycled posts because they are durable and termite resistant. The few (33.33%) who thought otherwise, termed the recycled posts as weak because they are “plastic”. This calls for a regular intensification of an awareness campaign to the community on the quality of the recycled plastic posts and perhaps a re-emphasis of the reduced cost share to 25% of the boma cost. This findings suggest that people’s attitudes toward wildlife conservation can significantly affect the success of conservation initiatives. Assessing and considering the factors influencing people’s attitudes could be critical in designing strategies to alleviate human–wildlife conflict. [20] emphasises that raising people’s awareness with the intention of making them realize the potential of the consequences of living, working or travelling in areas with carnivores is essential. This equips the people with knowledge about the environment and entails a preventive measure to reduce likelihood of attacks by adopting the right mitigation measures.

Although a small proportion of the respondents (14.89%) had lost their livestock to predators in the PPBs, this can negatively affect the people’s perception on the project. It is therefore critical to rectify the defects in the existing PPBs to prevent people from thinking that PPB are partially defective in deterring livestock predation at night. [13] argues that perceptions on HWC may shape expectations about proposed interventions. As such, interventions against HWC should not appear one-sided in addressing human behaviour, this can be seen as blaming the victim. Perception is shaped not only by the severity and frequency of losses, but by numerous social and biophysical factors relating to individual vulnerability and risk.

4. Conclusions

The PPBs made of wooden posts are still effective compared to the traditional bomas. However their current effectiveness are below those constructed using the recycled plastic posts. The effectiveness of the damaged wooden PPBs seem to be aided by the presence of dogs that help to reduce night livestock predations by alerting boma owners who sequentially scare the predator away.

The community have opted for the alternative “easy” source of posts from the sparsely distributed trees around their homesteads. This calls for a massive awareness on the long term impacts of extracting wooden poles from the ecosystem. This could be done together with the ongoing energy saving jiko projects that is aimed at reducing the wood fuel use by the community. Awareness and demonstration on the quality of the recycled plastic posts to counter the perceived weakness of the posts will equally be needed in winning the confidence of the community. In this way, the community will start seeing the association between recycling material and protecting the environment and how such a link can make a difference for people and the wildlife.

An open window period with a cost share less than 25% of PPBs repairs cost should be experimented to entice the old wooden posts PPBs owners to adopt the recycled plastic posts. This may necessitate making the boma to be “smart” through repairing the PPBs with recycled plastic posts and perhaps giving each household in PPBs “free” energy saving stoves for the purpose of saving the sparsely distributed vegetation in the project area.

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References

- [1] MEA (2005) *Ecosystems & Human Well-Being: Synthesis* (Millennium Ecosystem Assessment). Island Press, Washington DC.
- [2] FAO (2010) *Managing the Conflict between People and Lion. Review and Insights from the Literature and Field Experience*.
- [3] IUCN (2005) *Benefits beyond Boundaries. Proceedings of the Vth IUCN World Parks Congress*. IUCN, Gland, Switzerland and Cambridge, UK. Ix + 306 pp.
- [4] Sillero-Zubiri, C., Sukumar, R. and Treves, A. (2007) *Living with Wildlife: The Roots of Conflict and the Solutions. Key Topics in Conservation Biology*, 266-272.
- [5] Thirgood, S., Woodroffe, R. and Rabinowitz, A. (2005) *The Impact of Human Wildlife Conflict on Human Lives and Livelihoods*. In: Woodroffe, R., Thirgood, S. and Rabinowitz, A., Eds., *People and Wildlife: Conflict or Coexistence?* Cambridge University Press, Cambridge, UK, 13-26. <http://dx.doi.org/10.1017/CBO9780511614774.003>
- [6] Laurance, W.F. and Bierregaard, R.O.J., Eds. (1997) *Tropical Forest Remnants: Ecology, Management and Conservation of Fragmented Communities*. University of Chicago Press, Chicago.
- [7] Woodroffe, R., Thirgood, S. and Rabinowitz, A., Eds. (2005) *People and Wildlife: Conflict or Coexistence?* Cambridge University Press, Cambridge. <http://dx.doi.org/10.1017/CBO9780511614774>
- [8] Gurd, H. (2012) *Evaluating the Success of “Warrior Watch”: A Community-Based Conservation Initiative in Samburu, northern Kenya*. A Thesis Submitted in Partial Fulfilment of the Requirements of the Degree of Master of Science and the Diploma of Imperial College London.
- [9] KWS (2010) *National Conservation and Management Strategy for Lion and Spotted Hyena in Kenya (2009-2014)*.
- [10] BFF (2015) *Lion Conservation in Kenya*. <http://www.bornfree.org.uk/animals/lions/projects/lionconservation/>
- [11] Margoluis, R., Stem, C., Swaminathan, V., Brown, M., Johnson, A., Placci, G., Salafsky, N. and Tilders, I. (2013) *Results Chains: A Tool for Conservation Action Design, Management, and Evaluation. Ecology and Society*, **18**, 22. <http://dx.doi.org/10.5751/ES-05610-180322>
- [12] Salafsky, N., Margoluis, R., Redford, K.H. and Robinson, J.G. (2002) *Improving the Practice of Conservation: A Conceptual Framework and Research Agenda for Conservation Science. Conservation Biology*, **16**, 1469-1479. <http://dx.doi.org/10.1046/j.1523-1739.2002.01232.x>
- [13] Treves, A., Wallace, R.B. and White, S. (2009) *Participatory Planning of Interventions to Mitigate Human-Wildlife Conflicts. Conservation Biology*, **23**, 1577-1587. <http://dx.doi.org/10.1111/j.1523-1739.2009.01242.x>
- [14] Kusek, Z.J. and Rist, C.R. (2004) *Ten Steps to a Result-Based Monitoring and Evaluation System: A Hand-Book for Development Practitioners*. The World Bank, Washington DC. <http://dx.doi.org/10.1596/0-8213-5823-5>
- [15] Manoa, D.O. and Mwaura, F. (2016) *Predator-Proof Bomas as a Tool in Mitigating Human-Predator Conflict in Loitokitok Sub-County, Amboseli Region of Kenya. Natural Resources*, **7**, 28-39. <http://dx.doi.org/10.4236/nr.2016.71003>
- [16] Potgieter, G. (2011) *The Effectiveness of Livestock Guarding Dogs for Livestock Production and Conservation in Namibia*. Master’s Thesis, Nelson Mandela University, South Africa.
- [17] Ocholla, G.O., Koske, J., Asoka, G.W., Bunyasi, M.M., Pacha, O., Omondi, S.H. and Mireri, C. (2013) *Assessment of Traditional Methods Used by the Samburu Pastoral Community in Human Wildlife Conflict Management. International Journal of Humanities & Social Science*, **3**, 292-302.
- [18] KWS (2008) *Amboseli Ecosystem Management Plan, 2008-2018*.
- [19] GoK (2015) *Draft National Forest Policy, 2015*. Ministry of Environment, Water and Natural Resources.
- [20] Paris, R. (2006) *Wilderness Awareness Training Course for CIRAD Hwange Programme*. Harare.