Exploring human-wildlife interactions in agro-systems of northern Botswana

SASSCAL Task 314_2_Biodiversity

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Introduction

Humans and wildlife interact regularly as they share the space that provides life providing resources such as forage and water (Treves et al. 2006, Ogutu et al. 2017). Because of the increasing spatial and temporal scarcity of the resources as influenced by natural and anthropogenic factors such as land use, climate variability (droughts, floods, heat waves), diseases and human settlement expansions competition for these resources also intensifies and leads to serious conflict between people and wildlife (Redpath et al. 2013). In countries with high wildlife populations such as Botswana and Zimbabwe (Chase et al. 2016), the human-wildlife conflict is currently a major threat to wildlife conservation and sustainability of livelihoods of many local communities in the southern African region. Conflict reverses conservation efforts by eliminating wildlife species that damage crops, depredate on livestock or pose a threat to people's lives. Further, the damage caused by wildlife on crops, livestock and other properties deepens the economic hardships faced by farmers and contribute to despair, resentment and abject poverty among local communities. (Hoare 1999, 2000; Thirgood et al. 2005) Paradoxically, the tourism industry is booming in countries with wildlife and questions arise as to what cost-benefit sharing models are in place (Mbaiwa 2005), what are underlying causes of the conflict, and what mitigations are in place or can be developed to minimise the impact of human-wildlife conflict, which if not addressed urgently will weaken the efforts of local communities to adapt to climate change. Our project aimed to establish a greater understanding of the benefits and costs of human-wildlife interactions as influenced by land use, socio-economic and traditional knowledge and practices of small-scale farmers in northern Botswana.

Specific objectives

1. To determine the spatio-temporal intensity and distribution of carnivore-livestock depredations in eastern Makgadikgadi Pans.
2. To analyze the socio economic effects of crop-raiding by wildlife on crop production and farmers livelihoods and explore alternative viable economic options that can mitigate against hardships caused by crop raiding.
3. To investigate and analyze adaptive and innovative mitigation strategies employed by the farmers against crop and livestock depredations by wildlife
4. To determine causes and drivers of wildlife poaching, and the influence of CBNRM in reducing wildlife poaching in northern Botswana.

Table 2. Farmers' list of animals causing the most damage to their crops

	N	%
African elephant *(Loxodonta africana)*	119	100.0
Black backed Jackal *(Canus mesomelas)*	86	72.3
Cape porcupine*(Hystrix fricaeaustralis)*	62	52.1
Common duiker *(Sylvicapra grimmia)*	33	27.7
Vervet monkey *(Chlorocebus pygerythrus)*	16	13.4
Hippopotamus*(Hippopotamus amphibius)*	6	5.0
Greater kudu*(Tragelaphus strepsiceros)*	5	4.2
Total	327	274.8

Table 3. Proportion of farmers using modern methods

Adoption behaviour	Frequency	%
Chilli pepper	268	69.0
Beehive fence	1	0.3
Chilli pepper and beehive fence	2	0.5
None	117	30.2
Total	**388**	**100.0**

Materials and methods

The project was carried from 2013-2017 in northern Botswana in the eastern Okavango pan-handle (*Seronga, Eretsha, Gunotsoga, Beetsha and Gudigwa*), Makgadikgadi (*western Gweta, and Khumaga*) and Chobe region (*Mabele and Parakarungu*). Quantitative and qualitative methods were used to collect and analyse the data. While primary data were obtained through use of GIS, field observations, household interviews (semi-structured questionnaires), key informants (interview schedules) and focus group discussions; secondary data were sourced from relevant government departments (e.g. Department of Wildlife and National Parks, Ministry of Agriculture) and other sources (e.g. libraries

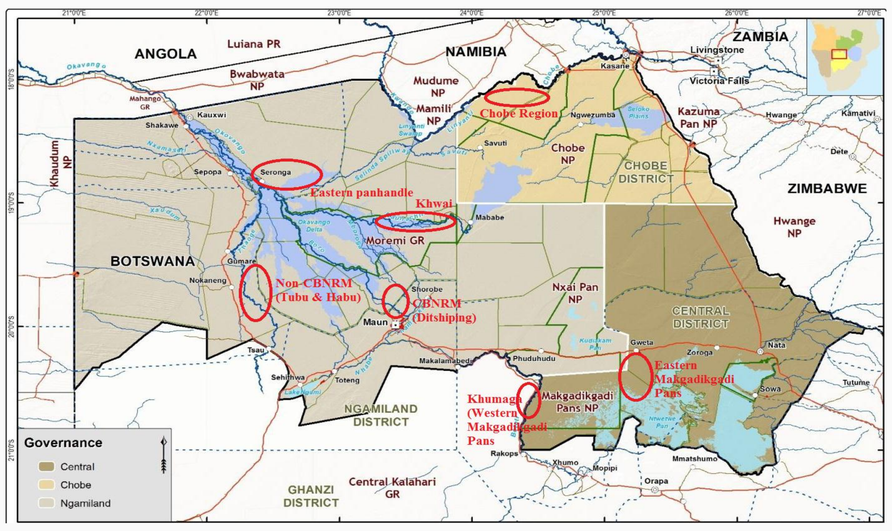


Figure 1. Study Area with study sites indicated with red circles (Map adapted from KAZA IDP 2011)

Results

1. Wild carnivore-livestock depredation

Lion depredations on livestock (particularly cows) are concentrated closer to park boundary (though p >0.05 NS), whereas those of leopard and wild-dogs are higher very far (>40 km) from the park boundary. There was a significant difference in livestock depredations between carnivore types (lion, leopard and wild-dog) ($\chi 2_{(2)} = 178.24$, $p < 0.05$). Lion was the predominant predator of livestock with over 69% (n= 397) of the depredation incidents attributed to it. With the exception of lion, depredations by leopard and wild dog differed significantly with distance from the protected areas ($\chi 2_{(4)} = 124.10$, $p < 0.05$) (Figure 3). Farmers reduced carnivore-livestock predations by herding their livestock, mostly cattle, during day-time and kraaling them at night (Table 1).

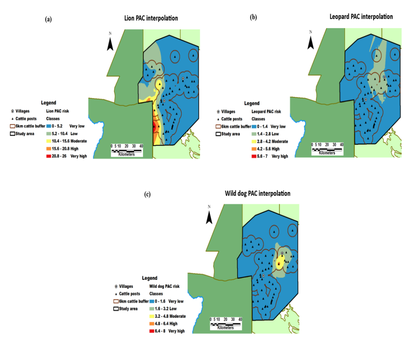


Figure 2. Distribution and spatial risk maps interpolated from number of livestock killed by (a) lion, (b) leopard and (c) wild dog for a period of five years from 2008 to 2012.

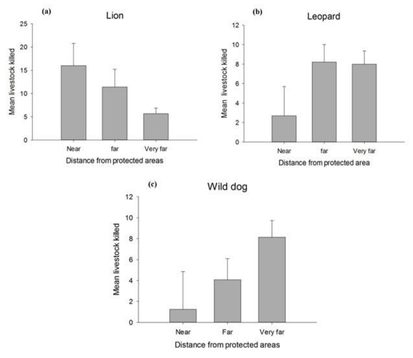


Figure 3. Influence of distance in the number of livestock killed by lion, leopard and wild-dog

Table 1. Traditional mitigation practices by livestock farmers in eastern Makgadikgadi

Husbandry Practices	Control(Pro-active) Measures
Herding livestock	Traditional medicine/craft
Building strong wooden kraals	Snares and traps
Use guarding dogs	Shooting predators to kill or scare

2. Crop damage by wildlife

Elephant was the frequent crop-raider and most destructive wildlife species in all the study sites (Table 2). Crop damage ranged from 0-100% of the total area planted, amounting to a loss of about US$53,000 in one cropping season. Arable farmers used scare-crows and chilli-pepper to deter wildlife from entering and damaging their crops. Carnivores, such as black backed jackal also fed on farmers water-melons. In all the study sites, farmers used mostly chilli pepper to ward off elephants which are known to be sensitive to capsicum smell (Table 2). Beehive were used by a small number and Although farmers are given monetary compensation by government the compensation rate was said to be lower than the market value of the damaged crops or predated livestock

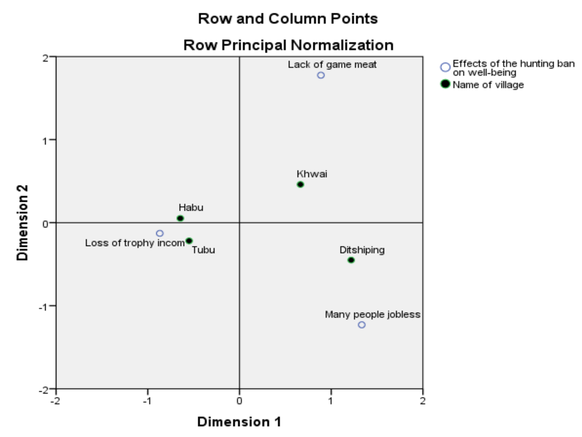
Table 4. perceptions of farmers on consequences of crop damage by wildlife

	n	%
Loss of food leading to poverty	19	16.0
Lack of food due to abandonment of molapo farming	100	84.0
Total	119	100.0

Wildlife poaching

Both CBNRM and non-CBNRM communities indicated that subsistence poaching was generally lower in CBNRM than in non-CBNRM areas because of the protection and the benefits enjoyed by the community.

Hunting ban was perceived to be triggering subsistence poaching (93% of the respondents).



Conclusions and Policy Implications

- Mitigation measures should be carnivore specific
- Identify high-risk areas over a regional landscape to inform mitigation strategies on distribution and movement of predators and livestock.
- Integrate risk models into multi-species EWS to enhance preparedness by various key stakeholders.
- Introduce CBNRM for eco-tourism for settlements near protected areas.
- Farmers should encouraged to graze and water their livestock far (>40km) from park boundaries. Otherwise invest in herding livestock (through training of herders and improving wages), in building strong kraals, and promoting mitigation-development research.
- Support further research on elephant distribution and movements, that also identifies corridors and critical resource sites, and encourage farmers not to farm within identified corridors and hotspots.
- Support research and initiatives that identify and promote effective and locally-informed mitigations (priority on repellents using locally available materials). Local production of materials used in mitigation efforts should be encouraged.
- Support research and investment in conservation agriculture, use of early-yielding seeds, community fencing, and farmers' capacity to use mitigation measures.
- DWNP should review its monetary compensation policy, with the view to delegate its management and payment to communities engaged in CBNRM.
- Review the national and SADC/KAZA elephant management policy with the view to keeping elephant numbers within LAC and within their range.
- Farmers to continue using a combination of non-lethal mitigation techniques to ward off elephants and problem-causing animals from their fields.
- Promote CBNRM in all communities living with wildlife in Botswana and KAZA to facilitate revenue generation, improve livelihoods and reduce poaching.
- Review CBNRM for purposes of addressing emerging issues (*loss of income, alienation, loss of game meat, top-down decision making, increased elephant population*).

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Acknowledgements