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Human-Wildlife Conflicts: Causes and Mitigation Measures in Tsavo Conservation Area, Kenya

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Abstract: ***Conflicts between people and wildlife currently rank amongst the main threats to conservation in Africa. In Kenya, for instance, with much of the wildlife living outside protected areas, one of the real challenges to conservation is how to enhance and sustain co-existence between people and wild animals. It is undoubtedly evident that the expansion of the human society has forced people to infringe on wildlife habitats and convert land to other uses incompatible with wildlife. Human-wildlife conflicts negatively impact on the humans and wildlife alike. An understanding of how the people and conservation agents deal with the problem of wild animals is critical in evolving and establishing sustainable conservation systems. This article presents and analyses data from case studies of human-wildlife interactions in Tsavo Conservation Area (TCA) in Kenya. A survey was conducted among households sampled within and adjacent to the TCA. The study investigated the causes and mechanisms and strategies applied to mitigate and manage human-wildlife conflicts and provide long-term solution to the prevalent resource use conflicts around and within TCA. The findings suggest the need to address the issue of human-wildlife conflict in the context of sustainable conservation practice through a combination of indigenous and conventional rationales to demonstrate that wildlife can co-exist with people.***

Keywords: Protected area, compensation, problem animal, mitigation

1. Introduction

Conflicts between humans and wild animals occur when either the need or behaviour of wildlife impact negatively on human livelihoods or when the humans pursue goals that impact negatively on the needs of wildlife. The Kenya Wildlife Service (KWS, 1995) considers human-wildlife conflicts to include the contentions relating to destruction, loss of life and property, and interference with rights of individuals or groups attributable directly or indirectly to wild animals.

Human-wildlife conflicts are prevalent in Africa where large numbers of big mammals such as elephants and lions still roam freely in marginal rangelands and protected areas. The increase in human population has resulted to encroachment into more marginal lands inhabited by wildlife, leading to fragmentation and conversion of land, for instance, to settled agriculture and other uses incompatible with wildlife. These, as Kangwana (1993), Conover (2002) and Okello *et al.,* (2003) contend does not only escalate conflicts between the people, wildlife, and the authorities responsible for the conservation of wildlife, but also pose a real challenge to sustainable wildlife conservation practice. In Kenya, for instance, where much of the wildlife live outside designated protected areas, Western (1995) observes that the people who live in these areas depend more on natural resources and find it difficult to tolerate wild animals in their lands when they consider them a threat to their lives and livelihoods.

The main wildlife problems in the Kenyan rangelands are crop damage, competition for water and grazing, livestock predation, increased risk of some livestock diseases, various inconveniences such as when protecting crops, and even human fatalities (KWS, 1992; Norton-Griffiths, 1996; Campbell *et al.,* 2000; Muruthi, 2005). Additionally, wildlife conservation strategies restrict the peoples' access to and use of the natural resources. Where such conflicts compromise the people's livelihoods, and solutions to conflicts are not adequate, it reduces and erodes their local support for conservation efforts (Mulholland and Eagles, 2002). The wild animals, many of which are already threatened or endangered are often killed in retaliation or to prevent future conflicts.

Practical mitigation of human-wildlife conflict is critical to the success of conservation in Tsavo conservation Area (TCA) and wildlife conservation in Kenya in general. Dozens of mechanisms and strategies have been initiated in an effort to reduce and manage human-wildlife conflicts and provide long-term solution to the prevalent resource use conflicts around and within TCA. However, there has been an increase in the human-wildlife interface problem, with serious consequences for sustainable conservation practice. Concurrently, the traditional strategies for resolving these conflicts that have existed in African communities have gradually eroded. The extension of the designated protected areas and forced evictions and restrictive access to resource use by local communities from the area coupled with incompatible land use practices have further exacerbated the problem.

Lessons learnt from the African Wildlife Foundation (AWF) heartlands (Muruthi, 2005) elicit two basic approaches of managing human-wildlife conflicts: prevention and mitigation. Preventive measures are the ones that can prevent or minimise the risk of conflicts arising between people and animals and include the extreme one of completely removing either the people or the animals, physically separating the two by the use of barriers, and employing a variety of scaring and repelling tactics. Muruthi (2005) further observes that although prevention is clearly the best option, at times reactive approaches are required after human-wildlife conflicts have occurred. The main approach here is

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mitigation known as Problem Animal Control (PAC), most often undertaken by the responsible wildlife authority. The "problem animal" can either be killed or captured for translocation.

A rather different approach to dealing with conflicts between local communities, wildlife and conservation authorities involves changing the attitudes of affected communities to wildlife and the conservation institutions (Western, 1989; Adams and Hulme, 2001; Mackinnon, 2001; Muruthi, 2005). This can be achieved by ensuring that the affected communities and individuals are active participants in, and enjoy tangible benefits from, wildlife management. Such initiatives, according to Hulme and Murphree (2001) and Mulder and Coppolillo (2005), may include education programmes, consolation payments and broader sharing of benefits associated with the presence of wildlife.

The Kenya Wildlife Service (KWS) implements a scheme for sharing revenue generated from park entrance fees with neighbouring rural communities as a way of encouraging those communities to take part in wildlife conservation (Leakey, 1990). The funds provided are channeled to local community level benefits, such as the construction of amenities like hospitals, water supply, cattle dips and classrooms for schools (KWS, 1992). This is another potential source of conflict for, as KWS (1995) observe, there is lack of transparency in actually constituting equitable distribution of wildlife benefits. For instance, Sindiga (1999) indicates that while provisions are made for a part of wildlife revenue to go to local communities in Kenya, KWS is given authority to meet its financial needs first, thus making implementation almost impracticable. Similarly, Muruthi (2005) also contends that it is open to question whether such benefit sharing programmes affect attitudes of affected communities to co-exist with wildlife. Additionally, the Kenya Wildlife Act provides for compensation to landowners who support wildlife on their land and for properties destroyed by wildlife (WCMA, 1976; KWS, 2004). The compensation may only be obtained for loss of life or personal injuries. No compensation is claimable where the injury or death occurred in the course of an unlawful act by the person concerned or in the course of normal wildlife utilisation activities. The compensation amount for loss of human life or injury by wildlife in Kenya according to Sindiga (1995) is usually insufficient or not proportional to the loss. Moreover, Campbell *et al.* (2000) note that the policy of non-compensation for individual losses and damage to property, such as predation of livestock or destruction of crops, goes against the demands of conflict prevention.

1.1 Objectives of the study

The broad objective of this study was to investigate human and wild animals' interactions that perpetuate human-wildlife conflicts in Tsavo Conservation Area (TCA) and adjacent areas in Kenya and suggest practical strategies of curbing and mitigating these conflicts. The study examined the type, nature and intensity of human-wildlife conflicts by identifying the resources that the local people seek in the protected areas and the damage caused by wild animals outside the protected areas and how they impart on the peoples' livelihoods.

2. Materials and Methods

2.1 Data collection

The research data was collected between March and September, 2011. A preliminary study which included a literature survey, initial site visits and discussion with local residents and conservation agents for purpose of familiarisation was conducted to get insight into the research problem.

A standard questionnaire was used to collect primary data from the respondents living around the TCA. The questionnaires included fixed-response questions on local conditions, cultural and socio-economic characteristics of the local communities including distance from the protected area boundary, human-livestock-wildlife interactions, and resource use and tenure patterns. Open-ended questions were included to elicit more extensive discussions of some of the issues raised. These included perceptions and attitudes towards the conservation institutions (experiences with wildlife, level of community involvement, relationship with the conservation authorities and their suggestions for mitigating structures on human-wildlife conflicts) in the TCA.

A set of structured questions was developed for the key informant interviews, basically with KWS personnel and other resource persons, including government and non-governmental officials. Case studies on selected schools, irrigation farmer's schemes and private ranches in the study area were also undertaken. General observations were made of fields damaged by wild animals and human activities inside the protected areas. Informal conversations with key informants in villages were also undertaken when the opportunity arose.

The study population was the total number of households within and adjacent to the TCA (Figure 2). The population was stratified into six study areas that include Makindu, Chyullu/ Mtito Andei (Kibwezi), Voi, Taita, Taveta, and Rombo/ Kuku (Loitokitok). In total, 347 households were randomly sampled from the local residents (at the household level) living within and adjacent to the TCA. Conceptually, these were the local people directly affected by the TCA or whose activities directly impacted on the TCA. The unit of analysis was the individual household, with the head of the household, or a representative responding to the questionnaire.

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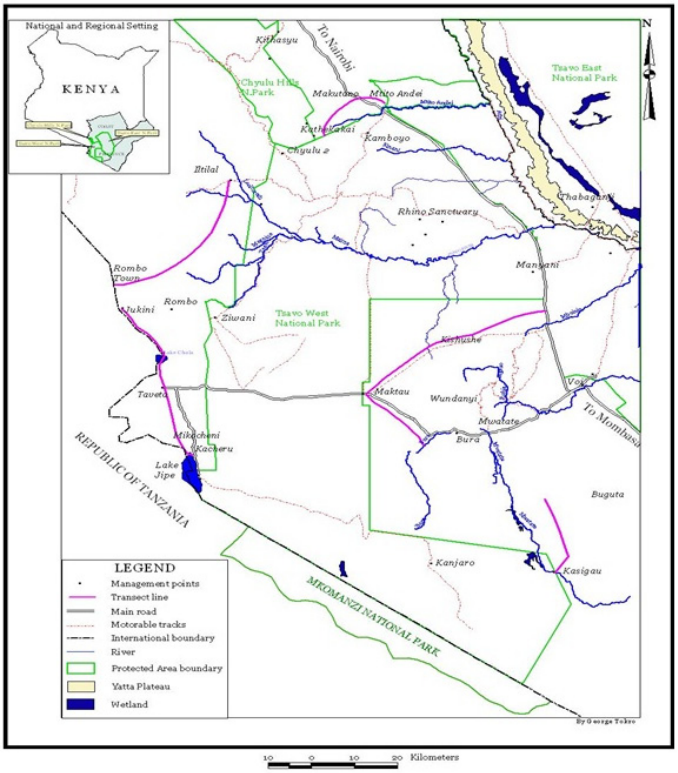

Figure 1: Map of Study Area. Source: Kenya wildlife service, (2011) GIS department

2.2 Data analysis

The data from both primary and secondary sources was processed and analysed using the Statistical Package for the Social Sciences (SPSS) version 11.5. Both descriptive and analytical procedures were used in data analysis. The analyses were done to determine the relationship between variables and assess their potentiality in causing conflicts and how they impart on the peoples' livelihoods as well as examine the effectiveness of the approaches in place to prevent and mitigate for the conflicts.

3. Results

3.1 Household Characteristics

The mean distance from the TCA to the households surveyed was 6.9 km, while the nearest household to the TCA boundary was 0.1 km and the furthest household was 37 km. Majority of the households (32.9%) were located within one and three kilometers from the TCA boundary, while 15.3% of the households were located 0.99 km from the TCA boundary (Table 1).

Table 1: Distance from the households to the TCA boundary

Distance in Km	*Frequency*	*Percent*
0-0.99	53	15.3
3-Jan	114	32.9
6-Apr	68	19.6
9-Jul	30	8.6
12-Oct	32	9.2
13-15	5	1.4
16-18	5	1.4
19 and above	40	11.5
Total	347	100

The common type of land tenure in the surveyed area was where the households owned the land without title deeds (57%), followed by households that owned the land communally (18%), and then those who owned the land with title deeds (16%). The rest of the households either had borrowed the land (1%), leased the land (1%) or were squatters on the land (6%). Majority of the households (68%) owned land of less than 12 acres. Households that owned land ranging between one and 3.99 acres were 25%, while 21% of the households owned land between four and 6.99 acres, 11% owned land ranging between seven and 9.99 acres, and 11% owned land in the range of 10 to 12.99 acres.

3.2 Communities' livelihood systems

The communities identified four different types of livelihood systems that they were engaged in. These included agro-pastoralism (or mixed farming, where livestock are kept together with crop growing), farming (crop farming alone) pastoralism (keeping of livestock only), business and other non-classified livelihood options. Majority of the households (41%) practiced agro-pastoralism, while 34% practiced crop farming, 12% pastoralism, 10% business and two percent other activities.

3.3 Nature of Human-Wildlife conflicts

Two types of conflicts were found to exist in the TCA and adjoining community owned areas. They include:

a) When the people and their livestock move into the TCA to access the resources that they need and lack in their areas.
b) When wild animals disperse from the TCA into the community land either to feed on their crops or on their normal migrations to their feeding or breeding areas.

Most of the time the animals either do one or more of the following;

i) injure or kill people,
ii) eat or destroy crops on the farms,
iii) kill or injure livestock,
iv) transmit diseases or disease causing parasites to livestock, and
v) utilise the grazing resources meant for community livestock.

Majority of the respondents (59%) reported that the nature of conflicts between humans and wildlife to be serious, while 40% reported that the nature of the human-wildlife conflict to be very serious. Generally all the districts are equally affected. Majority of the households (38%) reported that the conflicts occurred often, while 28% of the respondents reported that they occurred very often and 33% of the respondents reported they occurred moderately often. The respondents reported various properties that the wild animals use and destroy in their farms. These included 64.8% farm produce, 28.8% livestock, 4% water structures and 2.3% fencing structures.

3.4 Grazing livestock in the park

Seventy two percent (72%) of the households reported that they do graze their livestock in the TCA. Most of the grazing in the TCA is done in the dry season compared to the other

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times of the year. In the wet season the movement is minimal with 42% of the farmers declaring that they never take their animals to the TCA.

3.5 Commodities sought for by the people in the TCA

The commodities sought for by the farmers in the TCA include pasture, water and salts for their animals. Pasture was sought for by 75% of the respondents, while water was sought by 32% of the respondents and salts by 4% (Table 2).

Table 2: Commodities sought for by farmers for their livestock in the TCA (multiple responses)

Commodity	*Frequency*	*Percent*
Pasture	261	75.2
Water	111	32
Salts	14	4

The communities identified twelve other commodities that they seek from the park (Plate 1 and 2). These included grazing, water, charcoal, building materials, game meat, herbal medicine, wild vegetables/fruits, wood for carving, game trophies, mining/minerals, *Cartha edulis* (miraa) and farmland used mainly for growing *Cannabis sativa* (bhang). Majority of the respondents (99%) confirmed that wild animals do move into their farms.

Plate 1: Cattle drinking water inside the park (source KWS, 2009)

Plate 2: Poachers arrested by KWS Rangers with bush meat inside the park. (source KWS, 2009)

3.6 Conflicts Hotspot Areas

From the key informants interviews and focus group discussions, the participants were asked to name and locate the areas where most of the conflicts occur within the study areas. The areas were marked and located on a map of human-wildlife conflicts (Figure 2). The map shows the human-wildlife conflicts hotspots (or areas where a lot of conflicts occur). The hotspots are located outside the park boundaries, confirming what the survey found out that 98% of the respondents had encounters with wildlife in their farms or living areas.

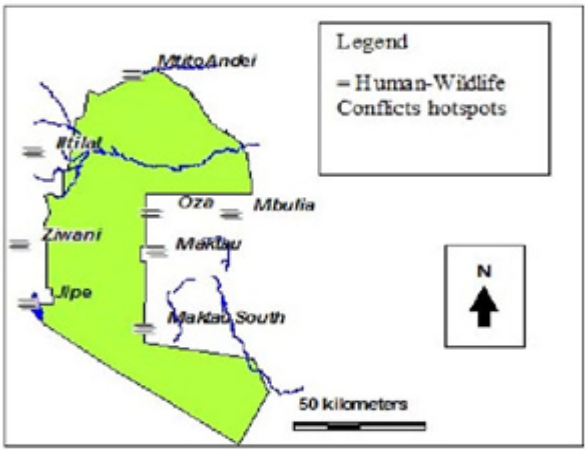

Figure 2: Hotspots areas where human wildlife conflicts occur

Twelve different types of wildlife were reported to commonly visit the community farms. Elephants were reported by 97% of the farmers, Monkeys by 91%, Baboons by 83%, Buffaloes by 71%, Hyaenas by 61% and Lions by 26% of the farmers. The Monkeys, Baboons and Hyaenas frequented the farms throughout the year, while the Elephants, Buffaloes and Lions mainly visited the farms in the dry season. The wild animals frequent the farms owned by the communities to seek for food, water and salts. Majority of the farmers (92%) identified food as the main reason the wild animals moved into the community farms. During the dry season the wild animals may leave the TCA area to look for water also, which may be scarce at this time of the year. The animals were found to significantly ($p \leq 0.05$) always visit the farms in the dry season and rarely in the wet season, when they move back to the TCA (Table 3). Majority of the animals once in a while frequent the farms all year round.

Table 3: Frequency and season of animal visit to farms and $\chi 2$ statistics

	Season (Percent)		
Frequency	Wet	Dry	All year round
Always	23	59	24
Often	40	37	29
Once in a while	8	3	39
Rarely	4	1	7
Very rarely	25	0	0
Never	0.3	0	1
$\chi 2$	245.109	199.745	269.545
df	5	3	4
p- value	0.001	0.001	0.001

n=347

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4. Strategies of solving human-wildlife conflicts in TCA and adjacent areas

4.1 Indigenous strategies

The surveyed communities identified several different methods they traditionally used to control wildlife menace. The methods included making noise using objects especially metal objects, scarecrows (Plate 3), burning of hot pepper, use of fire, burning of cow dung, use of dogs, use of spears, use of traps, burning of rubber and killing animals using arrows.

Plate 3: Homestead surrounded with scarecrows

4.2 Conventional strategies

The majority of the famers used the method of "reporting to KWS officials" as one of the methods of controlling human-wildlife conflicts for most of the animal species followed by making noises with metal objects, keeping vigil and chasing the animals.

4.3 Effectiveness of the wildlife control measures

Majority of the respondents (29%) felt that fencing off the wild animals was a very effective control measure, followed by control of the wild animals by KWS (25%), educating the communities and creating awareness (21%), eliminating rogue animals (20%), translocation of animals (20%), community social responsibility (16%), building livestock enclosures (15%), using traditional methods (11%), and finally digging of trenches (5%).

4.4 Community recommendations to KWS to minimise wildlife problems in order of priority

Majority of the farmers (43%) voted the use of electric fencing (Plate 4) as their priority number one in minimizing wildlife problems, while 27% of them voted provision of security as priority number one, and 16% voted having ordinary fences as priority number one in their recommendation to KWS.

Plate 4: Irrigated farm with electric fence

5. Discussion

The more closer the households and farms are to the TCA boundary, the more the conflicts between the humans and wildlife and this warrants special attention in designing mitigation measures. The influence of wildlife on the households is not limited to the areas next to the TCA but is vast up to 37 kms. This is due to the fact that wildlife do migrate long distances in search of food and home ranges. The households in Makindu and Kibwezi districts were found to be closer to the TCA boundary.

The household livelihood systems have implications on human-wildlife conflicts and in the use of the resources within and outside the TCA as the majority of the people (87% of the households) are engaged in activities that compete directly with wildlife. Agro-pastoralism, pastoralism and crop farming are livelihood systems that rely on the natural resources for them to be sustainable and also they result in perennial conflict with wildlife, and between pastoralists and farmers.

The shift in land tenure systems towards consolidation and individualization in the area where many wildlife areas and communally owned lands have been sub-divided into smaller individually owned farms and settlement schemes has altered access to water and grazing areas for the pastoral people. This has intensified competition and conflicts from the different land users.

Where and when the respondents took their animals to the TCA in the dry season, would cause conflicts in that this is also a time when the TCA is pressed to provide for its wild animals for water and food. The commodities sought by the communities in the park are also needed by the wild animals in the TCA and this creates competition causing conflicts.

The results show the magnitude of the wildlife problem to the farmers and the resulting conflicts that arise. The whole scenario can be summarized as follows:

a) Throughout the year the farmers have wild animals feeding on their crops. These include Baboons and Monkeys, which feed on their crops, while the hyaenas are eating their animals.
b) During the dry season they have to deal with animals on their crop and predators on their animals. These include Elephants, Buffaloes, lions and Hyenas.

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c) The grazing animals (mainly buffaloes and wildebeest) which frequent the grazing areas of the community throughout the year utilise the communities grazing and water resources creating a competition for the same.
d) The wild animals directly and/ or indirectly transmit diseases to the domestic animals.

The two major examples are;
1) The wildebeest carry the virus that causes malignant catarrh fever, and they pass the disease to cattle.
2) The buffaloes and other wild animals also carry ticks which transmit tick borne diseases to cattle, such as the East coast fever, Anasplasmosis, and Babesiosis.

This implies that the conflict/ problem is mainly throughout the year and involve different species of animals. This has the following socio-economic damages; loss of crops, loss of animals, loss of income from disease control and treatment, loss of grazing resources, loss of finances in animal control facilities, loss of water facilities and farm structures, loss of human life and injuries and inconveniences in protecting their property.

The problems caused by wild animals to schools can be divided into two main categories; the first group includes the problems that affect the schools directly and the second one includes the problems that affect the schools indirectly. The common problem affecting many pupils is the disruption of the school programmes by the elephants. The pupils have reduced contact hours and this affects their learning and performance in the national examinations.

Schools in the three district surveyed had not received any compensation for the crops, trees or the structures that had been destroyed by wildlife. Few schools reported that they had received some benefits from the wildlife fund. The Kenya wildlife service (KWS) had provided desks and water tanks to some schools and in other instances sponsored some selected students to visit the parks accompanied by their teachers at no cost. The respondents indicated that the benefits received from KWS to schools were inadequate compared to the damages caused by the wild animals. One school had received 30 desks, while another had received 40 desks.

6. Conclusion and Recommendations

The following were suggested (recommended) by the respondents as remedies to wildlife menace.

i. Enclosing the wild animals in the conservation area
This suggestion was popular with many farmers mentioning it. They suggested that the animals be fenced inside the TCA using an electric fence.

ii. Compensation for damaged property and human injuries
The respondents suggested that compensation be done by the KWS (who the people believe own the animals) for all the damaged property and human injuries. They believed the improved compensation will change the negative attitude of the people towards the wild animals. The following suggestions relating to the compensation for property were advocated:

- Compensation be done quickly, and not delayed.
- The procedure of compensation be shortened (less cumbersome).
- Compensation be done for crops and trees.

iii.KWS to be more vigilant in control and managing their animals
Many respondents advised the KWS to be more vigilant in their management of the animals. The following were specifically suggested;

- Monitor the movement of the animals all the time, so as to be sure that the animals are not moving outside the TCA.
- Station game rangers within the hotspots so that they can guard the people and control the animals effectively.
- Respond quickly when called. Provide a hot line that can be used by the communities in times of emergency.
- Employ the local population as Rangers in KWS.
- Search stray animals without delay.

iv.KWS to provide water to the animals
Most of the animals causing problems to the people invade the farms to look for water especially during the dry season. The people felt that if the animals were provided with water within or outside the TCA, the human-wildlife problem could be minimised.

v. Provision of wildlife benefits to the schools or the people
The KWS could also provide direct and indirect benefits to the areas affected by the wildlife menace. The benefits suggested included:

- Provision of school fees to pupils in the schools affected.
- Community development projects such as schools, hospitals, and infrastructure.
- Provide desks and other learning materials

vi.Educate the communities and create environmental conservation awareness
Educate the communities on wildlife conservation issues and also how to control wild animals. Create awareness on the economic advantages of wildlife found within the TCA. This objective can be accomplished by taking people to the parks, teaching in schools, use of videos and photographs.

vii. Quick response by KWS during emergency
KWS to respond quickly to an emergency by:

- Providing an ambulance in the local health centres
- Providing anti-snake venom in dispensaries

viii. Provision of transport
Provide transport to and from school for pupils that are affected.

7. Acknowledgements

We would like to acknowledge the dedicated and courageous efforts of the authorities and the conservation community in the Tsavo Conservation Area. It is as a result of their work that the conservation of the rich biodiversity in the area is enhanced still today. Despite the difficulties and challenges to the protected area rangers, wardens and the local communities, their efforts have helped to achieve conservation impact.

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