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Human-Elephant Conflicts in Coffee Based Agroforestry System in Mudigere Taluk Chikamagalur District Karnataka

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ABSTRACT

In India, the Asian elephant population is surrounded by human settlements and industrial installation and it is more or less look like island populations and hence, the physical space available to human and Asian elephant emerged as a major issue. Humanelephant conflict has often been an issue for many people in Asia and Africa, endangers people's lives, livelihoods and rural communities and drives loss of habitat and reductions well into the elephant population. The human and Asian elephant conflict study in Mudigere Taluk. In which ecological, cultural, sociological and religious influences combine to build for all involved parties a dynamic, deeply felt and potentially harmful variation. Recognizing the nature of the problem at hand, conflict resolution calls for a mixture of adaptive management strategies based on three elements: Elephant ecology and behavior patterns, spatial and temporal site-specific strategies determinants of conflict rather than density based indicators such as the number of people and elephants living together and the human sociopolitical and economic.

Keywords: Human-elephant conflict, Agroforestry, Management strategies, Mitigation

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INTRODUCTION

Human destruction into natural habitat is one of today's most important problems for the survival of Asian elephants. As a result of an increasing human population and its drive to a greater quality of life, the elephant is endangered by habitat destruction and fragmentation. Elephant reserves are being destroyed for purposes including the development of agriculture, human settlement and deforestation. In Asia, the elephants have lost so much of their former habitat that they are forced to attack the populations that destroyed them, resulting in escalated clashes with man. Conflicts occur between humans and animals where both coexist.

Human pressures on elephants triggered by deforestation and resource dispute and attempts to modify the impact of elephants on vegetation and crops are widely documented throughout Africa and Asia (Sukumar 1991, 2003). Conflict between humans and elephants refers to a number of overt and indirect adverse encounters between people and elephants that could affect both. Elephants must scarify the earth again to feed on the small grasses since

domestic animal are grazed. In such circumstances are caused by elephants diverting to peripheral forests or by their outward movements to agricultural fields, which usually lead to grain depredation. This has created man-elephant conflict in elephant habitat.

The Gaja Shastra (6^{th}-5^{th} century BC) and ancient literature allude to crop raiding by elephants. Gazetteers give numerous instances of entire villages being abandoned due to the ravages of elephants and other animals The conflict between elephant and human is a two ways process. Elephants damage man's crops and kill people; man has reduced or altered the elephant's natural habitat, captured them for domestication and shot them for their valuable tusks or sports (Sukumar 1992). The increasing level of human elephant conflict causing economic losses to the fringe villagers are the major threat to erode the public support for the conservation of Asian elephant in Mudigere Taluk.

By comparison, in vulnerable areas, more than two thirds of Asian elephant populations occur (Sukumar 1992 and 2006), human-elephant dispute faces a common, complicated and intractable conservation problem and represents a significant danger to elephants across their range. Lack of forage in the forest corridors will attract elephants to the nearby agricultural lands, generating clashes between humans and elephants (Sukumar 1992, 1990, 2008, Baruaet al. 2013). However, human-elephant clashes in South India are more severe and have become a significant conservation concern. Karnataka is home to 6049 wild elephants (Elephant Census 2017), which is about 30% of the world's elephant population. Around 2000 and 2019, in India more than 1150 people and 370 elephants died as a result of conflictand in that 04 are recorded in Mudigeretaluk.

Krishnan et al. (2019) worked on "Distribution and Habitat Use by Asian Elephants (Elephasmaximus) in a Coffee-Dominated Landscape of Southern India". This study suggests that the knowing the effect of land-use mosaics on the distribution of elephants and habitat changes is central to their survival in modified ecosystems. Study in 205 villages covering 610 km2 of plantation–agriculture–forest mosaic of divisions Hassan–Madikeri in Southern India, an region of extreme encounters between humans and elephants. We tracked the movement of elephants, crop damage accidents and human injury on a daily basis over a 2-year period (2015–2017) to identify the patterns of migration of elephants across the countryside and habitat-use trends, culminating in 1,117 GPS coordinates across six main ecosystems. Elephants were spread across the region throughout the first year, but a high concentration of locations was observed during the second year in the Northern part of the study area due to the fall of trees and the construction of barriers around coffee plantations, which triggered an overall change in distribution. Studies into elephant habitat use showed that elephants favored monoculture shelters of acacia, eucalyptus and tree fragments during the day, ignoring rivers, food, roads and dwellings. At night, farm land was used more regularly when traveling between shelters relative to fragments of woodland and habitations. During the dry and rainy season, fragments of the forest and agriculture were used considerably more. The use of monoculture shelters and coffee has increased over the years with a related decline in the use of wood fragments and agriculture. Retention of monoculture refuges in areas devoid of forest environments to provide protection for elephants and encourage free travel through open ecosystems will help to reduce human-elephant conflict and foster coexistence in these land-use mosaics. The main objectives of the present study are secondary data collection on human elephant confliction, mapping of conflict zones around the MudigereTaluk and mitigation measures taken to address the human-elephant conflicts issue.

MATERIALS AND METHODS

Study area

Mudigere Taluk is bounded by Chickmagalur Taluk towards North, Belur Taluk towards East, Sakaleshpur Taluk towards South (Fig. 1). Mudigere is located at 13.1378°N 75.6060°E. It has an elevation of 970 m (3,180 ft) and consist of 423 Villages and 30 Panchayaths. Barimale Estate is the smallest Village and Kalasa is the biggest village in area. It is in the 906 mtr elevation (altitude). Total population of Mudigere Taluk is 141,415 living in 31,880 Houses. Males are 70,838 and Females are 70,577. Total 17,065 person's lives in town and 124,350 lives in Rural.

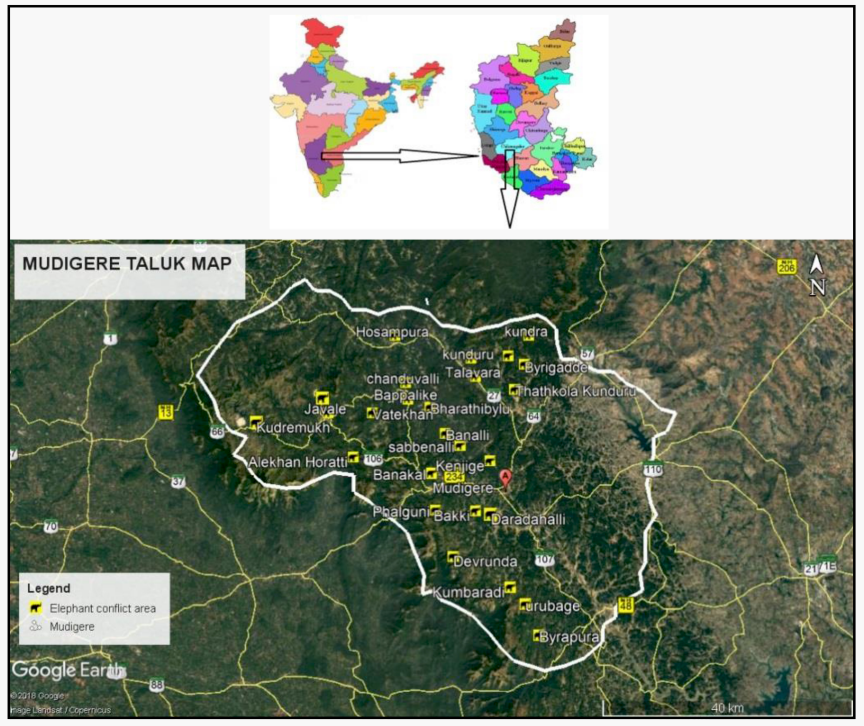

Figure 1. Map of Mudigere Taluk.

The annual rainfall usually varies from 3000 mm to 3500 mm each year and falls during the Southwest moansoons primarily from June to September. The landscape varies along the gradient of rainfall and elevation from semi evergreen in the east to dense deciduous in the central region and on the western hills to wet evergreen forests. Forest covers 46 percent of the Taluk's land area. State-controlled forests and reserve forests are situated along the Taluk periphery and intermittently delineate their borders with solar-powered electric fences, elephant-proof trenches or both.

Coffee plantations occupy 43 percent of the total area of the Taluk and other associated crops, including coffee, paddy, pepper, cardamom and oranges. Paddy cultivation starts during the month of June with soil tilling and plowing and seed sowing for the germination by August and September gowned up paddy are transplanted to the main paddy field. The Taluk is divided into three ranges: Mudigere, Aldur and Kalasa range.

Interaction with forest department officials and farmers.

The study was carried out between June 2018 to May 2019 in reverent and secondary data about the human-elephant conflict collected forest department. Karnataka Forest Department (KFD) maintains and records the locations of conflict site and provided compensations for the deaths and damages caused by the elephant raid to the framers. We summarized the crop damaged for the study site from the KFD data. GPS location from the KFD compensation data were marked on the Google earth to map the conflicts with in the coffee estate and in the village.

RESULTS AND DISCUSSION

Crop damaged details were collected from the Karnataka Forest Department by the elephant conflicts and farmers' compensation claims between 2009 and 2019. The high number of human elephant

Table 1. Humans killedby elephants with compenasation amounts provided.

Years	Name and address	Time	Range	Compensation (In Rupees)
2010-11	Satish s/o Chinnegowda Beerguru (v)	Night	Aldar	2,00,000
2013-14	Nasir Khan s/o Khadar Khan Phalguni (v)	Day	Mudigere	5,00,000
2015-16	Seenas/o Babu Koodahali (v), Banakal.	Night	Mudigere	5,00,000
2018-19	H.M Sunil s/o Oganna Gowda Urubage (v)	Night	Mudigere	5,00,000

conflicts occurs in Mudigere range as compared to other ranges every year compensation amount of Rs 5,00,000 lacks was paid for the farmers which infers the high rate of crop raid in the range (Table 1) . The major conflicted villages are Byrapyra, Urubage, Kumbaradi, Kundra, Kunduru, Hosampura, Beerguru, Ullemane Thathkola Sabbenalli, Thalavara, Kanegadde, Hebbalagadde, Baanalli, Balehalli, Alekhan Horatti, Byrigadde, Bappalike, Gadagodu, Balur, Vatekhan, Kadumane, Makkimane, Heggudlu, Girinalli, Kenjige, Bharathibylu, Phalguni, Banakal, Megur, Chanduvalli, Bidralli, Markal, Javali.

Conflict death cases

From human elephant conflicts, both human and elephant getting negative impacts. The Taluk is seasonal home for 10 elephants according to the farmers. Since 2010, 04 death cases are recorded from the elephant attack and 4 severe injuries. There is no elephant death case occurred till now. The conflicts death categories

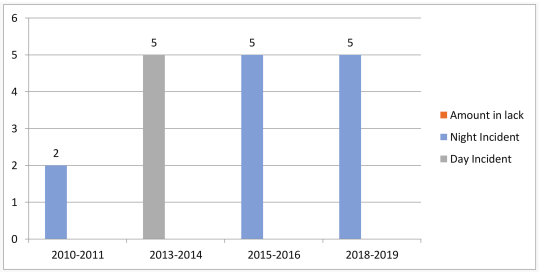

Figure 2. Year wise compensation amounts provided due to death caused by HEC.

Table 2. Compensation amounts onthe agricultural crops damaged done by the elephants.

Sl No.	Crop plant	Compensation amount (In Rupees)
01.	Paddy (100 kg)	1320
02.	Areca plant	2000
03.	Coconut plant	200
04.	banana	80
05.	Coffee	200
06.	Pepper	100

are as follows (Table1 and Fig.2) most of the incidents are occurred in night as the movement in day is restricted to the refuge are due to the human activity. Compensation for the crop damaged are provided to the farmers as allotted by the KFD in the Table2.

Seasonal trend of HEC

The trend crop raid by elephants during study period is highly seasonal. From June to August, the increase in insurance claims was largely due to damage to coffee plants, fruit trees and related pepper vines in the other crop group. The damage was concentrated against the rice paddies during the second crop season peak from November to December. Another increase in the number of incidents of damage to fruit trees and coffee bushes occurred during the coffee mating season in January-March. Perennial crops including coconut, arecanut and banana showed bimodal annual crop damage trends while damage to the seasonal rice crop occurred exclusively at the time of maturation. Coffee showed a bimodal damage pattern, comparable to the other perennial crops.

Forest department workers successfully caught a tusker that had caused trouble in MudigereTaluk in recent months, near the village of Byrapura in 2017. The elephant, aged between 25 and 30 years, will be shifted to theNagarahole forest. Residents had been demanding its capture because he was victim for a human kill and nightmare for the villagers during day and night. High level of wildlife–human conflicts in neighboring forest areas have been identified elsewhere (Naughton-Treves et al. 1998), indicating that wildlife uses the cover and relative protection of thicker forest growth to make short trips to crops

and nutrient-rich transformed human habitats. Large corporate estates in this region, with plenty of capital, water tanks kept for irrigation and native tree cover, remain lush and green even during dry months, making elephants attractive.

In looking at the reasons for these damage peaks we found three forms of crop raiding. Perennial fruit crops such as bananas, isca nut, fish tail palms and coconut are unlikely to be the primary source of increased visits to elephants as they ripen during the year.However, the June–August raiding period coincides with the fruiting seasons of jackfruit (May–September) and mango (May–August), two species that, according to local reports, account for the damaged by the elephants. Ripe jackfruits are strong-smelling, large and prominent, and are potentially the best seasonal appetizer. Harm to coffee, pepper and other fruit trees at this time may be mainly coincidental, as all these crops are interplant.

The second peak between November and December could be clarified by rice supply. Spatial division between rice paddies and coffee estates accounts for the relatively low coffee damage during this time of year.

The third high in January-March corresponds with the coffee maturing season, which means that coffee itself serves as a seasonal attraction when it is ripe. This is proved by our findings on the presence of coffee seeds in the piles of dung.Wildlife conservation has become synonymous with the physical separation of humans and wildlife through the establishment of PAs and efforts of conservationists and wildlife managers (Rodrigues et al. 2004 and Hansen,DeFries 2007).

Drivers of HEC

Unlike in earlier days, HEC has become a year-round trend according to stakeholders we interviewed. The high sociability, intelligence, musth and migration times of the elephants, versatility in their diet and behavior in response to disruption or danger and an optimal foraging technique (Sukumar 1990, Campos-Arciez 2006) have contributed to HEC's spatial and temporal expansion in MudigereTaluk.

Overthe past 30 years the area under coffee cultivation in MudigereTaluk has doubled. The mosaic landscape of the district's coffee agroforestry system offers a wide range of highly palatable, densely packed and easily accessible resources including fruit trees, paddy, grass and water. Perennial water bodies within coffee plantations, not located in state-controlled forests, and the use of fertilizers even during the dry season contribute to better plant growth. Further improvements in land use and deforestation and forest fires have resulted in destruction of the ecosystem and resulting disturbance of migratory corridors for elephants. During this analysis all these considerations have been echoed in stakeholder views.

Another factor to remember is the low human population density of large corporate properties. It ensures that large parts remain untouched for days or weeks and thus theoretically act as sanctuary areas outside the protected forests for elephants.

CONCLUSION

Human-elephant violence remains a major concern for many populations in Asia and Africa, threatens people's lives, livelihoods and local communities, and causes habitat loss and decreases in the elephant population. Current strategies for resolving conflict between humans and elephants rely mainly on either physical separation or prevention by domesticating, translocating or destroying problem elephants and/or compensating farmers. While these techniques remain effective methods for conflict management, the majority tend to be motivated by short-term, site-specific factors that often move human-elephant conflict issues from one place to another.

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