

STATUS OF HUMAN ELEPHANT CONFLICT (HEC) IN THE NILGIRI BIOSPHERE RESERVE: A CASE STUDY FROM THE BANDIPUR NATIONAL PARK, KARNATAKA, INDIA

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ABSTRACT

An assessment of human elephant (*Elephas maximus*) conflict was carried out in Bandipur National Park, Karnataka during 2012-13. The available forest department records related to conflict since 2007 onwards were also used for analysis. Primary conflicts included crop raiding, human casualties and elephant mortality. Crop damage was intense in the months of December and more than twenty cultivated plant species have been damaged. Elephants were killed near farmlands by farmers in defence of their crops. Among dead elephants males were 35.89% and females were 64.09%, their age class ranges from 1 to 38 years. Incidents took place normally in rainy (50%) and winter (42%) seasons as crop maturity correlates those seasons. The present investigation also revealed, 31 human casualties, of which thirteen human deaths and eighteen injuries were recorded. Male victims, were aged between 21-70 years, females were between 25 - 60 years old. Casualties for men was higher than female, about 79% of these incidents were caused by bulls. Mitigation measures presently adopted involve traditional drive away techniques including making noise by shouting, drum beating, bursting fire crackers and bursting fire crackers. Forest department also erected solar fence and EPTs along the forest boundary to prevent conflict.

Key words: Casualties, Crop raiding, *Elephas maximus*, EPTs, Mortality, Solar fence.

Introduction

Human demographic pressure, expansion of cash crops in previously forested areas and overlapping of requirements of human and elephant is a foremost cause of HEC (Hoare and Du Toit, 1999). A number of attempts have been made to document and quantify the crop depredation by elephant in different parts of the country (Sukumar, 1989b) and also every year ≥ 100 humans and 40-50 elephants are killed due to conflict related incidents in India (Johnsingh and Panwar, 1992; Lenin and Sukumar, 2011; Jha *et al.*, 2014). In Southern India, the problem has been studied in Biligiri Ranga Hills and other parts of Karnataka (Nath and Sukumar, 1998), Tamil Nadu (Balasubramaniam *et al.*, 1995; Avinash *et al.*, 2015), Anamalai Hills (Kumar *et al.*, 2004), Orissa (Palita and Purohit, 2008) and Kerala (Easa and Shankar, 1999). In West Bengal this conflict has been studied intensively by Singh *et al.* (2002). Williams *et al.* (2001) have conducted studies on the HEC in Rajaji National Park, north-west India. Attempt has been made in this paper to describe the regional pattern of conflict and its scenario in Bandipur National Park.

Material and Methods

Study area:

Bandipur National Park located in Chamara Nagar district, Karnataka, India. The study area comes in between the latitudes 11° 35' 34" N and 11° 57' 02" N and the longitudes 75° 12' 17" E to 76° 51' 32" E (Fig. 1). Covering an area of 868.63 km², it shares its boundaries with Nagarhole National Park (Karnataka) to its northwest, Mudumalai Wildlife Sanctuary (Tamil Nadu) to its south and Waynad Wildlife Sanctuary (Kerala) to its southwest. All these reserved areas are part of the Nilgiri Biosphere Reserve, which is the favourable ground for the Asian elephant. Two national highways connecting Mysore - Ooty (NH 67) and Mysore - Calicut (NH 212) passes through the park. Elevation ranges from 680 meters to 1455 from the mean sea level. The average annual rainfall is between 914 mm and 1270 mm. The Kabini dam marks the boundary between Bandipur Park and Nagarhole National Park; in the year 1973 this park was brought under Project tiger. Approximately 200 human settlements lie near the Park boundary in the northern side.

Man-elephant conflict in the region is an outcome of the growing space crisis, increasing human population in its periphery combined with human interference within the park and shortage of food and water.

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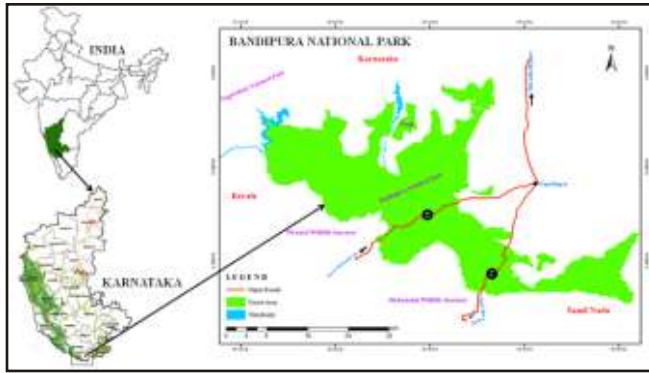


Fig. 1: The study area is located within Chamarajanagar district, Karnataka, India

Map preparation:

The topo sheets numbering 57 D/8, 57 D/12, 58 A/1, 58 A/5, 58 A/6, 58 A/9, 58 A/10 and 58A/14 of 1:50,000 scale related to the study area were collected from the Survey of India, Bangalore for geo-referencing. With the help of Arc-GIS (10.2 version) software different features were generated on map (Fig. 1).

Data collection:

The records related to conflicts from 2007 to 2012 were obtained from the Deputy conservator of forests offices in Bandipur National Park. We were provided with the original records, not secondary reports or compilations for internal communication. Annual data obtained from forest department were translated from the local language (Kannada) to English. The 1,502 records obtained for 2011 and 2012 contained detailed descriptions of crop damage recorded by month wise, we used these data for monthly analysis, we also studied all deaths and injuries related to HEC. In case of human injury or death, we conducted informal interviews with the local forest official, the victim's relatives, and witnesses to find out the identity, the age and sex of the offending elephant.

Results and Discussion

Though conflict incidents have been reported from time to time in the fringe villages around BNP, the intensity of conflict occurrence seems to be severe in contrast to other HEC areas of Karnataka. During our study (2007 to

2012) there were 23,732 crop raiding cases, 31 human death and injury cases and 39 elephant deaths were reported (Table 1). However, the current pace of disturbance factors like grazing, mushrooming resorts, encroachments and over exploitation of non-timber forest products (NTFP) could cause serious crisis for elephants and humans in the near future.

Distribution of crop raiding incidents: In the present study 111 villages have suffered crop raiding during 2012 and 2013, among that Hanchipura (130) suffered the highest occurrence of crop damage, followed by Yelachetti (74) and Naganapura (68). Thouless (1994) points out; the main economic damage caused by elephants in the agricultural areas was destruction of crops. The temporal distribution of crop raiding was not uniform in BNP, crop raiding in BNP was followed to have occurred throughout a year, higher in December lesser incidents during June to October (Fig. 2). Perennial fruit crops like banana, sugarcane and coconut are likely to be the main cause of increased elephant visits during a specific season because they ripen throughout the year. However, the raiding peak in June-August coincides with the fruiting seasons of jackfruit (May-September) and mango (May-August), two species that, when ripe, are excessively damaged by elephants, according to local reports. Damage done to ragi, groundnut, maize and jowar at this time may largely be coincidental as these crops are all inter-planted. The highest peak between November and January can be explained by the availability of rice and harvesting season of certain crops falls in winter season (November and January). The observed pattern of elephant depredation in agricultural areas suggests that cultivated crops are indeed significant in the diet of some elephants that are chronic crop raiders. Furthermore, cultivated crops are even more important than wild plants, given their superior nutritional attributes Sukumar (2003). It was not possible to identify the sex of the individual elephants in view of the fact that almost all the reported cases of elephant's depredations took place in the night. For example, although elephants naturally forage both during the day and night, foraging on crops invariably occurs at night and

Table 1: Records of human-elephant conflict in Bandipur National Park

Year	Number of crop raiding incidents	Number of human injuries	Number of human deaths	Number of elephant deaths
2007-08	4911	03	03	09
2008-09	8870	03	04	11
2009-10	6040	03	03	10
2010-11	2408	03	-	03
2011-12	679	04	01	04
2012-13	823	02	02	02
Total	23732	18	13	39

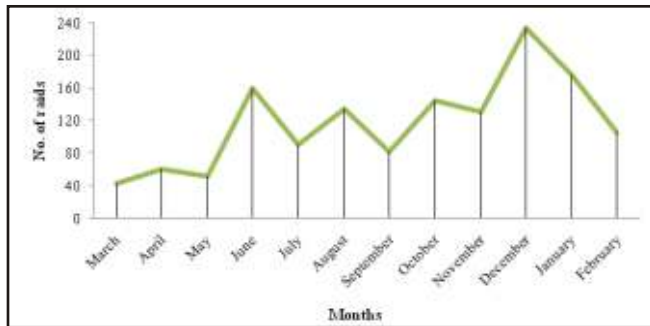


Fig. 2: Number of monthly raids on crops by elephants in Bandipur National Park between 2011 and 2012. (*n* = 1,502). Data come from damage reports filed by affected farmers (1 report = 1 incident of damage).

particularly during moonless nights (Barnes et al., 1995), probably to minimize risks of detection by farmers. However, the consensus was that more bull elephants were implicated in crop depredations than herds or family units. According to Sukumar (2003), adult bulls are likely to enter cultivated areas six times more frequently than female lead family units. Male elephants might obtain greater benefits (i.e., nutrition) from crop raiding than females (Sukumar and Gadgil, 1988). Sukumar and Gadgil (1988) presented this as evidence for the high-risk, high-gain strategy that Naughton – Treves (1998) proposed for sexually dimorphic species like elephant. This was contradicted by Balasubramanian *et al.* (1995) in their studies on HEC in Nilgiri Biosphere Reserves.

Humans Slaughter by elephants: Human injury and death at the hands of wild elephants is one of the most serious aspects of the HEC. Human slaughter by elephants receives greater publicity and evokes stronger emotions. During 2007-2013 only 31 incidents have been reported, of which thirteen human deaths and eighteen injuries were recorded. The number of human casualties by elephants was sporadic, does not show a clear trend within the study period (Table 1). The injury cases may be major (Fracture of bone, head injury, loss of limbs, etc.) and minor (mostly in the form of scratch, sprain, bruises,

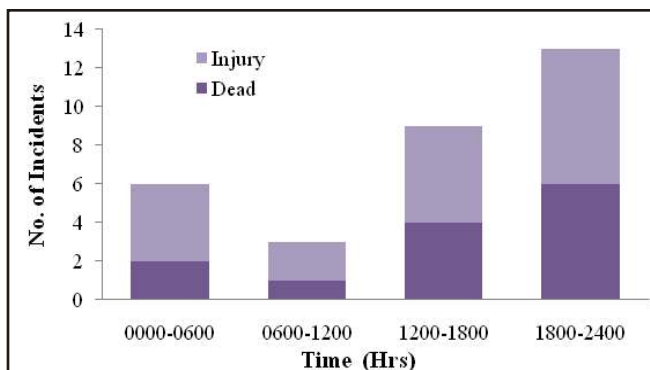


Fig. 3: Showing time of human casualties that occurred between 2007 and 2012 in study area.

etc). The number of incidents reported in the study area is very less compared to other areas. Williams and Johnsingh (1996a) recorded total death and injury of 115 incidents from three districts of Garo hills, Meghalaya during 1984-1995. Datye and Bhagwat (1995c) reported a total of 208 human deaths between 1980 and 1991 from south Bihar. The time of attack was recorded for all the incidents, 19% incidents took place at dawn, (during our study, findings revealed that poor people in this region prefer a little bushy lonely area near their dwelling places to attend nature call in the early morning and that is probably one of the reasons of elephant attack in the morning hours). 9% was reported in the second quarter (0600hrs-1200hrs), while 29% occurred in the afternoon and 41% at night (Fig. 3). Poor visibility at night has been blamed for the accidental encounters that occurred at night (Datye and Bhagwat, 1995c; Nath and Sukumar, 1998; Sukumar, 2003).

Elephant mortality: Elephants were killed by various means near the farmlands when they came to raid crops. From the available records, between 2007 and 2013, a total of thirty nine elephants lost their lives, of which thirty three were electrocuted by farmers in defence of their crops, five died of gunshot injuries and one died in road accident (Fig. 4). In Sri Lanka around 639 elephants were killed by villagers in between 1951 and 1969 in defence of crop (Santiapillai, 1996). The age classes of killed elephants in the study area were between 1 and 38 years, which includes fourteen males (35.89 %) and twenty five females (64.09 %). Data on elephant deaths due to conflict related cases shows more death of females. Loss of adult and sub-adult females compare to their counterpart in a park may cause significant effect on sex ratio. Increased mortality of elephants especially females decreases their gene pool (ANCF, 2007). If it happens even in the future it is very difficult to maintain healthy sex rate in the park and female population will be more vulnerable to death. It may

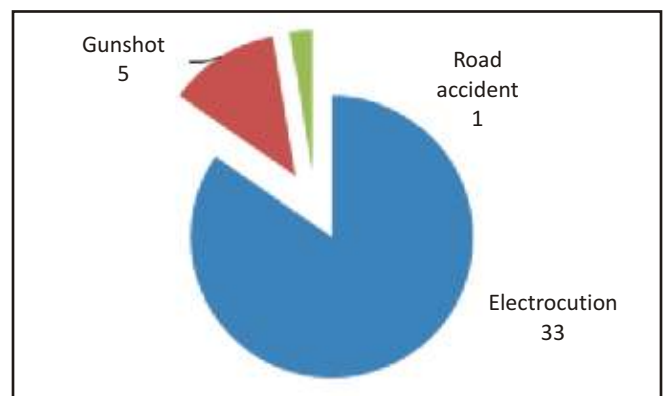


Fig. 4: Elephants kill by various reasons due to conflict between 2007 and 2012.

reduce the present sex ratio of male to female 1: 13.5 in the southern side and 1: 5.3 northern sides (ANCF, 2007). Ground survey revealed that there was no intention to kill only females. Sukumar and Gadgill (1988) reports, sometimes chances of death during crop raiding are equal for both the sexes in southern India.

Mitigation measures: The methods used to ward off elephants in the fringes of BNP include the age old, traditional drive away techniques which include noise-making activities like shouting, drum beating, bursting fire crackers and firing gun shots into the air by forest officials. Depending on the severity, captive trained elephants were deployed to drive away the raiders. Discussion with the villagers revealed that none of the active drive away methods is fully effective if used singly. Use of combinations of methods was also suggested by Hoare (2001), since reliance on one or two individual methods is particularly vulnerable to failure. In addition forest department established solar fence and Elephant Proof Trenches (EPTs) along the boundary of forest.

Indicator bias: We used incident reports filed by individual farmers seeking compensation from the Forest Department to assess the actual intensity of HEC in BNP. Using this indicator presents several problems. Villagers may not consistently file incident reports and forest

officials may not record all complaints. We received consistent complaints from our respondents about inefficient procedures. According to Nelson *et al.* (2003) People are discouraged from reporting damage for several reasons: strained relationship with the forest official in charge; the inconvenience and cost of travelling to the Forest Department office, that sometimes include the loss of a days' wage; the time lag between reporting and receiving compensation and the paucity of compensation. This bias leads to an underestimation of the real extent of HEC based on administrative data. Reports obtained from the Forest Department archives remain at present the only and best available data source for estimating the intensity of HEC in the BNP, despite these biases that tend to underestimate its real extent.

Conclusion

Protected areas and the presence of wild animal populations like elephants which inflict costs on local communities, may in turn, develop negative attitudes among local residents towards elephant reserves and elephant particular. We must think for tangible long-term solutions so that man and elephant can live together. Instead of Human-Elephant Conflict in coming days we must do everything for Human-Elephant Coexistence. Coexistence is difficult but has to be achieved.

निलगिरि जीवमण्डल रिजर्व में मानव-हाथी संघर्ष का स्तर : बांदीपुर राष्ट्रीय पार्क, कर्नाटक, भारत से केश अध्ययन

एच.जी. लिंगाराजू और जी.वी. वेंकटरमना

सारांश

बांदीपुर राष्ट्रीय पार्क, कर्नाटक में 2012-13 के दौरान मानव-हाथी (इलीफेज मैक्सिमस) संघर्ष का मूल्यांकन किया गया। विश्लेषण के लिए 2007 से आगे के संघर्ष से संबंधित उपलब्ध वन विभाग अभिलेखों का भी उपयोग किया गया। प्राथमिक संघर्ष में फसल छापामारी, मानव दुर्घटनाएं और हाथी मृत्यु शामिल हैं। दिसम्बर माह में फसल क्षति गहन थी और बीस से ज्यादा कृष्ट पादप प्रजातियों को क्षतिग्रस्त किया गया। अपनी फसलों की सुरक्षा के लिए किसानों द्वारा फार्मभूमियों के समीप हाथियों को मारा गया। मृत हाथियों में 35.89 प्रतिशत नर थे तथा 64.09 प्रतिशत मादाएं थी, इनकी आयु श्रेणी 1 से 38 साल थी। दुर्घटनाएं सामान्यतः वर्षाती (प्रतिशत) और सर्द (42 प्रतिशत) मौसमों में हुई क्योंकि फसल परिपक्वता इन मौसमों से सहसंबंधित थी। वर्तमान जांच से भी 31 मानवीय दुर्घटनाओं का पता चला जिसमें से तेरह मानव मृत्यु और अठारह क्षतियां अभिलिखित की गईं। नर शिकार की आयु 21-70 साल के बीच थी तथा मादाओं की 25-60 साल के बीच थी। पुरुषों की दुर्घटनाएं महिलाओं की अपेक्षा उच्च थी। इन दुर्घटनाओं में से करीब 79-प्रतिशत सांडों द्वारा की गई थी। वर्तमान में अपनाए गए न्यूनीकरण उपायों में चिल्लाकर, ड्रम बजाकर और पटाखे फोड़कर शोर मचाने सहित पारम्परिक दूर भगाने की तकनीकें शामिल हैं। वन विभाग ने संघर्ष रोकने के लिए वन सीमाओं के साथ-साथ ई टी पी और सौर तार बाड़ भी खड़ी की हैं।

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