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EVALUATION OF ELEPHANT-HUMAN CONFLICT TISTA –MECHI AREA NORTHERN WEST BENGAL

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ABSTRACT

Evaluation of Elephant-human conflict at Tista to River Mechi was done during the period 2000-2010. Data were gathered from various sources (Elephant Depredation Records from Forest Divisions, Ranges and Tea Gardens Association offices). Overall, 140 human death and 36 injured reported during the period of 2001-2010. Average 11.7 people's ±1.70/year. Kurseong (9.3 peoples/yr±1.5) found more number of deaths than Baikunathpur (1.30/yr±0.5) or wildlife-I (1.30/yr±0.3). Human death found peak during the month June and November, which coincided crop harvesting season maize and paddy respectively. However, statistically there is significant variation found both season. However, division wise analysis gives significant variation. On an average 471.6/year house are demolished Kurseong (366.3±68.80 cases/year) is getting more number of house damage by elephant than Baikunthapur (85.8±29.68) and Wildlife-I (19.5±6.97). Sixty five (65) elephant deaths reported in this region (Tista- Mechi) during the period of 2000-01 to 2011-12. Out of this, elephant –human conflict related cases (54%) that include gunshot (18.5%), Iron wounds (13.8%), electrocution (15.4%), and chemical poisoning (6.2%) were recorded. Landscape level planning is needed with consolidating habitat of Baikunthapur, Wildlife-I and Kurseong Forest Division including Jhapa Forest Division Nepal. Alternative crop can be prompted at large-scale with society formation to reduce conflict level in this region.

Key words: Elephant-human conflict, Human death, Elephant death, Electrocution, Poaching, Gunshot.

Introduction

Elephants in northern West Bengal constitute in the western most extension of the north-eastern Indian population (Barua and Bist, 1995; Choudhury, 1999). One of the challenges to wildlife conservation in recent years is the increasing conflict between wildlife and human beings, at least on local spatial and time scales. As human populations grow, there is increasing demand for land for agriculture and natural resources for industry leading to increased instances of conflict. Human expansion is also fragmenting the landscape and this further compounds the problem. As the land available to wildlife diminishes and the corridors between pockets of wildlife habitats disappear, a patchwork of habitat fragments is left behind, and the likelihood of humans and wildlife coming into conflict is much higher (Daniel, 1980; Balasubramanian *et al.,* 1995; Barua and Bist, 1995; Smith and Kasiki, 2000; Thapa, 2005). Conflict arises from a range of direct and indirect negative interactions between human beings and wildlife. This can culminate in potential harm to all those involved, and will lead to negative human attitudes resulting in decreasing human appreciation of wildlife and potentially severe detrimental effects for conservation (De Boer and Baquete, 1998; Nyhus *et al.,* 2000; Sillero-Zubeiri and Laurenson, 2001). Conflict generally arises from economic losses to agriculture, including loss of livestock through predation and destruction of infrastructure and human lives. A wide range of species from rodents to elephants including tigers, leopard and hyaena is responsible for conflict (Naughton–Treves, 1996; Naughton–Treves *et al.,* 1998; Hill, 2000; Saj *et al.,* 2001).

Being a wide-ranging species, elephants are more susceptible to the loss of natural habitat to agriculture and settlements and thus they are in greater conflict with humans than possibly any other animal. This is a common issue in the conservation of the Asian and African elephants. Crop losses in India run into millions of rupees each year and the number of people killed average 150–200 each year Bist (2002). Assessing such conflicts between people and animals in protected areas is important for designing sustainable conservation and management strategies (Newmark *et al*., 1994; Ite, 1996; Naughton *et al*., 1998). As there areas highest level of conflict we want to explore the status of elephant-human conflict in this reason. Though data on elephant-human conflict is variable on eastern side of landscape (Buxa-Jaldapara area) western part is lacking however, apart from Lahiri- Choudhury's study in (1975), the most comprehensive study on elephant human Sukumar, 2003 has conducted conflict in Buxa –Jaldapara area of northern west Bengal. A total of 24 villages around Buxa

Consolidation of habitat with wildlife habitat improvement and shifting some villages to fragment habitat south side highway and making physical barrier along Bagdogra-Naxalbari highway and alternative crop can reduce conflict level in this area.

Tiger Reserve and Jaldapara Wildlife Sanctuary including were monitored for year between 2001 and 2004 for collection of crop-raiding details. However for the present study, due to understandable reason of time constraint, monitoring of villages could not be carried out. Therefore data on elephant depredation in last ten years (2001-2010) were collected from various sources. The data was analysed in order to know status of elephant –human conflict in this region for landscape level planning for future elephant conservation and reduce level of elephant-human conflict.

Material and Methods

Study area

Study area falls in between River Tista to River Mechi, forest of Baikunthapur, Wildlife-I, and Kurseong Forest Division of northern West Bengal.

The Baikuthapur division is located on the southeast of Mahananda Wildlife Sanctuary (Fig.1). The elephants are known to come down to Bainkuthapur forest from Mahananda high ranges during the rainy and winter seasons of the year. The Bainkuthapur Division is divided into two patches by the river Tista. The patch east of the Tista is known as Apalchand Reserved Forest (RF) and patch west of the Tista is called as the Bainkuthapur forest. The vegetation is dominated by mixed Sal old plantation.

Mahananda Wildlife Sanctuary is part of Wildlife- I Division. The sanctuary extends over 168 km^2 and is known as the dry season range of elephants with semi-evergreen forest type dominating the stand. The Chuklong, Gulama Valley and the North Sevoke are important places used by the elephants. However, occasional visit of high attitude area Latpanchaer also recorded. In the wet season (June-September) and in winter season (September to January) elephants mostly use the foothill areas of the sanctuary. There is congregation 150-200 elephant including several family herd and bull together every year happen in month of May-Jun and October-November in Tista river floodplain areas in this sanctuary. Landslide, River floodplain upliftment and railway –elephant collision is major concern in this region.

The Kurseong Forest Division is highly fragmented and located to the west of Mahananda Wildlife Sanctuary (Fig.1). Lamagumpha Reserve Forest (RF), Bamanpokhri RF, Balsan RF, Rakti RF, DGHC Tatari RF, Mechi RF, Lohagharh RF, Dalka RF, UCCF amd Tukriajahr RF are all isolated forest patches interspersed with tea garden and villages with cultivation paddy and maize and army establishments . The Mechi River bound the western side of Kurseong division, which is an international boundary between Nepal and India. The elephant found four ranges in this region Bamanpokhri, Panighatta, Bagdogra and Tukrijhar ranges. The elephant 150-200 elephant migrated from here to eastern Nepal Bamandangi areas during crop harvesting season maize (May-Jun) and paddy (Nov-Dec/Jan).

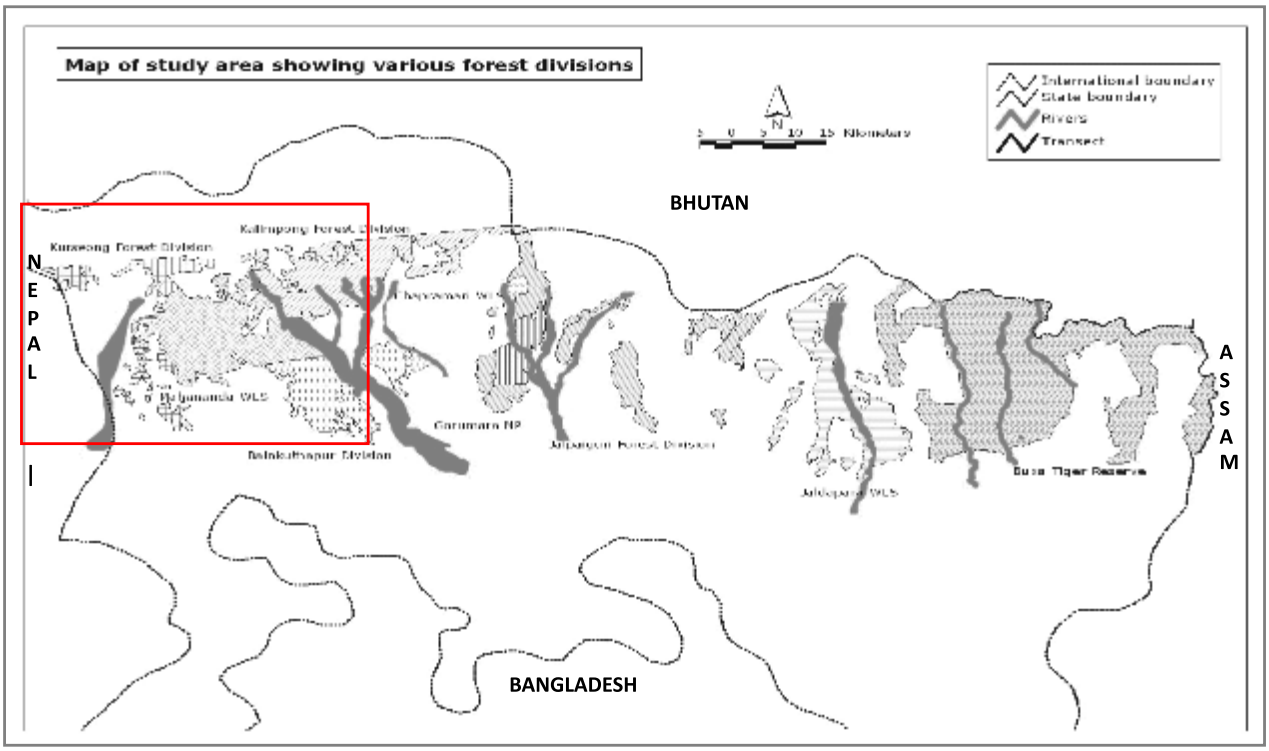

Fig. 1 : Map of the study area.

Methods

All data on elephant human conflicts were collected in fieldwork from December 2007 March 2011from various sources. In the past, elephant human conflict in northern West Bengal was assessed by using records on claims and compensation paid for crop damage, house damage, and human casualties and death. Records maintained by tea gardens on elephant depredation were valuable source of information on EHC in North Bengal.

Elephant Depredation Records from Forest Divisions and Ranges: Forest Department of each division maintains a record on claims made by victims and Compensation paid to them for crop damage, house damage, property damage, injury and human deaths. In absence of complete monitored data, these records were collected as Secondary data to study the extent of elephant human of each division over the past ten years. Information was present on number of claims, type of damage, date and place of occurrence and sum of money paid. All this data were collected from forest divisions present within the study area (Baikunthapur, Wildlife-I, Kurseong Forest Division).

Duty Registers and Human Death Records from Wildlife Squads: Information was collected from the offices of two Wildlife Squads near the conflict prone areas viz. Sukna Squad (Wildlife I) and Taipu squad (newly formed in Kurseong Forest Division, Darjeeling District). Information was present on the number of elephant's found and human deaths that occurred during their patrolling along with the names of the villages or habitations where they were found. Data on number of human deaths, age/sex of the victim, date; place and time of the incidence, number of elephants responsible for the death were collected.

Elephant Depredation Records from Tea Gardens: As landscape of northern West Bengal is interspersed with small and large aggregations of tea Estates that experience a considerable number of elephant depredations, tea gardens to be a reliable source of data. Concerned association of tea gardens record data on Movement and depredation caused by wild elephants in tea gardens.Terai Branch Indian Tea Association (TBITA), Bagdogra, Darjeeling were visited and record on elephant –human conflict (EHC) also gathered during the period 2001-2010 from their office record. The newspaper report etc was gathered. Personal field visit also done during other field survey in these areas. Data were collected from 2000-01 to 2009-10 over the period of ten years. Elephant death due to various causes also reported in these areas was also collected from Forest offices, newspaper reports and personal field visit in these areas.

Simple Excel sheet was used for analysis of human death and house damage cases and average and standard error was calculated. The human death GPS point were plotted on land use GIS map and elephant location data from squad and tea association also plotted on land use GIS map of this area.

Results and Discussion

Results

Human killed : Overall, 140 human death reported during the period of 2001-2010. Average 12.0±1.80/year. Kurseong Forest Division (9.0 person ±1.5) division in more number of deaths more fragments habitat than Baikunathpur (1.30 person ±0.5) or wildlife-I (1.40 person ±0.4). Human death found peak during the month June and November, which coincided crop harvesting season maize and paddy respectively (Fig 2). The details of human death are given in Fig 2. The location of human death and injuries at various years (2001-2010) showed in Fig 3. There was no significant difference found ("t" test) of human morality (death and injury cases) between Maize season: Feb-July (Mean 1.01, SD 0.659) and paddy season: Aug-Jan (Mean 1.11, SD 0.29). P=0.76, t= - 0.31. df=10).

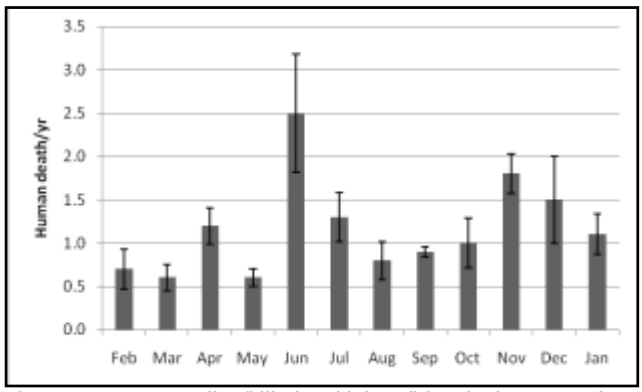

Fig. 2 : Human mortality (killed and injured) by elephant at various months at Tista to Mechi area, northern West Bengal 2001-2010

When we compare one way ANOVA test among the Divisions (only human deaths cases) there is significant variation found among divisions during maize season (F=8.188, > tabulated, F(2,17) = 3.59, p=0.0039; Mean BKP = 0.06., SD = 0.07, Mean WL-1 = 0.015., SD = 1.09, Mean KUR = 0.83, SD = 0.61) and paddy season (F=15.89, >tabulated >F(2,17) = 3.59, p=0.0002; Mean BKP = 0.166., SD = 0.212, Mean WL-1 = 0.105. SD = 0.120, Mean KUR= 0.803, SD= 0.332).

Ouse damage: Overall, 4716 hut damaged by elephant was recorded average 471.6/year. The trend is same as human death Kurseong Forest Division (366.3±68.80

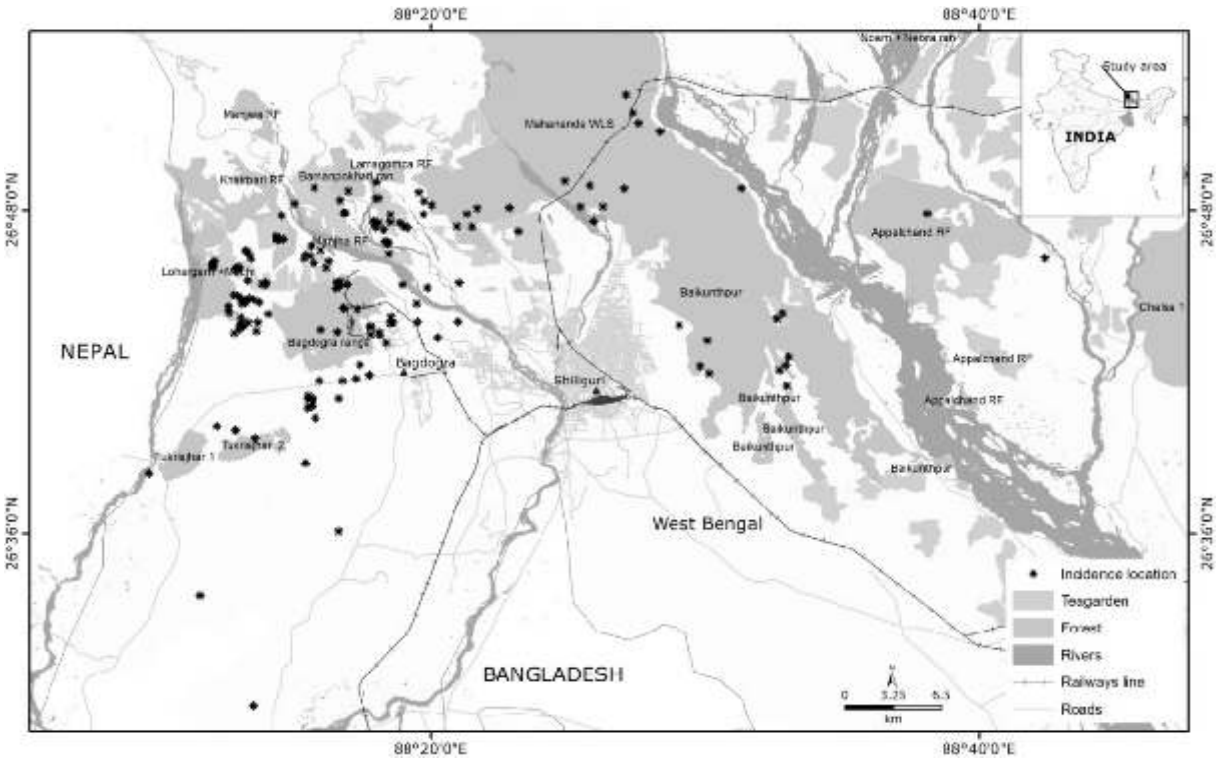

Fig. 3 : Location Human death and injury at Tista-Mechi area northern West Bengal 2001-2010

cases/year) is getting more number of house damage by elephant than Baikunthapur Forest Division (85.8±29.68) and Wildlife-I (19.5±6.97). When we compare one way ANOVA test among the Divisions (only human deaths cases) F there is significant variation found among divisions (F=17.95, > tabulated, F (2,29) = 3.33, p=0.0001; Mean BKP = 85.8., SD = 93.8, Mean WL-1 = 19.5., SD = 22.1, Mean KUR = 366.30, SD = 218).

Crop damage: As record was not uniform all divisions the data like some ranges only number of cases of crop damage not actual extent of areas not found . Some ranges available both form. Therefore, I divided in two form of extent damage and no cases include total damage of the division. The details area given Table 1.

Elephant-human conflict tea garden: Twenty (20) human death cases reported in the tea gardens of these areas. Average two (2) human killed/year in the tea garden these areas. 449 house demolished and average 41/year ± SE6.5, vegetation damage cases 11± SE2.07 and damage to property cases 9.4/year ±SE2.71. The details are given in fig 4. In the tea gardens, total conflict family herd is responsible 49%±SE12.8, Solitary 34.3%±SE8.3. The teagardens visiting frequency by elephant (n=305 during 2000-2010) found more in Tirihannah Tea Estate (TE) (17%), New Chamta TE (15%), Kamalpur TE (10%), Mohurgong & Gulma TE (10%) and Pahargomiah TE (8%).

There is no variation found ("t" test) family herd and solitary visiting to tea garden and villages during Maize season (Feb-July) (Herd: Mean = 0.757, SD= 0.455, solitary Mean= 1.06, SD = 0.454) and paddy season (Aug-

Table 1 : Crop damage Tista to Mechi area, northern West Bengal during the period 2001-2010

Year	Baikunthapur			Wildlife-I			Kurseong		
	Ha.	no. of cases	Amount paid (Rs.)	Ha.	no. of cases	Amount paid (Rs.)	Ha.	no. of cases	Amount paid(Rs.)
2000-01	205	–	655500	–	1261	179300	51.75	507	152100
2001-02	93	–	213300	–	711	208500	62.15	534	160200
2002-03	44	–	98400	–	24	12000	30.5	587	176100
2003-04	22	–	49500	–	524	203018	35.2	761	227300
2004-05	12	–	20000	–	317	143550	12	1654	498300
2005-06	70	–	159500	–	479	186700	6	1140	350800
2006-07	59		198000	–	505	213900	26	1757	530100
2007-08	51	–	194300	–	165	76500	–	495	148500
2008-09	198	–	742500	10	253	80900	122.02	–	488100
2009-10	83.8	–	281227	90	193	96500	95.5	–	712053

Jan) (herd Mean 1.97, SD 1.68, Solitary mean =1.59, SD=1.05). (P=0.27, t= - 1.16 df=10).

Frequency of elephant visit at various months at Tista to Mechi area: There is a peak found visiting herd in the month of May –Jun months which coincides Maize crop harvesting season. However, frequency of herd visiting August just starting of Paddy crop sowing season, after sowing fresh leaves may attract elephant visiting paddy field and raiding paddy. There is high peak found November, which coincides with paddy crop harvesting season. As maize is not cultivated, most of villages these areas so frequency of visiting maize is less by family herd than paddy crop as shown in the following figures (Fig.4). The paddy crop last eastern side of this landscape ends of November whereas western side paddy season also extend up to December –January and part of elephant family herd moving from eastern side to western side this time and form big clan including several family herds and solitary bulls (150-200 elephant) and raiding crops this areas (personal observation December, 2010).

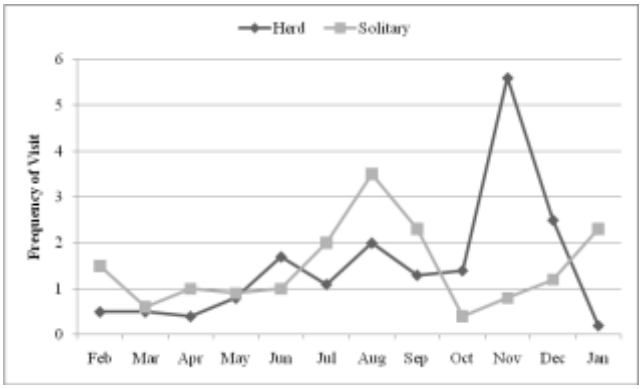

Fig. 4 : Frequncy of elephant visit at various months at Tista to Mechi area (Western side of northern west Bengal 2001-2010

Elephant death due to conflict

A total of 65 elephant death reported in this region (Tista- Mechi) during the period of 2000-01 to 2011-12. Out of this elephant –human conflict related cases (54%) that include gunshot (19 %), Iron wounds (13%), electrocution (15%), and chemical poisoning (6%). Natural causes 22%, others 9% were recorded. Poaching related cases 9% were recorded in this region. Elephant death due to gunshot found more percentage in Jhapa forest, Nepal (57%) where as electrocution found more percentage in Kurseong (27%) and chemical poisoning (20%) for Baikunthapur Forest Division. The details given in Table 2. One-way ANOVA was done elephant mortality causes: EHC related (Poaching, Electrocution, chemical poisoning, gunshot, Iron wounds), Accident related (ACC). Natural (NAT) and others (OTH), these are significant variation found among these above causes (F = 8.722, P = 0.0024 (df = 3, 11, Mean EHC = 1.02, SD = 0.435, Mean ACC = 0.175, SD = 0.222, Mean NAT = 0.275, SD = 0.263, OTH mean = 0.150, SD 0.100).

Table 2 : Elephant death due to conflict

Cause of death	BKP (%)	WLI(%)	KUR (%)	JHA (%)
Poaching	10	11.5	9.1	0
Electrocution	20	3.8	27.3	14.3
Chemical poisoning	20	3.8	4.5	0
Gunshot	10	15.4	13.6	57.1
Iron wounds	0	19.2	9.1	28.6
Total together	60	53.8	63.6	100

Discussion

Researchers in Africa and Asia have correlated elephant– human conflict (EHC) with elephant density (Hoare and Du Toit, 1999), human density (Sitati *et al.,* 2003), rainfall pattern (Hoare and Du Toit, 1999), protected area perimeter, mean slope of elevation (Sitati *et al.,* 2003), proximity of a protected area, mean distance from water settlement coverage (Sitati *et al*., 2003). Some studies documented behavioral pattern of elephants (Sukumar 1989; Damiba and Ables, 1993; Hoare, 1995). Smith and Kasiki (2000) found significant negative correlation between human elephant– conflict and permanent water availability, and with mean elevation. Hoare and Du Toit (1999) who studied northern Sebunwe, Kenya believes that the level of problem elephant activity is because of behavioral ecology of bulls. Male elephants staying in close proximity to crop field are found significantly closer to human settlements. Osborn (1998) found males congregating especially when crops are mature. Sitati *et al.* (2003) used a grid-based resolution method (25 km^2) to study the spatial pattern of crop raiding and found it to be clustered into distinct conflict zones and thus occurrence and intensity of crop raiding could be predicted on the basis of area under cultivation while the pattern of human deaths and injuries were less predictable. Parker and Osborn (2001) studied Muzarbani district on the eastern Zambezi Valley, northern Zimbabwe and found a strong nonlinear negative relationship between distance and the frequency of incidents (r^2 = 0.939) and has shown that the number of incidents decreased rapidly with increasing distance from border. Bell (1984) and Osborn (1998) also noted the influence of plant palatability on crop raiding by African elephants. Matkaje (1975) has shown, in Southern Tanzania, that there is more to wildlife-human conflict in linear settlements, while Jachmann (1989) and Osborn (1998) suggest that fertile soils support better quality forage to which elephants are always attracted.

There is clear seasonal pattern in human death during May-June maize crop harvesting season; October–November paddy-harvesting season in this

region. Therefore, elephant raids are also more common in these seasons. Though crop raiding we have not monitored primary level in these region. Our experience in eastern part of landscape Buxa-Jaldapara areas from primary data it was found same pattern. Similarly, a study by Sukumar found two peaks in crop raiding—the first one in maize crop, another in finger millet, whereas Tchamba (1996) has shown that elephant movement pattern is the cause for crop raiding not the rainfall pattern or crop availability. Hoare and Du Toit (1999) has shown weak relationship between rainfalls and raiding frequency during 1993-95 in Zimbabwe's Sebungwe region raiding was higher in moderated rainfall year than drought year. By analysis visiting frequencies in villagers and tea gardens in these areas we found elephant herd found peak in May-Jun, August and November for family herd whereas solitary animal found in the month of August and month of January. This may be solitary animal coming villages where store crop they are damaging houses and raiding crops in these months.

In this study, herds (49%) have been found to involve more in conflict (in terms of number of cases reported) than solitaries (34%) in tea gardens. Elephants follow old migration routes and opportunistically take advantage of resources that they pass. De Silve in Sri Lanka found males constitute 80–85% of all raids. (Roy Bhima in Malawai) crop damage to the extent of 85% by bull or bull group. Hoare (1999) studied the northern Sebunge region Studies in Africa found that solitary bulls and bull groups damage 79% of the crop, whereas Datye (1995) found that family herd's raid more often than bulls in central India. Similar results found by Balasubramanian *et al.,*1995 in Niligiri Biosphere reserve 65% damage by family led herd. Ramono in Sumatra found all male group raid crops in Sumatara (Sukumar, 2003). In this landscape eastern side, Buxa-Jaldapara area (Sukumar, 2003; Roy, 2010) found bulls 391 raids/year than family herd 201raids/year.

The primary reason endangering elephants in India are loss of habitat, through legal and illegal cultivation, change in forest composition by monoculture Plantation and manmade constructions (Daniel, 1980). A sub optimal habitat created by man is unable to meet the demands made on it by a herd of elephants. In a sub-optimal habitat, presence of elephants will result in further deterioration. Elephants in such habitats are compelled to seek sustenance elsewhere and come into conflict with man (Daniel, 1980). Habitats in northern West Bengal have faced exactly the situation described by Daniel (1980). In tea gardens, situation is no different. Tea cultivation (11%) is one of the major land covers in North Bengal after cultivation (21%) and forest (22%). Cultivation and tea gardens have been chief factors responsible for loss of once contiguous forest in northern Bengal resulting in isolated pockets of habitat irregularly dispersed across landscape. So the previous home range and migratory route of elephants were converted to land use of human interests. Remembering the position of growing crops and water points Smith and Kasiki (2000). When this happens recurrently they get accustomed to raiding easily available and accessible resources thus incurring damages to people in the process Today the land is 700 person/ Km^2. Elephants in northern west Bengal (Tista–Mechi) have gone through similar experience as illustrated above. Once their migration route extended till Nepal, O' Malley (1907), still today population of Kurseong and Mahananda division have been seen and reported to go for crop raiding in Nepal where they face retaliatory firing which makes them more ferocious. Eight elephant killed by gunshot from the period 2007-2011, Das (2013). This makes them problematic to handle upon returning to India as they cause high scale of human and property damage. In last ten years, conflict situation between elephants and human in northern west Bengal has intensified. People have become aggressive towards the species. If not do anything to control the situation then

As we see our results of conflict, Kurseong is main conflict zone and more fragmented habitat being crop damage, house damage or human deaths. Priority will be is given first consolidating the fragmented habitat and then improvement of habitat to facilitate more fodder species to elephant. A holistic approach will be taken as completely as landscape level in this Tista to Mechi area as elephant–human conflict tackling. Landscape level planning is needed to give space minimum 1000 km^2 good habitat with consolidating habitat of Baikunthapur, Wildlife-I, Kurseong Forest Division and including Jhapa Forest Division Nepal. As of official record actual forest areas of these three divisions is 733 Km^2 in these three-forest divisions together. Elephant use area 450 Km^2. Elephant habitat may be less than 250 km^2. If we lessen isolated forest, patch UCCF forest and Tukriajhar RF. Then habitat tally will less 200 km^2 left. Within 200 km^2 Baikunthapur have only Sal (*Shorea robusta*) dominated habitat elephant, fodder species density is very less in these forest areas. In Mahananda WLS, though some good habitat is available but that will not sustain long time fodder supply to elephant. Every day we need fresh elephant fodder these areas 22500 kg/day if we considered elephant population 150 in these areas. In kurseong Forest Division, Bamanpokhri forest is mainly Teak (*Tectona grandis*) dominated forest and Mechi forest in not good

habitat for elephant mostly degraded habitat and mixed plantation. UCCF, RF and Tukriajhar RF forest in this division interspersed with paddy and Tea cultivation. There is hardly any food plant present in these forest areas. The elephant only take refuse there forest areas and raiding crops surrounding villages and tea gardens beside this part of forest areas Army also established some portion in Bengdubi, Sukhna, Salugarah forest areas. We have until deficit of 800 km^2. How this required forest will be met is a big challenge for conservation of elephant in these areas. The floodplain of Tista, Balasan and Mechi grassland also give good supply of fodder during rainy season, this riverine forest should be improved slowly to restore the floodplain and grassland improvement. However, Mechi and Balasan river floodplain excessive pebble, sand collection and high biotic pressure (for fuel wood and fodder collection) already degraded riverine habitat.Tista Floodplain areas new village settlement already established in recent past The situation is very challenging when elephant cross international boundary and go for raid crops people of Nepal also not tolerated elephant problem. They took some time hard decision and gunshot and killed elephant. As because they elephant use countries land and internationally a short term and medium term long term, management plan need to prepare. However, some agency already involved only arranging meeting with both countries people but so far no ground management nothing have done so far to facilitate elephant or human. Radio-telemetry data Sukumar *et al.* (2006) showed that one migratory herd ranges more than 1000 Km^2 in these areas and range from Damdim (Malbazar) to Bamandangi, Eastern Nepal. As per Forest Division old record Banmandangi Jhapa areas originally has forest habitat a century ago and elephant migrate in these areas as part of their home range. During early seventies (1970) people from hill, areas migrated and settled these areas cutting these areas prime natural forest and transform the forest land to agricultural land like cultivation of paddy and maize with bamboo break. These transformation habitat originally part of home range and recorded 100 years ago (O' Malley 1907). These crop Paddy (*Oryza sativa*) and Maize (*Zea mays*) attract elephant getting higher crude protein (Sukumar, 1989b; Osborn, 1998; Roy, 2010) content than natural grass and trees.

Conclusion (Management implications)

The fragmented landscape south side of national highway, Bagdogra-Naxalbari Kuserong Forest division can be barricade by old railway track fence or boulder wall fence so that animal cannot reach fragmented forest of Kurseong Division south side of Highway and refuse at fragmented forest and do crop raiding and house damage and human killing. Central village, Taipu, MM Terai, Chenga basti, Tukra basti can be shifted to south side of highway in fragmentmented patch of UCCF or Tukriajhar forest of Kurseong Forest division. Elephant Corridor can be linked through tea gardens from Lamagumpha RF to Mechi RF forest through Simulabarie Tea Garden (TG), ORD Terai TG, Panighatta TG, Belgachi TG, MarapurTG, Manjha TG.

Alternative non-palatable crop is another option to reduce conflict in these areas. So far large-scale scientifically not tested in these areas. Crop like Mustard (*Brassica juncea*), Turmeric (*Curcuma longa*), Jute (*Corchorus capsularis*), Ginger (*Zingiber officinalie*), Sunflower (*Helianthus annuus*), can be tested to reduce conflict level. Alternative source of income can be generated change the livelihood of human in these areas lands use pattern will be change for not to attract crop field in these areas. Without knowing biological and ecological need for elephant, it is difficult to manage the population and reduce conflict level in this region. Moreover, it needs one big chunk of large forest together than fragment habitat. A good and extensive ecological research is needed to manage elephant population and reduce level of elephant-human conflict in this region.

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तिस्ता - मीची क्षेत्र, उत्तरी पश्चिमी बंगाल में हाथी - मानव संघर्ष का मूल्यांकन

मुक्ति राय

सारांश

तिस्ता से नदी मीची तक हाथी-मानव संघर्ष का मूल्यांकन 2000-2010 अवधि के दौरान किया गया। विभिन्न स्रोतों से आकड़े एकत्र किए गए (वन प्रभागों, रेंजों तथा टी गार्डन एसोसिएशन ऑफिस से हाथी लूटमार अभिलेख)। कुल मिलाकर, 2001-2010 अवधि के दौरान 140 मानव मृत्यु और 36 क्षतियां सूचित की गई, जो औसतन 11.7 लोग ± 1.70/वर्ष थी। बैकुण्ठपुर (1.30/वर्ष ± 0.5) अथवा वन्यजीव-I (1.30/वर्ष ± 0.3) की अपेक्षा कुर्सीयोग (9.3 लोग/वर्ष ± 105) में मृत्यु की ज्यादा संख्या पाई गई। मानवीय मृत्यु जून तथा नवम्बर माह के दौरान चरम पर पाई गई, जो क्रमशः

मकई और धान की फसल कटान मौसम के समय मेल खाता है। तथापि, सांख्यिकीय रूप से दोनों मौसम में महत्वपूर्ण विभिन्नता पाई गई। प्रभागवार विश्लेषण महत्वपूर्ण विभिन्नता बताते हैं। औसतन 471.6/वर्ष आवास गिराए गए। बैकुण्ठपुर (85.8 ±29.68) और वन्यजीव–I (19.5 ± 6.97) की अपेक्षा कुर्सीयोग (366.3 ± 68.80 मामले/वर्ष) में हाथी द्वारा आवास क्षतियों की संख्या ज्यादा है। 2000–01 से 2011–12 की अवधि के दौरान इस क्षेत्र (तिस्ता–मीची) में पैंसठ (65) हाथी मृत्यु सूचित की गई। इसमें से हाथी–मानव संघर्ष से संबंधित मामले 54% अभिलिखित किए गए जिनमें गनशॉट (18.5%) लोहे की छड़ से घाव (13.8%) विद्युतमारण (15.4%) रासायनिक जहर देना (6.21%) शामिल हैं। झापा वन प्रभाग नेपाल सहित बैकुण्ठपुर, वन्यजीव–I तथा कुर्सीयोग वन प्रभाग आवासों को समेकित करने के साथ भूदृश्य स्तर योजना बनाने की आवश्यकता है। इस इलाके में संघर्ष स्तर घटाने हेतु समाज संरचना के साथ बड़े पैमाने पर वैकल्पिक फसल प्रोत्साहित की जा सकती है।

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