



# Human-elephant conflict due to interstate movement of wild Asian elephants (*Elephas maximus*) from West Bengal to Odisha, India

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## ABSTRACT

Interstate movement of elephants from Odisha to neighboring states or vice versa was known earlier, but it was not a major concern at that time for the state as vast forest areas were available for their regular movement and bordering states i.e. Jharkhand and West Bengal. Fragmentation and degradation of elephant habitat along with developmental projects such as Subarnarekha canal project, electric power lines, road ways, railways, industries, expansion of agricultural fields, increase of anthropogenic pressure on habitat, etc. have posed wide spread and significant threat to elephants corridors and their habitats. A study was conducted during July 2010 to July 2014 in Baripada and Balasore Wildlife Division, Odisha, India. The present study took an effort to understand the migration pattern, herd behaviour, crop damage, house damage, human death, human injuries and present mitigation pattern for the period 1997-98 to 2013-14 and to formulate a comprehensive planning for conflict management and mitigation. Elephants killed or injured 31 people over the 17 years in villages of Baripada and Balasore Wildlife Division. During this period 1155 nos. house damaged, 757 nos. houses partly damaged, 398 nos. houses fully damaged, 3832.42 acres of crop damaged and 579 nos. of villages affected and 2539 nos. families affected. During 1997 to 2014 showed a higher frequency of human elephant interface in comparison to previous years. Some recommendations are put forth based on the present study to mitigate the human elephant conflict to certain extent.

**Key words:** Crop raiding, human elephant conflict, interstate elephant migration, Odisha, West Bengal

## INTRODUCTION

India holds the largest population of Wild Asian elephants (*Elephas maximus*) with nearly 27,000–29,000 animals found in the country (Rangarajan *et al.*, 2010). During the 20<sup>th</sup> century the number of elephants surviving in the wild declined drastically all over Asia (Sukumar, 2006) including India. Elephant travel long distances as part of their migration activities and at the same time they

stay within different forest habitats that are enriched with water and fodder (Graham *et al.*, 2010, Hedges *et al.*, 2009). Interstate movement of elephants from Odisha to neighboring states or vice versa was known earlier but it was not a major concern for the State as vast forest areas were available for their regular movement. Such interstate migration of elephants extends to four neighboring

states such as Andhra Pradesh, Chhatisgarh, Jharkhand and West Bengal. The present study emphasizes the migration and movement of elephant between West Bengal- Odisha.

Home range of elephants spreads over a length of 250 km from Lakhari in Odisha to Andhra Pradesh. Home ranges extends up to 600 km<sup>2</sup> – that have been recorded for females in Nilgiri in south India. In Rajaji National Park, home range of females extends 184-326 km<sup>2</sup> whereas male ranges over 188-407 km<sup>2</sup> (Ritesh *et al.*, 2009). Movement of elephants in Dudhwa National Park has been also seasonal and erratic. Animals of the western Nepal population range south along the Karnail river from the reserve to a patch of riverine forest across the border along India (Javed, 1996). The home range estimated to be 258.6 km<sup>2</sup>, 3343.1 km<sup>2</sup> and 4348.9 km<sup>2</sup> for three different bulls in Dalma Wildlife Sanctuary and Chhotanagpur Plateau of Central India. Some studies also highlighted that home ranges expanded to be maximum in winter and shrunk to minimum in summer (Datye and Bhagwat, 1995). Movement of animals in general and elephants in particular has been studied and reported by author like Eisenberg and Haynes (1949), Buss (1961), McNab (1963), Buechner *et al.*, (1963), Khan (1967), Lockhart (1972), Leuthoid (1977), Allaway (1979), Peters (1983), Sahi *et al.* (1985), Mckay (1990), Easa (1992), Johnsingh (1992), Hemanta *et al.* (1993), Joshua and Johnsingh (1995), Sunderraj *et al.* (1995), Tiwari (2005), Wesley *et al.* (1995), Wittemyer (2007), Ritesh and Rambir (2007), Santra (2007), Ritesh *et al.* (2009), Mishra *et al.* (2009), Ritesh and Rambir (2009) and Palei *et al.* (2013) and Mishra *et al.* (2014).

## MATERIALS AND METHODS

Baripada Forest Division is situated towards northern most part of Odisha (Fig. 1) between N 22° 33' 45" to 21° 17' 0" latitude and 85° 45' 30" to 87° 13' 15" E longitude. The area is bounded by the Singhbhum, Medinapur district, Balasore and Keonjhar on the east. Interstate elephant movement and human-elephant conflict is a major issue at present in the study area. Balasore Division is

located on the northern front of the state being bordered by Subarnarekha River.

Balasore district spreads over an area of 1968 km<sup>2</sup>. where about 4.47 km<sup>2</sup> of sal bearing DPFs are located in a splayed way. Similarly, the elephant passage area in Mayurbhanj district spread over an area of 17489.82 km<sup>2</sup> out of which the forest area comes to the 52.64 km<sup>2</sup>.

Information from 1997-98 to 2013-14 from the Forest Department records was used to quantify elephant depredations in the Baripada and Balasore Wildlife Division. Data on crop damage and house damage in incidents, human kill, human injury and elephant mortality was collected from office of the Divisional Forest Offices. To get a quantitative measure of economic losses due to the crop raiding and to evaluate people's attitudes, a survey of affected villages in the reserve was conducted. These data were verified through field visits to specific sites and by conducting informal interviews with government officials, local people or local community leaders. Rapidly assessments were carried out using the focus groups, field visit to area of elephant damage, and reconnaissance in to the forest with villagers to observe habitat types. To find out the nature of the conflict questions were asked about the land use pattern, details of human death and injury, ethnic composition of the villages and preventive measures.

## RESULTS AND DISCUSSION

### Human death and injury due to elephants

A total 16 cases human death and 15 cases human injury by elephants were reported during the period 1997 to 2014 (Fig. 2). Out of these 16 death, 9 (56%) death occurred in the winter, 4 (25%) in summer and 3(19%) in monsoon season (Fig. 3). The high deaths in winter may be correlated to the increase out door activities of men like in NTFP (Non-Timber Forest Product) collection in Forest and winter crop pattern during the season. Out of 16 death cases 12 deaths occurred in Baripada Forest Division under Deoli and Rasgovindapur Range and four death cases were in Nilgiri Range of Balasore Wildlife Division (WL).

The maximum number of human death and human injury in was reporting in the year 2011-12 in Baripada Forest Division. The majority of human death and human injury cases took places during the month October-December with the month of November (n=9cases). Out of 31 human death and human injury cases, the incidents happened more in the agriculture area 42% followed by Forest Area 35% and close to Village area 23% (Fig. 4).

### **Crop damage due to elephants**

During the study from 1997-98 to 2013-14, migrating elephants herd damaged 2565.4 acres of paddy in these Forest divisions (Fig. 5). Major crop damage occurred in Baripada and Balasore WL division (62% of the total area) mostly in 76 villages. A total of 1145 persons received the compensation in these forest divisions. Other economically important field and garden crops were damaged including fruit tree (banana, jackfruit, pineapple, coconut, and sugarcane, vegetables (cauliflower, cabbage, etc.),. Whereas Baripada Forest and Balasore WL Division mostly affected due migration of elephant, the highest number of crop depredations occurred in the year 2010-11 in Balasore Division 721 cases 435.65 acre. A total of Rs. 14 lakhs was sanctioned as ex-gratia payment for the victim of Human Elephant Conflict (HEC) in Balasore (Wildlife) division.

During 2012-13 in Balasore (Wildlife) Division, 971 cases with 724.06 acres of land and total 70 lakhs was sanctioned as ex-gratia payment for the victim of human elephant conflict in Balasore (Wildlife) Division. There was a elephant movement and damage for the last 17 year 1997 to 2014 but the number of incident as well as magnitude of loss was highest in the month of September to December (Fig. 6). Elephant damage more than 7 different type of major cultivated fruit tree plants and cash crops where paddy (*Oryza sativa*), sugarcane (*Saccharum officinarum*), maize (*Zea mays*), mango (*Mangifera indica*), jack fruits (*Artocarpus heterophyllus*), vegetable, coconut (*Cocos nucifera*) cabbage, cauliflower, and banana were the most common. The highest incidences of

crop raiding was recorded in Balasore Wildlife Division during the period 2011-12 (Table-1).

### **House and property damage**

During the study period, 1155 houses damaged comprising of partly damaged 757 and fully damaged 398; 579 villages and 2539 house holds were affected (Fig. 5). The maximum number of house were damaged during 2012 and the peak month was December that is just after harvesting when stored grain becomes the target. In 70% of cases house with stored paddy and brewed Rice were damaged. Maximum house hold and property damaged (60%) caused by the male Tusker, followed by herds (25%) and adult female (15%).

### **Some observations on elephants**

A qualitative assessment was made of factors responsible for crop damage. This was carried out by discussion with local people and forest department field staff. These are briefly stated below:

- i. Elephants used reserved forest patches for shelter during the day and as refused for raiding crops. Crops near forest or where agricultural fields are interspersed with forest are more prone to attack by elephants.
- ii. Un-harvested crops, harvested crops left in the fields and harvested crops stacked outside the house are prone to raids by elephants.
- iii. During the movement of elephants, they were not eating Swarna variety rice crop reason being due to spray of pesticides. Crop damage is mainly due to trampling. But elephant are used to eat local desi rice, Pratikhya, Mugei, Moti, Nagraj, Salphul, Sunapani, Gruhalaxmi, Puja and Malati etc.
- iv. Elephant have favor love for paddy, rice beer (Handia), brewed rice (Pakhala), and Mahua flower and stored paddy. It has been observed that elephant raids tribal houses for rice beer, brewed rice and local country liquor made out of mahua flowers. After drinking the brew they run amok destroying field and breaking the house.

- v. The crop damage due to elephant was increased because of unruly behavior of the public who were gathering in thousand numbers and preventing the movement of elephants and took photographs with flash light.

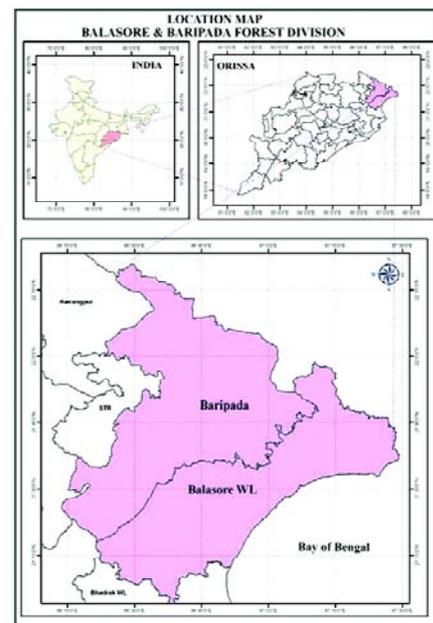
### **Migratory elephants from West Bengal to Odisha**

Elephants are long ranging migratory animals especially in search of food and require substantial areas to support their ecological needs. Habitat loss and fragmentation of traditional elephant corridors due to expansion of human habitation and agriculture has forced the elephants to split into a number of meta populations or herds and move to new areas in search of food and shelter. As a result, the interface of elephant and human has increased manifold. This results in conflicts with humans due to elephants raiding or destroying their crops.

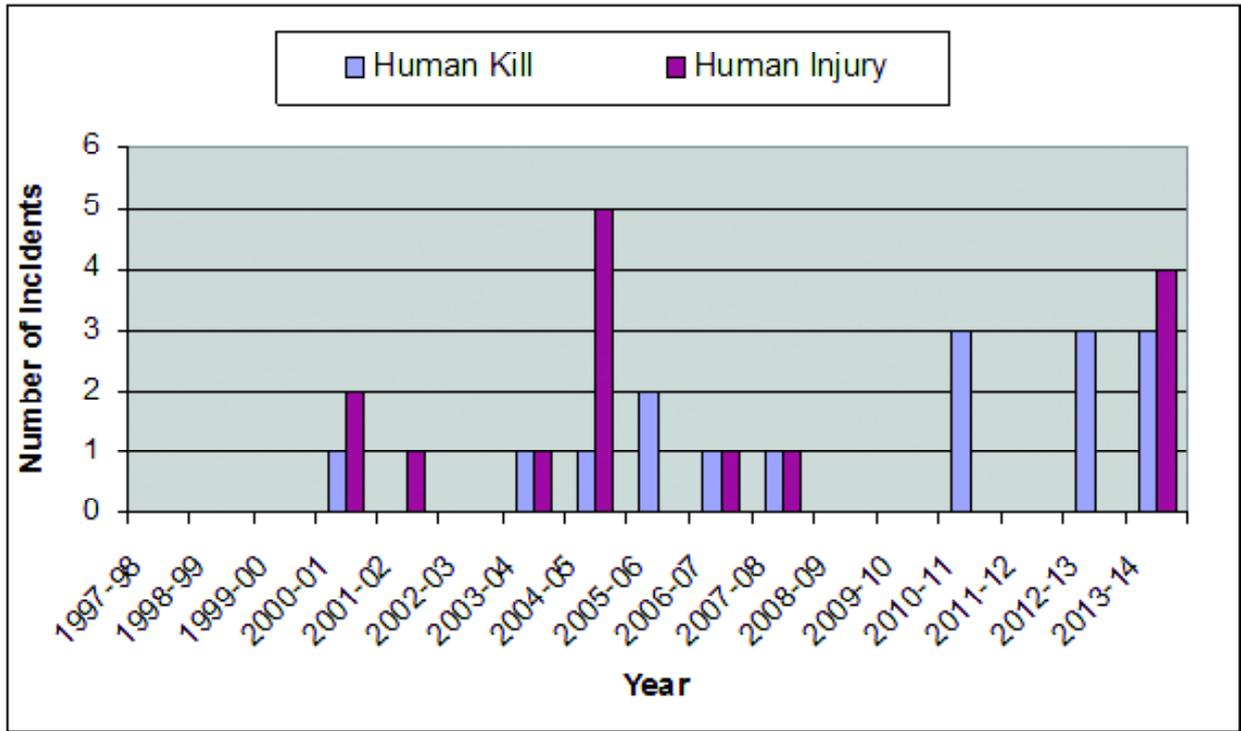
There is large scale sugarcane cultivation goes on in West Bengal on the other flank of Subarnrekha river which lures the wild elephants of Dalma during winter season when the crop matures. Deuli and Suliapada are part of Suliapada tahasil of Mayurbhanj district bordering South-West Bengal where there is good patch of Sal forest intercepted by low lying cultivated lands. The Elephants raid on these crop fields in West Bengal during November – December. To tackle these animals from damaging their crop, the local people in course of time have developed the art of driving them into Orissa, torturing them by several means in organized way. There is continuous migration of elephants from Jharkhand to Odisha via West Bengal. The interstate migration of elephants is recorded during 1997-98 to 2013-14 (Table 2 and Fig. 7). Deuli and Rasgovindpur Range under Baripada Forest Division is the most affected Range in respect of man elephant interface. Mainly migratory elephants from neighboring state West Bengal intrude Orissa through Suliapada Section of Suliapada Block and also through Moroda Block. Maximum number of elephant migrates from West bengal to Odisha during the winter season i.e. October to December (Fig. 8). The no. of elephants in herds ranging from 50 to 150 elephant intrude

into Suliapada Block during the harvesting period i.e. from the month of November to February and cause damages to the paddy crops, mud and thatched houses of the villagers and also to the lives of the people. The migratory elephants of different age groups come from Dalma Sanctuary of Jharkhand and then to Tapoban sanctuary of West Bengal and then to Odisha (Table 2).

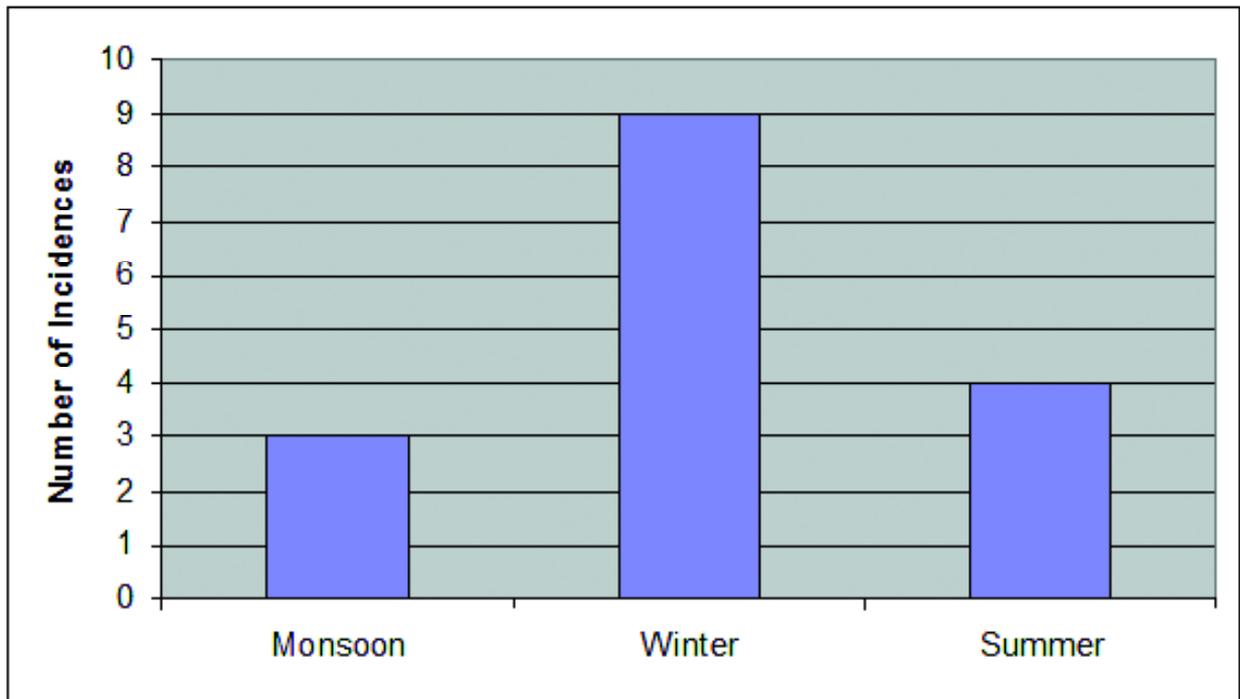
Raibania is a part of Jaleswar Tahasil of Balasore Civil District located on the northern front of the state being bordered by Subarnarekha River. On the other flank of Subarnarekha large scale Sugarcane cultivation goes on in West Bengal which lures the wild elephants of Dalma, Tholkabad to that area during winter season when the crop matures. Deuli and Suliapada are part of Suliapada Tahasil of Mayurbhanj district bordering South-West Bengal where there is good patch of Sal forest intercepted by low lying cultivated lands. The Elephants raid on these crop fields in West Bengal during September – December (Fig. 6). But it is seen that, the migratory elephants instead of using the forested areas intrude in to areas they feel safe being chased by the people in mob. Even if, they use the said forest in the day time, during the



**Fig. 1.** Map showing Baripada and Balasore Wildlife Division



**Fig. 2.** Human death and human injury due to migration of elephants from West Bengal to Odisha during the period 1997-98 to 2013-14



**Fig. 3.** Maximum attacks happened during the winter season followed by summer season

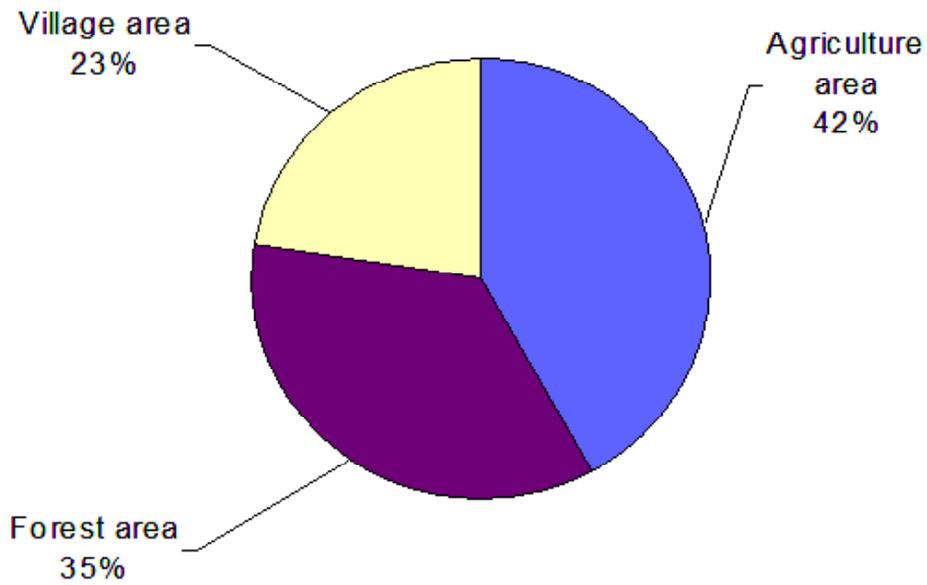


Fig. 4. Elephant attacks were highest in Agricultural area where activities of both elephants and human overlap

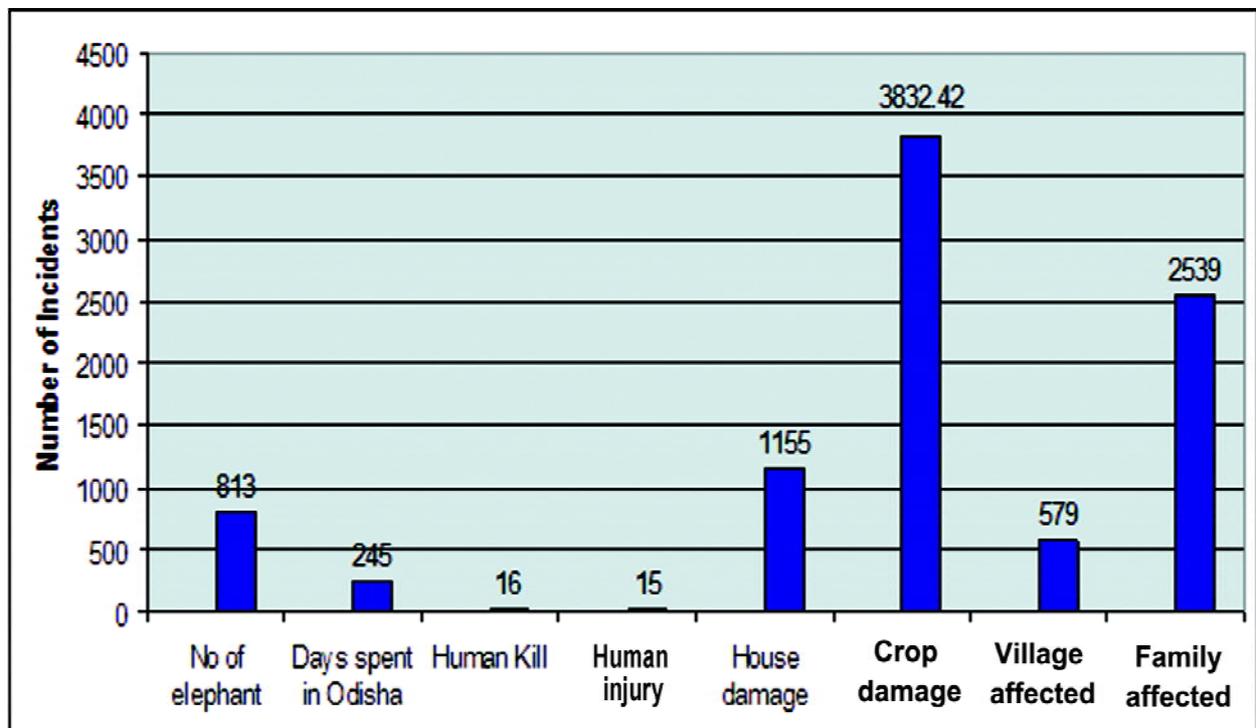
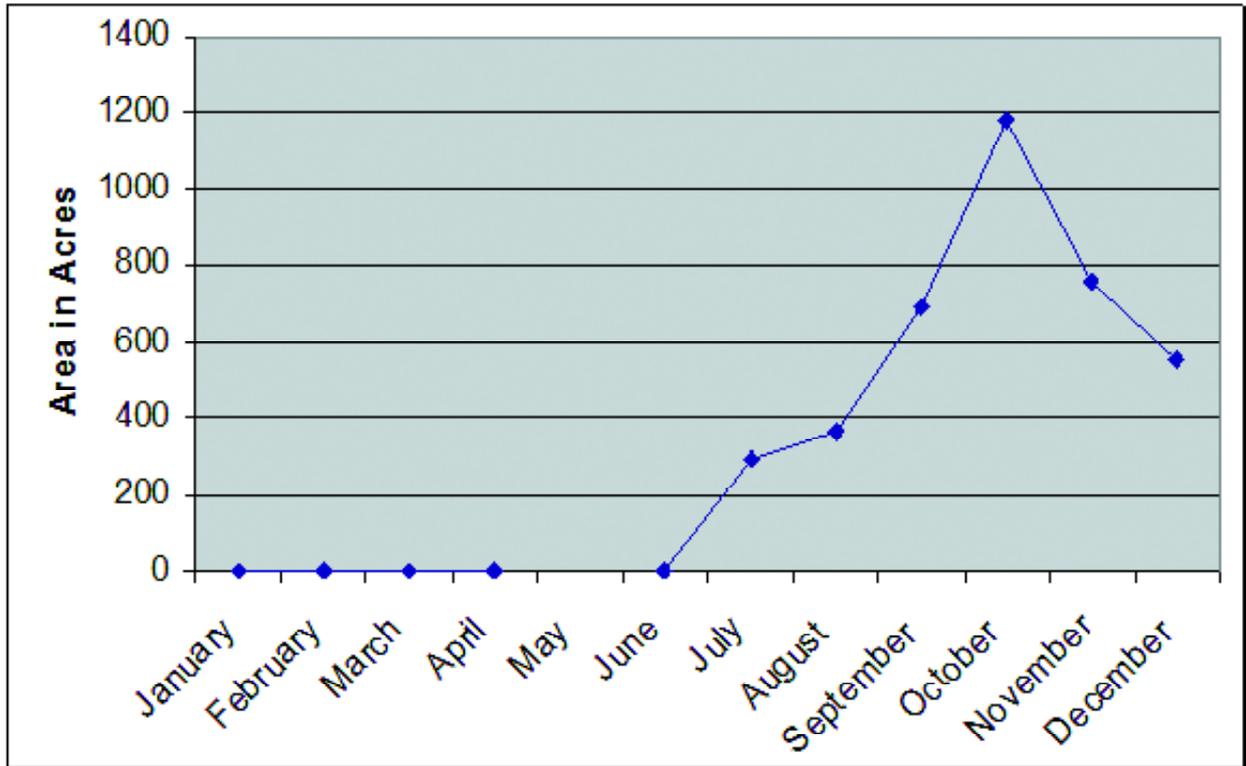
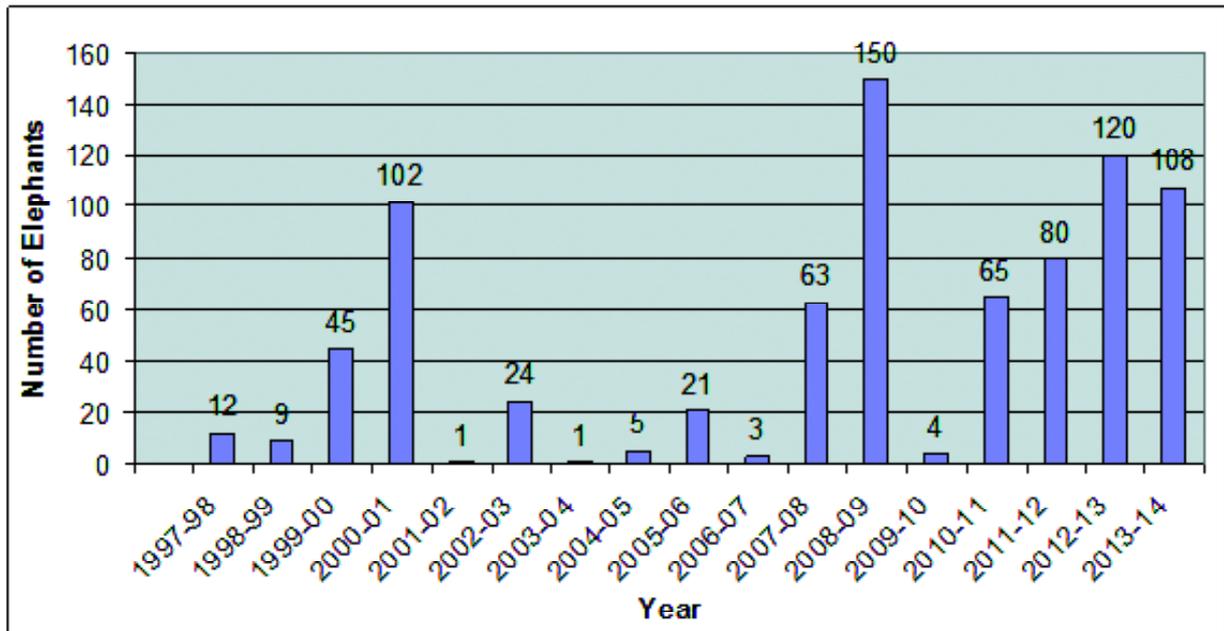


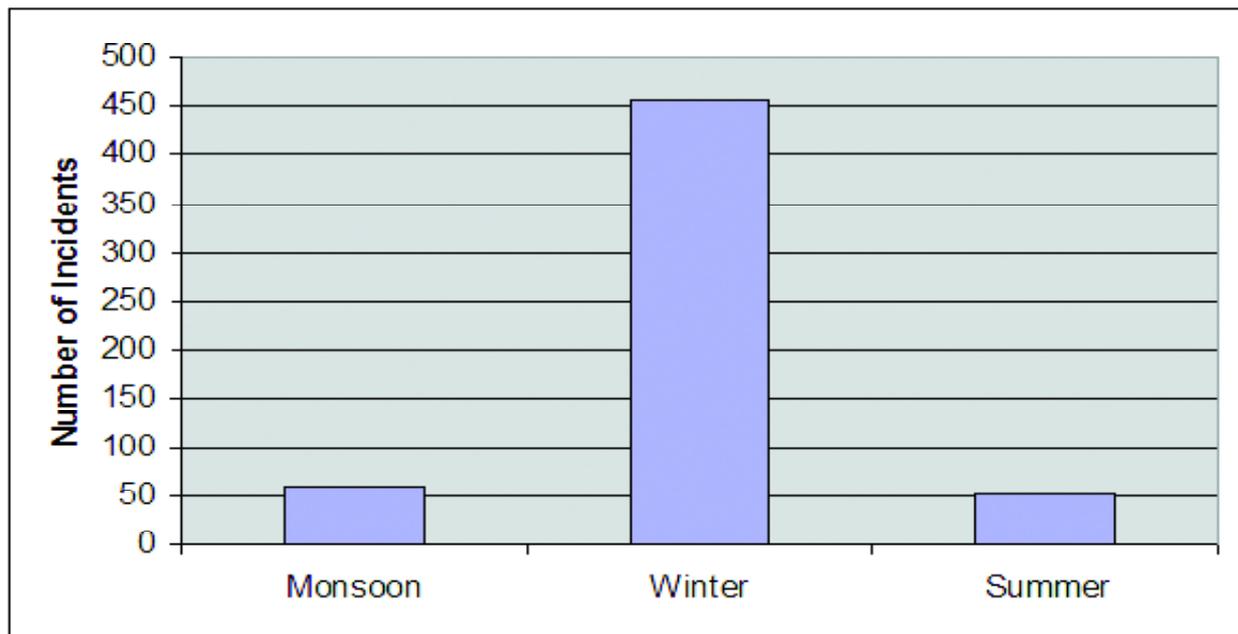
Fig. 5. Human death, injury, crop damage, house damage etc. by migrating wild elephants from West Bengal to Odisha during the period 1997-98 to 2013-14



**Fig. 6.** Month-wise crop damage by migrating wild elephants from West Bengal to Odisha during the period 1997-98 to 2013-14



**Fig. 7.** Year-wise elephant migration from West Bengal to Odisha during the period 1997-98 to 2013-14



**Fig. 8.** Maximum movement of elephant migration from West Bengal to Odisha during winter season followed by monsoon season from 1997-98 to 2013-14

night again they move out of the area and tend to visit the sugar cane and other crop field. The people from both flanks obstruct the movement which agitates them to retaliate and cause damage. Usually the route followed by the animals is covered under paddy field on the side of the boundary with very closely located human habitations. In course of their movement they cause damage to house frequently if not guided properly. During last four years with the local people, attempt is being made to guide the intruding animals safely back to their original habitat minimizing disturbance enroute and making people alert in advance to minimize damage to life and property of people as well threat to the life of animal. For the sake two active Elephant drive squads, Hulla Parties are to be kept in readiness round the clock, with provision of their vehicular movement required at times. Provision for food for hulla parties, light, kerosin oil, crackers, mashal, shoes for hulla parties, megaphone, beat drum, etc. becomes necessary at the time of elephant depredation.

Throughout their range wherever they occur, elephants are known to explore newer areas and extend their range. Several explanations have been suggested. Local overabundance of animals, habitat

loss, shortage of food and water resources, or simply a natural instinct to explore newer areas are some of the possible causes for elephants to make forays in new areas (Sukumar, 2006). Fragmentation of forests in Baripada, or creation of a large Subarnarekha canal near the border of West Bengal may be responsible for elephant movement in Baripada. Sometimes such forays are attributed to elephants having memorized past migratory routes which they are trying to use again. Migration by elephants is a natural process that helps sharing of grazing pressure between foraging areas. Where home ranges are totally lost the herds end up Wandering. The herd that went into Jharkhand from Dalma Wildlife Sanctuary to West Bengal forest after considerable initial conflict. It is being seen that, the migratory elephants instead of using the forested areas intrude in to areas they feel safe being chased by the people in mob. Even if, they use the said forest in the day time, during the night again they move out of the area and tend to visit the sugar cane and other crop field. The people from both flanks obstruct the movements which agitate them to retaliate and cause damage. Usually the route followed by the animals is covered

under paddy field on the side of the boundary with very closely located human habitations. Apart from these factors, scientists have explained elephant's attraction to field crops as an optimal foraging strategy wherein elephants visit crop fields because here food is available in large quantity and variety which makes foraging easier without having to spend time and energy looking for the food in the forests (Datye, 1995). Therefore it appears that elephants occurrence in West Bengal could be a result of combination of the above factors and not due to one single factor.

Interstate migration of elephants from Dalma Wildlife Sanctuary of Jharkhand State to Nilgiri area of Balasore district in Odisha through Midnapore district (West Bengal) and Mayurbhanj district of Odisha is being observed for the last 5 years. Dalama Wildlife Sanctuary is situated at 10 km<sup>2</sup>. south of Jamshedpur in Jharkhand State and is a small wildlife sanctuary over 193 km<sup>2</sup> area having 158 elephant population (Once their number was 300 as per 2007 census), which is beyond the carrying capacity of that sanctuary. Therefore, more than 100 elephants seasonally migrate to West Bengal and Odisha. These elephants from Dalma Wildlife sanctuary raid crop in Midnapore, Bankura and Bardhaman district of West Bengal. The people in these districts are forcibly driving the elephants from their traditional migratory routes using cruel means towards Odisha state. The increase of man animal conflict in South West Bengal *viz.*, Purulia, Bankura and Midnapore, has been a major administrative issue for the West Bengal Forest Department.

The problem started in 1987 when elephant herds from Dalma Wildlife Sanctuary, situated in the State of Jharkhand started migrating to Jhargram Division in the state of West Bengal. Initially this did not pose any significant problem for Odisha. Later, due to development in irrigation facilities the farmers in West Bengal started growing cash crops like sugarcane. Therefore to avoid damage to the cash crop, they are now indulging in unfair means to forcibly drive the elephant towards Odisha. The people of West Bengal have been trying to stop the

elephant from migrating towards Bankura, Bardhaman by a method locally known "hulla parties". These hulla parties with crackers, red hot spears and search lights drive elephants into Odisha. Burn to injury of many elephants entering Odisha is a testimony to these practices.

### **Attitude of local villagers and their behavior towards elephants**

Surveys suggest that the locals are emotionally attached to elephants because of their religious beliefs. Since most of the villagers do not have any previous experience of dealing with wild elephants, they live in great fear. Irresponsible news published in the local newspapers has also elephants in aggravated these fears. The masses are of the opinion that they will take suitable measures to protect their life and property if these elephants were to make the nearby forests their permanent home. A few of them preferred the stronger options of killing the elephants either by electrocution or by using fire arms, if elephants cause extensive damage. It is also noticed that elephants were disturbed by villagers during the day in the forests and therefore, retaliated by extensively damaging village property. Awareness programmes among villagers would help control this threat to elephants.

### **Mitigation measures**

Mitigation measures presently adopted involve traditional drive-away techniques including making noise by shouting, drum beating, bursting fire crackers and firing gun shots into the air, and using torch light, pelting stones and throwing burning torches has been used in severe cases. Machans are used for guarding the crops. Combinations of methods are most effective. Family herds were easily deflected, while single bulls were difficult to ward off. Affected villagers have suggested methods like regular patrolling by the Forest Department officials along the village near the forest, installing electric fencing, construction of stone wall, culling and lighting the village during night hours. Attempts are made to reduce conflict by changing the traditional cropping pattern by introducing some elephant-repellent alternative cash crops.

**Table 1.** Year wise elephant migration and depredation from West Bengal to Odisha during the period 1997-98 to 2013-14

Year	Human Kill		Human Kill	Human Injury		Human Injury	House damage		House damage	Crop damage		Crop damage
	Baripada	Balasore		Baripada	Balasore		Baripada	Balasore		Baripada	Balasore	
1997-98	00	00	00	00	00	00	30	00	30	9.8	00	9.8
1998-99	00	00	00	00	00	00	14	00	14	25	00	25
1999-00	00	00	00	00	00	00	03	00	03	10	00	10
2000-01	01	00	01	02	00	02	125	00	125	52	00	52
2001-02	00	00	00	01	00	01	00	00	00	00	00	00
2002-03	00	00	00	00	00	00	01	00	01	00	00	00
2003-04	01	00	01	01	00	01	00	04	04	00	00	00
2004-05	01	00	01	05	00	05	05	05	10	00	00	00
2005-06	02	00	02	00	00	00	10	07	17	2.5	00	2.5
2006-07	01	00	01	01	00	01	07	08	15	00	00	00
2007-08	01	00	01	01	00	01	04	09	13	00	00	00
2008-09	00	00	00	00	00	00	157	13	170	295.95	00	295.95
2009-10	00	00	00	00	00	00	00	25	25	00	00	00
2010-11	03	00	03	00	00	00	124	80	204	374.54	485.46	860.00
2011-12	00	00	00	00	00	00	131	49	180	259.94	385.62	645.56
2012-13	00	03	03	00	00	00	100	116	216	570.37	690.58	1260.95
2013-14	02	01	03	02	02	04	97	31	128	334.09	336.57	670.66
Total	12	04	16	13	02	15	808	347	1155	1934.19	1898.23	3832.42

**Table 2.** Elephant migration from West Bengal to Odisha

Year	State from where entered	Entry point (Odisha)	No of elephants entered	Days spent in Odisha
1997-98	West Bengal	Deuli Range	12nos ( M-2,F-6,C-4)	06
1998-99	West Bengal	Deuli Range	9nos ( M-3,F-5,C-1)	01
1999-00	West Bengal	Deuli Range	45nos ( M-4,F-35,C-6)	04
2000-01	West Bengal	Deuli and Rasgovindapur	102 nos ( M-7,F-65,C-30)	01
2001-02	West Bengal	Bangriposi Range	01nos ( M-1)	10
2002-03	West Bengal	Dukura and Deuli	24nos ( M-2,F-18,C-4)	03
2003-04	West Bengal	Deoli and Rasgovindapur	07nos ( M-3,F-2,C-2)	03
2004-05	West Bengal	Deuli,	05nos ( M-1,F-2,C-2)	02
2005-06	West Bengal	Dukura Range	21nos ( M-2,F-9,C-10)	35
2006-07	West Bengal	Deoli Range	24nos ( M-4,F-8,C-12)	21
2007-08	West Bengal	Deuli range	63nos ( M-19,F-13,C-31)	19
2008-09	West Bengal	Deuli Range	150nos ( M-21,F-62,C-67)	25
2009-10	West Bengal	Deuli Range	04nos ( M-1,F-2,C-1)	21
2010-11	West Bengal	Rasgovindapur	65nos ( M-19,F-13,C-33)	19
2011-12	West Bengal	Rasgovindapur	80nos ( M-17,F-34,C-29)	25
2012-13	West Bengal	Rasgovindapur	120nos ( M-28,F-48,C-44)	23
2013-14	West Bengal	Rasgovindapur	108nos ( M-26,F-52,C-30)	27

\*M-Male , F-Female, C-Cub

### Anti-depredation strategy

This would require a well organized set up in the Forest Divisions to continuously monitor elephant movement in all forest fringe areas, and to sound alert in the villages likely to be visited by elephants, in advance. The anti-depredation units are required to quickly take charge of the situation when the elephants enter into village area, and to organize a regulated drive operation of elephants to minimize damage to houses and crops. In selected locations, barriers would be constructed to secure the human habitations and paddy fields, and at the same time to allow safe passage to elephants. To check depredation elephant proof barriers like trenches, solar fencing, boulders packing etc, will be used to prevent exit of elephants from forest areas or to check entry in to the villages.

### Recommendations

i. An interstate committee must be created comprising representatives from West Bengal, Chhattisgarh, Jharkhand and Orissa. This committee should decide on the collection of uniform information relevant for elephant management. The collected information should be shared directly between the concerned

Divisional Forest Officers. This committee should involve individuals who have worked on elephant related issues in West Bengal and Odisha so that an effective management plan can be developed for elephant populations. During these meetings, emphasis should be given on quality improvement of elephant habitat in West Bengal and Odisha so that disoriented elephant migration can be stopped.

- ii. All the interstate border forest divisions should create elephant squads so that they can keep proper records of elephant movements and other variables important for management of elephant populations the squad continuing the monitoring 24 hours the month September to December. All the team members of such a elephant squad should be properly trained and equipped, including siren, wireless sets, binoculars, digital still Camera, night vision binocular and other equipment.
- iii. Development of interstate elephant corridor, West Bengal –Deuli- Suliapada corridor
- iv. Regular monitoring of maintenance of existing trenches, solar fencing and stone wall of the border area of Odisha and West Bengal

- v. Developing an action plan to mitigate human-elephant conflict and conservation of migrating elephant from Jharkhand via West Bengal to Odisha.

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