Fostering human-Asian elephant coexistence with community involvement in the Anamalai hills

FINAL REPORT
AUGUST 2019

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Abstract

Human-elephant conflict has been one of the critical conservation issues across Africa and Asia. Asian elephant (*Elephas maximus*) ranges outside Protected Areas into human-dominated landscapes, leading intense conflicts between people and elephants. Given that in countries such as India where millions of people and hundreds of elephants share resources and interact with each other, resolving human-elephant conflict is a high priority issue. In India, around 500 people and over 100 elephants lose their lives due to intense conflicts, which warrants conservation efforts to resolve conflicts and ensure safety of people and elephants is paramount importance. The project has been carried out in one of the critical conservation regions called the Valparai plateau in the Anamalai hills, which harbours second largest Asian elephant population in India. Loss of human life and property damage by elephants is a serious concern besides trauma and fear in people that elicit from conflicts. As many people who lost lives in direct encounters with elephants were primarily due to people were unaware of elephant presence. During the last two years (2017-19), we have tracked elephants on daily basis in the tea and coffee dominated landscape of the Valparai plateau which supports around 120 elephants and 70,000 people. Based on this information, we have established a multi layer 'Elephant Information Network’ with stakeholders including plantation companies, state forest department field staff, and local people to implement simple, adaptable, and unique measures of early warning systems, using SMS and voice call alert systems and mobile operated alert beacons. During the past two years we have sent out an average around 2000 text messages and calls to peoples' mobile phones and installed alert beacons in critical strategic points that would indicate elephant presence and their movements to people who reside within 2 km radius from elephant locations on the Valparai plateau. These measures have been well regarded by local community and encouraged them to be part of early warning systems and management of human-elephant conflict. All these collective efforts resulted in zero accidental (surprise) encounters for the sixth consecutive year. Though there were three people lost lives in 2017-18 due to ignored early warning and unplanned chasings of elephants, which were addressed through awareness and sensitization programmes through street plays and formal meetings with local community. These efforts in the later year of 2018, resulted in *no human death* on the plateau. And also, over a long-term, human fatal encounters remained one person/year (2003-2019) for the last fifteen years as compared to the period between 1994-2002, prior to our work on elephants in the region. Property damage incidents have been reduced to more than 50% during the project period as compared to 2011. These measures have been replicated by other agencies such as state forest departments in the states of Kerala, Karnataka, and West Bengal and also tea companies in Gudulur region of Tamil Nadu. Our work warrants a shift from reactive *Problem animal* approach to proactive *Problem location* approach for peaceful coexistence between people and elephants in altered landscape of people and elephants.
INTRODUCTION

Conservation of large mammals, particularly elephants, outside protected areas is increasingly becoming a challenge for scientific and conservation organizations, local communities, and park managers due to pressures as anthropogenic threats and compel coexistence with humans (Sitati and Walpole 2006, Graham et al 2010, Fernando et al 2012, Gubbi, 2012). Continuous degradation and conversion of natural habitats, fragmentation of natural habitats, and developmental activities posed a great threat to elephant survival in altered landscapes, leading to intense conflicts across Asia and Africa (Sukumar 1994, Sitati et al 2003, Chartier et al 2012). Effects of these threats, though not clearly documented, few studies (Burke et al. 2008; Ahlering et al 2011 & 2013) reported that human induced pressures increase stress levels in elephants and may affect their viability of population survival in human modified landscapes.

Asian elephant (Elephas maximus), recently recognized as National Heritage animal by the Indian Government, two third of its population lives in non-protected areas either close to or within human dominated landscapes giving opportunities into greater contact and conflict (Sukumar 1989, Madusudan et al 2015, Fernando et al 2019). Human-elephant conflict escalated with ever increasing human population coupled with hydro-electric projects, agriculture expansion, transportation networks and reservoirs within forested elephant habitats, resulted in fragmented populations (Leimgruber et al 2003) and pushed these pachyderms into neighboring human use areas (Desai 1991). Asian elephant worshiped as God, occupied cultural and religious prominence in human societies across Asia, is has been facing elevated threats due to human-elephant conflict. Thus, human-elephant conflict resolution is not only of scientific and conservation importance but a societal need to retain traditional values of tolerance in local communities towards elephants in human-elephant relationships.

There have been various techniques employed to deal with human-elephant conflict in interspersing areas of elephants and humans. Multiple methods of deterring elephants from human-use areas or crop lands by deploying physical barriers such as electric fences, elephant proof trenches etc., traditional methods of using crackers, use of tobacco – chilly rope, elephant drives etc., have showed mixed results in their efficacy in dealing with human-elephant conflicts (Nath and Sukumar 1998, Parker and Osborn, 2006, Kioko et al 2008, Chelliah et al 2010). Recently, numerous experimental trials focusing on innovative measures
have showed varying degree of success to mitigate human-elephant conflicts in Asia and Africa (King et al 2011, Davies et al 2011).

Of the various kinds of conflict mitigation techniques, early warning systems proved to be effective in reducing incidence of conflicts (Venkatraman et al 2005, Hedges and Gunaryadi 2009, Davies et al 2011). However, there have been very few human-elephant conflict studies which addressed long term monitoring on the efficacy of conflict mitigation techniques in terms of reduction in incidence of conflicts, adoptability of techniques by local communities, reduced stress levels in people, help increase levels of people tolerance towards elephants, and sustainability of conflict mitigation measures. Here in this report, we have addressed the following objectives.

A) Monitor movement of elephants and their conflict with people between 2017 -2019  
B) Conveying of elephant presence alerts to people over early warning systems (2017-19).  
C) Community participation in early warning systems  
D) Functionality and impacts of early warning systems on incidents of conflict

MATERIALS AND METHODS

A. Study area

The Valparai plateau in the Anamalai hills is a landscape of tea and coffee plantations interspersed with rainforest fragments and Eucalyptus plantations. The 220 km² Valparai plateau in amidst of protected areas which form an important landscape for Asian elephants in the Western Ghats of India. Nearly, around 40 rainforest fragments within monoculture plantations act as refuges for elephants to move across the plateau (Mudappa and Raman 2007, Kumar et al 2010, Figure 1). The plantation industry on the Valparai plateau owned by national and multinational companies support nearly 70,000 people working in tea and coffee plantations. The inevitable situation of using the plantation landscape by elephants and people dependency over tea and coffee plantations for survival led to interactions between elephants and people, leading to human-elephant conflict (Kumar et al 2004). The only way to resolve human-elephant conflict on the plateau is to make people vigilant of elephant presence and adopting better practices to promote coexistence between people and elephants.
Methods

Methods adopted during the study were briefed below:

- Establishing conflict response team (CRU) with a team of experienced tribal people who track elephants within plantation limits during the day and record information on date, time, identity of elephant herd, herd composition, incidence of conflicts, type of habitat, and movement with handheld GPS (Kumar et al. 2004, 2010). The information from CRU was intimated to the elephant information centre on daily basis.

- Elephant information network was established by initiating bulk SMS and voice call services where information about elephant presence and their movement from CRU, local people, and field staff of Tamil Nadu Forest Department was communicated to people on their mobile phones residing within 2 km from the place of elephants (Fig 2). A database which includes information about name of the person, place of residence, division, estate, about 4500
people who were willing to receive elephant messages on their mobile numbers has been maintained. Responses from people for Bulk SMS have been systematically recorded, grouped, and analyzed for their efficacy. A detailed explanation on methods has been mentioned elsewhere (Kumar and Ganesh 2012).

- Early warning remotely mobile operated elephant alert indicators with red LED flashing units have been installed in 32 locations which are visible from a distance of 1 km from nearest bus stop (Fig 3). For each light, at least two people mobile phone numbers from local plantation workers community were registered. These people are authorized to operate alert indicators in case of elephant presence within 1 km distance from the light. Information received in the form of SMS from alert indicators, when operated, was systematically recorded to understand involvement of people in alerting residents of respective localities about elephant presence. False alarms and failed operations were estimated based on elephant presence or absence within 1 km radius from each of the 32 lights installed on the Valparai plateau.

Results

A. Monitoring elephant movements

The Valparai plateau has been consistently used by around 120 elephants in tea and coffee plantations and rainforest fragments in year. During 2017-18 and 2018-19, 3573 herd-days and 3544, herd-days, respectively, (number of days of time spent by different elephant herds/solitary individuals which were more than a kilometer apart of time spent by elephants on the plateau. Elephant activity peaks between October and March in a year, a sensitive period for human-elephant interactions on the Valparai plateau. Elephant herds showed distinct ranging patterns with overlap in areas which has been consistent over years. This
matches with the findings of other studies carried out in Sri Lanka and Malaysia which indicate Asian elephants show strong fidelity to their ranges.

**Human-elephant conflict**

1. **Property damage by elephants**

The property damage incidents have reduced significantly during 2018-19 (n = 64) as compared to the year 2017-18 (n = 112). However, in both years, property damage by elephants continued to be low as compared to the year April 2011 - March 2012 (150 incidents). However, property damage incidents due to elephants on higher side as compared to previous four years between April 2016 - March 17 (71 incidents), April 2015 - March 16 (97 incidents) April 2014-March 15 (68 incidents), April 2013-March 2014 (97 incidents), April 2012-March 2013 (88 incidents). The slight increase in number of property damage incidents in the year 2017-18, were mainly due to changes in the way that food grains are stored and also negative interactions between elephants and people. Most of the property damage occurred between September and February (2017-18: 67%, n = 75, 2018-19: 84.4%, n = 54, Figure 4), denoting the peak conflict period which has been noticed over years. In both years, we have recorded high number of damages noticed to residential places (52 incidents, 46.4% in 2017-18 and 26 incidents, 41% in 2018-19), followed by ration shops and noon-meal centres (46 incidents, 41% in 2017-18 and 31 incidents, 48% in 2018-19) which store food grains such as rice, dhal, lentils, salt and sugar are located either inside or within 50 m distance from residential colonies which cause potential danger to people and their property.

2. **Human fatal incidents**

Over the past 25 years (1994-2019), of the 45 people who lost their lives to elephants, 35 fatalities attributed to the lack of awareness of elephant presence which lead to unexpected fatal encounters. During the past two years, early warnings about elephant presence and their movements in plantations resulted in no incident of human fatality due to lack of awareness.

![Figure 4. Distribution of property damage incidents by elephants across months during 2017-19.](image-url)
about elephant presence. However, unplanned chasing of elephants, ignoring warnings and inebriation resulted in three human fatalities. One particular incident where a person who was inebriated lost his life during a stone pelting drive incident. Angry mob demanded Kumkis (elephants used to chase or capture wild elephants) to drive away wild elephants which resulted in death of an elephant.

B) Early warning systems

Our regular interactions with various estates and awareness programs with local communities, resulted in an increase in subscribers to the bulk SMS and voice call alert services. The number of subscribed users increased to 4,464 mobile phones. The database includes 3345 males and 1,119 females, a significant participation by women as compared to the beginning of the project (348 women), in the Elephant Information Network.

1. Bulk SMS text and outbound voice call alerts

In 2017-19, we have sent out 1,342,921 messages (2017-18: 736174 and 2018-19: 607745; with an average of 41,014 messages/month), covering estate workers, women self-help groups, merchants, daily wage workers, managerial staff, and forest department personnel. Delivery of messages peaked between October and March which corresponds with the peak elephant movement on the plateau (Fig 5). Such a network has facilitated the range forest officer to send out rapid response teams to the most sensitive areas which would require immediate attention in terms of safety of life and property. Similarly, 1,141,159 call alerts sent out between 2017-19, only 19% of calls (n=216,051) were attended by recipients. Of the total unattended calls (n=925102), 90% was mainly due to recipient phone was busy and in 9.3% of cases, the recipient did not pick-up the call.

2. Mobile operate alert beacons

In addition to existing 30 flashing alert beacons, three more lights have been installed in critical locations of TATA Coffee plantation company. These alert lights are roughly
benefitting 20,000 people and help them about elephant presence within 1 km radius from each light location.

C) Community participation in elephant information network

Active participation by local communities has steadily increased in the elephant information network over the past one year. Peoples’ calls to the research team involves either to enquire or convey information about elephant presence in respective areas. This indicates the acceptance and seriousness with which local communities choose to make the best of use the facility made available.

Between 2017-19, 958 calls (2017-18: 421 and 2018-19: 532) response calls received from estate workers as a response to Bulk SMS and outbound voice call systems. Nature of calls received from people reveal that a majority of calls were related to conveying (47%) and enquiring (39%) of elephant locations to the research. Remaining calls were about request for help, request to subscribe for elephant alerts, and appreciation of alert services. The response calls indicate that people continue to rely upon these systems and created "My Message" attitude among local people since its inception in 2011.

Alert beacons were operated 634 and 442 times in 2017-18 and 2018-19, respectively, whenever elephants were seen within 1 km radius from each light location. Around 72% of operations were carried out between October and March, corresponding with elephant movements on the plateau. Local community was involved in 99% of light operations, indicating their sustained responsibility in alerting people living in each light locations.

Awareness and sensitization activities

Awareness and sensitization programmes are being carried out on a regular basis to convey the importance of elephants and our research findings while imparting precautionary steps to avoid fatal encounters with elephants. Between 2017-19, we have held 52 formal and field orientation interactions, covering 2,700 estate workers on the field. For the first time in Valparai, seven street plays performed by Sword Adhiyaman KalaiKuzhu, a team of professional street play artists to convey the importance of the need to coexist with elephants, precautionary steps required to be taken while moving through elephant presence areas and ill effects of alcohol consumption in the elephant use areas. Tea and coffee estate management have been instrumental in executing these shows. In February 2018, Parry Agro Industries limited, TATA Coffee Limited, and Periya Karamalai Tea Company supported our
initiative by providing space and ensured that their estate workers (634 people) attended the event. This being the first time, we received a lot of positive feedback and also brought to light some our shortcomings which could be improvised in the future.

**Sharing results with Government officials**

As a way of promoting the impacts of project in promoting human-elephant coexistence we have interacted with Forest Department officers of various states in India.

- Conducted an interaction with 45 forest range officers trainees from Karnataka, Maharashtra, and West Bengal on human-elephant coexistence: communication technology in mitigating conflicts and community participation on 14 October 2017
- Conducted an interaction with IFS trainees on 18 September 2017 about 'Human-elephant coexistence: A science based approach'. The meeting was attended by 32 trainees from six states of India.
- Dissemination of project results during a talk titled "Of pachyderms, panthers, and primates: understanding human-wildlife relationships" on 28 October 2017 for officers of Tamil Nadu Forest Department.
- We had an interaction meeting on 2 January 2018 attended by five core officers of Anamalai Tiger Reserve to convey the importance of project results and chalk out strategies to deal with human-elephant coexistence in the Anamalais.
- We were invited by the Project Elephant, Government of India to the workshop on 'Right of passage to elephants to mitigate human-elephant conflict' share our work titled "Human-elephant coexistence: a need for scientific approach for conflict resolution" in Thiruvananthapuram, Kerala on 12 January 2018.
- We have participated in the stakeholders meeting organised by the Tamil Nadu Forest Department on 13 February 2018 attended by 55 representatives of tea and coffee plantation companies, six media persons, and 25 Forest Department field staff. Objective of the meeting was to strengthen proactive steps and coordination between forest field staff, plantation company management, and NCF to address human-wildlife conflicts in the Valparai region.

**D) Impact of early warning systems**

- Consistent efforts and cooperation of local communities, plantation management and Tamil Nadu Forest Department field staff enabled to reduce human fatal incidents to zero
In 2018, besides providing increased safety to peoples' lives from elephants. And also, property damage incidents reached lowest with 64 incidents in 2018-19. Over a long-term, early warning systems helped to bring down human death incidents from an average of three persons/year between 1994 - 2002 (prior to our programme) to one person/year (2003 - 2019) for the last fifteen years. This has resulted in saving 23 people lives between 2003-2019, besides helped in increasing positive attitude in local people towards elephants.

- Our project has encouraged and provided inputs to the Kerala Forest Department to implement early warning systems in 42 centres across the state. Our efforts have also inspired West Bengal Forest Department to take up bulk SMS alert systems.
- The Valparai work also gave us an opportunity to experimentally initiate early warning systems in collaboration with the state Forest Department in Karnataka state and also encouraged the forest department to initiate advanced intimation systems in the Kodagu region which has been experiencing severe conflicts in terms of loss of human and elephant lives in the state of Karnataka.

**Peer-reviewed publications**


**Media coverage of the work between 2017-19**


References


**Acknowledgements**

We sincerely acknowledge the support from Van Teinhoven Foundation, Whitley Fund for Nature, Elephant Family, Oracle, Nilekani Philanthropies. We thank Tamil Nadu Forest Department, plantation companies, and local community for their continued cooperation in the field. We acknowledge the support from Niagara Automations, Coimbatore, GUPSHUP Enterprises for their technical support for the early warning systems. Field assistants and colleagues at Nature Conservation Foundation.