

Perception of Human-Elephant Conflict in Pokkunutenna, Sri Lanka: A Case Study

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Abstract

Pokkunutenna located adjacent to Udawalawe National park, and Dahiyagala Sanctuary faces human-elephant conflict (HEC) significantly and is perceived as high in human casualties. A questionnaire survey and field assessment performed to evaluate the severity of HEC incidences, the influence of parks and sanctuary on HEC, and effective mitigatory measures for HEC in the study area. The primary data collected using a convenience sampling method. Pre-tested 42 questionnaires were used to collect data. The sample collection was systematic with five houses gap, and the sixth household was interviewed after the first household. Collected data used to obtain descriptive statistics and tested for statistical significance using the *chi-square* test. Results showed that the HEC has recently emerged in Pokkunutenna village and identified two main causes for this trend. Those were, villagers, adopted crop cultivation as their main livelihood support and planted food crops such as paddy, coconut, and banana that attract elephants (64%). Both the National Park and the Sanctuary provide the main entry paths for the elephants. The invasive species *Lantana camara* removal may reduce intruding elephants, which inhibits other plant growth; eliminating natural fodder for elephants in the Udawalawe National Park. Although clearing obstacles of electric fences may reduce the magnitude of HEC, necessary measures have to be taken to clear the *Lantana camara*, which is deemed a natural way of controlling HEC.

Keywords: chi-square test, crop depredation, elephant attack, key informant interview, perception, questionnaire survey

Introduction

Pokkunutenna is one of the villages facing the HEC in the recent past in a higher probability. Mostly conflict occurs due to human population growth, not due to the elephant population. This increased growth of the human population causes competition with each other in acquiring resources. Failure to recognize the significance of HEC could result in a negative impact on elephant conservation too. HEC is a problem that affects the social and economic activities of the stakeholders in a specific area. Agriculture and particularly paddy are the significant economic activity of the people in Pokkunutenna. The destruction of crop plants made a massive impact on the economic activity of farmers. The recent history of this area shows an increasing trend in the mortality of both humans and elephants (Ranjeewa *et al.*, 2015). Therefore, it creates the HEC in a particular village, requires a systematic appraisal to suggest appropriate resolutions. The concept of conflict mainly depends on the perception of individuals towards it. The impact may include whether they can experience an economic loss or any physical damage. The case study aimed to reveal the perception of HEC by the villagers of Pokkunutenna village by achieving the following sub-objectives;

1. To show the severity of HEC incidences
2. To explain the influence of parks and sanctuary on the HEC of village
3. To determine effective mitigation measures for the HEC

Methodology

Study area

The Pokkunutenna, a village in Monaragala district village was selected as it is situated very close to the Northern border of Udawalawe National Park (Ranjeewa *et al.*, 2015) and the Dahiyaagala Wildlife Sanctuary (figure 1). Pokkunutenna village is located in the Thanamalwila Divisional Secretariat and the Grama Niladhari administrative of Kotaweharamankada. Besides two lakes (Tyambarae *wewa* and Pokkunutenna *wewa*), we can observe various types of land use patterns like paddy cultivation, the dominant type of farmers uses the Chena cultivation method for agricultural activity (Samaraweera, 2018). The presence of the landscapes within this area also plays an integral part in the HEC. Data were gathered mainly in two ways; questionnaires and interviewing the village people. The questionnaire consisting of both close and open-ended questions. Interviewing the people were not a formalized way but as a simple discussion, provided a better understanding of the social perceptions on wildlife and their conflicts. Moreover, the statutory bodies such as Grama Niladhari, Divisional Secretariat, Department of Wildlife Conservation, and Udawalawe regional centre around the village also have supplied and contributed to the secondary data collection.

Data collection

The questionnaire was pre-tested with the local respondents before finalizing. The convenience sampling method was used to collect primary data. The sample collection was systematic with five houses gap, and the sixth household was interviewed after the first household and corresponding GPS coordinates of the household locations recorded using the 'Altimeter' application tool. The collected data were entered into the MsExcel spreadsheet for further analysis.

Analysis

ArcMap 10.3.1 was used to create the study area map. The descriptive statistics obtained using Minitab *ver.18* for the analysis of responses. Furthermore, a *chi-square* test also used to test the association between variables at the significance level of 0.05, assuming homogeneity in the responses. In most cases, results were presented and visualized in the form of graphs and tables.

Results and discussions

Among 152 families (households) living in Pokkunutenna, a questionnaire survey was administered in a manner to obtain a response from each fifth household that the investigators find (in most cases). In that way, 42 questionnaire survey was successfully conducted. Possibly, more than one-fourth of the total families/households (28%) interviewed during the two-day visit. The educational status analyzed via the questionnaire reveals that secondary education received by 77% while only 10% among the respondents have received higher education.

Perception of HEC

The people's perception of the HEC status in recent years (during the last decade) is essential to consider before suggesting the mitigation strategies. Table 1 summarizes the results of the *chi-square* test performed to assess the livelihood difference in the villagers.

H_0 : No significant difference in the livelihood status of villagers in the Pokkunutenna

H_a : There is a significant difference in the livelihood status of villagers in the Pokkunutenna

There was enough statistical evidence to reject the H_0 at a 5% significant level lead to the acceptance of an alternate hypothesis suggest that the villagers perceive HEC to a greater extent during the recent decade than before with higher crop losses (p -value<0.05).

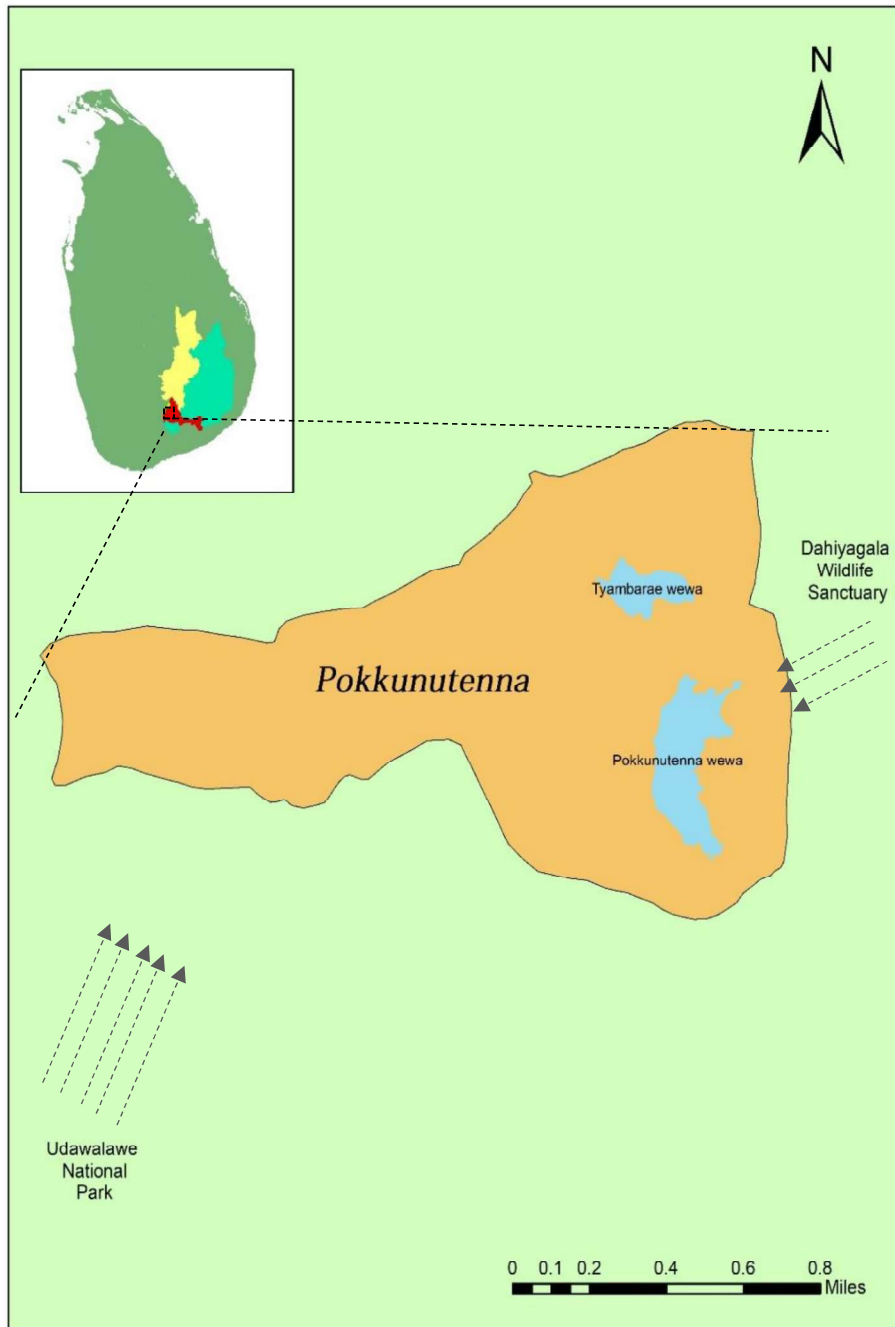


Figure 2: Geographical location of study area (arrows indicate the direction and the intensity of elephant intrusion in Pokkunutenna village)

Table 1: Livelihood differences (tested using *chi-square* goodness of fit)

	Observed values (% within each group)		P-value
	During the last decade (2011-2020)	Decade ago (before 2010)	
Number of respondents perceive HEC as a significant issue	36 (85.7%)	06 (14.3%)	0.000
Number of households faced crop losses	32 (76.2%)	10 (23.8%)	0.013

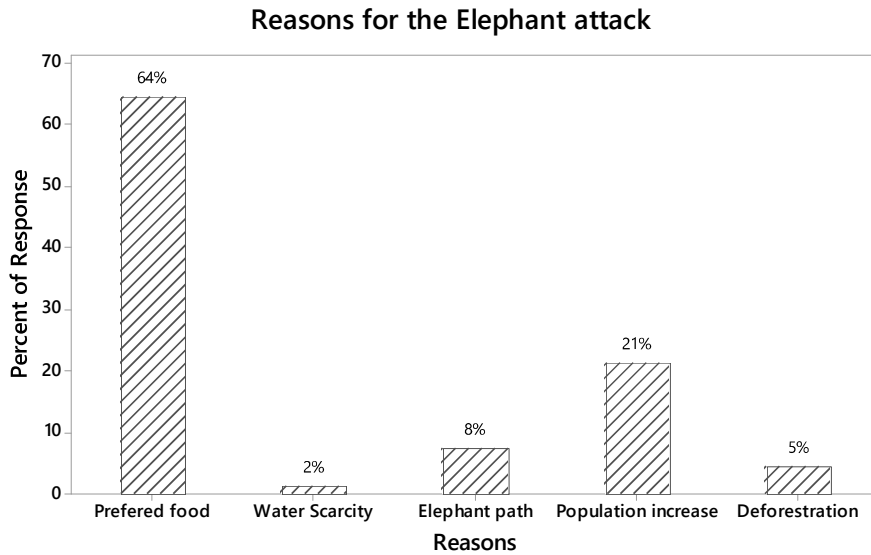
HEC incidences and its severity

The status of the HEC was assessed by analyzing the elephant visit, damage caused by them, and the reasons for the cyst. In this regard, group size, arrival time, frequency of elephants will also influence the routine activities of villagers. Although elephants used to come to the villages mostly on an irregular basis (60%), 80% of the HEC encounters sighted during nights. However, 100% of elephant depredation took place afternoon. A similar observation has been reported in several other studies performed in various parts of Sri Lanka (Hendavitharana, 1994; Santiapillai *et al.*, 2010; Dharmaratne and Magedaragamage, 2014). The cultivation pattern of the village also an essential reason for the elephant's visit to the village. The smell of paddy fields during the harvesting time attracts the elephants (Santiapillai and Read, 2010) could be the reason for irregular visits. Sixty-eight percent of the respondents revealed that the group size of the herd consisted of 3-5 individuals. It is the maximum number of elephants in the herd. About 18% witnessed the occurrence of single elephant depredation, mostly identified as a female. Although the group size of 3-5 individuals occupied Pokkunutenna at a higher frequency, damages sustained by the group size of 1 or 2 were observed to be severe (Personal observation, 02nd February 2020). The primary reason for elephant attack is the abundance of preferred food crops like mostly such as paddy, coconut, and banana had been indicated as a prominent reason (64%) for the elephant entry to the village (figure 2). Pokkunutenna has been facing the elephant depredation mostly from two sides (illustrated in figure 1).

Pokkunutenna was almost surrounded by the corner of Udawalawe National Park and Dahiyagala Wildlife Sanctuary. These organizations were highly occupied with the elephants, and they were functioning as the main entry paths for the elephants. So, it was assessed that their perception of the influence of these organizations concerning the HEC, and it was depicted by using the following figure 4.4. About 80% of respondents responded that Udawalawe National Park highly influences the HEC in Pokkunutenna. Furthermore, 11% of respondents were revealed that Dahiyagala Wildlife Sanctuary is also influenced the HEC in the village. Respondents have suggested the removal of *Lantana camara* locally known to be ‘Gandapana’ an invasive species (Ghisalberti, 2000) in the Udawalawe National Park (Fernando *et al.*, 2016) may reduce the elephants intruding the village. *Lantana camara* inhibits the growth of other plant and tree species (Mishra, 2015). This makes natural fodder available for elephants inside the Udawalawe National Park and the Dahiyagala Wildlife Sanctuary, which may reduce elephant intrusion. The government funding on the eradication of *Lantana camara* (Fernando *et al.*, 2016) was not taken into a high priority as a major accusation by respondents. Because of this reason, elephants break the electric fences and intrude into the village to satisfy their food requirement.

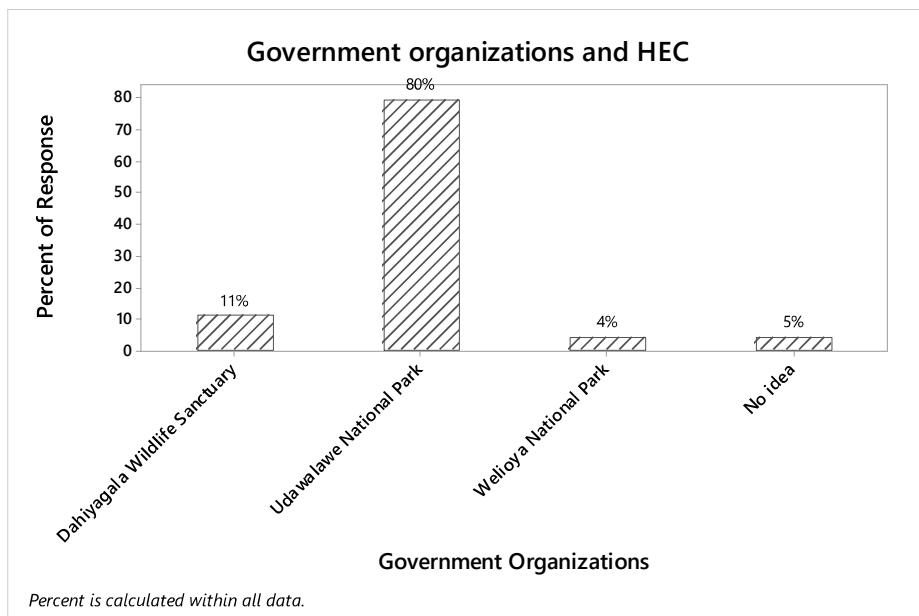
More than half of the households (57%) suggested providing guns to the Civil Security forces to protect human lives from elephant attacks in Pokkunutenna, which can be related to the common mode of elephant killings in Sri Lanka (Perera, 2009). Elephant fence was given as a solution by

33% of the survived population. Other 10% suggest to re-implement the Laser poles that were proposed and carried out previously by a Non-Governmental Organization; NDB was functioning effectively against reducing the elephant depredation into the village as an early warning system. The laser pole has functioned as alarming systems by honking and focusing high-intensity light on elephants. This method can be re-established at the places which serve as a high frequency of elephant entry points to the village.



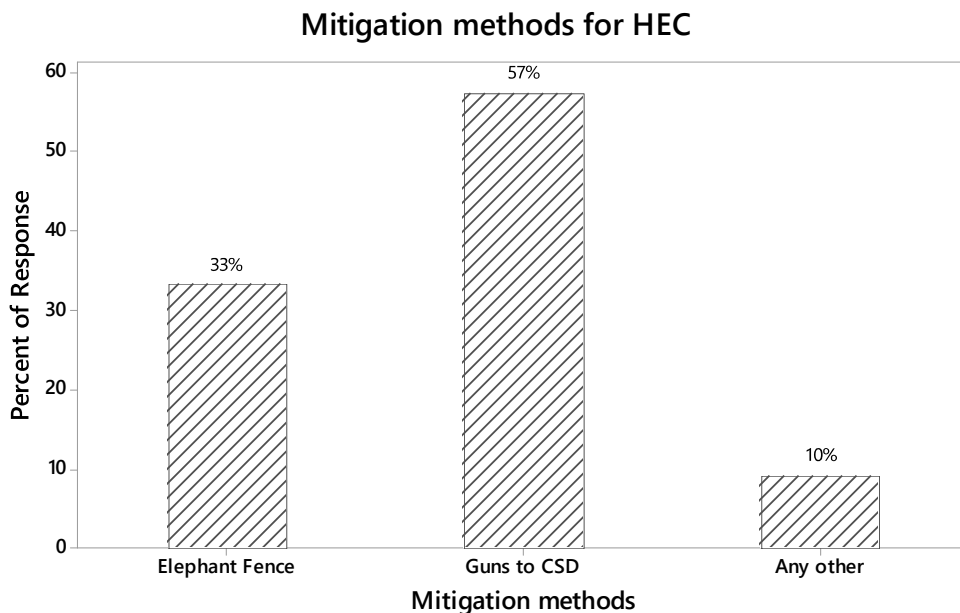
Percent is calculated within all data.

Figure 2: Reasons for the Elephant attack



Percent is calculated within all data.

Figure 3: Impact of Government organizations in HEC



Percent is calculated within all data.

Figure 4: Mitigation methods suggested by villagers to reduce HEC

Conclusion

The *chi-square* test results depict that there is a significant difference in the livelihood of people before and after this decade. More importantly, people perceived HEC as a significant threat in this decade than before (71.4%), and 52.4% of respondents indicate that the crop loss was increased in the last decade. The frequent visits of elephants to Pokkunutenna mostly occur during night time. The irregularity is highly based on the crop cultivation season in the village. The herd consisted of two elephants that produced severe economic damage than the herd consisted of 3-5 individuals. Preferred food crops like paddy, coconut, and banana had been indicated as prominent reasons at 64% for the elephant entry to the village. Moreover, the human population increase (21%) also seems to be a potential reason for the rise of HEC in Pokkunutenna. *Lantana camara* also plays a huge role in increasing the HEC in Pokkunutenna. The removal of *Lantana camara* will help to improve the natural fodder refurbishment in Udawalawe National Park. The significance of *Lantana camara* at the Dahiyagala wildlife sanctuary is not prominent. It is expected that providing guns to CSD will reduce the HEC by 57%. It will help to take control of elephant depredation at certain entry places. In addition to that, the early alarming system which uses light-emitting poles was a common impetrate by the villagers.

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