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Crop Raiding Behaviour of Elephants in the Northwestern Region of Sri Lanka

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Introduction

The north-western region of Sri Lanka offers a unique conservation problem with respect to elephants. Unlike all other elephant inhabited areas of Sri Lanka, this region has the lowest coverage in the protected area network (Fig. 1). With the exception of the Wilpattu National Park, the total extent of all the other protected areas in this region amounts less than 31,000 ha. Therefore, none of these protected areas are large enough to support a viable wild elephant population. However, a fairly substantial elephant population resides in this area. A census carried out by the Department of Wildlife Conservation (DWC) revealed that there are at least 591 elephants inhabiting the north-western region (Hendavitharana *et al*. 1993). However, de Silva & Attapattu (1997) reported that this number could be as high as 1500 elephants. Fernando *et al*. (2011) estimate the present elephant population in this region to be more than 1000 elephants.

Furthermore, this region has undergone rapid development in recent years under the Accelerated Mahaweli developmental project. This has led to a reduction in the available habitats as well as fragmentation of habitats, resulting in alteration in the access to food and water and disruption of elephant home ranges and movement patterns. These events have resulted in conflict between humans and elephants leading to loss of crops, property, and life of both man and elephants. Therefore, human-elephant conflict has become a major concern in the north-western region of Sri Lanka.

Many farmers have resorted to the use of poison, nail boards, live electric wires (Fig. 2), trap guns and shot guns to protect their crops, which has resulted in a marked increase in elephant mortality in the north-western region that accounts for nearly 40% of the elephant deaths that take place in Sri Lanka (Table 1).

The north-western and Mahaweli (north-central) regions also have the highest level of human elephant conflict in Sri Lanka based on human mortalities as well as other damages caused by elephants to crops and property. Therefore, this investigation was carried out to determine the crop raiding behaviour of elephants in the north-western region of Sri Lanka in order to develop a suitable management strategy for the human-elephant conflict that exists in the region.

Table 1. Regional distribution of wild elephant deaths in Sri Lanka during the period 1990 to 2000 (W. Hendavitharana, pers. comm.).

Region	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total	%
North-western	27	27	28	37	51	39	61	59	38	45	57	469	39
Mahaweli	16	20	28	34	32	11	24	42	42	31	38	318	26
Southern	2	9	28	21	19	27	25	34	24	15	29	233	19
Eastern	4	3	3	4	9	8	17	19	38	6	14	125	11
Central	-	-	3	5	1	5	3	4	2	3	10	36	3
Other areas	-	-	-	2	1	4	-	6	4	7	2	26	2
Total	49	59	90	103	113	94	130	164	148	107	150	1207	100

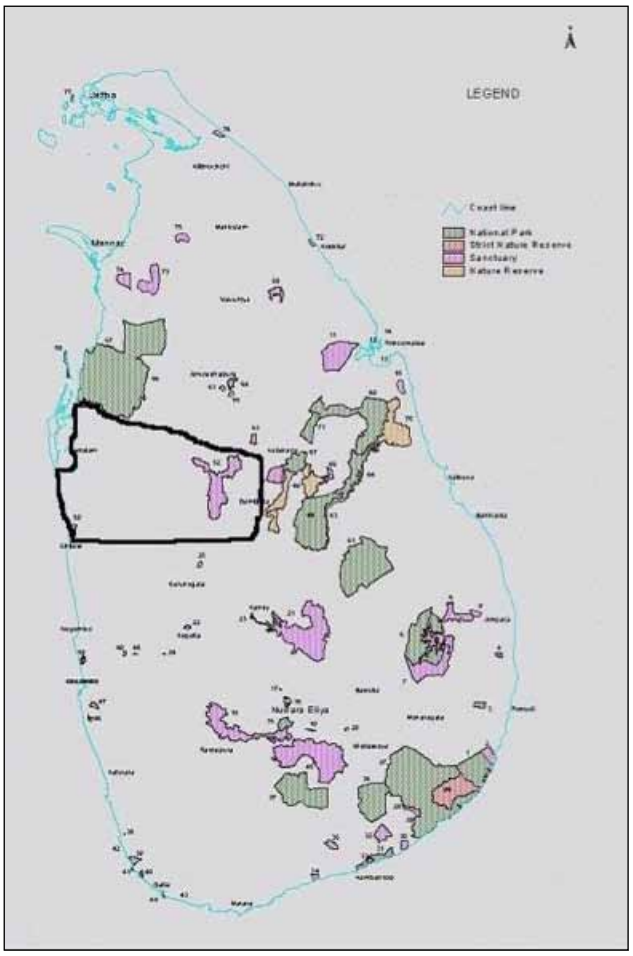

Figure 1. Protected areas network managed by the DWC. Thick black line = study area.

Materials and methods

The study area is located in north-western Sri Lanka encompassing the Mahaweli system H and adjoining areas (Fig. 1). It is demarcated by Puttalam in the east, Mahawa in the south, Habarana in the west, and Anuradhapura in the north. Extent of the study area is approximately 3000 km^2 and includes 15 administrative divisions. The area contains large tracts of government forests and plantation forests (mainly teak and eucalyptus). However, only a few protected areas under the administration of the DWC can be found within the study area. The human usage pattern within the study area can be grouped into three categories as, low use, high use and very high use (Fig. 3).

This study was conducted over a two-year period from January 1998 to December 1999. The study was carried out in three stages. First, secondary data on human or elephant mortality, crop damage and other types of damage reported to the DWC and divisional secretaries were collected to assess the level of human-elephant conflict in the region. Second, primary data were collected through an interview survey from 100 villages identified based on the secondary data collected. Third, from these 100 villages a sub sample of 50 villages were selected and monitored over two crop cycles.

Based on the secondary data collected, 100 villages were selected. This included 50 high conflict villages 30 medium conflict villages and 20 low conflict villages. This classification was primarily based on the number of incidents reported. Furthermore, proximity of the village to forest patches or water bodies frequented by elephants and the location of the village was also taken into consideration in selecting these villages. From each village two families were selected randomly and interviewed regarding their farming practices, past experience with elephants (i.e. whether the elephants have caused any crop, property or life damage), and their perceptions regarding the human-elephant conflict.

Based on the results of the preliminary survey a stratified sample of 50 villages was chosen. This included 25 high conflict villages, 15 medium conflict villages and 10 low conflict villages. Two farmers were selected from each village and their farmlands including their home garden were monitored at 10-day intervals over two cultivation cycles (i.e. maha 98/99 and yala 99). During each visit, the farmer's property was

Figure 2. Death of two elephants due to live electric wire connected to a fence.

surveyed for any elephant damage. If elephants had caused any type of damage the extent of the damage and approximate value of the damage caused was estimated. Further, any signs left behind by the elephants were also recorded. In addition to the farmers that were regularly monitored, crop damage, property damage, or life damage taking place in the villages monitored was also recorded.

To ascertain people's attitudes and perceptions about wild elephants, an interview survey was carried out involving settlers, farmers, local government officials, and field officers of various departments operating in the study area. Further, a workshop was held in Galagamuwa division, where the proposals drawn based on the findings of the study were presented to stakeholders and their perceptions and responses were collected.

Information on elephant deaths that were reported from the north-western region during the period January 1990 and December 2000 that coincides with this study were obtained from the DWC.

Results and discussion

Types of cultivation

All 200 families interviewed had home gardens, while 92% engaged in farming paddy and only 38% engaged in chena (shifting) cultivation. Of the 100 farmers from 50 villages monitored, 93% engaged in paddy farming while 7% engaged in chena cultivation only. Out of the farmers who cultivated paddy, 32% engaged in chena cultivation in addition to paddy cultivation. Chena cultivation was less common in the north-western region likely due to lack of rain and inability to protect their farmlands from elephant depredations. Further, in areas where Mahaweli water was available, most farmers engaged in year round farming (yala and maha) therefore presumably did not have time to engage in chena cultivation.

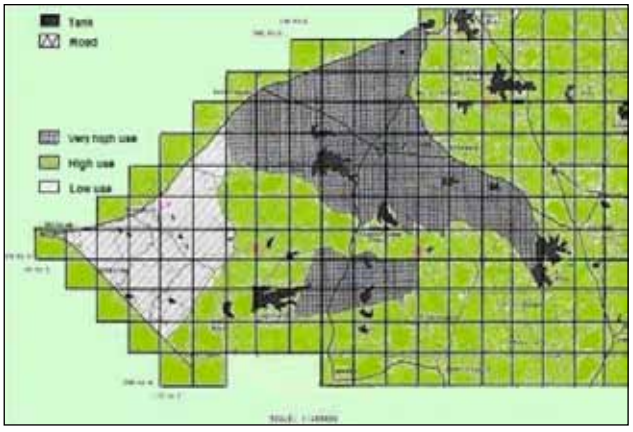

Figure 3. The study area according to the human landuse pattern.

Size of home gardens ranged from 0.25 - 8 acres with a mean of 1.2 acres, paddy fields from 0.5 - 20 acres with a mean of 2.4 acres, and chenas from 0.25 - 8 acres with a mean of 1.3 acres. As the extents of cultivation conducted by individual farmers were relatively small most of the people in this area carried out subsistence farming.

The most widely planted crop was paddy, which was also the staple diet. In addition, almost everyone had a home garden, where perennial crops such as jack fruit (*Artocarpus heterophyllus*), tamarind (*Tamarindus indica*), wood apple (*Limonia acidissima*), coconut (*Cocos nucifera*), mango (*Mangifera indica*), papaya (*Carica papaya*), banana (*Musa paradisica*) and cashew (*Anacardium occidentale*), and seasonal crops such as green chillies (*Capsicum annum*), corn (*Zea mays*) and eggplant (*Solanum melongena*) were cultivated.

All farmers planted paddy during the maha season, while only 57% of the farmers planted crops during the yala season due to lack of water to irrigate their crops. However, farmers in some areas did not plant crops because they could not protect their crops from elephants.

Elephant depredation by type of cultivation

A total of 31 incidents of raiding occurred in the monitored home gardens of the 100 farmers, which included 19 one-time damage cases and 4 repeat damage cases. Elephants raided paddy fields of 20 of the 100 farmers monitored. A total of 24 incidents occurred, which included 16 one-time incidents and 4 paddy fields raided twice. More than 90% of these incidents took place during the last month of the growing season. Elephants damaged the chenas of 8 farmers. A

total of 12 incidents occurred, which included 4 one-time incidents and 4 two-times incidents.

Of the 100 farmers from 50 villages monitored, elephants damaged home gardens of 23 farmers. The total loss was estimated to be Rs. 31,500/=. Elephants raided paddy fields of 20 of the 100 farmers monitored causing a total damage of Rs. 75,400/=. Elephants damaged the Chena's of 8 farmers, causing a loss of Rs. 11,000/=. The total cost of the damage incurred by the monitored farmers in all three types of cultivation was approximately Rs. 117,900/= during the period of study. None of the farmers monitored experienced any damages to their house or property. However, 36 incidents of property damage were recorded during the survey in the 50 villages that were monitored. Out of these 36 incidents 21 (58%) took place during the post harvest period where the elephants damaged rooms containing stored grain. In 2 (5%) instances the elephants damaged the kitchen, which the farmers claimed was to obtain salt. In the remaining 10 incidents of house damage no plausible reason could be attributed to the cause.

Elephants had a major impact on farming in the study area as they caused damage to all types of cultivation. While the crop was on the ground, elephants raided the plantations and caused damage, which was greater towards the end of the growing period. In the post-harvest period they raided stored grain, causing damage to house and property. Therefore elephants significantly impacted the lives of people and farming practices at all stages. A few farmers did not farm at all as they could not protect their crops from elephants, while others tended to plant short-term low yielding varieties to avoid depredation. Therefore elephants caused a significant negative impact on the livelihoods and wellbeing of the people in the area.

Crop protection

Crop protection was practiced only by 70% of the farmers. Of the farmers who practiced crop protection 94% built a tree hut in their farm from where they could observe the perimeter of the farm. These farmers mainly used making noises supplemented with firecrackers to chase away elephants that raided their farms. Out of the farmers that were interviewed, 8% used shotguns to chase away the raiding elephants. Thus the most common method was guarding from a watch hut, supplemented by the use of firecrackers, and in a few cases shot guns. One instance was recorded where community guarding was practiced and was found to be highly successful. Out of the farmers who practiced crop protection, 11% received damage to their crops. In the instance where community guarding was practiced, only 6% of the farmers received crop damage. Even in these instances the farmers managed to drive away the elephants before they could damage the entire farmland. However, of the farmers that did not guard their fields even in the presence of elephant depredation, 50% received crop damage. This indicates that most of the crop depredation could be prevented by proper guarding, with community guarding likely to be more effective in reducing conflicts.

Types of elephants raiding crops

Out of the 67 incidents of crop damage recorded during the study, the type of elephants causing the damage could be ascertained for 58 incidents. In the case of home gardens, solitary bulls were involved in 16 incidents, bull groups were involved in 9 incidents and herds were involved in 2 incidents. In the case of paddy fields, elephants causing the damage were found to be solitary bulls in 3 of the incidents, while bull groups were involved in 11 incidents and herds were involved in 8 incidents. Solitary bulls were involved 6 of the incidents involving chenas, while bull groups were involved in 2 incidents and herds were involved in a single incident. When considering the total incidents of crop raiding, 81% of elephants causing damage were bulls (43% solitary bulls, 38% bull groups) and 19% were herds. In the case of house damage, 88% of the incidents were by bulls. The results indicate that in the north-west of Sri Lanka also, bulls were mainly involved in crop raiding as was shown by other studies in India (Desai & Baskaran 1996) and Sri Lanka (Dissanayake *et al*. 1998).

Elephant mortality

A total of 412 elephant deaths were recorded during the ten-year period from 1990-1999 with an average of approximately 41 elephant deaths per year (Table 1). Mortality rates fluctuated somewhat within a year (Fig. 4). Higher mortality was recorded during the months of March and April (harvesting time of the maha season), and August, September, and October (harvesting time of the yala season and the driest months of the year) as well as June. The 412 elephant deaths recorded included 272 (66%) male elephants (which included 12 tuskers), 103 (25%) female elephants, and 37 (9%) elephants whose sex was undetermined owing to degradation of the carcass. The main cause of death was gunshot injury (57%) followed by electrocution (5%), accidents (4%), and land mines (3%). The cause of death could not be ascertained in the others (31%). The mortality data indicates that nearly two thirds of the elephants that die are males. Therefore, the sex ratio of wild elephants in this region is likely to change in the future creating a female bias.

Management of HEC

Unplanned development is one of the major reasons that have contributed to the human-elephant conflict. However, such development processes continue to take place in this region. Although there are few protected areas, some of the areas in the northwest still retain good elephant habitat and steps must be taken to prevent further development of these areas if elephants are to be conserved and escalation of the human-elephant conflict prevented.

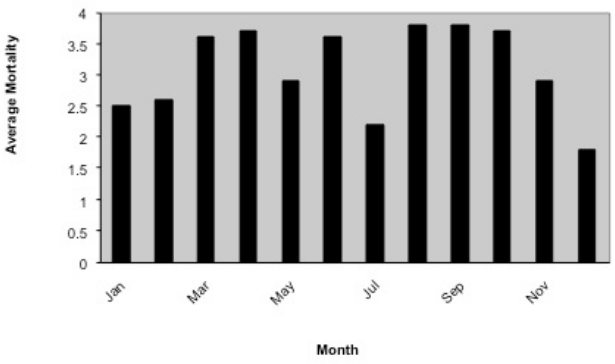

Figure 4. Monthly variation in elephant mortality in the north-western region from 1990-1999.

Perceptions

A marked difference in perception could be observed between local government officials and farmers. While the local government officials unanimously believed that elephants can be maintained within this region, the farmers unanimously support the idea that all elephants should be removed from the area. This presents somewhat of a dilemma in devising a management plan for these elephants as for the management plan to be effective it must be acceptable to all stakeholders concerned. Furthermore, community participation in management of the human-elephant conflict also appears to be an impractical approach, as most farmers view this as a problem that the government alone must solve. Therefore, the burden of managing human-elephant conflict will fall mainly on the shoulders of the DWC. Only a minimum input can be expected from the community. Hence, management of elephants in the north-western region must be considered within such a framework or the general community perception needs to be changed.

Management measures

The present management measures taken by the DWC in this area includes providing compensation for life and property damage, translocation of problem elephants, and provision of deterrents such as thunder flashes to farmers. Most people have very little faith in the compensation program due to the tediousness of the process. The compensation for crop losses by the Social Services department is no longer operational while compensation given for property damage is highly unsatisfactory. In many instances the claimant has to invest more than the compensation they receive. As a result most people do not even apply for compensation for minor losses. Therefore, if elephants are to be retained in this area the villagers must be compensated for the losses they experience due to elephants. Therefore, an efficient compensation scheme or a crop insurance scheme has to be devised to support these farmers if they are to bare the burden of conserving elephants in human use areas.

Provision of deterrents too is not carried out efficiently due to the lack of a specific mechanism to disburse such deterrents among the farmers. The farmers complain that thunder flashes are given to wrong people such as hunters who in turn use them in trap guns while the farmers who really need them to protect their crops have to fend for themselves. However, recently a new scheme has been introduced by the DWC, where a team of individuals are selected from each village by the local government officials such as Grama Seva Niladhari's or Divisional Secretaries. Then this team is given a brief training by the DWC on how to use the thunder flashes. Then the team will be provided a quota of thunder flashes under the supervision of the Grama Seva Niladhari's. This scheme has earned acceptance from the villagers who feel that it is a method that can be used effectively.

Overall, community programs such as provision of deterrents, electric fences at key locations to prevent entry of elephants into cultivations and villages, and removal of problem elephants would need to be continued. Additionally, proactive measures such as forecasting problems, regular patrolling of conflict areas, helping villages to protect their crops, providing deterrents, and rapid responses to incidents need to be strengthened. Furthermore, use of short electric fences to protect high conflict villages and short corridors to link habitat patches within the home range of elephants can also be used as possible management strategies to mitigate conflict. An effective and efficient compensation scheme must also be devised to help farmers who are affected by elephants. However, long-term management needs a comprehensive landuse management and implementation program.

However, DWC is not geared to undertake such intensive management at present. They are understaffed and lack the infrastructure that is needed to carry out the type of intensive management that will be required to maintain elephants in such high human use areas with minimal conflict. Therefore, if elephants are to be maintained in this area DWC will have to enhance the cadre strength as well as infrastructure facilities for their officers.

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Male in Sri Lanka's Northwest
Photo by Jennifer Pastorini