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HUMAN INTERFERENCE AND ITS IMPACT ON ELEPHANT CORRIDORS IN SOUTH INDIA

B. Ramakrishnan, & N. Sivaganesan
Salim Ali Centre for Ornithology and Natural History
Kalampalayam, Coimbatore 640 010, India

and

Rajiv Srivastava
District Forest Officer, Coimbatore Forest Division,
Tamil Nadu State Forest, India

ABSTRACT

Human interference and effects in Sujalkuttai- Bannari Corridor and Kallar-Vedar Colony Corridor in Nilgiri Biosphere Reserve have been studied from December 1994 to April 1995. Most people visit the corridors primarily for fuel wood collection, some of them for grazing livestock and few for collecting minor forest produce. Female population depends on the corridors for fuel wood, while the male population uses the corridor predominantly for grazing the livestock. Temporal use of the corridors by local people for fuel wood collection and grazing varies considerably . In both corridors fuel wood is extracted mostly from hill slopes and other areas inaccessible to elephants. Local people move more than 3 km from the villages in the Sujalkuttai-Bannari Corridor for fuel wood while the elephant population uses the forests up to 2 km distance from villages, and thus there is an overlap in the habitat use by man and elephant. In both corridors, the elephants prefer many of the plant species which are largely collected by villagers as fuel wood.

INTRODUCTION

Of late vast stretches of rain forest were cleared for various purposes like industries, river valley projects, plantations and rehabilitations (Chattopadhyay, 1985). While habitat loss and endangerment of many species were the immediate results, the remaining forest was either fragmented or lost its connectivity between forested areas. The creation of corridors between two reserves has been proposed to minimize the genetic effects of isolation (Diamond, 1975; Dendy, 1987). Large and medium sized herbivores and carnivores depend on corridors for exchange of genes between populations and to search for seasonal foraging grounds and water. Loss of forest cover due to plantaion and agriculture expansion were responsible for the loss of forest connectivity between forested areas in the Nilgiri Biosphere Reserve (Sukumar, 1990). Although the importance of corridors has been accepted widely for management

of wide ranging species, only a few studies have been carried out on the impact of human interferences on habitat corridors in India (Johnsingh *et al.*, 1990). It is imperative that studies on people's dependence on corridor be carried out in order to preserve the Asian elephant (*Elephas maximus*) populations in Peninsular India. The objectives of the present study are to determine the extent of human interference by local people living along the fringes of the two elephant corridors located in the Nilgiri Biosphere Reserve. The major aims are (a) to quantify the extent of fuel wood collection and minor forest produces, and (b) to assess the extent of lopping and wood cutting. The study also attempts to highlight the impact of biotic pressures within the corridors and the relationship between elephant usage pattern and biotic threats.

METHODS

The number of people visiting the corridors for collection of fuel wood, minor forest produce, grazing livestock and for moving from one village to another was recorded by a questionnaire. The survey was conducted over 45 days in the Sujalkuttai-Bannari Corridor and 34 days in Kallar-Vedar Colony Corridor. The questionnaire had two sets of information: First 'precise and closed' questions with a list a possible answers such as sex, age, time and purpose of visit. The human activities within the corridors were gathered by using the 'precise and closed' method. Information such as age, sex and purpose of visiting the corridor, namely collection of fuel wood , fishing and hunting were recorded from 276 people in Sujalkttai-Bannari Corridor and 176 people in Kallar-Vedar Colony Corridor. The second set of information was gathered through 'broad and open ended' questions giving the respondent an opportunity to express his views freely (Balakrishnan & Ndhlovu, 1992). The 'broad and open ended' questionnaire was used to collect data on fuel wood collection.

A total of108 people in Sujalkuttai-Bannari Corridor and 56 people in Kallar-Vedar Colony Corridor were interviewed to assess the impact of fuel wood collection on crucial elephant habitats. The questionnaire was restricted to local people living within 7 km around the fringes of the corridors.

Number of people and elephants sighted within the corridors in different hours of the day from 0600 to1500 hrs were also recorded. Human activities in different hours of the day were related to sightings of elephants, to assess use pattern of the corridors. Details of micro habitats like *nullahs*, open areas, gallery forests, and other forested areas used by people for fuel wood collection were noted during each field visit. Frequency of elephant sightings in different micro habitats was recorded to know the impact of fuel wood collectors on the crucial micro habitats of elephants.

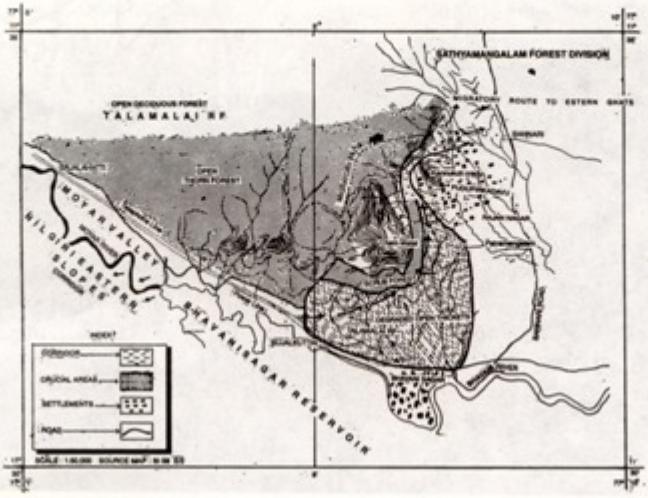


Fig. 1. Map of the Sujalkuttai - Banneri Corridor in Sathyamagalam forest division, Tamil Nadu.

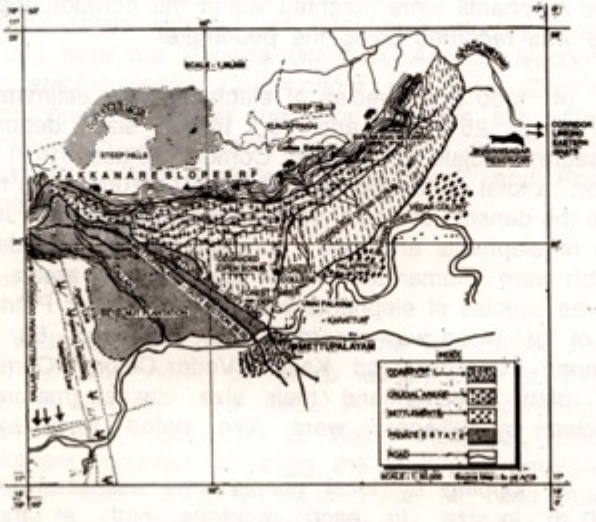


Fig. 2. Map of the Kallar - Vedar Colony Corridor in Coimbatore forest division, Tamil Nadu.



Fig. 3. Elephant-proof trench at the foot hill of Kallar-Kothagiri road in Kallar-Vedar-Colony Corridor.

To assess the extent of invasion of people on the corridors, the distance covered by them from the village fringes to the corridors for the collection of fuel wood and grazing of livestock was recorded by using the pedometer. Whenever the elephants were sighted within the corridor, the distance to the nearest village was recorded using the pedometer.

Density of food tree species of elephants was estimated in 170 strip transects (3.77ha) of 25 x 10m and 10 x 10m in size depending on terrain and biotic pressure in Sujalkuttai-Bannari Corridor (Dittus, 1977). In Kallar-Vedar Colony Corridor, a total of 55 strip transects of 50 x 10m (2.75 ha) were carried out to estimate the density of food tree species of elephants. In each transact, food species of elephants and their numbers were recorded. Only mature trees>10cm gbh were enumerated from the transect areas. Preference for various food tree species of elephants was estimated after Petrides (1975). The mean weight of fuel wood was recorded for 108 and 56 head loads in Sujalkuttai-Bannari Corridor and Kallar - Vedar Colony Corridor respectively. The type of plant species and their size classes (mature trees/ pole size classes) collected by villagers were also noted from each head load.

Intensity of lopping by local people was assessed from 15 quadrats of 50 x 10 m in size. In each quadrate girth at the breast height (gbh cm) of the lopped individuals belonging to various species and height (m) at which they were lopped were recorded. Density of various food species and lopped trees per ha and mean lopping height for various species were

estimated to assess the impact of human interference on elephant forage resources, particularly on trees. Damages induced by lopping on various food trees by local people were assessed for each species. Percentage rating was given for each lopped tree based on the extent of branches lopped.

STUDY AREA

Sujalkuttai -Bannari Corridor

This corridor (125 km^2) beginning at the tail end of Moyar Valley links the Bannari Forest Division on the eastern portion to the Kallar Forest areas of the Coiaambatore Central Forest Division on the west (Fig. 1). Populations of elephant in Moyar Valley are known to move from Sujalkuttai to Bannari through valley forest between Chemmalai (890 m) and Kannukuti Karadu (430 m) hills. Elephants use this corridor for feeding on browse and to use perennial water sources in Bolipallam and Varapallam areas. This corridor is drained by perennial rivers namely Moyar, Bhavani and Gandhapallam.

The common vegetation types are thorn forests (6A/C1) (Champion & Seth, 1968). Other forest types include southern dry deciduous forests (5A/ C3) and southern sub-tropical hill forests (8A/C1). The tree cover is dominated by *Albizia amara* with signs of over browsing by elephants. Other thorny species found here are *Accacia latronum, Accacia leucophloea, Accacia planiferons, Dichrostachis cinerea, Commiphora* spp. and *Ziziphus mauritiana.* The shrub cover comprises of *Cassia auriculata, Capparis* spp, *Grewia* spp and *Erythroxylum monogynum.* Unpalatable plants such as *Dodonaea viscosa, Euphorbia antiquarum, Lantana camera, Opuntia dillenii* and *Prosopis juliflora* are patchily distributed.

Kallar-Vedar Colony Corridor

The Kallar- Vedar Colony Corridor lies in the Coimbatore Forest Division, and is bounded on the north by steep escarpment of the Jackkanare mountains and on the east by crop fields. A long narrow strip of corridor beginning at Gandhapallam goes up to Kallar Reserve Forest along the foot hills of Jackkanare mountain bisecting the Mettupalayam-Kotagiri highway (Fig. 2). This corridor has contiguity up to Pillur RF and Attapadi Valley of Kerala State. The newly created elephant proof trenches surrounding the Tamil Nadu Agricultural University to prevent animals getting into their experimental plots is a serious threat for free movement of the animals from Vedar Colony to Kallar RF (Fig.3.)

The corridor between Kallar and Vedar Colonies is narrow with severe anthropogenic activities which bring rapid degradation of this corridor. The terrain is gently undulating except at Sirumugai Mudakku and Periya Kandi Mokkai and other hills in low lying areas. The approximate length of the corridor is 7km and average width ranges from 0.5km to 3km for effective usage by elephants.

Dry deciduous forests in hill slopes and open shrub forests in lowland areas dominate this corridor. *Anogeissus latifolia, Terminalia spp, Pterocarpus marsupium, Sapindus emarginatus* and *Accacia spp* are more confined to hill slopes. The lowland forests are dominated by thorny species such as *Toddalia asiatica, Limonia alata, Atlantia monophylla and Bauhinia racemosa. Ficus benegalensis* and *Tamarindus indica* are sporadically distributed.

RESULTS

Anthropogenic threats

Out of a total record of 276 people who visited the Sujalkuttai - Bannari Corridor during the study period, 114 were males and 162 were females (Table 1). Majority (67.7%) of them were fuel wood collectors, followed by minor forest produce collators (15.2%). Livestock grazers were another threat to this corridor. It is interesting to note that more females were dependent on the corridor for fuel wood. The proportion of males was more among people involved in grazing their livestock in both corridors. In the Kallar-Vedar Colony Corridor too the fuel wood collectors were more numerous (57.9%) followed by wood cutters (21.6%) (Table 1).

Pattern of use of the corridors by villagers

Figure 4 shows the impact of fuel wood collectors on the elephants' use pattern in the Sujalkuttai-Bannari Corridor during different hours of the day. Out of the total 31 sightings of elephant herds during 48 days of field work, a maximum of13 sightings (41.9%) were during 0700 to 0800hrs. Incidentally the time when maximum number of elephants were sighted (0700-0800 hrs) coincided with the peak fuel wood collecting time.

In Kallar-Vedar Colony Corridor elephants were sighted only on 3 occasions of which two were during 0700 to 0800hrs. (Fig. 5) Even though the sightings were few, the elephants seem to use the corridor more during the early hours 0700 0800hrs) of the day after which they retreat into dense cover. The livestock grazing was observed to be high between 1000-1100 hrs. There was a disturbance by livestock during the late evening while the elephants were drinking.

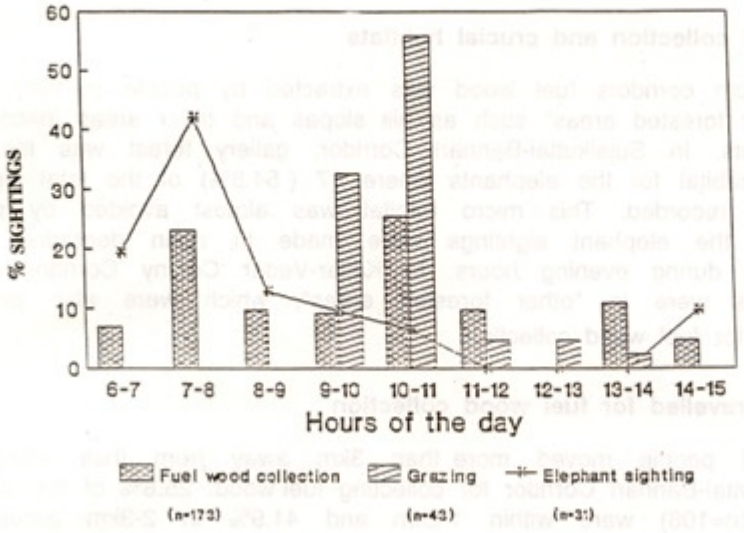


Fig.4. Relationship between anthropogenic activities and elephant sightings in Sujalkuttai -Bannari Corridor.

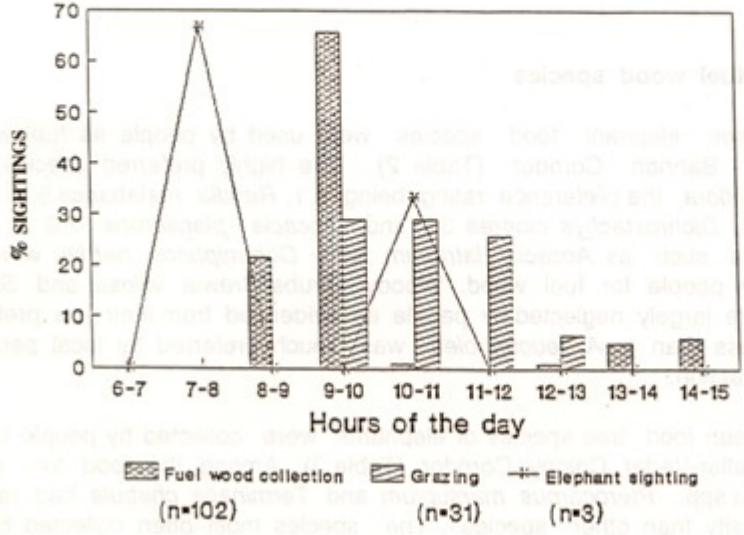


Fig. 5. Relationship between anthropogenic activities and elephant sightings in Kallar -Vedar Colony Corridor.

Fuel wood collection and crucial habitats

In both corridors fuel wood was extracted by people (n=108) mostly from "other forested areas" such as hill slopes and other areas inaccessible to elephants. In Sujalkuttai-Bannari Corridor, gallery forest was the most preferred habitat for the elephants where 17 (54.8%) of the total sightings (31) were recorded. This micro habitat was almost avoided by people. 16.1% of the elephant sightings were made in open degraded areas, but mostly during evening hours. In Kallar-Vedar Colony Corridor all the 3 sightings were in "other forested areas", which were also preferred by people for fuel wood collection.

Distance travelled for fuel wood collection

Local people moved more than 3km away from their villages in the Sujalkuttai-Bannari Corridor for collecting fuel wood. 25.8% of the elephant sightings (n=108) were within 1-2km and 41.9% in 2-3km areas from village fringes. Elephants were also sighted beyond 3km (41.9% n=31) from the village, mostly in the foot hill forest while taking rest under closed canopy. Out of the 3 sightings of elephant groups in Kallar-Vedar Corridor one was in 2-3km area and the other 2 sightings were within 3km area from the villages. In this corridor too these areas were heavily used by people for fuel wood collection.

Preferred fuel wood species

Thirteen elephant food species were used by people as fuel wood in Sujalkuttai - Bannari Corridor (Table 2). The highly preferred species were *Prosopis juliflora,* the preference rating being 6.1, *Randia malabarica* 5.2, *Albizia amara* 4.4, *Dichrostachys cinerea* 3.7 and *Accacia planiferons* 2.3 . A few tree species such as *Accacia latronum* and *Commiphora berriyi* were less preferred by people for fuel wood. Woody shrubs *Grewia villosa* and *Solanum torvum* were largely neglected by people as evidenced from their low preference rating of less than 1. *A. leucopholea* was much preferred by local people for arrack extraction.

Thirteen food tree species of elephants were collected by people for fuel wood in Kallar-Vedar Colony Corridor (Table 3). Among the food tree species only *Cordia* spp., *Pterocarpus marsupium* and *Terminalia chebula* had relatively higher density than other species . The species most often collected by local people as fuel wood were *Cordia* spp.' The preference rating being 5.0, *Pterocarpus marsupuim* 4.9, *Terminalia chebula* 4.9, *Hardwickia binata* 2.5 and *Albizia amara* 1.6. Eight tree species neglected by local people had a preference rating of < 1.

Lopping and wood cutting

Lopping signs were observed on 18 species in which only 10 of them were subjected to wood cutting in an area of 0.75 ha sampled in Sujalkuttai-Bannari Corridor (Table 4) *Albizia amara* was heavily lopped (14.7%) for fuel wood *Erythroxylum monogynum* and *Fluggea leucopyrus* were predominantly removed for non-fuel wood purposes. The above plant species were lopped at heights ranging from 1 to 4m. This has considerably altered the tree structure. In Kallar-Vedar Colony Corridor, 12 tree species were lopped for fuel wood in an area of 0.60 ha sampled (Table 4). In the transect areas, no trees were removed from less than 1 to 4m height which are available for elephants for foraging.

Intensity of lopping

Intensity of damages varied between species. Only a selected few species were intensely affected (Table 5). The extent of damage to *Randia dumetorum* was 67.5%, *Mundulea cerecea* 65%, *Fluggea leucopyrus* 63.3% and *Albizia amara* 62.5% , because of lopping. Although 18 species were lopped within the Sujal Kuttai-Bannari Corridor, only 6 species suffered from severe damage of which 3 species namely *Albizia amara* , *Acacia latronum* and *Dichrostachys cinerea* were elephant food trees (Table 5). These were heavily damaged because of heavy lopping in this corridor.

Damages on various plant species due to lopping were generally less except for a few species in Kallar-Vedar Colony Corridor. Only two preferred food species *Commiphora berryi* and *Ziziphus mauritiana* suffered heavily due to lopping (Table 6).

DISCUSSION

The Sujalkuttai -Bannari Corridor linking the Moyar valley which has contiguity towards Sigur Plateau and Mudumalai Wildlife Sanctuary is subjected to severe anthropogenic pressures. To maintain the movement of elephant populations between Eastern Ghats and Western Ghats the Sujalkuttai-Bannari and Kallar-Vedar Colony Corridors need greater protection. Isolation of elephant population is largely due to degradation of its habitats caused by human activity (Sukumar, 1990). In the study area livestock grazing, fuel wood collection and movement of people are the major activities observed in both corridors. These human activities have substantially affected the integrity of these corridors. This has led to the degradation of the corridors resulting in loss of forest connectivity between habitats. Moreover, these corridors are smaller in size and hence prone to epidemics. Panetta (1991) reported that diseases could spread between habitats through the corridors.

Grazing is a serious problem in both corridors. This has drastically altered the ground cover and has led to the increase in exotic weeds and other xerophytic plants such as *Lantana camara, Opuntia dillernii, Barbirica prorutis* and *Satachytorbita indica.* Dadadghao and Shankaranarayan (1973) reported that invasion of unpalatable species was perhaps due to the effect of over grazing. Hobbs (1987) stated that remnant forested areas are more prone to grazing by sheep or cattle which drastically alter the native vegetation. Similary in both corridors cattle grazing has led to degradation of the habitat. Sukumar (1985) has already reported the possible habitat deterioration due to high density of livestock in Sathyamangalam Forest Division.

The severe incidence of wood cutting on the hill slopes in Kallar-Vedar Colony Corridor has threatened the forest connectivity between Kallar RF and Vedar Colony area. People depend on hill slopes for cutting bamboo (*Bambusa arundinacea*) where it is dense. Field survey in hill slopes revealed the intensive use of bamboo patches by elephants as evidenced from the abundant dung piles. Though no systematic data on abundance of dung piles were collected to relate the disturbance factors by human, it appears that elephants use lowland disturbed forests during late evenings for foraging.

The peak human activity during early morning hours could be related to lack of abundant tree cover in close proximity to villages. Villagers have to travel greater distances for finding suitable sites for fuel wood collection. People take the risk of venturing into the corridors during morning hours when elephants are more active. This reveals severe dependency of local people on the corridor for fuel wood which is the source of revenue for them.

Johnsingh *et al..*, (1990) have indicated that insidious tree feeling and high grazing intensity affect the natural tree regeneration as revealed from their studies of Chilla-Motichur corridor, in the Rajaji National Park in Uttar Pradesh. Sukumar (1985) reported possible habitat deterioration due to high density of livestock in Sathyamanagalam Forest Division. Similary in both corridors, cattle grazing has led to degradation of the habitat.

The high intensity of fuel wood collection in "other forested areas" (hill slopes and valleys) could be attributed to the availability of dense cover and high trees in both corridors. More sighting of elephants in Sujalkutti - Bannari Corridor was influenced by availability of water, shade and abundant browse. Sivaganesan (1991) has reported the significance of gallery forests in the thorn forest of Mudumalai Wildlife Sanctuary to elephants with regard to shade and browse availability. The Sujalkuttai-Bannari Corridor, Bolipallam and Varapallam areas have plenty of food trees such as *A. leucopholea, A. planiferons, A. amara* and *D. cinerea* which are used

for shade too. Another reason for more sighting of elephants in the gallery is that they depend on browse to a greater extent during the dry season. It is supported by the studies of Sivaganesan (1991) who has reported that the elephants in the critical microhabitats of thorn forest of Mudumalai Wildlife Sanctuary use browse species heavily during the dry season. Sukumar (1989) also found a preference for browse by elephants during the dry season when it is abundant in Sathyamangalam Forest Division, Tamil Nadu. In Kallar-Vendar Colony Corridor elephants were sighted in hilly slopes where disturbances were maximum. The various development activities on the corridor have considerably reduced the width of the corridor. As a result a narrow bottle neck which connects the hill slope at Kothagiri road is used intensively by elephants as migratory routes. In this corridor, only slope forest is used heavily as the foot hill forests are not available to elephants during daylight hours. Highways between Kothagiri road and Coonor road also face severe disturbance and act as barriers during daylight hours. Bennet (1987) has also reported that the road acts as a barrier for the movement of animals.

Collection of data on elephant preferred food species such as *P. juliflora*, *R. malabarica*, *A. amara*, *D. cinerea* and *A. planiferons* have indicated a rapid deterioration of habitat quality in Sujalkuttai-Bannari Corridor. As a result of heavy fuel wood collection most of the trees have copious growth. Many food trees of elephants are also likely to disappear as they are preferred by people for fuel wood. Until now lopping of various species of trees in both corridors has not affected the plant cover except that it has modified the canopy structure and height as pointed out by Sivasubramaniyan (1995).

In the Kallar-Vedar Colony Corridor the lopping intensity is more on preferred food trees such as *C. berryi* and *Z. mauritania* which might lead to their local extinction from the corridor. The local extinction of food trees are generally attributed to elephants' excessive feeding on particular species. The present study clearly indicates the possibilities of the local extinction of preferred food trees mainly because of inense lopping, if the current trend continues. Importance of corridors for preventing habitat regeneration and minimizing the genetic effects of isolation was repoted by Dendy (1987) and Diamond (1975). To protect the finest elephant habitats between Eastern Ghats and Western Ghats, the narrow Sujalkuttai-Bannari Corridor and Kallar-Vedar Colony Corridor are most crucial as they allow for the movement of elephant populations between these two habitats. These corridors need to be preserved to ensure the genetic flow between the populations.

Management options for preserving the corridors

1. Programmes to supply wood by the authorities for the villagers who argely depend on these corridors would preserve the corridor viability. Grazing may be banned at least from the crucial areas (valleys and gallery forests) of the corridors.

2. Habitat restoration may be planned at the earliest to enhance forest cover in heavily degraded areas, particulary in Sujalkuttai -Bannari Corridor.

3. In the Kallar - Vedar Colony Corridor water scarcity is a serious problem for elephants during the dry season. Elephants had to visit Mettupalayam Forest Timber Depot colony for water during night hours by travelling a long distance from Vedar Colony. Water holes have to be created in this corridor to save the elephants, particulary the nursing females.

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TABLE 1

Percent impact of various anthropogenic pressures in Sujalkuttai - Bannari & Kallar- Vedar Colony Corridors.

Arthropogenic Pressures	Sujalkuttai - Bannari			Kallar - Vedar Colony	
	Female (n=162)	Male (n=114)	Overall (n=276)	Female (n=92)	Male (n=96)
Cattle grazers	3.1	21.9	10.9	3.6	21.7
Goat grazers	0.6	10.1	4.7	1.2	7.6
Fuel Wood Colectors	74.7	45.6	62.7	90.5	28.3
MFP Collectors	19.1	9.7	15.2	3.6	-
People movement	2.5	11.4	6.2	1.2	1.1
Wood cutting	-	0.9	0.4	-	41.3

(n = Total number of persons sampled)

TABLE 2

Preference rating of various food species of elephants collected by people for fuel wood in Sujalkuttai-Bannari Corridor in Sathiyamangalam Forest Division, Tamil Nadu.

Plant species	*Density (ha)*	*Relative density*	*Frequency of fuel wood collections (n=108)*	*% Frequency*	*Preference rating*
Albizia amara	46.7	6.0	75	26.4	4.4
Accacia latronum	230.8	29.7	48	16.9	0.6
Accacia planiferons	62.9	8.1	53	18.7	2.3
Accacia mellifera	2.4	0.3	1	0.4	1.1
Bauhinia racemosa	2.7	0.3	1	0.4	1.0
Commiphora berryi	41.6	5.4	1	0.4	0.1
Dichrostachys cinerea	13.3	1.7	18	6.3	3.7
Grewia villosa	193.6	24.9	15	5.3	0.2
Prosopis juliflora	8.5	1.1	19	6.7	6.1
Premna sp.	13.8	21.8	7	2.5	1.4
Randia dumetorum	39.0	5.0	30	10.6	2.1
Rndia malabarica	2.1	0.3	4	1.4	5.2
Solanum torvum	119.4	15.4	12	4.2	0.3

(Sampled area for estimating density of food tree species = 3.77 ha)

TABLE 3

Preference rating of various food species of elephants collected by people for fuel wood in Kallar- Vedar Colony Corridor in Coimbatore Forest Division, Tamil Nadu.

Plant species	Density (ha)	Relative density	Frequency of fuel wood Collections (n=108)	% Frequency
Albizia amara	27.27	13.04	30	20.3
Albizia lebbecsk	8.36	4.00	2	1.4
Accacia latronum	23.27	11.13	3	2.0
Accacia planiferons	33.45	15.99	13	8.8
Cordia spp.	6.55	3.13	23	15.5
Bauhinia recemosa	15.27	7.30	10	6.8
Dichrostachys cinerea	15.27	7.30	2	1.4
Hardwickia binata	13.09	6.26	23	15.5
Pterocarpus marsupium	6.91	3.30	24	16.2
Randia dumetorm	30.55	14.61	5	3.4
Randia malabarica	21.82	10.44	1	0.7
Tamarindus indica	4.36	2.09	2	1.4
Terminalia chebula	2.91	1.39	10	6.8

(Sampled area for estimating density of food tree species = 2.75 ha)

TABLE 4

Percent lopping of various plant species by people in (1) Sujalkuttai-Bannari and (2) Kallar - Vedar Colony Corridors.

Plant species	% Lopping				Elephant food species
	Corridor 1		Corridor 2		
	Mean	S. D.	Mean	S. D.	
Accacia latronum	55.0	24.3	-	-	+
Accacia mellifera	-	-	20.0	0.0	+
Accacia planiferons	45.8	20.1	-	-	+
Accacia torta	-	-	30.0	0.0	+
Albizia amara	62.8	18.8	21.7	7.6	+
Albizia lebbeck	15.0	0.0	-	-	+
Bauhinia racemosa	32.5	19.4	20.0	17.3	+
Carissa carandas	20.0	5.0	-	-	-
Cassia fistula	17.5	3.5	-	-	-
Chloroxylon swietenia	31.7	8.2	10.0	0.0	-
Commiphora berryi	-	-	18.0	0.0	+
Dichrostachys cinerea	19.2	18.6	-	-	+
Diospyros montana	-	-	20.0	0.0	-
Erythroxylum monogynum	50.0	21.2	-	-	-
Fluggea leucopyrus	63.3	37.9	-	-	-
Hardwickia binata	17.5	3.5	18.3	7.6	+
Lepisanthes tetraphylla	-	-	15.0	0.0	-
Limonia alata	40.0	0.0	25.0	14.1	-
Mundulea sericea	65.0	0.0	-	-	-
Prosopis juliflora	20.0	7.1	-	-	+
Randia dumetorum	67.5	11.9	-	-	+
Randia malabarica	45.0	0.0	-	-	+
Sapindus emarginatus	15.0	0.0	-	-	-
Atrychnos potatorum	-	-	17.5	3.5	-
Ziziphus mauritiana	-	-	60.0	0.0	+

TABLE 5

Intensity of lopping and wood cutting of various plant species by people in Sujalkuttai-Bannari Corridor, Sathymangalam Forest Division, Tamil Nadu. (Sampled area = 0.75 ha)

Plant Species	Frequency		Density		Mean lopping height (m)	
	Lopping	Wood cutting	Lopping	Wood cutting	Mean	S. D.
Albizia amara	11	12	14.7	16.0	1.9	1.0
Accacia latronum	6	14	8.0	18.7	1.2	0.5
Accacia planiferons	6	3	8.0	4.0	2.2	1.1
Albizia lebbeck	1	0	1.3	0.0	3.5	0.0
Cassia fistula	2	0	2.7	0.0	2.0	0.0
Bauhinia racemosa	4	0	5.3	0.0	3.5	0.0
Chloroxylon swietenia	6	0	8.0	0.0	1.7	0.7
Carissa carandas	3	1	4.0	1.3	0.8	0.6
Dichrostachys cinerea	8	2	10.7	2.7	1.4	0.7
Erythroxylum monogynum	6	10	8.0	13.3	1.3	0.6
Fluggea leucopyrus	3	9	4.0	12.0	1.0	0.3
Hardwickia bunata	2	0	2.7	0.0	2.3	0.4
Mundulea cerecea	1	0	1.3	0.0	1.8	0.0
Randia malabarica	4	4	5.3	5.3	0.9	0.2
Sapindus emarginatus	1	2	1.3	2.7	1.5	0.0
Prosopis juliflora	1	0	1.3	0.0	2.5	0.0
Limonia alata	4	1	12.0	1.3	2.2	0.7
		0	1.3	0.0	0.8	0.0

TABLE 6

Percent lopping of various plant species by people in Sujalkuttai-Bannari & Kallar - Vedar Colony Corridors. (Sampled area = 0.75 ha)

Plant Species	Frequency		Density		Mean lopping height (m)	
	Lopping	Wood cutting	Lopping	Wood cutting	Mean	S. D.
Albizia amara	3	0	5.0	0.0	3.7	1.5
Accacia mellifera	1	0	1.7	0.0	0.3	0.0
Accacia torta	1	0	1.7	0.0	1.5	0.0
Bauhinia racemosa	4	0	6.7	0.0	3.5	2.6
Chlorxylon swietenia	1	0	1.7	0.0	2.5	0.0
Commiphora berryi	1	0	1.7	0.0	0.5	0.0
Diospyros montana	1	0	1.7	0.0	2.5	0.0
Hrdwickia binata	3	0	5.0	0.0	3.8	2.2
Limonia alata	2	0	3.3	0.0	1.4	0.9
Lepisanthes tetraphylla	3	0	5.0	0.0	2.8	0.8
Strychnos potatorum	2	0	3.3	0.0	0.8	0.4
Ziziphus mauritiana	1	0	1.7	0.0	0.3	0.0

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