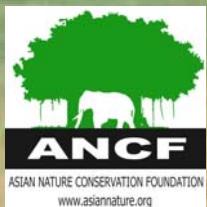


# **MANAGEMENT PLAN FOR THE ELEPHANTS IN BANDIPUR TIGER RESERVE**

**TO**

**BANDIPUR TIGER RESERVE, KARNATAKA FOREST  
DEPARTMENT**

**By**



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# I. INTRODUCTION

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Bandipur Tiger Reserve (BTR) with its large area (around 900 km<sup>2</sup>) supports a sizable proportion of the elephant population of Karnataka as well as the landscape of Elephant Ranges 7 & 8 (Sukumar *et al.* 2006). The elephants of Bandipur are a part of a larger population and landscape, as this area is contiguous with the adjoining elephant habitats within the state and in the neighbouring states of Tamil Nadu and Kerala allowing free movement of elephants across the landscape. Hence, the conservation of the species cannot be viewed in isolation. The viability of the BTR elephant population is not in question, but threats from habitat degradation (due to overgrazing, firewood collection and weed proliferation), developmental projects (such as interstate highway and dams), continued ivory poaching and human-elephant conflict need to be focused upon by the park management in order to ensure effective management of the elephant population. Further, though its contiguity with adjoining habitats within the state and neighbouring states is an advantage for BTR, there is need for more coordinated elephant/forest management with neighbouring forest divisions.

## 1. Population and Age Structure of Elephants

### 1.1. Population Estimation

Population estimation is fundamental to the management and conservation of any species. Estimating animal numbers or densities is difficult in tropical forest habitats, due to poor visibility and low density of some animal species, which result in inadequate sample sizes. This tends to result in over or under estimating numbers. The Forest department in the past has adopted several methods for estimation. However since 2002, through synchronized elephant censuses, a direct (sample block count) and an indirect (line transect dung count) method (Burnham *et al.* 1980) have been used for estimating the density of Asian elephants (*Elephas maximus*) uniformly throughout the country.

The number and density of elephants estimated using sample block counts during 2002, 2005 and 2007 varied considerably across 2002 to 2007 (Table 1.1). The density declined from 2.26 elephants / km<sup>2</sup> in 2002 to less than half (1.1 elephants/km<sup>2</sup>) during the 2007 count and such variations have been attributed to changes in climatic conditions and its effects on vegetation growth, visibility etc. Throughout southern India the year 2002 saw a major drought that could have affected the normal spatial distribution of elephants apart from increasing visibility, resulting in higher numbers or densities estimated for the Bandipur Tiger Reserve (BTR). Similarly the high rainfall recorded during 2005 & 2007 may have affected the visibility due to dense vegetation and thus it could have resulted in underestimation of elephants using the sample block count method.

Table 1.1: Elephant population density and numbers estimated using sample block count in Bandipur Tiger Reserve during 2002, 2005 and 2007 synchronized elephant censuses.

Year	No. of blocks sampled	No. elephants counted	Mean density and range of elephant numbers			Mean number
			Mean	LCL	UCL	
2002	59	843	2.26	1469	2487	1975
2005	38	459	1.34	825	1610	1217
2007	57	486	1.10	741	1268	1005

However, a density around 2 elephants/ km<sup>2</sup> is likely to be a reliable estimate for BTR considering the densities of elephants estimated for its surrounding forest divisions such as Mudumalai Wildlife Sanctuary (2.2 to 2.5 elephants/km<sup>2</sup> estimated using line transect direct sighting and dung count methods by Baskaran and Desai 2000, Airvazagan *et al.* 2002, Sukumar *et al.* 2002 - Synchronized Census Report 2002), Wayanad Wildlife Sanctuary (2.4 and 3.0 elephants/km<sup>2</sup> respectively using sample block count and line transect dung count method by Sivaram *et al.* 2006 - Synchronized Census Report 2005) and Nagarhole National Park (3.0 elephants/km<sup>2</sup> using line transect direct sighting method by Karanth and Sunquist 1992).

## 1.2. Age Structure of Elephants

For conserving the species it is important to know not only the current trends in the population numbers but also other demographic parameters such as age structure, sex ratio, fertility, mortality and physiological condition, which would give an idea of the viability of a population.

Age and sex composition data collected based on the observation of elephants in BTR are shown in Tables 1.2 & 1.3. The elephants of BTR are a part of larger population of the Nilgiri-Eastern Ghats and the elephants in BTR move from the southern side to the northern side of the park and vice versa and also move to and from the adjoining areas of Mudumalai, Nagarhole, Wayanad etc. However the population structure especially sex ratio varies considerably between two regions of BTR with the southern side having higher skew towards females (male to female 1: 13.5) compared to northern side (1:5.3) due to the general trend of decreasing ivory poaching pressure from south to north within southern India.

### 1.2a. Elephant Population Management:

- The higher proportion of adult males in the northern side of the BTR and adjoining Nagarhole Tiger Reserve, along with the scarcity of tuskers in the other elephant areas, could attract more ivory poachers to this region in the near future. Therefore vigilance to counter this possibility is a matter of urgency.
- Anti poaching measures needs to be extended to all the Forest Divisions in the landscape rather than the present system of having them only in the protected

area network. Because tuskers do not confine themselves only to the protected areas, they get poached when they move into adjoining territorial forest Divisions due to their wide-ranging habits.

- The protection needs to be strengthened and a coordinated management strategy needs to be adopted across the states of Karnataka, Kerala and Tamil Nadu in a landscape level approach to effectively protect these populations.

Table 1.2: Age-sex composition and sex ratio of elephants observed from the southern side of Bandipur Tiger Reserve between 2002-2005

Age class	Percentage of females	Percentage of males	Sex Ratio
			Male : Female
Calf <1	5.0	5.0	-
Juvenile	11.8	11.5	1:1
Sub-adult	16.7	5.2	1:3.2
Adult	41.8	3.1	1:13.5

Table 1.3: Age sex composition and sex ratio of elephants observed from northern side of Bandipur Tiger Reserve between 2002-2005

Age class	Percentage of female	Percentage of male	Sex Ratio
			Male : Female
Calf <1	4.3	4.3	-
Juvenile	11.4	12.2	1:1
Sub-adult	15.9	11.1	1:1.4
Adult	35.9	6.8	1:5.3



Plate 1: A herd of elephants grazing in the Kabini backwater area on the northern side of Bandipur Tiger Reserve adjoining Nagarhole Tiger Reserve.

## **2. Habitat Management:**

**2.1. Habitat Contiguity:** Since the elephant is a wide-ranging species, managing the larger landscape including maintaining habitat contiguity are essential for the long-term conservation of the species. For example elephant clans in the Nilgiri Biosphere Reserve (which includes the BTR) annually range over 650 km<sup>2</sup> with high fidelity to their home range, seasonal ranges and corridors (Baskaran *et al.* 1995, Baskaran 1998). Some of the clans also show seasonal movements to particular habitat types available within the forest division and adjoining forest divisions (Baskaran 1998). Though the BTR is spread over an area of over 870 km<sup>2</sup> with diverse habitat types, yet elephant clans and bulls from BTR would still be ranging into the adjoining forest divisions of Mudumalai & Wayanad Wildlife Sanctuaries, Nagarhole National Park etc, as elephants of BTR are a part of the larger population of the landscape and the administrative boundaries of various forest divisions do not always coincide with ecological boundaries (home ranges). Therefore maintaining habitat contiguity is essential not only within BTR but also with the adjoining forest divisions too. Further, the sex ratio of the elephant population appears to be biased towards females in the adult and sub-adult classes and such a skew is more pronounced in the southern than in the northern part of the park due to higher poaching intensity in the southern side. Such unequal sex ratios between the two parts of BTR also warrant maintaining habitat contiguity to maintain genetic diversity.

Habitat contiguity could be affected (or lost) by a variety of factors. For instance, the establishment or expansion of non-forest activities such as the growth of human settlements, spread of agriculture including large scale commercial plantations, establishment of hydro-electric projects, highways and railway lines within the forest areas or in forested revenue or private lands that presently connect two adjoining larger habitats. These non-forest activities sometimes independently or along with natural topographical constraints (steep contours, deep valleys) result in loss of habitat contiguity.

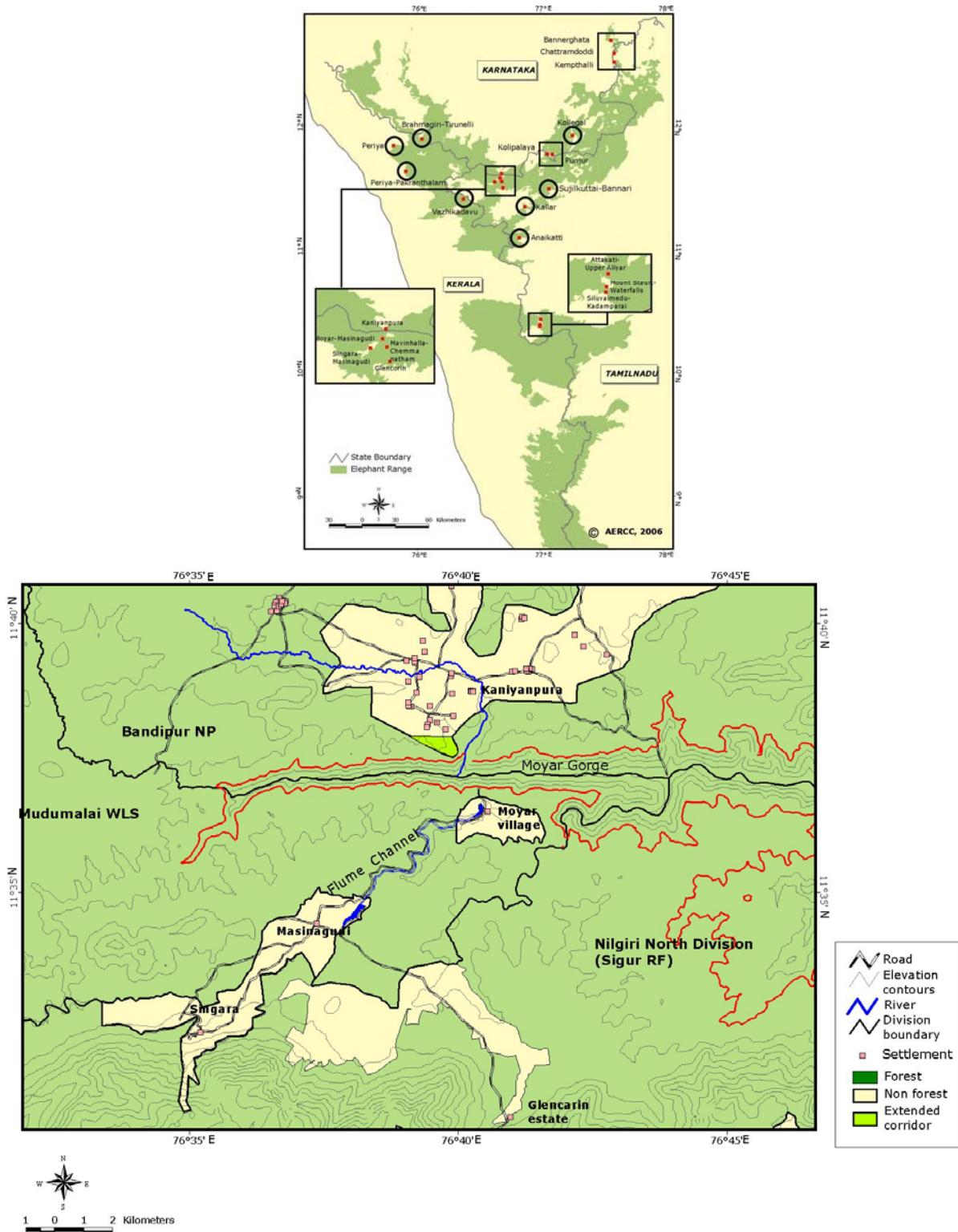
Presently, the BTR is fortunate to be without human settlements inside. But it has threats from other factors like (1) peripheral settlements (Kaniyanpura on the northern side) coupled with topographical constraints (Moyer gorge on the southern side), (2) Interstate Highways (Mysore-Udhagamandalam and Mysore-Calicut via Sultan Bathery) and (3) Irrigation and Hydro-electric project reservoir (Kabini Dam) that affect the habitat contiguity at a different level.

### **2.1a. Habitat Contiguity Management:**

**Kaniyanpura Corridor:** In the eastern side of BTR at Moyer Range, the expansion of Kaniyanpura, a peripheral village towards the southern side *i.e.* towards the Moyer gorge had resulted in the formation of a bottleneck (Fig. 2.1) affecting the habitat contiguity in this region. The BTR, with funding support from Project Elephant, Govt. of India and technical support from the Asian Elephant Research and Conservation Centre (AERCC) of the ANCF, managed to widen the bottleneck to 500m and realigned the park boundary. Though this corridor is protected to some extent, there is need for continuous vigilance to prevent any other developmental activities (like the

proposed but subsequently stopped proposal for tourist resort that would affect the movement of elephants and other wildlife directly or indirectly.

Figure 2.1: Map showing elephant distribution in southern with the locations of corridors (top) and the map of Kaniyanpura corridor showing the Moyar gorge on the southern side and the Kaniyanpura village on the northern side. The extended corridor area is highlighted in fluorescent green colour.



Interstate highways: At present the two highways: (1) Mysore- Udhagamandalam and (2) Mysore- Calicut via Sultan Bathery have not affected the habitat contiguity of BTR. With the current width of the highway and the traffic intensity, elephants and other larger mammals continue to cross the highways, although it acts as a barrier for arboreal species like squirrels since canopy contiguity is lost (Desai & Baskaran, 1998). A large number of squirrels and other lower vertebrates (reptiles and amphibians) get killed by speeding vehicles while crossing the road and many species of wildlife avoid using the forest areas up to 500m from roadsides due to the effect of vehicular disturbances (Boominathan & Baskaran, 1999). The existing highways in BTR already have the track record of killing several highly endangered species like the tiger (*Panthera tigris*), leopard (*P. pardus*), sloth bear (*Melursus ursinus*) etc including an elephant calf. With the current economic boom in India, public infrastructure facilities are expanding rapidly and extensively throughout the nation and most of the interstate highways have already been widened from existing two lanes to 4 – 6 lanes width and in addition the number of vehicles plying in the highway has also increased significantly. Thus, it is highly possible that these two highways running across BTR will also get widened into 4-6 lane roads and if that happens these roads could potentially affect the movements of larger mammals like elephants in the future. So Park management needs to keep in mind the adverse impact of these highways on wildlife while dealing with any proposal to widen existing highways and also establish new highways.

Kabini Reservoir: This reservoir is situated between BTR and Nagarhole Tiger Reserve. There were old plans to increase the height of the dam. If such a development takes place, it may increase the submergence of land leading to further loss of elephant habitat and could potentially block habitat contiguity and stop the movement of elephants between the parks, which is currently taking place only during dry season. So Park management needs to be cautious in accepting/approving any such ‘developmental’ projects.

**2.2. Proliferation of Exotic Weeds and its Impacts:** Evolution has always been promoted by the existence of natural barriers. Human impact on pristine ecosystems aided species in crossing ecological barriers and spreading into new environments. The alien invasive species are well known for their aggressiveness in colonization. Their impacts on native ones and on the naturalness of the ecosystem can be immense, unpredictable and often irreversible (Sandland *et al.* 1996). Alien species are recognized as the second largest threat to biological diversity (IUCN 2000). The species such as Lantana (*Lantana camara*) and Eupatorium (*Eupatorium odoratum*) are alien invasive plants in India respectively from North America and West Indies. These two species of exotic weeds invaded the natural habitats of BTR many decades ago, but their impact on native vegetation has been significant particularly over the last decade. Though the impacts of these weeds on native species has not been fully understood, these two species have taken away most of the ground cover (space) available to the dominant tall grass species such as *Themeda cymbalaria*, *T. triandra* and *Cymbopogon flexuosus* and other native herbs, shrubs including regeneration classes of native tree species. Additionally, the vacant space created along the streams due to natural mortality of old bamboo clumps after flowering has been occupied by

Eupatorium first and subsequently Lantana invaded to replace the Eupatorium. The impact of Lantana is more intense and widespread than Eupatorium. The proliferation of these two species has affected significantly the biomass of grass and browse available to elephants and other large mammals. Such an impact could also result in changes in vegetation dynamics through increased dependency of elephants on browse tree species. On the positive aspects of Lantana: species such as sloth bear, jungle fowl, frugivorous birds etc consume fruits of Lantana; sambar, gaur etc rarely browse on this species but it provides good shelter for many nocturnal animals. No wild animal is observed to feed on Eupatorium. Lantana is known to regenerate through seed emergence and also from roots leftover at subsoil level (copious growth).

**2.2a. Weed Management:** Though permanent eradication of species dispersed by birds is quite difficult (as birds would disperse the seeds from adjoining non-forest areas), some effort needs to be made on an experimental basis to control their distribution at periodic intervals. Because in some places like the tourism zone of BTR, Lantana has already achieved much higher densities and biomass, thus becoming (i) a major barrier for the free movement of large mammals including elephants apart from (ii) reducing the large herbivore food resources and (iii) intensifying impacts of the forest fire.

**2.3. Forest Fire and Its Impacts:** Forest fires in BTR are man-made fires mostly set by forest product gatherers (in remote areas) and cattle graziers (along the fringes). The higher accumulation of leaf fall due to the deciduous nature of the forest and the presence of tall grass in semi dry conditions form fuel for forest fires. Forest fires are predominantly ground fires that wipeout all the grass cover including the herbs and saplings of tree species. But the Lantana thickets along the dry streams during low rainfall/drought years also catch fire and take the ground fire up to canopy level, burning mature trees. The effect of forest fires have reduced some of the favoured food species like *Kydia calycina*, *Boswellia serrata* etc. (Sivaganesan, 1991). Further, since grass species form the bulk (>60%) of annual diet of elephants in the Nilgiri Biosphere region (Baskaran 1998) protecting it from forest fires is very important not only for preserving the food resources but also to reduce their (elephants') impacts on browse species.

**2.3a. Fire Management:** The BTR management is taking the necessary precautions to reduce forest fire by establishing firebreaks along the roadsides and with additional temporary firewatchers stationed at special camps established for fire control during the dry season. Presently the anti-poaching watchers and their widely distributed camping sites with their wireless communication facilities have been managing forest fire control. In spite of all these efforts, quite often-large tracts of deciduous forests get burnt. So in locations where forests are highly prone to fire, early or patch burning could be tried, as this would reduce the impacts on the regeneration and recruitment classes of tree species and grass species. Additionally such steps increase the manpower availability to the other unburned areas. Early burn areas also act as firebreaks. This strategy needs to be adopted annually with different spatial locations to prevent the same location being subject to early burning every year otherwise early burning too could affect the vegetation and other smaller organisms as in the case of dry season fires. Special efforts in terms of more fire breaks and fire watchers needs

to be taken for areas that act as dry season ranges of elephants as for instance the areas around the major perennial water sources in the deciduous tracts.

**2.4. Biotic Pressure:** Grazing by domestic cattle and fire wood collection although not legally permitted, have become serious habitat threats degrading forest conditions almost all along the northern boundary of the BTR. There are 213 fringe villages (Management Plan 2005) with 1,16,000 scrub cattle (Raju 1995) located along the northern side that mostly collect the firewood and graze their cattle in the bordering areas of BTR. Considering a case study (Silori & Mishra 1995) that estimated 1800 cubic meter of firewood and 451 cubic meter of cattle dung were being collected annually from the forest by just eight villages around the eastern part of the Mudumalai Wildlife Sanctuary, the magnitude of biotic pressure in BTR by 213 villages and 1,16,00 cattle can be estimated. Besides, the domestic cattle also spread contagious diseases such as Foot & Mouth disease, Rinderpest, Anthrax etc, to the wildlife animals.

#### **2.4a. Biotic Pressure Management:**

To reduce the firewood collection, recently the park management with the help of voluntary agencies has provided LPG connections to about 600 villagers who live along the eastern fringes of BTR. Village based committees called “*Nama Sanga*”, have been established, which is currently managing this scheme with an initial corpus of funding.

Through similar strategies, local communities need to be motivated and helped to replace the large number of scrub cattle with higher milk yielding hybrid cows. In doing so the present number (1,16,000) could easily be reduced to approximately one third of its size. Also it is recommended that revenue lands be used to raise fodder for stall-feeding the hybrid cows and establish co-operative milk collection booths so that monetary benefits directly go to the villagers. Partial funding could also be raised through the revenue department under rural development schemes for establishing such facilities. If it is successfully implemented, it could permanently reduce biotic pressure on the adjoining natural habitat by over 50%.

Additionally Park management needs to continue to inoculate cattle from the surrounding villages every year to reduce the threat of disease transmission to wildlife.

**2.5. Waterholes:** BTR has reasonably adequate waterholes for elephants. The three major perennial rivers viz. (1) Moyar River on the southeastern side, (2) Nugu River (Moolehole) in the middle region and (3) Kabini River on the northwestern part of the park along with some of their major tributaries provide water sources round the year for the elephants and other animals. Additionally, reservoirs constructed on the fringes of the Reserve such as (1) Kabini Reservoir (Major Irrigation Dam) at Beechanahalli on the northwestern boundary, the minor irrigation dams at (2) Mangala near Bandipur on the eastern boundary (3) Kudregundihalla, Hanchipura and (4) Eastern dams near Hediyalal also provide perennial water sources to the animals. In addition, the continuous effort by the Park management to provide water facility to wild animals since the inception of Project Tiger has resulted in large numbers of artificial ponds and small tanks with a significant numbers of them concentrated around the tourism area (Management Plan 2005). Looking at the distributions of

perennial waterholes it appears no more waterholes are required, as creating more artificial waterhole would also artificially boost the growth rate of elephant population and other large herbivores that would in turn devastate the vegetation within its habitats as reported in Africa (Ben-Shahar 1993). The present overabundance of Lantana around the tourism zone could be the result of artificially increasing the density of large herbivores by creating large numbers of waterholes.

**2.5a Waterhole Management:** As existing perennial water sources are sufficient (Management Plan 2005), Park management needs to concentrate only in maintaining the existing check dams and ponds that are inside the park by desilting, repairing the seepage and leakages on a regular basis. No new waterholes are needed for BTR.

### **3. Human-Elephant Conflict**

#### **3.1. Yearly Variation:**

Human-Elephant Conflict (HEC) causes significant loss to both human and elephant populations. In India, elephants kill around 200 people, damage crops and property worth several crores every year (Bist 2002, Sukumar 2003) and similarly as many as 40-50 elephants are electrocuted, poisoned or shot by farmers annually (Bist 2002, Johnsingh and Panwar 1992). Though compensation or ex-gratia is paid to the victims of HEC, it accounts for only a fraction of the actual losses. With HEC reported to increase in many parts of their ranges, it is posing a major challenge to Park managers.

The Bandipur Tiger Reserve, with its linear geographic dimension of forest area and being surrounded by more than 200 agricultural based human settlements on the northern side also experiences considerable HEC. For example, an average of 6 human casualties and damage to about 1200 farmers' crop fields have been reported to take place annually for the last 14 years (1994 – 2007). Both human casualties (Fig. 3.1a -  $R^2 = 0.0186$ ) and the number of farmers affected due to crop depredation (Fig. 3.1b -  $R^2 = 0.0368$ ) by elephants did not increase significantly although there were remarkable variations between years. Both human casualties and crop depredation have been remarkably high during 2007 compared to previous years.

#### **3.2. Range-wise (Spatial) Variation:**

The spatial distribution of crop depredation from 9 Forest Ranges (Table 3.1) suggests that Hediya Range consistently experienced more elephant damage as compared to the other ranges. Moyar range is second most affected by elephants. The other ranges such as Moolehole, and A.M. Gudi that do not have forest area abutting the agriculture villages on the Karnataka side (see Fig. 3.2) have not experienced HEC. The possible reasons for the higher frequency of HEC in the Hediya and Moyar ranges could be due to higher degradation of habitat coupled with locations of waterholes at the fringe areas. These ranges could have lost their forest cover (possibly under revenue department) to a considerable degree due to agriculture in the past.

Fig. 3.1: Number of human casualties (a) and crop depredation (b) by elephants took place in around Bandipur Tiger Reserve between 2003 and 2007 as an index of HEC

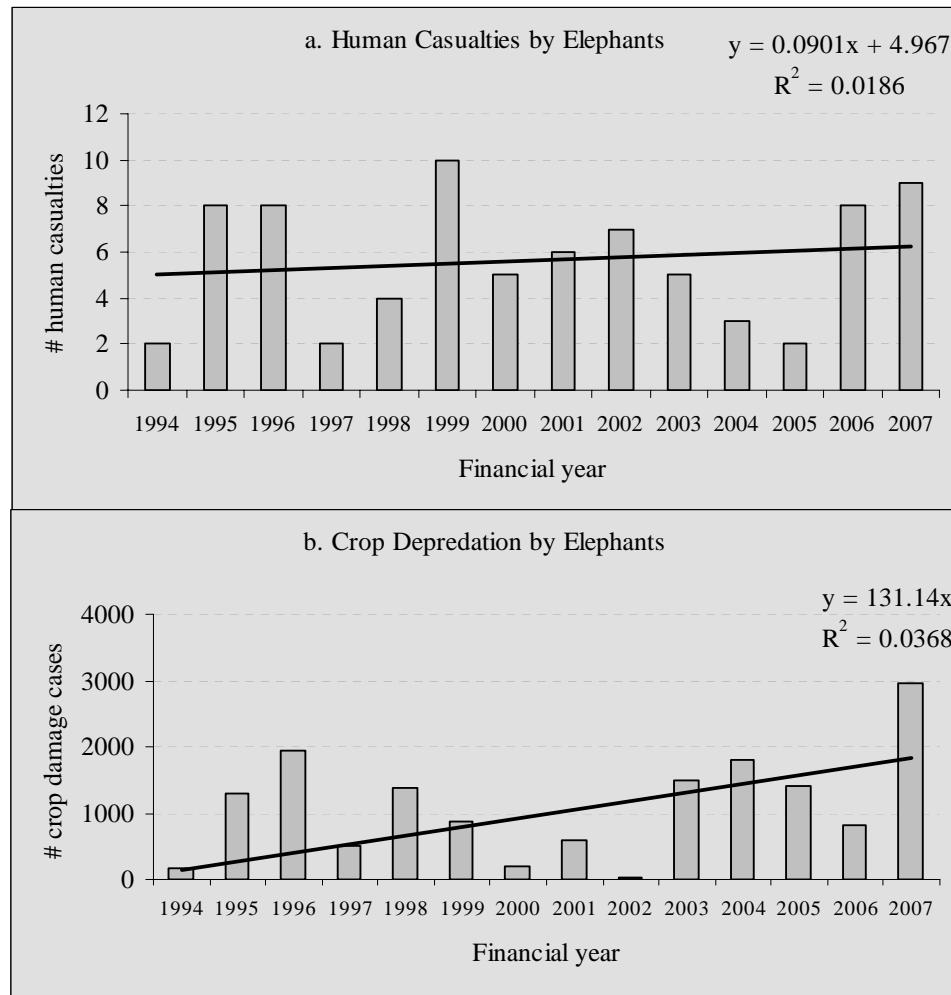


Table 3.1: Number of farmers claiming compensation against crop depredation by elephants in Bandipur Tiger Reserve between 2003 and 2007

Ranges	# of crop depredation cases reported (Cdc)					Range wise Cdc Total	Mean Cdc/Year	Perimeter (km) of Hs/Ag*	# of Cdc/km of perimeter
	2003	2004	2005	2006	2007				
Hediyala	483	856	617	315	1738	4009	802	40.4	19.8
Moyer	700	586	274	326	877	2763	553	62.8	8.8
Moliyur	201	118	405	92	215	1031	206	44.9	4.6
Maddur	410	108	115	92	116	841	168	25.6	6.6
N. Begur	-	110	6	0	19	135	34	17.0	2.0
Bandipur	0	16	0	0	0	16	3	3.9	0.8
Moolehole	0	0	0	0	0	0	0	0.0	0.0
A. M. Gudi	0	0	0	0	0	0	0	0.0	0.0
Gundre	0	0	0	0	0	0	0	4.9	0.0
<b>Total</b>	<b>1794</b>	<b>1794</b>	<b>1417</b>	<b>825</b>	<b>2965</b>	<b>8795</b>	<b>1759</b>	<b>199.6</b>	<b>8.8</b>

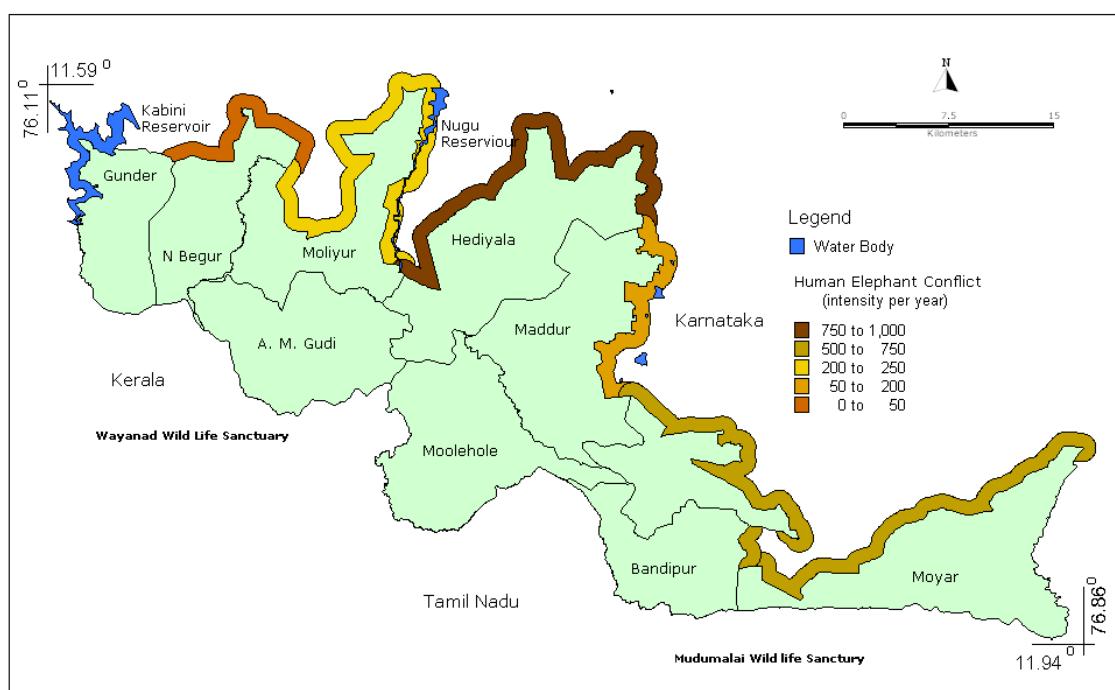
\* Perimeter of Range boundary (km) abutting Human settlements/Agriculture

**3.3. HEC Mitigation:** Elephant proof trench (EPT) has been established all along the northern part of BTR. However due to frequent filling of the EPT by villagers to have access to adjoining forest areas for firewood and cattle grazing, it has become ineffective at many locations. Since no protective measure could be effective without people's participation, plans to construct a permanent wall along the boundary if implemented must be done consultation with neighbouring communities. If people's cooperation is available, the existing EPT could also be maintained with side plastering, which might prevent/reduce closing of EPT.

Additionally, the Park management could also experiment with constructing fences using old rails (unused meter gauge rail-lines as these are currently being replaced by broad gauge lines) or old rails in combination with thick steel rope in the high conflict zones.

Local communities in the adjoining areas of BTR need to be motivated to change their present cropping patterns of cultivating palatable crops such as ragi, maize, sugar cane etc to crops non-palatable to elephants such as sun flower, soya beans etc. This will reduce crop damage by elephants.

Figure 3.2: Incidence of crop damage by elephants (average number of farmers' fields affected in different ranges from 2003-2007) along the northern boundary of BTR. The southern side of BTR is contiguous with other forest divisions such as Wayanad, Mudumalai, and Nilgiri North and thus does not experience HEC.



#### **4. Poaching pressure on elephants:**

Bandipur Tiger Reserve is one of the least fragmented habitats in south India. However, reported deaths of elephants due to human - elephant conflict and elephant poaching for ivory are some of the important conservation problems here. The following proximate reasons could be identified for the incidents of poaching in Bandipur Tiger Reserve (TR).

1. The habitat supports a high density of elephants, with a reasonable number of adult males,
2. The reserve has a 190 km boundary with human habitations which is easily approachable and easy to traverse along the whole length as the habitat is undulating (the average elevation is 1000 m),
3. The reserve falls within a forest area encompassing 3 different states, where interstate co-operation in controlling illegal activities has to be improved substantially.

##### **4. 1. Deaths due to poaching**

Poaching of elephants (Figure 4.1) for tusks in Bandipur TR has been reported for a long time. The recorded number of elephants killed due to poaching during the period 1977 to 1993 was about 27 animals.

| From 1994 to 2007, 49 elephants have been killed for ivory with peak elephant poaching period for the park being 1994 to 1998. During this period a total of 33 elephants (67 %) have died and out of 9 ranges, six (Begur, Moliyur, Maddur, Mulehole, Moyar and Hediyal) experienced elephant poaching during this period. The pooled data for this period (1994 to 1998) showed that poaching was reported every month with the peak of elephant deaths reported in July.



Figure 4.1: Elephant death due to poaching

The first wet season (May to August) accounted for 77 % of the deaths that occurred for all seasons during 1994 to 1998. Both dry (January to April) and second wet seasons (September to December) had 23% of deaths. Ranges such as Begur, Moliyur and Mulehole had more poaching during first wet season. Moyar was a sensitive area for poaching during the second wet season. Moliyur and Maddur had more deaths during the dry season and Moliyur had poaching problems during all three seasons during this period.

From 2001 to 2007, a total of only 7 elephants died, N. Begur, Hediyal and AM Kudi ranges appeared to be main elephant poaching regions during this period. In this

period (2001 to 2007), the concentration of poaching focused more towards first wet and second wet seasons, the first wet season recording more deaths.

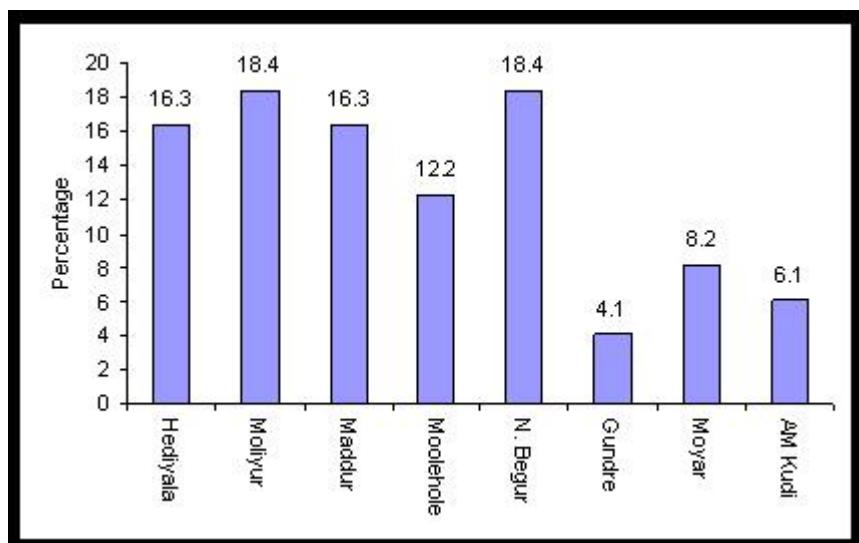
During the first wet season, because of high and continuous rainfall, and the inadequate facilities provided to the patrolling staff, it is to be expected that the patrolling intensity (Figure 4.2) would go down, which may have led to more deaths. More importantly during the wet season, the probability of detecting dead elephants decreases due to less or no patrolling, fast decay rate of kills, and less odour of the kill (through which the dead animals are normally located).



Figure 4.2: Anti poaching staff patrolling the forest

It was found that ranges where more deaths have taken place (N. Begur, Moliyur and Hediyal - Figure 4.3) are very remote, i.e. located very far from their administrative offices and staff quarters, with human habitations and notorious poachers close to the forest.

Figure 4. 3: Percentage of elephants poached for different ranges (from 1994 to 2007)



In some ranges, poaching incidents have stopped (Mulehole and Moyar ranges for example). It could be due to effective enforcement in these areas or the arrest of a particular poaching gang, responsible for the continuous killing of elephants here.

Poaching of elephants in a given range could be due to chance factor alone. However, understanding the deaths of elephants in different ranges provides insights into the manpower available, facilities provided, proximity to human habitation and other

factors. Once the sensitivity of the area is identified and possible causes pinpointed, based on the deaths and other illegal activities, an effective management strategy can be evolved.

#### **4.2. Status of the tusks and investigation**

Of the 33 cases of poaching reported from 1994 to 1998, for 26 cases (79%) tusks were missing and for only 7 cases, they were recovered. In these 7 cases, there are no details of the gang involved and other information for three of the incidents. The failure in recovering the tusks of many of the poached elephants and identifying the poachers involved during 1994 – 1998 played an important role in the continuing occurrence of poaching incidents. The failure also suggested that, when a poaching case was registered, no further investigation was carried out or that there was poor co-ordination between the forest department and the investigating department or investigation processes were very complicated or that the registered cases were not monitored regularly.

During 2001 to 2007, out of 7 cases reported, tusks were recovered in 4 cases and the poachers were detained. From 2001 it appeared that when a poaching case was registered, further investigation was carried out or active co-ordination between the forest department and the investigating department was noticed, and the registered cases were monitored regularly by range level officers.

#### **4.3. Anti-poaching measures**



The department has taken several anti-poaching measures to control poaching. Initially, only 4 anti-poaching camps were established in the park. After severe poaching incidents in 1996, the number of camps has been increased and currently the park has 32 anti-poaching camps (Figure 4.4). These camps are located at strategic points such as close to human habitations, deep inside the park (Figure 4.5), close to game roads and highways passing through the park.

Figure 4.5: Anti – poaching camp located inside the park

Each camp is staffed by about five persons who include one forest guard, 2 permanent watchers and 2 temporary watchers. At any given time 3 staff stay in the camp and are allowed to work in shifts. Regular attendance and a field diary are maintained. The area covered, animal species observed and other related information are reported in the diary. The attendance and the diary is periodically checked by inspecting forest staff and visiting officers. To monitor the patrolling operation, the staff are instructed to leave identification marks, which are checked regularly. The department has spent substantial funds in establishing and operating the camps.

The establishment of anti-poaching camps, the subsequent increase in their numbers and the location have also played a crucial role in reducing the number of elephants killed for ivory.

#### **4.4. Poachers: Different states and groups.**

##### **4.4.1. Kerala Poachers**

Big and small poaching groups (Figure 4.6) have been operating in this region for a long time. Poachers from Kerala dominate this region. They are mainly from Waynad district, which shares a border with Bandipur NP. There are two distinct poachers' centres in Kerala, which can be referred as Pulpally and Sultan Bathery. Small but numerous groups from these two centers are regularly involved in poaching of elephants and other animals.

##### **Pulpally Group:**

The group operates from villages such as Pulpally, Sasimala, Chamapara, Seethamount, Mullankolli and Kolivalli, which are located on the Kerala-Karnataka border and reportedly harbor regular poachers. Poachers from Sasimala, Chamapara, Seethamundi, Pulpally Parakadavavu, Mullankolli and Kolivalli villages operate in Begur, Gundre, Kalkere and Moolehole ranges.

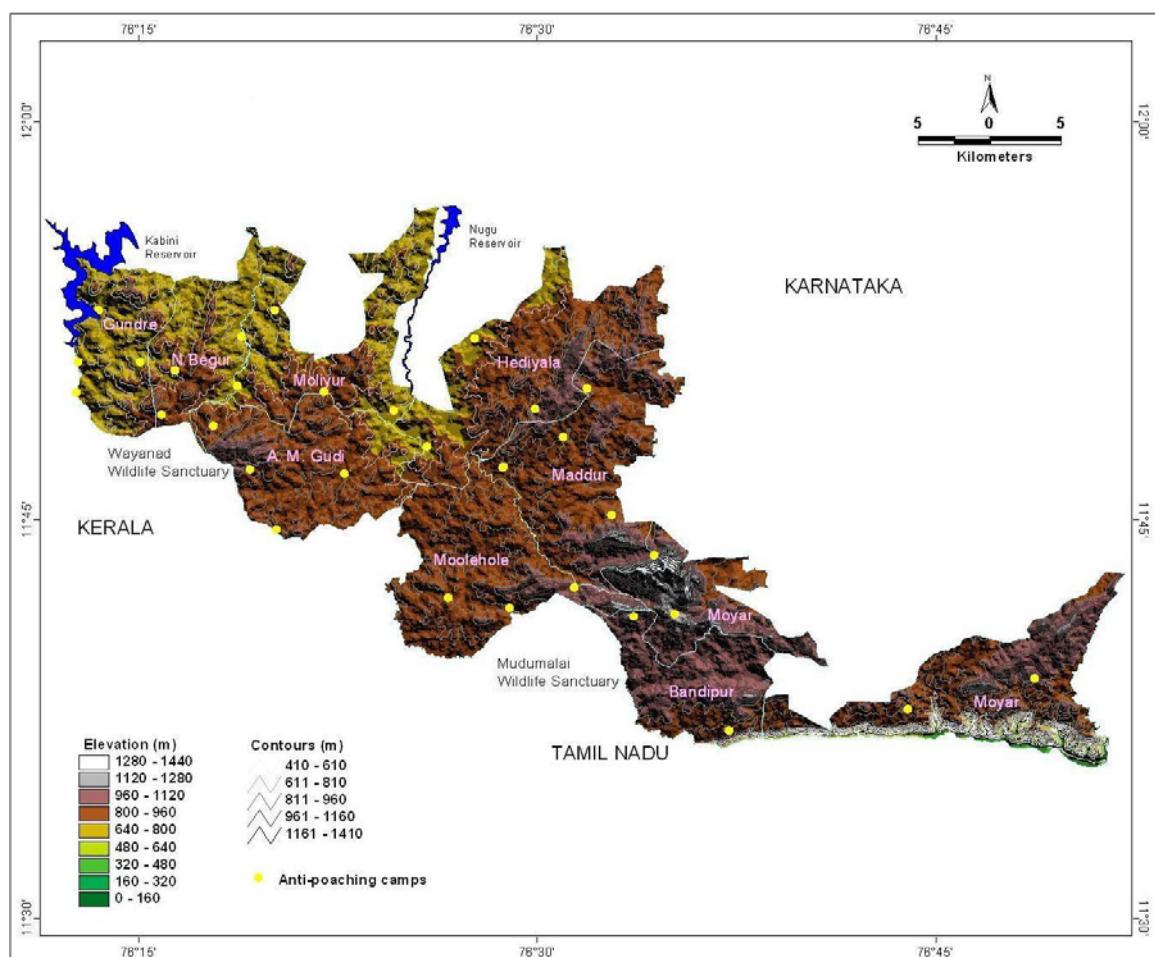
##### **Sultan Bathery Group.**

There are 10 to 15 poachers (individuals and groups) operating from Sultan Bathery for the last 3-4 yrs. All the poachers were poor settlers in the beginning. Now, most of them have become landowners. The Sultan Bathery group operates from villages such as Muthanga, Kallur, Kallumukku and Thottamulla.

Out of 10 groups identified in the region, currently 3 main groups, Podiyan (tribal), Vellutha Abubakar and Chalipara Babu are very active. These poachers have been involved in many cases of elephant poaching in Kerala (Waynad), Karnataka (Bandipur and Nagarhole) and Tamil Nadu (Mudumalai), none of them have been convicted so far due to lack of evidence.

Poachers from Sultan Bathery mainly operate in Kerala and Tamil Nadu forests and occasionally along the tri-junction of the three states, particularly in Mulehole of Bandipur (Karnataka), Mudumalai (Tamil Nadu) and Kurchiat of Waynad (Kerala).

Figure 4.4: Locations of anti poaching camps in Bandipur Tiger Reserve



#### **4.4.2. Karnataka Poachers**

Two to three small groups of poachers operate from the Karnataka side of Bandipur National Park. These groups were identified based on the arrest of a person involved in poaching (Figure 4.7) for a long time. These groups can be referred as the Moyar group, Hediya group and Naganapura group.

**Moyar Group:** The group members are primarily from Kallipur, Hagadhall and Hangala villages of Gundalpet taluk.



Figure 4.7: Wildlife poachers from the Karnataka side of the park

**Hediya, Naganapura and N. Begur Groups:** These groups primarily operate from Hediya, Madukanamule, Dakayithipura of HD Kote taluk. In 2001 a group of poachers were arrested and the members of the group come from a village called Kenchenalli located in N. Begur region.

There are about 40 locations from which elephant poachers for Bandipur Tiger Reserve and Wayanad Wildlife Sanctuary originate and most of the culprits are located within 5 km buffer around the forests (Figure 4.7).

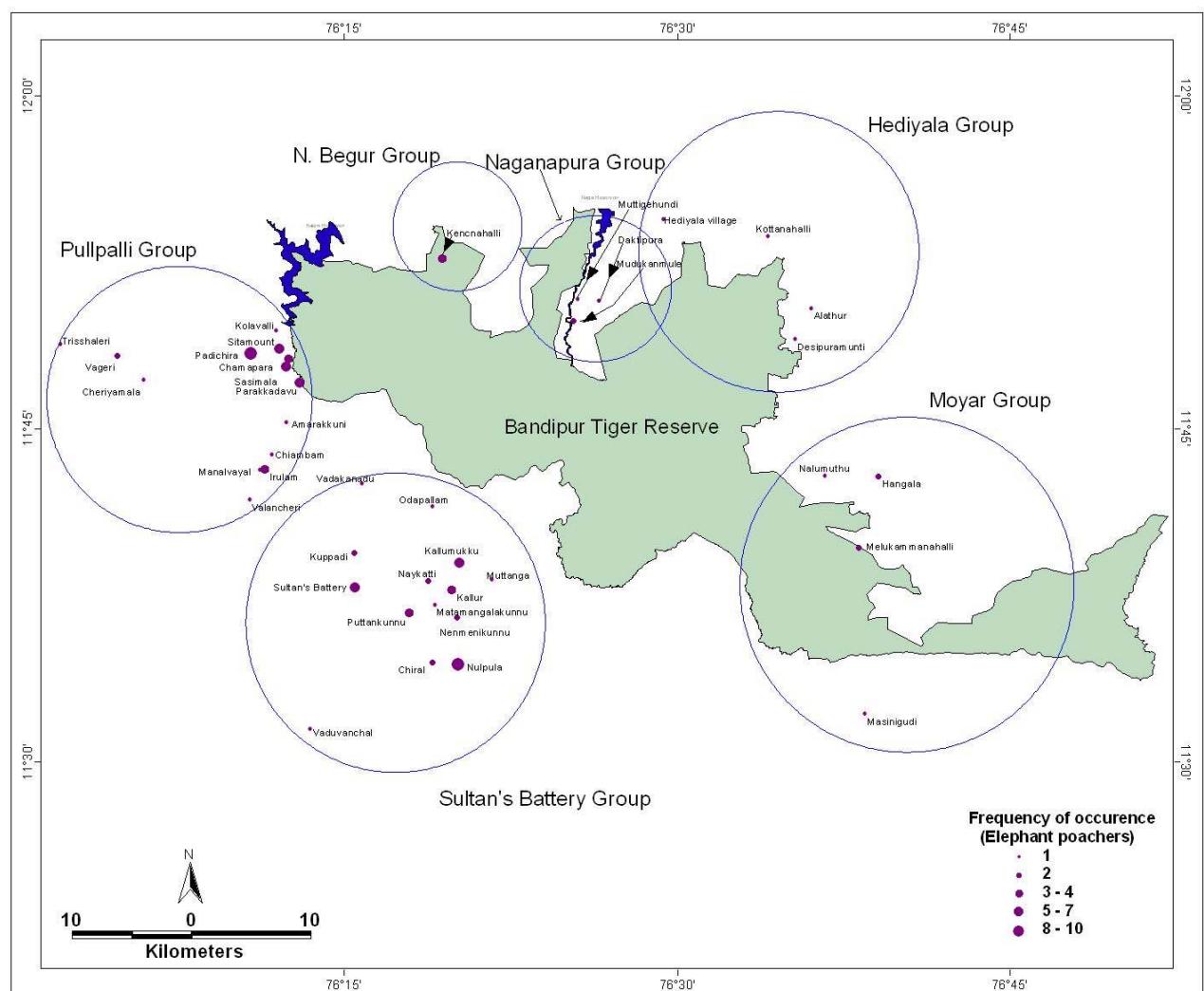
Since 1995, a number of cases of poaching have been filed in Gundlupet and Nanjankudu police stations. According to the police, in the last 10-20 yrs, nearly 59 poachers are operating in Bandipur and adjoining forest areas. The department is maintaining a photographic profile of these poachers, with location details.

#### **4.5. Current status of poaching in the park:**

Although the number of elephant poached for ivory has come down, deaths of elephants due to poaching still continues.

Among all these three poaching groups, the Kerala group (both Pulpally and Sultan Bathery) is still very active. They would continue to be actively involved till very effective anti-poaching strategies are adopted for controlling them. There are no poaching incidents in Moyar after Puligi Madeva and Kulla gangs were arrested.

Figure 4.6: Identified groups of elephant poachers and their locations



All poaching occurring in Bandipur could be due to Kerala poachers, who are close to the forest and could cut across the border into Karnataka. The administrative divisions are very far from the actual places of incidence.

Poaching cases take time and efforts to solve, as the poachers are often from other states. Visiting these places and identifying the people is time consuming; more sustained efforts need to be made to address this problem

The incidence of poaching continues, as most of the poachers are from Kerala. In some cases, once they are arrested by the Kerala forest department and the case transferred to other states, the case is not followed up. The poachers who were arrested are out on bail. This was the status of many other cases that were transferred between the states.

#### **4.6. Control Measures**

Selection of staff for these sensitive areas, starting from the Deputy Conservator of Forests to the watchers, is an important issue. The administrative officer should have a thorough knowledge of the problem and other aspects related to it.

The forest personnel, who are undergoing and those who have undergone watcher and guard training, should be mandatorily posted in the Tiger Reserve and other sensitive areas. Fresh candidates, during training period, should be posted in these sensitive areas instead of with Squads and Check-posts.

Coordination between the forest and police departments is very essential. Regular meetings between Superintendents of Police and Deputy Conservators of Forests, circle inspectors of police and range officers, counterparts in neighboring divisions, circles and ranges, particularly in the interstate border areas, would improve the efficiency of enforcement. However, meetings alone do not solve the problem, follow-up is also equally important.

Legally empowering wildlife law enforcers, allowing the park staff to use fire-arms, increasing the penalty for poaching, legally controlling the possession of fire-arms and ammunition by the local people should be given priority. Poaching offences should be made non-bailable, even in the High Court. Till the case is disposed, the party should be kept in jail. The monitoring of the cases should be done through regular meetings.

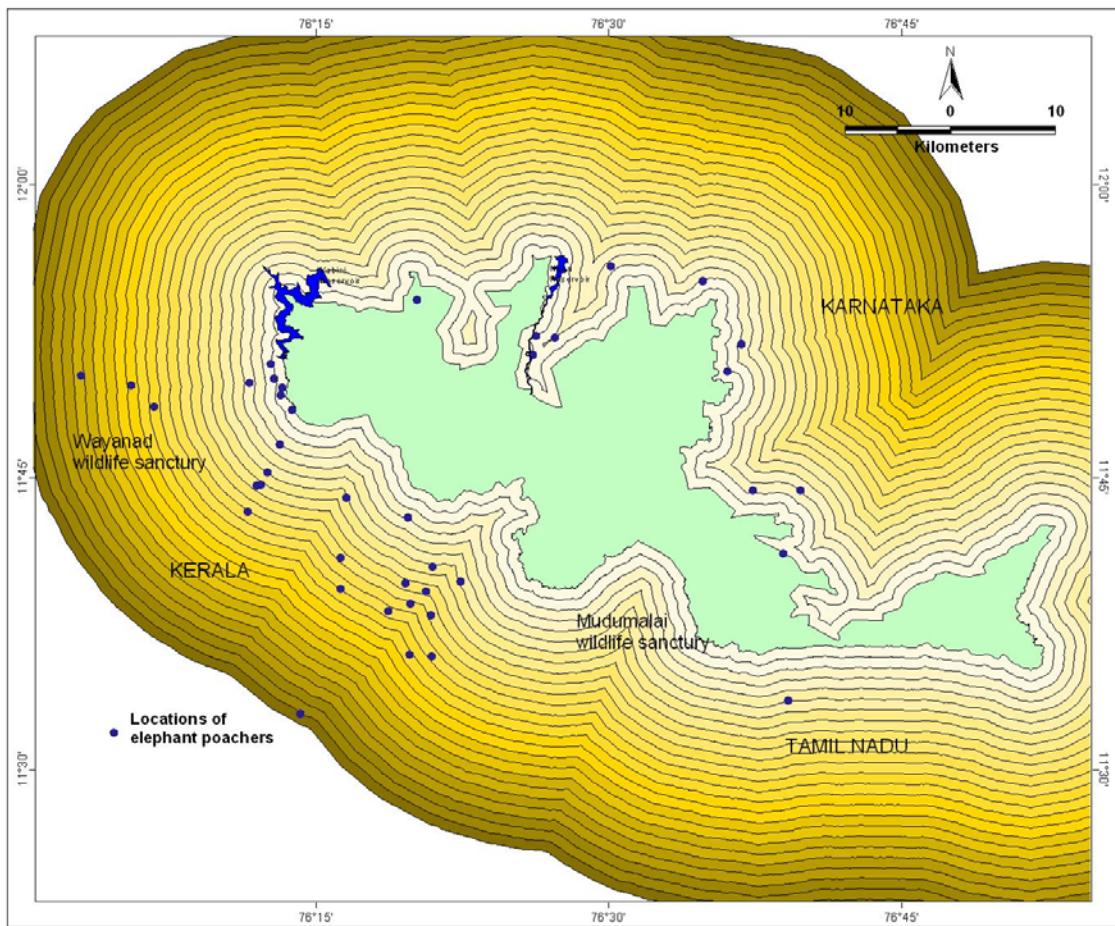
Kurchiat, Muthanga, Sultan Bathery (Waynad Wildlife Sanctuary), Chedalayam (Wayanad south Forest division), N. Begur, Gundre, Mulehole, Kalkere, Hediylala (Bandipur National Park), Mudumalai, and Kargudi (Mudumalai Wildlife Sanctuary) are the sensitive ranges for elephant poaching in this region. Selection of personnel, from the Range Officer to the ground staff, should be based on factor such as ground knowledge, intelligence gathering, using of fire-arms and other related skills.

The welfare of the ground staff needs to be given high priority. Frequent interaction between the higher level forest officer and the lower level staff is very important, as it would help in understanding the problems of the ground staff and the support needed

by them Considering the poor level of support for family needs provided to them at present, no staff is motivated to work in these areas. It would be worth establishing a Central School for forest staff children. These facilities may motivate the staff to work in such areas.

In some regions, without community support, particularly, tribal community support, illegal activities are not possible. Even if these tribal or local people are involved in illegal activities, they get very little money out of these activities. The tribals who live here have to be educated and their movement monitored. The socio-economic conditions of the people living around the park should be taken into consideration.

Figure 4.7: Locations and distance (from the reserve) of elephant poachers



## 5. Status and management of captive elephants:

The Bandipur Elephant Camp (BEC) appears to have been established by the Maharajah of Mysore. During that period, elephants were used for hunting and entertaining guests of the Maharajah. Each elephant was under the custody of a mahout. Grass-paddy was the staple ration. This was under the mahout's control. The camp was established with all adult female elephants. Male elephant, Jayaprakash (Figure 5.1), joined this camp when he was said to be 6 yrs. old. Except for male calves born, some of which died or were sold, male elephants did not form a part of this particular camp system.

Currently the camp has 14 elephants, of which 9 are captive born, 4 are orphaned and 1 are confiscated from circus



The camp has 3 adults ranging 35-60 yrs, 3 sub adults, ranging 12-13 yrs, 3 calves ranging 1-1.6 yrs and 4 juveniles ranging 4-6 yrs. The camp has 3 breeding females (1 adult + 2 sub adults) with ages ranging from 12 to 37 yrs (Table 5.1). Free ranging status of the animals and an active male results in many births in the BEC. Mean age of the observed elephants was 14.6 years with ages ranging from 1.2 – 60 years

Figure 5.1. Male elephant Jayaprakash

Table 5.1: Name, age and source of captive elephants kept in Bandipur Elephant Camp

S.No	Name of the Elephant	Age (Years as on March 2008)	Source
1	Jayaprakash	45	Captured
2	Diana	13	Captive born
3	Theresa	12	Captive born
4	Chaitra	36	Captive born
5	Rani	60	Rescued from Circus
6	Rajendra	6	Captive born
7	Roopa (now Seetha)	6	Captive born
8	Muruthanjai	4	Orphan calf (rescued from wild)
9	Padmaja	6	Orphan calf (rescued from wild)
10	Pritiviraj	8	Orphan calf (rescued from wild)
11	Hamsaraja	4	Captive born
12	Krishana	1.6	Captive born
13	Manikandan	1.3	Captive born
14	Bhatra (Dina Calf)	1.2	Captive born

Three calves had been rescued from the wild, as they had got separated from their natal herd. One adult female was rescued from a circus (Rani, 60 yrs., female). The single adult male in the group, Jayaprakash (45 yrs.) had been captured from the wild around three decades ago.

The current number kept in the camp reflects more closely the wild patterns of elephant herds (Figure 4.2.), that is 28.5% of adult females (2 breeding sub-adults + 1 breeding adult), 7% of adult male, 0% of sub-adult females (since reflected in the adult ratio), 21% of juvenile males, 14% of juvenile females, and 21% of calves. The overall sex ratio of the animals kept currently is biased towards males. However, the adult sex ratio is clearly biased towards females. Juveniles and calves are biased towards only males. Breeding females outnumber breeding males, since sub-adult females are also breeding in this camp.



Figure 5.2: Number reflecting the pattern of wild herd

### 5.1. Management

For all the forest camp elephants observed, the forest itself is the natural shelter. The size of the shelter is thus vast and it is open. The elephants have earthen flooring and natural shade of forest trees.

Currently, Tavarekatte kere, Pick-up kere, Bandipur kere, Sulli katte kere are used for both drinking and bathing. These tanks are located at a mean distance of 200 meters from the camp. In the morning elephants are taken to Bandipur kere and Pick-up kere which are 0.5 km away from the camp. During summer, bore well water is used wherein water is provided in buckets for the animals. The elephants drink 2.2 times per day, an average of 18- 20 trunk fulls. This works out to approximately 100 liters/day. The mean number of times the elephants are bathed is 2.0 with varying size of the bathing place as it depends on the availability of tanks. The mean duration of bath is 2 hrs and all the elephants are scrubbed using stones.

All the elephants are allowed to rest and sleep in forest or natural conditions with access to shade. They are reported to be in the forest all the time except for a period of about 4 hrs, when they are used for tourist rides (Figure 5.3). All the elephants are allowed social interaction among themselves. The area of interaction is vast as it is in the forest. Interaction is allowed for 24 hrs amongst the 14 individuals. Sixty-four percent ( $N = 14$ ) of the animals in BEC are docile, while 21% are dis-



Figure 5.3: A female elephant, used for tourist ride

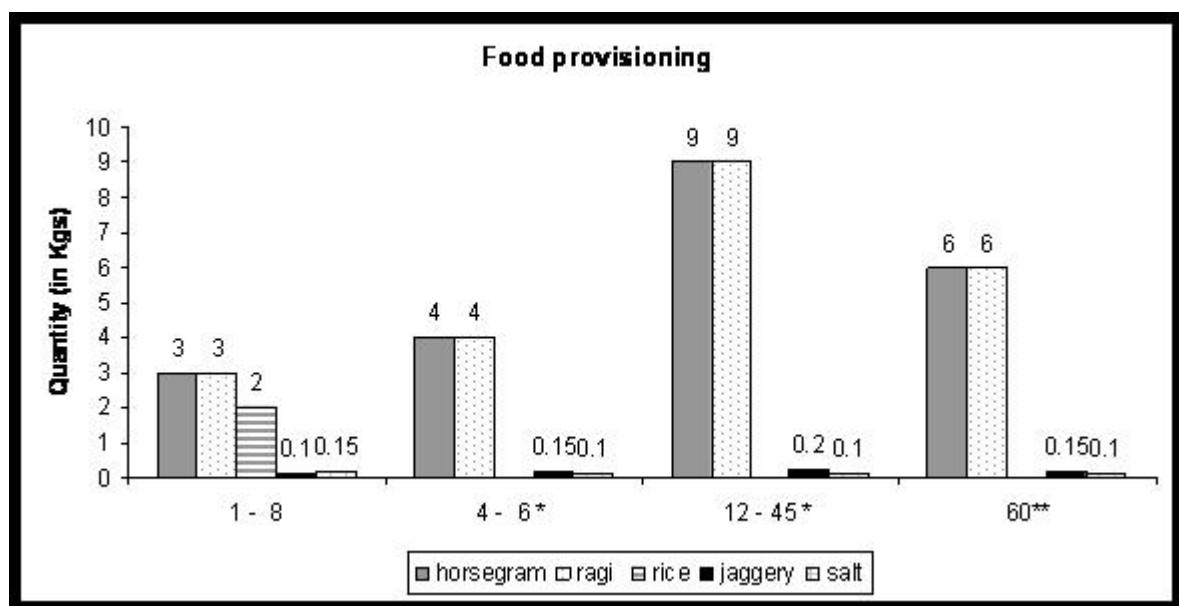
bedient. Only 14 % show signs of being unruly as they have thrown off people.

None of the elephants show aggression toward people by injuring or killing humans. Only one elephant, Jayaprakash (male, 45 yrs), shows the sign of stereotypic behavior in the form of resting its trunk on the tusk.

Only 4 elephants are used for work purpose. They are Jayaprakash, Diana, Theresa and Chaitra. Work type involves carrying tourists on “howda” for trips within the forest. Working hours are between 9-11 a.m. and 4- 6 p.m. - a total of 4 hours daily. The distance covered is 1 km per trip with a weight of 400kgs. All the four animals were reported to have begun working when they were 15 yrs. of age. The working elephants are not given any rest, food or water while working.

All the elephants are provided with stall feeding and allowed to free range for food. The feeding time is from 8 -9 a.m. and 3 - 4 p.m and the stall rations include horse gram, ragi, jaggery, coconut, salt (Figure 5.4). Rice is also added along with other items for the juvenile males and calves.

Figure 5. 4:Quatity of various types of rations supplied to the captive elephants



Three females, Diana (13 yrs.), Theresa (12 yrs.) and Chaitra (36 yrs.) show occurrence of oestrus cycles and the elephant Rani (60 yrs.) is not cycling. Remaining female animals are yet to show signs of oestrus as they are only 6 yrs. old. The elephants are exposed to both captive and wild males and age at first birth (figure 5.5 & 5.6) ranged from 12 yrs to 22 yrs with one calf being born at each calving. The elephant Chaitra has given birth to 4 calves, of which one female died when she was 3 yrs. old. The adult male elephant Jayaprakash is reproductively active and exhibiting signs of “musth”. The period of musth is 4 months during which the animal is allowed to roam in



Figure 5.5: Dina’s calf, the latest arrival to the camp  
the forest. BEC has a very active male, who is said to have mated with all the females and has been also observed to mate with wild females. Presence of an active male and the free ranging nature of the camp (wild males freely mating with camp females) is the reasons for many calves being born.



Sixty-four percent of the animals suffer from diarrhea occurring three times a year. This is attributed to eating fresh grass or eating mud. The elephant Rani has toe nail cracks which is persistent across all seasons and is attributed to neglect by the previous management. All the animals are dewormed regularly. None of the elephants are vaccinated and tests of blood/ urine/ dung have not been done. Weight has not been measured for any of the animals.

Figure 5.6: Theresa and her calf

A veterinary doctor, who has about 10 years of experience in treating elephants is available. There is no veterinary clinic facility available within the camp. The doctor visits once in a month and is also the doctor for the Nagarhole Elephant Camp. The current doctor to elephant ratio is 1: 54.

With reference to the infrastructure and budget, the following are available in the camp:

- staff quarters
- cooking shed
- cooking vessels

d. provision shed

However, the condition of these facilities has to be improved. The annual cost of maintaining an elephant is between Rs. 3, 00,000 to 4, 00,000. Annual veterinary cost is Rs. 5000/- . Cost in terms of salary for the mahout / cawadi range from Rs. 50,000 to 96,000/-

Average age of mahouts in the camp is 30.3yrs ranging from 19 – 45 yrs. Mean experience as a mahout is 6.42 yrs (S.E = 1.0, %CV = 15.7, N = 4) ranging from 0.67 – 20 yrs. The mean experience with the elephant that the mahout is currently handling is 4.8 yrs, ranging from 1 – 10 yrs. All the mahouts / cawadis belong to the tribal community and all the keepers have received training with 71 % of them learning by experience. Most of the mahouts have attended school. The mean annual salary for a mahout/ cawadi is Rs. 38,457 /- ranging from Rs.15, 000/- to 62,000/- per year. Only 43% percent of the mahouts have permanent jobs. 57% of the mahouts have been provided accommodation. However, the condition of the quarters has to be improved

## **5.2. Management Problems**

Some basic facilities are inadequate.

1. The kitchen cum store room is very small
2. There are no animal stands (partitions) which separate the elephant from the kitchen cum store room
3. There is no water- tank
4. Elephant equipment and accessories including “howda” are kept in the space meant for vehicle parking, exposed to rain and weather changes.
5. Mahout quarters, on an average, are about 3 kms from the camp.
6. Due to lack of manpower resources, the mahouts are also engaged in forest- fire control operations, as well as conducting tourist rides.
7. Due to lack of manpower, mahouts are changed often and have no / little control or development of a trusting relationship with the elephant.
8. Permanent staff get benefits which are not available for the non- permanent staff.
9. The current camp site is dominated by Lantana plants with less grass cover.
10. Calves have no food source around the camp and during summer this situation becomes worse.
11. During summer, the type of food given should be changed to paddy-grass, grains.
12. Ragi is not processed in time due to many factors; consequently elephants do not get their rations on time.

### **5.3. Recommendations**

- It is recommended that reducing the current number of 14 elephants to 2-3 small units would be beneficial. This could be achieved in the following manner:
  - Ai) Rescued animals
  - A ii) Seized animals with both rescued and seized animals' together acting as a small family unit
  - B i). Elephants born in the camp along with their mothers
  - B ii) Tourism/ working elephants
  - B iii) Creating a combination of the above, in a way which would not separate their social unit

The separation into different units should not sacrifice the family unit of the animal.

- Changing the current campsite to smaller units in Rampura etc.is recommended. The current BEC, even with a smaller number, does not have running water source close to the camp. Establishing campsites close to the main roads should be avoided. Thus Bandipur and Moolahole may not be ideal locations due to the above-mentioned reasons. Sites with fewer disturbances and closer to a good source of running water have to be selected.
- Appointing an exclusive staff at Forester level for camp management. This person has to have an independent charge and should not be used for any other work. Appoint a point person for all 3/2 camps exclusively in charge of Bandipur elephants with
  - Forester
  - One Head Mahout - C.O. or Camp Officer
  - One Veterinary Doctor
- Providing staff quarters closer to the camps.
- Shifting food habits to raw food, ragi straw/ paddy straw with grains as supplement. As mentioned earlier, ragi and other food items are not processed in time due to many factors; consequently elephants do not get their rations on time
- Two keepers have to be appointed for the management of each elephant, at least for the adults.
- Qualified veterinary assistant has to be appointed or an increase in the doctor - elephant ratio.
- Tourist rides should be kept to a minimum. Due to the overload of visitors, elephants often do not get enough bathing or foraging time. If they have calves, they do not get adequate resting time to suckle them (Figure 5.7.). Given that the welfare of the elephants should be the uppermost concern, the interest of tourists should be secondary to the interests of the animals.



Figure 5.7: Calf following the mother (used for tourist ride)

- Not more than 2 adult human beings should be allowed on the back of the elephants. Along with the mahout, this constitutes about 150-200 kg weight on the spine, which is a delicate part of the elephant anatomy. The elephant gear like houdahs etc. should be kept under proper care and supervision. Rusted or worn out parts often damage the body of the animal by scratching or chafing or more seriously injuring.
- Elephant Rani needs special care as it is a rescued animal from a circus and is not habituated to eating forest food. Also the animal is old (Figure 8) and cannot eat much of wild food. Food intake for this animal has to be increased. Nutrient mixes, fruits, soft feed and green grass should be given to her under the supervision of a specially appointed mahout.



Figure5. 8: Body condition of Rani, who was rescued from a circus

- Given that much of the private establishments around the Bandipur National Park have benefited greatly from the forests and the environment, they should be drawn into and engaged with certain aspects of the management of the elephants in the different locations chosen. They should be encouraged to contribute towards the upkeep, care and monitoring of the facilities. There is a proposed and approved model for an Elephant Nature Park and Rescue Center, based on the famous Thailand model of Ms. Lek Chailert, at the Bannerghatta National Park, which is a government-public-private enterprise. It is recommended that the same be studied and implemented and a management committee of both official and non officials be formed for the proper management of the elephants at the BEC.
- Old elephants juveniles and calves need specific management. Their day-to-day care should be closely overseen by the appointed personnel. Members of the above mentioned governing body should visit the sites regularly and give written reports to the DCF on the functioning and improvements made, and problems, if any.

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