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Daily routine of captive Asian elephants (*Elephas maximus*) in three management systems of Tamil Nadu, India and its implications for elephant welfare

V. Vanitha[1*], K. Thiyagesan[2] and N. Baskaran[3]

[1]D.G.G. Arts College (Women), Mayiladuthurai - 609 001, Tamilnadu, India

[2]Postgraduate and Research Department of Zoology and Wildlife Biology, A.V.C. College, Mannampandal 609305, Mayiladuthurai, Tamil Nadu, India

[3] Asian Nature Conservation Foundation, Innovation Centre, Indian Institute of Science, Bangalore - 560012, India.

Abstract

Under natural conditions elephants move extensively, experience complex physical, and social environments and engage in diverse activities. While in captivity their movements are restricted, activities are limited and timed for monotonous work. This study compares the daily routines of elephants managed in three captive systems in Tamil Nadu private, temple and forest department to understand how far their daily activities are in accordance with their natural behaviour in the wild. Data collected using focal sampling method for 77 elephants together from three systems show that the captive elephant in the private places, especially those with individual owners are put to significantly more work (7½ hours/day), mostly begging at towns and cities, with stressful walking in hot climate compared to the other two systems. The temple elephants remain in indoor enclosures for significantly longer period (16 hours/day) with very little time (<1 hour) allotted for walking/exercise. In contrast, the captive elephants in the forest department system are assigned significantly lesser time for work (2½ hours/day) and are given more time for natural feeding (13 hours/day), which they also use for other activities like resting, socializing and reproduction similar to that of wild elephants. The study suggests minimizing work duration for private elephants, and increasing the duration of exercise and bathing by reducing the time spent on resting and blessing by temple elephants, to improve their welfare.

Keywords : Asian elephant, captivity, daily routine, elephant welfare, temple elephants

INTRODUCTION

On a day-to-day basis, elephants in natural conditions engage in different activities like feeding, resting, moving, socializing, etc. with bulk of the time spent on foraging activities that include moving to food resources, food gathering and processing. These activities are scheduled within the day-night cycle while ensuring sufficient time for each activity, which changes seasonally in response to climate (Own-Smith, 1988). While doing so, they experience varieties of spatial environments that vary according to habitat and season as they move over an extensive space (600800 km^2) annually with an average distance of 46 km per day (Baskaran *et al*., 1995 and Baskaran, 1998) and come across hundreds of familiar and unfamiliar individuals, including friends and foes, relatives and non-relatives, higher-ranking and lower-ranking competitors and other species, both friendly and unfriendly (Poole and Granli, 2009). On the other hand, captive elephants in general, especially those at the Hindu temples and private facilities, lack the biologically relevant mental stimulation, physical activity, complex social and physical environments as their daily routines are very limited, and timed for monotonous work all the year round, are managed mostly in isolation without conspecifics, movements confined through chaining in small barren indoor enclosures, without access to outdoor enclosures or natural feeding, and with little opportunity for walking or exercise (Vanitha, 2007). Such manmade interventions have been documented to affect their behaviour and welfare in captive condition (Schmidt, 1948; Kurt, 1995; Clubb and Mason, 2002) in terms of limiting their movement, play, and social interaction (Adams and Berg, 1980; Schmid, 1995; Wiedenmayer, 1995; Brockett *et al*., 1999), foot problems: foot rot due to the damp, unhygienic conditions (Galloway, 1991; Roocroft and Oosterhuis, 2001) and uneven wear of feet due to predominantly stationary existence on smooth surface (Schmidt, 2002), joint problems such as arthritis due to over weight and reduction in movement (Galloway 1991, Hittmair and Veilgrader, 2000; West 2001; Weissengruber *et al*., 2006), acyclicity among female elephants (Schulte *et al*., 2000) and above all increase in the stereotypies (Schmid, 1995; Gruber *et al*., 2000).

India, which has a strong cultural and religious link to Asian elephant, manages more than two thirds of its captive stock (2700 out of 3400) in private and temple facilities across 23 states and union territories including

*Corresponding Author

email: *vanithabaskar@rediffmail.com*

the Andaman and Nicobar Islands, with the major share being in the northeastern states (55%) followed by southern India (25%) (MoEF, 2004). Tamil Nadu, a southern state of India, manages about 150 elephants in captivity at timber (forest) camps, zoos, and in religious institutions such as Hindu temples, mutts, trusts, charities, mosques and by individual owners (Vanitha, 2007). The Tamil Nadu Government categorized these elephants into three different captive systems forest department captive elephants, temple elephants and private elephants. The private and temple systems that manage over two thirds of the captive elephants in the state mostly keep single female elephants for cultural and religious purposes. Most of the elephants in the private facilities are highly mobile; on the other hand, all the temple elephants remain mostly in chain in small indoor enclosures (Vanitha, 2007). Forest department manages its captive elephants largely at the forest camps (>90%) in semi-wild condition in large social groups. These were earlier used for timber hauling purposes but are used presently for eco-tourism owing to the ban on logging in forested areas by Govt. of India (Vanitha, 2007). Therefore, the daily routines of the elephants vary extensively among the three systems. This study compares the daily routines of captive Asian elephants managed in three systems private, temple and forest department in Tamil Nadu to understand how far their daily routines in the three systems are in accordance with elephant behaviour in natural condition and suggests measures to improve their welfare.

METHODS

Study area

The present study was carried out in Tamil Nadu, a southern state of India. Data on daily routines were collected from captive elephants managed in (1) The forest camps at Mudumalai and Anaimalai Wildlife Sanctuaries, (2) Arignar Anna Zoological Park (AAZP), Chennai, (3) Temples, and (4) Private owners of the state.

Assessment of daily routines

The daily routine of the elephants managed in the three systems was assessed using focal sampling method (Altmann, 1974) for a sample of 24 elephants representing various temples (n = 14) and private facilities (n = 10) in Tamil Nadu. Observations were made on each individual between March and August 2005 from the time the elephant was taken out of the shed in the early hours till it was tethered back in the late evening or early night on a given day for a period of 23 days/month/elephant. An observation hour was divided into three 20-minute sample blocks with each block consisting of 15 minutes of observation and 5 minutes break. In the forest department system, the daily routines of 53 elephants were recorded by direct observation method except for natural feeding at timber camps. The natural feeding duration was recorded by noting down the time of leaving of the elephants into the forest and bringing back all of them to the camps. Some of the daily routines were combined together as they take place either simultaneously (e.g. begging/walking) or alternatively during night (e.g. feeding/resting) that could not be differentiated. Therefore, daily routines were categorized into the following seven types.

***Drinking and bathing*:** Includes drinking water and cleaning or washing the elephant in natural and artificial water bodies or with bore well water.

***Daily rituals*:** Activities performed by temple and private elephants as part of the religious rituals include processions and the time spent in blessing the devotees in temple.

***Safari ride*:** Carrying people into the sanctuary for eco-tourism purpose by the forest department captive elephants.

***Cooked ration feeding*:** Feeding the concentrated ration like ragi, rice and grams as supplementary diet.

Cut fodder feeding and resting: Time spent on feeding the cut fodder during the day and night hours and resting at elephant house or any other temporary tethering yard by private and temple elephants and stall feeding/resting during nighttime in forest department elephants.

***Natural feeding and resting*:** Grazing or browsing and resting by elephants in forest areas especially by timber camp elephants.

***Walking and begging*:** Time spent on walking mainly for collecting money and/or food by private elephants and mere walking for exercise or along with begging by temple elephants.

Data analysis: Mean time spent on various daily routines was computed by pooling each daily routines of all elephants in a given systems separately. 'Work' includes begging and daily rituals for private elephants, daily rituals/blessing for the temple elephants and safari ride for forest department elephants. 'Exercise' includes begging and walking for private elephants, walking along with or without begging in the case of temple elephants and natural feeding by the forest department elephants. 'Rest' includes resting with or without cut fodder both during day and night time for the private and temple elephants and stall-feeding and natural feeding for the forest department elephants. Differences in daily routines among the three systems were tested using One-way ANOVA. Since there were significant differences among the elephants of the three systems in time spent on major routines, the data were further analyzed using Tukey's Multiple Comparison

test to differentiate specifically which among the three systems varied significantly.

OBSERVATIONS AND RESULTS

Daily routine of private elephants

Among the private facilities, elephants owned by institution such as mutts, mosques, trusts, missions were used almost similar to the temple elephants for daily rituals and blessing devotees. But the private elephants owned by the individuals (*mahouts*) are mostly hired out on contract basis for cultural programmes, marriages, and religious ceremonies like temple festivals at temples that do not own any elephants and commercial activities like film shootings. Such works are available for 24 days a month and on the remaining days these elephants are used for begging at shops and houses in the nearby bazaars and streets. At some shops and homes the elephant gets food items like vegetables, fruits and rice instead of or apart from money. As it cannot go every day to the same town for begging, sometimes it is taken to places as far away as 3040 kilometers forcing the elephants walk long distances and most times even in hot weather too.

Among the 10 private elephants sampled, two were institution-owned, used only for daily rituals in temples and the remaining eight were individual (*mahout*) owned used for commercial purposes. A comparison of daily rituals between the private and temple elephants (Table 1) shows that the private-owned elephants (8.2% of day hours) spend lesser time on daily rituals compared to temple elephants (20.6%). On the other hand, private elephants are used in begging a far higher time (22.5%) compared to the temple elephants (3.7%). The mean begging time (about 5½ hours/day) coupled with the mean time spent on daily rituals (about 2 hours/day) by the private elephants together works out to about 7½ hours a day, the private elephants are put to work every day. Further, the work duration of individual-owned elephants (>7 ½ hours a day) was far higher than the institution-owned elephants (< 6 ½ hours a day). Therefore, the time spent on begging by private elephants, although give some exercise, would be too stressful as far as elephant physiology is concerned in hot weather conditions that prevail in Tamil Nadu plains. Apart from the daily rituals and begging/exercise, other activities of private elephants were more or less similar to temple elephants (Table 1).

Daily routine of Temple elephants

Unlike the private elephants, daily ritual is the major work for the temple elephants. This includes usual rituals to the deity (pooja) and blessing of the devotees. On an average, performing pooja takes about 2030 minutes during normal days and a couple of hours on festive days, which occurs at least once a year. Each temple elephant spends nearly 20% of its day (about 5 hours) on rituals and the highest record of daily ritual time for a temple elephant was 9½ hours. The actual pooja lasts only about 2030 minutes, but the majority of the time (90%) is spent on blessing the devotees. On such occasions, the mahouts earn additional money through donations by the devotees. The temple elephant goes for walk and exercise for less than a hour/day (3.7%), and spends 65% of a day in resting and feeding in the indoor enclosures.

Daily routine of Forest department elephants

The daily routine of captive elephants, managed by the forest department, includes bathing, safari ride, feeding of cooked ration, natural feeding and stall-feeding. At present, safari ride is the only work for these elephants. Only selected individuals such as adult males free from musth and adult females not in advance pregnancy or not lactating are used for the safari rides to tourists for a couple of hours in the morning (06:3008:30 hours) or in the evenings (15:3017:30 hours). Otherwise, bulk of the remaining time the elephants are mostly left free for natural feeding in the nearby forest areas. Natural feeding is not feasible to the elephants at the zoo. In the forest department timber camps, most adult males are tethered during the nighttime (supplied with cut fodder) owing to threat of poaching for ivory. Data on daily routine reveal that on an average 55.5% of a day (about 13 hours/day), the forest department elephants are left free into the forest areas for natural feeding and for about 24% (about 6 hours/day) for stall-feeding and about 6 hours/day for resting. Working duration (safari ride) accounted for less than 10% of a day (about 2 hours/day/elephant).

Comparison of daily routine of elephants in the three captive systems

A comparison of the time spent on each major routine by elephants among three systems shows significant difference in work, exercise and rest (one-way ANOVA: Table 2). For example, the time spent on work by the forest department elephants (about 2 h/day in safari ride) was far lower than the private elephants (about 7½ hours/day in begging and daily rituals) and temple elephants (about 5 hours/day in daily rituals) (Table 2). Further, multiple comparison of each major daily routine between systems (Tukey's Test) reveals that the mean time spent on work and exercise was significantly different in all the three systems (Table 2). Nevertheless, the mean time spent on resting was the same between private and temple systems and was significantly higher in the case of forest department elephants. The 13 hours of time allowed to the forest department elephants for foraging not only provided ample time and freedom to act the way they liked (feeding, resting and socializing with other individuals) but also get the food plants and exercise during the course of foraging; this benefit is

Table 1. Mean time spent on various daily routines by the captive elephants in the three management systems in Tamil Nadu

Daily routine	Mean duration (minutes) ± SD/elephant/day (24 h)		
	Private	Temple	Forest Department
Bathing/drinking	89.7 ±30.2	83.1 ±34.7	126.2 ±40.1
Daily rituals	117.6 ±230.1	296.8 ±199.4	-
Safari ride	-	-	141.5 ±151.2
Cooked ration feeding	39.4 ±17.5	45.9 ±14.7	32.3 ±8.0
Cut fodder feeding and resting	869.2 ±164.0	960.5 ±187.8	340.8 ±449.7
Natural feeding/resting	-	-	799.2 ±427.2
Walking/begging	324.2 ±218.1	53.7 ±71.8	-

Table 2. Differences in the major daily routine of the captive elephants in the three management systems in Tamil Nadu (horizontal line connects similar means; tested using Turkey's test: One-way ANOVA

Major daily routine	Mean duration (minutes) ± SD/elephant/day (24 h)			Statistical test	
	Private	Temple	Forest Department	F	P
Work	441.8 ±162.2	296.8 ±199.4	141.5 ±151.2	28.4	0.0
Exercise	324.2 ±218.1	53.7 ±71.8	799.2 ±427.2	67.4	0.0
Rest	869.2 ±164.0	960.5 ±187.8	1140.0 ±141.6	28.1	0.0

not available to private and temple elephants.

Tools of restraint used among three systems

Hobbles, chains and sticks are used to restrain the captive elephants of the forest department. The elephants are chained to trees at the campsites during nighttime and are let out to graze in the forests with their hobbles and or a long trailing chain for the *mahout* to track and bring them back by evening. During the *musth* time a special chain called "*musth* chain", which is thicker and longer than the normal one used to tether the bulls. *Kraal* is another type of restraint used while training the new captures and weaned captive-born juveniles. The animals are trained to obey the commands of the *mahout* by offering a piece of sugarcane as a reward and a 'stick' is occasionally used to punish disobedience. Private and temple elephants are mostly restrained by chains, as they are not let out for free grazing unlike the forest department timber camp elephants. Apart from chains, *Ankush* (a steel hook) is used to control the private and temple elephants. Use of *Ankush* is more common in the temple (91%) followed by private systems (87%). On the other hand, *Ankush* is not even kept for emergency use by the *mahouts* in the forest department; the adult bulls in *musth* are also controlled only with stick. This shows the uniqueness and friendly way of handling of the captive elephants in the forest department.

DISCUSSION

The elephants have evolved over 50 million years from small creature (Shoshani and Tassy, 1996) to increasingly large-bodied, long-lived animals adapted to move over long distances so as to meet their ecological, social and reproductive needs (Poole and Granli, 2009). The Asian elephants living in the wild experience both cold (as low as 12° C) as well as hot weather conditions (as high as 35° C) due to seasonal extremes of the tropical regions. Thus, free-living Asian elephants time their activity according to seasons. Secondly, they move on an average 46 km per day in search of food, water and other requirements (Baskaran, 1998). But, in captivity, their movement is confined and the diktats of the management alter their activity according to their needs that varied among the three management systems (Vanitha, 2007). The present study estimated that the private elephants on an average work for about 7 hours/day with a wide variation of 310 hours/day among the individuals. In the private facility, the individual-owned elephants work for longer periods (begging for 7 hours/day) with extensive stressful walking in hot weather. On the other hand, the institution-owned private elephants (mutts, mosques, charities and trusts) work for about 3 hours/day that too only to bless devotees standing in the same place at the temple yard and about half an hour of walking

as exercise. Although the seven hours of work (for most of the private elephants) is only slightly more than that of the work duration of timber logging or safari ride prescribed by veterinary experts for forest department elephants (Krishnamurthy and Wemmer, 1995), the major difference is in the work place in the case of private elephants. While the forest department elephants have forested areas with sufficient shade, the work places of individually owned private elephants are residential and commercial places without any shade. Further, the average distance of daily walking for a private elephant could well be higher as the *mahout* usually forces it to walk longer to collect more money. Although walking is good for the health of the elephants, as they move extensively for about 46 km in their natural conditions, too much of walking in hot weather especially on metal road is not advisable both for the regulation of their body temperature and for their feet. Elephants do not have sufficient sweat glands to maintain their body temperature and during hot weather they rest in shaded areas and also prefer to wallow or bath in natural condition. The pad of an elephant's foot is designed for walking long distances on uneven and rough surface (Schmidt, 2002) and is not suitable for walking on metal roads, which may cause uneven wear of feet and consequently lead to arthritis. Thus forcing them to work for six or more hours with stressful walking in scorching sun would affect its health adversely.

On the other hand, the temple elephants get very little exercise. The mean time spent on walking and exercise by them is less than a hour/day; there were two temple elephants without any exclusive time for walking or exercise. Secondly, on an average, temple elephants are chained for more than 16 hours (nearly 70% of the time) a day in their indoor enclosures depriving them of any opportunity for exercise. Further, the blessing activity (wherein *mahouts* earn money) at the crowded temple entrance (constituting 90% of the 5 hours/day time spent on daily rituals) without much opportunity for free movement being under the control of *mahout* or being in chains, and within a limited space also curtail the freedom for the much required exercise. Therefore, the higher time allotted to temple elephants for resting in their indoor enclosures (16 hours/day or 70% of time) and blessing at crowded temple yards (5 hours/day) with very less time (<1 hour/day) for exercise may affect them both physically and psychologically, as studies on zoo elephants in western countries have shown that inadequate exercise among the zoo elephants led to obesity, arthritis and other joint problems, and might lower the life expectancy compared to wild elephants (Kurt and Hartl, 1995; Clubb and Mason, 2002). The large body of the elephants and rather inflexible limb joints, so well adapted for long distance moving, are particularly vulnerable to arthritis in a sedentary captive environment (Weissengruber *et al*., 2006). In daily routines of temple elephants, there is neither a guideline nor supervision on day-to-day basis, unlike that in the forest department. This coupled with the lack of *mahout's* personal interest in the well-being of the temple elephants should be viewed seriously and addressed immediately. One possible way to provide better welfare and social atmosphere to the temple elephants is to place a few temple elephants together in a common place, especially in cities, where they are densely distributed but managed in isolation (Vanitha, 2007).

Unlike the private and temple elephants, the daily routines of elephants managed by the forest department did not seem to affect their health condition. Apart from lesser working time (less than 2 hours/day presently in the form of safari ride), they are let out into the forest freely for 13 hours a day (55.5%) for foraging, which not only provides them the opportunity to feed on plants of their choice, but also ample time and freedom for activities in terms of feeding, resting, breeding or socializing with other individuals, etc. Such free movements and activities provide sufficient exercise especially during the course of foraging, an opportunity that is not available for private and temple elephants. Even in the past, when the forest department used the elephants intensively for timber logging, their workloads, duration and timings of work had been planned taking into account their age, sex and even the seasons (Krishnamurthy and Wemmer, 1995). Needless to say, the availability of vast natural habitat for foraging that provides semi-natural conditions to the timber camp elephants and strict follow-up of daily routine guidelines planned scientifically during colonial period based on elephant biology are the two major reasons for the healthy condition of the captive elephants managed by the forest department in Tamil Nadu.

Overall, the study shows that both the temple elephants as well as the institution-owned private elephants lack in adequate exercise, while the individual-owned private elephants are put to harder work (7.5 hours/day) in the hot climates of cities and towns. Further, the elephants in these two systems are provided with inadequate quantity and quality of green fodder (Vanitha, 2007; Vanitha *et al*., 2008). Such situations could affect the health of the elephants, both physically and physiologically, as reported elsewhere on captive elephants (Kurt and Hartl, 1995). In support of the above statement, a considerable number of elephants, both in the temple and in the private institutional systems, are with stereotypes, have arthritis and are overweight, while the individually owned private elephants have poor health condition (Vanitha, 2007; Vanitha *et al*., 2008) suggesting that the daily routines of private and temple elephants need to be modified to

improve their welfare. The routines of captive elephants in the forest department are scheduled scientifically in accordance with the elephant behaviour in the natural habitats.

Conclusions and recommendations

In summary, the daily routines of the captive elephants in the private and temple systems are not in accordance with the natural behaviour of the elephants in the wild unlike forest department captive system, which manages their captive stock more scientifically with appropriate guidelines on daily routines strictly followed. Therefore, we suggest the following measures to improve the welfare of the captive elephants and use them on a more sustainable way:

- The working times of individual-owned private elephants (including begging) should be restricted to 06:0009:00 and 16:0018:00 hours, as practiced in the forest department system.
- Institutions (mutts, mosque, trusts and missions) and temples should reduce the time spent on blessing of devotees by their elephants to the maximum of one hour or it be discontinued totally and should allot more time for welfare activities like walking/exercise and bathing. Money collection from devotees in temples through blessing by the elephants should be banned completely.
- All institution-owned private and temple elephants should be walked or exercised for a minimum of threefour hours with the exercise time spread both in the morning (06:0009:00 hours) and evening (16:0018:00 hours) considering the timings of the daily rituals in the respective temples.
- Some temple elephants are given bath once in twothree days or a week (Vanitha, 2007). Regular bathing is important, minimum of once a day and preferably twice a day during summer, for all the captive elephants.
- A detailed guideline has to be issued to the owners of private and temple elephants by the State Forest Department and Project Elephant, Government of India on daily routine including working duration, chaining period, food quality and quantity and other welfare measures.
- The authorities of the temple (Hindu Religious and Charitable Endowment Board) and the private institutions that own captive elephants (mutts, mosques, trusts and missions) should make frequent inspections to ensure that the daily routines of elephants are followed meticulously. The local forest department officials should also monitor the working hours of the private elephants frequently, especially those owned by individuals.
- In the case of forest department captive elephants, especially at the forest camps, very few animals are presently used in safari ride in spite of the availability of male elephants, especially young bulls fit for work. These elephants may also be trained and used for safari rides not only to maximize the use of captive elephants to earn revenue but also to provide opportunities to more number of tourists to enjoy the wild.
- Selected elephants (tuskless males, females of young adults and sub-adults) could also be used in patrolling the forest areas by placing them in anti-poaching camps similar to Kaziranga in Assam and Jaldapara in West Bengal.

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