Ecology and Management of Captive Elephants in Forest Camps of Tamil Nadu

Assessment on the Management, Population Demography and Welfare Status of Captive Elephants in Forest Camps of Tamil Nadu

Elephants in Captivity- CUPA/ANCF Occasional Report No.12

Compassion Unlimited Plus Action
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Preface

Tamil Nadu's forest camps are home to around 45 captive elephants and the camps (FCs) have a very long history of elephant keeping. They are a relic of the British period of maintaining elephants to harvest forest wood and acting as a source for providing elephants to other institutions. The forest camp offers scope for maintaining genetic viability and population growth as elephants from the camp are allowed to range free, with opportunities to mate with wild males/females. However, currently, FCs have only a few breeding females as a consequence of many being transferred or sold to zoos/ temples.

Though forest camps have a very long history in maintaining captive elephants and have introduced qualified veterinary scientists, there has been no detailed investigation into the population status, management and welfare conditions. This investigation aims to reduce this gap in the existing knowledge.

This document has four sections: Section 1 identifies the efforts that have gone into maintaining the camp, its objectives and history of keeping elephants. Overall camp structure, selection of permanent, temporary and rest camps are discussed. Details of responsibility of staff, day to day function, work schedules, workloads, diet, healthcare, handling of elephant by mahout, proposed management strategy and other aspects related to the running of camps in Tamil Nadu have been discussed through this section.

Section 2 deals with overall population status, management and welfare of captive elephants in forest camps of Tamil Nadu. This section along with the executive summary also provides recommendations for managing forest camps in the state. It has a detailed report on the population status, management and welfare conditions. The detailed report is presented in the following sequence: introduction, objective, methodology, results, discussion and references. Depending on the needs and interests of the readers, either the executive summary or the detailed report can be referred to.

Section 3 is an attempt to review the demography status of Asian elephants, identify age structure, fecundity and inter-calving intervals, seasonality in birth, sex ratio, aspects related to population demography.

Section 4 lists out the elephants kept in the camp, providing details such as name, age, sex, current location, source, type of shelter, floor, source of water, details of interactions among elephants kept in the camps, elephant personality, types of work, source of food, reproductive status, disease reported, availability of veterinary doctor for each elephant kept in the camps.

This section also provides insights of mahouts, their age, community, experience as mahout, source training, occupation of father and grandfather, education, annual salary, job status, marital status, number of children, type of tool used, health status, insurance availability and source, and mahout's interest in his son continuing in this profession.

We assume the knowledge we developed through this document will motivate others to develop an in-depth investigation which may help in developing a specific plan for maintaining and keeping elephants in forest camps.

Acknowledgements

This study was part of an all India project on the Management Regimes of Captive Elephants and Mahouts, conducted by Compassion Unlimited plus Action (CUPA) with financial assistance from the World Society for Protection of Animals (WSPA), UK.

We thank the Principal Chief Conservator of Forests and Chief Wildlife Warden, Government of Tamil Nadu, Wildlife Wardens from Mudumalai Wildlife Sanctuary, Mudumalai and Indira Gandhi Wildlife Sanctuary, Pollachi, for giving us the necessary permissions for this investigation

We are grateful to many individuals and organizations for helping to collect the data on captive elephants from forest camps of Tamil Nadu, particularly Mr. Gauis Wilson, (Researcher Nityata Foundation, Bangalore) Mr. S.P. Gopalakrinsha (Researcher A Rocha India, Bangalore), Mr. Venketesh (M.Sc. Wildlife Biology- student, AVC College, Mayiladuthurai, Tamil Nadu) . Foresters –Anamalai and Theppakadu elephant camps, veterinary assistants in Mudumalai, Selvam, Driver ANCF, mahouts and cawadis from the forest camps extended invaluable support in completing this investigation

Dr. Roshan K Vijendravarma, Post Doctoral Researcher, Department of Ecology and Evolution, University of Lausanne, Switzerland and Sujata SR, CUPA, Bangalore provided critical inputs. Nirupa Rao CUPA, Bangalore, Kumari Swamy (M.Sc. Wildlife Biology- student, AVC College, Mayiladuthurai, Tamil Nadu) and Susanto Sen (Bangalore) offered editorial support. Y. S. Neema, Bangalore, Ramesh Belagere, Club for Awareness and Nature Study (CAN) Bangalore, Nirupa Rao, CUPA provided editorial, layout and designing support.

Section 1:
Managing Captive Elephants in Forest Camps of Tamil Nadu

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2: Field Director and Conservator of Forests, Mudumalai Tiger Reserve, Mount Stwart hill, Udhagamandalam, Nilgiris 643 001, Tamil Nadu

Introduction

The Tamil Nadu (formerly Madras Presidency) state forest department administered several camps in its forests which harnessed elephant power for timber related operations (Kalaivanan, 2008). The forest department took up elephant capturing by the conventional Pit Method from 1889 onwards in the Madras Presidency, mainly to build up the work force of elephants needed for timber extraction. In the Anamalais where large areas were cleared for planting with teak, elephant-capturing operation was taken up in 1889 and up to 1972 more than 600 elephants were captured from the wild to meet the demand for working elephants.

In Mudumalai, elephant capturing was taken up in 1910 and continued till 1953. Thus there was a necessity for building up permanent Camp Sites with necessary infrastructure such as "Kraals" to train newly captured elephants. Such "elephant camps" were established in areas with high elephant density- a choice that appeared to be based on exploiting the capture of elephants and selecting the right animals for timber operations. Surplus elephants and elephants considered not fit enough for timber extraction work such as calves were disposed off by conducting auction sales.

The emphasis from harvesting timber from forests has now shifted to conservation of natural resources. Thus, only two such camps remain: the Theppakadu Elephant Camp established in 1927 in Mudumalai (one of the biggest attractions for visitors to Mudumalai and one of the renowned camps with a treasured history) and the elephant camp in Top Slip, Anamalais.

The ban on timber extraction and the equally important ban on capture of wild elephants have had two effects:

- Firstly, depletion of wild stock of elephants was prevented.
- Secondly, camp elephants began to be used in conservation related activities.

The management of camp elephants also underwent a change from imposing human control on all aspects of the elephant/s life to one of releasing the animals to free range in the forest subject to the work (for conservation / tourism) performed by the animals.

Objectives

The captive elephants in both the camps are no longer used for timber extraction work, since these areas are managed exclusively as protected areas. The objective of the elephant camps has changed from exploitation to conservation related activities such as:

1) Eco-tourism
2) Patrolling for anti poaching operations
3) To mitigate human-elephant conflict outside the reserve or other areas (*Kumkie*/ *Koonkie* work)
4) Other miscellaneous works connected with forestry
5) As a Conservation & Training center for Asian elephants and as a center providing knowledge on elephants to visitors.

At present all the captive elephants are stationed in different places depending on fodder and water availability. Due to foraging by elephants, the surrounding area appears to be depleted of fodder. In addition, indiscriminate lopping of fodder trees within 10 km radius around the camps has resulted in the total absence of many of the fodder trees particularly many species of *Ficus, Grewia, Kydia* etc. To avoid infections through fecal infestation, periodic shifting of camp to rest locations is mandatory.

Time line of captive elephant management in Tamil Nadu

The important historical events relating to captive elephant management can be depicted as follows.

1850 – Departmental use of elephant power was formulated.
1874 – Elephant capture started under the guidance of Coimbatore collector.
1889 – Elephant captures were started by Forest Department in Coimbatore divisions.
1910 – Elephant capture was started in Mudumalai Wildlife Sanctuary.
1910 - Elephant camp first started near game hut.
1927 – Theppakadu elephant camp was established.
1956 - Varagaliyar (Top slip- Anaimalai) Elephant camp was established.
1953 – Elephant capture discontinued in Mudumalai Wildlife Sanctuary.
1972 to 75 – Capturing operation resumed as population control measures.
After 1975 Elephant camp as important conservation centre.

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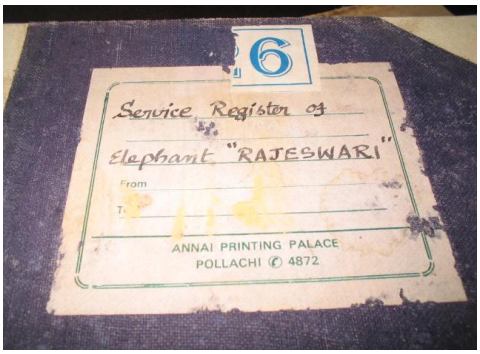

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Figures 1a,b,c and d: Service, livestock and other records reflecting a long history of the elephant camp

Camp structure

Mudumalai is currently having a permanent camp at Theppakadu and two rest camps at Bombax and Abhayaranyam, besides a number of temporary camp locations in the tiger reserve. The elephant camps have the following elements:

Permanent Camp:

The components of a permanent camp are

I. An open sided cooking shed on level ground surrounded by elephant stands. The stands consist of timber railings with assigned places for each elephant. The objective is to facilitate feeding the elephants and or inspection.
II. The shed house with a table for food preparation, a fire place (smoke free) for cooking food, cooking vessels and moulds for forming the cooked rations into cakes. A ration chart listing the animal's bio-data, prescribed food, work load, is also displayed in the shed.
III. Food stores kept in a dry rodent proof shed, where raw food grains are stocked and accounted for. This shed has a platform, rack and separate facilities for storing gear and tack.
IV. A kraal (2 compartmental) to facilitate training of newly captured wild elephants, as well as for weaning and training of captive-born calves. These kraals are also for treating sick elephants, particularly during rainy seasons, where continued observation and prolonged treatment may be necessary.
V. A veterinary dispensary to attend to the day-to-day treatment of sick and injured elephants
VI. Residence for the forester and the elephant man and their families located in the vicinity of the camp

Selection of Permanent Camp sites

1. Should be located on well drained soil.
2. Location should bear perennial running water sources.
3. Desirable to locate where elephants shed can be maintained on a permanent basis.
4. Should have road facilities for easy transportation of elephant provisions.

Temporary Camp

Temporary campsites are selected as and when necessary, mainly when the elephants are sent for timber hauling, patrolling and other forest operations. The campsites are located close to the work site.

Rest Camp

During the hottest period of the year and when the animal/s is/ are rested (without having any work) animals have to be shifted to fresh camping ground. During two months of dry season (March and April), this is the rest period for the elephant/s, fodder is usually scarce in the forest. During this period, the camp is shifted temporarily to an alternate site with sufficient fodder and water. This change of camps allows the vegetation to regenerate in the previous campsite and to minimize re-infection by parasites; this is absolutely essential and needs to be implemented every year (see figures 2a to 2bh for the photographs representing different facilities at all the three camps.

Before deciding a campsite the following points must be considered.
a. Availability of sufficient water.
b. Availability of forest lands rich with elephant fodder.
c. Accessible and safe terrain.
d. Safe from wild elephants.

The Theppakadu elephant camp is a well planned elephant camp with all the above elements. Further, the sites of the rest camps at Abhayaranyam and at Bombax are also well selected, and have been provided with temporary huts.

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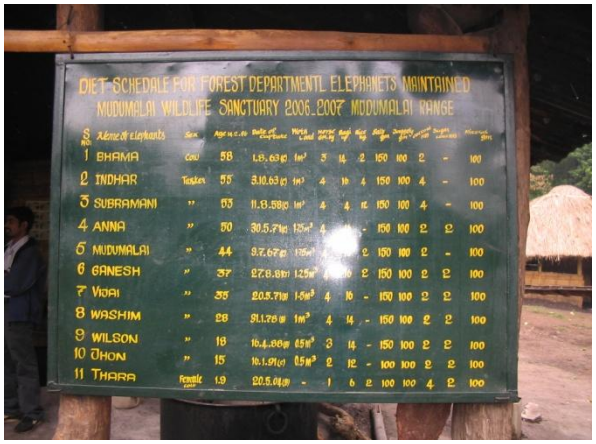

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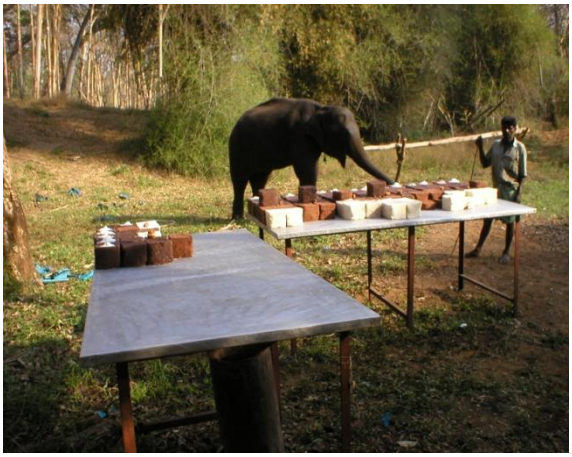

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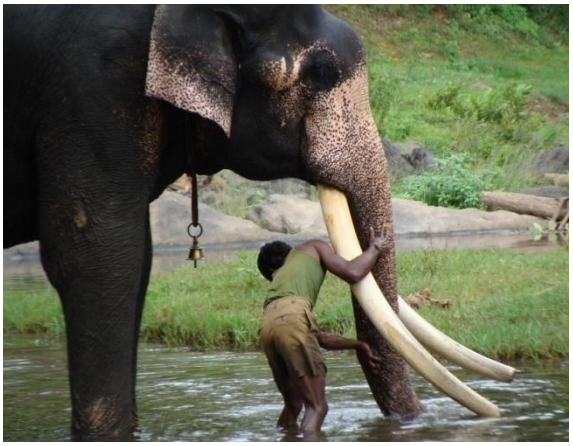

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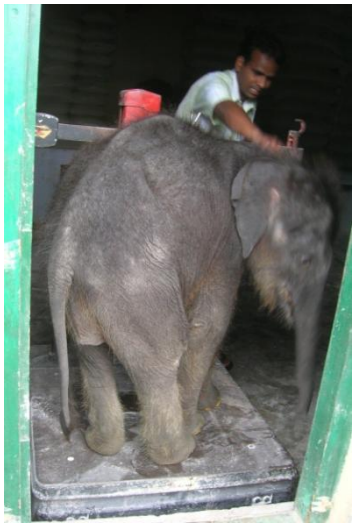

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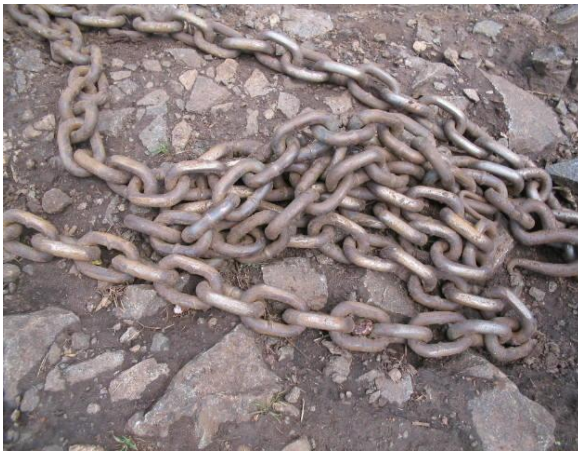

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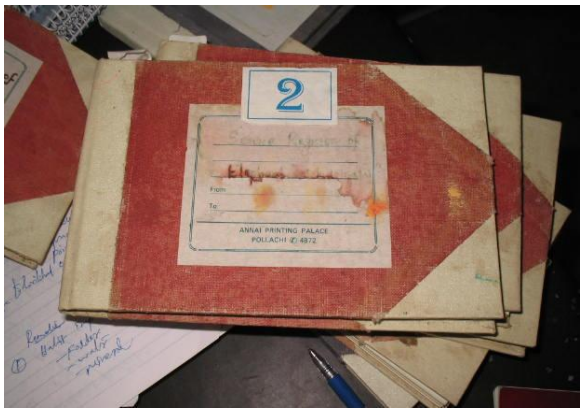

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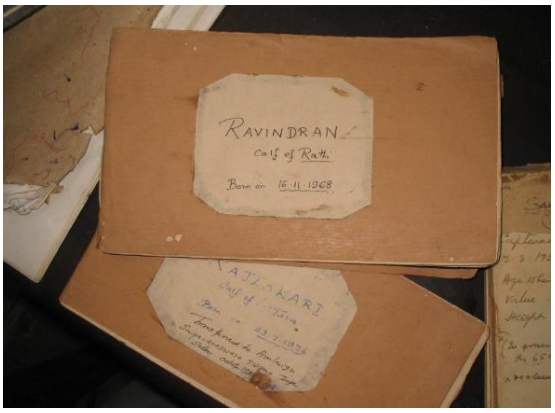

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Figures 2a to 2bh: Infrastructure in permanent, temporary rest camps, Buildings and other infrastructure in permanent camp (a, b, c, d, e and f) food preparation hall (g, h, i and j) visitor entry points (k and l), material used to cook food (m and n) animal stand (o and p) , animal safari (q and r) animal crawl (s and t), forest cover available (u and v), entry point of permanent camps (w and x). Infrastructure (y), grazing site (z), animal stand (aa), river (ab), food preparation hall, display board, food preparation (aa, ab, ac, ad, ae and af), animal assembling location (ag), elephant stand (ah), food preparation hall (ai, aj, ak and al)), bathing elephants (am and an) forest around the camps (ao and ap), mahout quarters (aq, ar, as and at), unloading ration (au and av), veterinary facilities (aw, ax, ay, az and ba), chain used (bb), record keeping (bc and bd), veterinary equipments (be and bf) trimming tusks (bg) and inspecting elephant (bh).

Duties and Responsibilities of the Staff attached to Elephant camp

Duties of Forest Ranger

The Forest Ranger is administrative in charge of the camp and is responsible for all the administrative matters, personnel matters, pay and establishment of the camp staff. He is also responsible for the reporting for the camp, estimation and financial budgeting, expenditure and maintenance of the accounts.

Duties of Forester

Forester in charge of the elephant camp is directly responsible for the care and management of the elephants under his control.

His duties are:

- Wholly in charge of the livestock, their accoutrements, food grains and other miscellaneous stores entrusted in the same and accountable for the same.
- Responsible for day-to-day management of the camp and seasonal work schedule, this is in vogue.
- Responsible for maintenance of discipline among the elephant men.
- Responsible for issue of daily grain rations, supervising the proper looking after and feeding of elephants according to the diet schedule.
- Responsible for the proper training of the newly captured elephants and weaned calves.
- Takes adequate care of the elephant's health as and when elephants fall sick, arranges to get proper veterinary care promptly, is conversant with giving first aid both for elephants and elephant men.
- Maintenance of proper hygiene conditions in and around campsite.
- Periodically checks the fodder resources available around the camp and their abundance.
- Provision of adequate supply of cut fodder to the animals, which needs to be tied up for various reasons.
- Maintains all the records and registers intended in an elephant camp and record relevant information.
- Maintains separate register for logging day-to-day happenings and interesting events, such as mating, calving, birth/height and weight of calves, monthly growth rate, incidence of musth, behaviour, sickness and other relevant matters.
- Carries out the instructions given by his superiors and veterinary personnel (FVO and FVAS). Get all instructions recorded in the Instruction Note Book particularly by FVAS and Field Director and should invariably send copies of such instructions to his ranger (Figures 3a, b, c and d).

a

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Figures 3a, b, c and d: Examples of duties of Forester: Forester along with his supporting staff inspecting and unloading the ration material at a camp (a and b), forester at the camp directing the mahout for their daily routine (c), tusks of dead captive elephant stored in forester's custody (d).

Duties of the elephant men (Mahout/ cawadi)

Each working elephant has a Mahout and Cawadi (Second mahout). Both Mahout and Cawadi are responsible for the proper upkeep of the animal and they are under the control of the official in charge of the camp.

Mahout

- Responsible for training of the animal for all purposes.
- Takes proper care of the accoutrements provided for the elephants.
- Responsible for taking the animal for work, giving bath and assisting the official in charge of the camp in all the activities connected with the elephant camp.
- Responsible for the health of the animal and report promptly for proper veterinary care as and when his elephant fall sick or gets injured for proper veterinary care.

Cawadi (Second mahout):

- The mahout is assisted by his Cawadi in training, giving bath to the animal, feeding the animal, taking proper care of the accoutrements provided and also in other activities in managing his ward.
- Assists in cooking rations in the camp.
- Assists in maintaining the camp hygiene by proper disposal of dung and litter collected around the camp, providing water for cooking, collection of fuel for cooking, etc., (Figures 4a,b,c,d,e,f,g,h,i,j,k,l, m and n)

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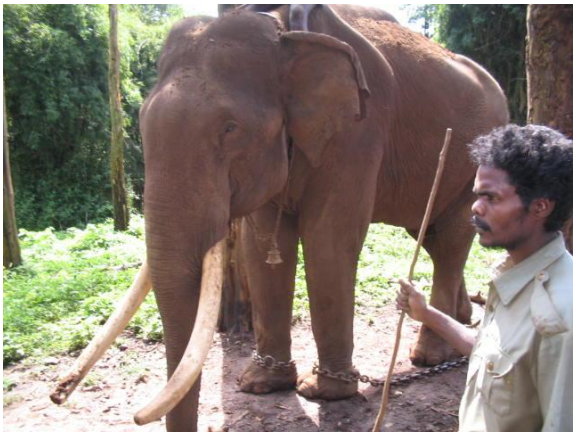

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Figures 4a, b, c, d, e, f, g, h, i, j, k, l, m and n: Duties of Mahouts; making calf to walk (a), making elephant to bring its night browse (b), dusting elephant (c), giving bath to a tusker (d), preparing food (e, f g and h), directing kunki elephants to help in treating wounded wild female elephant (i and j), controlling the animals with commends and stick (k and l) and preparing and applying oil (m and n)

Duties of Forest Veterinary Assistant Surgeon:

The duties of FVAS vis-à-vis elephant camp is as follows.

- Responsible for veterinary care of all the departmental elephants.
- Prescribes rations for the departmental elephants as well as work load/dragging capacity.
- Annually fixes and revises the **book** value of the departmental elephants.
- Responsible for disease prevention work in and around the tiger reserve.
- Organizes timely preventive vaccination of departmental elephants against Anthrax and other communicable diseases.
- Periodically records the body measurements of all the departmental elephants, such as height, girth and body weight.
- Maintains a book at each elephant camp and the FVAS should note instructions or remarks for guidance of the subordinate in charge of the elephants.
- Checks food materials for their quality as well as adequacy.
- Prevents elephants from being over-worked and at the first signs of fatigue, the elephant/s is given rest or light duty.
- Checks the fodder resources available around the campsite (Figures 5a,b,c,d,e,f,g and h)

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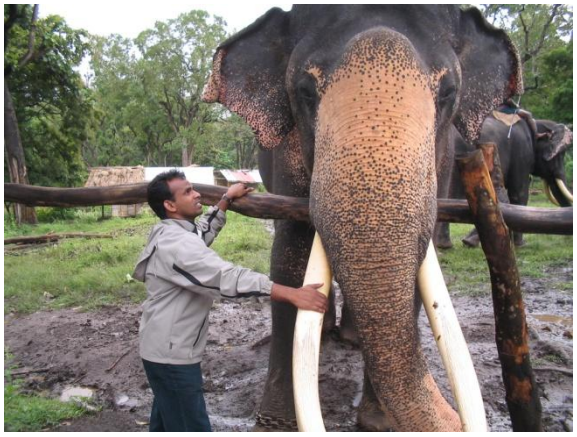

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Figures 5a, b, c, d, e, f, g and h: Examples of duties of veterinary surgeon: Inspecting elephants (a), drawing blood for clinical examination (b and c), organizing veterinary equipment for treating wild elephant through kunki elephant (d and e), administering the medicine with the help of the kunki elephant (f and g) and inspecting the status of tusk (h).

Duties of Forest Livestock inspector & Forest Livestock Assistant (FLA)

To assist the FVAS in all his activities

- To vaccinate cattle in the fringe areas of the sanctuaries (Figures 6a and b)

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Figures 6a and b: Responsibilities of forest livestock assistant (FLA), assisting veterinary surgeon in different activities (a and b).

Day to day functions of the camp:

During night hours, after the evening food, the elephant is released in the forest for grazing with long trailing chain; this will leave trailing mark on the ground which enables the mahout to trace the elephants in the morning.

Time schedule	Camp routines
6:30 am	Elephants are brought back from the grazing area
6:30 am – 8:00 am	Bathing and scrubbing
8:00am – 8:30 am	Training session
8:30 am – 9:00 am	Application of neem oil on the foot, Inspection by veterinary personnel for the health check up Morning feeding with grain rations (cooked)
9:00 am – 3:30 pm	Left out for grazing
3:30 pm – 5:00 pm	Evening bathing and scrubbing
5:00 pm – 5:30 pm	Training session
5:30 pm – 6:00 pm	Evening feeding with grain rations (cooked)
6:00 pm – 6:30 am (next day)	Left out for grazing (males & calves are fed with fodder leaves in the camp itself)

Work schedule/working hours

Elephants which are used for joy rides to carry the visitors for wildlife sighting are worked in the morning - 7:00 to 9:00 hrs- and in the evening- 16:30 to 17:30 hrs. During heavy energetic work like timber work and other regular forest operations, the following seasonal work schedule is followed: work hours are adjusted according to season, work sessions in South India during monsoon and winter are from 8:00 to 11:00 hrs. and 14 to 17 hrs. During dry season from January to March the working hrs are from 7:00 to 10:00 hrs and 15 to 18:00 hrs. Using of elephants for work should be avoided during the hottest period of the day. If the elephants are used for work during this period, it may disturb all the thermoregulatory mechanisms of the animal (Figures 7a, b, c, d, e and f).

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Figures 7a, b, c, d, e and f: Work schedules for elephants kept in the camps; Making elephant to carry night browse, getting bathed (b), applying oil (c), arranging elephant for treatment (d), displaying food item given to elephants (e) and feeding elephant (f)

Work of forest camp elephants/ advantage:

The following work is allotted to the elephants in consonance with the objectives of sanctuary management:

- Forest operations:
  a. Timber movement: to clear fallen logs on the road side and to move siezed timber from patta land.
  b. Clearance of jungle for campsite.
  c. Clearance of jungle on the roadside.
  d. Clearing of obnoxious weeds like *Lantana camera.*
  e. Construction of temporary bridge over stream
- Forest protection:
  a. Used for patrolling in the interior of forest areas.
  b. Elephant movement in the forest for collection of fodder to different areas- will increase protection from poaching.
- Eco-tourism
  a. Elephants are being used for joy rides to carry visitors for wildlife sightseeing.

b. Elephant camp open for visitors to see their bathing, feeding and other husbandry activities.

- Education and publicity:
  The Elephant camps are open to the general public. The department has developed an educational package for tourists. Video shows explaining the plight of elephants in the wild, efforts being made for their conservation are presented. Camp serves as platform for research to know more about elephants.
- Kumkie operations:
  The foremost importance of the camp is elephants being used to drive wild elephants whenever conflict happens; Tamil Nadu camp elephants are being used even in other states as an anti-depredation measure.
- Capture and translocation of problematic wild elephants
- To assist in rescue operations for rescuing animal/s in distress such as those stuck in swamps, fallen in wells, etc. The elephants can also be used in rescue operations in disaster affected (cyclones) areas
- To assist in treating sick wild elephants.
- Breeding programme
- Germ-plasm conservation:
  Since both male and female elephants are left free in the wild, chances of such elephants mating with their wild counterparts are high, thus, ensuring flow of genes between captive and wild elephants
- Camp acts as a rescue center to rear and adopt wild abandoned calves, if any (Figures 8a, b, c, d, e, f, g and h)

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Figures 8a, b, c, d, e, f, g and h: Elephants participating in different activities, dragging log (as some form of work, exercise and practice-a), carrying fuel wood for food preparation (b), carrying tourists (c and d), removal of weeds (e and f), participating in Kunki operations (f and h)

Work load

Work load given to the elephant varies according to age:

Training for timber hauling starts at the age of 6 years

6 -15	15-25 vrs	25-45 vrs
Light work	Moderate work	Heavy work

Above 45 years – Work is gradually reduced every year up to the age of retirement at 58 yrs old. A few animals that maintain good health and those whose teeth have not worn out are used for a few more years. The elephant is not a good pack animal, is not suited for carrying heavy loads. The elephant is unique in its ability to drag and lift weight, but they cannot carry a load more than 400kgs.

Workload according to height

Height of Elephants (m)	**Weight (Kg) (Allowed to carry on its back)**
<1.50	Not used for carrying load
1.51 ~ 1.80	Not exceeding 150 kg (carry only fodder and trainer)
1.81 ~ 2.25	Not exceeding 200
2.26 ~ 2.55	Not exceeding 300
>2.5	Not exceeding 400

(Ref: Kerala captive elephant management rules, 2003)

Dragging capacity allowed

Height of Elephants (m)	**Dragging limit allowed** Weight (Kg)
<2.10	Not used for dragging
2.11 ~ 2.25	Not exceeding 750 kg
>2.25	Not exceeding 1000 kg

(Ref: Kerala captive elephant management rules, 2003)

Load should be reduced to 50 % in hilly or difficult terrain (Figures 9a, b, c and d).

a

b

c

d

Figures 9a, b, c and d: Examples of workload given to elephants in the camps, making the animal to drag small logs as practice (a, b and c) and making elephant to carry log for preparing food (d).

Diet of elephants:

The diet of the elephants consists of following:

Concentrate feeding: Elephants are bulk feeders, since they have simple stomachs; they have to spend at least 18-20 hrs in a day to feed. As elephants in captivity are maintained for various forestry works, the animals have to spend energy performing various types of hard work. About 7-8 hours in a day is spent for work, bath, commuting, etc,

The digestive system of elephant is suited to their continuous feeding habit. The main reasons for the continuous feeding may be the lower efficiency and the shorter time spent in Gastro-intestinal tract i.e., about 21 to 24 hrs. The dry matter digestibility in elephants is 45-50% (Ananthasubramaniam, 1979) whereas, crude protein and crude fiber digestibility is about 89% and 18.5% respectively (op.cit.). Hence, to compensate the loss of time for grazing and replenish the energy spent, the captive elephants are fed with readily available energy in the form of concentrated grain ration.

Ingredients of concentrates are:

Horse gram (*Macrotyloma uniflorum*) -	For protein source
Ragi (*Eleusine coracana*) -	For carbohydrate
Salt -	For better assimilation and absorption of ingested nutrients in the intestinal tract; also to reduce intestinal parasite burden and increase palatability of food.
Jaggery (unrefined sugar syrup derived from sugarcane (*Sacharum* sp.)	For palatability

Diet schedules

The following considerations are used for planning the diet.

- Selection of ingredients: It is based on the nutritive value, palatability, ease of availability throughout the year and economic consideration of food grains. Compared to other food grains, ragi and horse gram are high in nutritive value, cheaper in cost. It is easy to cook and elephants like these grains.
- Diet formula: It is formulated according to the age, sex, weight and the workload. The quantity of each grain for different classes/size of animals has been decided after much care and thorough examination.

Age / Sex		Horse gram (Kg)	Ragi (Kg)	Salt (g)	Jaggery (g)	Mineral mixture (g)
1 to 6 yrs		1	4	100	100	100
6 ~ 15 yrs		1	8	100	100	100
Male	Rest	3	14	100	100	100
>15 yrs	Work	5	18	150	100	100
Female	Rest	2	12	100	100	100
>15 yrs	Work	4	16	150	100	100

As and when necessity arises, such as for those animals which are in rundown condition, pregnant and lactating cow elephants, growing calves, orphaned calves, etc., prescription of special diets is followed such as coconut (*Cocos nucifera*), rice (*Oryza sativa*), gingelly (*Sesamum indicum*) oils, vitamins, and other nutritive tonics, etc.

Rice is included in the diet of young calves and lactating mothers, sugarcane (*Sacharum* sp) is prescribed for calves and animals under training. Inclusion of jaggery in the diet is to facilitate administration of oral medicine to the elephants, as they are conditioned to the taste of jaggery. The quality and adequacy of the ration is inspected by Veterinary personnel regularly.

The prescribed diet is used for the whole day and the elephants are fed with cooked rations both in morning and evening *i.e.,* half the prescribed quantity in the morning and remaining half in evening. Standard size moulds are used for making cakes of cooked food. This facilitates easy distribution for individual elephants, and easy verifications by inspecting officers.

Elephants in the forest camps are sent out for grazing. This is a desirable practice as they have seasonal preference and choose their own required fodder. This also encourages socializing, resulting in mating and other activities. But under special circumstances, such as when the elephants are used for providing rides to tourists, elephants in musth newly weaned calves and sick or incapacitated animals, they are tied near the vicinity of the camp and cut fodder is given during night hours.

The quantity of cut fodder to be provided should be at least 3% of the body weight, taking wastage into consideration. When the elephants are left out for grazing, adequate precautions must be taken to hobble them, and use a trailing chain. Even a hobbled animal can move over a distance of about 1~2 km. The elephant man (mahout/ cawadi)

should take care to leave the animals, where adequate fodder is available. They must also check for the presence of wild tuskers, which tend to be aggressive towards captive elephants Figures 10a, b, c, d, e, f, g and h).

a

b

c

d

e

f

g

h

Figures 10a, b, c, d, e, f, g and h: Display of different food items (10a, b, c, d, e, g) and mixing of different cooked food items (g and h).

Health care: management

The following health care protocols are followed for the elephant camp.

a). **Skin care:** Two times bath for elephant both morning and evening each lasting at least 1.5 –2hrs. This helps in following ways.

i. To reduce their body temperature.
ii. To relax the animals; elephant love spending time in the water
iii. Scrub bath improves their blood circulation and skin condition.
iv. To wash the wounds.
v. Improves bond between animal and mahout/cawadi.
vi. Better chance to find abscess, cyst, wound and other skin infection in early stage.
vii. To reduce and prevent external parasitic infection like ticks, mites and louse (Figures 11a and b)

a

b

Figures 11a and b: Mahouts checking skin for parasites (a) and washing wounds (b).

b**). Foot care**: Application of Dekamil oil* on the foot over the nails, commisure of tusk and on external genital opening in female elephants. This helps in following ways:

i. Strengthening of cuticle.
ii. Prevent over growths of cuticle.
iii. Prevent splitting of nails.
iv. It acts as an antiseptic and prevents foot rot and foot abscess.
v. It acts as a fly repellent and prevents egg lying on the foot, commissure of tusk and female external genitalia, thus prevents gastric and valval myiasis.

*(Dekamil oil consists of neem (*Azadiracta* indica) oil 15 kg; Camphor (a terpenoid with aromatic odour) -0.5g; Garlic (*Allium sativum*) -0.5g; Dekamil (gardenia resin-0.5g Figure 12 and b)

a b

Figure 12 a and b: Applying dekamil oil (a and b); note the container made of bamboo; designed and made by mahouts).

c). Preliminary health checks up: It is carried out every day (Figures 13 and b) while elephants assemble at the feeding centre, by veterinary personnel. If an animal is found sick in the preliminary health check up then the animal is subjected to special clinical examination.

d). Screening for parasites: The dung samples from all animals are subjected to screening for parasite ova once every three months.

e). De-worming: De-worming carried out once in every three months.

f). Vaccination: Annual vaccinations carried out against Anthrax. If there is any outbreak of Foot and Mouth Disease (FMD), Hemorrhagic Septicemia and Rabies in the fringe areas or among village cattle and wild animals, the elephants are also vaccinated against these diseases.

g). Tetanus toxoid: Freshly wounded animals are subjected to tetanus toxoid or it is given once in every 6 months.

h). Screening for Tuberculosis: All the animals are screened for tuberculosis at least once in a year.

i). Haemogram: Complete haemogram is done at least once in a year to diagnose disease condition already existing.

j). Screening for blood parasite: Screening for blood parasites especially for trypanasomiasis is done at least once in a year.

k). Body weight Measurements: As the elephant is a large sized animal it is difficult to find out chronic wasting condition. Hence, the body weight and other measurements is done at least once in three months to diagnose chronic wasting diseases and malnutrition. It also helps to know about growth rate, seasonal variation, post musth effect and treatment responded for malnutrition.

l). Health camp to elephant men: Anthropozoonotic disease like Tuberculosis may spread from human to animals or vice versa, hence the healthy animals need healthy mahouts. Conduction of regular health camps for mahouts/cawadis every year is a must

m). Planned, Balanced & Special diet: The quantity of diet for different classes/size of animals is decided after much care and thorough examination. Special diet is prescribed as and when necessity arises, such as for those animals which are in run down condition, pregnant and lactating cow elephants, growing calves, orphaned calves, etc.

n).Prescribed work load/ Working hours: Workload for different classes/height/size of animals is prescribed after much care and thorough examination to maintain animals in good condition.

o). Trimming of tusks (Figures 14a and b): The tusk tips of captive bulls become sharp by constant use. The tips are trimmed by Veterinary personnel periodically to avoid breakage while working, to prevent injury to other animals and also unnecessary tusk fracture while animal is playing or fighting with another tusker. The trimming is only a managerial practice and not for show purpose. Hence the Veterinary personnel should take proper precautions in trimming the tusk tips, particularly in young stock to avoid injury in the core.

p). Trimming of nails: Over grown nails may be trimmed regularly to avoid unnecessary injury to the animals, splitting of nails and other foot problems.

q). Rodents are a carrier for Encepahlomylocarditis virus. Hence the elephants' provision store and elephant house should be rodent-proof.

r). Care of Musth elephants:

Bulls maintained in captivity, particularly in forest department come to musth periodically. Musth is a sign of health, as only bulls in normal health will come to musth. As soon as a bull comes to musth it is tied up close to the camp, special musth fetters must be used to fetter the animals. If the animal responds to the mahout, the animal can be taken for watering; withhold horse gram from the diet and give reduced quantity of cooked rations

Taking suitable precautions, the temporal glands of the animal is examined and cleaned and dressed with fly repellant oil. Sometimes, the gland may get infected and hence should be attended regularly. The temporal gland discharge and urine have break down products of testosterone. Hence it gives a pungent odour. It can attract a wild bull in musth. This has to be prevented. An elephant in musth will show inclination to mate

with a cow elephant in oestrous, hence if the bull does not exhibit aggression, it can be permitted to mate with a receptive cow elephant. Consorting with a cow elephant may reduce the aggression of the elephant in musth and also if mated, it reduces the duration of musth.

Not allowing the animal for grazing or other bulls to come in close proximity of the animal in musth. The bull shall never be disturbed by presence of other people, vehicles or other animals.

s).Care of pregnant /Lactating cow elephants:

Cow elephants in the forest camps breed regularly, as they have access to bulls both captured and wild. If the animal has conceived, the signs of pregnancy will be observed from 10 to 12 months of pregnancy, the gait of animal shows down, the breasts start filling with the outward tilting of the teats. There may be viscous discharge from the mammae. From 12-13 months of pregnancy, the foetal movement can be observed.

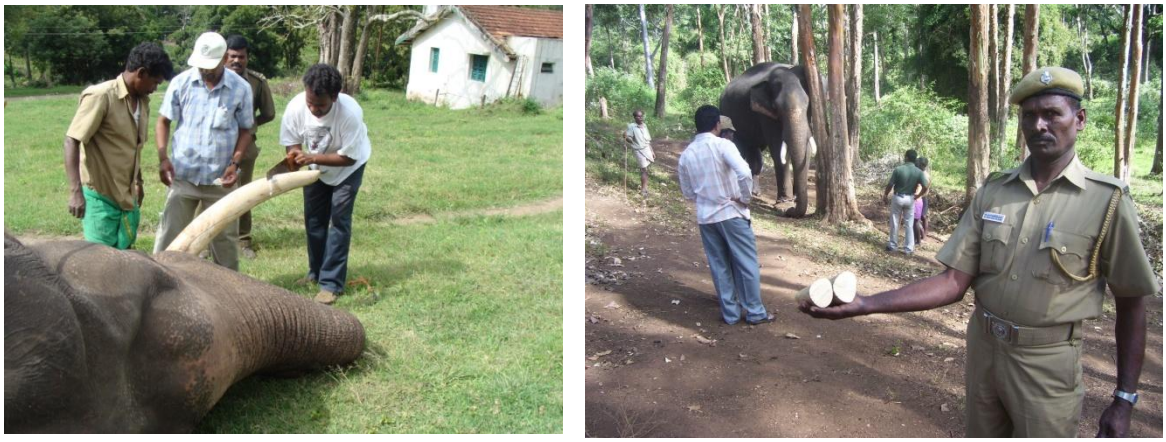
Once the foetal movements are observed, the animal is taken off from work and given complete rest until the calf is born and is 6 months of age. The quantity of ration or concentration is raised. A special diet consisting of vitamins, mineral, soaked green grams and coconuts are provided, 6-10 coconuts/day provided before and 10 coconuts after delivery. Coconut milk contains several nutritious materials and enhances the quality of mother's milk. At the time of delivery one of the non-lactating cow elephants will keep company with animal and after delivery acts as allo-mother.

As soon as the calving takes place, the animal must be brought to the camp and observed to know whether the mother allows the calf to suckle and the calf is active. Fly repellant oil must be applied around the umbilical cord. Veterinary care for the mother should be available. FVAS must check whether placenta has been expelled by the mother elephant, whether the milk is adequate for the calf and their must also observe feeding frequency.

a

b

Figures 13 a and b: Preliminary health check-up and drawing blood from elephant (a) and equipments associated with veterinary clinic (b).



a b

Figures 14a and b: Trimming of tusk (a) and display of trimmed tusks (b).

Handling of Elephants by Mahouts:

The elephant is trained and handled by giving positive reinforcement for responding followed by rewards like sugar cake, banana, jaggery, etc., the animal will show love and be affectionate with his mahouts. The mahout must be able to establish his dominance over the elephants, and to make the elephants feel that the mahout is smarter at the same time a loving and affectionate partner. Rather, mahout is a senior partner, who is firm but not cruel. This type of relationship will lead to a positive response from the elephant like obeying commands. Showing love and affection can simply control the animal and the obedience comes by the use of sticks.

The specialty of the Mudumalai elephant camp is that the elephants are handled only with ordinary plain stick by the mahouts. The use of ankush (Iron hook) has been banned for the past 30 years. If the mahouts/cawadis use Ankush or any other sharp metal and are caught by officials, he will be given departmental punishment like suspension, cut of increments.

"Elephant never forgets" this saying is true and people who are familiar with elephants know it. Elephants have a remarkable memory for events and people and are also believed to be emotional, so elephants naturally remember well. All the negative experiences undergone during musth are remembered- captive male elephants deliberately try to attack their mahouts. The bigger problems of aggressive behaviour by an elephant towards a mahout are the magnitude of the aggressions, resulting in serious injury, permanent disability or even death of mahout/cawadi.

Most of the tuskers in the Mudumalai elephant camp can be handled and are controllable by their mahout even in musth. The reason could be the systematic management rather than the method of handling and training of elephants. The schedule of morning bath followed by training by giving positive reinforcement and feeding will increase the bond and increase the relationship between elephant and mahout. The planned and prescribed work followed by relaxation time for grazing and bathing in the evenings helps the elephant creates a positive association with the mahout.

The reason for manslaughter and aggression of elephants towards his mahout are as follows:

i. Crude method of handling, training and punishing the elephants by using Ankush, putting thorny chain. Mahout who is not very familiar with elephant moods and psychology loses patience and tends to punish the elephant. The elephant remains adamant, which makes the situation go from bad to worse.
ii. Inexperienced people become mahouts due to lack of employment, mahouts are changed frequently for an elephant:
iii. Long exhausting walk in the hot climate.
iv. Long exhausting work schedule
v. Deprivation of food and water
vi. Inexperience in identifying the onset of musth, using the elephants for work before completion of musth, in post musth stage.

Vision for future

A Calf Rescue Center

One of the common objectives of the Mududmalai forest camp is hand rearing of orphan calves. Tribes of Mudumalai first successfully reared orphan calves in southern India. Elephant calves which are found alone in the jungle or any other part of the state also have been shifted to this camp. The key factors for success are expertise in hand rearing of orphan calves, veterinary facilities, conducive environment and availability of other elephants for its socialization. Even though the present camp acts as a rescue center for wild orphan calves there is no separate and exclusive infrastructure facilities.

B Reduction of Impact of Elephant Camp on Natural Resources

Fodder Management

Developing a fodder farm, purchase of hay at cheaper prices in summer, letting out all females and tuskers to graze/browse, except unpredictable, problematic, musth elephants and dominant tuskers

Fuel wood management

Use of gas or some alternatives like gasifier using Lantana stem.

C. Continue Ban on Sale of Female Stock.

For a camp to be sustainable, with no new captures from the wild, sale or transfer of female elephants to other institutions must be stopped.

In Mudumalai camp, even though 110 female calves were born in the past, most of them were sold. Since 1985, no new breeding females have delivered a calf. If this continues the, future of this camp will be a question mark. Hence, as per Krishnamoorthy commission's (2001) recommendation, no female stock should move out from the camp.

D. Disease Threats and Mortality.

1. Ban on moving elephants from temples to forest camps as a precautionary measure to prevent transmission of Tuberculosis and other infections to camp as well as wild elephants

2. Construction of toilets for the local communities to reduce Coli-salmonella infection and its related mortality
3. Periodical screening of all elephants against Tuberculosis once in 6 months with budgetary requirements

E Construction of New Kraal
A well established two compartmental kraal is a must for any camp. This will be helpful to restrain animal for routine treatment, weaning calves and to train newly captured rogue elephants.

F. Effective Management of Staff and their transfer
Selection of mahouts and their transfer to an elephant is the most important factor in effective elephant husbandry. Dominant elephants need only dominant mahouts for better handling. Selection of mahouts also should be done based on their quick sense of reflexes and stamina. Hence, selection of elephants- mahout combination before any inter transfer among camps should be done after consultation with the Forester, Range officer and Forest Veterinarian who worked for maximum time and who know details of elephants and mahouts/cawadis of a camp.

G.Training Programmes
Training programmes need to be conducted every six months for mahouts and cawadis, whereby the services of experienced mahouts can also be used. All aspects of elephant husbandry, health care, methods of training elephants, *kumkie* training, dealing of problematic rogue elephants and 10 commandments of good mahouts can be covered as part of the training programme. Apart from this, special emphasis is also required on motivational aspects of the staff, so that their commitment to the elephants remains high.

H. Skill Up-Gradation, Motivation and Training Programme for mahouts
Regular training, skill up-gradation and motivational programme for the mahouts should be arranged every year. Outreach programme and visit to other camps to exchange their knowledge also can be arranged.

I Eco-tourism
Use local communities to create awareness of wildlife to tourists as this will also improve their economic situation. Regular elephant training programmes and elephant bathing in the camp premises can be combined with eco-tourism activities by involving local communities.

H. Regular Training for elephants
Periodical training for elephants with normal verbal and tactile commands and *kumkie* training is a continuous process.

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Section 2:
Captive Elephants in Forest camps

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Executive Summary

Tamil Nadu Forest Department has been maintaining elephants in their forest camps (FC) for about 150 years. The elephants are used for jungle patrolling; weed control, eco-tourism, 'kunkie' operation, conservation education and training.

The main objective of this investigation is to understand the population and management status of the both elephants and their handlers, through the assessment of the welfare status of elephants maintained in forest camps and the assessment of the socio-economic status and professional experience of elephant handlers (mahouts/ cawadis).

A team of experts, from wildlife biologists to welfare activists, rated different parameters of importance to the welfare of captive elephants and this rating was then used to assess the welfare status of elephants and mahouts/ cawadis. A mean rating (M-R) for each parameter, across all the participating experts, has been used as the Experts' Rating (E-R) which represents the importance attached to a parameter.

Twenty-eight elephants (62%)of the forest camps had been captured from the wild, while 14 (30%) were captive born. Mean rating (M-R) for this parameter was 2.0 with a deviation of 66% being observed from the Expert's rating (E-R). FCs showed a range in the number of handler changes from 0 – 8 per animal. M-R was 4.2 with a deviation of 47% from E-R.

All the FC elephants were maintained in natural conditions with an adjacent protected forest area with access to natural shade. M-R was 7.4 with a deviation of only 8% from E-R being observed. All the elephants had access to a river within close distance of the camp. The elephants were bathed twice a day in the river for 0.5 – 1.5 h. M-R was 5.8 with a deviation of 22% from E-R.

Except three (an adult male, an orphaned infant female and a 4y old male, all elephants were given opportunity to interact; the interaction time varied from 2 – 24 h. Number of individuals ranged from 1-20, each FC had three mother-offspring pairs; the number of related individuals across both camps was nine. M-R was 6.4 showing a deviation of 18% from E-R.

Fifty seven percent of the elephants were not used for any work, and work type involved carrying tourists/as Kunkie/ carrying firewood/ its fodder/ weed removal. M-R was 6.0 showing a difference of 25% from E-R (Figure 10a and b).

All elephants, except for the orphaned female elephant, were allowed to free range, stall feed included: Ragi (*Eleusine coracana*), Horse gram (*Dolichos biflorus*), Rice (*Oryza sativa*), Coconut (edible part of *Cocos nucifera*), Salt, Jaggery (Sweet extract from sugarcane), mineral mix, sugar cane (*Saccharum* sp.), bamboo (Bambuseae tribe) leaves; mineral mix not provided for Anamalai FC elephants. M-R was 6.2 with a deviation of 22% from E-R.

Mother-offspring pairs were present in both FCs, with a total of nine related individuals across the camps. Except for two adult males, all others were reproductively active, Seven adult males had not sired offspring. M-R for female reproductive status was 6.3 showing a deviation of 15% from E-R.M-R for male reproductive status was 3.5 with a difference of 57% being observed from E-R.

Occurrence of diarrhoea observed in some elephants, anemia in one elephant and all elephants said to be dewormed regularly for Mudumalai FC. Mudumalai elephants immunized against Anthrax once a year and the elephants were subjected to oiling of cuticle/ nails twice a day. Weight taken once in three months and body measurements once a year for Mudumalai FC elephants. M-R was 7.0 (SE= 0.3, N=12) indicating a difference of 6% from E-R.

Each FC had access to a veterinary doctor with 5-7 years experience in handling elephants, and the doctor with Mudumalai FC was at the camp itself, hence, visits were daily. For Anamalai FC, the doctor was on call, located 100 Km from the camp site. M-R was 5.7, showing a deviation of 29% from E-R.

Mean age of the handlers of FC was 37.9 yrs. with age ranging from 18-55 yrs and the mean experience in the profession was 13.4 yrs, ranging from 0.5 to 37 yrs. Mean experience with a specific camp elephant was 6.3 yrs. ranging from 0.3 – 35 yrs. M-R was 6.9 showing a deviation of 24% from E-R

Most handlers reported handling elephants as a family occupation and the mean wage was Rs.51, 591/- annually ranging from Rs.14, 400/- to Rs. 1, 22,424/- one lady mahout worked voluntarily. Only 36% of the mahouts/ cawadis were insured, with self as the source of funding. M-R for the socio-economic status of the handlers was 4.7 indicating a deviation of 32% from E-R

Overall M-R for elephant welfare status for the forest camps in Tamil Nadu was 5.9 showing a deviation of 24% from the overall E-R. Deviations of less than 40% from E-R, accounted for 69% of all differences observed. The availability and access to forest areas in the presence of conspecifics, with opportunity to interact and free range, ought to provide the basic framework for a suitable captive environment. This was available for both FCs.

Recommendations

The presence of conspecifics, natural physical environment such as river/water-bodies/ forest cover, and veterinary intervention makes forest camps the best model for elephant keeping. However, there is conspicuous lack of clarity in the objective of establishing forest camps and zoos—whether they contribute to conservation or welfare.

Good welfare status for a captive elephant is when minimum deviation is experienced in its biological and ecological needs. Wildlife conservation implies efforts at maintaining available natural resources (flora and fauna).

The importance of captive elephants to wildlife conservation can be considered to be of two types:

Direct Conservation

Back to wild

- Release of captive elephants into the wild**,** fully integrated into wild habitat, without any human interference: complete and unhindered addition to gene pool and numbers of wild elephant population
- Partially integrated: as observed currently in forest camps/ some zoos– free grazing, mating, scope for exposure to forest and its environment, but elephants' activity under human control
    - When camp tusker/s and female/s are allowed to forage in the elephant habitat, this results in breeding between wild and camp elephants. This enables genetic exchange between the two populations.

Indirect Conservation

- Well trained elephants called Kumkies (Koonkies) are being used to drive away wild rogue elephants as a conflict mitigation measure, to build confidence and create conservation awareness among the public.
- Kumkies are also used to capture and translocate problematic wild elephants from highly fragmented forest patches as a population control measure, this would otherwise not be possible by any other machinery
- Elephants in forest camps are also used for forestry operations such as uprooting lantana, removing trees fallen along roads. They can also be used to patrol the forest in areas with thick forest cover.
- Provides opportunity for scientific study of elephant biology and behaviour that would otherwise not be possible with wild elephants. The result of that research study can be used for management of elephant reserves.
- Camp elephants are also used in rescuing and treating wild elephants which are in distress/sick due to human interference.
- As a means of providing awareness on nature and natural resources:

  The camp serves as a place to educate and teach students from schools and colleges about nature education and awareness.

Tourism and education of public on wildlife through eco-tourism using elephant rides in forest areas, involvement of tourists in feeding routine of camp elephants

All activities which involve human interference in elephants' lives will compromise welfare of the animal/s as the animal/s will not be able to engage in species-typical activity of its choosing.

Welfare

Captive elephant welfare should involve provision for natural environment, scope for exhibiting natural behaviour; focus of veterinary care should be more towards preventing health problems rather than treating elephants for various recurring ailments; management should avoid unnecessary and heavy workload for the elephants, prevent unnatural work regimes, implement complete stoppage of cruel handling of elephants, link elephant and mahout welfare together as they are in constant interaction with each other, develop specific plans for both elephant and mahout welfare

Welfare options for the forest camp elephants of Tamil Nadu:

One option available for the captive elephants of Forest camps of Tamil Nadu would be release in to the wild, thereby adding to the conservation value of the region, with suitable health checks being done on the elephants.

Back-to-wild option may not be possible for Mudumalai Forest camp as there is a highway cutting across the sanctuary endangering the lives of the captive elephants. Villages occur within the forest limit which might lead to a chance of conflict between elephants and local residents. Additionally, it may not be an ideal location as the number of wild elephants are known to be high in this region leading to conflict between both populations and a probable reduced survivability of the introduced population.,

For the Anamalai camp elephants, release into the wild could be feasible considering only numbers of wild elephants in that region. Human population pressure in the form of fragmentation of habitat and potential for conflict with local residents, however, may not permit implementation of back-to-wild concept.

Given this situation, the logic of keeping captive elephants in these forest camps appears to be based on a combination of indirect conservation value and welfare. Within the two camps in Tamil Nadu (Mudumalai and Anamalai), the latter camp appeared to be fulfilling the objective of partial integration of captive elephants in the wild, compared to the former.

Forest camps/institutions often house more than one elephant in (semi-) natural surroundings. The daily routine of the elephant often involves work. In general, this work is carried out under less stressful conditions than, for instance, the circus and temple elephants. Camp elephants require extensive management plans and budgets because of the presence of several elephants and animal handlers.

Space and diet

Availability of forest conditions for Forest camp elephants: We need to change the management of elephants that are tied for several hours in some forest camps, more specifically Mudumalai Camp. This is applicable for some elephants in Anamalai also. Most elephants have limited foraging movement since their feet are shackled or are tied to heavy drag chains.

Free grazing is good for both elephant and the habitat: depending on the situation, or some specific cases, all elephants can be safely let loose in the jungle for foraging, so that we can minimize impact of FCs on the habitat by way of cutting *Ficus* and other trees

Except in specific cases, elephants may be allowed to roam without hobbling. Experiments on using only drag chains may be considered, for the easy retrieval of the animals by mahouts.

Since study of elephants can be one objective of captivity, the foraging behaviour of such elephants (unfettered) can be studied (by trained mahouts) and can be of immense value to elephant biology.

Campsites should be changed periodically depending upon the availability of fodder and water. In doing this, we need to address the mahouts' requirement of accommodation, etc.

Both the forest camps in Tamil Nadu have to consider alternative campsites so that there is enough foraging material and water in different seasons as there might not be enough fodder during summer**.** This needs planning and management and should not be based on random decisions of site selection.

During summer, providing more nutritional food could be considered: green gram (*Vigna radiata*), digestive mixtures, potions, minerals, vitamin supplements, salt and jaggery (hardened balls of sugarcane -*Saccharum* sp.- juice) could be considered.

Supplements can be provided on veterinarian's advice. There are fodder lands available outside the park with the revenue department which can be used to raise some fodder crop.

Source of stall feed supply should be checked regularly for quality and pesticide contamination. This is in the light of reports of elephant deaths, including calves, in some cases.

The debate on providing cooked food and specific supplements such as jaggery to elephants needs to be critically reviewed. Specific reasons for administering a given food item(s) needs to be displayed on the ration chart. This should be a source of knowledge and a learning experience for newcomers.

When elephants are used for tourism during summer, extra food should be provided to the elephants.

Water

Perennial water source is available for both the camps; quality is contaminated in Mudumalai due to presence of villages (at some places sewage water also gets mixed with the water source), in the dry season, water flow is limited and results in low quantity and quality water available for elephants.

Regular water tests and water treatment need to be considered. During drought season, water should be released from the Pygara dam, courtesy the Tamil Nadu Electricity Board, on request from the Forest Department.

When an elephant is bathing or drinking water, it may defecate, contaminating the water source. Mahouts should make efforts to isolate the dung piles from the water-source.

No scientific observation on water consumption by individual elephants is available, resulting in lack of information on the quality, quantity and effect of cleanliness of this important resource.

Exercise and work

In camps, where elephant rides are offered or the animals are used as active tourist attractions, care should be taken to ensure that the elephants' routine is not disturbed. For example, the schedule for feeding the elephant should not be disturbed/ delayed for the convenience of tourists.

Elephants which are old, pregnant, and with calves should not be used for tourist rides, as is being done in some national parks and zoos

Work or work load needs to be planned, it may be suggested that during dry season elephants should not be made to work; more specially using elephants for tourism should be prevented

It is recommended that the use of elephants for tourist rides during the summer months be lowered. Their use in monsoon is even more problematic as the ground is very slippery and makes it difficult for the elephant to walk with a load.

Patrolling or use as kunkie for conflict mitigation constitutes a better alternative activity for forest camp and national park elephants. This is to be preferred over using the elephant for tourist rides. Other activities preferred to tourist rides are weed removal/ removal of fallen logs from roads. Any work activity should not compromise the elephant's foraging or its access to food and water.

Allowing for formation of small groups of elephants within different areas of the national park/ sanctuary helps in covering the sanctuary or park more effectively. This may also help in using the elephants for patrolling the forest. This should not be done at the cost of separating established herd members (related/ unrelated).

Elephant enclosures, especially in zoos, tend to be monotonous. This is despite their large home range size. As elephants are active for 75% of the day, it is important to provide for their normal activities, e.g. dust baths, mud wallows, browsing, foraging, challenges to retrieve food, appropriate social interaction, scratching posts and other environmental enrichment and stimulation. In fact, zoos are good to keep a few retired camp elephants that are well trained, and are easy to handle and cannot forage for themselves, keeping in mind that their family structure is not disturbed or broken while shifting to zoos.

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Routine followed for the forest camps appeared reasonable: each animal was used for 4 trips/day lasting for 30 minutes each trip for one to two weeks and thus, gets rest till the next routine. The animal may be rested for 2 to 3 weeks.

Time of work: – 7 to 8.30a.m. and 4 to5.30.p.m. no compromise to be allowed in this schedule, no extra trips for any given individual animal to be permitted. This system is followed in Mudumalai, but the protocol for work in Anamalai is not based on prescribed norms, but is based on the demands, each elephant ride may go on for more than one hour, animals are used during hot hours of the day.

Immediately after the monsoon; forage is available for elephants even during work hours – but during the dry season the scope for feeding while working is limited; since elephants feed continually, tourist rides during summer may not provide opportunity to forage while working. The elephant rides should be banned during summer.

In Vandalur zoo, elephant rides are not advisable during hot weather. Use of elephants for work in high temperatures affects the animal's themoregulatory mechanism, leading to possible display of aggression that may be dangerous to the visitors.

Training

Three aspects need to be considered

- Training of elephants captured from the wild
- Training of calves
- Nature of training

It appears that the established methods of training elephants captured from the wild are harsh. The entire process of bringing a wild animal under human control can be traumatic for the captured animal. Efforts have to be made to implement positive reinforcement for

captured adult elephants also. There have been instances of "trust" being established between wild, free roaming animals and people. The establishment of a "relationship of trust" between the captured elephant and its human handler may be time-consuming and a long-drawn process when harsh punishment is not involved. But it is the need of the hour for the welfare of the elephant.

There are a total of 48 basic commands. Of these, about 35 commands involve only positive reinforcement; other 10-12 involve both positive and negative reinforcement with mild punishment and taps. The way the younger generation of mahouts handled elephants in day to day practice appeared to be harsh, this needs to be investigated and changed by giving exposure and regular training and a sensitization programme.

Training of calf/sub-adults includes: weaning process, isolation, separation from mother and family group. The recommended methods are: positive reinforcement without separation from mother and in the presence of adult elephants.

This training is accomplished by providing food, treats and light taps on the elephant's legs and head in order to make him/her understand what is required. The elephant learns association of words with an action, which is then rewarded. This method is time-consuming, but is more welfare oriented than the traditional methods.

Regular training at least for a few hours, with positive reinforcement is suggested; training for basic upkeep, usage for kunkie, patrolling, timber hauling, loading or offloading animals in vehicles; weed removal, safari, habituating the animals to crowds or other elephants is important

Reproduction

While breeding may constitute a positive indicator of the health and environment of an elephant, reproduction is meaningless unless the increased numbers get an equal if not better quality of life. We also do not recommend separating individual elephants from family herds.

There is no written policy on the vision as to whether the elephants are kept for conservation or welfare. Therefore, even though reproduction is a signal of good welfare, there is no existing vision (policy) to increase or decrease population in camps.

For Tamil Nadu FCs, it is a curious case: on the one hand all available resources are found and on the other, not a single female elephant has given birth since 2005 as there are no breeding females due to past transfer of such elephants to other institutions. For instance, the 22y old female Ashwini was recently shifted from FC to Vandalur zoo. The transfer of a viable female from a suitable setting for breeding to a more restricted environment with reduced access to males is not advised.

Our data seems to suggest there are only a few breeding females in the population in Tamil Nadu. As temples maintain predominantly female elephants, most of the FC elephants have been sourced out to these places. - Henceforth the release of females from the camps will be prevented through exclusive laws.

Depending on the vision mentioned above, a policy document should be made available on elephant reproduction and the following features should be considered:

- Knowledge of oestrus cycles, mating period, calving intervals, age at first birth and number of births is important in managing the reproductive health of females.

- For males, details on musth are not available (where available, they are vague and inconclusive) for most camps in terms of time, duration, age at first musth, synchrony/asynchrony in musth and if the elephant has been exposed to females.

Veterinary care

Mudumalai FC has a veterinary care unit, including the presence of a residential veterinary doctor with experience in treating elephants, but all these aspects are distinctly absent in Anamalai FC.

Anamalai FC needs a resident veterinarian with expertise in elephants along with sufficient veterinary care units.

Some of the problems faced in veterinary care are:

- Doctors do not have access to timely laboratory reports to enable them to take appropriate medical action. Most reports reach them after a delay of several days to one year, rendering lab results worthless.
- Veterinarians may like access to a modern, contemporary, reasonably well-equipped laboratory.
- There should be scope for veterinary research. Presently, limited funds may be available from the department. This may be insufficient for detailed investigations or follow-up.
- Government approvals for emergency testing are time-consuming and therefore valuable time needed for treating affected animals is lost.
- The department does not provide adequate welfare measures to the doctors resulting in employee turnover and frequent change of doctors. Hence, experience of such doctors is also going waste. The appointment of new doctors will result in the same cycle of learning and employee turn-over.

The following procedures need to be followed:

- Periodic health check-up.
- Blood/urine and dung sampling for routine clinical examination.

- Specific check-up for Tuberculosis. Herpes, etc.
- Routine check of feet, skin, eyes and for injuries, if any.
- Cattle, stray dogs should be removed from elephant camps and their surroundings as they can propagate diseases to elephants or in the case of dogs, they create havoc among elephants.

Equipment related to handling animals

Information on the current status of equipment such as chains, ropes and howdah is very sketchy or not critically reviewed. Equipment such as leg chain, "bedi" or collar, neck chain, etc. has to be periodically replaced. Howdah used for tourist rides should be regularly checked to ensure that it does not hurt the animal (effort can be taken to find light weight howdahs).

The use of *namdha* and *khadi* on elephants while providing rides: soft rope can be used instead of coconut based coirs; elephant grass is currently used as source *khadi*, it may increase the weight, succulent grasses are known to be light weight–used in Bandipur (for example).

Cushioning effort to be increased to reduce the pressure of *namdha* and *khadi* on the body. Leather used to prevent body scratches to be lubricated with castor oil (oil from *Ricinus communis*) everyday, and replaced as it become old and hard.

Body measurements

Weight and body measurements in relation to height, neck and chest girth and body length should be periodically measured in standard, calibrated measuring units. Measuring number of defecations, number of boluses, dung boluses per defecation, circumference of each bolus is recommended in relation to an individual elephant's age. This provides authentic information on digestion, health and nutrient uptake by the animal.

Simple body condition measures should be documented regularly like visibility of ribs, scapula and buckle cavity. These measurements are an indicator of the captive animal's health condition.

The departmental veterinarian should maintain all data in a health or medical register.

Funds

Information on this aspect is not transparent or the value of this important parameter is not clearly understood. There seems to be a delay in release of funds earmarked. In most camps there seems to be a delay in payment of wages and wage arrears. Fund allocation and dispersal should be done on a consistent and regular basis. Financial hardships of mahout/cawadis have been seen to result in misappropriation of rations meant for the elephant. This may not be true in all cases.

Elephant mahouts/cawadis

Except for permanent employees of the forest camps and zoos, who are few in number, most are daily wage workers. Employee status needs to be looked into, and improved upon, according to years of service and expertise.

New, temporary cawadis train themselves by observing and participating in group activities. Training should be consistent and offered throughout the year. The monitoring officers should grade their performance. Training should include specific classes on elephant biology, physiology and psychology, simple first-aid treatment, personal hygiene, etc. Mahouts/cawadis should be taken for inter-camp and zoo visits within or outside the state. A one- or two-day training program has little relevance. The same resources could be utilised better for the welfare of the mahouts/cawadis.

Due to frequent change of handlers, the experience of mahouts/cawadis in handling particular, individual elephants is not high. Both mahouts and cawadis show poor education level. Salaries provided are insufficient. This is true of insurance coverage as well. Consumption of alcohol seems to be high amongst both. Mahouts and cawadis are clear that their children would not join the profession. If elephant-keeping is to be successful, certain incentives for the families of the mahouts need to be initiated. Only then would it be seen as a profession of choice and not of poverty and illiteracy.

Transfer or exchange of elephants between facilities

Several studies suggest that movement across facilities breaks social bonds, especially among females. The shifting of animals leads to disruption of hierarchy and results in related problems. It may also result in aggression towards an animal, which has been reintroduced into its own group. Transfers or relocations of elephants should be done after much thought. Necessary discussions with the mahouts and handlers need to be undertaken to avoid arbitrary and random movements, which may disrupt an elephant's emotional ties with related herd members.

> There are usually some “problem” elephants in zoos and camps, brought in through confiscation or dumped by private owners or agencies unable to cope with the animal. Thereafter, these are parked in forest camps and zoos. These elephants require a different management concept with a specific and more care-oriented approach.
>
> Specific quarantine measures—decision to allow this animal to interact with other members of the centre may be taken according to the background of the animal. Health checks and other tests should be completed without delay.
>
> Camps are burdened with many animals coming from different sources. Government should allocate extra budget as contingency/non-planned expenditure to ensure proper care of these animals. These specific elephants often suffer due to the reluctance of the concerned department to take action on their behalf.

Establishment of monitoring committees exclusively for these confiscated/rescued/ abandoned elephants that are parked in camps and zoos needs to be looked into.

There is also clear scope for the formulation of a care facility, which is NOT necessarily a forest camp or zoo, due to the existing numbers of suffering and abused captive elephants across the states. Care centers need to be placed within a forest and close to a river. An area not inhabited by wild elephants may also be considered.

Adoption of elephant FCs

It is recommended that forest camps may be adopted by NGOs and other agencies that have a proven track record of being professional, knowledgeable, mature and sincere. This includes working with the concerned departments, volunteering for daily activities and maintenance of record-keeping, involvement in budget allocation and working with the concerned attendants. However, care should be taken that camps should not indirectly fall into the power of organizations with a declared or undeclared commercial intention. The department should always keep an administrative control over this.

Introduction

Captive elephants were worked by the authorities for timber hauling and related tasks during the British period in Madras presidency (Krishnamurthy and Wemmer, 1995), having a long history of maintaining elephants in captivity (~140y: Taylor and Poole, 1998). With the ban on extraction of forest produce, addition to the captive elephant population has been from capture of wild elephants perceived to be a source of conflict with people/ from birth of elephants in captivity/ as a result of rescue from other institutions maintaining such elephants.

Tamil Nadu Forest Department has been maintaining elephants for about 150 years. The elephants are used for jungle patrolling; weed control, eco-tourism, 'kunkie' operation, conservation education and training (Kalaivanan, 2008). The present system of management reflects a mixed legacy of traditional and colonial influences. This continues to evolve with present-day modern practices. Currently, the forest camps have males and there are only few breeding females, as the female calves have been sold to temples or to other agencies.

Objective

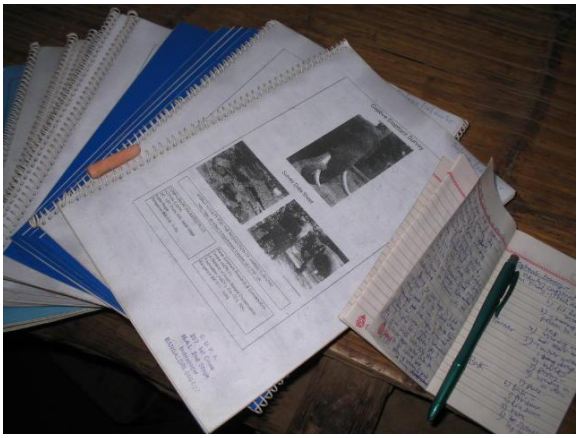
The main objective of this investigation is to understand the population, management and welfare status of both the elephants and their handlers. Hence, this report aims to:

- Assess the welfare status of elephants maintained in forest camps of the forest department, Tamil Nadu
- Assess the socio-economic status and professional experience of elephant handlers (mahouts/ cawadis)

Method

Ferrier (1947) opined that the care of elephants in captivity should be based on providing conditions that are similar to those experienced by the animals in the wild. Elephants cannot be considered to be domesticated (Lair, 1997); keeping these animals in conditions decided and completely controlled by people may affect the well-being of the animals. Data was collected through observations of elephants/ interviews with relevant personnel in the institution (Figures 1a, b, c, d, e, f, g, h, i, j, k, l, m and n). Related data such as shelter type/ size/ floor type were grouped together to form a parameter with each individual constituent data termed as a sub-parameter.

Welfare status of the elephants has been assessed by comparing physical/ physiological/ social and psychological features in captivity with those observed in the wild. Deviations from conditions in the wild have been considered to represent poor welfare. The greater the deviation, the poorer is the welfare. Deviation from conditions in the wild for the parameters observed was rated using a scale developed by elephant experts.



a

b

c

d

e

f

g

h


STABLE
ZERO
LO-BAT
ON/OFF
UNITS
SET
Z
ZERO

i


FWE
ELECTRONIC BALANCE
2.142
kg
STABLE
ZERO
LO-BAT
ON/OFF
UNITS
SET
Z
ZERO

j

k

l

m n

Figures 1a, b, c, d, e, f, g, h, i, j, k, l and n: Data collection in the field; data sheet used (a), direct observations (b and c), veterinary doctor providing details of health care (d), interviews with mahouts (d, e and f) taking body measurements (g and h), measuring weight of dung piles (i and j), measuring circumferences of dung piles (k and l) and measuring length and width of chain used (m and l).

The rating method

The rating scale from zero (unsuitable conditions) to ten (suitable conditions) was used to assess the welfare status of captive elephants and their handlers. Experts (both wild and captive elephant specialists, wildlife veterinary experts, managers from protected areas, those having both wild and captive elephants and other wildlife, personnel from welfare organisations and elephant handlers) were invited to assess the welfare based on welfare parameters and their significance through a exclusive workshop conducted on the subject (Varma, 2008; Varma, et al., 2008; Varma and Prasad, 2008). Experts rated a total of 114 welfare parameters covering major aspects of captivity

- The experts, based on their concept of the importance of a particular parameter to an elephant, developed ratings for each parameter. For example mean expert rating f 8.0 (SE= 0.5, N=29) for a parameter 'floor' and 9.0 (SE=0.4, N=31) was arrived for 'source of water' from the ratings suggested by each expert
- A mean rating at for each parameter, across all the participating experts, has been used as the Experts' Rating (E-R) which represents the importance attached to a parameter.
- For example, if an elephant is exposed only to natural flooring, the animal receives a rating of 8 and for entirely unnatural flooring the value is 0; if animal is exposed to both natural and unnatural flooring, the value is 4 (as 8+0/2= 8/2= 4). If an elephant is exposed to a natural water source, such as a river, it receives a value of 9; if the source of water is large lakes or reservoirs, it gets 4.5. A value of 3.5 is assigned for small water bodies like tanks and ponds. Tap water (running) gets 2.5 and if only buckets, pots, and tankers are in use, then the allocated value is 0.5.
- Elephants were visited on the ground; data for each parameter was collected by direct observations or with the interviews of people associated the animal. Mean Rating (M-R) was calculated for a given parameter, along with its sub-parameter.

Thus the Mean Rating (M-R) denotes welfare status of existing conditions on the ground for the particular parameter.

- In this investigation, variables which represent a common feature of the captive condition have been grouped to form a parameter. For example, the variables shelter type, shelter size, floor type in the shelter; all represent different aspects of the physical space provided to the elephant. Hence, they are grouped together to form the parameter "Shelter" and each constituent variable is a sub-parameter. In this investigation, the E-R for a parameter (say, shelter) represents the mean of E-Rs across all related sub-parameters. M-R is also based on similar lines.
- E-R and M-R for each of the regime here represent the average across related parameters observed for the regime. For instance, E-R / M-R for a parameter "shelter" represents the average of related parameters (termed sub-parameters) such as type, flooring, size, and shade availability.
- Results have been presented comparing E-R and M-R as a means of comparing the extent of deviation present in the parameters observed. The difference between E-R and M-R (expressed as percentage) indicates deviations from the prescribed norm.
- For handlers, the difference between expert rating (E-R) and existing status (M-R) have been used to indicate the professional/ socio-economic status of value to the handler and his elephant.

Result

Data was collected for 47 elephants (31 males, 15 females, and one calf -unknown sex) belonging to two Forest camps (FC): Mudumalai FC, Mudumalai and Anamalai FC, Pollachi, Tamil Nadu. Male elephant age ranged from 3 – 62y, while female age ranged from 0.2 – 71y (Figure 2).

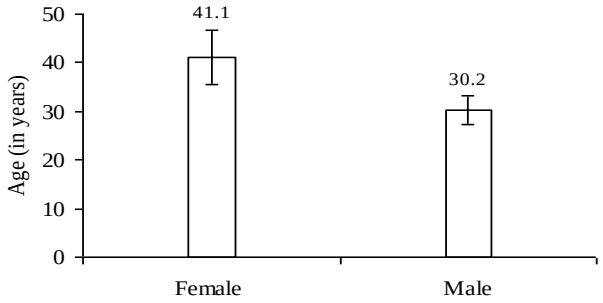
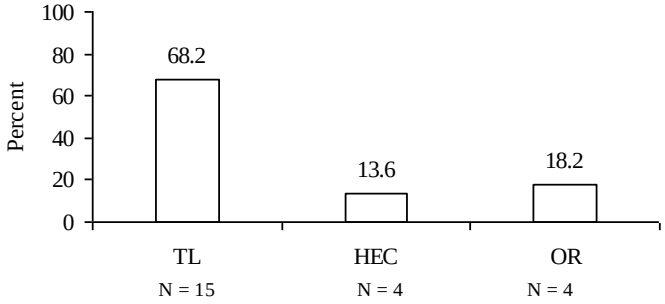


Figure 2: Mean age of FC elephants

Source of elephants

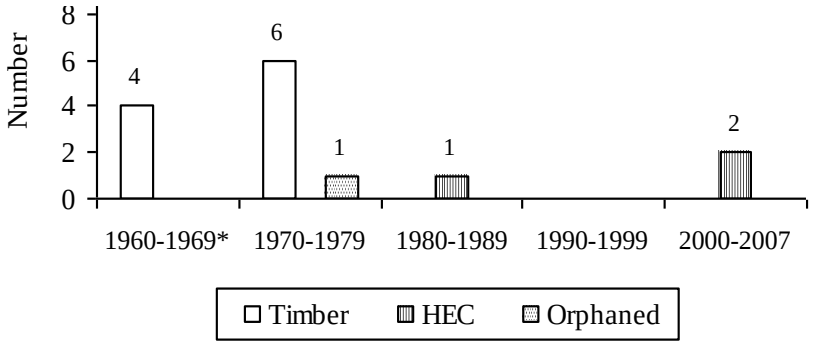
Twenty-eight elephants had been captured from the wild, while 14 were captive born within the FCs, three were rescued/ orphaned and two had been received from temples. A cause of greater stress would be the capture of wild elephants. Hence, this parameter was rated. Mean rating (M-R) was 2.0 (SE = 0.41, N = 45) with a deviation of 66% being observed from the Expert's rating (E-R).Conditions to which the captive elephant is

exposed to may change following transfer across locations/ institutions (Figures 3a and b).



TL: Timber logging HEC: Human-elephant conflict OR: Orphaned

Figure 3a: Reasons for capture from wild



*: includes data from 1958 also
HEC: Human-elephant conflict

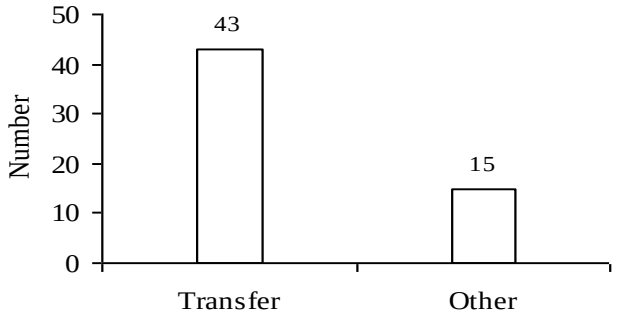
Figure 3b: Reason for capture from wild (year-wise distribution)

Purpose of keeping

Use of elephants for work and consequent exploitation of the animals may be associated factors (Kurt and Garai, 2007; Krishnamurthy and Wemmer, 1995). Low rating reflects this philosophy of overexploiting captive elephants at the cost of their welfare. M-R was 8.0 (SE = 0, N = 45) implying no commercial interest in the elephants. 100% congruence was observed with E-R for this parameter.

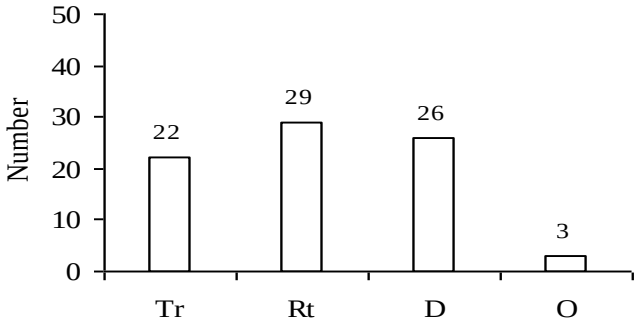
Change of mahouts/ cawadis

Frequent change of handlers may have a negative effect on the elephant, as each change is accompanied by breakage of a bond between mahout and elephant (Panicker, 1998). FCs showed a range in the number of handler changes (figure 3a and b): from 0 – 8 per animal. M-R was 4.2 (SE = 0.4, N = 42) with a deviation of 47% from E-R (Figures 4a and b).



(Other: Trainees) Transfer in first bar (of graph) refers to mahout

Figure 4a Reason for change in mahout per elephant



Tr: Transfer Rt: Retired D: Death O: Others
Other: Transfer of elephants/ death/ calves growing up/ calves being brought in)

Figure 4b: Reason for mahout working with more than one animal

Shelter

- All the FC elephants were maintained in natural conditions with an adjacent protected forest area with access to natural shade (Figures 5a, b, c, d, e and f).
- When the elephants were tied at night, they were kept in the open with earthen flooring.

a

b

c

d

e

f

Figures 5a, b, c, d, e and f: Shelter and associated parameters provided to elephants in forest camps. Forest cover around the camp for free grazing (a, b and c).Elephant carrying fodder to the forest camp (d) animals assembled for stall fed at the camp site(note earthen floor-e and f).

Attributes of the living space forms an important part of a captive elephant's life with unsuitable flooring/ absence of shelter affecting the animal. M-R was 7.4 (SE= 0.3, N = 6) with a deviation of only 8% from E-R being observed (Figure 6a and b).

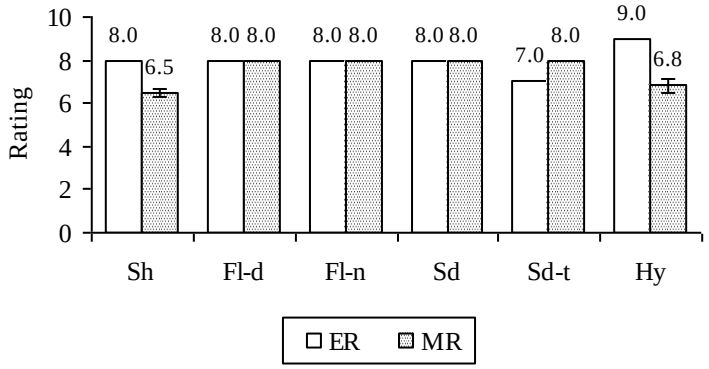
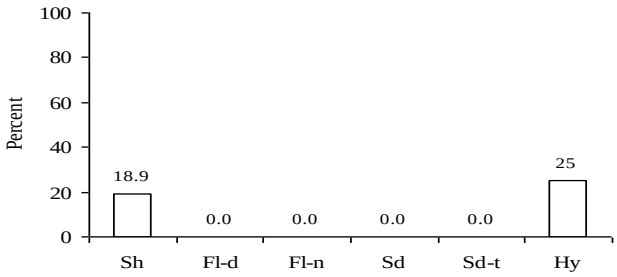


Figure 6a: Comparison of M-R and E-R for 'shelter' sub-parameters



Sh: Shelter Fl-d: Flooring (day)
Fl-n: Flooring (night) Sd: Shade availability
Sd-t: Shade type Hy: Hygiene maintenance

Figure 6b: Percentage wise deviation from E-R for 'shelter' sub-parameters

Water and its use by elephants

- All the elephants had access to a river within close distance of the camp.
- The elephants drank 3-4 times/ day (from 36 – 80 liters per day)
- Water was tested annually, for quality in Mudumalai only; the river in Mudumalai was said to be polluted by sewage; quantity available for use was less in summer.
- The elephants were bathed twice a day in the river for 0.5 – 1.5h using "thalai" brush (Mudumalai) or nylon brush (Anamalai-Figures 7a, b, c, d, e and f)

a

b

c

d

e

f

Figures 7a, b, c, d, e and f: Status of water and scope for bathing in the forest camp.

Availability of running water, accessibility to the elephants when it needs to drink/ bathe, conducting tests of water quality was evaluated. M-R was 5.8 (SE= 0.8, N = 8) with a deviation of 22% from E-R (Figure 8a and b).

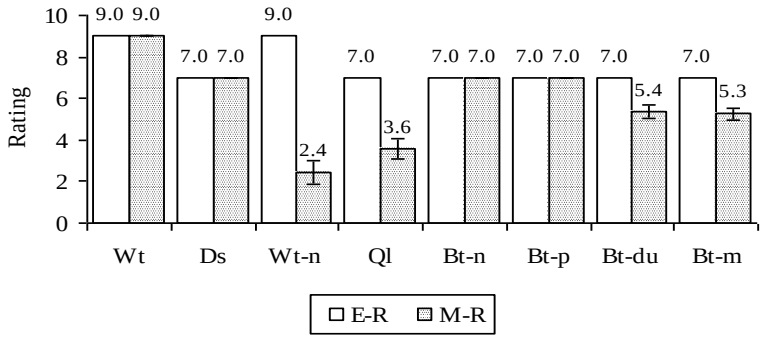
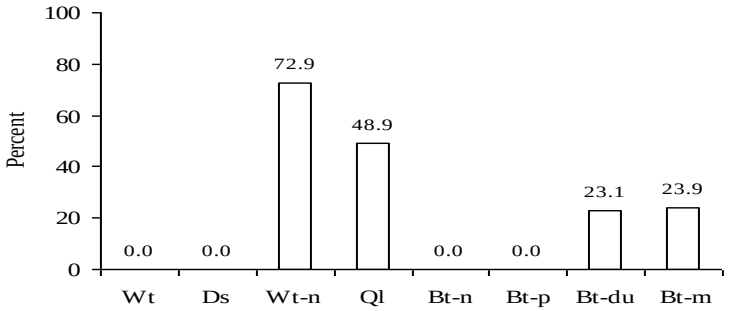


Figure 8a: Comparison of M-R and E-R for 'water' sub-parameters



Wt: Availability of perennial source of running water
Ds: Distance to water source
Wt-n: Number of times they drank water
Ql: Water quality tests
Bt-n: Bathed (number of times)
Bt-p: Bathing place
Bt-du: Bath duration
Bt-m: Bathing materials

Figure 8b: Percentage wise deviation from E-R for 'water' sub-parameters

Sleep

- Females with their calves were allowed to free range in the surrounding forest. Males were tied with 10m chains near the camp. It should, however, be noted that the practice of chaining males has been discontinued at the time of writing this report
- Sleep duration ranged from 1-4h at night

Adult elephants sleep for 3-4h at night (Kurt and Garai, 2007), with infants sleeping in the day/ night. The opportunity to free range in forest conditions enables the animals to select suitable space/ time for this activity. Rating has been designed to reflect this aspect of their biology. M-R was 5.9 (SE=1.2, N=3) showing a deviation of 26% from E-R for this parameter (Figure 9a and b).

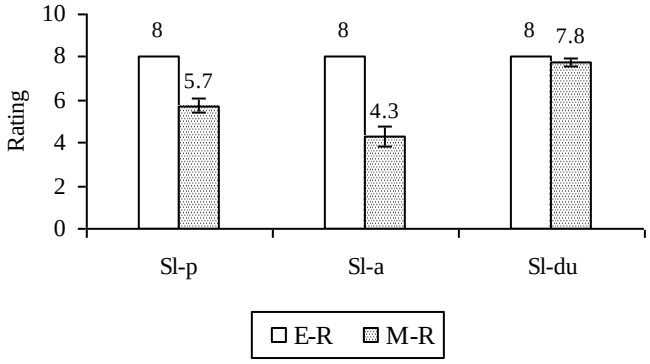
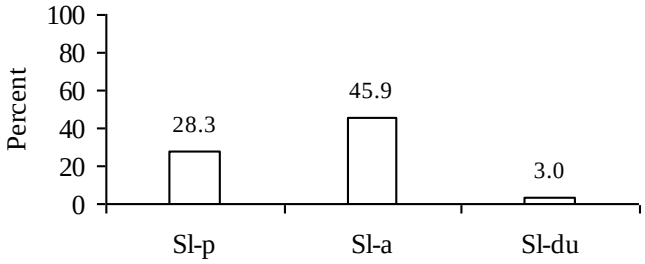


Figure 9a: Comparison of M-R and E-R for 'sleep' sub-parameters



Sl-p: Sleeping place Sl-a: Sleeping area Sl-du: Sleep duration

Figure 9b: Percentage wise deviation from E-R for 'sleep' sub-parameters

Walk

- All the elephants were walked within the camp site and in the surrounding forest
- Time of walk ranged from 9:00a.m. to 4p.m. and 6p.m. to 7a.m.; orphaned infants: 7:30a.m., 11:30 a.m. and from 3:00 p.m. to 5:00 p.m.

Wild elephants are said to be active for nearly 80% of a day (Kane, et al., 2005), foraging across several kilometers. Keeping this in context, walking was rated for captive elephants. Opportunity to walk on suitable terrain (natural/ earthen/ across varied habitat) was given high rating. Deviation from E-R was 0% for the sub-parameter 'walk' and 38% for the sub-parameter 'Time of walk' (Figure 10).

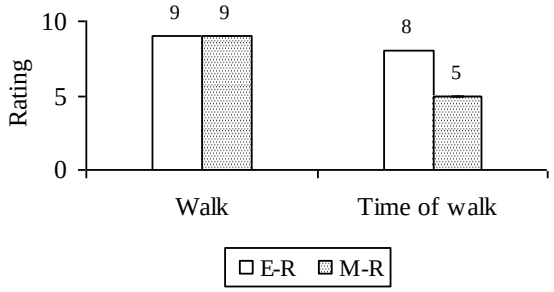


Figure 10: Comparison of M-R and E-R for 'walk' sub-parameters

Social interaction

- All, except three, elephants were given opportunity to interact; one adult male, a 4 year old male and an orphaned infant female were not allowed interaction
- Interaction time varied from 2 – 24h
- Number of individuals ranged from 1-20
- The animals were within touching distance
- Each FC had three mother-offspring pairs; the number of related individuals across both camps was nine (Figures 11a, b, c, d, e and f)

a

b

c

d

e f

Figures 11a,b,c,d,e and f: Social interactions available for elephants in forest camps; Social play (a), adult male and female interaction (b and c), calf with mother and other adult females (d), adult male interacting with two adult females(e), three females together (f).

The complex set of interactions in elephant society is well-known (Sukumar, 2003, Poole and Moss, 2008). Opportunity to interact with other elephants in groups including a combination of age/sex was given high rating. M-R was 6.4 (SE=0.8, N=4) showing a deviation of 18% from E-R (Figure 12a and b).

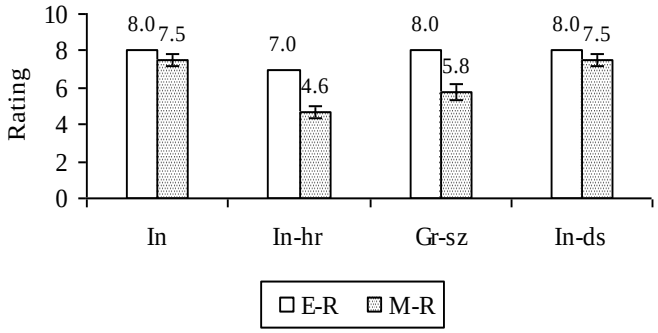
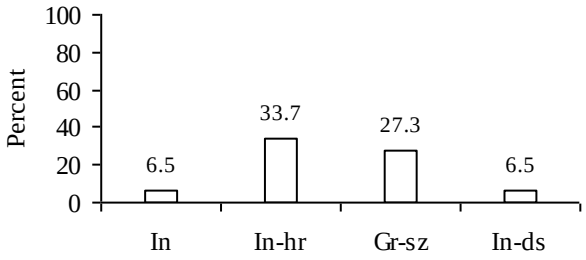


Figure 12a: Comparison of M-R and E-R for 'social interaction' sub-parameters



In: Opportunity for interaction In-hr: Interaction hours
Gr-sz: Group size In-ds: Interaction distance

Figure 12b: Percentage wise deviation from E-R for interaction sub-parameters

Observed behaviour

- Sixty three percentages of the elephants were described as quiet/ reliable with 35% said to be undependable/ nervous/ easily frightened
- 35% of the elephants had exhibited aggression toward people (all males)
- 24% elephants exhibited stereotypic head bobbing movement (of low to medium intensity)

Captivity enforces conditions which prevent independent exercise of choice by the elephants, dependent as they on their human benefactors for many resources/ time (Bradshaw, in press). Deviations from normative behaviour in the wild have been observed in captive situations. The manageability of elephants in terms of their temperament, occurrence of aggression/ stereotypy has been rated.M-R was 4.8 (SE=0.5, N=4) for stereotypic behaviour with a difference of 42% from E-R being observed and M-R for the intensity of such behaviour was 4.3 (SE= 0.9, N = 4) with a deviation of 48% from E-R (Figure 13a and b).

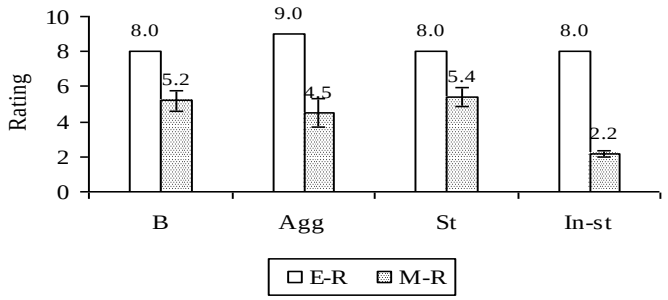
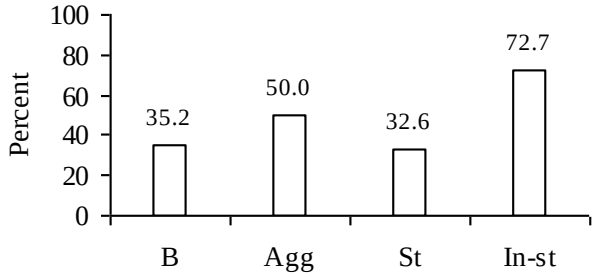


Figure 13a: Comparison of M-R and E-R for 'behaviour' sub-parameters



B: Observed behaviour Agg: Aggression towards people
St: Stereotypic behaviour In-st: Intensity of stereotypy

Figure 13b: Percentage wise deviation from E-R for 'behaviour' sub-parameters

Work

- Fifty seven percentages of the elephants were not used for any work (11 females, 15 males)

- Work timings ranged from 7a.m. to 9a.m./ 8a.m.-11a.m. to 4p.m. to 6p.m./ 3p.m. to 5 p.m. with variation according to summer / winter
- Work type involved carrying tourists/ as Kunkie/ carrying firewood/ its fodder/ weed removal
- For safari (tourist ride) elephant carried four people, two trips/ day
- Howdah made of Jute bags filled with grass with iron rods attached to it. Castor oil applied as a lubricant to the metal attachments
- Forest shade available, water from river was accessible and rest provided during work (duration not specified-see Figures 14 a, b, c, d, e and f)

a

b

c

d

e

f

Figures 14 a, b, c, d, e and f: Different type of work given to elephants in forest camps, carrying night fodder 9a), carrying tourists (b), carrying log and bamboo (e and d), working as a kunki (c) and removal of lantana weed (f).

Making elephants perform unnatural activities such standing in one place for long durations/ playing with sports equipment such as balls may not be strenuous. They are, however, alien to the natural repertoire and may have negative effects, in the long term, on the animal's body. Nature of work, timings, availability of rest/ food and water was evaluated. M-R was 6.0 (SE= 1.3, N= 7) showing a difference of 25% from E-R (Figure 15a and b).

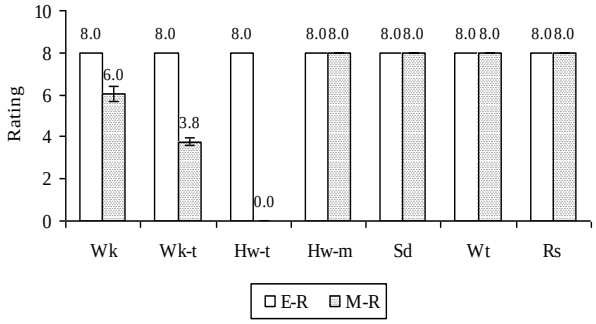
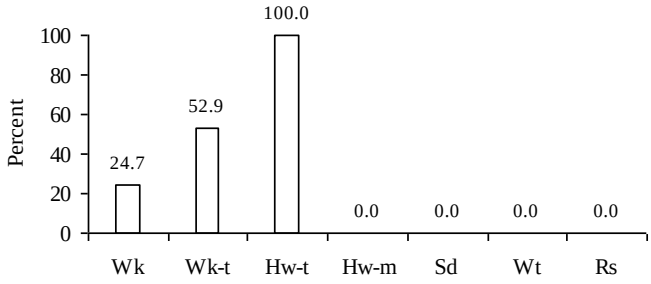


Figure 15a: Comparison of M-R and E-R for 'work' sub-parameters



Wk: Work type Wk-t: Work timing Hw-t: Howdah type Hw-m: Howdah maintenance
Sd: Shade availability Wt: Water availability Rs: Rest availability

Figure 15b: Percentage wise deviation from E-R for 'work' sub-parameters

Food

- All elephants, except for the orphaned female infant elephant, were allowed to free range
- Orphaned infant female calf fed 14 times/ day, every 2 hours
- Feeding site for Mudumalai camp was reported to be lacking in hygiene, as it was not cleaned often
- Stall feed included: Ragi (*Eleusine coracana*), Horse gram (*Dolichos biflorus*), Rice (*Oryza sativa*), Coconut (edible part of *Cocos nucifera*), Salt, Jaggery (Sweet extract from sugarcane), mineral mix, sugar cane (*Saccharum* sp.), bamboo (Bambuseae tribe) leaves; mineral mix not provided for Anamalai FC elephants
- Except for one male, none of the elephants were reported to have raided crop fields
- Ration chart used in both camps (Figures 16a, b, c, d, e and f)

a

b

c

d

e

f

Figures 16a, b, c, d, e and f: Different type of food provided to elephants in the camp; display of different type of food items given to the elephant (a, b and c) carrying leaves as night fodder (d), feeding signs of captive elephants, reported near forest camp (e and f).

Wild elephants feed on a variety of plants (Sukumar, 1991), a range difficult to duplicate while providing only stall feed. Hence, free-ranging opportunity to browse/ graze in habitat with diverse vegetation has been considered. Types of stall feed have also been evaluated. M-R was 6.2 (SE= 1.2, N = 5) with a deviation of 22% from E-R Figures 17a and b).

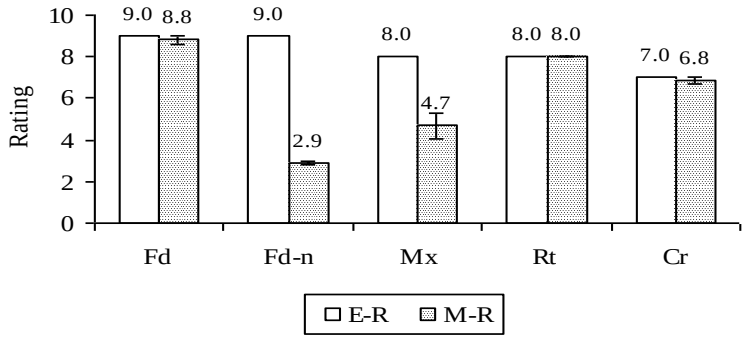
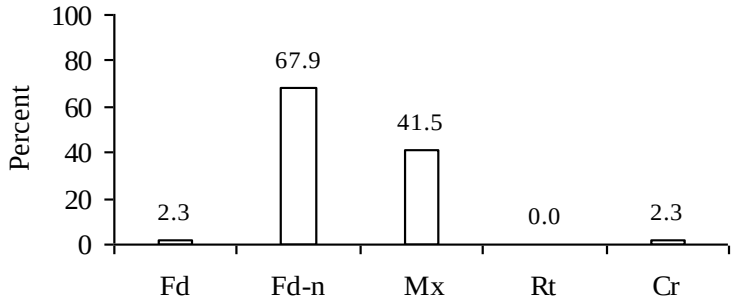


Figure 17a: Comparison of M-R and E-R for 'food' sub-parameters



Fd: Food provisioning type Fd-n: Number of food items
Mx: Mineral mix given Rt: Usage of ration chart
Cr: Crop raiding

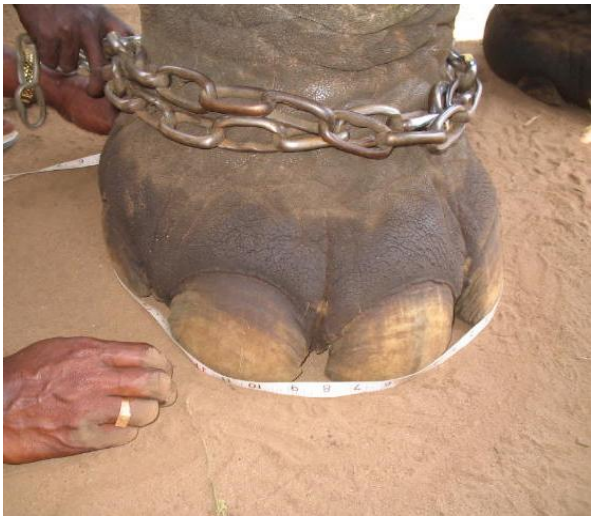
Figure 17b: Percentage wise deviation from E-R for 'food' sub-parameters

Chaining

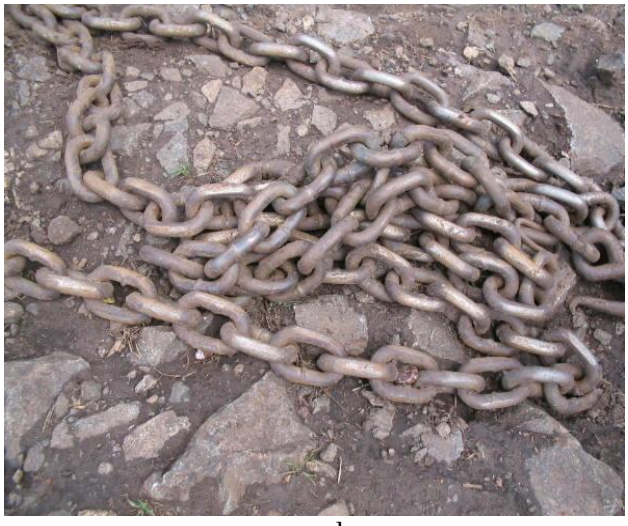
- 77% of elephants (all males) were chained at night with chain weighing 150Kg, of size 16mm and length of 15m. Female elephants were left in the forest with a drag chain; Poole and Taylor (1998) report tethering/ chaining for Mudumalai FC elephants for around 6h. The practice of chaining males at night has since been discontinued ((Figures 18a, b, c and d)
- All elephants, except calves, were tied by both their forelegs

a

b



c



d

Figures 18a, b, c and d: Chaining of elephants in forest camps: Drag chains used for different age classes of males (a and b), Examples of leg chain used (c) and other type of chain used in the camp (d).

Captive elephants are subjected to the practice of being chained as a form of management. Gruber et al., (2000) have shown an increase in the frequency of stereotypic behaviour exhibited among chained elephants when compared to those in paddocks. M-R was 2.3 (SE= 1.7, N = 3) showing a difference of 71% from E-R (Figures 19a and b)

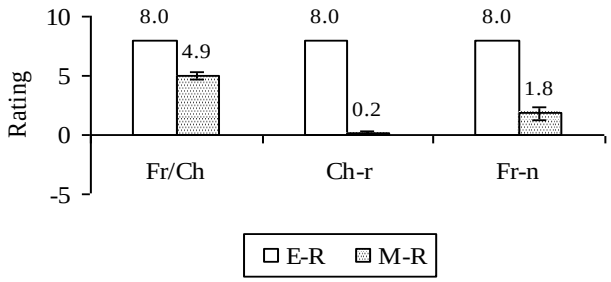
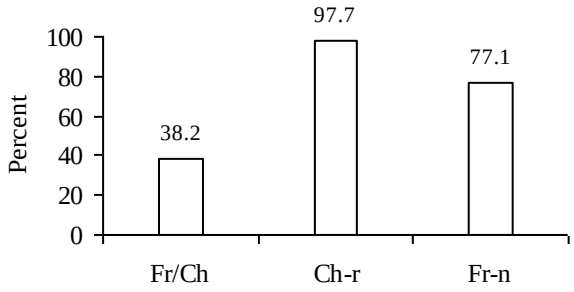


Figure 19a: Comparison of M-R and E-R for ‘chain’ sub-parameters



Fr/Ch: Free-ranging/ chained Ch-r: Chaining region on elephant's body
Fr-n: Free-ranging opportunity at night

Figure 19b: Percentage wise deviation from E-R for 'chain' sub-parameters

Reproductive status

- Cycling status was not known for six adult females while it was said to occur for the other six
- Exposure to both wild and captive males was reported
- Two adult females had not given birth, despite occurrence of oestrus cycles/ mating
- Abortion of foetus was reported for two adult females, another had produced still-born calves
- Each FC had three mother-offspring pairs; the number of related individuals across both camps was nine (Figures 20a, b, c and d).
- Except for two adult males, all others were reproductively active
- Seven adult males had not sired offspring
- Three adult males were not in musth
- Among males exhibiting musth, 14 were said to be unpredictable during this period
- Handling of musth elephants: isolation and chaining; two elephants had injured people while in musth
- All elephants with post-musth problems reported infection/ injury of the leg

Normal reproductive functioning was observed among physically healthy elephants (Kurt and Garai, 2007). Absence of normal reproductive behaviour was associated with social isolation/ other stress inducing factors (Clubb and Mason, 2002). The rating was designed to represent the social environment associated with pre and post reproduction: presence of individuals of opposite sex/ observations on mating/ presence of cows during parturition/ occurrence of musth and related factors.

a

b

c

d

Figures 20a, b, c and d: Examples of different adult females who act as reproductive individuals and their calves.

M-R for female reproductive status was 6.3 (SE= 0.7, N= 6) showing a deviation of 15% from E-R.M-R for male reproductive status was 3.5 (SE= 1.4, N= 6) with a difference of 57% being observed from E-R (Figure 21a, b, c and d).

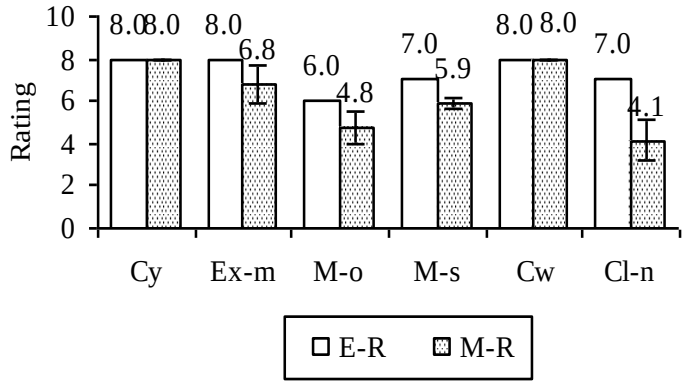


Figure 21a: Comparison of M-R and E-R for 'female reproductive status' sub-parameters

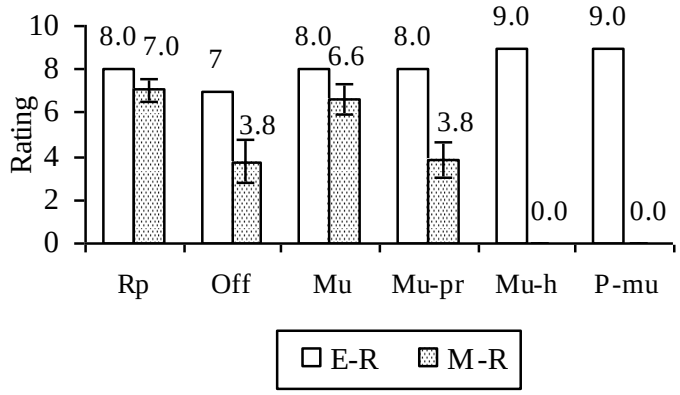


Figure 21b: Comparison of M-R and E-R for 'male reproductive status' sub-parameters

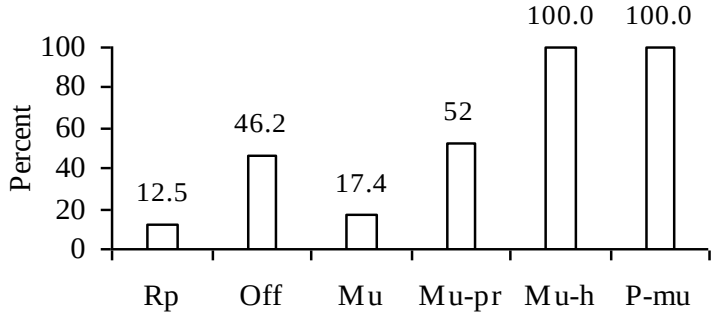
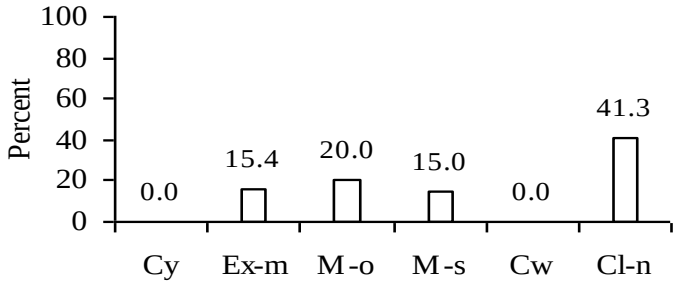


Figure 21c: Percentage wise deviation from E-R for male reproductive status



Cy: Cycling status Ex-m: Exposure to males
Rp: Reproductively active/ not Off: Offspring sired
M-o: Mating observation M-s: Male source
Mu: Occurrence of musth Mu-pr: Behavioural problems
Cw: Presence of cows Cl-n: No. of calves born
Mu-h: Handling of musth P-Mu: Post musth problems

Figure 21d: Percentage wise deviation from E-R for female reproductive status

Health status and veterinary routines

- Two adult females, both > 50y, reported to be blind in one/ both eyes
- Occurrence of diarrhoea observed in some elephants, anemia in one elephant
- All elephants said to be dewormed (both FCs), regularly for Mudumalai FC
- Mudumalai elephants immunized against Anthrax once a year
- Mudumalai FC elephants subjected to oiling of cuticle/ nails twice a day
- Dung and urine analysis done for Mudumalai elephants once a year (urine analysis, dung- twice a year)
- Weight taken once in three months and body measurements once a year for Mudumalai FC elephants

The occurrence of foot problems among captive elephants is a major health issue (Mikota, et al., 1994). Krishnamurthy and Wemmer (1995) noted the occurrence of stomach disorders/ diarrhoea during a 30y period among timber elephants in Top Slip. In addition, diseases such as tuberculosis/ herpes virus infection can be contracted in captivity with fatal consequences. Scheduled practice of veterinary routines can act as a preventive measure. M-R was 7.0 (SE= 0.3, N=12) indicating a difference of 6% from E-R (Figure 22a and b).

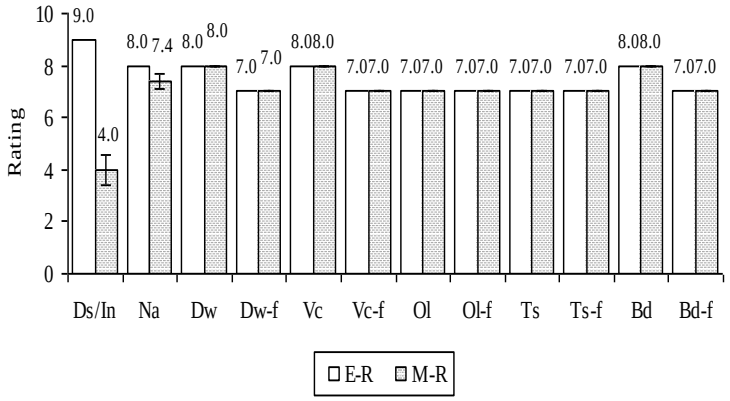
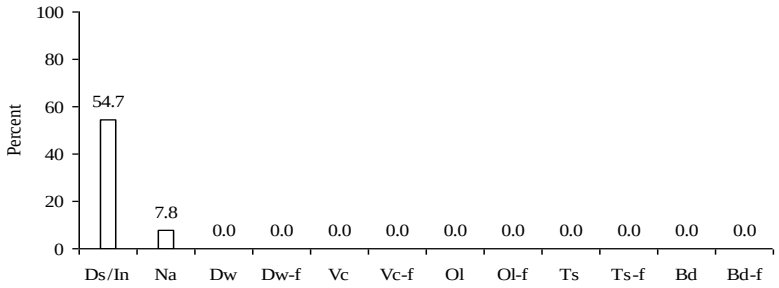


Figure 22a: Comparison of M-R and E-R for 'health and veterinary' routine sub-parameters



Ds/In: Disease/ injury occurrence — Na: Nature of disease/ injury
Dw: Deworming status — Dw-f: Frequency of deworming
Vc: Vaccination status — Vc-f: Frequency of vaccination
Ol: Oiling status — Ol-f: Frequency of oiling
Ts: Dung/ urine/ blood sample tests — Ts-f: Frequency of tests
Bd: Body measurements taken — Bd-f: Frequency of body measurements

Figure 22b: Percentage wise deviation from E-R for 'health and veterinary' routine sub-parameters

Veterinary personnel and infrastructure

- Each FC had access to a veterinary doctor with 5-7 years experience in handling elephants
- The doctor with Mudumalai FC was at the camp itself, hence visits were daily. For Anamalai FC, the doctor was on call, located 100 Km from the camp site
- Mudumalai FC had two veterinary assistants while none were available for Anamalai FC
- Dispensary with basic veterinary equipment was available at Mudumalai FC, not available in Anamalai FC
- Health/ service/ other records were maintained at both camps
- Other facilities such as cooking shed/ vessels/ camp site/ kraal were available with their status varying from moderate to good across both camps (Figures 23 a, b, c and d)

a

b

c

d

Figures 23 a, b, c and d; Veterinary facilities available in different camps. Veterinary doctors on duty in two different camps (a and b) and veterinary surgeon's office, clinic and the equipments used(c and d).

Availability of timely health care with good infrastructure is an important part of a captive elephant structure. M-R was 5.7 (SE= 0.5, N = 15) showing a deviation of 29% from E-R (Figure 24a and b).

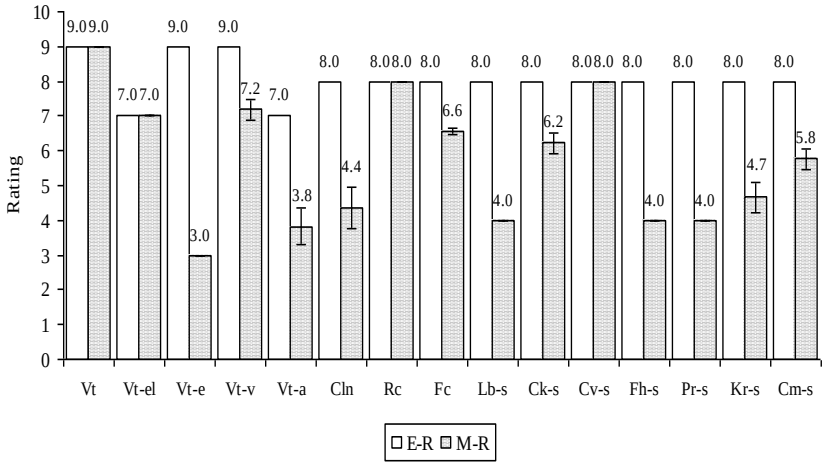
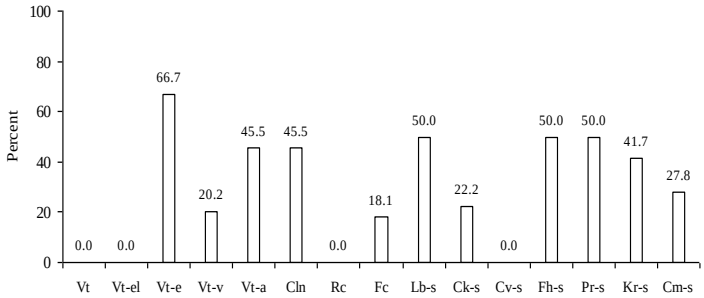


Figure 24a: Comparison of M-R and E-R for 'veterinary personnel and infrastructure' sub-parameters



Vt: Availability of veterinary doctor Vt-el: Veterinarian's experience with elephants
Vt-e: Veterinarian's years of experience Vt-v: Visits by doctor
Vt-a: Availability of veterinary assistant Cln: Availability of clinic facility
Rc: Maintenance of records Fc: Facilities available
Lb-s: Status of laboratory facility Ck-s: Status of cooking shed
Cv-s: Status of cooking vessels Fh-s: Status of food preparation hall
Pr-s: Status of provision shed Kr-s: Status of kraal
Cm-s: Status of camp site

Figure 24b: Percentage wise deviation from E-R for 'health and veterinary' routine sub-parameters

Professional experience and socio-economic status of handlers

Mahout/ cawadis are an integral part of a captive elephant environment in a system which involves free contact with the animals. Mean age of the handlers was 37.9y (SE= 1.2, N= 71), with age ranging from 18-55y.

Professional experience

- Mean experience in the profession was 13.4y (SE= 1.3, N= 71), ranging from 0.5 to 37y
- Mean experience with a specific camp elephant was 6.3y (SE= 0.9, N= 69), ranging from 0.3 – 35y

- Most handlers had chosen this profession as it was a traditional occupation with a few joining out of interest
- All the handlers had been trained by experience
- Knowledge of commands was said to be good

Professional experience has a direct effect on the way elephants are handled. This parameter has been rated considering the mahout/ cawadi's experience in this profession/ with a specific elephant, knowledge of commands and other relevant features. M-R was 6.9 (SE= 0.1, N= 422) showing a deviation of 24% from E-R (Figure 25a and b).

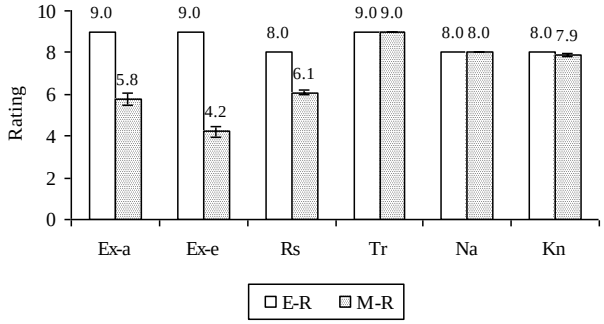
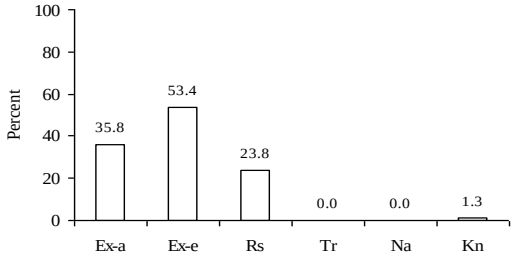


Figure 25a: Comparison of M-R and E-R for 'professional experience' of handlers



Ex-a: Experience (as % of handler age) Ex-e: Experience (as % of elephant age)
Rs: Reason for choosing this profession Tr: Training status
Na: Nature of training Kn: Knowledge of commands

Figure 25b: Percentage wise deviation from E-R for 'professional experience' sub-parameters

Socio-economic status

- All handlers belonged to tribal/ Malasar community (Figures 26 a, b, c, d, e, f, g and h).
- Most handlers reported handling elephants as a family occupation
- Eighty percentages of handlers had studied up to / less than the 5th standard. Only two had studied upto the 10th
- Mean wage was Rs.51,591/- annually, ranging from Rs.14,400/- to Rs. 1,22,424/- one lady mahout worked voluntarily
- Number of children ranged from 0 -8 per family

- Only 36% of the mahouts/ cawadis were insured, with self as the source of funding
- Only four mahouts had been reported for bad conduct (from a total of 71)
- Each handler had worked with a mean of three elephants (ranging from a change of zero to nine elephants) with 30% said to have been attacked by elephants
- Handlers of 43% were said to consume alcohol with most reported to be drinking after work and only one drinking once a month

a

b

c

d

e

f

g

h

Figures 26 a, b, c, d, e, f, g and h: Mahout of different age classes in Mudumalai (a), Malasar community mahout in Anamalai (b) Houses of two different communities (c and d),women from mahout family depending on the river (e), school for mahout children within one camp site (g) and mahout children playing (h).

Handlers' welfare has to be considered as this aspect is important on its own, also poor welfare and poor handling of animals maybe interlinked. M-R was 4.7 (SE= 0.1, N = 722) indicating a deviation of 32% from E-R (Figure 27a and b).

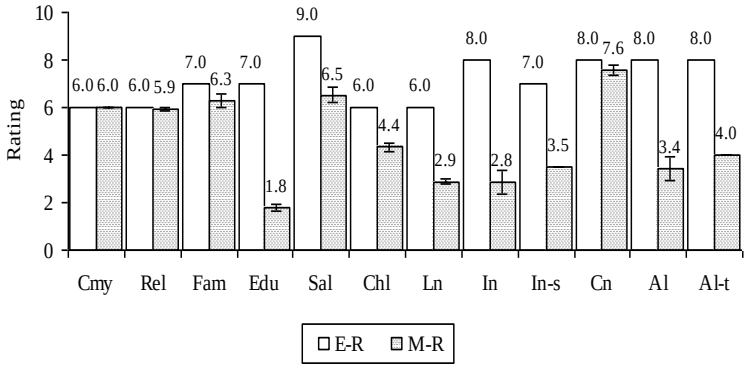
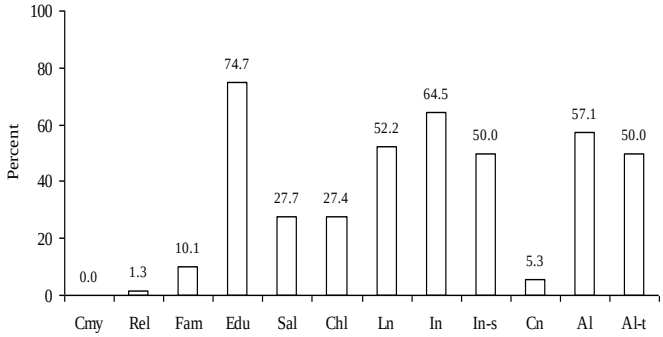


Figure 27a: Comparison of M-R and E-R for 'socio-economic' status of handlers



Cmy: Community Rel: Having mahout relatives
Fam: Family occupation Edu: Education level
Sal: Salary drawn Chl: Number of children
Ln: Languages known In: Insurance cover availability
In-s: Insurance source Cn: Bad conduct
Al: Alcohol consumption Al-t: Timings of consumption

Figure 27b: Percentage wise deviation from E-R for 'socio-economic' status sub-parameters

Distribution of Percentage wise deviation from E-R across all parameters

Eighty-five parameters were observed, representing 62% of all the parameters rated by the experts. Overall M-R was 5.9 (SE= 0.05, N= 2855) showing a deviation of 24% from the overall E-R (Figure 28) Deviations less than 40% from E-R accounted for 69% occurrence among all differences observed. The availability and access to forest areas in the presence of conspecifics, with opportunity to interact and free range, ought to provide basic framework for a suitable captive environment. This was available for both FCs.

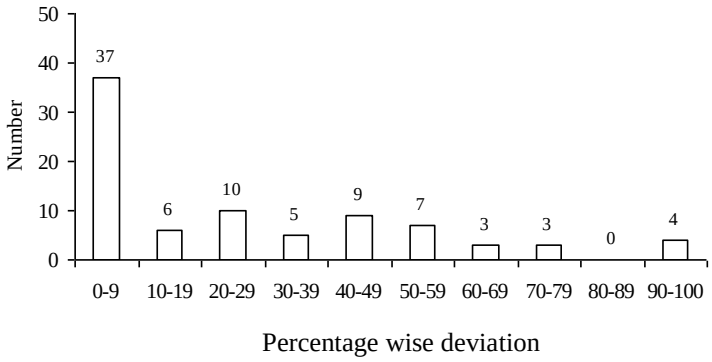


Figure 28: Distribution of Percentage wise deviation from E-R across all parameters

Discussion

Acknowledging the physical vigour, mental ability and social complexity of elephants, Kane et al., (2005) states the need to maintain elephants in captivity based on their individual needs as well as on the species' natural history. The knowledge gained from studies on wild elephants can be used as reference to show the deviations experienced by captive elephants and use this as an indicator of welfare status. On one hand, the conditions provided in the FCs are near ideal: forest areas, free ranging opportunity, access to conspecifics and minimum or no work. However, some areas which need greater application are:

- Transfer of calves from their natal herd: most adult female elephants in both camps have given birth to at least one calf. Taylor and Poole (1998) estimated birth of one live young every 7.7y for Mudumalai FC and a mortality of 11% of total births (upto 10y) inclusive of stillbirths. With reproductive success, the number of elephants should have increased along with occurrence of related individuals. But, the number of related individuals within a group is relatively less, implying shifting/ separation of animals.

  Gadgil and Nair (1984) observed two adult females, unrelated, rush to the rescue of a calf on hearing its alarm call— in a FC in the state of Karnataka. The authors opine that separating young animals for training can be traumatic for all the animals concerned.

  Clubb and Mason (2002) cite several authors stating the negative effects of shifting of elephants which may lead to breakage of established bonds/ conflict within the new herd. The elephants: Pari (male, born to a resident camp elephant, Valli) and Aswini (female, adult) were shifted to Vandalur zoo in the state of Tamil Nadu from Anamalai FC.
- Chaining elephants using shackles on both forelegs: Kurt and Garai (2007) mention the deleterious effects of chaining elephants in terms of physical injury to the animals. Incidentally, all the post-musth injuries are related to the leg, possibly a consequence of chaining the elephants
- Mahout change: frequent change of handlers may be a source of stress (Clubb and Mason, 2002). The most frequent reason in the FCs for change in mahout was

transfer of mahout either due to retirement or due to change in allocation of elephant

- Transfer across institutions: The transfer of a female elephant, Thayalnayaki (36y) from a temple to Anamalai FC resulted in infection of resident FC elephants with tuberculosis as Thayalnayaki died following TB infection

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Section 3:
Demography Status of Asian Elephants (*Elephas maximus)* in Captivity of Tamil Nadu Forest Camps

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Introduction

Asian Elephants (*Elephas maximus)* are an endangered species struggling for their survival both in wild and captivity. Asian elephants were probably the first to be tamed about 4,000 years ago by the people of the Indus Valley civilization [Carrington, 1959]. Since that time, the animal has played a pivotal role in the religious, cultural, political, and economic life of the peoples of Asia (Sukumar *et al*., 1997). Loss of habitat and large scale capture in the past for domestication has resulted in the decline of Asian elephant population in the wild. For instance, during the past century alone, up to 100,000 elephants may have been captured from the wild all over Asia (Sukumar, 1989). There are about 50,000 elephants remaining in the wild and about 15,000 elephants in captivity throughout the country (Sukumar *et al*., 1997). This figure was revised by Bist *et al*., during 2001 he stated that about 3,400 to 3,600 elephants were kept in domestication in 24 states in the country. Historically, stocks of captive elephants have been maintained almost entirely through replenishment from the wild. Reproduction in captivity was negligible, with the result that rulers had to resort regularly to obtaining elephants from wild populations (Sukumar *et al*., 1997). Most of the captive elephants in India have been with temples, zoos, timber camps, nature reserves and private owners. The proper maintenance and breeding of captive elephants is important for the conservation of the species.

The management and husbandry of elephants in temples and private owners has been marked by deficiency of health and veterinary care, and maintenance of elephants in social isolation. This has consequences on the psychology and behaviour of the elephants. In the wild, elephants exhibit a matriarchal social structure. This social structure has been of key importance in the evolution of the behavioral repertoires exhibited by males and females, which includes helping behavior. According to Schults (2000) elephant society is characterized by a high degree of social facilitation demonstrated through allomothering, cooperation among adults, and interest in ailing individuals. This social structure will help to take care of offspring; offspring form the integrating component of elephant society and is the focus of cooperation and interaction.

A healthy (physically and psychologically) captive population can be maintained by providing features important to the elephants' biology and behaviour. Such an environment can be found in forest camps which are situated in and around protected areas and within which a naturally occurring wild elephant population occurs. Such camps also maintain elephants of both sexes and across age groups. Elephants in forest camps are kept together and also let out for foraging in the forest, which enables the elephants to get adequate food and socially interact with other animals.

For conserving species in captivity, it is important to know not only the number of animals in the camp, it is important to know how many viable breeding females there are in the camp and at what rate they have been breeding (calving interval between two calves of a mother). This can be analysed by looking at demographical parameters such as number of viable breeding females, calves, calving interval for each female and survival rate of calves per female. This would give an idea of the viability of the camp for captive breeding.

An understanding of population demography helps in providing information on the status of the population. In a population with limited number of males/ females, transfer of individual animals to different locations can be damaging. Knowledge of the reproductive status of individual elephants can prevent untoward ill effects of making pregnant animals work. In forest camps, records have been maintained for each of the elephants. This can be used to construct the demographical profile of the camps.

The present study deals with the demographic analysis of two forest camps' viz., Mudumalai Forest Camp and Anamalai Forest Camp in Tamil Nadu. Demographic analysis was done using data from only those elephants which were alive in both the camps because some females who had given birth many times in the past may not be alive. Including those animals' data is meaningless, therefore we are presenting the data of elephants which are alive in both the camps. The present study will provide useful input on the present status of elephants in forest camps of Tamil Nadu. Further this may give an idea for captive breeding of elephants.
Based on above, the objectives were:

1. To study the demography status of captive elephants in the forest camps of Tamil Nadu, fecundity and calving interval of adult females in the camp
2. To identify the number of births in the camp and its survival rate in the camps
3. To identify health status and breeding behavior of camp elephants
4. The effect of transferring female elephants from forest camp to zoo for breeding
5. To provide management suggestions to conserve the captive elephants in the forest camps

Study area:
There are two elephant camps in Tamil Nadu one is Theppakadu elephant camp which is located in Mudumalai Tiger Reserve (erstwhile Mudumalai Wildlife Sanctuary), in Nilgiri district, the other is Varagaliyar elephant camp which is located in Indira Gandhi Tiger Reserve (erstwhile Indra Gandhi National Park) in Anamalai, Coimbatore district.

Materials and methods
Data was collected from both the camps of Tamilnadu viz., Mudumalai or Theppakadu elephant camp and Anamalai or Varagaliyar elephant camp. The elephants are maintained as mixture of adult, sub-adult, juvenile and calf of both sexes. Details of all captive elephants from both the camps were collected from camp studbook year 1997 to 2006. Sukumar *et al* (1997) already have a publication of captive elephants from both the camps; therefore we have collected data after 1997. The present study deals with only present status of captive elephants in both forest elephant camps.

Mudumalai Forest Camp
Mudumalai forest camp is one of the very old elephant camps in the country which has been maintaining elephants for the past 130 years or so (Sukumar *et al*., 1997). These elephants were used for logging operations in the past and taking tourists inside the park. Elephants in this camp are mixed herds consisting of adult females, adult males and calves of different age classes. This camp is now located in two places: one is in

Theppakadu, another one is Bombox, both the camps are located inside the forest and close to the perennial Moyar river. These elephants are let out for free grazing in the forest and provided supplementary food twice a day. The ration of the supplementary food varies depending on the age and it is fixed by the veterinarian of the camp. In this camp, totally 22 elephants of various age and sex class are kept and most of them are males. Out of 24 animals in the camp 17 are males and 7 are females, of which one female is a calf <1 year old. There are four breeding age females and two "senior" females who stopped breeding. Of the four breeding females only two animals are in breeding condition or are breeding regularly. In the case of males, age ranged from 7 years to 54 years.

These elephants are socializing both in the camp and let out for free grazing in the forest. Mudumalai is home to wild elephants as well; about 700 wild elephants are using this forest in different seasons. Thus, captive cows have chances for mating with wild bulls. Sukumar et al (1997) stated that significant number of calves born in captivity have been sired by wild bulls. All the elephants in this camp have details such as date of capture, place of capture, their age when captured, height and weight at the time of capture, etc. Likewise, captive born details such as year of birth, mother's name, sex of calf, place of birth (whether in the camp or inside the forest) height and weight when they were born are also available in the camp stud book. Details such as mortality records of captive elephants are also collected from the stud book.

Varagaliyar Forest Camp

Varagaliyar camp in Anamalai is also an old elephant camp in the state; Anamalai forest was known for its timber operations in the past for which elephants were caught from the wild. In fact, some animals were also transferred from Varagaliyar to Theppakadu for various purposes. This camp is male biased, there are more males than females. All together twenty two elephants in the camp of which nine are females which include a 1year old calf, rest were males. At present only one breeding female (Selvi aged about 47 years, calved six times) is available in the camp. Anamalai is also home to wild elephants, but the density of wild elephants may not be as good as Mudumalai. There are about 400-500 wild elephants using this area for annual and seasonal home ranges. Data was collected from the camp stud book and from interviews with elephant men, forest officials and veterinary officers.

Data Analysis

Details of captive elephants were obtained from the forest camp of Mudumalai and Varagaliyar. The records had details of elephants captured and born in captivity from 19th century. All the data was collected and entered in an MS-Excel file. Details such as elephant name, year of capturing or year of birth, sex of the animals, place of capturing or birth, age of the animals etc., were scrutinized for both the camps. All the data which was collected from both the camps could not be used in the analysis due to various reasons. Some animals captured from the wild, within few months had been transferred elsewhere, therefore we have used data of elephants born in captivity whose date of birth was known, and animals which have been in the camp from 1996 – 2006.

Data was pooled sex-wise, age was estimated from the shoulder height and from fore-foot circumference of the animals (See Sukumar, 1989, Arivazhagan & Sukumar 2008). In the case of adult females, other information such as number of births in captivity for the past 10 year period, age and sex of these calves were noted. For the female fecundity rate, calving interval and sex ratio of calves born in captivity were calculated for overall and individual females. In some cases, sex was not known. Such data was discarded from calculating sex ratio. Table 1 gives the distribution of breeding/non-breeding females in both camps.

Table -1: Female elephants in the Forest camps

	Mudumalai	**Anamalai**
Total females	6	9
Breeding female number	1	1
Beyond breeding age	2	3
Not breeding (young and adults females)	3	5

Results

Age Structure

Age structure of elephants in captivity is completely different from those in the wild because very few breeding females are in captivity, and most them are aged therefore, the age structure is biased towards adults of both sexes. For the present study, we have used data of 46 animals from both the camps. There is a clear difference in the age structure of elephants in both the camps (Figures 1a, b, c, d, e f and g for examples of different age classes found in the camps). In Mudumalai camp, the age structure was derived from 24 captive elephants of various age classes (Table 2). Of these 25% was females, among the 25% of females, only 50% of adult females were of breeding age. The present age structure indicates that there are very few adult females in the camp of which only one female is breeding at present. The present age structure of elephants in Mudumalai camp is not showing any healthy trends.

Table 2: Age structure of elephants in Mudumalai Forest Elephant Camp

Age class (Yrs)	**Female**	**Male**	**Female (%)**	**Male (%)**
0-1 (calf)	1	0	4.2	0.0
1-5 (juveniles)	0	0	0.0	0.0
5-15 (Sub-adults)	0	3	0.0	12.5
15-35 (adults)	2	8	8.3	33.3
35-55 (adults)	1	7	4.2	29.2
>55 (adults)	2	0	8.3	0.0
Total	6	18	25.0	75.0

a

b

c

d

e

f

g

Figures 1a, b, c, d, e, f and g: Examples of different sex and age classes of elephants kept in Forest camps in Tamil Nadu; adult female (a); adult male (b) sub-adult male (c), sub-adult female (d) juvenile female (e), juvenile male (f) and calf (g)

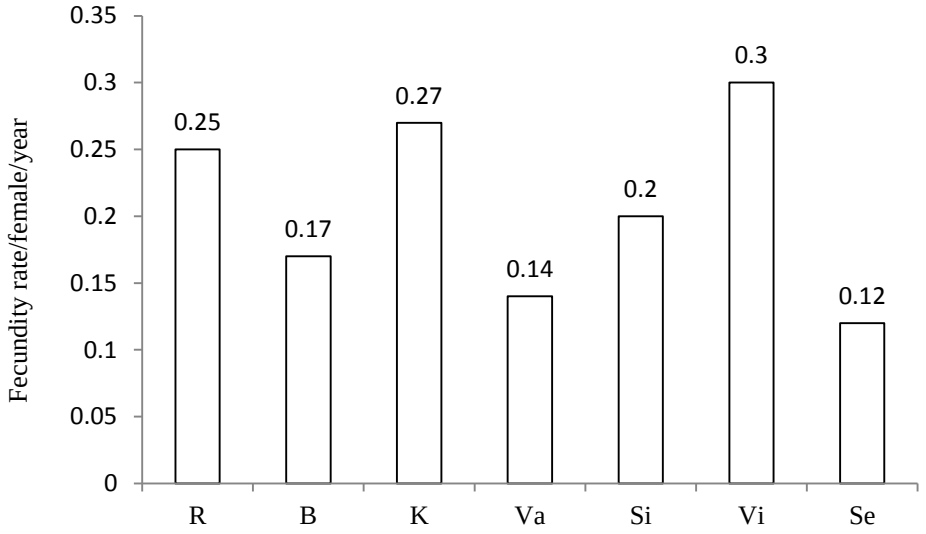
On the other hand, Anamalai has slight difference in the age structure (Table 3). Despite higher occurrence of females (41%) compared to Mudumalai camp (25%), only one female (Selvi) was in breeding condition. She gave birth last in 2005. In Anamalai camp though 5 females in the breeding age class have not calved as yet and it is cause for concern. 'Wilcoxon matched pairs test' was used to test if significant differences existed in the proportions of female or male age classes between both the camps. Though a marginal difference was observed in the female segments, that is not statistically significant ($Z=1.82$, $p=0.06$). Besides though there is high amount of percentage variation observed for males, they are not statistically significant ($Z=1.21$, $p=0.22$) between the camps.

Table 3: Age structure of elephants in Anamalai Forest Elephant Camp

Age class	**Female**	**Male**	**% Female**	**% Male**
0-1 (calf)	1	0	4.5	0.0
1-5 (juvenile)	0	1	0.0	4.5
5-15 (sub-adult)	0	1	0.0	4.5
15-35 (adults)	2	6	9.1	27.3
35-55 (adults)	4	4	18.2	18.2
>55 (adults)	2	1	9.1	4.5
Total	**9**	**13**	**40.9**	**59.1**

Fecundity and Inter-calving interval

Fecundity rate of elephants was calculated from mature females, above 17 years (the mean age at first calving) the fertility rate (births per mature female per year). In total 42 births were recorded from 7 adult females considering both the camps. In Mudumalai camp three adult females (namely Rathi, Bhama and Kamachi) had given birth to 20 calves, and two case of stillborn birth were observed from female Kamachi during 1986 and 1989. The fecundity rate was 0.25, 0.17 and 0.27 were recorded from Rathi, Bhama and Kamachi respectively (Figure 2). In Anamalai camp fecundity was recorded from four adult females namely Valli, Sivakami, Vijayalakshmi and Selvi, the fecundity rate was 0.14, 0.20, 0.25 and 0.12 respectively. The average fecundity rate (calves born per adult female per year) recorded was 0.23 in Mudumalai camp and 0.17 in Anamalai camp. The results indicate that the Mudumalai camp had higher fecundity rate than Anamalai's camp despite the number of females being high in Anamalai camp.



R: Rathi, B: Bhama, K: Kamachi, Va: Valli, Si: Sivakami, Vi: Vijayalakshmi, Se: Selvi

Figure 2: Fecundity rate of adult females from different forest camps in Tamil Nadu

Inter calving interval was derived from each breeding female for both camps. In Mudumalai, the female Rathi aged about 69 years had calved till 1987, the total number of births was 10, the average calving interval worked out to be 4 years; female Bhama aged about 58 years had given birth till 1991, the number of calves four, the average inter calving interval was found to be 5.8 years, and female Kamachi aged about 49 years old had given birth 6 times, the last birth was in 2004, average calving interval was 3.7 years. After 2004, female Kamachi conceived and aborted once in 2006. Over all mean calving interval in the Mudumalai camp was 4.5±1.3. (Table.4)

In the case of Anamalai camp, out of eight adult females only 4 were breeding: female Valli aged about 62 years had calved 5 times, one was twin births, last birth was in 1993, the average calving interval was 3.9 year; female Sivakami aged about 56 years, had

calved 5 times, the last birth was in 1997, the average calving interval was 3.8 years; female Vijayalakshmi aged about 54 years had calved 5 times, last calf was in 1987, the average calving interval was 3.2 years, and female Selvi aged about 47 years, had calved 7 times, last calf was in 2005, the average calving interval was 3.7 years, the only female still in breeding condition in the camp. The overall mean calving interval was found to be 3.7±0.26. (Table 4).

Table.4. Mean calving interval of elephants in Mudumalai and Anamalai camp

	Mudumalai Camp	Anamalai Camp
Mean Caving Interval	4.5± 1.28	3.7± 0.26
STD	1.13	0.26
SE	0.65	0.13
95% CI	3.2 - 5.7	3.4 - 3.9

Seasonality in Birth

In total, 42 births were recorded in both the camps. In order to look at the season in which more births was recorded in both the camps, data was pooled from both camps and plotted; the result shows that high number of births was observed during the month of July (n=6) followed by a small peak in February, May and November. No birth was recorded during month of June (Figure 3).

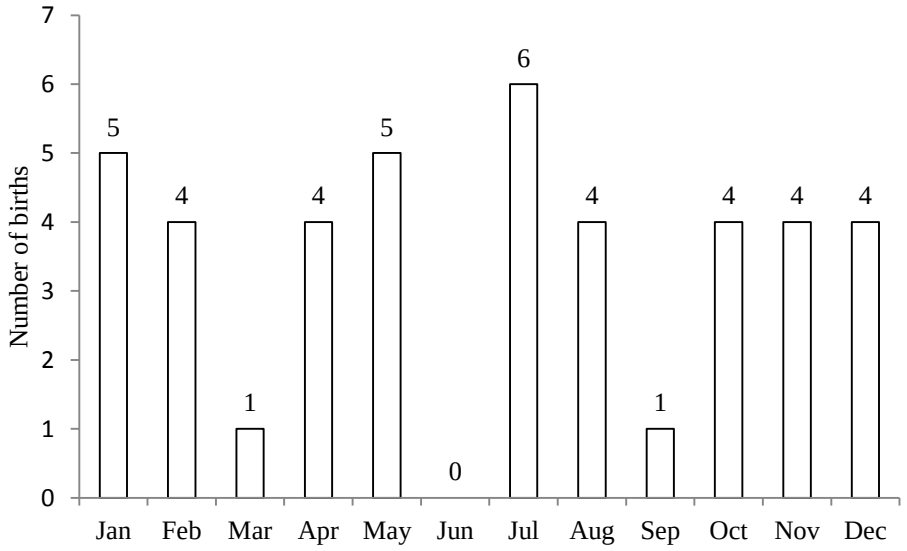


Figure 3: Seasonality in birth in forest camps in Tamil Nadu

A small variation was observed in the birth of male and female segments across the months (Figure 4), In the month of August, September and November there was no female calves born in captivity during the past 13 years.

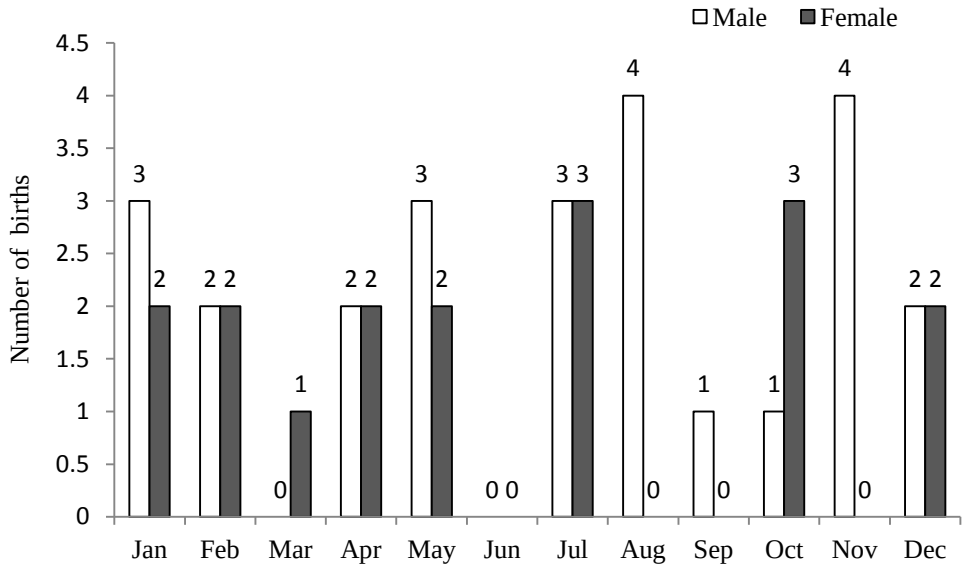


Figure 4: Frequency of male and female calves born across the month

Sex Ratio

In total, 42 calves were born in captivity in both the camps, of which 25 were males and 17 female. Male:female ratio was 1:1.47. The overall sex ratio of male:female calves calculated for Mudumalai Camp was 1:1.25 and in Anamalai was 1:1.67, which is not statistically significant from a 1:1 ratio.

Discussions

Age structure

Age structure is important information for the species and for judging its future. The age structure of elephants of two forest camp were studied *viz*, Mudumalai and Anamalai camp. Data was collected from the camp stud books and elephant mahouts. Data was collected from 1993 to 2006, earlier data (before 1993) data was published by Sukumar *et.al.* (1997).The result of the present age structure shows that both the camps have male biased population. Seventy five percent of male segments were observed in Mudumalai and fifty nine percent were observed in the Anamalai camp. On the other hand in the wild, age structure biased more towards female than the male due selective poaching of males for ivory resulting in female biased age structure (Sukumar, 1989 and Arivazhagn, 2005). Besides, the female segment was 25% in Mudumalai and 41% in Anamalai camp. The differences observed in female segments of both the camps are not statistically significant. Another interesting observation from the present study was that despite more number of females kept in the Anamalai camp than Muduamalai, the Mudumalai camp elephants were breeding better than the Anamalai camp. About 5 females in Anamalai camp of breeding age have not given birth yet. This may be due to some nutrient deficiency or they have not come into oestrous as yet. More often these females are

transported from forest camps to zoos and temple which could causes a stress for animals that could affect the oesterous cycle of the female. Geist (1971) described that stress could affect the cow's hormonal systems such that ovulation stops or foetus spontaneously aborts. The continued translocation of elephants from camp to zoo or temple may cause physiological problems for the animals which may lead to the stop of breeding and bring down the life span of the animals. The present age structure observed in both the camps shows that not many breeding females are available for captive breeding.

Fecundity and Inter Calving Interval

The average fecundity rate observed from both the camp revealed that Mudumalai (0.23/adult female/year) camp showed a higher rate than Anamalai camp (0.17/adult female/year). The present fecundity rate is higher than that of earlier captive study data by Sukumar *et al*. (1997). However, the high fecundity rate observed from both the camp is much more comparable with the wild population of Asia and Africa (Law et al. 1975, Sukumar, 1989, Sukumar et al. 1997 and Arivazhagan and Sukumar 2005). Besides, the number of breeding females observed from both the camps is lesser. Therefore bringing the more breeding females into the camp may improve the captive breeding of elephants in Tamilnadu. And also one breeding female Kamachi which had the most potential for breeding in the Mudumalai camp aborted during 2004; therefore the breeding females should not be used for tourism purpose in both the camps. Further, breeding females in both the camps should be given extra care in-terms of food (highly nutritious food). Special veterinary care for the breeding females would help increase captive breeding in both the camps.

There is a variation observed in the inter-calving interval of individual females in both the camps. Among the three females in Mudumali camp, female Kamachi showed a smaller inter-calving interval of (3.7 years) followed by Rathi (4 years) and Bhama (5.8 years). The variation observed for individual females is dependent on the nutritional status and physiological condition of the individual female. Sukumar *et al.* (1997) described that the less fecundity or inter-calving interval observed have been imposed by social barriers to reproduction as a consequences of management practices and the nutritional status may also have inadequate, given the heavy workload during earlier years. Overall mean calving interval observed in Mudumalai camp was 4.5 (± 1.3). On the other hand in Anamalai camp, out of eight adult females kept in captivity, only four animals were breeding, they were Valli (3.9 years), Sivakami (3.8years), Vijayalakshmi (3.2) and Selvi (3.7 years). The overall mean calving interval observed in Anamalai camp was 3.7(±0.26) years. The earlier study of captive elephants in the same camp sites observed calving intervals of 10.5 years (Sukumar *et al*.1997) and 7.7 years (Taylor and Poole 1998). This present study result shows that the mean calving interval was comparatively very low. These inter-calving intervals easily comparable with that of wild population, Arivazhagan and Sukumar (2005) observed that the mean inter-calving interval in the three wild populations were 5.1 year in Nagarahole, 5.3 years in Mudumalai and 6.9 years in Periyar. These intervals are relatively higher than that of captive elephants in Tamilnadu.

Seasonality in Birth

Out of forty two births observed in the camp during the study period the highest number of calves were born in July followed by February, May and November. It indicates that July is the beginning of the wet season, when nutritious forage would be ensured for the lactating mother, similar peak observed for wild population in African justified that wet-season is a pattern that would be favoured by natural selection (Laws et al., 1975; Hanks, 1979; Eltringham, 1982). Sukumar, *et al*.1997 stated that a high number of birth was not observed in the beginning of the wet-season unlike wild population, but the present study result indicates that it is similar to that observed in wild population.

Sex Ratio

The present observation on the sex ratio of calves born in captivity shows that it is a male biased sex ratio; male:female ratio was 1:1.47 in both the camp. The sex ratio observed in the present study was almost similar to that of Sukumar, *et al*.1997, observation of 1:1.18.1. A male – biased sex ratio at birth seems pronounced for mothers in the 20-40 age class when they could be expected to be in relatively good condition (Sukumar, 1997). Trivers and Willard (1973) according to this model, in polygynous species for which the males have a higher variation in lifetime reproductive success than females, a mother in good condition should invest preferentially in sons because a high-quality male is likely to enjoy high reproductive success. The present observation in the sex ratio may conform to the model of Trivers and Willard.

Conclusion and Recommendations

The present status of captive elephants in the Tamilnadu forest camps urgently needs special attention for captive breeding of elephants in the forest camps. Despite high fecundity rate observed in the last 13 years in both the camps only few females were in breeding status, rest were not in breeding status (at least 5 females), Though they had reached the breeding stage, they had not calved as yet. Therefore, capturing of some juvenile or sub-adult female (5-10 years) from the wild may support or improve the captive breeding in the state.

Presently elephant populations in the wild are increasing in numbers thus resulting in increase in human elephant conflicts. Capturing of wild elephants especially juvenile or sub-adult females may help to improve the captive breeding and this may also bring down the future population increase in the wild.

This has to be seriously considered if the government wants captive breeding of elephants. The present situation of captive elephants in both the forest camps may result in stop of breeding at any time. The breeding female being given extra care in-terms of health and veterinary care would improve the captive breeding. Another important point is that captive sexes of both sexes in both camps have been used for tourism purposes. Since, few breeding female are available in captivity they should not be used for the tourism purpose. An evidence show that the female Kamachi was calving every 3.5 years and last caved in May 2004. Subsequently it was pregnant during 2005 and it was aborted because this female was used for tourism purpose. After that no calve was produced by this female.

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Section 4:
Profiles of Elephants

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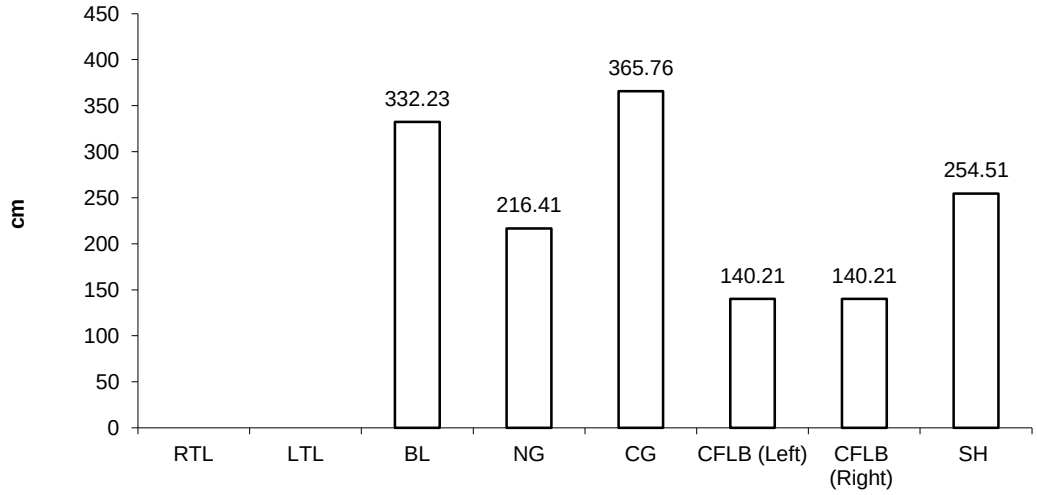
4: Forest Range Officer, Ullandi Range, Indira Gandhi Wildlife Sanctuary, Topslip, 642133, Tamil Nadu,

ANAMALAI FOREST CAMP

Name of the Elephant	Dev
Age (in yrs)	62
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Long
Source	Captured
Date & Year of source	6/9/1960
Age/height at source	7 years
Location of origin	Ullandy valley
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	yes
Hours/day	12
Number of elephants	2
Personality	Undependable
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	No
Number of calves sired	NK
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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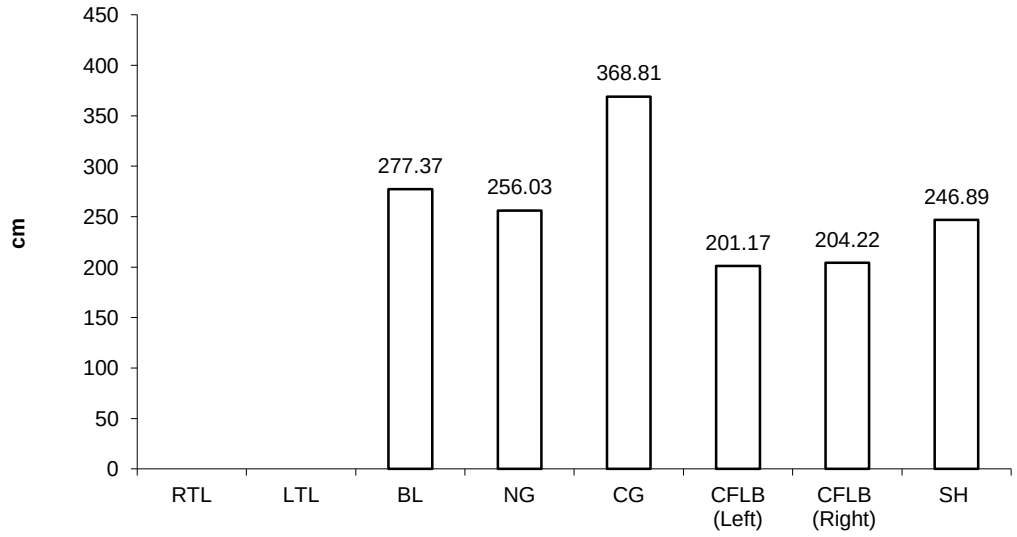
Mahout name	Ramaswamy
Age	55
Caste	Malasar
Mahout's experience (years)	11
Total experience with this animal	11
Source of training	Experience
Mahout's father occupation	Daily wage
Mahout's Grandfather occupation	Daily wage
Education	1st standard
Salary/yr	96000
Job status	Permanent
Marital status	Married
Number of children	3
Type of tool used	Stick
Health status	Not good
Insurance	Yes
Source	Self
Will his children join this profession	No

Name of the Elephant	Pallavan
Age (in yrs)	53
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Short
Source	Captured
Date & Year of source	20/10/1968
Age/height at source	2 yrs
Location of origin	Ullandy
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	2
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	Work as Kungi
Hours/day	Depending on the workload
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Reported
Number of calves sired	NK
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	3



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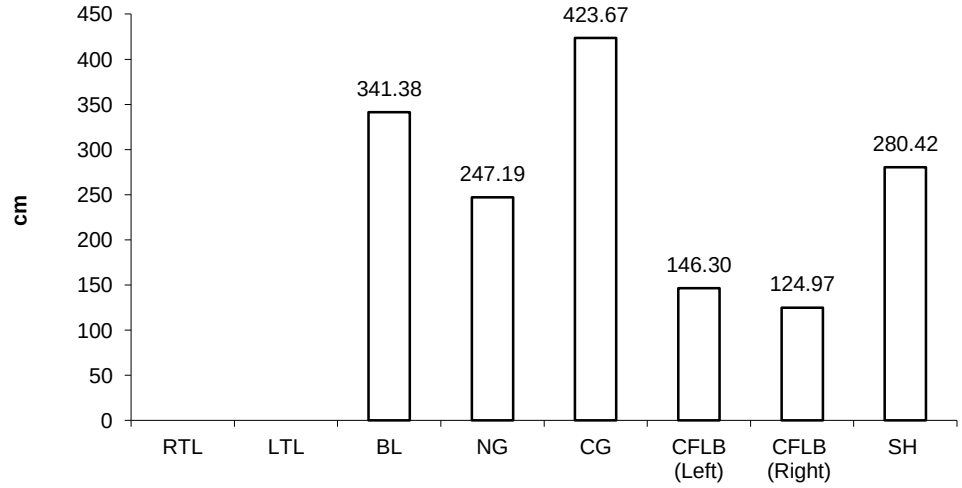
Mahout name	Murugan
Age	27
Caste	Malasar
Mahout's experience (years)	5
Total experience with this animal	5
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	5th standard
Salary/yr	14,000
Job status	Temporary
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	Yes

Name of the Elephant	Nanjan
Age (in yrs)	46
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Long
Source	Captured
Date & Year of source	04/12/1978
Age/height at source	15 yrs
Location of origin	Not known
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	3
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Reported
Number of calves sired	1 (officially known case)
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	3



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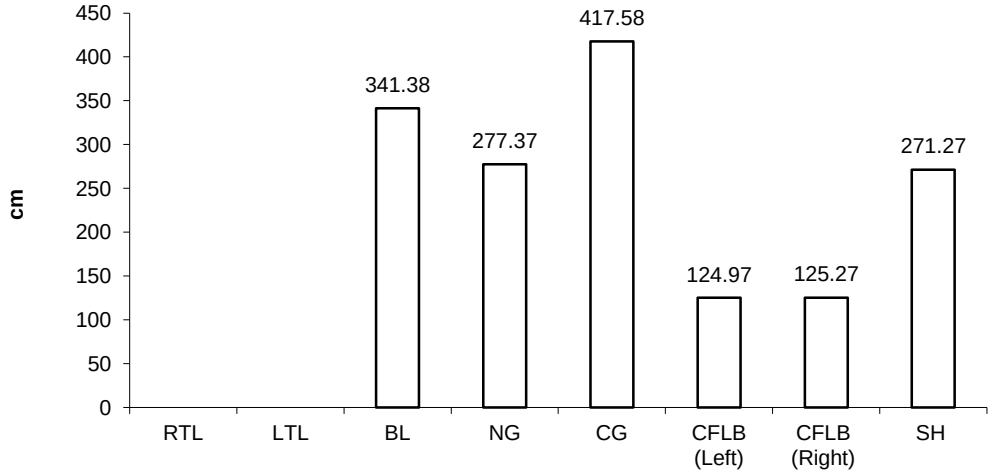
Mahout name	Prakash
Age	37
Caste	Kadar
Mahout's experience (years)	5
Total experience with this animal	0.5
Source of training	Experience
Mahout's father occupation	Daily wage
Mahout's Grandfather occupation	Elephant catcher
Education	5th standard
Salary/yr	52,932
Job status	Permanent
Marital status	Married
Number of children	3
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	Yes

Name of the Elephant	Kaleem
Age (in yrs)	41
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Long
Source	Captured
Date & Year of source	04/12/1978
Age/height at source	10 yrs
Location of origin	Sathyamangalam
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	2
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	Kungi
Hours/day	Depending on the workload
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Reported
Number of calves sired	7 (officially known case)
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	0



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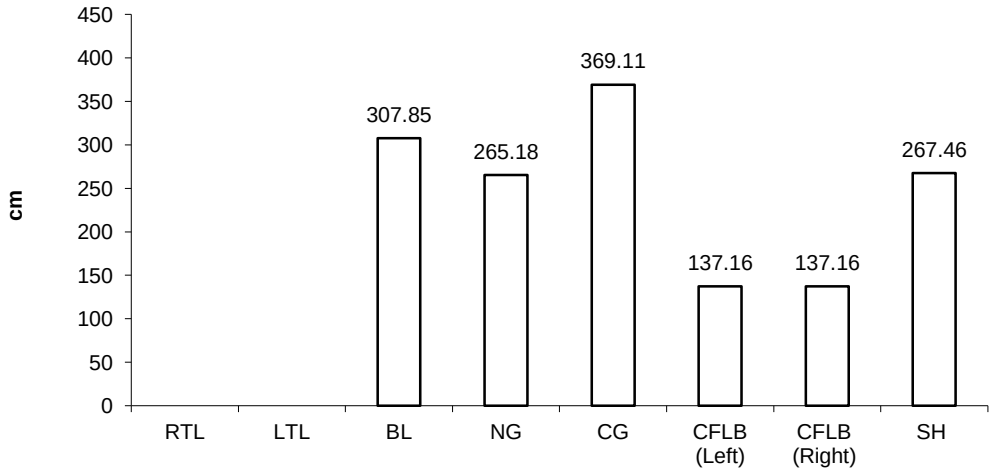
Mahout name	Palaniswamy
Age	52
Caste	Malasar
Mahout's experience (years)	35
Total experience with this animal	35
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	3rd standard
Salary/yr	12,0000
Job status	Permanent
Marital status	Married
Number of children	6
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	No

Name of the Elephant	Ram
Age (in yrs)	37
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Long
Source	Captured
Date & Year of source	20/11/1978
Age/height at source	6 yrs
Location of origin	Kanyakumari
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	2
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	0



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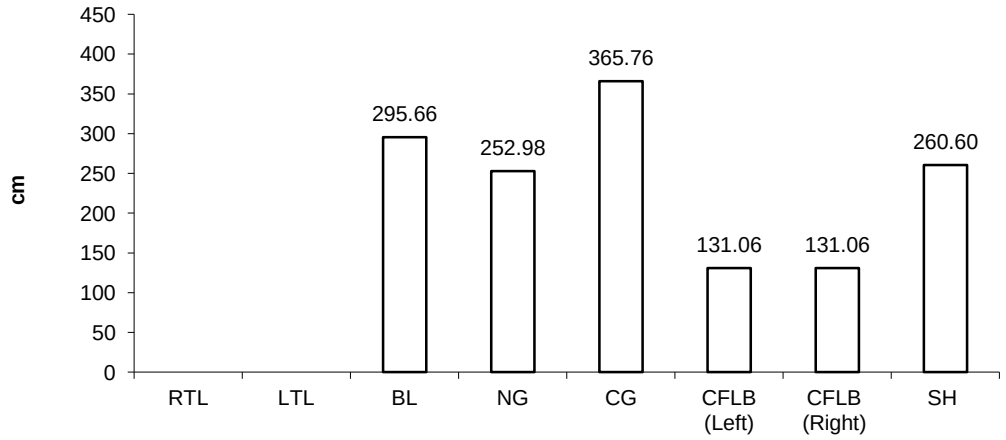
Mahout name	Kumar
Age	40
Caste	Malasar
Mahout's experience (years)	13
Total experience with this animal	13
Source of training	Experience
Mahout's father occupation	Not known
Mahout's Grandfather occupation	Not known
Education	No
Salary/yr	66,000
Job status	Permanent
Marital status	Married
Number of children	5
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	Yes

Name of the Elephant	Suriya
Age (in yrs)	33
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Curved
Source	Captured
Date & Year of source	10/12/1999
Age/height at source	21 yrs
Location of origin	Ambur, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	No
Hours/day	NA
Number of elephants	NA
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Not reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	Not known



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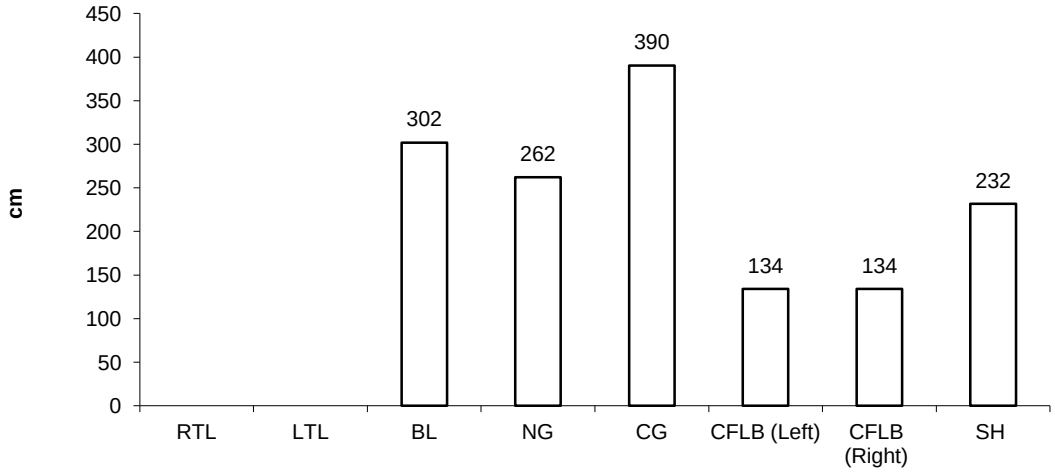
Mahout name	Palani
Age	48
Caste	Malasar
Mahout's experience (years)	28
Total experience with this animal	3
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	8
Salary/yr	78,000
Job status	Permanent
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	Yes

Name of the Elephant	Pari
Age (in yrs)	26
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Curved
Source	Captured
Date & Year of source	13-08-1988
Age/height at source	8 yrs
Location of origin	Kavalur, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	3
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Reported
Number of calves sired	No
Type of disease reported	Swelling in left leg
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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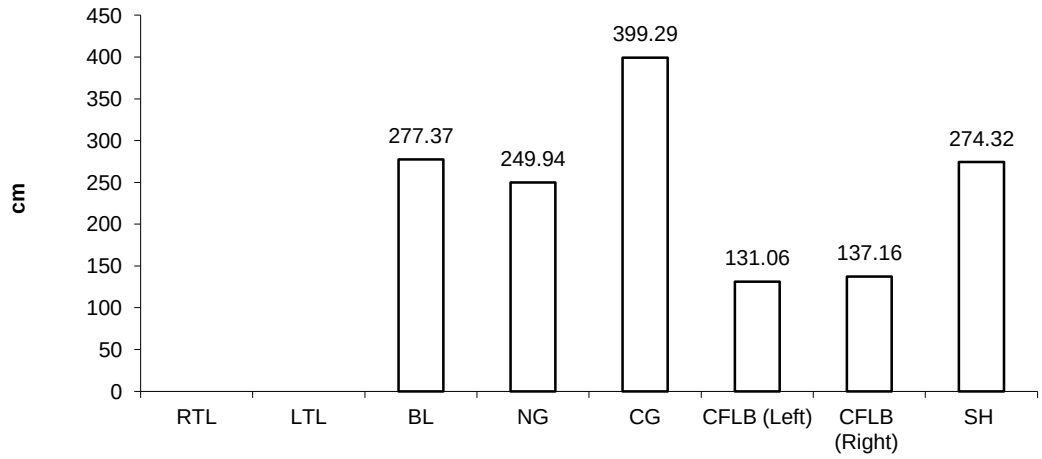
Mahout name	Vijayan
Age	35
Caste	Malasar
Mahout's experience (years)	5
Total experience with this animal	4
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	5^{th} standard
Salary/yr	72,000
Job status	Permanent
Marital status	Married
Number of children	3
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	No

Name of the Elephant	Kapil dev
Age (in yrs)	24
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Long
Source	Captive born
Date & Year of source	05/05/1983
Age/height at source	Not known
Location of origin	Anamalai
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	No
Hours/day	NA
Number of elephants	NA
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	Kungi
Hours/day	Depending on the workload
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	1



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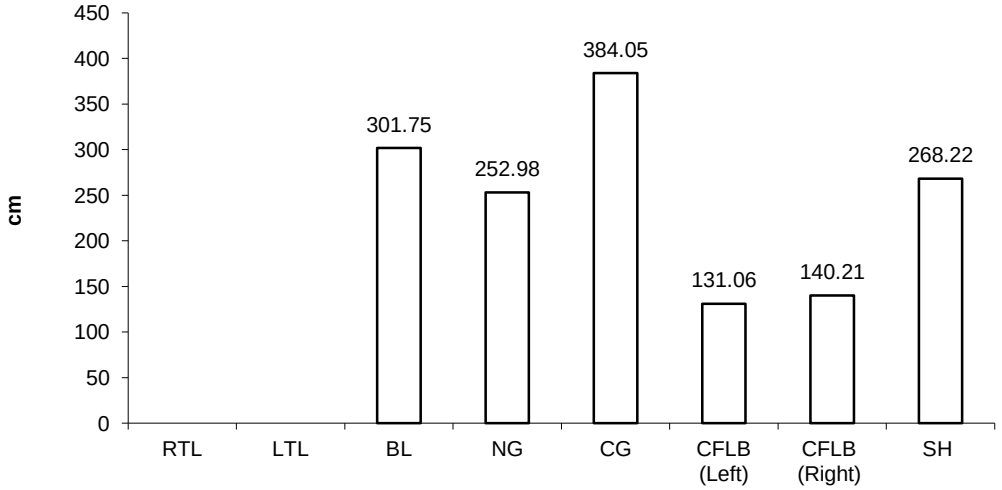
Mahout name	A. Chandrasekar
Age	30
Caste	Malasar
Mahout's experience (years)	1
Total experience with this animal	1
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	5th standard
Salary/yr	14,000
Job status	Temporary
Marital status	Married
Number of children	3
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	Barani
Age (in yrs)	22
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Long
Source	Captive born
Date & Year of source	20-01-1986
Age/height at source	Not known
Location of origin	Anamalai
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	No
Hours/day	NA
Number of elephants	NA
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Not known
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	Not known



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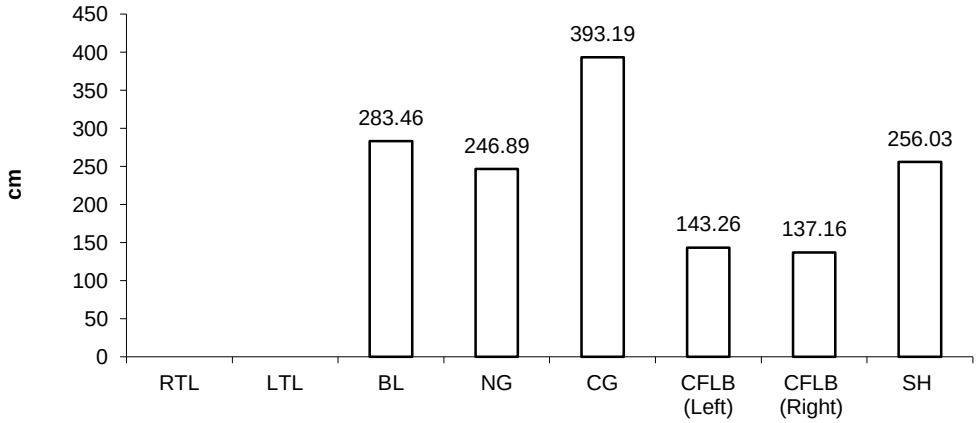
Mahout name Age Caste Mahout's experience (years) Total experience with this animal Source of training Mahout's father occupation Mahout's Grandfather occupation Education Salary/yr Job status Marital status Number of children Type of tool used Health status Insurance Source Will his children join this profession	No details of mahout available




Name of the Elephant	Venkatesh
Age (in yrs)	21
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Long
Source	Captive born
Date & Year of source	06/04/1987
Age/height at source	Not known
Location of origin	Anamalai
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	No
Hours/day	NA
Number of elephants	NA
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	Reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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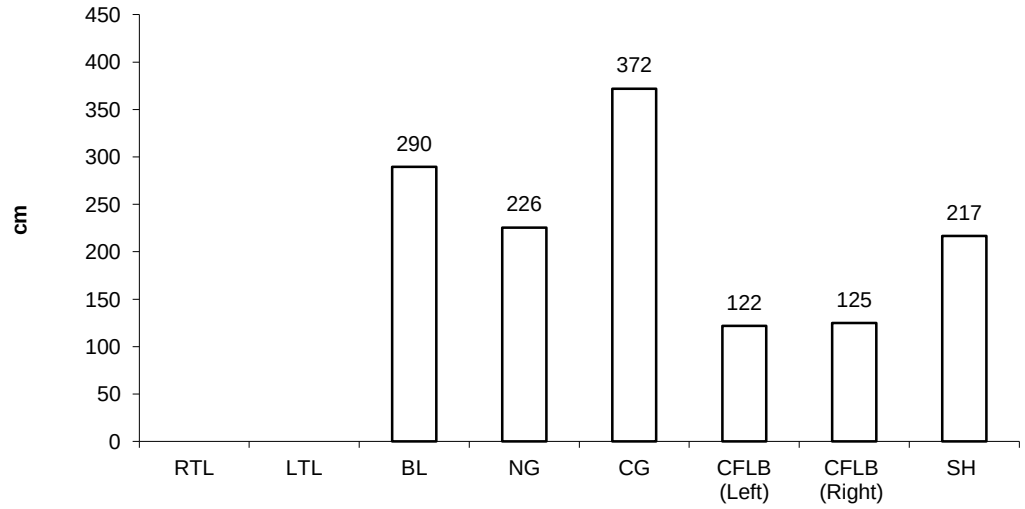
Mahout name	Ramesh
Age	24
Caste	Malasar
Mahout's experience (years)	5
Total experience with this animal	5
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Not known
Education	3rd standard
Salary/yr	14,000
Job status	Temporary
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	Valli
Age (in yrs)	62
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Captured
Date & Year of source	27/01/1967
Age/height at source	6yrs
Location of origin	Tunacadauv Kerala
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	2
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Occurrence of heat cycle	Yes
Number of calves born	3
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	3



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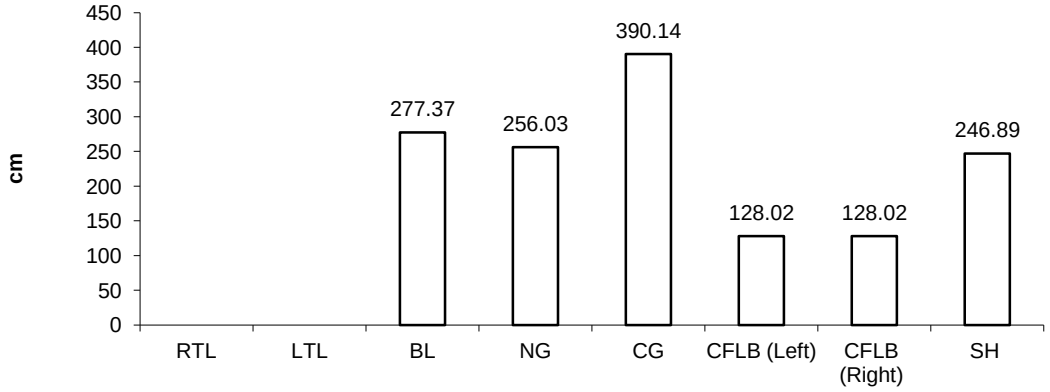
Mahout name	Ramesh
Age	24
Caste	Malasar
Mahout's experience (years)	5
Total experience with this animal	5
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Not known
Education	3rd standard
Salary/yr	14,000
Job status	Temporary
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	Sivakami
Age (in yrs)	56
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Captured
Date & Year of source	16/11/1973
Age/height at source	23yrs
Location of origin	Sathyamangalam, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	3
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Occurrence of heat cycle	Yes
Number of calves born	3
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



KEY

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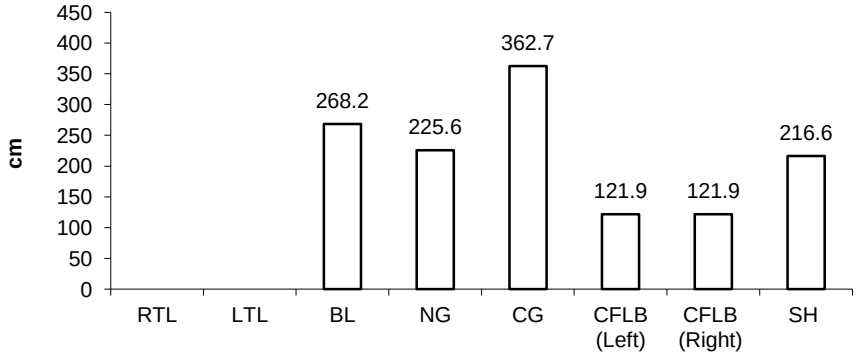
Mahout name	Thriumurthy
Age	47
Caste	Malasar
Mahout's experience (years)	11
Total experience with this animal	8
Source of training	Experience
Mahout's father occupation	Daily wage
Mahout's Grandfather occupation	Daily wage
Education	2nd standard
Salary/yr	90,480
Job status	Temporary
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	No

Name of the Elephant	Vijayalaksmi
Age (in yrs)	54
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Captured
Date & Year of source	29/12/1972
Age/height at source	20yrs
Location of origin	Ullandy Range, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	2
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Occurrence of heat cycle	Yes
Number of calves born	4
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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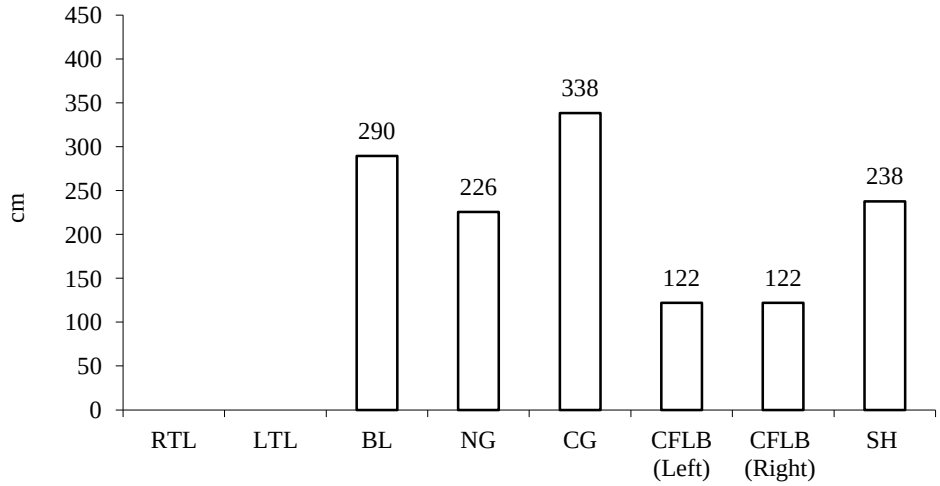
Mahout name	Karupuswamy
Age	40
Caste	Malasar
Mahout's experience (years)	15
Total experience with this animal	8
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	5th standard
Salary/yr	60,000
Job status	Temporary
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	Yes

Name of the Elephant	Saradha
Age (in yrs)	52
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Captured
Date & Year of source	01/07/1961
Age/height at source	7yrs
Location of origin	Ullandy Range, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	3
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Occurrence of heat cycle	Yes
Number of calves born	0
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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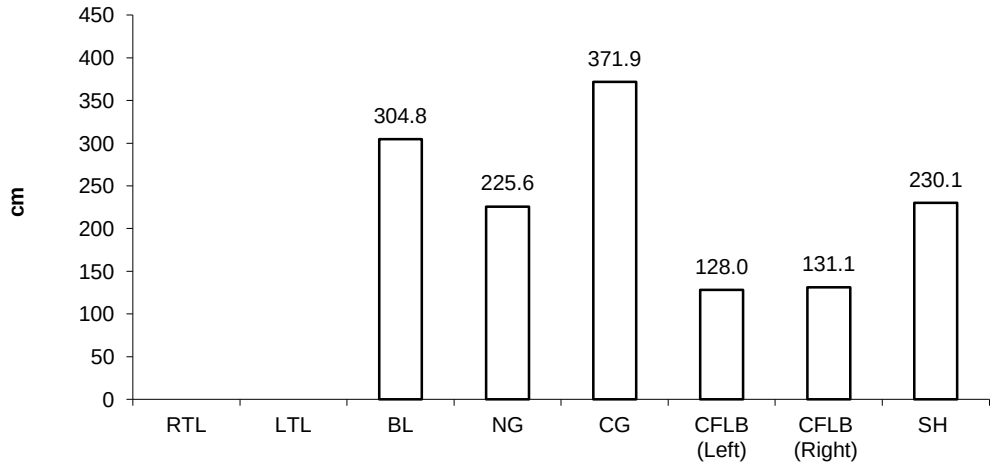
Mahout name	Raju
Age	44
Caste	Malasar
Mahout's experience (years)	30
Total experience with this animal	4
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Not known
Education	4th standard
Salary/yr	66,000
Job status	Temporary
Marital status	Married
Number of children	4
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	Yes

Name of the Elephant	Selvi
Age (in yrs)	47
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Captured
Date & Year of source	04/06/1970
Age/height at source	4yrs
Location of origin	Mudmumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	2
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Occurrence of heat cycle	Yes
Number of calves born	8
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	4



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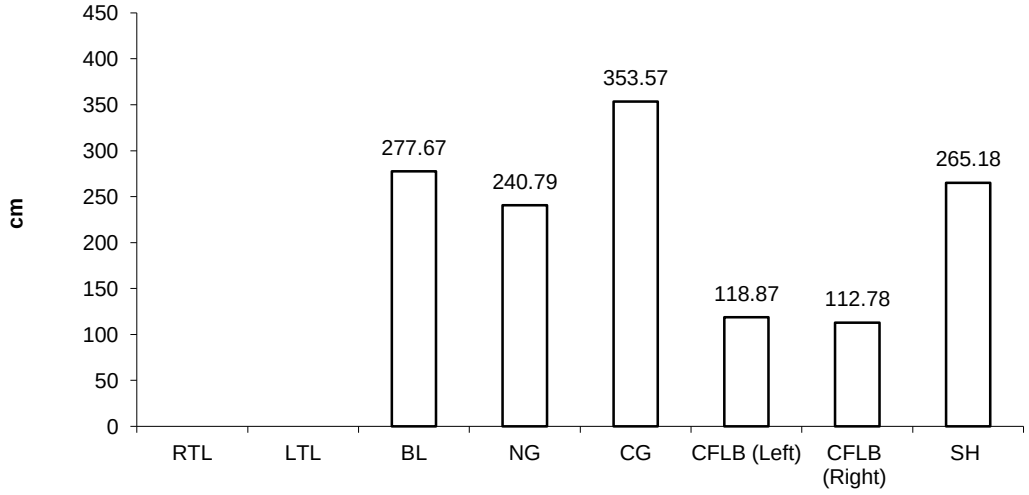
Mahout name	Mailswamy
Age	30
Caste	Malasar
Mahout's experience (years)	2
Total experience with this animal	2
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	3rd standard
Salary/yr	14,400
Job status	Temporary
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	Thaiyal nayaki
Age (in yrs)	36
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Transferred
Date & Year of source	16/03/2004
Age/height at source	30yrs
Location of origin	Viadeshwaram Temple, chidambaram, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	1
Personality	Undependable
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Occurrence of heat cycle	No
Number of calves born	0
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	1



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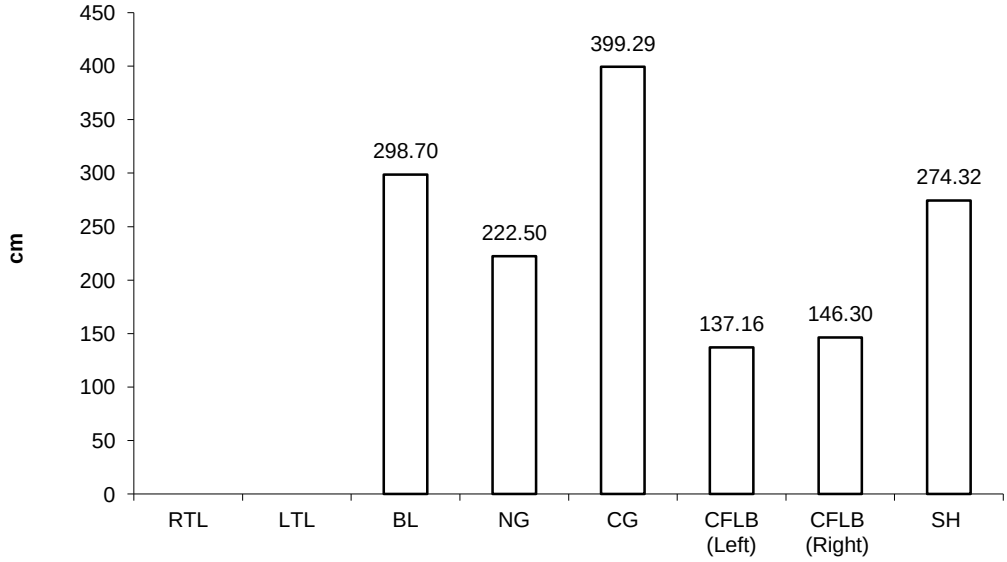
Mahout name Age Caste Mahout's experience (years) Total experience with this animal Source of training Mahout's father occupation Mahout's Grandfather occupation Education Salary/yr Job status Marital status Number of children Type of tool used Health status Insurance Source Will his children join this profession	No mahout and Cawadi

Name of the Elephant	Kalpana
Age (in yrs)	26
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Captured
Date & Year of source	25/08/2004
Age/height at source	28yrs
Location of origin	Sethumadai, Pollachi, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	3
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Occurrence of heat cycle	Yes
Number of calves born	0
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	0



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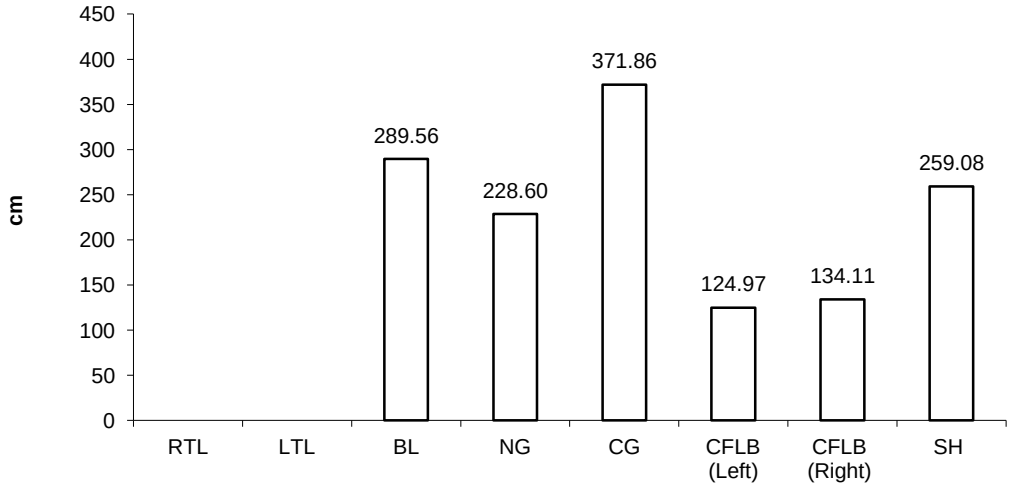
Mahout name	Kumar
Age	30
Caste	Malasar
Mahout's experience (years)	4
Total experience with this animal	2
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	3rd standard
Salary/yr	14,400
Job status	Temporary
Marital status	Married
Number of children	3
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	Ashwini
Age (in yrs)	22
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Captive born
Date & Year of source	20/01/1986
Age/height at source	Not known
Location of origin	Anamalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	2
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Occurrence of heat cycle	Yes
Number of calves born	0
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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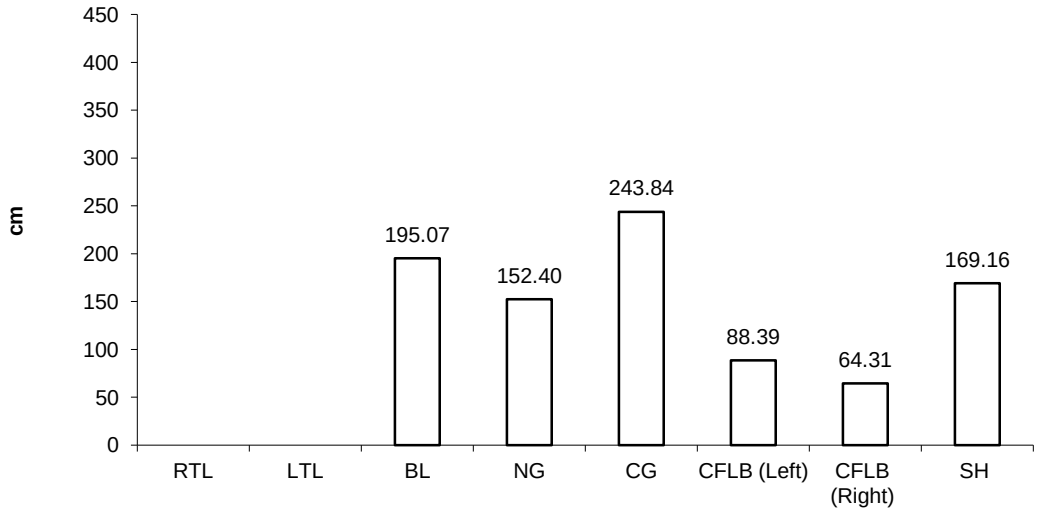
Mahout name	Kanappan
Age	47
Caste	Malasar
Mahout's experience (years)	5
Total experience with this animal	5
Source of training	Experience
Mahout's father occupation	Daily wage
Mahout's Grandfather occupation	Daily wage
Education	2nd standard
Salary/yr	79932/
Job status	Permanent
Marital status	Married
Number of children	9
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	Yes

Name of the Elephant	Raj vardhan
Age (in yrs)	7
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Short
Source	Orphaned
Date & Year of source	21/03/2004
Age/height at source	2yrs
Location of origin	Kozhikamuthy, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	10
Number of elephants	10
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	No
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	3



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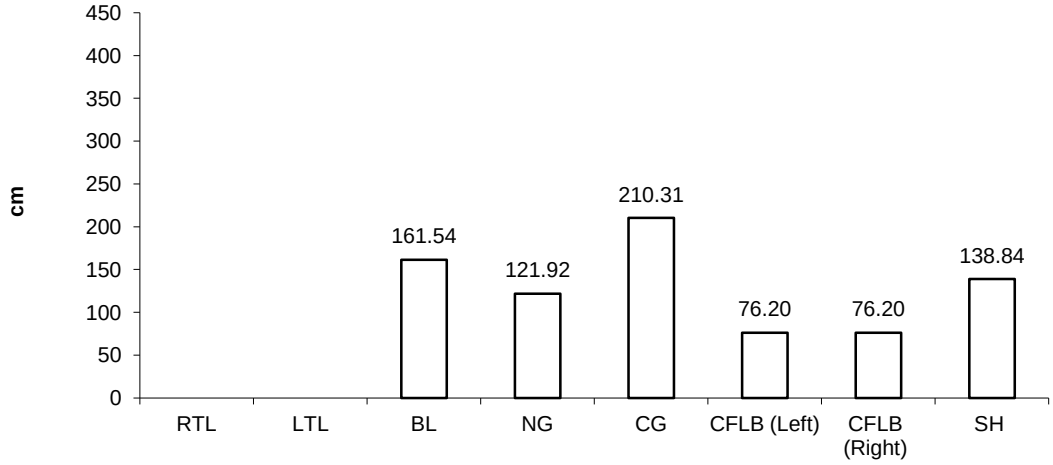
Mahout name	Raju
Age	36
Caste	Malasar
Mahout's experience (years)	8
Total experience with this animal	1
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	3rd standard
Salary/yr	14,4000/
Job status	Permanent
Marital status	Married
Number of children	4
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	Bullu
Age (in yrs)	4
Female/ Male	Male
Current Location of animal	Anamalai
Makhna/Tusker	Tusker
Tusk type	Short
Source	Captured
Date & Year of source	20/11/2003
Age/height at source	1yrs
Location of origin	Valpari, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	No
Hours/day	NA
Number of elephants	NA
Personality	Undependable
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt and jaggary
Status of Musth	No
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	1



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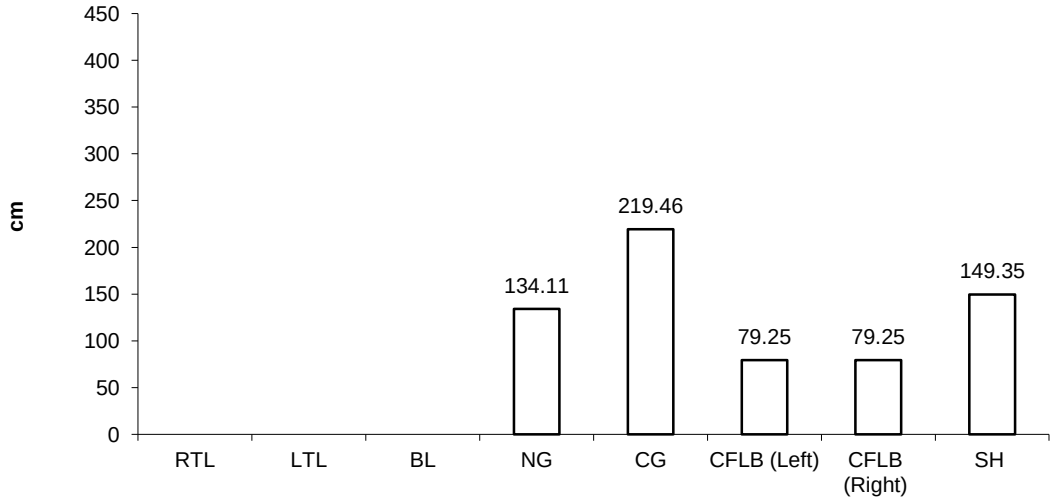
Mahout name	Kananan
Age	36
Caste	Malasar
Mahout's experience (years)	3
Total experience with this animal	3
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	4th standard
Salary/yr	14,400/
Job status	Temporary
Marital status	Married
Number of children	4
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	Selvi calf
Age (in yrs)	1
Female/ Male	Female
Current Location of animal	Anamalai
Tush type	Not visible
Source	Captive born
Date & Year of source	06/07/2005
Age/height at source	Not known
Location of origin	Anamalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	2
Personality	Playful
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging with mother
Type of food	Mother's milk
Occurrence of heat cycle	No
Number of calves born	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	0



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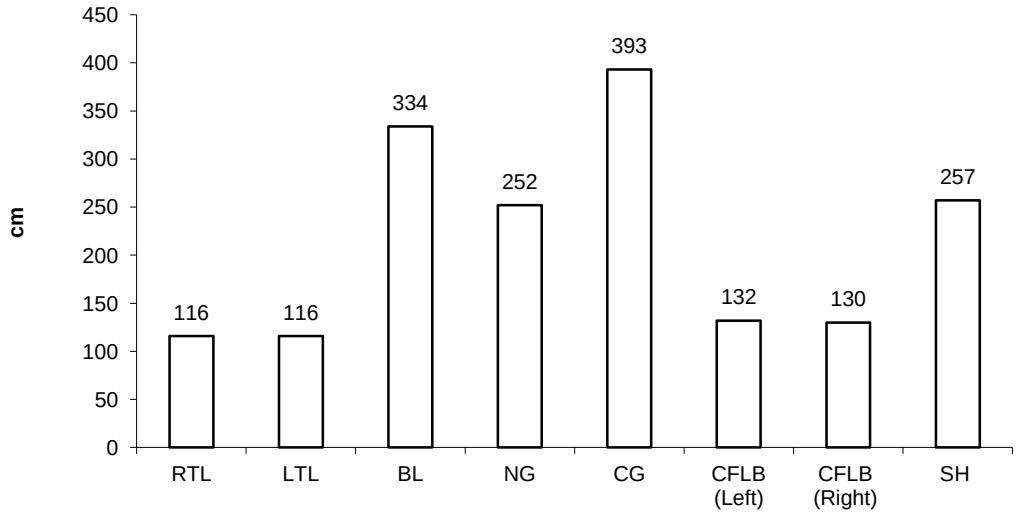
Mahout name Age Caste Mahout's experience (years) Total experience with this animal Source of training Mahout's father occupation Mahout's Grandfather occupation Education Salary/yr Job status Marital status Number of children Type of tool used Health status Insurance Source Will his children join this profession	No mahout or cawadi

MUDUMALAI FOREST CAMP




Name of the Elephant	Indhar
Age (in yrs)	55
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Inward
Source	Captured
Date & Year of source	Not known
Age/height at source	Not knwon
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	10
Number of elephants	7
Personality	Undependable
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Not reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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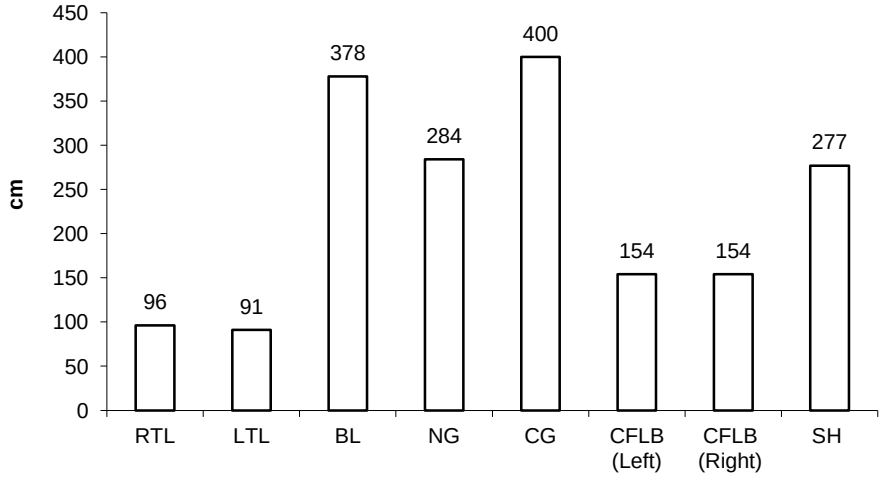
Mahout name	Natarajan
Age	55
Caste	Malasar
Mahout's experience (years)	32
Total experience with this animal	12
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	4th standard
Salary/yr	84,400/
Job status	Permanent
Marital status	Married
Number of children	6
Type of tool used	Stick
Health status	Not Good (lung infection)
Insurance	Yes
Source	Self
Will his children join this profession	Yes

Name of the Elephant	Subramani
Age (in yrs)	53
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Upwards
Source	Captured
Date & Year of source	11/08/1958
Age/height at source	3yrs
Location of origin	Thoonacadavu, Kerala
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	10
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	Kungi
Hours/day	Depending on the workload
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	1 (officially known case)
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	8



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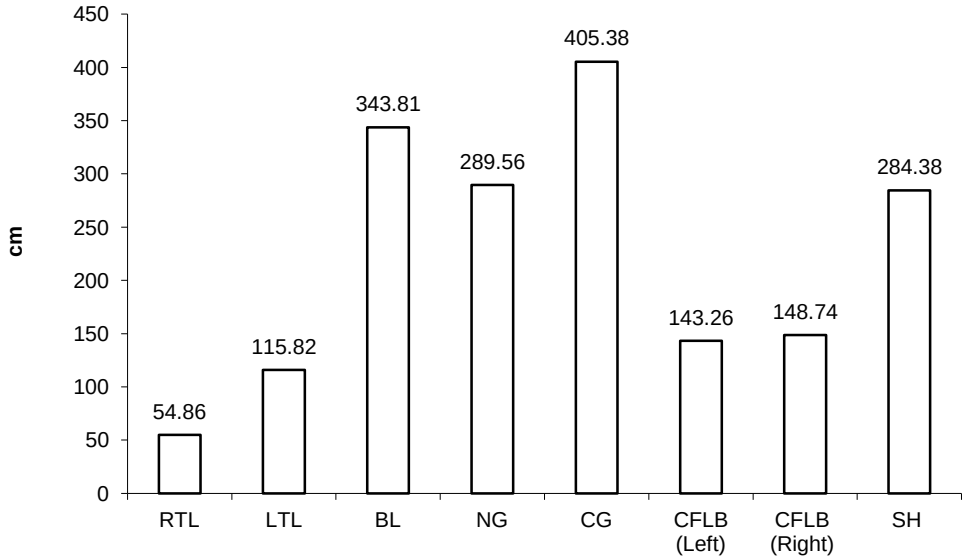
Mahout name	Kirumaram
Age	37
Caste	Betta kurumba
Mahout's experience (years)	18
Total experience with this animal	15
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	8th standard
Salary/yr	18,000/
Job status	Permanent
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	Yes

Name of the Elephant	Anna
Age (in yrs)	49
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Upwards/Right tusk broken
Source	Captured
Date & Year of source	1971
Age/height at source	13yrs
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	7
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	Kungi/weed removal
Hours/day	Depending on the workload
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	3



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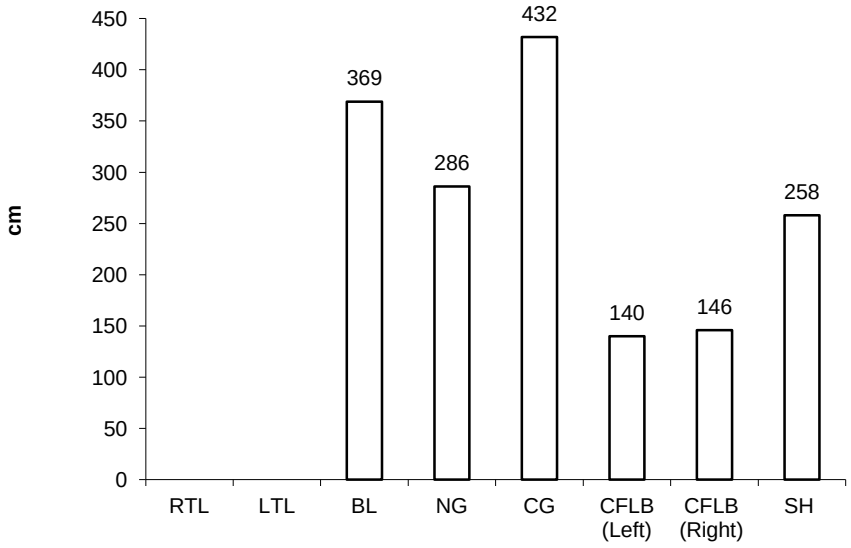
Mahout name	K.M. Masanan
Age	39
Caste	Katunaickar
Mahout's experience (years)	30
Total experience with this animal	8
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	7th standard
Salary/yr	88,000/
Job status	Permanent
Marital status	Married
Number of children	No
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	NA

Name of the Elephant	Morthy
Age (in yrs)	47
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Makhna
Tusk type	NA
Source	Captured
Date & Year of source	1997
Age/height at source	35yrs
Location of origin	Padanthurai, Gudalore, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	No
Hours/day	NA
Number of elephants	NA
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Not reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	0



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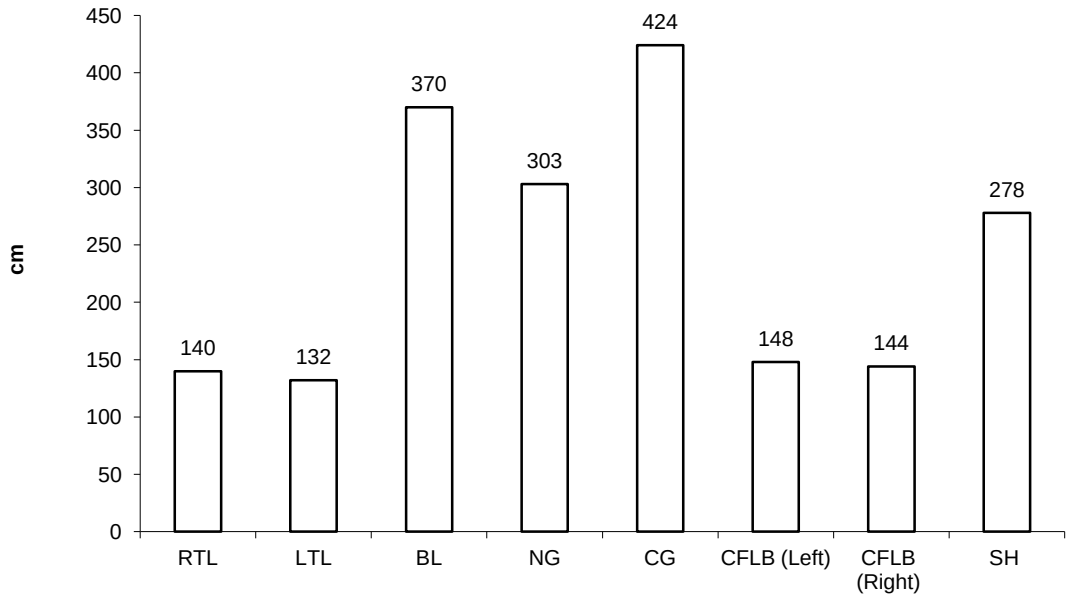
Mahout name	P. Chinnappan
Age	48
Caste	Malasar
Mahout's experience (years)	30
Total experience with this animal	8
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	8th standard
Salary/yr	72,000/
Job status	Permanent
Marital status	Married
Number of children	4
Type of tool used	Stick
Health status	Not good
Insurance	No
Source	NA
Will his children join this profession	Yes




Name of the Elephant	Mudumalai
Age (in yrs)	44
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Inward
Source	Captured
Date & Year of source	Not known
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	3
Personality	Frightened
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	Kungi/weed removal
Hours/day	Depending on the workload
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	4 (officially known case)
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	3



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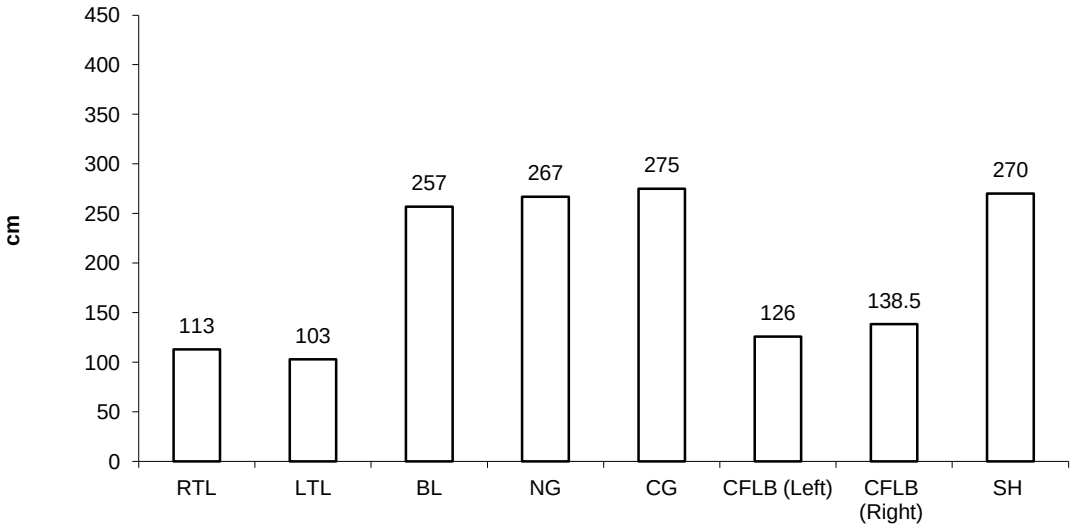
Mahout name	M. Maran
Age	52
Caste	Kattu Naickar
Mahout's experience (years)	40
Total experience with this animal	26
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	No
Salary/yr	12,1244/
Job status	Permanent
Marital status	Married
Number of children	6
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	Yes

Name of the Elephant	Shankar
Age (in yrs)	38
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Upwards
Source	Captured
Date & Year of source	Not known
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	10
Number of elephants	2
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	Not known
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	3



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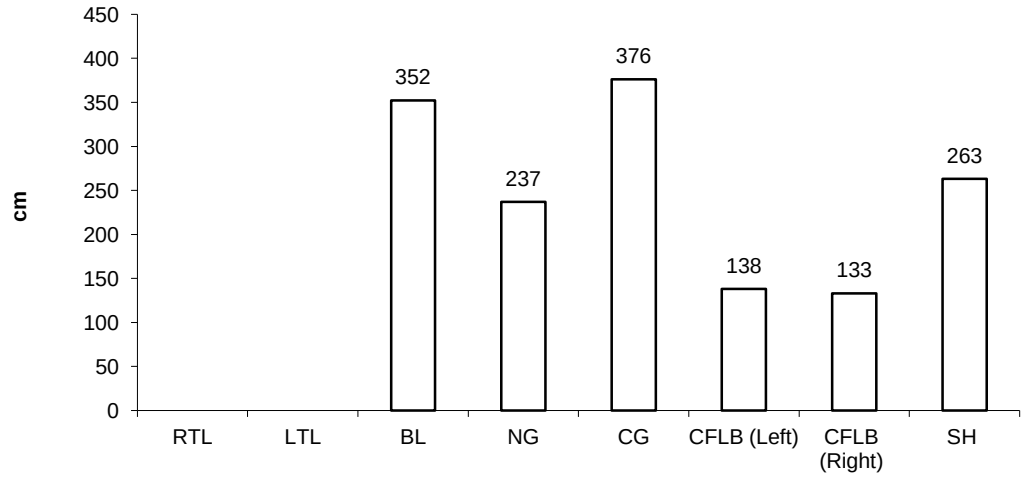
Mahout name	P. Manakadavan
Age	47
Caste	Malasar
Mahout's experience (years)	25
Total experience with this animal	3
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	5th Standard
Salary/yr	63,600/
Job status	Permanent
Marital status	Married
Number of children	4
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	Yes




Name of the Elephant	Ganesh
Age (in yrs)	36
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Outwards
Source	Received
Date & Year of source	Not known
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	6
Personality	Undependable
Number of people killed/injured	2 (Killed)
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	Not known
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	5



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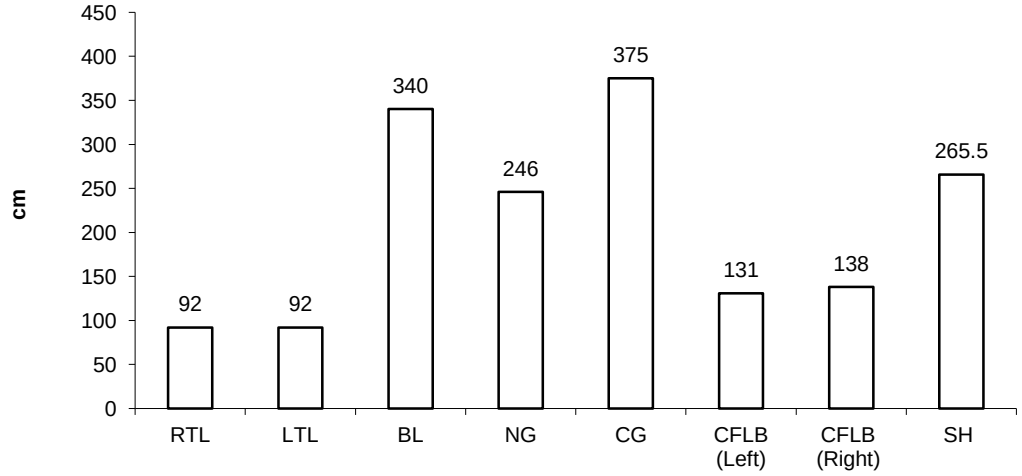
Mahout name	A.Velai
Age	47
Caste	Naickar
Mahout's experience (years)	25
Total experience with this animal	25
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	0
Salary/yr	84,600/
Job status	Permanent
Marital status	Married
Number of children	1
Type of tool used	Stick
Health status	Not good (attacked by elephant)
Insurance	Yes
Source	Self
Will his children join this profession	No

Name of the Elephant	Vijay
Age (in yrs)	35
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Inward
Source	Captive born
Date & Year of source	02/03/1973
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	4
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	Not known
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	4



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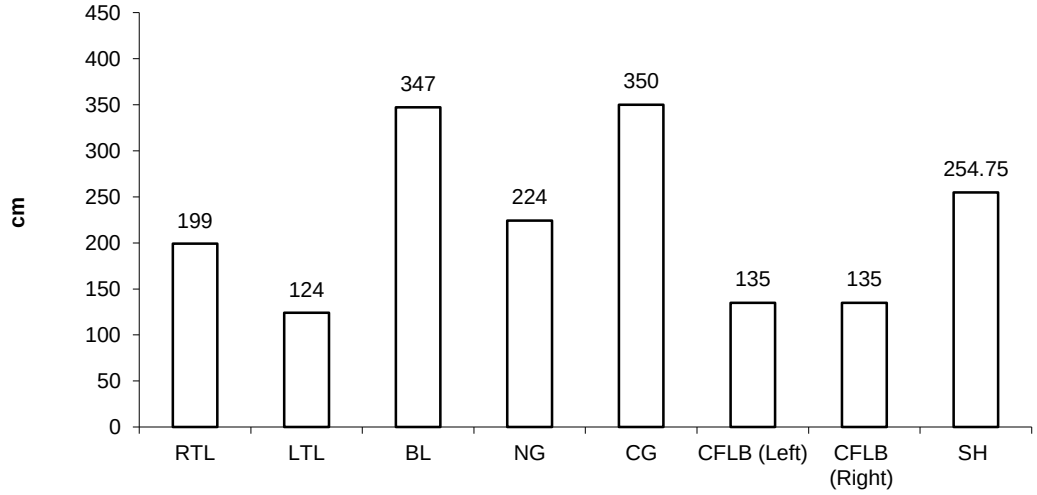
Mahout name	K. Marikan
Age	53
Caste	Naickar
Mahout's experience (years)	32
Total experience with this animal	7
Source of training	Experience
Mahout's father occupation	Daily wage
Mahout's Grandfather occupation	Daily wage
Education	0
Salary/yr	96,600/
Job status	Permanent
Marital status	Married
Number of children	4
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No




Name of the Elephant	Sujai
Age (in yrs)	35
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Inward
Source	Captive born
Date & Year of source	02/03/1973
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	2
Personality	Undependable
Number of people killed/injured	1 (killed)
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	Not known
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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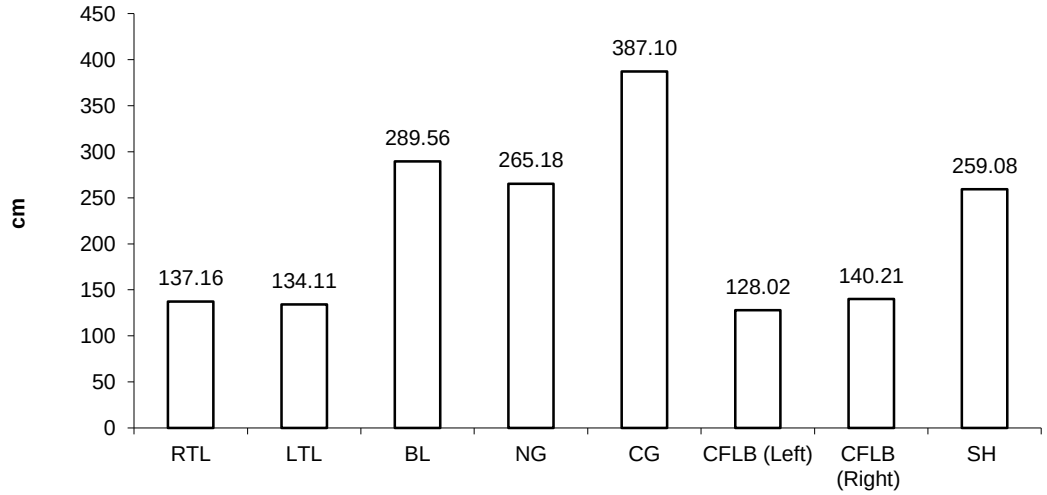
Mahout name	K. Palaniswamy
Age	44
Caste	Malasar
Mahout's experience (years)	23
Total experience with this animal	1
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	5^{th} standard
Salary/yr	80,400/
Job status	Permanent
Marital status	Married
Number of children	1
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	Yes




Name of the Elephant	Santosh
Age (in yrs)	34
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Inward
Source	Captive born
Date & Year of source	20/05/1971
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	11
Personality	Undependable
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	Not known
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	3



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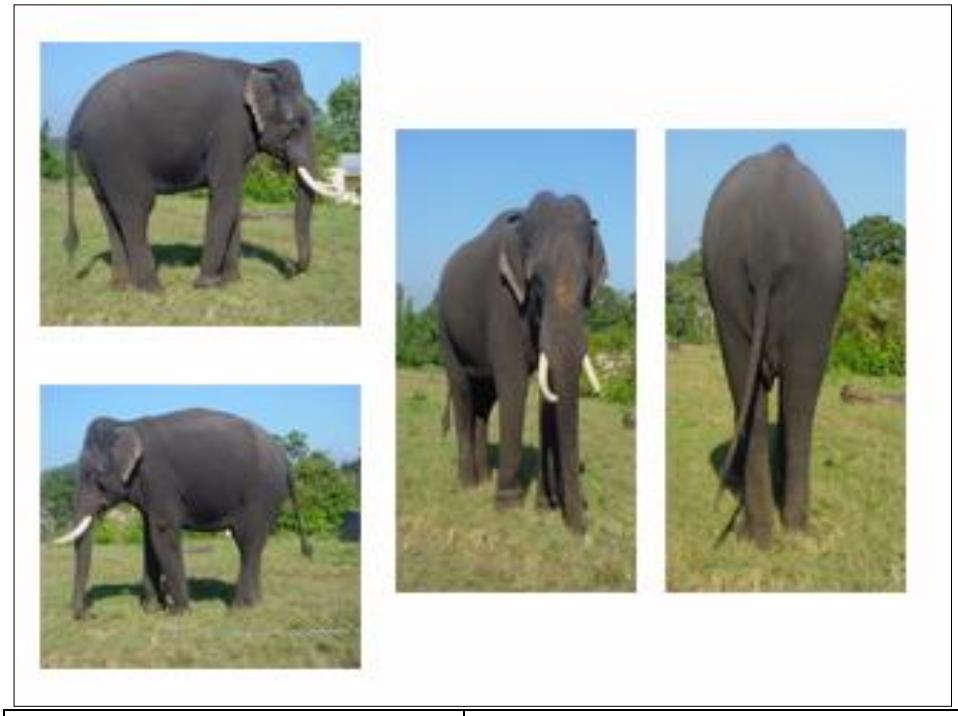
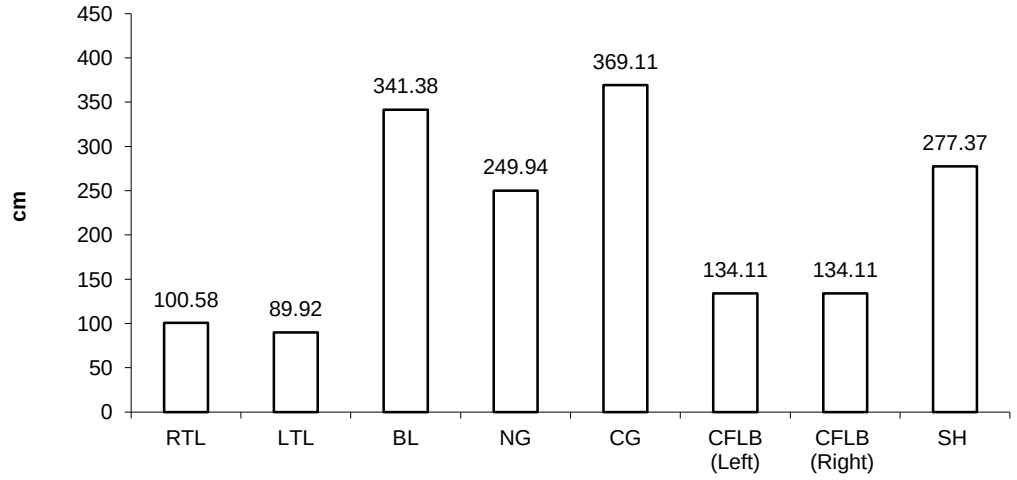
Mahout name	B. Kethan
Age	51
Caste	Betta Kurumbar
Mahout's experience (years)	40
Total experience with this animal	3
Source of training	Experience
Mahout's father occupation	Forest guard
Mahout's Grandfather occupation	Not known
Education	8th standard
Salary/yr	12,2424/
Job status	Permanent
Marital status	Married
Number of children	5
Type of tool used	Stick
Health status	Not good (attacked by elephant)
Insurance	No
Source	NA
Will his children join this profession	No



Name of the Elephant	Wasim
Age (in yrs)	28
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Upwards
Source	Captive born
Date & Year of source	31/01/1971
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	10
Number of elephants	4
Personality	Undependable
Number of people killed/injured	1 (Killed)
Stereotypic behaviour	Yes
Type of work	Tourist safari
Hours/day	4 hrs
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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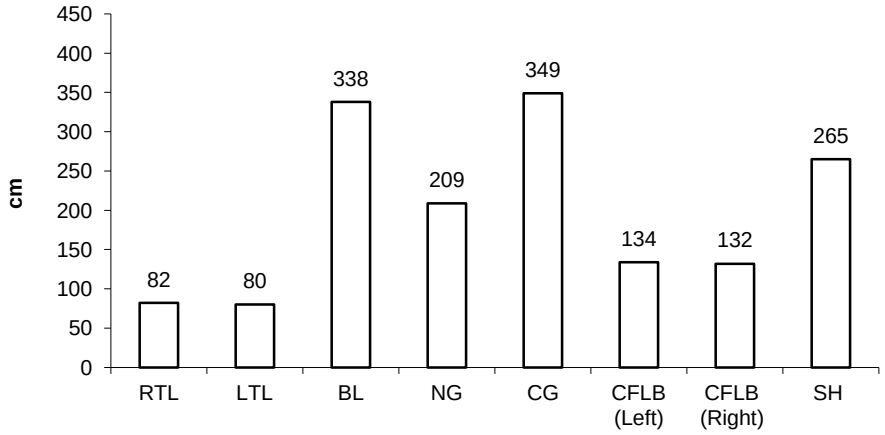
Mahout name	M.Madan
Age	50
Caste	Betta Kurumbar
Mahout's experience (years)	25
Total experience with this animal	15
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	0
Salary/yr	80,400/
Job status	Permanent
Marital status	Married
Number of children	0
Type of tool used	Stick
Health status	Not good
Insurance	Yes
Source	Self
Will his children join this profession	NA

Name of the Elephant	Chearn
Age (in yrs)	23
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Inward
Source	Captive born
Date & Year of source	31/07/1994
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	7
Personality	Agitated
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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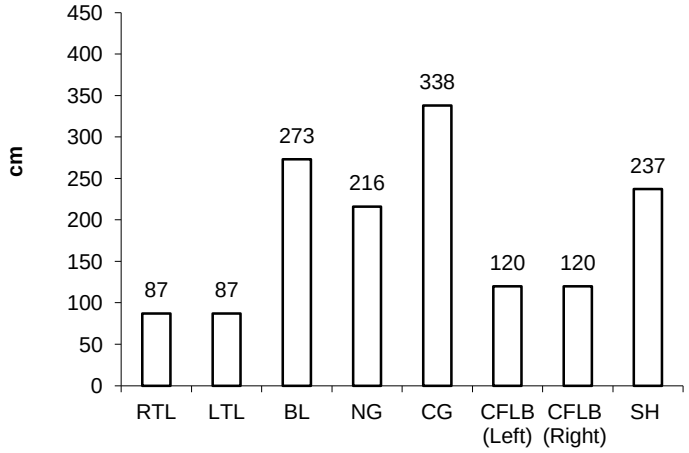
Mahout name	M. Maran
Age	43
Caste	Betta Kurumbar
Mahout's experience (years)	28
Total experience with this animal	8
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	0
Salary/yr	69,324/
Job status	Permanent
Marital status	Married
Number of children	5
Type of tool used	Stick
Health status	Not good (attacked by elephant)
Insurance	No
Source	NA
Will his children join this profession	Yes




Name of the Elephant	Jambo
Age (in yrs)	20
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Inward
Source	Orphaned
Date & Year of source	1987
Age/height at source	1yr
Location of origin	Not known
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	7
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Not known
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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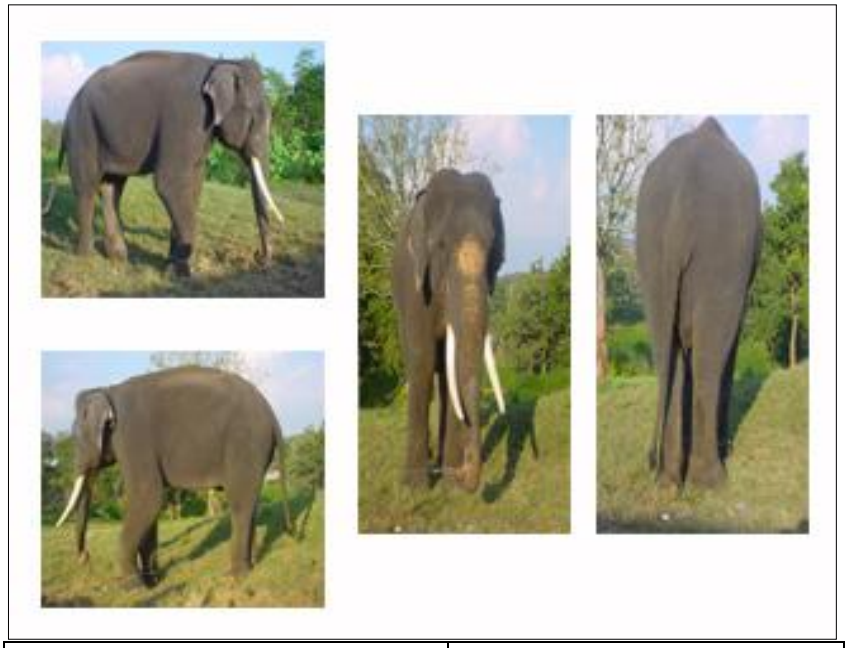
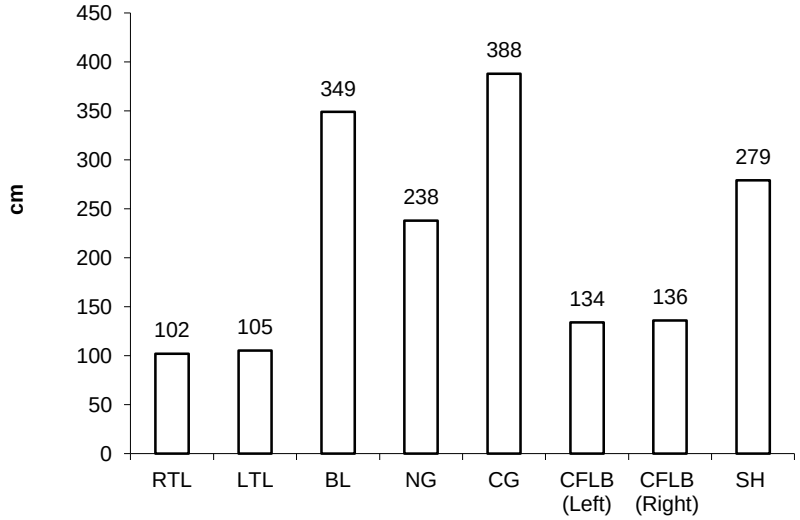
Mahout name	M. Marigan
Age	45
Caste	Naickar
Mahout's experience (years)	25
Total experience with this animal	3
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	5th standard
Salary/yr	78,000/
Job status	Permanent
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Not good (Stomach problems)
Insurance	Yes
Source	Self
Will his children join this profession	No



Name of the Elephant	Wilson
Age (in yrs)	18
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Inward
Source	Captive born
Date & Year of source	16/04/1988
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	11
Number of elephants	7
Personality	Undependable
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	Kungi/weed removal
Hours/day	Depending on the workload
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Not known
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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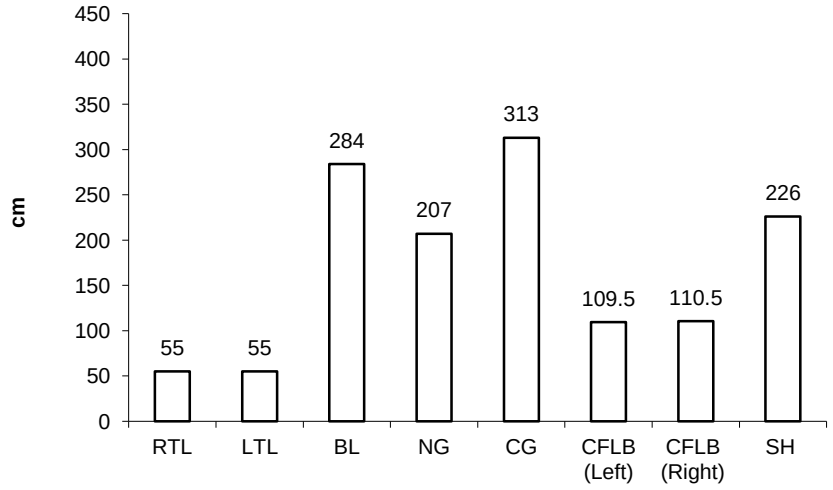
Mahout name	Bomma
Age	53
Caste	Betta Kurumbar
Mahout's experience (years)	10
Total experience with this animal	8
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Not known
Education	0
Salary/yr	1,02000/
Job status	Permanent
Marital status	Married
Number of children	5
Type of tool used	Stick
Health status	Not good (Injured by elephant)
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	John
Age (in yrs)	14
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Downwards
Source	Orphaned
Date & Year of source	1993
Age/height at source	4 months
Location of origin	Sathyamangalam, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	9
Personality	Undependable
Number of people killed/injured	1 (killed)
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Not reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	4



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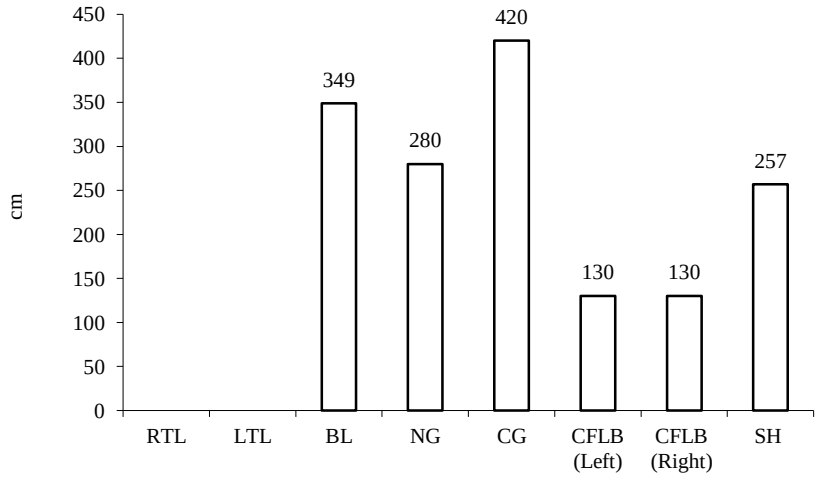
Mahout name	Chandran
Age	30
Caste	Naickar
Mahout's experience (years)	10
Total experience with this animal	1
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	6^{th} standard
Salary/yr	69,600/
Job status	Permanent
Marital status	Married
Number of children	3
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No

Name of the Elephant	Rathi
Age (in yrs)	71
Female/ Male	Female
Current Location of animal	Mudumalai
Tush type	Not visible
Source	Captured
Date & Year of source	Not known
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	20
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Occurrence of heat cycle	No
Number of calves born	13
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	4



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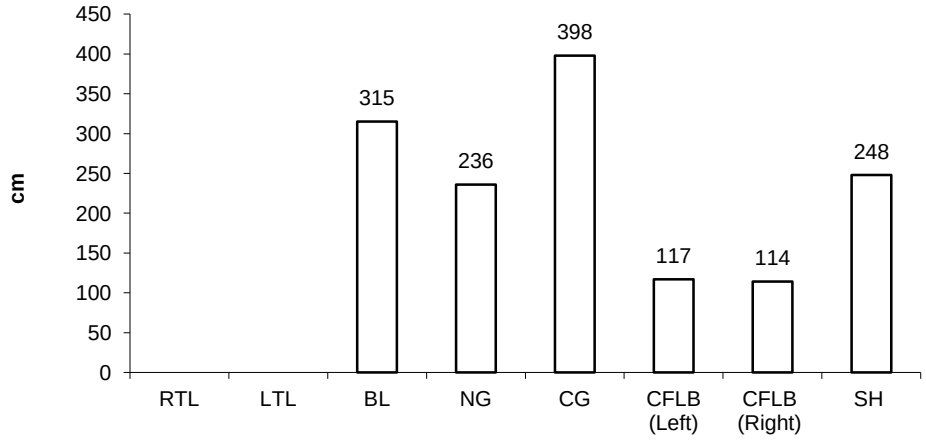
Mahout name	Marigan
Age	18
Caste	Jenu Kurumba
Mahout's experience (years)	2
Total experience with this animal	2
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	8th standard
Salary/yr	21,000/
Job status	Temporary
Marital status	Not married
Number of children	NA
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	NA

Name of the Elephant	Bhama
Age (in yrs)	58
Female/ Male	Female
Current Location of animal	Mudumalai
Tush type	Not visible
Source	Captured
Date & Year of source	Not known
Age/height at source	Not known
Location of origin	Topslip, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	18
Number of elephants	3
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Occurrence of heat cycle	No
Number of calves born	4
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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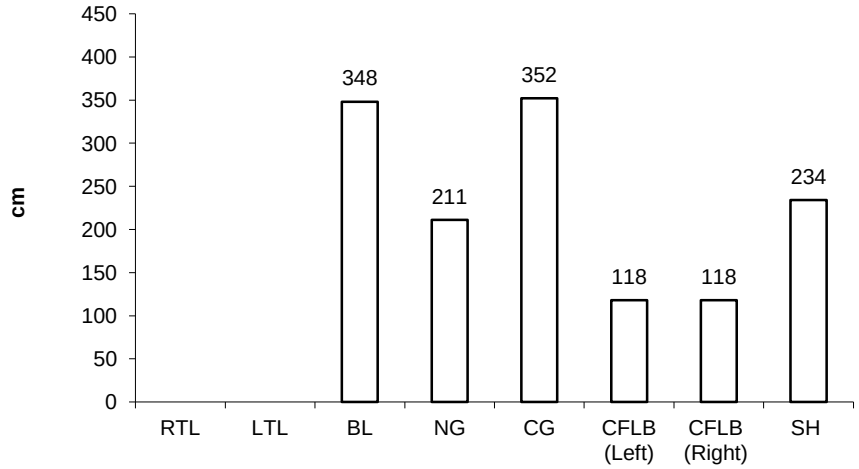
Mahout name	K.Madan
Age	55
Caste	Kurumbar
Mahout's experience (years)	27
Total experience with this animal	4
Source of training	Experience
Mahout's father occupation	Daily wage
Mahout's Grandfather occupation	Daily wage
Education	0
Salary/yr	81,000/
Job status	Permanent
Marital status	Married
Number of children	4
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	Yes

Name of the Elephant	Kamatchi
Age (in yrs)	49
Female/ Male	Female
Current Location of animal	Mudumalai
Tush type	Pointed both
Source	Captured
Date & Year of source	Not known
Age/height at source	Not known
Location of origin	Topslip, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	10
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	Tourist safari
Hours/day	4
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Occurrence of heat cycle	Yes
Number of calves born	6
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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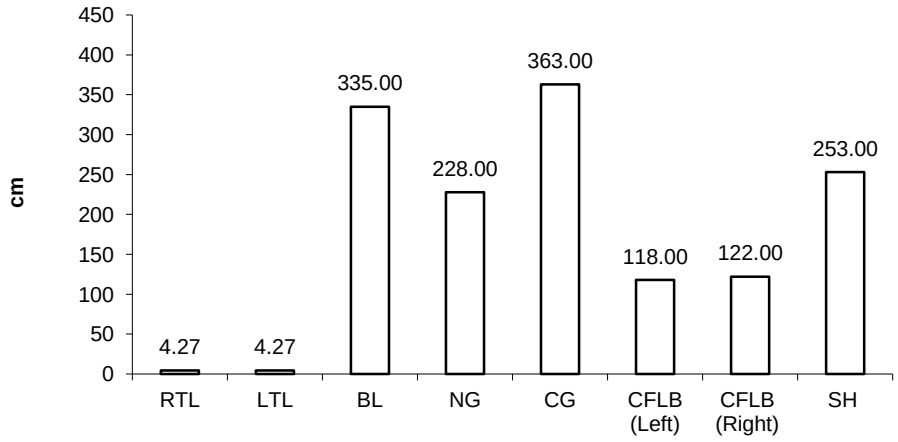
Mahout name	K.Manban
Age	45
Caste	Betta Kurumba
Mahout's experience (years)	30
Total experience with this animal	9
Source of training	Experience
Mahout's father occupation	Kawadi
Mahout's Grandfather occupation	Agiriculture
Education	5th standard
Salary/yr	74,000/
Job status	Permanent
Marital status	Married
Number of children	3
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	Yes

Name of the Elephant	Sentilvadivu
Age (in yrs)	33
Female/ Male	Female
Current Location of animal	Mudumalai
Tush type	Not visible
Source	Captured
Date & Year of source	1971
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	1
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	Tourist safari
Hours/day	4
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Occurrence of heat cycle	No
Number of calves born	0
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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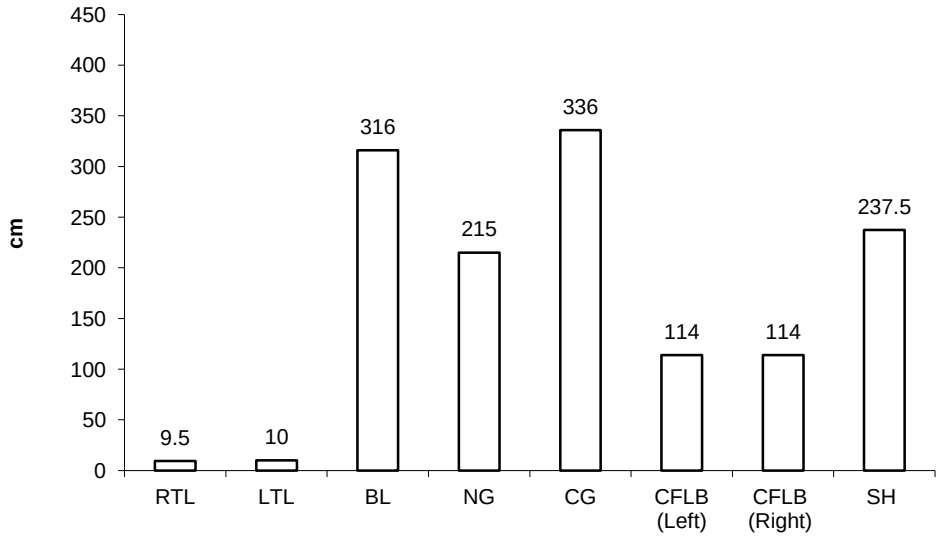
Mahout name	K. Soman
Age	50
Caste	Betta Kurumba
Mahout's experience (years)	20
Total experience with this animal	1
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Daily wage
Education	0
Salary/yr	88,200/
Job status	Permanent
Marital status	Married
Number of children	6
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	No




Name of the Elephant	Sumangala
Age (in yrs)	18
Female/ Male	Female
Current Location of animal	Mudumalai
Tush type	Visible
Source	Orphaned
Date & Year of source	1989
Age/height at source	3 months
Location of origin	Tripattur, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	Yes
Hours/day	20
Number of elephants	10
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Occurrence of heat cycle	No
Number of calves born	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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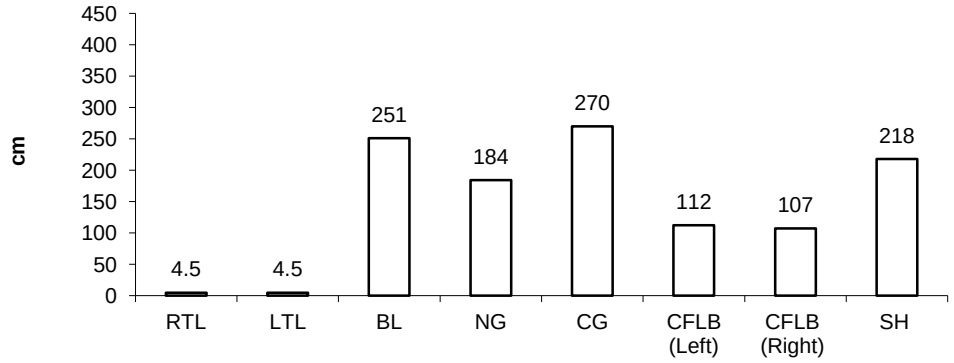
Mahout name	M. Manban
Age	45
Caste	Kurumbar
Mahout's experience (years)	30
Total experience with this animal	7
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	5th standard
Salary/yr	83,496/
Job status	Permanent
Marital status	Married
Number of children	6
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	Yes

Name of the Elephant	Udayan
Age (in yrs)	8
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Makhna
Tusk type	NA
Source	Captive born
Date & Year of source	24/11/1998
Age/height at source	Not known
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	9
Number of elephants	7
Personality	Unpredictable
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Not reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	1



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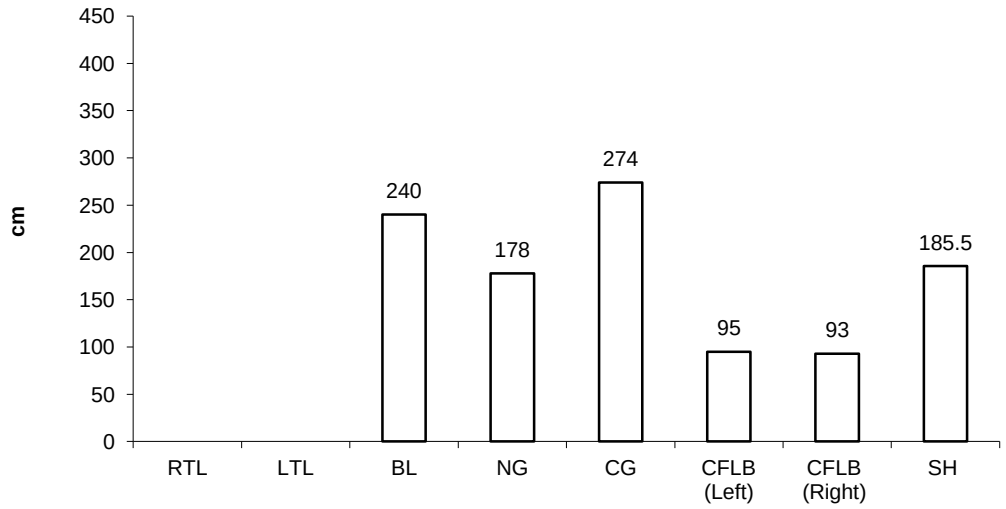
Mahout name	R. Gopalan
Age	49
Caste	Malasar
Mahout's experience (years)	25
Total experience with this animal	1
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	6th standard
Salary/yr	69,324/
Job status	Permanent
Marital status	Married
Number of children	2
Type of tool used	Stick
Health status	Good
Insurance	Yes
Source	Self
Will his children join this profession	Yes

Name of the Elephant	Bomman
Age (in yrs)	7
Female/ Male	Male
Current Location of animal	Mudumalai
Makhna/Tusker	Tusker
Tusk type	Downwards
Source	Orphaned
Date & Year of source	2000
Age/height at source	3 yrs
Location of origin	Mudumalai, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	River
Interaction with other Elephants	Yes
Hours/day	12
Number of elephants	12
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	Yes
Type of work	No work
Hours/day	NA
Source of food	Free ranging and stall fed
Type of food	Forest species and ragi, horse gram, coconut, salt, jaggary and mineral mix
Status of Musth	Not reported
Number of calves sired	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	2



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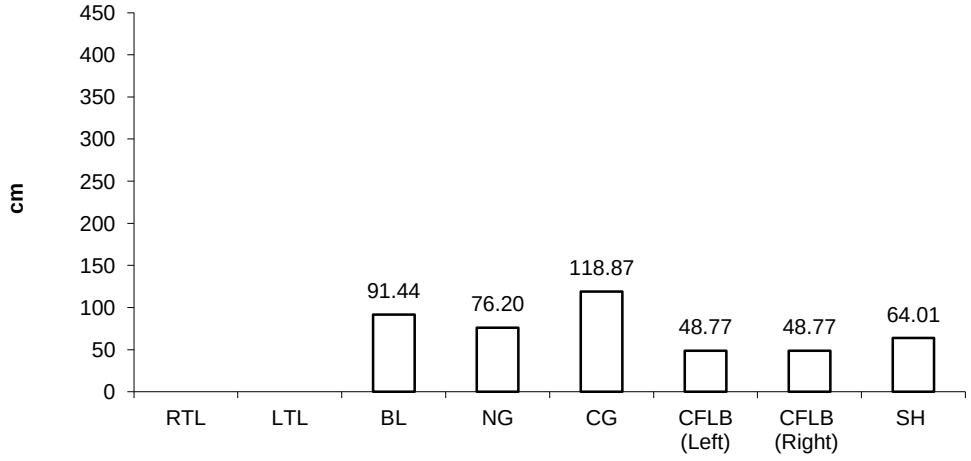
Mahout name	Vijayan
Age	24
Caste	Naickar
Mahout's experience (years)	13
Total experience with this animal	1
Source of training	Experience
Mahout's father occupation	Mahout
Mahout's Grandfather occupation	Mahout
Education	8th standard
Salary/yr	18,000/
Job status	Temporary
Marital status	Not married
Number of children	NA
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	NA

Name of the Elephant	Orphan Calf
Age (in yrs)	0.17
Female/ Male	Female
Current Location of animal	Mudumalai
Tush type	Not visible
Source	Orphaned
Date & Year of source	05/08/2006
Age/height at source	1 months
Location of origin	Kargudi, TN
Type of shelter	Free ranging
Type of flooring	Earthen
Source of water	Stream
Interaction with other Elephants	No
Hours/day	NA
Number of elephants	NA
Personality	Quite
Number of people killed/injured	No
Stereotypic behaviour	No
Type of work	No work
Hours/day	NA
Source of food	Stall fed
Type of food	Loctogen, Glucose and others
Occurrence of heat cycle	No
Number of calves born	No
Type of disease reported	No details available
Availability of veterinary doctor	Yes
Number of mahouts changed	0



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Mahout name	M. Manban
Age	45
Caste	kurmbar
Mahout's experience (years)	30
Total experience with this animal	0.1
Source of training	Experience
Mahout's father occupation	Kavadi
Mahout's Grandfather occupation	?Daily wage
Education	5th standard
Salary/yr	83,496/
Job status	Temporary
Marital status	Not married
Number of children	NA
Type of tool used	Stick
Health status	Good
Insurance	No
Source	NA
Will his children join this profession	NA

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Tamil Nadu Forest Department (TNFD): The Tamil Nadu Forest department is the custodian of 22,865 sq. km. of forest land and invaluable wildlife in the state of Tamil Nadu. Tamil Nadu, therefore, has adopted a compelling vision to inspire people to protect wilderness, the ecological diversity and species richness. The Tamil Nadu State Forest Act, 1882, The Wildlife Protection Act, 1972, Forest Conservation Act, 1980 and a host of rules formulated under these Acts are being implemented by the Forest Department. Adhering to the best scientific principles and incorporating traditional knowledge, new socio-economically and ecologically sound paradigms for managing forests and wildlife have also been incorporated into the management strategies adopted by this department

Compassion Unlimited Plus Action (CUPA) is a non profit public charitable trust registered in 1991 that works for the welfare of all animals. Since 1994, CUPA has worked in close collaboration with government departments and agencies on various projects. CUPA's mission is to protect animals from abuse and violence and do what may be required in alleviating suffering at the hands of humans. CUPA does not differentiate between pet, stray or wild animals, since all often require assistance and relief from cruelty, neglect and harm. The organization's objective has been to design services and facilities which are employed fully in the realization of these goals.

Asian Nature Conservation Foundation (ANCF) is a non-profit public charitable trust set to meet the need for an informed decision-making framework to stem the rapidly declining natural landscape and biological diversity of India and other countries of tropical Asia. The foundation undertakes activities independently and in co-ordination with Government agencies, research institutions, conservation NGOs and individuals from India and abroad, in all matters relating to conservation of natural resources and biodiversity, endangered flora and fauna, wildlife habitats and environment including forests and wetlands. It participates and disseminates the procured information, knowledge and inferences in professional, academic and public forums.

World Society for Protection of Animals (WSPA) With consultative status at the United Nations and the Council of Europe, WSPA is the world's largest alliance of animal welfare societies, forming a network with 910 member organizations in 153 countries. WSPA brings together people and organizations throughout the world to challenge global animal welfare issues. It has 13 offices and hundreds of thousands of supporters worldwide.

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The objectives of keeping elephants in forest camps have changed over their history and presently the camps are for eco tourism, patrolling for anti poaching operations, help in mitigation of human-elephant conflict and act as conservation & training center for Asian elephants. This document provides some details of ecology, management and welfare status of captive elephants kept in Forest Camps of Tamil Nadu.

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ASIAN NATURE CONSERVATION FOUNDATION
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WSPA
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