National Studbook for the Lion-Tailed Macaque
(Macaca silenus)

Data Current Till : **30th September, 2002**

Published in : **December, 2003**

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FINANCIAL SUPPORT

केन्द्रीय चिड़ियाघर प्राधिकरण
Central Zoo Authority

(Statutory Body Under the Ministry of Environment and Forests, Govt. of India)

ACKNOWLEDGEMENTS

Our first and foremost thanks go to the Central Zoo Authority, for giving Wildlife Institute of India, the task of compiling the studbooks for five endangered species. We also thank Shri P.R Sinha, Member Secretary and Shri. Bipul Chakraborty, Scientist, Central Zoo Authority, for their valuable assistance and guidance throughout the duration of this project.

We are most obliged to all the zoo directors and other zoo staff who provided us with all co-operation and assistance in compiling the data. My special thanks goes to Ms Avanti Mallapur Anand, alumnus from Wildlife institute of India for sharing her LTM data with us.

We are thankful to Dr. Goutam Narayan, Pygmy Hog Breeding Centre, Guwahati for sending us the SPARKS software and to ISIS for all the assistance in this regard.

Last but not the least, we extend our sincere gratitude to Ms. Laurie Bingaman Lackey, International Species Information System, who helped a lot with the data analyses.

We are grateful to the Director, Wildlife Institute of India, DehraDun, for giving us an opportunity to be part of such a vital endeavour.

Contents

Species status in the wild

Lion-tailed Macaque (*Macaca silenus*) or "LTM" is classified as endangered by the IUCN Red Data Book and the U.S. Fish & Wildlife Service. It is an Appendix I species under CITES. This primate is endemic to the rainforests of the Western Ghats in South India. The estimated free-ranging population is about 4000 individuals (Kumar *et al.*1995) . LTMs survive in the wild in the states of Kerala, Karnataka, and Tamil Nadu.

Population estimates for LTM are given below in **Table A**

Table A. Population estimates for Lion –Tailed Macaque in the wild

	No. of troops	No. of individuals	Source
Karnataka	48	960	Lion tailed Macaque *(Macaca silenus)* PHVA workshop report. Madras, 11-14 October 1993.
Kerala	64	1261	Easa *et al.* (1997).
Tamil Nadu	53	965	Lion tailed Macaque *(Macaca silenus)* PHVA workshop report. Madras, 11-14 October 1993.

Threats to LTM populations in the wild are largely due to habitat fragmentation (loss/deterioration) and poaching. The illegal felling of rainforest trees both inside and outside protected areas, clearing of forest patches for cultivation, and expansion of tea, coffee and rubber plantations are some of the major factors for the loss of the primary habitat of LTMs. Biotic pressures including that of Minor Forest Produce collection also cause habitat deterioration; overexploitation of seeds, fruits and other MFPs substantially deplete the food resource base for LTMs and it also poses a serious threat to forest regeneration. The major causes of forest fires especially in Karnataka is the activities of minor forest collectors and deliberate burning of grasslands by settlers to promote grazing, which has led to the expansion of grass savannas at the cost of medium and high elevation evergreen forests (Karanth,1992). Development projects like construction of large and medium scale dams for irrigation and power generation, mining and road construction also influence the quality of forest habitat. Sharavathi, Chakra-Savehaklu, Varahi and Yelanir Ghat projects for power generation, iron-ore mining in Kudermukh, Hassan-Mangalore railway are some example of development projects which have already caused deterioration and fragmentation of LTM habitats in Karnataka (Karanth, 1992) .

Existing habitat is greatly reduced (estimates of about 1% of the original), and remaining populations are isolated in forest fragments mostly < 20 km² or, in a few cases in plantations (AZA's Lion-Tailed Macaque Species Survival Plan, 1998).

Green and Minkowski (1977) stressed the importance of large interbreeding populations for maintaining genetic variability and suggested the need for a continuous evergreen patch of about 135 km² for the survival of a viable population of about 500 animals.

Under the present scenario, habitat fragmentation and population isolation give rise to inbreeding depression. To ensure conservation of LTM, effective management actions are needed. Planned and careful Captive breeding of this species can be an important tool for its conservation. The 1993 PHVA workshop recommended that a healthy captive stock of LTM could prove crucial for intensive metapopulation management by providing genetic material for supplementing the wild population by re-introduction of animals. Hence, there is a need for proper and planned *ex situ* conservation programmes to support *in situ* programmes for this endangered species.

Biological Data:

Scientific Name

- *Macaca silenus* (Linnaeus,1758)

Common Names

- Lion-tailed macaque, *Siah bandar* in Hindi, *Singalika* in Kannada, (Roonwal & Mohnot, 1977), *simhavalan* in Malayalam, *singalam* in Tamil (pers. comm. Dr. A. Kumar).

Habitat

- LTMs are unique amongst macaques in being limited to the tropical wet evergreen forest.

Current Distribution and Numbers

- Confined to a long, narrow band of forest in the Western Ghats (mountains) of Southern India, measuring about 850 km in length and about 30 km wide at its maximum width (from almost southern tip of the Western Ghats to slightly north of Sharavathi river in Karnataka).
- Approximately 4000 LTMs

Size

- Male 5 -10 Kg, Female 3-6Kg (Body weight)
- Male 45-61 cm, Female 40-45 cm (Body length)
- Male 24-38 cm, Female 25-32cm (Tail length)

Physical Description

- Pelage is black, with a conspicuous tail tuft (especially in adult males) that gives the species its common name. Face is bare and black in adults, bright pink in the newborn. Prominent silvery mane occurs in both sexes, and begins growing at about three months of age. Males have large canines.

Life History Characteristics

- The diet is predominantly frugivorous, reflecting the fact that this macaque spends >90% of its time in trees. It also feeds on seeds, stems, insects, bird and reptiles eggs and small mammals. Only males, with large canines can open the tough skin of certain fruits.
- Sexual maturity is attained at age 2.5-4 years for both sexes (in captivity).
- In wild, age at first birth for females is about 6.5 years, considerably higher than in other macaques. Male reaches sexual maturity at 7-8 years, and social maturity at 9-10 years (pers. comm. Dr. A. Kumar).
- Gestation period approximately 172 days;
- Life span over 20 years (26 years -captive record)

Behaviour

- Most of the groups in continuous forests have only one adult male, with 5-6 adult females. Most of the *silenus*-group macaques have such a social organisation (pers. comm. Dr. A. Kumar). An average size of about 20 individuals is small compared to other species. Adult females outnumber adult males about 3 to 1. Male migrates to new groups on reaching sexual maturity, whereas females remain in the natal group for life, and have strong relations with kin. Females have a prominent "sexual skin" under the tail, which swells during estrus. Typically, one offspring is born every other year.
- The male LTM exhibits a behavioural trait that distinguishes it from the other macaques. The leading male occasionally utters a very loud call especially when the group is beginning its activities in the morning, thus promotes cohesion within the group and it also serves to make the group's presence known to other groups of LTM.

Source: (AZA's Lion-Tailed Macaque Species Survival Plan, 1998)

Scope and conventions of Studbook

(A) Assumptions

1. Animals bought from animal dealers are considered as wild born.
2. If more than one individual is brought to any captive facility on the same date (either by Forest Department or animal dealers) they are considered siblings, assuming that they belong to the same troop and are caught in one capture attempt. Thus to show wild caught siblings, their dams and sires are kept the same and recorded as ' Wild' followed by the first alphabet of Zoo's name (where it came first) and a number, which is unique to that parent. For example, if individual 1 and 2 came to Thiruvananthapuram zoo from the wild on the same day and are recorded as siblings i.e they have the same parents which are recorded as WILDT1(sire) and WILDT2 (Dam) and the next set of wild siblings which came to Thiruvananthapuram zoo had different numbers assigned to their parents i.e WILDT3 (sire) and WILDT4 (dam).
3. If the estimated age of wild caught siblings are the same then considering the social behaviour of LTMs, the sire of such individuals is kept the same but dams are recorded as different, for example individuals 6, 7, 8, 9, 10 and 11.
4. The year of capture is recorded as the year of the individual's transfer to its first captive facility.
5. If only the year of birth is known then 30th of June of that year is taken as the date of birth for an individual.
6. The exact wild capture locations for most of the individuals are not known and hence a broader location category i.e India is used.
7. When it is not possible to specify the dam and sire of an individual due to large social groups (with multiple males and females), Parents are recorded as MULT followed by first alphabet of the zoo in which it is present and a number, which refers to an unique batch of animals. If there is any difference in the composition of the group of possible parents, they are assigned with a different MULT number. For details see section 'Symbol used'.
8. If the final fate (when it is known what happened to the animal finally) of an individual is not known it is recorded as Lost-to-follow-up. Such individuals are shown as l t f between local Id and event columns.
9. Unsexed individuals are put as both dam and sire in MULT group, for e.g individuals 4 and 5 are present in both MULTR1 (Sires) and MULTR2 (Dams).
10. All individuals are identified by local/expert knowledge not by artificial markings and the animal keepers identify the unmarked individual correctly
11. The date of transfer is taken as the date on which animal is sent from an institution and if this date is not available then the date on which it is acquired by the subsequent institution is considered.
12. Individuals were assigned studbook numbers in an ascending order based on their date of birth. Older animals are listed first followed by younger animals, except in a few cases, when we received and recorded data after the allotment of permanent studbook numbers. These cases were, however allotted numbers in sequence to the last number recorded. In the present studbook these numbers start from 209 onwards.
13. The new National stud book numbers have been allotted to all individuals and these numbers are used in all graphs and figures.
14. The International stud book numbers are given in Section 1and 2 in a separate column.
15. Individuals, which were already assigned National stud numbers in the National studbook for the Lion tailed macaque (current till 30th September 2000, compiled by Wildlife Institute of India, published in May 2001) have retained their old stud numbers in this studbook.
16. New individuals not recorded in the previous edition are allotted new National studbook numbers. The new National stud numbers start from 227.

(B) Symbol Used:

1. **WILDH#:** Parents of wild siblings of Nehru Zoological Park, Hyderabad, Andhra Pradesh
2. **WILD#:** Parents of wild siblings of National Zoological Park, Delhi.
3. **WILDT#:** Parents of wild siblings of Thiruvananthapuram zoo, Kerala.
4. **WILDN#:** Parents of wild siblings of Nandankanan Zoological Park, Orissa.
5. **WILDP#:** Parents of wild siblings of Mahendra Chaudhury Zoological Park, Chatbir, Punjab.
6. **WILDJ#:** Parents of wild siblings of Jaipur zoo, Rajasthan.
7. **WILDM#:** Parents of wild siblings of Arignar Anna Zoological Park, Vandalur, TamilNadu.
8. **WILDK#:** Parents of wild siblings of Kanpur Zoological Park, Uttar Pradesh.

MULT groups of National Zoological Park, Delhi:
MULT1 : Possible sires 6, 9, and 16 (Adult males in this group)
MULT2: Possible dams 7, 8, and 10 (Adult females in the group)

MULT groups of Thiruvananthapuram Zoo, Kerala:
MULTR1:. Possible sires 2, 4, and 5 (Adult males in this group) (4 & 5 are of unknown sex).
MULTR2: Possible dams 3, 4 and 5 (Adult females in this group) (4 & 5 are of unknown sex).
MULTR3: Possible sires 76, 78, and 80 (Adult males in this group)
MULTR4: Possible dams 77 and 79 (Adult females in this group)
MULTR5: Possible sires 76 and 78 (Adult males in this group)
MULTR6: Possible sires 78 and154 (Adult males in this group)
MULTR7: Possible dams 56, 61, 77 and 79 (Adult females in this group)
MULTR8: Possible sires 154,159 and 164 (Adult males in this group)
MULTR9: Possible dams 56 and 61(Adult females in this group)
MULTRA= MULTR10 Possible sires 106,159,164 (Adult males in this group)
MULTRB= MULTR11 Possible sires 106,164, 165 (Adult males in this group)
MULTRC= MULTR12 Possible sires 106,164 (Adult males in this group)
MULTRD= MULTR13 Possible dams 136,171(Adult females in this group)

MULT groups of Thrissur Zoo, Kerala:
MULTH1: Possible sires 73, 74, 208 (Adult males in this group)
MULTH2: Possible dams 204 to 207 (Adult females in this group)
MULTH3: Possible sires 215, 218, 220 (Adult males in this group)
MULTH4: Possible dams 201, 203 (Adult females in this group)

MULT groups of Kanpur Zoological Park, U.P:
MULTK1: Possible sires 36, 43, and 44 (Adult males in this group).

MULT groups of Arignar Anna Zoological Park, Vandalur,Tamil Nadu:
MULTM1: Possible sires 149, 150,154, & 157 (Adult males in this group).
MULTM2: Possible dams 89, 104,151, 152,153 , and156 (Adult females in this group).

MULT groups of Jaipur Zoo, Rajasthan:
MULTJ1: Possible dams 216, 217,162 (Adult females in this group).

(C) Time Scale:
The earliest date entered in the studbook is September 1966 and data is current through September 2002. The studbook software used is SPARKS 1.52, its associated programmes and Population management 2000.

(D) Zoo Specific Issues :

Note about National Zoological Park, Delhi and Arignar Anna Zoological Park, Vandalur, TamilNadu:

1. National Zoological Park had dates of events (birth, death, or transfer of individual). However, information about the individual's gender, parentage, which individual died/transferred was not clearly mentioned. These available dates were then tallied with the International Studbook. Details of gender, birth and transaction history of an individual was gleaned from the International Studbook. Hence for all the individuals of NZP with an International studbook number, information about gender, parents and transactions are taken from the International Studbook.
2. Some individuals viz.22 ,30, 17, 18, 42,59, 68, 90,101 and 181 are put into "lost to follow up" list. Though zoo records pertaining to transactions carried out are available, it is unclear as to which individual corresponds to which transaction. The possible transactions for the above mentioned individuals (present in zoo records are): 4 females died, 1 female sent to Mysore, 2 individuals (unsexed) sent to Malaya, 1 individual (unsexed) sent to Switzerland, and 1individual (unsexed) died.
3. Similarly in Arignar Anna Zoological Park, Vandalur, the individuals present in their captive facility between 1983 to1989 are also kept in "lost to follow up" list, it is unclear from the records, which individual corresponds to which transaction. The transactions that took place there are: 1:1 sent to Shimla on 8.10.1986, 1:3 sent to Assam State Zoo on 13.3.1986, one male sent to Baroda zoo on 25.2.1989, one male to Guindy Children's Park on 20.3.1984, and four individuals died (2:2). The males present in Arignar Anna Zoological Park, during this period were 130, 149, 150, 154, &157, females present were 89, 104,151,152, 153, and 156.
4. In National Zoological Park, Delhi records from 20.11.1977 to 11.6.1979 could not be located in the Zoo. Thus gaps in the information are filled with the help of the International Studbook.

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Species status in Indian zoos

The present studbook is divided into two sections. Section 1 includes historical listing of all individuals held in Indian zoos. A total of 241 individuals are registered in section 1. Among them,105 are wild caught, 110 captive born (of these 22 individuals have parents in MULT groups) and 26 of unknown origin.

For all kind of analysis data from Section 2 were taken, it comprises of current living population, their lineage and historical data including age, sex and parentage.

Amongst dead individuals, only data with complete information were taken into analysis and individuals with incomplete information and those which haven't contributed to the present population were not considered. This was essential to optimize the analytical procedure as incomplete data-sets would yield no results.

However, several of our data in Section 2 were incomplete given the incomplete and inadequate record-keeping of Indian zoos in general, and we certainly could not afford to ignore them entirely in the analysis. To overcome this problem, we made some assumptions based on the animal and our knowledge of the captive individuals. These assumptions were used as premises in decision- making in the course of the analysis (see Appendix II for list of these assumptions).

As of 30th September 2002, there are 56 individuals (33.22.1) living in 15 institutions of India.

Demographic analysis:

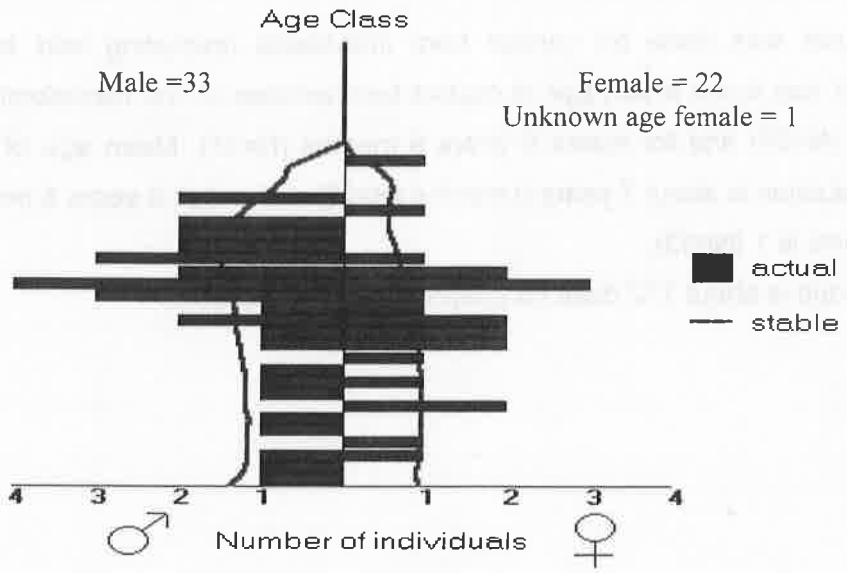
As mentioned earlier for all kind of analysis data from Section 2 is used, which contains pedigree data on 185 (84.90.11) individuals. The detail of status of total captive population has been summarised in Table. 1.

Table.1: Lion-tailed macaque data as of 30th September 2002.

	Male	Female	Unknown sex	Total
(Section 1)				
Total Registered	105	110	26	241
Total wild caught	53	52	7	112
Total captive born	47	48	17	112
Unknown Origin				
Alive as of 30th September 2002.				
Wild origin	13	15		28 (13.15)
Captive born	16	12	-	28 (16.12)
Unknown Origin	0	1	-	1 (0.1)
Total Breeding Animals				
Wild born that have bred	8	11	-	19 (8.11)
Captive born that have bred	5	16	-	21 (5.16)
Living proven breeders (animals who have bred at least once)				
Wild born	2	1	-	3 (2.1)
Captive born	2	2	-	4 (2.2)

Figure 1, shows the age structure of the current population of LTM. A healthy, growing population would be pyramid shaped with the majority of the animals in the lower age classes. The existing age structure does not show a healthy trend. It reflects very less recent births in especially for females, which is indicative of an unstable declining population. The number of females is less as compared to males. **Figure 1,** also demonstrates the majority of population falls in the higher age classes hence nearing reproductive senescence, especially in case of males 50% individuals (age > 16) have already reached reproductive senescence .

Figure1. Age Pyramid of Captive LTM as on 30th September 2002



Demographic analysis gives the life table of captive population, which indicates the different phases of animals at various age classes during its lifetime. The life tables of captive animals do not necessarily show biological features of a species. It evaluates zoo management in the past. The main indicators from the life table can be used to evaluate the health of captive population. These are fecundity (Mx) and mortality (Qx). The instantaneous growth rate (r) and projected growth rate (λ) give an indication of the population's overall health. The life table does not take import of any individual from wild or release into wild into consideration for calculating the population parameters. It is entirely based on actual births and deaths happened in the captivity. These terms are defined in glossary (Appendix-I).

Fecundity (Fertility):

Present analysis shows successful breeding in LTM from 3.5 to 17 years in males and 2 to 17 years in females.

The fecundity and mortality figures are exported from SPARKS for an analysis in the PM2000 programme. The data have been smoothed after which the fertility values for the oldest and youngest age classes were corrected to reality as the smoothing process can put a small fictitious value in age classes with zero value and the small sample sizes in older classes can distort their values.

Though the analysis has been done it is not very reliable especially for the higher age classes as the sample size is too small. No relevant conclusion about the demographic trends can be derived from this data set.

The captive male population of LTM in India shows peak reproduction from the age of 8 to 14 years and then it declines gradually (**Figure 2**). Similarly, **Figure 3**, shows peak reproduction in captive females is from the age 6 to 9 of years.

These curves may not reflect exact biological features of the species but could be result of zoo management.

When the analysis was done on captive born individuals (excluding wild born to avoid estimated age), it was found mean age of captive born females at first reproduction is about 5 years 8 months (N=20) and for males 6 years 9 months (N=11). Mean age of captive born females at reproduction is about 7 years 9 months (N=20) and males 9 years 6 months (N=11).

The mean litter size is 1 (N=53).

The gestation period is about 172 days for offspring of both sexes.

Figure 2. Age specific fertility in captive male of LTM. Actual Vs Model
(Data age >15 are very unreliable due to small sample size)

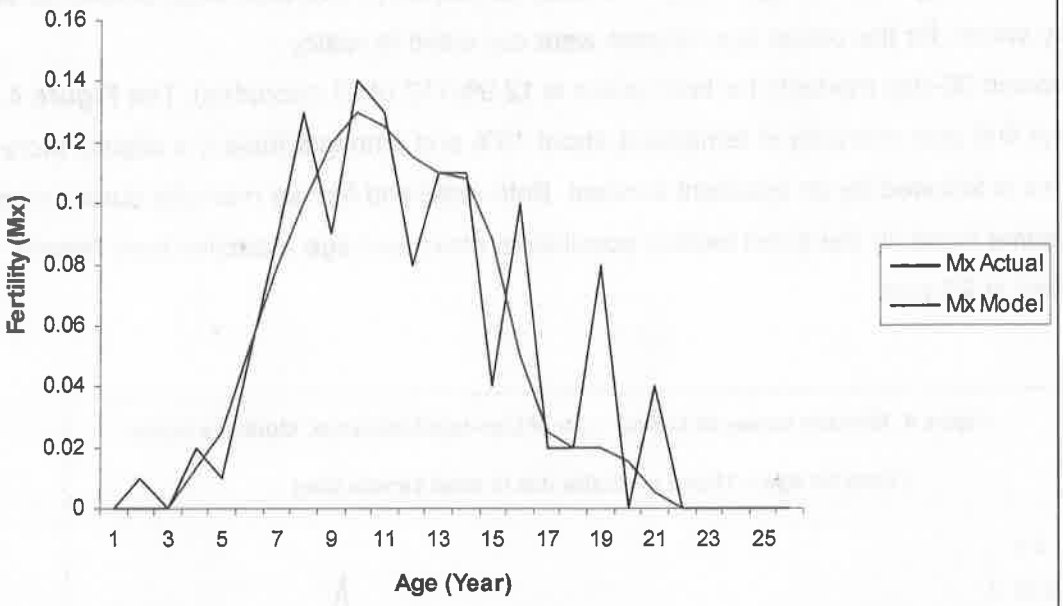
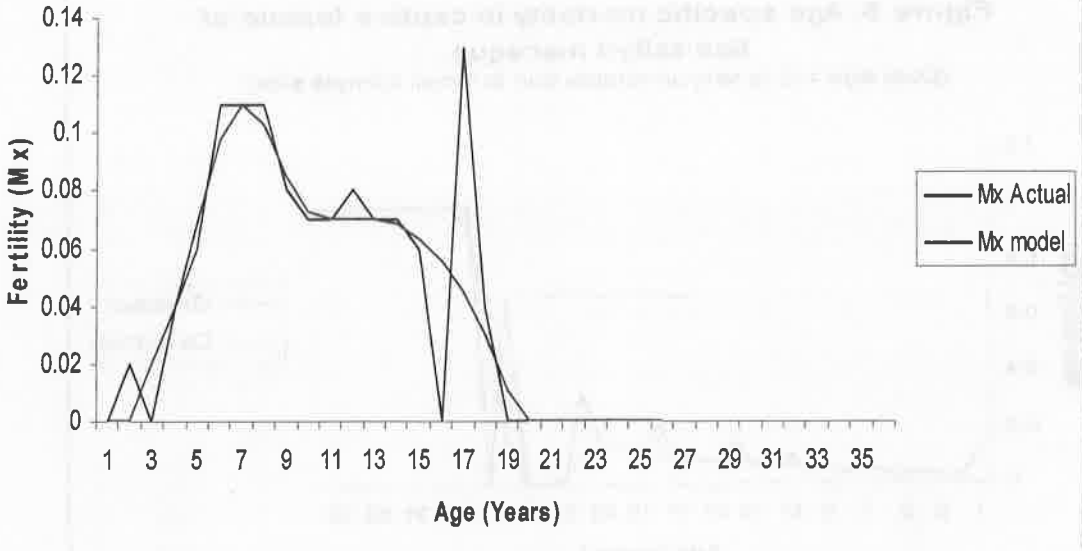


Figure 3. Age specific fertility in captive female of Lion -tailed macaque.
(Data >13 ia very unreliable due to small samle size)



Mortality:

The mortality rate Qx of an age class is the proportion of animals belonging to that class and dying before reaching the next age class. The data for mortality have also been smoothed and the mortality values for the oldest age classes were corrected to reality.

Analysis showed 30-day mortality for both sexes is 12.9% (12 of 93 neonates). The **Figure 4** and **5**, shows first year mortality in females is about 13% and amongst male it is slightly more i.e 19%. This is followed by an excellent survival. Both male and female mortality curves show almost the same trend. In the given captive population, maximum age a captive born female and male lived is 26 year.

Figure 4. Mortality curves of captive male of Lion-tailed macaque: Model Vs Actual

(Data for age > 15 are unreliable due to small sample size)

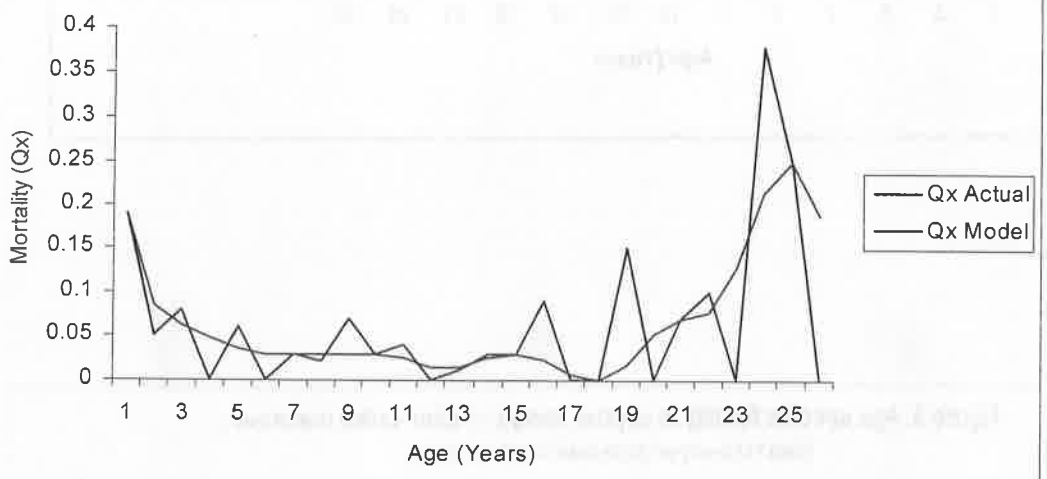
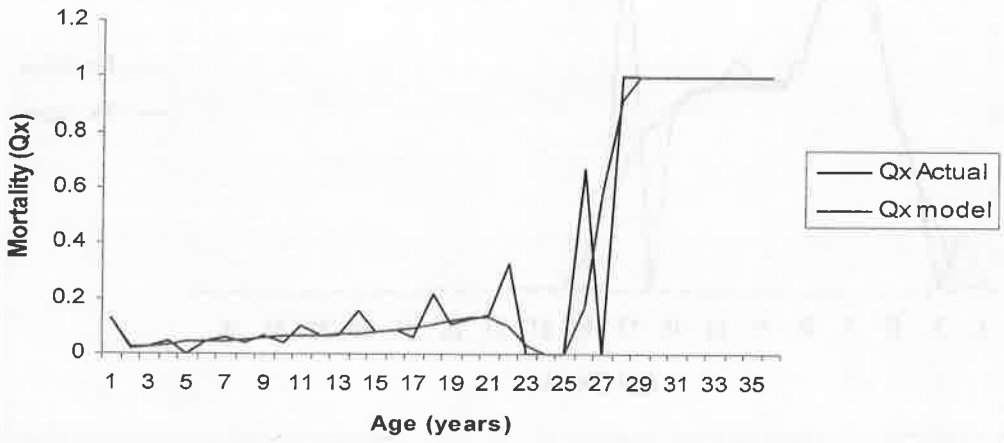


Figure 5. Age specific mortality in captive female of lion-tailed macaque.

(Data age >13 is very unreliable due to small sample size)



Instantaneous rate of growth (r)

The rate of growth for males is r = -0.0409 and for females is r = -0.0554. This mean population is decreasing for males by 4% per year and for females by 5% per year.

Projected growth rate (λ)

λ for lion-tailed macaque as on 30th December 2002 is 0.953 means a 5% decline in population size per year. λ and r are calculated on the bases of birth and death rates in the life table.

Genetic analysis

Out of total 56 current living individuals (as on 30th September 2002), 19 individuals were removed from the genetic analysis. These excluded individuals were either those who have reached reproductive senescence (age class> 18 for males and > 16 for females) or were very young (age class < 4 for males and < 3 for females). Analysis showed current captive population is based on 19 founders (**Table 2**).

The reproductive success and founder representation of the wild caught animals has been very variable with some animals being hardly represented in the current stock, while others are fully represented (**Figure. 6**).

Table 2. Founder representation in Captive Lion-tailed macaques as of 30th September 2002

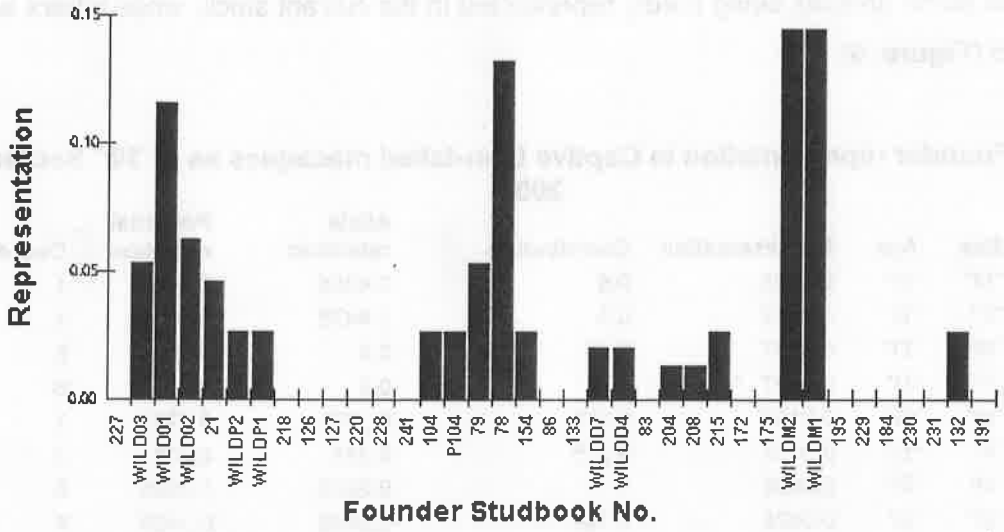
National Stud #	Sex	Age	Representation	Contribution	Allele retention	Potential retention	Descendants
WILDP2	"M"	"D"	0.0263	0.5	0.4365	0.4365	1
WILDP1	"F"	"D"	0.0263	0.5	0.4475	0.4475	1
WILDM2	"M"	"D"	0.1447	2.75	0.8	0.8	6
WILDM1	"F"	"D"	0.1447	2.75	0.8	0.8	6
WILDD7	"M"	"D"	0.0197	0.375	0.2275	0.2275	3
WILDD4	"F"	"D"	0.0197	0.375	0.231	0.231	3
WILD03	"M"	"D"	0.0526	1	0.2925	0.2925	6
WILD02	"M"	"D"	0.0625	1.188	0.3405	0.3405	6
WILD01	"F"	"D"	0.1151	2.188	0.5395	0.5395	6
P104	"M"	"D"	0.0263	0.5	0.5	0.5	1
83	"M"	14	0	0	0	1	0
79	"F"	"D"	0.0526	1	0.517	0.517	4
78	"M"	"D"	0.1316	2.5	0.872	0.872	4
241	"M"	16	0	0	0	1	0
231	"M"	11	0	0	0	1	0
230	"F"	11	0	0	0	1	0
229	"M"	12	0	0	0	1	0
228	"F"	16	0	0	0	1	0
227	"M"	18	0	0	0	1	0
220	"M"	16	0	0	0	1	0
218	"M"	17	0	0	0	1	0
215	"M"	"D"	0.0263	0.5	0.5	0.5	1
21	"F"	"D"	0.0461	0.875	0.352	0.352	4
208	"M"	"D"	0.0132	0.25	0.2475	0.2475	1
204	"F"	"D"	0.0132	0.25	0.2525	0.2525	1

National Stud #	Sex	Age	Representation	Contribution	Allele retention	Potential retention	Descendants
195	"F"	12	0	0	0	1	0
191	"F"	6	0	0	0	1	0
184	"F"	11	0	0	0	1	0
175	"F"	13	0	0	0	1	0
172	"F"	13	0	0	0	1	0
154	"M"	"D"	0.0263	0.5	0.4485	0.4485	1
133	"M"	15	0	0	0	1	0
132	"F"	"D"	0.0263	0.5	0.5	0.5	1
127	"M"	16	0	0	0	1	0
126	"M"	16	0	0	0	1	0
104	"F"	"D"	0.0263	0.5	0.5	0.5	1

Note: *Individual with P is a hypothetical sire for the wild caught female which came pregnant from the wild.*

Key: M= male F= female D= dead individual

Figure 6. Founder Representation in captive LTM as on 30th September 2002



Definitions of the terms mentioned in **Table 2** are given below:

- Representation: It gives percentage of the current population descended from a particular founder. For example if it is 0 (eg. Studbook # 126) then 0% of current population are descended from stud # 126. Value of 0.0263 (as given in Table 2 for an individual having studbook # 215) shows that 12.63% of current population are descended from this particular individual.
- Contribution: It calculates equivalent number of living animals solely descended from each founder. For example, an immediate offspring of a founder will acquire half of the alleles from the founder , therefore one offspring represents the equivalent of only 0.5 (50%) of an animal solely descended from that founder. If this immediate offspring of founder breeds, will contribute 0.25 (25%) of the alleles of founder in a direct second generation descendant . Therefore, a founder with one immediate offspring and one direct second generation descendant in the living population has a founder contribution of 0.5+0.25=0.75.
- Allele retention: The proportion of the total genome from each founder that is represented in the living descendant population. If a founder has had two offspring, it is likely to have passed 75% of its genetic material (retention-0.75). If a founder had only one offspring, who in turn had one offspring before dying, only 25 % (retention=0.25) of that founder's genetic material will remain in the descendant population. Where the retention is 0, the animal has yet to breed. If the founder is alive, then its retention can improve. The values given for **potential retention** shows possibility for an animal to pass 100% of its genetic material. But in practice, these are not attainable. Thus, these are theoretical numbers.

In the genetic summary given in **Table 3,** shows there are 17 potential founders, wild individuals which have not contributed at all to the current population. Founder genome equivalent (fge) is 5.37 (5 individuals) indicating that present captive population of LTM behaves genetically like 5 founders. This is a measure of the loss of genetic variation due to bottlenecks and disparities in founder representation. This means there are many founders which have not contributed to the current population (**Fig. 6**)

Table 3. Genetic Summary of captive lion-tailed macaque as on 30th Sepetember 2002.

	Current	Potential
Founders	19	17 additional
Founder genome equivalents	5.37	26.8
Founder genome surviving	8.8	26.8
Gene diversity retained	0.907	0.981
Population mean kinship	0.093	0.019
Mean inbreeding	0.242	0.019
% of pedigree known	100	-----

Over 90% of wild genetic diversity (GD=0.907) is currently being retained; meaning 10% of the gene diversity has been lost during the years in captivity.

Mean Inbreeding coefficient of the population is 0.242. The mean inbreeding coefficient of a population is the proportional decrease in observed heterozygosity relative to the expected heterozygosity of the founder population. This value lies between 0 to 1; smaller the value more heterozygous is the population. The average mean kinship is about 0.093. The mean kinship of a population is equal to the proportional loss of gene diversity of the descendant (captive-born) population relative to the founders. Low mean kinship value signifies rare genes and less relatives in the population.

The population has 17 living founders not represented in the descendent population yet. Hence there is potential to improve the genetic diversity of current population by breeding these founders.

Table 4 shows ordered list of Mean kinship (MK). This analysis has been carried out from PM 2000 software. Mean kinship measures the genetic importance of each LTM relative to all others in the analyses. The younger animals are given less weightage as they have more years of breeding life left, and hence there is no urgency to breed these individuals as compared with older animals nearing reproductive senescence.

Table 4.Ordered lists of mean kinship by sex

Rank	Male Stbk#	MK	Known	Age	Location	Female Stbk#	MK	Known	Age	Location
1	83	0.000	100.0	14	Mysore	86	0.0000	100.0	15	Mysore
2	126	0.000	100.0	16	Trivandru	172	0.0000	100.0	13	Trivandru
3	127	0.000	100.0	16	Trivandru	175	0.0000	100.0	13	Mysore
4	133	0.000	100.0	15	Madras	184	0.0000	100.0	11	Mysore
5	218	0.000	100.0	17	Trichur	191	0.0000	100.0	6	Madras
6	220	0.000	100.0	16	Trichur	195	0.0000	100.0	12	Calcutta
7	227	0.000	100.0	18	Patna	228	0.0000	100.0	16	Patna
8	229	0.000	100.0	12	Trivandru	230	0.0000	100.0	11	Trivandru
9	231	0.000	100.0	11	Mysore	135	0.0263	100.0	16	Assam
10	241	0.000	100.0	16	Trivandru	136	0.0510	100.0	16	Trivandru
11	142	0.026	100.0	13	Trivandru	197	0.0855	100.0	10	Jaipur
12	123	0.033	100.0	18	Chatbir Z	179	0.1130	100.0	12	Patna
13	186	0.076	100.0	9	Madras	187	0.1184	100.0	8	Madras
14	199	0.086	100.0	8	Jaipur	190	0.1184	100.0	6	Madras
15	200	0.095	100.0	5	Jaipur	234	0.1184	100.0	3	Madras
16	170	0.108	100.0	13	Hyderabad	167	0.1242	100.0	14	Bhilai
17	138	0.109	100.0	15	Delhi					
18	143	0.113	100.0	15	Nandankan					
19	189	0.118	100.0	7	Madras					
20	219	0.124	100.0	18	Bhilai					
21	221	0.124	100.0	17	Bhilai					

Managemenmt and Breeding recommendations:

To achieve demographic and genetic goals under current scenario there is need to increase population growth rate, rectify past disparities in founder representations, regulate family sizes and sex ratios to maximise effective size of population. It could be accomplished by optimising breeding conditions by reducing mortality and increasing fertility. Hence the most important recommendation for the zoo managers would be-

1. **Acquire more females from foreign zoos**: A social group of LTMs usually have only one adult male, with 5-6 adult females in wild. Adult females outnumber adult males about 3 to 1. The age pyramid (**Figure 1**) shows in captivity females are lesser than males, majority of population of females fall in higher age classes and are approaching reproductive senescence. Females in wild remain in the natal group for life, and have strong relations with other females in the group (kin). So there are possibilities that in absence of same kin, females are not fertile in the captivity. Hence, it is recommended more females ideally belonging to the same natal group should be acquired from the foreign zoos to establish new social groups in Indian zoos.
2. **Research and husbandry improvements:** To know the causes of mortality (in juvenile and adults) and low fertility in the zoos. There is need to devise appropriate research and husbandry programmes to resolve the problems. It is vital to do post-mortems for all individuals dying and record causes of death whether they are due to congenital factors, due to insufficient maternal care or disease related. Similarly, research should be taken on issues of infertility whether it is due to non-conducive environment, inbreeding, stress, non-compatible mates so on. Arignar Anna Zoological park, has been successfully breeding LTMs for last few years, so they should proactively participate in research programmes on reproductive biology of LTM and come up with husbandary guidelines for the other zoos holding the species.
3. **Animal Identification:** There is foremost need to give Individual identification to each captive individual. Without reliable techniques for individual recognition the data from even the most carefully maintained studbook are open to dispute. Though animal keepers in Indian zoos are a very important source of information on the individuals, one cannot rely on experience or memory alone to track individual specimens;

- Firstly, animal keepers should be trained to use standard and adequate methods of animal identification. In absence of transponder, ear tag, tattoo etc they can be trained to identify individual by their unique physical markings. Whatever technique an institution uses should be recorded and explained properly.
- Secondly, zoo directors should not change sections of animal keepers unless it is absolutely essential. This will maintain consistency in animal identification, record keeping and will make animal keepers answerable for their sections.

- Arignar Anna Zoological park has already intiated the process of marking individuals by implanting transponders (their letter No.2708/WL1/2000 dt. 14.11.2002.)

4. **Mating recommendations: Table 5** gives mating pairs recommended for the next year.

Table 5 : Breeding pair recommended for captive lion-tailed macaque

Serial #	Studbook # of mating pairs	Transfer involved	Inbreeding co-efficient of offspring
1	Male 227 x female 228	No transfer (both in Patna)	0
2	Male 83 x female 86	No transfer (both in Mysore)	0
3	Male 83 x female 175	No transfer (both in Mysore)	0
4	Male 83 x female 184	No transfer (both in Mysore)	0
5	Male 133 x female 191	No transfer (both in Vandalur)	0
6	Male 133 x female 195	Transfer female from Alipore	0
7	Male 126 x female 172	No transfer (both in Trivandarum)	0
8	Male 126 x female 230	No transfer (both in Trivandarum)	0
9	Male 227 x female 179	No transfer (both in Patna)	0

Vandalur, Mysore and Trivandarum zoo has good population of LTM in captivity. Therefore, breeding pairs are recommended for these three zoos. Transfer to Vandalur zoo has been recommended for the wild caught female currently housed at Alipore zoo. This is the only individual left at Alipore zoo. Patna zoo also have wild caught potential breeders. These individuals have bred in past though their infant was still born. Hence breeding has been recommended for these pair at Patna zoo also or these breeding pair could be transferred to one of the zoos mentioned above.

If mating is successful as per recommendations made then there will be an improvement in genetic status of captive population of Lion-tailed macaque as shown in **Table 6**.

Table 6. Change in genetic status after mating recommendations for captive lion-tailed macaqueceros population

	Initial status	After mating recommendations
Population size N	37	46
Founder genome equivalents	5.37	9.39
Gene diversity retained	0.907	0.9468
Mean kinship	0.093	0.0532
% of pedigree known	100	100

Section 1

Historical Listing of Lion-Tailed Macaque *(Macaca silenus)*

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
12	F	~ 1958	WILD	WILD	INDIA ASSAM	~ 1966 21-Sep-66	NONE _____ ltf	Capture Transfer		
13	M	~ 1960	WILDH1	WILDH2	INDIA HYDERABAD	~ 1960 20-Feb-64 24-Jul-83	NONE _____	Capture Transfer Death		
14	M	~ 1960	WILDH1	WILDH3	INDIA HYDERABAD	~ 1964 20-Feb-64 24-Jul-83	NONE _____	Capture Transfer Death		
15	?	????	WILD	WILD	INDIA TRIVANDRU	~ 1961 4-Jul-61	NONE _____ ltf	Capture Transfer		
16	M	18-Mar-62	6	7	DELHI	18-Mar-62 10-Oct-77	_____	Birth Death		513
17	?	????	UNK	UNK	DELHI	26-Oct-62	_____ ltf	Transfer		
18	?	????	UNK	UNK	DELHI	26-Oct-62	_____ ltf	Transfer		
19	F	~ 1963	WILDN1	WILDN2	INDIA NANDANKAN	~ 1965 29-Jan-66 16-Jun-84	NONE _____	Capture Transfer Death		718
20	F	~ 1963	WILDN1	WILDN3	INDIA NANDANKAN	~ 1965 29-Jan-66 18-May-67	NONE _____	Capture Transfer Death		717

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
21	F	~ 1964	WILD	WILD	INDIA	~ 1966	NONE	Capture		526
					DELHI	29-Apr-66	_____	Transfer		
					INDIA	20-Nov-77		Death		
22	?	30-Nov-65	MULT1	MULT2	DELHI	30-Nov-65	_____ ltf	Birth		0
23	M	~ 1965	WILD	WILD	INDIA	~ 1967	NONE	Capture		776
					NANDANKAN	29-Mar-67	_____	Transfer		
						15-Nov-75		Death		
24	?	????	WILD	WILD	INDIA	~ 1955	NONE	Capture		0
					TRIVANDRU	24-Sep-65	_____ ltf	Transfer		
25	?	21-May-66	MULTR1	MULTR2	TRIVANDRU	21-May-66	_____	Birth		0
						14-Jul-71		Death		
26	F	13-Jun-67	6	7	DELHI	13-Jun-67	_____	Birth		970
					SANDIEGOZ	9-Mar-71	_____	Transfer		
						6-Jan-93		Death		
27	M	1-Mar-67	6	10	DELHI	1-Mar-67	_____	Birth		969
					SANDIEGOZ	9-Mar-71	_____	Transfer		
						2-Mar-93		Death		
28	F	~ 1968	WILD	WILD	DELHI	26-Mar-70	_____	Transfer		918
						8-Nov-85		Death		
29	F	7-Jan-69	6	7	DELHI	7-Jan-69	_____	Birth		859
						13-Aug-82		Death		
30	?	1-Apr-69	MULT1	MULT2	DELHI	1-Apr-69	_____ ltf	Birth		0
31	F	15-Jun-69	WILD	WILD	INDIA	~ 1971	NONE	Capture		999

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
					CALCUTTA	~ 1971	_____	Transfer		
					ADELAIDE	18-Oct-71	_____	Transfer		
						18-Jul-85		Death		
32	M	~ 1969	WILD	WILD	INDIA	~ 1971	NONE	Capture		1000
					CALCUTTA	~ 1971	_____	Transfer		
					ADELAIDE	18-Oct-71	_____	Transfer		
						9-Feb-96		Death		
33	M	????	WILDJ1	WILDJ2	INDIA	~ 1973	NONE	Capture		0
					JAIPUR	10-Jan-73	_____	Transfer		
					JODHPUR	7-Mar-84	_____ ltf	Transfer		
34	F	~ 1970	WILD	WILD	INDIA	~ 1973	NONE	Capture		0
					ASSAM	14-Aug-73	_____	Transfer		
						12-Apr-77		Death		
35	F	19-May-70	6	10	DELHI	19-May-70	_____	Birth		925
						16-Mar-79		Death		
36	M	~ 1970	WILD	WILD	INDIA	30-Jun-73	NONE	Capture	KALLU	1102
					KANPUR	6-Oct-73	2301	Transfer		
						3-Feb-94		Death		
37	M	~ 1971	WILD	WILD	INDIA	~ 1973	NONE	Capture		
					ASSAM	8-Oct-73	_____	Transfer		
						8-Oct-73		Death		
38	?	7-May-71	16	10	DELHI	7-May-71	_____	Birth		982
						1-Dec-81		Death		
39	M	9-Sep-71	16	21	DELHI	9-Sep-71	_____	Birth		994
						6-Nov-84		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
40	M	~ 1972	WILDN4	WILDN5	INDIA NANDANKAN	~ 1974 13-Feb-74 10-Feb-82	NONE _____	Capture Transfer Death		1119
41	F	~ 1972	WILDN4	WILDN6	INDIA NANDANKAN	~ 1974 13-Feb-74 29-Aug-75	NONE _____	Capture Transfer Death		777
42	F	1-Apr-72	16	10	DELHI	1-Apr-72	_____ ltf	Birth		1025
43	M	~ 1972	WILDK1	WILDK2	INDIA KANPUR	~ 1974 ~ 1974 31-Mar-87	NONE 2302	Capture Transfer Death	BHOLLA	1155
44	M	~ 1972	WILDK1	WILDK2	INDIA KANPUR	~ 1974 6-Nov-74 21-Jun-93	NONE 2303	Capture Transfer Death	BHUDHA	1156
45	F	~ 1973	WILD	WILD	INDIA KANPUR	~ 1974 20-Jan-75 11-Aug-90	NONE 2304	Capture Transfer Death	MEETA	1170
46	?	14-Apr-73	16	21	DELHI	14-Apr-73 11-Jun-79	_____	Birth Death		1074
47	F	28-Sep-73	16	10	DELHI	28-Sep-73 17-Jun-89	_____	Birth Death		1099
48	F	24-Sep-74	16	29	DELHI	24-Sep-74 1-Dec-87	_____	Birth Death		1151

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
49	F	10-Nov-74	16	10	DELHI	10-Nov-74	_____	Birth		1158
						12-Nov-85		Death		
50	F	24-May-75	16	21	DELHI	24-May-75	_____	Birth		1185
						21-May-87		Death		
51	M	~ 1976	WILD	WILD	INDIA	~ 1978	NONE	Capture		1345
					TRIVANDRU	1-Jul-78	_____	Transfer		
					CHATBIR Z	6-Mar-79	_____	Transfer		
						29-Sep-84		Death		
52	F	~ 1976	WILD	WILD	INDIA	~ 1978	NONE	Capture		0
					TRIVANDRU	~ 1978	_____	Transfer		
					CHATBIR Z	6-Mar-79	_____	Transfer		
						1-Jul-81		Death		
53	M	23-Mar-76	16	29	DELHI	23-Mar-76	_____	Birth		1242
					JAIPUR	27-May-87	_____	Transfer		
						14-Oct-94		Death		
54	M	26-May-76	16	35	DELHI	26-May-76	_____	Birth		1253
					NANDANKAN	20-Jan-82	_____	Transfer		
						6-Mar-01		Death		
55	F	13-Nov-76	16	21	DELHI	13-Nov-76	_____	Birth		1278
						27-Aug-89		Death		0
56	F	20-Feb-77	MULTR3	MULTR4	TRIVANDRU	20-Feb-77	_____	Birth		0
						3-Sep-84		Death		
57	F	18-Jul-77	16	42	DELHI	18-Jul-77	_____	Birth		1311

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
					NANDANKAN	20-Jan-82	_____	Transfer		
58	M	26-Apr-78	39	35	DELHI	26-Apr-78	_____	Birth		1370
					JAIPUR	11-Feb-81	_____	Transfer		
						16-Oct-82		Death		
59	F	29-Apr-78	39	29	DELHI	29-Apr-78	_____ ltf	Birth		1371
60	?	11-Aug-78	39	35	DELHI	11-Aug-78	_____	Birth		1387
						3-Sep-90		Death		
61	F	29-Sep-78	MULTR5	MULTR4	TRIVANDRU	29-Sep-78	_____	Birth		0
						13-Aug-84		Death		
62	?	1-Oct-78	39	42	DELHI	1-Oct-78	_____	Birth		1392
						21-Oct-78		Death		
63	?	17-Oct-78	39	48	DELHI	17-Oct-78	_____	Birth		1393
						17-Oct-78		Death		
64	F	~ 1979	WILD	WILD	INDIA	~ 1983	NONE	Capture		1148
					HYDERABAD	12-Sep-83	5	Transfer		
						10-Sep-85		Death		
65	F	29-Jul-79	39	48	DELHI	29-Jul-79	_____	Birth		1451
						16-Apr-91		Death		
66	F	5-Aug-79	MULTK1	45	KANPUR	5-Aug-79	IKAN1	Birth	NEETA	1453
						~ Nov 2000		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
67	M	11-Sep-79	39	48	DELHI	11-Sep-79	_____ ltf	Birth		1456
68	?	1-Oct-79	39	42	DELHI	1-Oct-79	_____	Birth		1460
						3-Jan-80		Death		
69	M	????	UNK	UNK	CHATBIR Z	~ 1979	_____	Transfer		1332
						15-May-94		Death		
70	M	????	WILD	WILD	INDIA	~ 1974	NONE	Capture		
					ASSAM	2-Nov-74	_____	Transfer		
						18-Jan-81		Death		
71	?	????	WILD	WILD	INDIA	????	NONE	Capture		
					TRIVANDRU	????	_____	Transfer		
						25-May-72		Death		
72	?	????	WILD	WILD	INDIA	~ 1971	NONE	Capture		
					TRIVANDRU	25-Jan-71	_____	Transfer		
						4-Aug-72		Death		
73	M	????	UNK	UNK	TRICHUR	????	_____	Transfer		
					TRIVANDRU	6-Jan-72	_____	Transfer		
					TRICHUR	10-Oct-75	_____	Transfer		
						10-Oct-81		Death		
74	M	????	WILD	WILD	INDIA	~ 1972	NONE	Capture		
					TRIVANDRU	25-Sep-72	_____	Transfer		
					TRICHUR	11-Jun-76	_____	Transfer		
						18-Jan-82		Death		
75	?	????	WILDT3	WILDT4	INDIA	~ 1973	NONE	Capture		
					TRIVANDRU	5-May-79	_____	Transfer		
						2-Jul-79		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
76	M	????	WILDT3	WILDT4	INDIA TRIVANDRU	~ 1973 5-May-73 21-Jan-80	NONE _____	Capture Transfer Death		
77	F	????	WILD	WILD	INDIA TRIVANDRU	19-May-73 21-May-74 13-Mar-81	NONE _____	Capture Transfer Death		
78	M	~ 1975	WILD	WILD	INDIA TRIVANDRU JAIPUR	30-Jun-75 9-Dec-75 12-May-81 18-Nov-96	NONE _____ _____	Capture Transfer Transfer Death		1220
79	F	~ 1975	WILD	WILD	INDIA TRIVANDRU JAIPUR	~ 1975 16-Dec-75 12-May-81 10-Jun-90	NONE _____ _____	Capture Transfer Transfer Death		1221
80	M	????	WILD	WILD	INDIA TRIVANDRU	~ 1976 10-Jan-76 10-Mar-77	NONE _____	Capture Transfer Death		
81	F	~ 1980	WILDP1	WILDP2	INDIA CHATBIR Z	~ 1981 26-Oct-81 16-Sep-89	NONE _____	Capture Transfer Death	SONI	
82	M	~ 1980	WILDP1	WILDP2	INDIA CHATBIR Z	~ 1981 26-Oct-81	NONE _____	Capture Transfer	MAHIWAL/B	

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
83	M	~ 1990	UNK1	UNK5	BANNERGHA	????	_____	Transfer		
					MYSORE	4-Nov-01	ZAK07	Transfer		
84	F	????	UNK1	UNK4	BANNERGHA	????	_____	Transfer		
						31-Aug-97		Death		
85	F	????	UNK1	UNK3	BANNERGHA	????	_____	Transfer		
						24-Jun-99		Death		
86	F	~ 1988	UNK	UNK	BANNERGHA	????	_____	Transfer	NETRA	2237
					MYSORE	20-Jan-92	ZAK03	Transfer		
87	M	4-Apr-80	39	47	DELHI	4-Apr-80	_____	Birth		1481
						????		Death		
88	?	10-Nov-80	39	49	DELHI	10-Nov-80	_____	Birth		1517
						13-Nov-80		Death		
89	F	12-Mar-81	MULTR6	MULTR7	TRIVANDRU	12-Mar-81	_____	Birth		1490
					MADRAS	18-Sep-85	_____ ltf	Transfer		
90	F	8-Apr-81	39	29	DELHI	8-Apr-81	_____ ltf	Birth		1546
91	F	1-May-81	39	42	DELHI	1-May-81	_____	Birth		1551
						6-Feb-00		Death		
92	F	10-Jul-81	39	49	DELHI	10-Jul-81	_____	Birth		1563
93	M	~ 1982	WILD	WILD	INDIA	~ 1983	NONE	Capture		
					HYDERABAD	12-Jul-83	_____	Transfer		
						21-Oct-90		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
94	F	~ 1982	WILDH4	WILDH5	INDIA	~ 1984	NONE	Capture	SUMITRA	
					HYDERABAD	8-Mar-84	7	Transfer		
						2-Feb-90		Death		
95	F	~ 1982	WILDH4	WILDH6	INDIA	~ 1984	NONE	Capture		1600
					HYDERABAD	8-Mar-84	_____	Transfer		
						14-Jan-97		Death		
96	M	~ 1982	WILD	WILD	INDIA	~ 1987	NONE	Capture	MOHAN	1943
					TRIVANDRU	22-Apr-87	_____	Transfer		
97	F	31-Mar-82	MULTR8	MULTR9	TRIVANDRU	31-Mar-82	_____	Birth		1540
					VEERMATA	22-Dec-92	_____ ltf	Transfer		
98	M	28-Apr-82	39	47	DELHI	28-Apr-82	_____	Birth	KALUA	1608
					LUCKNOW	24-Mar-88	_____	Transfer		
					KANPUR	23-Jan-96	1KAN3	Transfer		
						~ Nov 2000		Death		
99	F	2-Jul-82	39	48	DELHI	2-Jul-82	_____	Birth		1615
					CHATBIR Z	21-Oct-89	_____	Transfer		
						17-Aug-95		Death		
100	F	26-Aug-82	39	42	DELHI	26-Aug-82	_____	Birth		1625
					LUCKNOW	24-Mar-88	_____	Transfer		
						10-Jun-88		Death		
101	M	2-Dec-82	39	50	DELHI	2-Dec-82	_____ ltf	Birth		1651
102	M	~ 1983	WILD	WILD	INDIA	????	NONE	Capture		1736
					MOHOTTA	????	_____	Transfer		
					PESHWE	11-Jan-84	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
103	F	26-Nov-82	78	79	JAIPUR	26-Nov-82	_____	Birth	BORI	
					TRIPURA	26-Apr-90	_____	Transfer		
						3-Aug-00		Death		
104	F	~ 1983	WILD	WILD	INDIA	????	NONE	Capture	JAYA	
					MADRAS	????	_____	Transfer		
					ASSAM	15-Jun-86	_____	Transfer		
						31-Jan-92		Death		
105	M	~ 1980	WILD	WILD	INDIA	~ 1995	NONE	Capture	RAMAN	
					KODANAD	14-Nov-95	_____	Transfer		
					TRIVANDRU	15-Dec-01	_____	Transfer		
106	M	24-Jan-83	MULTR8	MULTR9	TRIVANDRU	24-Jan-83	_____	Birth		
107	M	14-May-83	39	47	DELHI	14-May-83	_____	Birth		1844
					NY BRONX	31-Mar-89	_____	Transfer		
108	M	17-Jul-83	MULTK1	45	KANPUR	17-Jul-83	_____	Birth		1676
						18-Jul-83		Death		
109	F	4-Oct-83	54	57	NANDANKAN	4-Oct-83	FEMAL2	Birth		1689
						24-Aug-96		Death		
110	M	~ 1984	WILDM1	WILDM2	INDIA	~ 1990	NONE	Capture	MOHAN	1468
					GUINDY	7-Apr-90	_____	Transfer		
					MADRAS	26-Apr-90	_____	Transfer		
111	M	~ 1984	WILD	WILD	INDIA	~ 1986	NONE	Capture		
					PARRAS	1-Feb-86	_____ ltf	Transfer		
112	M	19-Feb-84	WILD	161	TRIVANDRU	19-Feb-84	_____	Birth		1713

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
					MYSORE	4-Aug-84	_____	Transfer		
					TORONTO	9-Mar-86	20487 ltf	Transfer		
113	F	22-Jun-84	MULTK1	45	KANPUR	22-Jun-84	_____	Birth		1731
						23-Jun-84		Death		
114	?	21-Nov-84	39	42	DELHI	21-Nov-84	_____	Birth		1273
						21-Nov-84		Death		
115	F	~ 1985	WILDM1	WILDM2	INDIA	~ 1990	NONE	Capture	RADHA	1467
					GUINDY	7-Apr-90	_____	Transfer		
					MADRAS	26-May-90	_____	Transfer		
						16-Nov-95		Death		
116	F	~ 1984	WILD	WILD	INDIA	~ 1988	NONE	Capture	LAXMI	
					KODANAD	5-Sep-88	_____	Transfer		
					TRIVANDRU	15-Dec-02	_____	Transfer		
117	F	~ 1985	WILD	WILD	INDIA	~ 1987	NONE	Capture	MANI	1965
					TRIVANDRU	13-Jul-87	_____	Transfer		
					HYDERABAD	27-Jul-87	_____	Transfer		
118	F	20-Feb-85	67	50	DELHI	20-Feb-85	_____	Birth		1854
					NY BRONX	31-Mar-89	_____	Transfer		
119	F	28-Mar-85	54	57	NANDANKAN	28-Mar-85	FEMAL3	Birth		1773
						9-Apr-91		Death		
120	F	~ 1986	WILDM1	WILDM2	INDIA	~ 1990	NONE	Capture	BHAMA	1829
					GUINDY	7-Apr-90	_____	Transfer		
					MADRAS	26-May-90	_____	Transfer		
121	F	~ 1986	WILD	WILD	INDIA	~ 1988	NONE	Capture	BINDU	2163

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
					TRIVANDRU	25-May-88	_____	Transfer		
122	M	31-Mar-86	MULTRA	97	TRIVANDRU	31-Mar-86	_____	Birth	RAVI	1851
						20-Apr-86		Death		
123	M	1-Apr-86	82	81	CHATBIR Z	1-Apr-86	_____	Birth	MAJNU	1869
124	M	6-May-86	MULTK1	45	KANPUR	6-May-86	_____	Birth		1860
						7-May-86		Death		
125	F	~ 1987	UNK	UNK	BANNERGHA	????	_____	Transfer		
126	M	~ 1987	WILD	WILD	INDIA	~ 1989	NONE	Capture	GANESH	2053
					TRIVANDRU	18-May-89	_____	Transfer		
127	M	~ 1987	WILD	WILD	INDIA	~ 1989	NONE	Capture	GUNJAN	
					KODANAD	13-Dec-89	_____	Transfer		
					TRIVANDRU	15-Dec-02	_____	Transfer		
128	M	19-Jan-87	54	109	NANDANKAN	19-Jan-87	_____	Birth		2013
						19-Jan-87		Death		
129	M	21-Jan-87	54	57	NANDANKAN	21-Jan-87	MALE2	Birth		1921
						26-May-91		Death		
130	M	30-Jan-87	MULTM1	MULTM2	MADRAS	30-Jan-87	_____ ltf	Birth		
131	M	14-Nov-87	82	81	CHATBIR Z	14-Nov-87	_____	Birth	LAILA	1998
						25-Sep-90		Death		
132	F	~ 1988	WILD	WILD	INDIA	~ 1990	NONE	Capture	RUKUMANI	2258
					MADRAS	26-May-90	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
						25-May-97		Death		
133	M	~ 1988	WILD	WILD	INDIA	~ 1994	NONE	Capture	RAMU	
					MADRAS	20-Jun-94	_____	Transfer		
134	M	~ 1988	WILD	WILD	INDIA	~ 1989	NONE	Capture	RANJAN	
					KODANAD	23-Sep-89	_____	Transfer		
					TRIVANDRU	15-Dec-02	_____	Transfer		
						27-Aug-03		Death		
135	F	31-Jan-88	MULTM1	MULTM2	ASSAM	31-Jan-88	_____	Birth	MUNI	
136	F	13-Mar-88	MULTRB	97	TRIVANDRU	13-Mar-88	_____	Birth	THARA	2027
					HYDERABAD	22-Sep-03	_____	Transfer		
137	?	1-Jun-87	67	47	DELHI	1-Jun-87	_____	Birth		2063
						11-Jun-88		Death		
138	M	19-Jul-88	67	42	DELHI	19-Jul-88	_____	Birth		2075
139	M	18-Sep-88	67	47	DELHI	18-Sep-88	_____ ltf	Birth		2096
140	M	3-Nov-88	54	57	NANDANKAN	3-Nov-88	_____	Birth		2110
						20-Aug-89		Death		
141	M	14-Nov-88	54	109	NANDANKAN	14-Nov-88	_____	Birth		2116
						14-Nov-88		Death		
142	M	30-Jun-90	MULTH3	MULTH4	TRICHUR	30-Jun-90	_____	Birth	BABU	2067
					TRIVANDRU	16-Nov-94	_____	Transfer		
					HYDERABAD	22-Sep-03	_____	Transfer		
143	M	25-Jan-89	54	119	NANDANKAN	25-Jan-89	MALE3	Birth		2127

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
144	M	????	UNK	UNK	DELHI	25-Sep-89	_____	Transfer		
						25-Apr-98		Death		
145	F	????	UNK	UNK	CALCUTTA	????	_____	Transfer		
					RANGOON	20-Feb-71	_____ ltf	Transfer		
146	F	????	UNK	UNK	CALCUTTA	????	_____	Transfer		
					KUALA LUM	15-Dec-70	_____ ltf	Transfer		
147	F	~ 1987	UNK	UNK	UNKNOWN	~ 1987	_____	Birth		1960
					BARODA	????	_____	Transfer		
						16-Nov-96		Death		
148	F	????	WILD	WILD	INDIA	~ 1983	NONE	Capture		
					MADRAS	9-Feb-83	_____ ltf	Transfer		
149	M	????	WILD	WILD	INDIA	~ 1983	NONE	Capture		
					MADRAS	24-Feb-83	_____ ltf	Transfer		
150	M	????	WILD	WILD	INDIA	~ 1983	UBK	Capture		
					MADRAS	22-Mar-83	_____ ltf	Transfer		
151	F	????	WILD	WILD	INDIA	~ 1983	NONE	Capture		
					MADRAS	4-Sep-83	_____ ltf	Transfer		
152	F	????	WILD	WILD	INDIA	~ 1984	NONE	Capture		
					MADRAS	9-Jul-84	_____ ltf	Transfer		
153	F	????	WILD	WILD	INDIA	~ 1985	NONE	Capture		
					MADRAS	26-Jan-85	_____ ltf	Transfer		
154	M	????	WILD	WILD	INDIA	~ 1980	NONE	Capture	KISHORE	

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
					TRIVANDRU	3-Jun-80	_____	Transfer		
					MADRAS	18-Sep-85	_____ ltf	Transfer		
155	M	????	WILDM1	WILDM2	INDIA	~ 1986	NONE	Capture		
					MADRAS	17-Jul-86	_____ ltf	Transfer		
156	F	????	WILDM1	WILDM2	INDIA	~ 1986	NONE	Capture		
					MADRAS	17-Jul-86	_____ ltf	Transfer		
157	M	????	WILD	WILD	INDIA	~ 1989	NONE	Capture		
					MADRAS	7-Jun-89	_____ ltf	Transfer		
158	F	????	UNK	UNK	BANNERGHA	????	_____	Transfer	SHARAVATHi	1528
					MYSORE	~ 1981	ZAK01	Transfer		
						1-Feb-98		Death		
159	M	~ 1980	WILD	WILD	INDIA	????	NONE	Capture	MANJA	1596
					TRIVANDRU	????	_____	Transfer		
					MYSORE	7-Dec-82	ZAK02	Transfer		
						~ Jan 2003		Death		
160	F	????	WILD	WILD	INDIA	~ 1980	NONE	Capture	LEENA	1357
					TRIVANDRU	14-May-85	_____	Transfer		
						5-Aug-85		Death		
161	F	~ 1982	WILD	WILD	INDIA	~ 1984	NONE	Capture	SITA	1668
					TRIVANDRU	14-Feb-84	_____	Transfer		
					MYSORE	4-Aug-84	_____	Transfer		
					TORONTO	9-Mar-86	20488	Transfer		
162	F	4-Nov-88	78	79	JAIPUR	4-Nov-88	_____	Birth		
						16-Sep-99		Death		

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National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
163	M	????	WILD	WILD	INDIA MYSORE	???? 6-Dec-89	NONE _____ ltf	Capture Transfer	GIRI	
164	M	????	WILD	WILD	INDIA TRIVANDRU	???? ???? 26-Sep-93	NONE _____	Capture Transfer Death	SANKAR	
165	M	????	WILD	WILD	INDIA TRIVANDRU	~ 1987 28-Apr-87	NONE _____ ltf	Capture Transfer	RANJAN	1994
166	M	9-Jan-90	54	109	NANDANKAN	9-Jan-90 29-Sep-94	_____	Birth Death		2235
167	F	19-Feb-90	UNK	UNK	BHILAI	19-Feb-90	_____	Birth	GEETA	
168	F	16-Mar-90	54	57	NANDANKAN	16-Mar-90 5-Sep-99	_____	Birth Death		2249
169	M	9-Jan-90	MULTP1	99	CHATBIR Z	9-Jan-90 23-Apr-90	_____	Birth Death		2256
170	M	5-Dec-90	110	115	MADRAS HYDERABAD	5-Dec-90 27-Aug-92	_____ _____	Birth Transfer	SHAHIDHAR	2294
171	F	8-Oct-90	MULTRC	97	TRIVANDRU DELHI	8-Oct-90 13-Mar-95 5-May-96	_____ _____	Birth Transfer Death		
172	F	30-Jun-90	WILD	WILD	INDIA TRIVANDRU	~ 1993 20-Nov-93	NONE _____ ltf	Capture Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
173	F	31-Dec-91	110	120	MADRAS	31-Dec-91 8-Sep-94	_____	Birth Death	MALAR	
174	M	~ 1992	WILD	WILD	INDIA MADRAS	~ 1993 2-May-93 8-Aug-93	NONE _____	Capture Transfer Death	SEKAR	
175	F	~ 1990	WILD	WILD	BANNERGHA MYSORE	~ 1990 10-Oct-92	NONE ZAK04	Capture Transfer	PRIYA	2274
176	M	~ 1990	WILD	WILD	INDIA SHIMOGA MYSORE	~ 1990 ~ 1990 13-Mar-96 31-Jan-98	NONE _____ CZAK05	Capture Transfer Transfer Death	RAMA	2242
177	M	12-Jan-92	54	57	NANDANKAN PATNA	12-Jan-92 26-Mar-95 11-Dec-00	LTM17 _____	Birth Transfer Death		2403
178	F	14-Jan-92	110	132	MADRAS	14-Jan-92 21-Jul-95	_____	Birth Death	GEETHA	2360
179	F	29-Jan-92	54	109	NANDANKAN PATNA	29-Jan-92 26-Mar-95	LTM18 _____	Birth Transfer		2404
180	M	18-Aug-92	110	115	MADRAS	18-Aug-92 21-Jun-95	_____	Birth Death	PADAN/SANKAR	2384

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National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
181	M	10-Mar-93	MULTRC	MULTRD	TRIVANDRU	10-Mar-93	_____	Birth		
					DELHI	13-Mar-95	_____ ltf	Transfer		
182	M	1-Oct-93	110	132	MADRAS	1-Oct-93	_____	Birth	VIJAYAN	2468
183	M	21-Dec-93	110	120	MADRAS	21-Dec-93	_____	Birth		2498
					GUINDY	7-Aug-98	_____ ltf	Transfer		
184	F	~ 1992	WILD	WILD	MANAGLORE	~ 1992	_____	Transfer	SHANTI	
					MYSORE	13-Jun-96	ZAK06	Transfer		
185	F	~ 1994	WILD	WILD	INDIA	~ 1995	NONE	Capture		
					PARRAS	7-Sep-95	_____ ltf	Transfer		
186	M	4-Jan-95	110	132	MADRAS	4-Jan-95	_____	Birth	SEENU	
187	F	14-Jun-95	110	120	MADRAS	14-Jun-95	_____	Birth	VENI	
188	F	13-Jul-96	110	132	MADRAS	13-Jul-96	_____	Birth	RANI	
					GUINDY	7-Aug-98	_____ ltf	Transfer		
189	M	13-Jul-96	110	120	MADRAS	13-Jul-96	_____	Birth	LINGAN	
190	F	27-May-98	110	120	MADRAS	27-May-98	_____	Birth	MALA	
191	F	5-Jun-98	WILD	WILD	INDIA	~ 1999	NONE	Capture	APSARA	
					MADRAS	5-Jun-99	_____	Transfer		
192	M	26-Oct-99	110	120	MADRAS	26-Oct-99	_____	Birth	MANI	
						28-Sep-02		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
193	F	????	UNK	UNK	RENUKA	????	_____	Transfer		
					CHATBIR Z	21-Apr-95	_____	Transfer		
						1-Oct-98		Death		
194	M	????	WILD	WILD	INDIA	~ 1992	NONE	Capture		
					CALCUTTA	30-Sep-92	_____	Transfer		
						3-Jan-01		Death		
195	F	~ 1991	WILD	WILD	INDIA	~ 1992	NONE	Capture		
					CALCUTTA	20-Feb-95	_____	Transfer		
196	M	~ 1980	WILD	WILD	INDIA	~ 1980	NONE	Capture		1364
					VOC PKZOO	~ 1980	_____ ltf	Transfer		
197	F	11-Dec-93	78	162	JAIPUR	11-Dec-93	_____	Birth		
198	?	20-May-94	78	162	JAIPUR	20-May-94	_____	Birth		
						15-Jun-94		Death		
199	M	15-Oct-95	78	162	JAIPUR	15-Oct-95	_____	Birth		
200	M	10-Jun-99	199	197	JAIPUR	10-Jun-99	_____	Birth		
201	F	????	WILD	WILD	INDIA	~ 1988	NONE	Capture		
					TRICHUR	17-Apr-88	_____	Transfer		
						7-Mar-93		Death		
202	F	????	WILD	WILD	INDIA	~ 1989	NONE	Capture		
					TRICHUR	9-May-89	_____	Transfer		
						18-Jan-99		Death		
203	F	30-Apr-74	MULTH1	MULTH2	TRICHUR	30-Apr-74	_____	Birth		
						24-Jan-96		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
204	F	????	WILD	WILD	INDIA TRICHUR	~ 1973 5-Sep-73 1-Aug-82	NONE _____	Capture Transfer Death		
205	F	????	WILD	WILD	INDIA TRICHUR	~ 1973 18-Feb-73 22-Sep-81	NONE _____	Capture Transfer Death		
206	F	????	WILD	WILD	INDIA TRICHUR	~ 1972 23-May-72 16-Aug-75	NONE _____	Capture Transfer Death		
207	F	????	WILD	WILD	INDIA TRICHUR	~ 1971 8-Dec-71 5-Jan-75	NONE _____	Capture Transfer Death		
208	M	????	WILD	WILD	INDIA TRICHUR	~ 1968 14-Sep-68 19-Apr-74	NONE _____	Capture Transfer Death		
209	?	11-Oct-63	MULT1	MULT2	DELHI	11-Oct-63 22-Nov-64	_____	Birth Death		
210	F	????	WILDJ1	WILDJ2	INDIA JAIPUR	~ 1973 10-Jan-73 3-Jul-75	NONE _____	Capture Transfer Death		
211	F	~ 1977	WILDJ3	WILDJ4	INDIA JAIPUR JODHPUR JAIPUR	~ 1978 15-Mar-78 7-Mar-84 17-Oct-92	NONE _____ _____ _____	Capture Transfer Transfer Transfer	SEETA	

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
					KANPUR	10-Sep-93	_____	Transfer		
						16-Jan-03		Death		
212	M	~ 1977	WILDJ3	WILDJ4	INDIA	~ 1978	NONE	Capture		
					JAIPUR	15-Mar-78	_____	Transfer		
						17-Dec-83		Death		
213	M	????	UNK	UNK	UNKNOWN	????	_____	Birth		
					JODHPUR	????	_____	Transfer		
					JAIPUR	24-Sep-77	_____	Transfer		
						23-Dec-77		Death		
214	F	????	UNK	UNK	UNKNOWN	????	_____	Birth		
					JODHPUR	????	_____	Transfer		
					JAIPUR	24-Sep-77	_____	Transfer		
					JODHPUR	29-Sep-80	_____ ltf	Transfer		
215	M	~ 1984	WILD	WILD	INDIA	~ 1986	NONE	Capture		
					TRICHUR	1-May-86	_____	Transfer		
216	F	5-Jun-84	78	79	JAIPUR	5-Jun-84	_____	Birth		
						24-Aug-92		Death		
217	F	30-Jan-86	78	79	JAIPUR	30-Jan-86	_____	Birth		
						1-Dec-86		Death		
218	M	~ 1986	WILD	WILD	INDIA	~ 1988	NONE	Capture		
					TRICHUR	11-Aug-88	_____	Transfer		
219	M	26-Aug-83	UNK	UNK	BHILAI	26-Aug-83	_____	Birth	RAM	
220	M	~ 1987	WILD	WILD	INDIA	~ 1990	NONE	Capture		
					TRICHUR	5-Feb-90	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
221	M	10-Apr-87	UNK	UNK	BHILAI	10-Apr-87	_____	Birth	SHYAM	
222	F	4-May-87	78	79	JAIPUR	4-May-87	_____	Birth		
						15-Oct-97		Death		
223	?	11-Aug-91	78	MULTJ1	JAIPUR	11-Aug-91	_____	Birth		
						28-Aug-91		Death		
224	?	1-Sep-91	78	MULTJ1	JAIPUR	1-Sep-91	_____	Birth		
						6-Sep-91		Death		
225	M	10-May-93	MULTR7	MULTR8	TRIVANDRU	10-May-93	_____	Birth		
					DELHI	6-Mar-95	_____ ltf	Transfer		
226	F	19-Jul-92	78	162	JAIPUR	19-Jul-92	_____	Birth		
						11-Mar-93		Death		
227	M	~ 1985	WILD	WILD	INDIA	????	NONE	Capture		
					MOBILEZOO	????	_____	Transfer		
					PATNA	15-Jul-98	_____	Transfer		
228	F	~ 1987	WILD	WILD	INDIA	????	NONE	Capture		
					MOBILEZOO	????	_____	Transfer		
					PATNA	11-Aug-98	_____	Transfer		
229	M	~ 1991	WILD	WILD	INDIA	~ 1999	NONE	Capture	KIRAN	
					THATTEKK	~ 1999	_____	Transfer		
					TRIVANDRU	15-Dec-02	_____	Transfer		
230	F	~ 1991	WILD	WILD	INDIA	~ 1991	NONE	Capture	RANI	
					THATTEKK	30-Jun-91	_____	Transfer		
					TRIVANDRU	15-Dec-02	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
231	M	~ 1992	WILD	WILD	INDIA	~ 2002	NONE	Capture	KRISHNA	
					MYSORE	1-Nov-02	ZAKO8	Transfer		
232	F	24-Sep-97	177	179	PATNA	24-Sep-97	_____	Birth		
						24-Sep-97		Death		
233	M	15-Jun-00	182	187	MADRAS	15-Jun-00	_____	Birth	VENKET	
234	F	14-Apr-01	110	120	MADRAS	14-Apr-01	_____	Birth	VIJI	
235	F	16-Dec-01	219	167	BHILAI	16-Dec-01	_____	Birth	RAJKUMARI	
236	M	17-Jan-02	182	187	MADRAS	17-Jan-02	_____	Birth	DAS	
237	M	15-Jul-02	186	120	MADRAS	15-Jul-02	_____	Birth		
						15-Jul-02		Death		
238	M	9-Jan-03	189	191	MADRAS	9-Jan-03	_____	Birth		
239	M	23-Jul-03	182	187	MADRAS	23-Jul-03	_____	Birth	MURUGAN	
240	F	????	WILD	WILD	INDIA	????	NONE	Capture		
					MOBILEZOO	????	_____	Transfer		
					PATNA	6-Jul-98	_____	Transfer		
						13-Apr-00		Death		
241	M	~ 1987	WILD	WILD	INDIA	~ 2002	NONE	Capture	RAJESH	
					TRIVANDRU	16-Aug-02	_____	Transfer		

TOTALS: 106.110.25 (241)

Section-2
Lion-Tailed Macaque Studbook Data Used for Analysis

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
1	M	~ 1955	WILD	WILD	INDIA	~ 1966	NONE	Capture		
					ASSAM	21-Sep-66	_____	Transfer		
						10-Apr-71		Death		
6	M	~ 1957	WILD01	WILD02	INDIA	~ 1959	NONE	Capture		429
					DELHI	11-Sep-59	_____	Transfer		
						20-Sep-90		Death		
7	F	~ 1957	WILD01	WILD03	INDIA	~ 1959	NONE	Capture		437
					DELHI	11-Sep-59	_____	Transfer		
						4-Oct-70		Death		
8	F	~ 1957	WILDD4	WILDD5	INDIA	~ 1959	NONE	Capture		450
					DELHI	23-Oct-59	_____	Transfer		
					BURMA	6-Nov-69	_____ ltf	Transfer		
9	M	~ 1957	WILDD4	WILDD6	INDIA	~ 1959	NONE	Capture		449
					DELHI	23-Oct-59	_____	Transfer		
					BURMA	6-Nov-69	_____ ltf	Transfer		
10	F	~ 1957	WILDD4	WILDD7	INDIA	~ 1959	NONE	Capture		444
					DELHI	23-Oct-59	_____	Transfer		
						31-Dec-76		Death		
11	F	~ 1957	WILDD4	WILDD8	INDIA	~ 1959	NONE	Capture		445
					DELHI	23-Oct-59	_____	Transfer		
						23-Nov-67		Death		
12	F	~ 1958	WILD	WILD	INDIA	~ 1966	NONE	Capture		0
					ASSAM	21-Sep-66	_____ ltf	Transfer		
13	M	~ 1960	WILDH1	WILDH2	INDIA	~ 1960	NONE	Capture		0

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
					HYDERABAD	20-Feb-64	_____	Transfer		
						24-Jul-83		Death		
14	M	~ 1960	WILDH1	WILDH3	INDIA	~ 1964	NONE	Capture		0
					HYDERABAD	20-Feb-64	_____	Transfer		
						24-Jul-83		Death		
16	M	18-Mar-62	6	7	DELHI	18-Mar-62	_____	Birth		513
						10-Oct-77		Death		
19	F	~ 1963	WILDN1	WILDN2	INDIA	~ 1965	NONE	Capture		718
					NANDANKAN	29-Jan-66	_____	Transfer		
						16-Jun-84		Death		
20	F	~ 1963	WILDN1	WILDN3	INDIA	~ 1965	NONE	Capture		717
					NANDANKAN	29-Jan-66	_____	Transfer		
						18-May-67		Death		
21	F	~ 1964	WILD	WILD	INDIA	~ 1966	NONE	Capture		526
					DELHI	29-Apr-66	_____	Transfer		
						20-Nov-77		Death		
23	M	~ 1965	WILD	WILD	INDIA	~ 1967	NONE	Capture		776
					NANDANKAN	29-Mar-67	_____	Transfer		
						15-Nov-75		Death		
26	F	13-Jun-67	6	7	DELHI	13-Jun-67	_____	Birth		970
					SANDIEGOZ	9-Mar-71	_____	Transfer		
						6-Jan-93		Death		
27	M	1-Mar-67	6	10	DELHI	1-Mar-67	_____	Birth		969
					SANDIEGOZ	9-Mar-71	_____	Transfer		
						2-Mar-93		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
28	F	~ 1968	WILD	WILD	DELHI	26-Mar-70 8-Nov-85	_____	Transfer Death		918
29	F	7-Jan-69	6	7	DELHI	7-Jan-69 13-Aug-82	_____	Birth Death		859
31	F	15-Jun-69	WILD	WILD	INDIA CALCUTTA ADELAIDE	~ 1971 ~ 1971 18-Oct-71 18-Jul-85	NONE _____ _____	Capture Transfer Transfer Death		999
32	M	~ 1969	WILD	WILD	INDIA CALCUTTA ADELAIDE	~ 1971 ~ 1971 18-Oct-71 9-Feb-96	NONE _____ _____	Capture Transfer Transfer Death		1000
34	F	~ 1970	WILD	WILD	INDIA ASSAM	~ 1973 14-Aug-73 12-Apr-77	NONE _____	Capture Transfer Death		0
35	F	19-May-70	6	10	DELHI	19-May-70 16-Mar-79	_____	Birth Death		925
36	M	~ 1970	WILD	WILD	INDIA KANPUR	30-Jun-73 6-Oct-73 3-Feb-94	NONE 2301	Capture Transfer Death	KALLU	1102
37	M	~ 1971	WILD	WILD	INDIA ASSAM	~ 1973 8-Oct-73 8-Oct-73	NONE _____	Capture Transfer Death		0
38	?	7-May-71	16	10	DELHI	7-May-71	_____	Birth		982

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
						1-Dec-81		Death		
39	M	9-Sep-71	16	21	DELHI	9-Sep-71	_____	Birth		994
						6-Nov-84		Death		
40	M	~ 1972	WILDN4	WILDN5	INDIA	~ 1974	NONE	Capture		1119
					NANDANKAN	13-Feb-74	_____	Transfer		
						10-Feb-82		Death		
41	F	~ 1972	WILDN4	WILDN6	INDIA	~ 1974	NONE	Capture		777
					NANDANKAN	13-Feb-74	_____	Transfer		
						29-Aug-75		Death		
42	F	1-Apr-72	16	10	DELHI	1-Apr-72	_____ ltf	Birth		1025
43	M	~ 1972	WILDK1	WILDK2	INDIA	~ 1974	NONE	Capture	BHOLLA	1155
					KANPUR	~ 1974	2302	Transfer		
						31-Mar-87		Death		
44	M	~ 1972	WILDK1	WILDK2	INDIA	~ 1974	NONE	Capture	BHUDHA	1156
					KANPUR	6-Nov-74	2303	Transfer		
						21-Jun-93		Death		
45	F	~ 1973	WILD	WILD	INDIA	~ 1974	NONE	Capture	MEETA	1170
					KANPUR	20-Jan-75	2304	Transfer		
						11-Aug-90		Death		
46	?	14-Apr-73	16	21	DELHI	14-Apr-73	_____	Birth		1074
						11-Jun-79		Death		
47	F	28-Sep-73	16	10	DELHI	28-Sep-73	_____	Birth		1099
						17-Jun-89		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
48	F	24-Sep-74	16	29	DELHI	24-Sep-74	_____	Birth		1151
						1-Dec-87		Death		
49	F	10-Nov-74	16	10	DELHI	10-Nov-74	_____	Birth		1158
						12-Nov-85		Death		
50	F	24-May-75	16	21	DELHI	24-May-75	_____	Birth		1185
						21-May-87		Death		
51	M	~ 1976	WILD	WILD	INDIA	~ 1978	NONE	Capture		1345
					TRIVANDRU	1-Jul-78	_____	Transfer		
					CHATBIR Z	6-Mar-79	_____	Transfer		
						29-Sep-84		Death		
52	F	~ 1976	WILD	WILD	INDIA	~ 1978	NONE	Capture		0
					TRIVANDRU	~ 1978	_____	Transfer		
					CHATBIR Z	6-Mar-79	_____	Transfer		
						1-Jul-81		Death		
53	M	23-Mar-76	16	29	DELHI	23-Mar-76	_____	Birth		1242
					JAIPUR	27-May-87	_____	Transfer		
						14-Oct-94		Death		
54	M	26-May-76	16	35	DELHI	26-May-76	_____	Birth		1253
					NANDANKAN	20-Jan-82	_____	Transfer		
						6-Mar-01		Death		
55	F	13-Nov-76	16	21	DELHI	13-Nov-76	_____	Birth		1278
						27-Aug-89		Death		0
56	F	20-Feb-77	78	79	TRIVANDRU	20-Feb-77	_____	Birth		0
						3-Sep-84		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
57	F	18-Jul-77	16	42	DELHI	18-Jul-77	_____	Birth		1311
					NANDANKAN	20-Jan-82	_____	Transfer		
58	M	26-Apr-78	39	35	DELHI	26-Apr-78	_____	Birth		1370
					JAIPUR	11-Feb-81	_____	Transfer		
						16-Oct-82		Death		
59	F	29-Apr-78	39	29	DELHI	29-Apr-78	_____ ltf	Birth		1371
60	?	11-Aug-78	39	35	DELHI	11-Aug-78	_____	Birth		1387
						3-Sep-90		Death		
61	F	29-Sep-78	78	79	TRIVANDRU	29-Sep-78	_____	Birth		0
						13-Aug-84		Death		
62	?	1-Oct-78	39	42	DELHI	1-Oct-78	_____	Birth		1392
						21-Oct-78		Death		
63	?	17-Oct-78	39	48	DELHI	17-Oct-78	_____	Birth		1393
						17-Oct-78		Death		
64	F	~ 1979	WILD	WILD	INDIA	~ 1983	NONE	Capture		1148
					HYDERABAD	12-Sep-83	5	Transfer		
						10-Sep-85		Death		
65	F	29-Jul-79	39	48	DELHI	29-Jul-79	_____	Birth		1451
						16-Apr-91		Death		
66	F	5-Aug-79	36	45	KANPUR	5-Aug-79	IKAN1	Birth	NEETA	1453
						~ Nov 2000		Death		
67	M	11-Sep-79	39	48	DELHI	11-Sep-79	_____ ltf	Birth		1456

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
68	?	1-Oct-79	39	42	DELHI	1-Oct-79	_____	Birth		1460
						3-Jan-80		Death		
78	M	~ 1975	WILD	WILD	INDIA	30-Jun-75	NONE	Capture		1220
					TRIVANDRU	9-Dec-75	_____	Transfer		
					JAIPUR	12-May-81	_____	Transfer		
						18-Nov-96		Death		
79	F	~ 1975	WILD	WILD	INDIA	~ 1975	NONE	Capture		1221
					TRIVANDRU	16-Dec-75	_____	Transfer		
					JAIPUR	12-May-81	_____	Transfer		
						10-Jun-90		Death		
81	F	~ 1980	WILDP1	WILDP2	INDIA	~ 1981	NONE	Capture	SONI	0
					CHATBIR Z	26-Oct-81	_____	Transfer		
						16-Sep-89		Death		
82	M	~ 1980	WILDP1	WILDP2	INDIA	~ 1981	NONE	Capture	MAHIWAL/B	U1575
					CHATBIR Z	26-Oct-81	_____	Transfer		
83	M	~ 1990	WILD	WILD	INDIA	????	NONE	Capture	SHASI	0
					BANNERGHA	????	_____	Transfer		
					MYSORE	4-Nov-01	ZAK07	Transfer		
86	F	~ 1988	WILD	WILD	INDIA	????	NONE	Capture	NETRA	2237
					BANNERGHA	????	_____	Transfer		
					MYSORE	20-Jan-92	ZAK03	Transfer		
87	M	4-Apr-80	39	47	DELHI	4-Apr-80	_____	Birth		1481
						????		Death		
88	?	10-Nov-80	39	49	DELHI	10-Nov-80	_____	Birth		1517

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
						13-Nov-80		Death		
91	F	1-May-81	39	42	DELHI	1-May-81	_____	Birth		1551
						6-Feb-00		Death		
92	F	10-Jul-81	39	49	DELHI	10-Jul-81	_____	Birth		1563
93	M	~ 1982	WILD	WILD	INDIA	~ 1983	NONE	Capture		0
					HYDERABAD	12-Jul-83	_____	Transfer		
						21-Oct-90		Death		
94	F	~ 1982	WILDH4	WILDH5	INDIA	~ 1984	NONE	Capture	SUMITRA	0
					HYDERABAD	8-Mar-84	7	Transfer		
						2-Feb-90		Death		
95	F	~ 1982	WILDH4	WILDH6	INDIA	~ 1984	NONE	Capture		1600
					HYDERABAD	8-Mar-84	_____	Transfer		
						14-Jan-97		Death		
96	M	~ 1982	WILD	WILD	INDIA	~ 1987	NONE	Capture	MOHAN	1943
					TRIVANDRU	22-Apr-87	_____	Transfer		
97	F	31-Mar-82	154	56	TRIVANDRU	31-Mar-82	_____	Birth		1540
					VEERMATA	22-Dec-92	_____ ltf	Transfer		
98	M	28-Apr-82	39	47	DELHI	28-Apr-82	_____	Birth	KALUA	1608
					LUCKNOW	24-Mar-88	_____	Transfer		
					KANPUR	23-Jan-96	1KAN3	Transfer		
						~ Nov 2000		Death		
99	F	2-Jul-82	39	48	DELHI	2-Jul-82	_____	Birth		1615
					CHATBIR Z	21-Oct-89	_____	Transfer		
						17-Aug-95		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
100	F	26-Aug-82	39	42	DELHI	26-Aug-82	_____	Birth		1625
					LUCKNOW	24-Mar-88	_____	Transfer		
						10-Jun-88		Death		
101	M	2-Dec-82	39	50	DELHI	2-Dec-82	_____ ltf	Birth		1651
102	M	~ 1983	WILD	WILD	INDIA	????	NONE	Capture		1736
					MOHOTTA	????	_____	Transfer		
					PESHWE	11-Jan-84	_____	Transfer		
103	F	26-Nov-82	78	79	JAIPUR	26-Nov-82	_____	Birth	BORI	0
					TRIPURA	26-Apr-90	_____	Transfer		
						3-Aug-00		Death		
104	F	~ 1983	WILD	WILD	INDIA	????	NONE	Capture	JAYA	0
					MADRAS	????	_____	Transfer		
					ASSAM	15-Jun-86	_____	Transfer		
						31-Jan-92		Death		
105	M	~ 1983	WILD	WILD	INDIA	~ 1995	NONE	Capture	RAMAN	0
					KODANAD	14-Nov-95	_____	Transfer		
					TRIVANDRU	15-Dec-02	UNK	Transfer		
106	M	24-Jan-83	154	61	TRIVANDRU	24-Jan-83	_____	Birth		0
107	M	14-May-83	39	47	DELHI	14-May-83	_____	Birth		1844
					NY BRONX	31-Mar-89	_____ ltf	Transfer		
108	M	17-Jul-83	36	45	KANPUR	17-Jul-83	_____	Birth		1676
						18-Jul-83		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
109	F	4-Oct-83	54	57	NANDANKAN	4-Oct-83	FEMAL2	Birth		1689
						24-Aug-96		Death		
110	M	~ 1984	WILDM1	WILDM2	INDIA	~ 1990	NONE	Capture	MOHAN	1468
					GUINDY	7-Apr-90	_____	Transfer		
					MADRAS	26-Apr-90	_____	Transfer		
111	M	~ 1984	WILD	WILD	INDIA	~ 1986	NONE	Capture		0
					PARRAS	1-Feb-86	_____ ltf	Transfer		
112	M	19-Feb-84	WILD	161	TRIVANDRU	19-Feb-84	_____	Birth		1713
					MYSORE	4-Aug-84	_____	Transfer		
					TORONTO	9-Mar-86	20487 ltf	Transfer		
113	F	22-Jun-84	36	45	KANPUR	22-Jun-84	_____	Birth		1731
						23-Jun-84		Death		
114	?	21-Nov-84	39	42	DELHI	21-Nov-84	_____	Birth		1273
						21-Nov-84		Death		
115	F	~ 1985	WILDM1	WILDM2	INDIA	~ 1990	NONE	Capture		
					GUINDY	7-Apr-90	_____	Transfer		
					MADRAS	26-May-90	_____	Transfer		
						16-Nov-95		Death		
116	F	~ 1985	WILD	WILD	INDIA	~ 1988	NONE	Capture	LAXMI	0
					KODANAD	5-Sep-88	_____	Transfer		
					TRIVANDRU	15-Dec-02	UNK	Transfer		
117	F	~ 1985	WILD	WILD	INDIA	~ 1987	NONE	Capture	MANI	1965
					TRIVANDRU	13-Jul-87	_____	Transfer		
					HYDERABAD	22-Sep-03	UNK	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
118	F	20-Feb-85	67	50	DELHI	20-Feb-85	_____	Birth		1854
					NY BRONX	31-Mar-89	_____ ltf	Transfer		
119	F	28-Mar-85	54	57	NANDANKAN	28-Mar-85	FEMAL3	Birth		1773
						9-Apr-91		Death		
120	F	~ 1986	WILDM1	WILDM2	INDIA	~ 1990	NONE	Capture	BHAMA	1829
					GUINDY	7-Apr-90	_____	Transfer		
					MADRAS	26-May-90	_____	Transfer		
121	F	~ 1986	WILD	WILD	INDIA	~ 1988	NONE	Capture	BINDU	2163
					TRIVANDRU	25-May-88	_____	Transfer		
123	M	1-Apr-86	82	81	CHATBIR Z	1-Apr-86	_____	Birth	MAJNU	1869
124	M	6-May-86	36	45	KANPUR	6-May-86	_____	Birth		1860
						7-May-86		Death		
125	F	????	UNK	UNK	BANNERGHA	????	_____	Transfer		0
126	M	~ 1987	WILD	WILD	INDIA	~ 1989	NONE	Capture	GANESH	2053
					TRIVANDRU	18-May-89	_____	Transfer		
127	M	~ 1987	WILD	WILD	INDIA	~ 1989	NONE	Capture	GUNJAN	0
					KODANAD	13-Dec-89	_____	Transfer		
					TRIVANDRU	15-Dec-02	UNK	Transfer		
128	M	19-Jan-87	54	109	NANDANKAN	19-Jan-87	_____	Birth		2013
						19-Jan-87		Death		
129	M	21-Jan-87	54	57	NANDANKAN	21-Jan-87	MALE2	Birth		1921
						26-May-91		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
131	M	14-Nov-87	82	81	CHATBIR Z	14-Nov-87	_____	Birth	LAILA	1998
						25-Sep-90		Death		
132	F	~ 1988	WILD	WILD	INDIA	~ 1990	NONE	Capture	RUKUMANI	2258
					MADRAS	26-May-90	_____	Transfer		
						25-May-97		Death		
133	M	~ 1988	WILD	WILD	INDIA	~ 1994	NONE	Capture	RAMU	0
					MADRAS	20-Jun-94	_____	Transfer		
134	M	~ 1988	WILD	WILD	INDIA	~ 1989	NONE	Capture	RANJAN	0
					KODANAD	23-Sep-89	_____	Transfer		
					TRIVANDRU	15-Dec-02	UNK	Transfer		
						27-Aug-03		Death		
135	F	31-Jan-88	WILD	104	ASSAM	31-Jan-88	_____	Birth	MUNI	0
136	F	13-Mar-88	106	97	TRIVANDRU	13-Mar-88	_____	Birth	THARA	2027
					HYDERABAD	22-Sep-03	UNK	Transfer		
137	?	1-Jun-87	67	47	DELHI	1-Jun-87	_____	Birth		2063
						11-Jun-88		Death		
138	M	19-Jul-88	67	42	DELHI	19-Jul-88	_____	Birth		2075
140	M	3-Nov-88	54	57	NANDANKAN	3-Nov-88	_____	Birth		2110
						20-Aug-89		Death		
141	M	14-Nov-88	54	109	NANDANKAN	14-Nov-88	_____	Birth		2116
						14-Nov-88		Death		
142	M	30-Jun-90	215	203	TRICHUR	30-Jun-90	_____	Birth	BABU	2067
					TRIVANDRU	16-Nov-94	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
					HYDERABAD	22-Sep-03	UNK	Transfer		
143	M	25-Jan-89	54	119	NANDANKAN	25-Jan-89	MALE3	Birth		2127
145	F	????	UNK	UNK	CALCUTTA	????	_____	Transfer		0
					RANGOON	20-Feb-71	_____ ltf	Transfer		
146	F	????	UNK	UNK	CALCUTTA	????	_____	Transfer		0
					KUALA LUM	15-Dec-70	_____ ltf	Transfer		
148	F	????	WILD	WILD	INDIA	~ 1983	NONE	Capture		0
					MADRAS	9-Feb-83	_____ ltf	Transfer		
154	M	~ 1975	WILD	WILD	INDIA	~ 1980	NONE	Capture	KISHORE I	N 0
					TRIVANDRU	3-Jun-80	_____	Transfer		
					MADRAS	18-Sep-85	_____ ltf	Transfer		
159	M	~ 1980	WILD	WILD	INDIA	????	NONE	Capture	MANJA	1596
					TRIVANDRU	????	_____	Transfer		
					MYSORE	7-Dec-82	ZAK02	Transfer		
160	F	????	WILD	WILD	INDIA	~ 1980	NONE	Capture	LEENA	1357
					TRIVANDRU	14-May-85	_____	Transfer		
						5-Aug-85		Death		
161	F	~ 1982	WILD	WILD	INDIA	~ 1984	NONE	Capture	SITA	1668
					TRIVANDRU	14-Feb-84	_____	Transfer		
					MYSORE	4-Aug-84	_____	Transfer		
					TORONTO	9-Mar-86	20488 ltf	Transfer		
162	F	4-Nov-88	78	79	JAIPUR	4-Nov-88	_____	Birth		0
						16-Sep-99		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
165	M	????	WILD	WILD	INDIA TRIVANDRU	~ 1987 28-Apr-87	NONE _____ ltf	Capture Transfer	RANJAN	1994
166	M	9-Jan-90	54	109	NANDANKAN	9-Jan-90 29-Sep-94	_____	Birth Death		2235
167	F	19-Feb-90	67	59	BHILAI	19-Feb-90	_____	Birth	GEETA	0
168	F	16-Mar-90	54	57	NANDANKAN	16-Mar-90 5-Sep-99	_____	Birth Death		2249
170	M	5-Dec-90	110	115	MADRAS HYDERABAD	5-Dec-90 27-Aug-92	_____ _____	Birth Transfer	SHAHIDHAR	/2294
172	F	~ 1990	WILD	WILD	INDIA TRIVANDRU	~ 1993 20-Nov-93	NONE _____	Capture Transfer		0
173	F	31-Dec-91	110	120	MADRAS	31-Dec-91 8-Sep-94	_____	Birth Death	MALAR	0
174	M	~ 1992	WILD	WILD	INDIA MADRAS	~ 1993 2-May-93 8-Aug-93	NONE _____	Capture Transfer Death	SEKAR	0
175	F	~ 1990	WILD	WILD	BANNERGHA MYSORE	~ 1990 10-Oct-92	NONE ZAK04	Capture Transfer	PRIYA	2274
176	M	~ 1990	WILD	WILD	INDIA SHIMOGA MYSORE	~ 1990 ~ 1990 13-Mar-96 31-Jan-98	NONE _____ CZAK05	Capture Transfer Transfer Death	RAMA	2242

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
177	M	12-Jan-92	54	57	NANDANKAN	12-Jan-92	LTM17	Birth		2403
					PATNA	26-Mar-95	_____	Transfer		
						11-Dec-00		Death		
178	F	14-Jan-92	110	132	MADRAS	14-Jan-92	_____	Birth	GEETHA	2360
						21-Jul-95		Death		
179	F	29-Jan-92	54	109	NANDANKAN	29-Jan-92	LTM18	Birth		2404
					PATNA	26-Mar-95	_____	Transfer		
180	M	18-Aug-92	110	115	MADRAS	18-Aug-92	_____	Birth	PADAN/SAN	K2384
						21-Jun-95		Death		
182	M	1-Oct-93	110	132	MADRAS	1-Oct-93	_____ ltf	Birth	VIJAYAN	2468
183	M	21-Dec-93	110	120	MADRAS	21-Dec-93	_____	Birth		2498
					GUINDY	7-Aug-98	_____ ltf	Transfer		
184	F	~ 1992	WILD	WILD	MANAGLORE	~ 1992	_____	Transfer	SHANTI	0
					MYSORE	13-Jun-96	ZAK06	Transfer		
185	F	~ 1994	WILD	WILD	INDIA	~ 1995	NONE	Capture		0
					PARRAS	7-Sep-95	_____ ltf	Transfer		
186	M	4-Jan-95	110	132	MADRAS	4-Jan-95	_____	Birth	SEENU	0
187	F	14-Jun-95	110	120	MADRAS	14-Jun-95	_____	Birth	VENI	0
188	F	13-Jul-96	110	132	MADRAS	13-Jul-96	_____	Birth	RANI	0
					GUINDY	7-Aug-98	_____ ltf	Transfer		
189	M	13-Jul-96	110	120	MADRAS	13-Jul-96	_____	Birth	LINGAN	0

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
190	F	27-May-98	110	120	MADRAS	27-May-98	_____	Birth	MALA	0
191	F	5-Jun-98	WILD	WILD	INDIA	~ 1999	NONE	Capture	APSARA	0
					MADRAS	5-Jun-99	_____	Transfer		
192	M	26-Oct-99	110	120	MADRAS	26-Oct-99	_____	Birth	MANI	0
						28-Sep-02		Death		
193	F	????	UNK	UNK	RENUKA	????	_____	Transfer		0
					CHATBIR Z	21-Apr-95	_____	Transfer		
						1-Oct-98		Death		
194	M	????	WILD	WILD	INDIA	~ 1992	NONE	Capture		0
					CALCUTTA	30-Sep-92	_____	Transfer		
						3-Jan-01		Death		
195	F	~ 1991	WILD	WILD	INDIA	~ 1992	NONE	Capture		0
					CALCUTTA	20-Feb-95	_____	Transfer		
196	M	~ 1980	WILD	WILD	INDIA	~ 1980	NONE	Capture		1364
					VOC PKZOO	~ 1980	_____ ltf	Transfer		
197	F	11-Dec-93	78	162	JAIPUR	11-Dec-93	_____	Birth		0
198	?	20-May-94	78	162	JAIPUR	20-May-94	_____	Birth		0
						15-Jun-94		Death		
199	M	15-Oct-95	78	162	JAIPUR	15-Oct-95	_____	Birth		0
200	M	10-Jun-99	199	197	JAIPUR	10-Jun-99	_____	Birth		0
201	F	????	WILD	WILD	INDIA	~ 1988	NONE	Capture		0
					TRICHUR	17-Apr-88	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
						7-Mar-93		Death		
203	F	30-Apr-74	208	204	TRICHUR	30-Apr-74	_____	Birth		0
						24-Jan-96		Death		
204	F	~ 1967	WILD	WILD	INDIA	~ 1973	NONE	Capture		0
					TRICHUR	5-Sep-73	_____	Transfer		
						1-Aug-82		Death		
208	M	~ 1955	WILD	WILD	INDIA	~ 1968	NONE	Capture		0
					TRICHUR	14-Sep-68	_____	Transfer		
						19-Apr-74		Death		
209	?	11-Oct-63	MULT1	MULT2	DELHI	11-Oct-63	_____	Birth		0
						22-Nov-64		Death		
211	F	~ 1977	WILDJ3	WILDJ4	INDIA	~ 1978	NONE	Capture	SEETA	0
					JAIPUR	15-Mar-78	_____	Transfer		
					JODHPUR	7-Mar-84	_____	Transfer		
					JAIPUR	17-Oct-92	_____	Transfer		
					KANPUR	10-Sep-93	_____	Transfer		
						14-Jan-03		Death		
212	M	~ 1977	WILDJ3	WILDJ4	INDIA	~ 1978	NONE	Capture		0
					JAIPUR	15-Mar-78	_____	Transfer		
						17-Dec-83		Death		
215	M	~ 1984	WILD	WILD	INDIA	~ 1986	NONE	Capture		0
					TRICHUR	1-May-86	_____	Transfer		
216	F	5-Jun-84	78	79	JAIPUR	5-Jun-84	_____	Birth		0
						24-Aug-92		Death		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
217	F	30-Jan-86	78	79	JAIPUR	30-Jan-86 1-Dec-86	_____	Birth Death		0
218	M	~ 1986	WILD	WILD	INDIA TRICHUR	~ 1988 11-Aug-88	NONE _____	Capture Transfer		0
219	M	26-Feb-86	67	59	BHILAI	26-Feb-86	_____	Birth	RAM	0
220	M	~ 1987	WILD	WILD	INDIA TRICHUR	~ 1990 5-Feb-90	NONE _____	Capture Transfer		0
221	M	10-Apr-87	67	59	BHILAI	10-Apr-87	_____	Birth	SHYAM	0
222	F	4-May-87	78	79	JAIPUR	4-May-87 15-Oct-97	_____	Birth Death		0
226	F	19-Jul-92	78	162	JAIPUR	19-Jul-92 11-Mar-93	_____	Birth Death		0
227	M	~ 1985	WILD	WILD	INDIA MOBILEZOO PATNA	???? ???? 15-Jul-98	NONE _____ _____	Capture Transfer Transfer		0
228	F	~ 1987	WILD	WILD	INDIA MOBILEZOO PATNA	???? ???? 11-Aug-98	NONE _____ _____	Capture Transfer Transfer		0
229	M	~ 1991	WILD	WILD	INDIA THATTEKK TRIVANDRU	~ 1999 ~ 1999 15-Dec-02	NONE _____ _____	Capture Transfer Transfer		0

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	House Name	International Stud #
230	F	~ 1992	WILD	WILD	INDIA	~ 1999	NONE	Capture		0
					THATTEKK	~ 1999	_____	Transfer		
					TRIVANDRU	15-Dec-02	_____	Transfer		
231	M	30-Jun-92	WILD	WILD	INDIA	~ 2002	NONE	Capture	KRISHNA	0
					MYSORE	1-Nov-02	ZAK08	Transfer		
232	F	24-Sep-97	177	179	PATNA	24-Sep-97	_____	Birth		0
						24-Sep-97		Death		
233	M	15-May-00	182	187	MADRAS	15-May-00	_____	Birth	VENKET	0
234	F	14-Apr-01	110	120	MADRAS	14-Apr-01	_____	Birth	VIJI	0
235	F	16-Dec-01	219	167	BHILAI	16-Dec-01	_____	Birth	RAJKUMARI	0
236	M	17-Jan-02	182	187	MADRAS	17-Jan-02	_____	Birth	DAS	0
237	M	15-Jul-02	186	120	MADRAS	15-Jul-02	_____	Birth		0
						15-Jul-02		Death		
238	M	9-Jan-03	189	191	MADRAS	9-Jan-03	_____	Birth		
239	M	23-Jul-03	182	187	MADRAS	23-Jul-03	_____	Birth	MURUGAN	0
241	M	~ 1987	WILD	WILD	INDIA	~ 2002	NONE	Capture	RAJESH	
					TRIVANDRU	16-Aug-02	_____	Transfer		
TOTALS:		84.90.11 (185)								

Section 3

Current Population of Lion- Tailed Macaques by Location as of 30th September 2002

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International Stud #
Assam State Zoo, Guwahati, Assam										
135	F	31-Jan-88	WILD	104	ASSAM	31-Jan-88	_____	Birth	MUNI	
Totals:	0.1	.0 (1)								
Bannerghatta Zoological Park, Bangalore, Karnataka										
125	F	????	UNK	UNK	BANNERGHA	????	_____	Transfer		
Totals:	0.1	1								
Maitri Bagh Zoo, Bhilai, Chattisgarh										
167	F	19-Feb-90	67	59	BHILAI	19-Feb-90	_____	Birth	GEETA	
219	M	26-Feb-86	67	59	BHILAI	26-Feb-86	_____	Birth	RAM	
221	M	10-Apr-87	67	59	BHILAI	10-Apr-87	_____	Birth	SHYAM	
235	F	16-Dec-01	219	167	BHILAI	16-Dec-01	_____	Birth	RAJKUMARI	
Totals:	2.2	.0 (4)								
Alipore Zoological Garden, Calcutta, West Bengal										
195	F	~ 1991	WILD	WILD	INDIA	~ 1992	NONE	Capture		
					CALCUTTA	20-Feb-95	_____	Transfer		
Totals:	0.1	.0 (1)								

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National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International Stud #
M.C. Zoological Park, Chatbir, Punjab										
82	M	~ 1980	WILDP1	WILDP2	INDIA	~ 1981	NONE	Capture	MAHIWAL	1575
					CHATBIR Z	26-Oct-81	_____	Transfer		
123	M	1-Apr-86	82	81	CHATBIR Z	1-Apr-86	_____	Birth	MAJNU	1869
Totals:	2	.0 (2)								
National Zoological Park - Delhi										
57	F	18-Jul-77	16	42	DELHI	18-Jul-77	_____	Birth		1311
					NANDANKAN	20-Jan-82	_____	Transfer		
92	F	10-Jul-81	39	49	DELHI	10-Jul-81	_____	Birth		1563
138	M	19-Jul-88	67	42	DELHI	19-Jul-88	_____	Birth		2075
Totals:	1.2	.0 (3)								
Nehru Zoological Park, Hyderabad, A.P										
117	F	~ 1985	WILD	WILD	INDIA	~ 1987	NONE	Capture	MANI	1965
					TRIVANDRU	13-Jul-87	_____	Transfer		
					HYDERABAD	22-Sep-03	UNK	Transfer		
136	F	13-Mar-88	106	97	TRIVANDRU	13-Mar-88	_____	Birth	THARA	2027
					HYDERABAD	22-Sep-03	UNK	Transfer		
142	M	30-Jun-90	215	203	TRICHUR	30-Jun-90	_____	Birth	BABU	2067
					TRIVANDRU	16-Nov-94	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International Stud #
					HYDERABAD	22-Sep-03	UNK	Transfer		
170	M	5-Dec-90	110	115	MADRAS	5-Dec-90	_____	Birth	SHAHIDHAR	2294
					HYDERABAD	27-Aug-92	_____	Transfer		
Totals:	2.2	.0 (4)								
Jaipur Zoological Garden, Jaipur, Rajasthan										
197	F	11-Dec-93	78	162	JAIPUR	11-Dec-93	_____	Birth		
199	M	15-Oct-95	78	162	JAIPUR	15-Oct-95	_____	Birth		
200	M	10-Jun-99	199	197	JAIPUR	10-Jun-99	_____	Birth		
Totals:	2.1	.0 (3)								
Arignar Anna Zoological Park, Vandalur, Chennai										
110	M	~ 1984	WILDM1	WILDM2	INDIA	~ 1990	NONE	Capture	MOHAN	1468
					GUINDY	7-Apr-90	_____	Transfer		
					MADRAS	26-Apr-90	_____	Transfer		
120	F	~ 1986	WILDM1	WILDM2	INDIA	~ 1990	NONE	Capture	BHAMA	1829
					GUINDY	7-Apr-90	_____	Transfer		
					MADRAS	26-May-90	_____	Transfer		
186	M	4-Jan-95	110	132	MADRAS	4-Jan-95	_____	Birth	SEENU	0
187	F	14-Jun-95	110	120	MADRAS	14-Jun-95	_____	Birth	VENI	0

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International Stud #
189	M	13-Jul-96	110	120	MADRAS	13-Jul-96	_____	Birth	LINGAN	0
190	F	27-May-98	110	120	MADRAS	27-May-98	_____	Birth	MALA	0
191	F	5-Jun-98	WILD	WILD	INDIA	~ 1999	NONE	Capture	APSARA	0
					MADRAS	5-Jun-99	_____	Transfer		
233	M	15-May-00	182	187	MADRAS	15-May-00	_____	Birth	VENKET	0
234	F	14-Apr-01	110	120	MADRAS	14-Apr-01	_____	Birth	VIJI	0
236	M	17-Jan-02	182	187	MADRAS	17-Jan-02	_____	Birth	DAS	0
238	M	9-Jan-03	189	191	MADRAS	9-Jan-03	_____	Birth		
239	M	23-Jul-03	182	187	MADRAS	23-Jul-03	_____	Birth	MURUGAN	0
Totals:	7.5	.0 (12)								

Sri Chamarajendra Zoological Garden, Mysore, Karnatka

83	M	~ 1990	WILD	WILD	INDIA	????	NONE	Capture	SHASI	
					BANNERGHA	????	_____	Transfer		
					MYSORE	4-Nov-01	ZAK07	Transfer		
86	F	~ 1988	WILD	WILD	INDIA	????	NONE	Capture	NETRA	2237
					BANNERGHA	????	_____	Transfer		
					MYSORE	20-Jan-92	ZAK03	Transfer		
159	M	~ 1980	WILD	WILD	INDIA	????	NONE	Capture	MANJA	1596
					TRIVANDRU	????	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International Stud #
					MYSORE	7-Dec-82	ZAK02	Transfer		
175	F	~ 1990	WILD	WILD	BANNERGHA	~ 1990	NONE	Capture	PRIYA	2274
					MYSORE	10-Oct-92	ZAK04	Transfer		
184	F	~ 1992	WILD	WILD	MANAGLORE	~ 1992	_____	Transfer	SHANTI	
					MYSORE	13-Jun-96	ZAK06	Transfer		
231	M	30-Jun-92	WILD	WILD	INDIA	~ 2002	NONE	Capture	KRISHNA	
					MYSORE	1-Nov-02	ZAK08	Transfer		
Totals:	3.3	.0 (6)								
Nandankanan Biological Park, Nandankana, Orissa										
57	F	18-Jul-77	16	42	DELHI	18-Jul-77	_____	Birth		1311
					NANDANKAN	20-Jan-82	_____	Transfer		
143	M	25-Jan-89	54	119	NANDANKAN	25-Jan-89	MALE3	Birth		2127
Totals:	1.1	.0 (2)								
Sanjay Gandhi Biological Park, Patna, Bihar										
179	F	29-Jan-92	54	109	NANDANKAN	29-Jan-92	LTM18	Birth		2404
					PATNA	26-Mar-95	_____	Transfer		
227	M	~ 1985	WILD	WILD	INDIA	????	NONE	Capture		
					MOBILEZOO	????	_____	Transfer		
					PATNA	15-Jul-98	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International Stud #
228	F	~ 1987	WILD	WILD	INDIA	????	NONE	Capture		
					MOBILEZOO	????	_____	Transfer		
					PATNA	11-Aug-98	_____	Transfer		
Totals:	1.2	.0 (3)								
Veermata Jijabhai Bhosale Udyan, Peshwe, Bombay										
102	M	~ 1983	WILD	WILD	INDIA	????	NONE	Capture		1736
					MOHOTTA	????	_____	Transfer		
					PESHWE	11-Jan-84	_____	Transfer		
Totals:	1	.0 (1)								
Trichur Zoo, Trichur, Kerala										
215	M	~ 1984	WILD	WILD	INDIA	~ 1986	NONE	Capture		
					TRICHUR	1-May-86	_____	Transfer		
218	M	~ 1986	WILD	WILD	INDIA	~ 1988	NONE	Capture		
					TRICHUR	11-Aug-88	_____	Transfer		
220	M	~ 1987	WILD	WILD	INDIA	~ 1990	NONE	Capture		
					TRICHUR	5-Feb-90	_____	Transfer		
Totals:	3	.0 (3)								
Thiruvananthapuram Zoo, Kerala										
96	M	~ 1982	WILD	WILD	INDIA	~ 1987	NONE	Capture	MOHAN	1943

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International Stud #
					TRIVANDRU	22-Apr-87	_____	Transfer		
105	M	~ 1983	WILD	WILD	INDIA	~ 1995	NONE	Capture	RAMAN	
					KODANAD	14-Nov-95	_____	Transfer		
					TRIVANDRU	15-Dec-02	UNK	Transfer		
106	M	24-Jan-83	154	61	TRIVANDRU	24-Jan-83	_____	Birth		
116	F	~ 1985	WILD	WILD	INDIA	~ 1988	NONE	Capture	LAXMI	
					KODANAD	5-Sep-88	_____	Transfer		
					TRIVANDRU	15-Dec-02	UNK	Transfer		
121	F	~ 1986	WILD	WILD	INDIA	~ 1988	NONE	Capture	BINDU	2163
					TRIVANDRU	25-May-88	_____	Transfer		
126	M	~ 1987	WILD	WILD	INDIA	~ 1989	NONE	Capture	GANESH	2053
					TRIVANDRU	18-May-89	_____	Transfer		
127	M	~ 1987	WILD	WILD	INDIA	~ 1989	NONE	Capture	GUNJAN	
					KODANAD	13-Dec-89	_____	Transfer		
					TRIVANDRU	15-Dec-02	UNK	Transfer		
172	F	~ 1990	WILD	WILD	INDIA	~ 1993	NONE	Capture		
					TRIVANDRU	20-Nov-93	_____	Transfer		
229	M	~ 1991	WILD	WILD	INDIA	~ 1999	NONE	Capture		
					THATTEKK	~ 1999	_____	Transfer		

National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International Stud #
					TRIVANDRU	15-Dec-02	_____	Transfer		
230	F	~ 1992	WILD	WILD	INDIA	~ 1999	NONE	Capture		
					THATTEKK	~ 1999	_____	Transfer		
					TRIVANDRU	15-Dec-02	_____	Transfer		
241	M	~ 1987	WILD	WILD	INDIA	~ 2002	NONE	Capture	RAJESH	
					TRIVANDRU	16-Aug-02	_____	Transfer		
Totals:	7.4.0	(11)								

Appendix I
GLOSSARY

Fecundity rate:

The average number of same-sexed young born to animals in that age class. Because SPARKS is typically using relatively small sample sizes, SPARKS calculates Mx as half the average number of young born to animals in that age class. This provides a somewhat less "noisy" estimate of Mx, though it does not allow for unusual sex ratios. The fecundity rates provide information on the age of first, last, and maximum reproduction.

Founder:

An individual at the top of the pedigree, assumed to be unrelated to all other founders. An individual is not yet a founder of the captive-born population until it has living descendants in the population.

Founder genome equivalents:

The number of equally represented founders with no loss of alleles (retention = 1) that would produce the same gene diversity as that observed in the living, descendant population. Equivalently, the number of animals from the source population that contain the same gene diversity as does the descendant population. The gene diversity of a population is 1 - 1 / (2 * fge).

Founder genome surviving:

The sum of allelic retentions of the individual founders (i.e, the product of the mean allelic retention and the number of founders).

Inbreeding Coefficient :

Probability that the two alleles at a genetic locus are identical by descent from a common ancestor to both parents. The mean inbreeding coefficient of a population will be the proportional decrease in observed heterozygosity relative to the expected heterozygosity of the founder population.

Kinship:

Probability that alleles randomly selected from homologous loci in two individuals are identical by descent from a common ancestor. A measure of the genetic identity of two individuals.

Kinship value:

The weighted mean kinship of an animal, with the weights being the reproductive values of each of the kin. The mean kinship value of a population predicts the loss of gene diversity expected in the subsequent generation if all animals were to mate randomly and all were to produce the numbers of offspring expected for animals of their age.

Mean Kinship:

The mean kinship is a coefficient between an animal and all animals (including itself) in the living, captive-born population. The mean kinship of a population is equal to the proportional loss of gene diversity of the descendant (captive-born) population relative to the founders and is also the mean inbreeding coefficient of progeny produced by random mating. Mean kinship is also the reciprocal of two times the founder genome equivalents.

Mortality rate:

The proportion of individuals that die during an age class. It is calculated from the number of animals that die during an age class divided by the number of animals that were alive at the beginning of the age class (i.e.-"at risk").

Potential Founder:

An animal imported into the population, with no other relatives in the population, that has not yet produced any living descendants. If a Potential Founder reproduces, it becomes a Founder.

Reproductive value:

The expected number of offspring produced this year and in future years by an animal of age x.

Smoothing:

The process of eliminating sharp peaks and dips in a data series. The Model life-table can smooth the Px and Mx values by replacing each point with the median of that value, the preceding value, and the following value. These data series can be smoothed several times.

(Appendix II)

Since the available data had many missing values and details, due to inadequate record keeping, some modifications had to be done with the data to enable meaningful analysis. Given below the details of modifications.

- To make MULT category useful for analysis data collapsing is done. In this all possible parents in MULT group are collapsed into one hypothetical animal. In following cases data collapsing is done:
- MULTK1 (includes 36,43, & 44) is collapsed into 36 i.e wherever MULTK1 is mentioned as sire, it is changed into 36. The reason for choosing 36 as it is the first and eldest male in Kanpur zoo, which was introduced to the captive group. Therefore its chances of being alpha male is quite high.
- MULTR8 (includes 154, 159, and 164) collapsed into 154. This is the only individual in the group about which information related to acquisition and death is available. Its year of birth is estimated as 1976 because it first bred in 1982 and it has to be >5 years.
- MULTR9 (includes 56 & 61) collapsed into 56. Both females in this group are descendants of the same set of parents.
- MULTB is collapsed into 106 as this the only male in this group about which information is available.
- MULTM1 is collapsed into wild as all animals in this group were wild caught.
- MULTH3 is collapsed into 203; this is the only female in the group about which information is available.
- MULTH4 is collapsed into 215. All males in this group are wild caught and their estimated age is same.
- MULTH1 is collapsed into 208; this is the only female in the group about which information is available.
- MULTH2 is collapsed into 204. All males in this group are wild caught and their estimated age is same. 204 was picked randomly.
- MULTR3 is collapsed into 78 this is the only male in the group about which information is available.
- MULTR4 is collapsed into 79 this is the only female in the group about which information is available.
- Current population of Maitri Bagh Zoo, Bhilai, are descendants of a pair obtained from National Zoological Park, Delhi. Since Delhi's population are descendants of 67 (sire) and 68 (dam), so 67 (sire) and 68 (dam) substitute UNK parentage for Bhilai's population.
- Individuals which are transferred outside the country and categorised in Itf are not used in genetic analysis.

Appendix III
Full name of Institutions

Trivandru/Trivandrum	Thiruvananthapuram Zoo, Kerala.
Trichur	State Museum & Zoo, Thrissur, Kerala
Bannergha	Bannerghatta Zoological Garden, Bangalore, Karnataka
Parras	Parassinikkadavu Snake Park, Kerala
Chatbir Z	M.C. Zoological Park, Punjab.
Nandankan	Nandankanan Zoological Park, Bhubaneswar, Orissa.
SandiegoZ	San Diego Zoological Society Wild Animal Park, U.S.A