Indian national studbook

for Indian rhinoceros

2002

Central Zoo Authority

Delhi, India

Species status in the wild:

The greater one-horned rhinoceros (*Rhinoceros unicornis*), is listed as one of the world's most endangered species of mega-herbivore.

This species once found in large numbers throughout the the Indo-Gangetic plains and Brahamaputra valley of the Indian sub-continent (Laurie,1978), now exists as a few small population units situated on the northern border of eastern India and Nepal. The Rhino occurs in the following areas:

India: Manas, Kaziranga, Orang, Pabitora, Jaldapara, Gorumara, Dudhwa, Katerniaghat Nepal: Royal Bardia, Royal Chitwan; Pakistan: Lal Sohanra (Foose & Strien, 1997).

The latest population estimates are given in **Table.A** given below :

Table. A: Wild Population Estimates for Greater One-horned Rhinoceros

	Global Captive Population *2000 Estimate	Subspecies Wild Population *2000 Estimate
One-horned rhinoceros	139	~ 2,400

**Source IUCN/SSC African & Asian Rhino Specialist Groups & T. J. Foose International Rhino Foundation - August 2000*

The primary threats to Indian rhinos in India are poaching for the horn and habitat degradation due to loss of alluvial plain grasslands to agricultural development.

However, the pressure from poachers has been substantial, with some areas in India in particular impacted, e.g. Laokhowa (where the rhino has become extinct) and Manas (where the population has been reduced to no more than 20% of its previous levels in the 1980s). The number of rhinos lost to poachers from 1986 to 1995 has been reported as about 450 in India and about 50 in Nepal (Menon 1996). The numbers of rhinos poached in both India and Nepal have declined in 1994 and 1995 compared to 1990–1993 (Foose & Strien, 1997). This decline in poaching is attributed to intense protection by the Indian and Nepalese wildlife authorities.

In both these countries, the programmes of protection and translocation must be continued and further increased. This is particularly so in India where there remain many areas (Laokhawa, Manas, Orang) which in recent history have had rhinos populations and are capable of accommodating populations of viable size, if properly protected. These areas should be protected and new populations established. Alternatively, remnant ones could be reinforced, either through translocations from areas where populations now exist in sufficient numbers to

be unaffected by removals (Foose & Strien, 1997) or by captive breeding programmes. Thus, managed breeding remains a potential tool for the conservation of Indian rhinoceros.

Given below are the detailed population estimates of the Indian rhinoceros:

Table.B. Greater One-horned Rhinoceros Areas & Population Estimates

Population Estimates for Indian Rhinoceros (*Rhinoceros unicornis*)							
Locality	**Year**	**Numbers**	**Source**	**Locality**	**Year**	**Numbers**	**Source**
INDIA				NEPAL			
Kaziranga	1999	**1649**	[1]	Royal Chitwan	1999	**600**	[1]
Orang	1999	**46**	[1]	Royal Bardia	1999	**51**	[1]
Manas	1999	**5**	[1]	Suklaphanta	1999	**1**	[1]
Jaldapara	1999	**53**	[1]	**NEPAL - TOTAL**		**652**	
Gorumara	1999	**19**	[1]	**PAKISTAN**			
Pobitora	1999	**76**	[1]	Lal Sohanra	1995	**2**	[1]
Dudwa	1999	**16**	[1]	**CAPTIVE COLLECTIONS**			
Katerniaghat	1999	**4**	[1]	In Range States	1998	**40**	[2]
INDIA – TOTAL		**1868**		Outside Range States	1998	**98**	[2]
				CAPTIVE COLLECTIONS		**138**	
				WILD POPULATIONS -		**2522**	
				TOTAL INDIAN RHINO		**2658**	

Sources for Population Tables.

1. *Van Strien & Foose. 2000. Report of IUCN SSC Asian Rhino Specialist Group, Regional Meeting, Kaziranga, February 1999*

2. *International Studbook, Great Indian Rhinoceros*. Basel, 1999.

Biological Data:

Scientific Name and Origin

- *Rhinoceros unicornis*
- *Rhinoceros*: from the Greek *rhino*, meaning "nose" and *ceros*, meaning "horn"
- *unicornis*: from the Latin *uni*, meaning "one" and *cornis*, meaning "horn"

Common Names

- Asian greater one-horned rhinoceros: referring to the single large horn
- Indian and/or Nepalese rhinoceros: referring to the species' endemic range

Habitat

- Originally found on alluvial plain grasslands, where the grass grew up to eight metres tall. Also found in the adjacent swamps and forests. The Great Indian Rhino's range has now been so restricted by human activity that it often must use cultivated areas, pastures and modified woodlands.

Current Distribution and Numbers - Northern India, southern Nepal

- Approximately 2,400

Size

- 4,000-6,000 lb (1,800 - 2,700 kg) - perhaps more
- 5.75 - 6.5 ft (1.75 - 2.0 m) tall at shoulder
- Single horn 8 to 24 inch (20 to 61 cm) long
- Largest land mammal (after elephants) along with the African white rhino

Physical Description

- Brownish-gray, hairless, with rivet-plated (armor-plated), knobby skin
- One horn
- Upper lip semi-prehensile

Life History Characteristics

- Feeds on grasses, fruit, leaves, tree and shrub branches, cultivated crops
- Females sexually mature at 5 to 7 years of age (in captivity 4years); males at 9 to 10 years (in captivity 7 to 8 years)
- Gestation period approximately 15 - 16 months; inter-birth interval of 1 calf every 3 years
- Life span approximately 47 years (captive record)

Behaviour

- Apart from cow-calf pairs, groups are rare. Temporary associations of a few sub-adults or adult males sometimes form at wallows or on grazing grounds.

Source: *Van Strien & Foose. 2000. Report of IUCN SSC Asian Rhino Specialist Group, Regional Meeting, Kaziranga, February 1999*

Scope and Conventions of Studbook

(A) ASSUMPTIONS

1. Animals bought from animal dealers are considered as wild born.
2. The year of capture is recorded as the year of the individual's transfer to its first captive facility.
3. 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.
4. The exact wild capture locations for most of the individuals are not known and hence a broader location category i.e India is used.
5. 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.
6. Individuals are identified by local/expert knowledge not by artificial markings.
7. 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.
8. 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 104 onwards.
9. The new National studbook numbers have been allotted to all individuals and these numbers are used in all graphs and figures.
10. The old National studbook numbers and the International studbook numbers are given in Section 1 and 2.

(B) SYMBOL USED:

1. **IN#:** Individuals present in International Studbook but missing in the records of respective zoos.

(C) TIME SCALE:

The earliest date entered in the studbook is September 1966 and data is current through September 2000. The studbook software used is SPARKS 1.42 and its associated programmes.

ZOO SPECIFIC ISSUES :

1. 11 Female Rangi received from Assam State Zoo, Guwahati, according to National Zoological Park, Delhi, records but no mention of this female was found in Guwahati zoo transfer records.
2. In Nehru Zoological Park, Hyderabad, records female Padma (13) was transferred to Hyderabad zoo from Assam State Zoo, Guwahati but no mention of this female's transfer is found in Guwahati zoo transfer records.

(E) SOURCES OF DATA:

Through questionnaires, zoo records, already published National and International studbooks.

References and Bibliography

Dee, M., Foose,T. & K. Willis .1994. AZA SSP Masterplan Indian/Nepalese Rhino *(Rhinoceros unicornis).* 1994 Edition, Draft 1

Foose, T.J. & van Strien, N. 1997. *Asian Rhinos: Status Survey and Conservation Action Plan (New Edition).* IUCN/SSC Asian Rhinoceros Specialist Group. IUCN, Gland.

Laurie, W.A. 1978. The ecology and behaviour of the greater one-horned rhinoceros. Ph.D. dissertation. Cambridge University.450pp.

Menon, V. 1996. Under Siege: Poaching and Protection of Greater One-Horned Rhinoceros in India. Species in Danger: Greater One-Horned Rhinoceros (*Rhinoceros unicornis*). TRAFFIC International, Cambridge, U.K.

Status of the species in Indian zoos:

A total of 115 individuals are registered in the present studbook. Of these 77 individuals (66%) are wild caught and 38 (33%) are captive born. As of 30th September 2000, there are 38 individuals held in 16 institutions of India, out of these 24 individuals are wild caught and 14 captive born.

Demographic analysis:

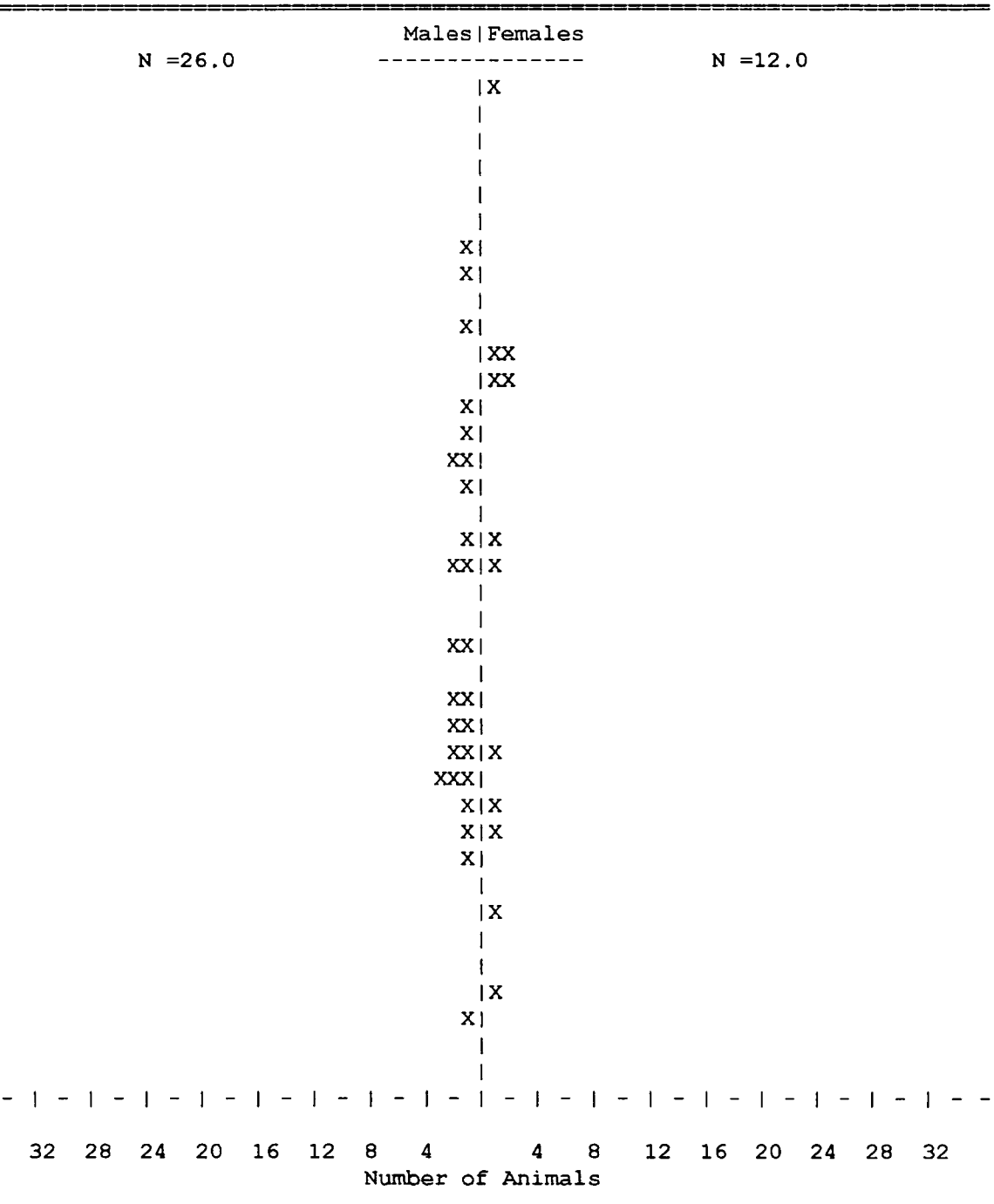
The details of the status of total captive population has been summarized in Table. 1.

Table.1: Greater One horned rhinoceros data as of 30th September 2000.

	Male	Females	Total
Total Registered	66	49	115
Total wild caught	44	33	77
Total captive born	21	16	37
Unknown birth	1		1
Alive as of 30th September 2000.			
Wild origin	16	8	24
Captive born	10	4	14
Total Breeding Animals	11	15	26
Wild born that have bred	8	14	22
Captive born that have bred	3	1	4
Living proven breeders (animals who have bred at least once)			
Wild born	4	5	9
Captive born	1		1

The Age pyramid report (**Figure1**), does not show a healthy trend. It reflects a complete absence of recent births in both sexes. The number of females are very less as compared to males resulting in a skewed sex ratio. There are only 12 females, of these 10 females are in their reproductive phase (**Figure 2.**). Similarly, as given in **Figure 3.** 24 out of 26 males are in reproductive age classes.

Figure. 1. Age Pyramid Report
Restricted to: Greater One horned rhinoceros studbook
Status: Living by 30th September 2000
Taxon Name: *Rhinoceros unicornis*



X >>> Specimens of known sex...

Figure.2. Age Pyramid Report
Restricted to: Female Greater One Horned rhinoceros studbook
Status: Living by 30th September 2000
Taxon Name: *Rhinoceros unicornis*

```
Age  Studbook Numbers >>>  Female
---  ----------------
 37|    13
 36|
 35|
 34|
 33|
 32|
 31|
 30|
 29|
 28|
 27|    32    34
 26|    36    38
 25|
 24|
 23|
 22|
 21|
 20|    60
 19|    65
 18|
 17|
 16|
 15|
 14|
 13|
 12|   *80
 11|
 10|    89
  9|   *92
  8|
  7|
  6|   *96
  5|
  4|
  3|  *100
  2|
  1|
  0|
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
-
Total=  12
```

Note: * indicates captive-born animals

Figure.3. Age Pyramid Report
Restricted to: Male Greater One horned rhinoceros studbook
Status: Living by 30th September 2000
Taxon Name: *Rhinoceros unicornis*

```
Age  Studbook Numbers >>>  Male
---  ----------------
 37|
 36|
 35|
 34|
 33|
 32|
 31|    23
 30|    26
 29|
 28|    31
 27|
 26|
 25|    40
 24|    44
 23|    47    49
 22|    55
 21|
 20|    58
 19|    62   *63
 18|
 17|
 16|  *71    *72
 15|
 14|   *75    76
 13|   *77   *78
 12|    79    81
 11|   *82    83    *85
 10|    88
  9|   *91
  8|    93
  7|
  6|
  5|
  4|
  3|
  2|  104
  1|
  0|
   | - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - -
Total=  26
Note: * indicates captive-born animals
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Fecundity (Fertility):

A successful parentage in One horned rhinoceros ranges mainly from 4 to 32 years in females, and 7 to 40 years in males (Dec. 1998, International Studbook for One horned rhinoceros) . The fecundity and mortality figures are taken from an analysis in the DEMOG programme using data exported from SPARKS. 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 values and the small sample sizes in older classes can distort their values.

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

Figure 4. shows that very few males have bred at the age of 3 and 4 years. This could be due to the underestimation of the age of wild caught males. For example 43, which has bred at the age of 3 years , is a wild caught individual. Thus, this anomalous pattern in fertility could be due to wrong estimation of age for a wild caught animal.

In the given data set only 3 captive bred males have reproduced successfully **(Table.1.),** of these, two males first bred at the age of 8.5 years, and one male at the age of 10.5 years. Currently, only one male amongst these three is surviving. One of the males that died after surviving for 29 years last bred at the age of 22 years. Some males show no reproduction at the breeding age also, it could be due to lack of partner to breed. As it is very clear from Pyramid report that there are very limited number of females in captivity and many institutions **(Table 8**) have no females to mate with their males. **Figure 4** shows peak reproduction in males at the age of 14 to 17 years.

Similarly, **Figure 5,** reflects fertility in captive females. Only one captive born female had bred successfully (**Table1**). The first breeding took place at the age of 9.5 years and last at the age of 17years. **Figure 5,** shows peak reproduction in females from the age of 10 to 19 years. At certain reproductive age classes there is no reproduction. It could be again due to lack of partner, or due to unavailability of favourable conditions for reproduction.

Generation time (T) is about 17 years. This is the average interval between generation, not the minimum or maximum. The gestation period is about 478 days for offspring of both sexes.

Figure 4 .Age specific fertility in captive held males of One horned rhinoceros: Model Vs Actual

(Data for ages >22 are very unreliable due to small sample size)

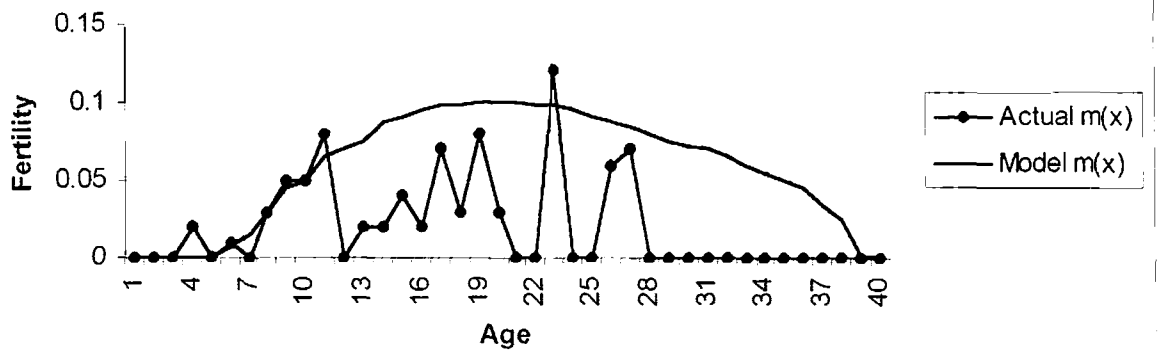
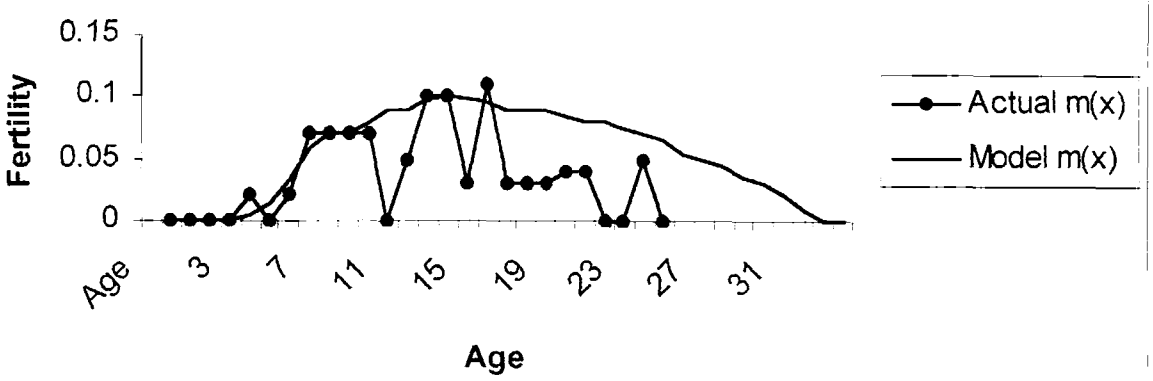


Figure 5. Age specific fertility in captive held females of One horned rhinoceros: Model Vs Actual

(Data for ages >22 are very unreliable due to small sample 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. In **Figure 6** and **7,** first year mortality in both the sexes is high i.e 25 -30% followed by excellent survival (95-100%) and mortality increases gradually from 15-16 years onwards. Both male and female mortality curves almost show the same trend.

The data shows that the maximum age one male lived is 56 years, which seems to be unlikely. This male was a wild caught animal and it could be due to over-estimated age at the time of capture. In the given captive population maximum age a captive born female lived is 21 years and captive born male lived is18 years.

Amongst captive born living individuals, as of 30th September,2000, highest age attained by captive born female is 13years and male is 20 years (**Table. 2**)

Figure 6. Mortality curves of male One horned rhinoceros in Captivity : Model Vs Actual
(Data for ages>13 are very unreliable due to small sample size)

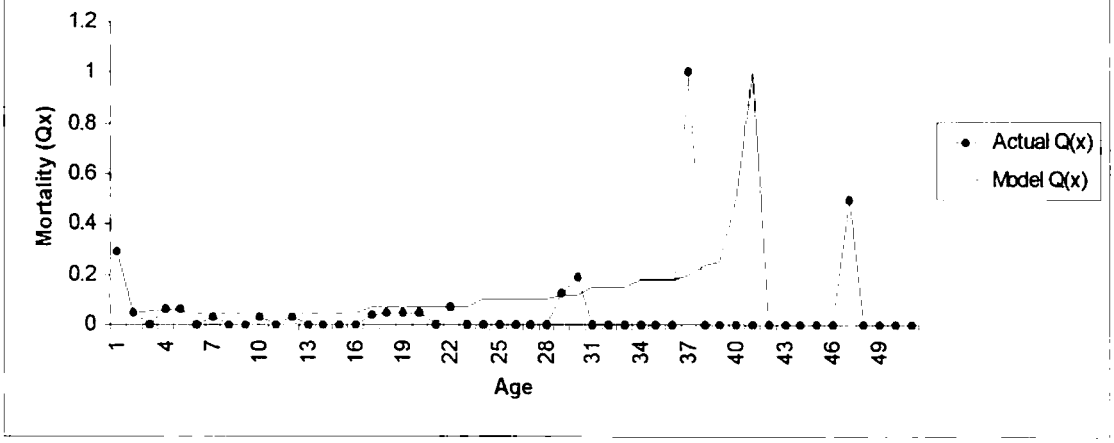
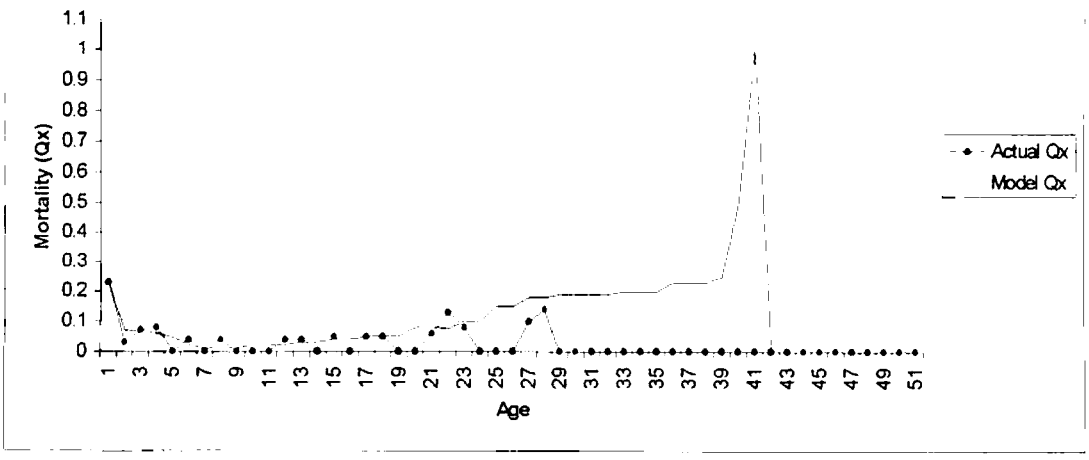


Figure 7. Mortality curves in captive held One horned rhinoceros female: Model Vs Actual
(Data for ages > 10 are very unreliable due to small sample size)



Genetic Analysis

Today's captive born population is based on 14 founder animals, out of which 9 founder animals are living, as of 30th September 2000, (listed in **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 other are fully represented. 15 wild caught animals have not bred at all and hence not contributed to the captive population **(Table.2)**.

Table. 2. Founder representation in the One horned rhinoceros

New National Stud #	Sex	Status	Representation	Contribution	Allele retention	Potential retention	Living Descendant
31	M	L	0	0	0	1	0
38	F	L	0	0	0	1	0
40	M	L	0	0	0	1	0
47	M	L	0	0	0	1	0
49	M	L	0	0	0	1	0
55	M	L	0	0	0	1	0
58	M	L	0	0	0	1	0
60	F	L	0	0	0	1	0
76	M	L	0	0	0	1	0
79	M	L	0	0	0	1	0
81	M	L	0	0	0	1	0
83	M	L	0	0	0	1	0
88	M	L	0	0	0	1	0
89	F	L	0	0	0	1	0
104	M	L	0	0	0	1	0
12	M	D	0.0357	0.5	0.5	0.5	1
27	F	D	0.0357	0.5	0.5	0.5	1
43	M	D	0.0357	0.5	0.5	0.5	1
13	F	L	0.0357	0.5	0.5	1	1
23	M	L	0.0357	0.5	0.5	1	1
26	M	L	0.0357	0.5	0.5	1	1
32	F	L	0.0357	0.5	0.5	1	1
65	F	L	0.0714	1	0.744	1	2
36	F	L	0.0714	1	0.75	1	2
44	M	L	0.1071	1.5	0.8605	1	3
62	M	L	0.1071	1.5	0.8705	1	3
7	M	D	0.1250	1.75	0.7025	0.7025	7
8	F	D	0.1250	1.75	0.7085	0.7085	7
34	F	L	0.1429	2	0.935	1	4

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

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 # 31) then 0% of current population are descended from stud # 31. Value of 0.1429 (as given in Table 2 for an individual having

studbook # 34) shows that 14% 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.

Genetic summary given in **Table 3,** shows there are 29 potential founders (14 of which have bred at least once and15 have not yet bred). Living descendants are retaining 92% of wild genetic diversity of the 14 founders. Mean inbreeding coefficient of population is 0.00, which shows captive population is not inbred.

Table 3. Genetic summary as of 30th September 2000.

	Living Descendant Population
Number of founders:	14
Potential founders:	29 (14+ 15 not yet bred)
Founder genomes surviving:	9.090
Founder Genome Equivalents:	6.877
Fraction source gene diversity retained:	0.927
Fraction wild source gene diversity lost:	0.073
Mean inbreeding coefficient:	0.000

Table 4 ,shows ordered list of Mean kinship (MK), the analysis has been carried out using DEMOG .

Mean kinship measures the genetic importance of each rhinoceros 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	MALES	MK	Age	Known	Location	FEMALES	MK	Age	Known	Location
1	31	0	29	1	Assam	38	0	27	1	Nandakanan
2	40	0	26	1	Mysore	60	0	21	1	Assam
3	49	0	24	1	Patna	89	0	11	1	Assam
4	47	0	24	1	Nandakanan	13	0.0178	38	1	Hyderabad
5	55	0	23	1	Veermata	32	0.0178	28	1	Calcutta
6	58	0	21	1	Assam	36	0.0357	27	1	Ranchi
7	76	0	14	1	Gorumara	65	0.0357	19	1	Delhii
8	79	0	13	1	Trivandrum	80	0.0625	13	1	Patna
9	81	0	13	1	Trivandrum	92	0.0625	10	1	Kanpur
10	83	0	12	1	Jaldhapara	100	0.0625	3	1	Delhii
11	88	0	11	1	Tripura	34	0.0714	28	1	Hyderabad
12	104	0	3	1	Assam	96	0.0892	6	1	Assam
13	23	0.0178	32	1	Calcutta					
14	26	0.0178	31	1	Delhi					
15	63	0.0357	20	1	Hyderabad					
16	71	0.0357	17	1	Calcutta					
17	75	0.0357	15	1	Chatbir					
18	93	0.0446	8	1	Delhi					
19	44	0.0535	25	1	Assam					
20	62	0.0535	20	1	Patna					
21	77	0.0892	14	1	Assam					
22	82	0.0892	12	1	Assam					
23	72	0.1026	17	1	Lucknow					
24	78	0.1026	14	1	Kanpur					
25	85	0.1026	12	1	Kanpur					
26	91	0.1026	10	1	Kanpur					

Key: Known-% of each animal's pedigree that is known. MK- Mean Kinship

Table 5, provides information on Mean kinship of living animals to living non founders held in different locations.

For future breeding programme, possible mating choices are given in **Table 6.** It shows inbreeding coefficients for potential offspring. Similarly, **Table 7** lists down possible mating choices in different locations and inbreeding coefficients for potential offspring.

Table 5. Mean Kinship Of Living Animals To Living Non-Founders

New National Studbook#	Sex	Sire	Dam	Inbreeding	Mean kinship	Location
13	F	WILD	WILD	F = 0.0000	mk = 0.0179	Hyderabad
23	M	WILD	WILD	F = 0.0000	mk = 0.0179	Calcutta
26	M	WILD	WILD	F = 0.0000	mk = 0.0179	Delhi
31	M	WILD	WILD	F = 0.0000	mk = 0.0000	Assam
32	F	WILD	WILD	F = 0.0000	mk = 0.0179	Calcutta
34	F	WILD	WILD	F = 0.0000	mk = 0.0714	Hyderabad
36	F	WILD	WILD	F = 0.0000	mk = 0.0357	Ranchi
38	F	WILD	WILD	F = 0.0000	mk = 0.0000	Nandankan
40	M	WILD	WILD	F = 0.0000	mk = 0.0000	Mysore
44	M	WILD	WILD	F = 0.0000	mk = 0.0536	Assam
47	M	WILD	WILD	F = 0.0000	mk = 0.0000	Nandankan
49	M	WILD	WILD	F = 0.0000	mk = 0.0000	Patna
55	M	WILD	WILD	F = 0.0000	mk = 0.0000	Veermata
58	M	WILD	WILD	F = 0.0000	mk = 0.0000	Assam
60	F	WILD	WILD	F = 0.0000	mk = 0.0000	Assam
62	M	WILD	WILD	F = 0.0000	mk = 0.0536	Patna
63	M	12	13	F = 0.0000	mk = 0.0357	Hyderabad
65	F	WILD	WILD	F = 0.0000	mk = 0.0357	Delhi
71	M	23	32	F = 0.0000	mk = 0.0357	Calcutta
72	M	37	34	F = 0.0000	mk = 0.1027	Lucknow
75	M	43	27	F = 0.0000	mk = 0.0357	Chatbir Z
76	M	WILD	WILD	F = 0.0000	mk = 0.0000	Gorumara
77	M	44	50	F = 0.0000	mk = 0.0893	Assam
78	M	37	34	F = 0.0000	mk = 0.1027	Kanpur
79	M	WILD	WILD	F = 0.0000	mk = 0.0000	Trivandru
80	F	62	36	F = 0.0000	mk = 0.0625	Patna
81	M	WILD	WILD	F = 0.0000	mk = 0.0000	Trivandru
82	M	44	50	F = 0.0000	mk = 0.0893	Assam
83	M	WILD	WILD	F = 0.0000	mk = 0.0000	Jaldhapar
85	M	37	34	F = 0.0000	mk = 0.1027	Kanpur
88	M	WILD	WILD	F = 0.0000	mk = 0.0000	Tripura
89	F	WILD	WILD	F = 0.0000	mk = 0.0000	Assam
91	M	37	34	F = 0.0000	mk = 0.1027	Kanpur
92	F	62	36	F = 0.0000	mk = 0.0625	Kanpur
93	M	26	65	F = 0.0000	mk = 0.0446	Delhi
96	F	44	50	F = 0.0000	mk = 0.0893	Assam
100	F	62	65	F = 0.0000	mk = 0.0625	Delhi
104	M	WILD	WILD	F = 0.0000	mk = 0.0000	Assam

Table 6 Mating Choices : Inbreeding coefficients for potential offspring.

(Males across top, females down side)

	23	26	31	40	44	47	49
13	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0
96	0	0	0	0	0.25	0	0
100	0	0	0	0	0	0	0

	55	58	62	63	71	72	75
13	0	0	0	0.25	0	0	0
32	0	0	0	0	0.25	0	0
34	0	0	0	0	0	0.25	0
36	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0
80	0	0	0.25	0	0	0	0
89	0	0	0	0	0	0	0
92	0	0	0.25	0	0	0	0
96	0	0	0	0	0	0.062	0
100	0	0	0.25	0	0	0	0

	76	77	78	79	81	82	83
13	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0
34	0	0	0.25	0	0	0	0
36	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0
96	0	0.25	0.0625	0	0	0.25	0
100	0	0	0	0	0	0	0

	85	88	91	93	104
13	0	0	0	0	0
32	0	0	0	0	0
34	0.25	0	0.25	0	0
36	0	0	0	0	0
38	0	0	0	0	0
60	0	0	0	0	0
65	0	0	0	0.25	0
80	0	0	0	0	0
89	0	0	0	0	0
92	0	0	0	0	0
96	0.062	0	0.062	0	0
100	0	0	0	0.125	0

Table 7. Mating Choices : Inbreeding coefficients for potential offspring. Males across top, females down side.

Inbreeding coefficients for possible matings at: **HYDERABAD**

	63
13	0.2500
34	0.0000

Inbreeding coefficients for possible matings at: **CALCUTTA**

	23	**71**
32	0.0000	0.2500

Inbreeding coefficients for possible matings at: **DELHI**

	26	**93**
65	0.0000	0.2500
100	0.0000	0.1250

Inbreeding coefficients for possible matings at: **ASSAM**

	31	**44**	**58**	**77**	**82**	**104**
60	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
89	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
96	0.0000	0.2500	0.0000	0.2500	0.2500	0.0000

Inbreeding coefficients for possible matings at: **NANDANKAN**

	47
38	0.0000

Inbreeding coefficients for possible matings at: **PATNA**

	49	**62**
80	0.0000	0.2500

Inbreeding coefficients for possible matings at: **KANPUR**

	78	**85**	**91**
92	0.0000	0.0000	0.0000

Figure.3. Age Pyramid Report
Restricted to: Male Greater One horned rhinoceros studbook
Status: Living by 30th September 2000
Taxon Name: *Rhinoceros unicornis*

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Age  Studbook Numbers >>>  Male
---  ----------------
 37|
 36|
 35|
 34|
 33|
 32|
 31|    23
 30|    26
 29|
 28|    31
 27|
 26|
 25|    40
 24|    44
 23|    47    49
 22|    55
 21|
 20|    58
 19|    62   *63
 18|
 17|
 16|  *71    *72
 15|
 14|   *75    76
 13|   *77   *78
 12|    79    81
 11|   *82    83    *85
 10|    88
  9|   *91
  8|    93
  7|
  6|
  5|
  4|
  3|
  2|  104
  1|
  0|
   | - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - -
Total=  26
Note: * indicates captive-born animals
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Section 1

HISTORICAL LISTING OF GREATER ONE HORNED RHINOCEROS (*Rhinoceros unicornis*)

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
1	M	~ 1914	WILD	WILD	INDIA	~ 1957	UNK	Capture	MOHAN SR		
					ASSAM	13-Dec-57	UNK	Transfer			
					DELHI	5-Apr-59	UNK	Transfer			
						13-Apr-70		Death			
2	M	~ 1940	WILD	WILD	INDIA	~ 1978	UNK	Capture	RAJESH		
					ASSAM	3-Mar-78	UNK	Transfer			
						18-Jan-87		Death			
3	F	~ 1948	WILD	WILD	INDIA	~ 1958	UNK	Capture	PADMINI SR	82	
					ASSAM	5-Oct-58	UNK	Transfer			
						28-Oct-64		Death			
4	M	~ 1950	WILD	WILD	INDIA	????	UNK	Capture	MONY		
					ASSAM	????	UNK	Transfer			
					TRIVANDRU	29-May-56	UNK	Transfer			
						16-Feb-87		Death			
5	F	~ 1951	WILD	WILD	INDIA	~ 1960	UNK	Capture	GEETA		
					ASSAM	19-Jun-60	UNK	Transfer			
					PARIS	????	UNK ltf	Transfer			
6	F	~ 1952	WILD	WILD	INDIA	~ 1962	UNK	Capture	DEEPALI SR	30	
					ASSAM	29-Oct-62	UNK	Transfer			
					WASHINGTO	5-Nov-63	UNK	Transfer			
						28-Dec-63		Death			
7	M	~ 1955	WILD	WILD	INDIA	~ 1960	UNK	Capture	SHIVAJI	24	NR001
					ASSAM	24-Sep-60	UNK	Transfer			
						23-Sep-84		Death			
8	F	~ 1956	WILD	WILD	INDIA	~ 1965	UNK	Capture	PADMINI JR	25	NR002
					ASSAM	29-Sep-65	UNK	Transfer			
						19-Oct-82		Death			
9	M	7-Apr-60	WILD	5	ASSAM	7-Apr-60	UNK	Birth	MOHAN JR	33	
					DELHI	24-Nov-65	UNK	Transfer			
						5-Jul-88		Death			
IN1	M	????	WILD	WILD	INDIA	????	UNK	Capture	KASI	1	
					ASSAM	????	UNK	Transfer			

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
					MYSORE	24-Apr-65	UNK	Transfer			
						30-Apr-79		Death			
IN2	F	????	WILD	WILD	INDIA	????	UNK	Capture	RANI	11	
					ASSAM	????	UNK	Transfer			
					MYSORE	15-Jun-56	UNK	Transfer			
						7-May-92		Death			
IN3	M	16-Apr-71	IN1	IN2	MYSORE	16-Apr-71	UNK	Birth	VINU	53	
					GELSNKRKN	28-Aug-75	UNK	Transfer			
					TORONTO	28-Jul-76	UNK	Transfer			
					NY BRONX	30-May-90	UNK	Transfer			
IN4	M	????	WILD	WILD	INDIA	????	UNK	Capture	LACIT	62	
					ASSAM	????	UNK	Transfer			
					VEERMATA	14-Apr-52	UNK	Transfer			
						14-Sep-80		Death			
IN5	M	????	WILD	WILD	INDIA	~ 1974	UNK	Capture	JAYA	64	
					ASSAM	3-Jan-74	UNK	Transfer			
					NAGOYA	2-Oct-74	UNK	Transfer			
IN6	F	~ 1953	WILD	WILD	INDIA	~ 1953	UNK	Capture	KUSHAL	75	
					MADRAS	9-Jun-53	UNK	Transfer			
					NY BRONX	15-Jun-80		Death			
IN7	F	19-Jul-75	IN1	IN2	MYSORE	19-Jul-75	UNK	Birth	INDIRA	79	
					GELSNKRKN	25-Jun-76	UNK	Transfer			
					TORONTO	27-Apr-79	UNK	Transfer			
IN8	M	????	WILD	WILD	INDIA	~ 1959	UNK	Capture	JAISINGH	90	
					LUCKNOW	30-Mar-59	UNK	Transfer			
						6-May-79		Death			
IN9	F	????	WILD	WILD	INDIA	~ 1944	UNK	Capture	ROSY	105	
					LUCKNOW	2-Apr-44	UNK	Transfer			
						2-Apr-73		Death			
10	F	12-Jun-61	WILD	105	CALCUTTA	12-Jun-61	UNK	Birth	SNEHA	23	
						14 Aug 1982		Death			
11	F	~ 1962	WILD	WILD	INDIA	????	UNK	Capture	RANGI	43	
					ASSAM	????	UNK	Transfer			
					DELHI	28-Mar-68	UNK	Transfer			
						10-Nov-84		Death			
12	M	~ 1962	WILD	WILD	INDIA	~ 1962	UNK	Capture	RAJKUMAR	76	NR003

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
					ASSAM	28-Jun-62	UNK	Transfer			
					HYDERABAD	16-Jun-64	UNK	Transfer			
						19-Aug-83		Death			
13	F	~ 1963	WILD	WILD	INDIA	????	UNK	Capture	PADMA	77	NR004
					ASSAM	????	UNK	Transfer			
					HYDERABAD	26-Jun-68	UNK	Transfer			
14	F	10-Apr-63	WILD	6	ASSAM	10-Apr-63	UNK	Birth	RAJKUMARI	28	
					U.S.A.	5-Nov-63	UNK	Transfer			
						9-Sep-80		Death			
15	F	10-Jul-63	7	3	ASSAM	10-Jul-63	UNK	Birth	JAPARI	29	
					SANDIEGOZ	11-Feb-65	UNK	Transfer			
					SD-WAP	26-Apr-72	UNK	Transfer			
					GULF BREZ	7-Nov-95	UNK	Transfer			
16	M	~ Jun 1964	WILD	WILD	INDIA	~ 1964	UNK	Capture	KOSHA		
					ASSAM	28-Oct-64	UNK	Transfer			
						13-Nov-64		Death			
17	F	~ Apr 1967	WILD	WILD	INDIA	~ 1967	UNK	Capture	RUKIMINI	46	
					ASSAM	23-Dec-67	UNK	Transfer			
					LOSANGELE	25-Nov-69	UNK	Transfer			
						10-Nov-88		Death			
18	F	~ 1968	WILD	WILD	INDIA	~ 1968	UNK	Capture	LAKHIMI		
					ASSAM	28-Feb-68	UNK	Transfer			
						23-Mar-70		Death			
19	F	~ 1968	WILD	WILD	INDIA	~ 1968	UNK ltf	Capture	KALONG MUKH		
					ASSAM	1-Aug-68	UNK	Transfer			
					BARODA	5-Apr-69	UNK	Transfer			
					MYSORE	19-Jan-90	UNK	Transfer			
20	M	~ Jul 1968	WILD	WILD	INDIA	~ 1969	UNK	Capture	KUMAR		
					ASSAM	23-Jul-69	UNK	Transfer			
						23-Mar-70		Death			
21	M	~ 1969	WILD	WILD	INDIA	~ 1970	UNK	Capture	SASADEV	73	
					ASSAM	30-Jul-70	UNK	Transfer			
					BELGIUM	27-Feb-71	UNK	Transfer			
						16-Oct-88		Death			
22	M	~ 1969	WILD	WILD	INDIA	~ 1971	UNK	Capture	SANTU	81	

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
					ASSAM	28-Jun-71	UNK	Transfer			
					BROWNSVIL	29-Aug-73	184002	Transfer			
						3-Dec-73		Death			
23	M	~ 1969	WILD	WILD	INDIA	~ 1974	UNK	Capture	MEGHNAD		NR005
					ASSAM	12-Feb-74	UNK	Transfer			
					CALCUTTA	11-Mar-74	UNK	Transfer			
24	M	~ May 1969	WILD	WILD	INDIA	~ 1969	UNK	Capture	BHISMA		
					ASSAM	26-Jul-69	UNK	Transfer			
						27-Dec-69		Death			
25	F	10-Jul-69	WILD	WILD	INDIA	~ 1969	UNK	Capture	KUMARI		
					ASSAM	20-Jul-69	UNK	Transfer			
						24-Jul-70		Death			
26	M	~ 1970	WILD	WILD	INDIA	~ 1982	UNK	Capture	DABBU/AGNI	151	NR023
					ASSAM	5-May-82	UNK	Transfer			
					DELHI	23-Jan-83	UNK	Transfer			
27	F	~ 1971	WILD	WILD	INDIA	~ 1978	UNK	Capture	SHAKUNTALA		NR015
					ASSAM	15-Jun-78	UNK	Transfer			
					CHATBIR Z	29-Jul-78	UNK	Transfer			
						25-May-86		Death			
28	F	28-Jan-71	9	11	DELHI	28-Jan-71	UNK	Birth	ROOPA	51	
					WHIPSNADE	5-Feb-73	UNK	Transfer			
29	M	12-Sep-71	7	8	ASSAM	12-Sep-71	UNK	Birth	KRISHNA	57	
					NAGOYA	29-Sep-74	UNK	Transfer			
30	M	25-Nov-71	12	13	HYDERABAD	25-Nov-71	UNK	Birth	RAJESH	58	
						11-Aug-83		Death			
31	M	~ 1972	WILD	WILD	INDIA	~ 1982	UNK	Capture	GANESH JUN	172	NR006
					ASSAM	15-Jul-82	UNK	Transfer			
32	F	~ 1973	WILD	WILD	INDIA	~ 1974	UNK	Capture	MAYURI	95	NR007
					ASSAM	22-Jan-74	UNK	Transfer	Kadambani		
					CALCUTTA	11-Mar-74	UNK	Transfer			
33	F	~ Apr 1973	WILD	WILD	INDIA	~ 1973	UNK	Capture	MAYANG KUMARI	66	
					ASSAM	14-Aug-73	UNK	Transfer			
					NY BRONX	25-Sep-74	UNK	Transfer			

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
34	F	~ May 1973	WILD	WILD	INDIA	~ 1973	UNK	Capture	MAYA	128	NR008
					ASSAM	11-Aug-73	UNK	Transfer			
					KANPUR	1-Mar-77	UNK	Transfer			
					LUCKNOW	30-Apr-97	UNK	Transfer			
					HYDERABAD	23-Sep-99	UNK	Transfer			
35	F	16-Jun-73	WILD	WILD	INDIA	~ 1973	UNK	Capture	RADHA	67	
					ASSAM	21-Jun-73	UNK	Transfer			
					NY BRONX	30-Jan-75	UNK	Transfer			
						12-Jul-76		Death			
36	F	~ 1974	WILD	WILD	INDIA	~ 1974	UNK	Capture	CHITRA LEKHA	155	NR011
					ASSAM	21-Jul-74	UNK	Transfer			
					PATNA	25-May-88	UNK	Transfer			
					RANCHI	4-Dec-96	UNK	Transfer			
37	M	23-May-74	7	8	ASSAM	23-May-74	UNK	Birth	LACHIT	70	NR010
					KANPUR	1-Mar-77	UNK	Transfer			
						8-Aug-92		Death			
38	F	~ Jun 1974	WILD	WILD	INDIA	~ 1974	UNK	Capture	NUMALI	153	NR009
					ASSAM	16-Sep-74	UNK	Transfer			
					NANDANKAN	4-Apr-76	UNK	Transfer			
39	F	~ 1975	WILD	WILD	INDIA	9-Aug-75	UNK	Capture	ANJALI		
					ASSAM	10-Aug-75	UNK	Transfer			
						20-Aug-77		Death			
40	M	~ 1975	WILD	WILD	INDIA	~ 1980	UNK	Capture	RAM/MUNNI	61	NR026
					ASSAM	24-Jan-80	UNK	Transfer			
					MYSORE	23-Jan-85	UNK	Transfer			
41	M	~ 1975	WILD	WILD	INDIA	~ 1976	UNK	Capture			
					ASSAM	2-Feb-76	UNK	Transfer			
						7-Mar-76		Death			
42	M	~ May 1975	WILD	WILD	INDIA	~ 1975	UNK	Capture	SHAYAM		
					ASSAM	2-Jun-75	UNK	Transfer			
					NANDANKAN	4-Apr-76	UNK	Transfer			
					ONTHE WAY	22-Apr-76		Death			
43	M	17-Oct-75	WILD	WILD	INDIA	~ 1977	UNK	Transfer	BALRAM		NR014
					ASSAM	17-Oct-77	UNK	Transfer			
					CHATBIR Z	14-Dec-77	UNK	Capture			

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
						3-Jul-93		Death			
44	M	~ 1976	WILD	WILD	INDIA	~ 1980	UNK	Capture	LAKSMAN	168	NR012
					ASSAM	27-Jan-80	UNK	Transfer			
45	F	~ Mar 1976	WILD	WILD	INDIA	~ 1976	UNK	Capture			
					ASSAM	6-Apr-76	UNK	Transfer			
					LUCKNOW	17-Oct-79	UNK	Transfer			
						19-Dec-83		Death			
46	M	1-Nov-76	WILD	WILD	INDIA	~ 1976	UNK	Capture	SANJAI	91	
					ASSAM	13-Nov-76	UNK	Transfer			
					LUCKNOW	17-Oct-79	UNK	Transfer			
						18-Jan-80		Death			
47	M	~ 1977	WILD	WILD	INDIA	~ 1977	UNK	Capture	NANDAN		NR013
					ASSAM	22-Aug-77	UNK	Transfer			
					NANDANKAN	29-Nov-79	UNK	Transfer			
48	M	~ 1977	WILD	WILD	INDIA	~ 1982	UNK	Capture	KAMAL		
					ASSAM	6-Feb-82	UNK	Transfer			
						7-Feb-82		Death			
49	M	~ Apr 1977	WILD	WILD	INDIA	~ 1977	UNK	Capture	KANCHA\BIJ	156	NR016
					ASSAM	19-Aug-77	UNK	Transfer			
					PATNA	25-May-79	UNK	Transfer			
50	F	9-Jan-78	7	8	ASSAM	9-Jan-78	UNK	Birth	GEETA LAXMI	168	NR017
						11-Jan-98		Death			
51	M	~ 1978	WILD	WILD	INDIA	~ 1978	UNK	Capture	KRISHNA JR	92	
					ASSAM	24-Mar-78	UNK	Transfer			
					KANPUR	17-Oct-79	UNK	Transfer			
					LUCKNOW	23-May-82	UNK	Transfer			
						1-Jan-85		Death			
52	M	~ Aug 1978	WILD	WILD	INDIA	~ 1978	UNK	Capture	PRABHAT		
					ASSAM	9-Nov-78	UNK	Transfer			
						24-Nov-78		Death			
53	M	12-Nov-78	12	13	HYDERABAD	12-Nov-78	UNK	Birth	LADDU /VEER	96	
					KENYA	17-Jun-83	UNK	Transfer			
54	F	9-Jan-79	23	10	CALCUTTA	9-Jan-79	UNK	Birth	GOMOTI		
					GERMANY	10-Mar-86	UNK	Transfer			

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
55	M	~ Mar 1978	WILD	WILD	INDIA	~ 1979	UNK	Capture	SHIVA		NR018
					ASSAM	24-Apr-79	UNK	Transfer			
					VEERMATA	25-Feb-85	UNK	Transfer			
56	F	9-Mar-79	43	27	CHATBIR Z	9-Mar-79	UNK	Birth			
						9-Mar-79		Death			
57	F	~ Jul 1979	WILD	WILD	INDIA	~ 1980	UNK	Capture	PARBATI		
					ASSAM	20-Jan-80	UNK	Transfer			
						18-Jun-83		Death			
58	M	~ Apr 1980	WILD	WILD	INDIA	~ 1980	UNK	Capture	JOHN\PALIT	170	NR019
					ASSAM	23-Aug-80	UNK	Transfer			
59	M	~ May 1980	WILD	WILD	INDIA	~ 1980	UNK	Capture	RAMU SR		
					ASSAM	3-Sep-80	UNK	Transfer			
					MADRAS	17-Apr-85	UNK	Transfer			
						7-Jul-89		Death			
60	F	~ 1980	WILD	WILD	INDIA	~ 1980	UNK	Capture	GINI\ TARAL	171	NR020
					ASSAM	23-Aug-80	UNK	Transfer			
61	F	13-Nov-80	43	27	CHATBIR Z	13-Nov-80	UNK	Birth			
					DELHI	5-May-82	UNK	Transfer			
						2-Jun-86		Death			
62	M	~ 1981	WILD	WILD	INDIA	~ 1982	UNK	Capture	RAJU	157	NR022
					PATNA	5-Mar-82	UNK	Transfer			
63	M	15-May-81	12	13	HYDERABAD	15-May-81	UNK	Birth	SRINIVAS	106	NR021
64	F	~ Jun 1981	WILD	WILD	INDIA	~ 1981	UNK	Capture	RUPA		
					ASSAM	3-Jul-81	UNK	Transfer			
						11-Oct-81		Death			
65	F	~ 1982	WILD	WILD	INDIA	~ 1982	UNK	Capture	MOHINI /RUBY	194	NR037
					ASSAM	4-Jun-82	UNK	Transfer			
					DELHI	12-Dec-90	UNK	Transfer			
66	F	~ Apr 1982	WILD	WILD	INDIA	~ 1982	UNK	Capture	DALIMI		
					ASSAM	2-May-82	UNK	Transfer			
						27-Oct-82		Death			
67	M	9-Jun-82	7	8	ASSAM	9-Jun-82	UNK	Birth	SHYAM JR		
						23-Sep-98		Death			
68	F	1-Oct-82	37	34	KANPUR	1-Oct-82	UNK	Birth	RASHMI	122	

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
					YOKOHAMA	31-Mar-85	UNK	Transfer			
						4-Jan-95		Death			
69	M	15-Feb-83	43	27	CHATBIR Z	15-Feb-83	UNK	Birth			
						2-Mar-83		Death			
70	F	~ Mar 1983	WILD	WILD	INDIA	~ 1983	UNK	Capture	SABITRI		
					ASSAM	9-Apr-83	UNK	Transfer			
						30-Apr-83		Death			
71	M	4-Jun-84	23	32	CALCUTTA	4-Jun-84	UNK	Birth	DEBRAJ	150	NR024
72	M	6-Aug-84	37	34	KANPUR	6-Aug-84	UNK	Birth	LOHIT	129	NR025
					DUDHWA	27-Apr-92	UNK	Transfer			
						25-Nov-92	UNK	Transfer			
					LUCKNOW	6-Apr-95	UNK	Transfer			
73	M	11-Dec-84	43	27	CHATBIR Z	11-Dec-84	UNK	Birth			
						21-Dec-84		Death			
74	F	~ Dec 1985	WILD	WILD	INDIA	~ 1986	UNK	Capture	SUCHILA		
					ASSAM	27-Feb-86	UNK	Transfer			
						28-Feb-86		Death			
75	M	9-May-86	43	27	CHATBIR Z	9-May-86	UNK	Birth	RAJA /PRINCE		NR027
76	M	~ Jan 1987	WILD	WILD	INDIA	~ 1987	UNK	Capture	RATUL	174	NR028
					ASSAM	25-Aug-87	UNK	Transfer			
					GORUMARA	17-Oct-95	UNK	Transfer			
77	M	11-May-87	44	50	ASSAM	11-May-87	UNK	Birth	BISHNU	173	NR030
78	M	17-Jun-87	37	34	KANPUR	17-Jun-87	UNK	Birth	MOHIT	140	NR029
79	M	~ Mar 1988	WILD	WILD	INDIA	~ 1988	UNK	Capture	RAMU	177	NR035
					ASSAM	2-Sep-88	UNK	Transfer			
					TRIVANDRU	19-May-93	UNK	Transfer			
80	F	8-Jul-88	62	36	PATNA	8-Jul-88	UNK	Birth	HARTALI	159	NR032
81	M	26-Jul-88	WILD	WILD	INDIA	~ 1989	UNK	Capture	JADU	177	NR035
					ASSAM	26-Jul-89	UNK	Transfer			
					TRIVANDRU	19-May-93	UNK	Transfer			
82	M	30-Mar-89	44	50	ASSAM	30-Mar-89	UNK	Birth	MOHESH	176	NR034
83	M	~ Jun 1989	WILD	WILD	INDIA	25-Jul-89	UNK	Capture	MADU	178	
					ASSAM	26-Jul-89	UNK	Transfer			
					JALDHAPAR	17-Oct-95	UNK	Transfer			
84	M	~ 1989	WILD	WILD	INDIA	~ 1989	UNK	Capture	DHAN		

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
					ASSAM	26-Jul-89	UNK	Transfer			
						4-Sep-89		Death			
85	M	20-Jun-89	37	34	KANPUR	20-Jun-89	UNK	Birth	ROHIT	160	NR036
86	M	~ 1989	WILD	WILD	INDIA	~ 1989	UNK	Capture	KANAK		
					ASSAM	25-Jun-89	UNK	Transfer			
						26-Jun-89		Death			
87	M	~ Mar 1990	WILD	WILD	INDIA	~ 1990	UNK	Capture	PRAKASH		
						22-Apr-90		Death			
88	M	~ 1990	WILD	WILD	INDIA	~ 1990	UNK	Capture	PRADEEP	179	NR038
					ASSAM	20-Aug-90	UNK	Transfer			
					TRIPURA	14-Oct-94	UNK	Transfer			
89	F	~ 1990	WILD	WILD	INDIA	~ 1991	UNK	Capture	BAGHEKHAT I	192	NR039
					ASSAM	10-Aug-91	UNK	Transfer			
90	F	30-Apr-91	WILD	WILD	INDIA	~ 1991	UNK	Capture	MONOMALI		
					ASSAM	6-Aug-91	UNK	Transfer			
						17-Aug-91		Death			
91	M	5-Jul-91	37	34	KANPUR	5-Jul-91	UNK	Birth	MUDIT	186	NR040
92	F	6-Jul-91	62	36	PATNA	6-Jul-91	UNK	Birth	CHOTKI	203	NR041
					KANPUR	26-Apr-99	UNK	Transfer			
93	M	27-Dec-92	26	65	DELHI	27-Dec-92	UNK	Birth	AYODHYA	202	NR044
94	F	25-Nov-94	58	60	ASSAM	25-Nov-94	UNK	Birth			
						25-Nov-94		Death			
95	M	~ 1995	WILD	WILD	INDIA	~ 1995	UNK	Capture	HANUMAN		
					ASSAM	21-Mar-95	UNK	Transfer			
						27-Nov-95		Death			
96	F	22-Jan-95	45	50	ASSAM	22-Jan-95	UNK	Birth	RITA	235	NR042
97	M	~ 1995	WILD	WILD	INDIA	~1995	UNK	Transfer	RANGA		
					ASSAM	11-Jun-95	UNK	Capture			
						5-Nov-95		Death			
98	M	28-Aug-95	26	65	DELHI	28-Aug-95	UNK	Birth	MEGHDOOT	251	NR045
						6-Mar-99		Death			
99	M	29-Apr-96	78	34	KANPUR	29-Apr-96	UNK	Birth	TARUN		NR043
					LUCKNOW	30-Apr-97	UNK	Transfer			
						19-May-97		Death			
100	F	27-Nov-97	62	65	DELHI	27-Nov-97	UNK	Birth	MAHESWARI	252	NR046

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
101	F	15-Jun-99	58	60	ASSAM	15-Jun-99	UNK	Birth			
						15-Jun-99		Death			
102	M	????	UNK	UNK	UNKNOWN	????	UNK	Birth	MADAN		
					ASSAM	????	UNK	Transfer			
					LOSANGELE	4-Dec-65	UNK ltf	Transfer			
103	M	????	WILD	WILD	INDIA	~ 1988	UNK	Capture	BAUL		
					ASSAM	16-Sep-88	UNK	Transfer			
						24-Sep-88		Death			
104	M	~ Jul 1998	WILD	WILD	INDIA	~ 1998	UNK	Capture	LOHAMANI		
					ASSAM	26-Oct-98	UNK	Transfer			
105	F	????	WILD	WILD	INDIA	????	UNK	Capture	LAUIE/RANI	21	
					ASSAM	????	UNK	Transfer			
					CALCUTTA	6-Jun-61	UNK	Transfer			
					TOKOYO	16-Jul-61	UNK	Transfer			
						13-Dec-91		Death			
106	F	????	WILD	WILD	INDIA	~ 1968	UNK	Capture	GOTANGI	48	
					ASSAM	29-Jul-68	UNK	Transfer			
					OMAHA	23-Jan-70	UNK	Transfer			
						31-Jan-70		Death			
TOTAL		**66.49.0**	**(115)**								

Section 2

Current Population Of Greater One Horned Rhinoceros by location as of 30th September 2000

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
Nehru Zoological Park, Hyderabad, A.P											
13	F	~ 1963	WILD	WILD	India	????	UNK	Capture	Padma	77	NR004
					Assam	????	UNK	Transfer			
					Hyderabad	26-Jun-68	UNK	Transfer			
34	F	~ May 1973	WILD	WILD	India	~ 1973	UNK	Capture	Maya	128	NR008
					Assam	11-Aug-73	UNK	Transfer			
					Kanpur	1-Mar-77	UNK	Transfer			
					Lucknow	30-Apr-97	UNK	Transfer			
					Hyderabad	23-Sep-99	UNK	Transfer			
63	M	15-May-81	12	13	Hyderabad	15-May-81	UNK	Birth	Srinivas	106	NR021
Total	1:2	3									
Assam State Zoo, Guwahati											
31	M	~ 1972	WILD	WILD	India	~ 1982	UNK	Capture	Ganesh Jun	172	NR006
					Assam	15-Jul-82	UNK	Transfer			
44	M	~ 1976	WILD	WILD	India	~ 1980	UNK	Capture	Laksman	168	NR012
					Assam	27-Jan-80	UNK	Transfer			
58	M	~ Apr 1980	WILD	WILD	India	~ 1980	UNK	Capture	John\Palit	170	NR019
					Assam	23-Aug-80	UNK	Transfer			
60	F	~ 1980	WILD	WILD	India	~ 1980	UNK	Capture	Gini\Taral	171	NR020
					Assam	23-Aug-80	UNK	Transfer			
77	M	11-May-87	44	50	Assam	11-May-87	UNK	Birth	Bishnu	173	NR030
82	M	30-Mar-89	44	50	Assam	30-Mar-89	UNK	Birth	Mohesh	176	NR034
89	F	~ 1990	WILD	WILD	India	~ 1991	UNK	Capture	Baghekhati	192	NR039
					Assam	10-Aug-91	UNK	Transfer			
96	F	22-Jan-95	45	50	Assam	22-Jan-95	UNK	Birth	Rita	235	NR042
104	M	~ Jul 1998	WILD	WILD	India	~ 1998	UNK	Capture	Lohamani		
					Assam	26-Oct-98	UNK	Transfer			
Total	6:3	9									
Zoological Garden, Alipore, Calcutta											
32	F	~ 1973	WILD	WILD	India	~ 1974	UNK	Capture	Mayuri	95	NR007
					Assam	22-Jan-74	UNK	Transfer			

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
					Calcutta	11-Mar-74	UNK	Transfer			
23	M	~ 1969	WILD	WILD	India	~ 1974	UNK	Capture	Meghnad		NR005
					Assam	12-Feb-74	UNK	Transfer			
					Calcutta	11-Mar-74	UNK	Transfer			
71	M	4-Jun-84	23	32	Calcutta	4-Jun-84	UNK	Birth	Debraj	150	NR024
Total	2:1	3									
National Zoological Park, Delhi											
26	M	~ 1970	WILD	WILD	India	~ 1982	UNK	Capture	Dabbu/Agni	151	NR023
					Assam	5-May-82	UNK	Transfer			
					Delhi	23-Jan-83	UNK	Transfer			
65	F	~ 1982	WILD	WILD	India	~ 1982	UNK	Capture	Mohini/Ruby	194	NR037
					Assam	4-Jun-82	UNK	Transfer			
					Delhi	12-Dec-90	UNK	Transfer			
93	M	27-Dec-92	26	65	Delhi	27-Dec-92	UNK	Birth	Ayodhya	202	NR044
100	F	27-Nov-97	62	65	Delhi	27-Nov-97	UNK	Birth	Maheswari	252	NR046
Total	2:2	4									
Ranchi Zoo, Bihar.											
36	F	~ 1974	WILD	WILD	India	~ 1974	UNK	Capture	Chitralekha	155	NR011
					Assam	21-Jul-74	UNK	Transfer			
					Patna	25-May-88	UNK	Transfer			
					Ranchi	4-Dec-96	UNK	Transfer			
Total	0:1	1									
Nandankanan Biological Park, Orissa											
38	F	~ Jun 1974	WILD	WILD	India	~ 1974	UNK	Capture	Numali	153	NR009
					Assam	16-Sep-74	UNK	Transfer			
					Nandankan	4-Apr-76	UNK	Transfer			
47	M	~ 1977	WILD	WILD	India	~ 1977	UNK	Capture	Nandan		NR013
					Assam	22-Aug-77	UNK	Transfer			
					Nandankan	29-Nov-79	UNK	Transfer			
Total	1:1	2									
Patna Zoo, Bihar											
62	M	~ 1981	WILD	WILD	India	~ 1982	UNK	Capture	Raju	157	NR022
					Patna	5-Mar-82	UNK	Transfer			
49	M	~ Apr 1977	WILD	WILD	India	~ 1977	UNK	Capture	Kancha\Bij	156	NR016
					Assam	19-Aug-77	UNK	Transfer			
					Patna	25-May-79	UNK	Transfer			

New National Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name	International stud #	Old National stud #
80	F	8-Jul-88	62	36	Patna	8-Jul-88	UNK	Birth	Hartali	159	NR032
Total	2:1	3									
V.J.B.U, Bombay											
55	M	~ Mar 1978	WILD	WILD	India	~ 1979	UNK	Capture	Shiva		NR018
					Assam	24-Apr-79	UNK	Transfer			
					Veermata	25-Feb-85	UNK	Transfer			
Total	1:0	1									
Gorumara, West Bengal											
76	M	~ Jan 1987	WILD	WILD	India	~ 1987	UNK	Capture	Ratul	174	NR028
					Assam	25-Aug-87	UNK	Transfer			
					Gorumara	17-Oct-95	UNK	Transfer			
Total	1:0	1									
Sri Chamarajendra Zoological Gardens, Mysore, Karnataka											
40	M	~ 1975	WILD	WILD	India	~ 1980	UNK	Capture	Ram/Munni	61	NR026
					Assam	24-Jan-80	UNK	Transfer			
					Mysore	23-Jan-85	UNK	Transfer			
Total	1:0	1									
Lucknow Zoological Park, U.P											
72	M	6-Aug-84	37	34	Kanpur	6-Aug-84	UNK	Birth	Lohit	129	NR025
					Dudhwa	27-Apr-92	UNK	Transfer			
						25-Nov-92	UNK	Transfer			
					Lucknow	6-Apr-95	UNK	Transfer			
Total	1:0	1									
Kanpur Zoological Park, U.P											
78	M	17-Jun-87	37	34	Kanpur	17-Jun-87	UNK	Birth	Mohit	140	NR029
85	M	20-Jun-89	37	34	Kanpur	20-Jun-89	UNK	Birth	Rohit	160	NR036
91	M	5-Jul-91	37	34	Kanpur	5-Jul-91	UNK	Birth	Mudit	186	
92	F	6-Jul-91	62	36	Patna	6-Jul-91	UNK	Birth	Chotki		
					Kanpur	26-Apr-99	UNK	Transfer			
Total	3:1	4									
M.C. Zoological Park, Chatbir Punjab											
75	M	9-May-86	43	27	Chatbir Z	9-May-86	UNK	Birth	Raja /Prince		NR027
Total	1:0	1									

Thiruvananthapuram Zoo, Kerala											
79	M	~ Mar 1988	WILD	WILD	India	~ 1988	UNK	Capture	Ramu	177	NR035
					Assam	2-Sep-88	UNK	Transfer			
					Trivandru	19-May-93	UNK	Transfer			
81	M	26-Jul-88	WILD	WILD	India	~ 1989	UNK	Capture	Jadu	177	NR035
					Assam	26-Jul-89	UNK	Transfer			
					Trivandru	19-May-93	UNK	Transfer			
Total	2:0	2									
Jaldhapara, W.Bengal											
83	M	~ Jun 1989	WILD	WILD	India	25-Jul-89	UNK	Capture	Madu	178	
					Assam	26-Jul-89	UNK	Transfer			
					Jaldhapara	17-Oct-95	UNK	Transfer			
Total	1:0	1									
Sephaijala Zoological Park, Sepahaijala, Tripura											
88	M	~ 1990	WILD	WILD	India	~ 1990	UNK	Capture	Pradeep	179	NR038
					Assam	20-Aug-90	UNK	Transfer			
					Tripura	14-Oct-94	UNK	Transfer			
Total	1:0	1									

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 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 time

Appendix- I

Full name of Institutions

Trivandru	Thiruvananthapuram Zoo, Kerala, India
Bannergha	Bannerghatta Zoological Garden, Bangalore, Karnataka
Chatbir Z	M.C Zoological Park, Punjab, India
Nandankan	Nandankanan Zoological Park, Bhubaneswar, Orissa, India
Washingto	Smithsonian National Zoological Park, Washinton, D.C, U.S.A
Toronto	Toronto Zoo, Ontario, Canada
NY Bronx	Wildlife Conservation Park Bronx Zoo, NY, U.S.A
Nagoya	Nagoya Higashiyama Zoo, Japan
SandiegoZ	San Diego Zoological Society Wild Animal Park, U.S.A
Gulf Brez	The Gulf Breeze Zoo, Florida, U.S.A
Losangele	Los Angeles Zoo, U.S.A
Whipsnade	Whipsnade Wild Animal Park, U.K
Yokohama	Kanazawa Zoological Gardens of Yokohama, Japan