

NATIONAL STUDBOOK

Phayre's Leaf Monkey (*Trachypithecus phayrei*) II Edition

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Central Zoo Authority

National Studbook of Phayre's Leaf Monkey (*Trachypithecus phayrei*) II Edition

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FOREWORD

Phayre's leaf monkey, a primate species inhabiting moist evergreen forests in north-eastern India is severely threatened by habitat fragmentation and degradation. For species threatened with extinction in their natural habitats ex-situ conservation offers an opportunity for ensuring their long-term survival. The Central Zoo Authority (CZA) in collaboration with zoos in India has accordingly initiated a conservation breeding program for the species in Indian zoos.

Ensuring long-term genetic viability and demographic stability is critical for the management of the captive population. Pedigree information contained in studbooks forms the basis for this management. As a part of this endeavor a Memorandum of Understanding has been signed with the Wildlife Institute of India for compilation and update of studbooks of selected species in Indian zoos.

As part of the project outcomes the WII has compiled the 'National studbook for Phayre's leaf monkey (*Trachypithecus phayrei*) in Indian zoos: II Edition'. The recommendations contained in the studbook form the basis for the long term management of the species in captivity. It is hoped that the zoos housing Phayre's leaf monkey will adopt the recommendations for ensuring effective management of the captive population.

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PHAYRE'S LEAF MONKEY

(*Trachypithecus phayrei*)

Species Information

The Phayre's leaf monkey or Phayre's langur is a medium-sized Colobine found in the tropical forests of Southeast Asia. The species epithet commemorates Arthur Purves Phayre. It is one of the most enigmatic and least known primate species found in India. Like other leaf monkeys it is characterized by a ruminant-like digestive system.

Taxonomy

Phylum	Chordata
Sub-phylum	Vertebrata
Class	Mammalia
Order	Primata
Family	Cercopithecidae
Sub- family	Colobinae
Species	<i>Trachypithecus phayrei</i>



The genus *Trachypithecus* is the most diverse langur taxon, distributed in southwestern China, south and southeastern Asia. There are 3 known sub-species namely, *Trachypithecus phayrei phayrei* (Bangladesh, India), *T. p. crepuscula* (Southwestern China), *T. p. shanicus* (Southwestern China and northeastern Myanmar). Recent genetic analyses have demonstrated that *T. p. crepuscula* and *T. p. phayrei* do not form a monophyletic clade. *T. p. phayrei* from India is the sister taxon of *T. barbei* and *T. obscurus*, but *T. p. crepuscula* from Vietnam represents a distinct lineage, being a close relative of the *T. francoisi* species group (Karanth *et al.* 2008; Nadler *et al.* 2003). He *et al.* (2012) suggest a sister relationship of *T. p. shanicus* and *T. p. Phayrei* while *T. p. crepuscula* may represent a distinct species throughout its distribution range, although incongruence between nuclear and mitochondrial genes suggests that hybridization may have occurred with *T. p. phayrei* (He *et al.* 2012).

Morphology

The species is easily identified in the field by a distinct white patch seen around the eyes and on upper and lower lips (Choudhury 1987). This is also why they are often referred to as spectacled langurs. They are greyish to black in colour. Their brow, hands and feet are jet black, and their upper arms, legs and tail are silvery grey (Rowe 1996).

The sexes are alike and females are larger. The head to body length ranges from 44 – 61 cm in males and from 65 – 86 cm in females. The tail constitutes 68 % of the overall length, ranging from 65 to 86 cm (Choudhury 1987). The average body mass of an adult male Phayre's leaf-monkey is around 7.3 kilograms, and for the female it is around 6.2 kilograms (Fleagle 1988). Male Phayre's leaf monkeys can be distinguished from females in the field by observing differences between ocular markings. In males, the white ocular rings around the eyes are parallel to the side of the nose, resulting in a black strip uniform in width. In females, the white ocular rings around the eyes bend inwards toward the nose causing more of black triangular shape (Bhattacharya and Chakraborty 1990). Other than newborns, individuals have an extended cap of hair on the head (Srivastava 1999). Infants are orange colored that begins to change after 3 months of age (Srivastava 1999).

Distribution

Phayre's leaf monkeys (*Trachypithecus phayrei*) occur in eastern Bangladesh, south-western China (southern, western and central Yunnan), north-eastern India (Assam, Mizoram, and Tripura), Lao PDR, Myanmar, Thailand (north of the peninsular zone) and northern Vietnam (Groves 2001).

The species has three subspecies occupying different ranges

- *Trachypithecus phayrei phayrei*: This subspecies is found in Bangladesh, north-eastern India (Assam, Mizoram, and Tripura), and western Myanmar (Groves 2001).
- *T. p. crepuscula*: This subspecies is found in Bangladesh, southern China, south western Laos, central and north western Thailand, and northern Vietnam (Groves 2001). In Bangladesh this subspecies occurs to the south of the range of the subspecies *T. p. phayrei* (Groves, 2001).
- *T. p. shanicus*: This subspecies is found in southwestern China in the Yingjiang-Namting River and Tunchong- Homushu Pass districts and northern and eastern Myanmar (Groves 2001).



Habitat

Phayre's leaf monkeys are primarily arboreal and prefer primary and secondary evergreen and semi-evergreen forest, mixed moist deciduous forest, but are also found in bamboo-dominated areas, light woodlands, and near tea plantations. In thick evergreen forests, Phayre's leaf monkeys can be found 15 to 50 m above the ground. In areas lacking primary and secondary forests, this species depend on bamboo and small shrubs like *Macaranga denticulata* and the herb *Alpinia allughas* (Choudhury, 1987,

1994, 1996). Phayre's leaf monkeys may also be found along stream banks containing thick bamboo forests (Bose 2003). In Mizoram this species was found in secondary forests and a dense bamboo forest with few scattered trees (Raman *et al.*, 1995). In Bangladesh this species lives in semi-evergreen forests and semi-deciduous/evergreen forests (Feeroz *et al.*, 1995; Gittins and Akonda, 1982). In Lao PDR, the species occurs mostly in forests with a heavily broken canopy and tall bamboo (Timmins *et al.* 2011).

Behavioural ecology

Activity patterns

Phayre's leaf monkeys are very shy and typically flee when threatened. Resting and feeding are the predominant activities of the species (Koenig *et al.* 2004). Phayre's leaf monkeys are strongly territorial against other groups of the same species, although sympatric groups of other species may share the same territory. Gupta (1997) studied the activity patterns of the species and reported the activity budget to be dominated by feeding (41.7%), followed by resting (28.3%), travelling (8.2%), while other activities such as grooming, calling, playing, suckling, aunting, etc. accounted for 21.8%. The activity budget of the species reported from southern Assam by Bose and Bhattacharjee (2002) was dominated by feeding (39.4%), followed by resting (34.4%), travelling (14.8%), grooming (7.2%), playing (1%) while time spent in miscellaneous activities such as comfort movements accounted for 3.2% of the time. Activity starts with a bout of feeding starting before dawn, while noonday heat is avoided by resting in shady trees followed by a second bout of feeding late in the afternoon (Choudhury 1994).

The daily distance travelled is more than 1 kilometre per day while the home range for the species in Thailand is on average 87.7 ha (Koenig *et al.* 2004). They are also known to visit salt licks and significantly increase their home range on such occasions (Pages 2005). Phayre's leaf-monkeys are sympatric with capped langurs, (*Trachypithecus pileatus*) in the West Bhanugach Reserve Forest of Sylhet, Bangladesh (Feeroz *et al.*, 1995) and in Rajkandi Reserve Forest where they feed in the same or adjacent trees (Stanford, 1988). They rest in trees with extensive branching and moderate shade (*Artocarpus chaplasha*, *Gmelina arborea*, *Albizia chinensis*, *Melocanna baccifera*, *Melocanna bambusoides*, *Bambusa tulda* or *Acacia mangium*) (Aziz and Feeroz 2009) preferring a height between 8 to 29 meters (Gupta 2002).

Foraging and feeding behaviour

Their diet consists of fibre rich foliage, shoots, petioles, leaves, flowers and buds with *Leguminosae* and *Moraceae* providing the highest proportion (32%) of their food. They feed during early morning (0600-0800 hrs) and in the late afternoon (1400-1600 hrs) (Aziz and Feeroz 2009). Like other colobine monkeys they have a unique digestive system, analogous to that of ruminants, which allows them to exploit foliage as a food source. Their diet comprises of young and matures leaves and shoots (66%), followed by flowers and buds (16%) and fruits and seeds (14%) with a noticeable seasonal variation in their diet (Aziz and Feeroz 2009). Aziz and Feeroz (2009) observed that Phayre's leaf monkeys in Bangladesh consume more leaves during winter (76%), fruits and seeds during monsoon (57%) and

flowers and buds are consumed mostly during summer (41%). However, bamboo shoots form a significant part (19%) of their diet throughout the year. Various observations from India and Myanmar also stress the importance of shoots of tall bamboos (for example, *Melocanna*) in this leaf monkey's diet (Green 1978, Mukherjee 1982, Choudhury 1994a, 1994b, Gupta and Kumar 1994, Raman 1996, Srivastava 1999, 2006, Platt *et al.* 2010). Bose and Bhattacharjee (2004) reported that plants like *Havea brasiliensis* (67.4%), *Delonix regia* (5.8%) and *Acacia auriculiformis* (4.3%) contribute more than 75% of the annual diet of the species in Tripura. Bose and Bhattacharjee (2002) observed that in Tripura the species has changed its food habits to include twigs and leaves of *Havea brasiliensis* or rubber tree which are also used for night roosting. Exotic plant species also form an important part of their diet (24.3%) (Gupta and Dasgupta 2004).

Phayre's leaf monkeys divide into sub-troops during foraging and feeding particularly when food is scarce, but maintain close association among the dispersed members through visual and vocal contact. Although they primarily feed in trees, they are also reported to spend a large amount of time feeding on climbers and epiphytes (Suarez 2013). They occasionally come close to the ground when consuming bamboo shoots or soil, or when drinking water (Suarez 2013).

Social organization and behaviour

Phayre's leaf monkeys live in groups containing 1–5 adult males and 3–12 adult females (Koenig and Borries 2012). They have group density of 3.4 groups/square kilometre in Thailand (Borries *et al.* 2008) while in Tripura the group density is 7.6 groups/square kilometres (Gupta and Kumar 1994). Groups are generally cohesive, but individuals or subgroups may occasionally range >300 m apart (Lu *et al.* 2012). Phayre's leaf monkeys show a linear dominance hierarchy in their social organization with unidirectional and transitive relationships (Koenig *et al.* 2004), similar to those observed in other colobines (Borries *et al.* 1991; Koenig 2000). The adult females in the group are ranked inversely to age. Younger adult females occupy the highest rank; older adults occupy the middle ranks while sub-adult females are found at the bottom of the hierarchy (Koenig *et al.* 2004). Adult females of this species are known to show dispersal (Borries *et al.* 2004; Koenig *et al.* 2004). Male immigration or infanticide is not seen in this species (Borries *et al.* 2008). On the contrary the males frequently associate and occasionally care for infants and also act as mediators on behalf of infants, if the infants are involved in conflicts with females (Koenig *et al.* 2004). It is a territorial species and defends its territory against conspecific groups. However, inter-group aggression has not been observed (Gupta 2000). Most of the interactions consist of displacements rather than overt aggression or submissive signals (Koenig *et al.* 2004).

Mating patterns in Phayre's leaf monkeys range from polygynous to promiscuous, depending on the composition of the group (Lu *et al.* 2012). Males are philopatric and begin mating with adult females as adolescents. Once they are adult, young males commonly outrank older adult males (Koenig and Borries 2012). In females sexual swellings are absent (Nunn 1999). Menstrual cycles are 30 days long, on average (Lu *et al.* 2010). In Phayre's leaf monkeys females show a preference for mating with adult

males during post ovulatory period (POP) while they choose to mate with adolescents during the pre-conceptive period (PC) (Lu *et al.* 2012). Proceptive behaviour during mating includes female presentation and head shaking toward any adolescent or adult male. Attractive behaviour includes male solicitations and inspections of female hindquarters. Receptive behaviour includes copulations (mount with intromission) as well as attempted copulations (mounting only) (Sommer *et al.* 1992). Displacement events such as a male displacing another male involved in a sexual encounter, or a male approaching a female directly following termination of mating and the female subsequently leaving and vocalizing are common forms of agonistic behaviour in Phayre's leaf monkeys (Lu *et al.* 2012). Females in larger groups reproduce at a slower pace and have lower reproductive rates as compared to those in smaller groups (Borries *et al.* 2008).

Table 1: Life history traits of Phayre's leaf monkeys (*Trachypithecus phayrei*)

Mating System	Multi-male-multi-female groups (Koenig and Borries 2012)
Breeding season	December-April (peak) (Borries <i>et al.</i> 2005)
Average gestation period	205.3 days (Lu <i>et al.</i> 2010)
Weaning age (mean)	depending on group size (small to large)- 18.3 to 21.4 months (Borries <i>et al.</i> 2008)
Inter birth interval	22.3 6 ± 3.99 months (Borries <i>et al.</i> 2011)
Age at first reproduction	5 years; 5.3 years (female) (Ossiet <i>et al.</i> 2006; Borries <i>et al.</i> 2011)
Lifespan in captivity	28.3 years (maximum) (Weigl 2005)

Phayre's leaf monkeys give birth throughout the year with a mean gestation period of 205.3 days (Lu *et al.* 2012). At the time of first birth, female Phayre's leaf monkeys are at an average of 5.3 years of age (Borries *et al.* 2011). The inter-birth interval following a surviving infant is at an average of 22.3 ± 3.99 months (median= 23.0, range = 14–32, n= 40) with a notably large range of 18 months (Borries *et al.* 2011). Females give birth to one offspring at a time, which is nursed for almost a year, which greatly increases its chance of survival. Mothers are the main caregivers as they feed, protect and groom newborns. Adolescents tend to keep contact with their mothers, even after she gives birth to additional offspring (Larney *et al.* 2007).

Both male and female Phayre's leaf monkeys use vocal calls for communication. A loud I- "kahkahkah" alarm call is used by adult males while a softer "whoo" call is used when adult males detect a predator within the area (Srivastava 1999). The "cheng-kong" call is emitted by the dominant male to bring the group together (Srivastava 1999).

Population status in the wild

The Phayre's leaf monkey population is small and isolated in India and Bangladesh (Choudhury 2001; Molur *et al.* 2003). The status of Phayre's leaf monkey in Lao PDR is localized due to hunting pressure and habitat fragmentation, and it inhabits three national protected areas. In Vietnam the species is rare and there are records only from a handful of areas (Nadler *et al.* 2004). In Thailand, there are good

populations in Nam Nao National Park and Phukhio Wildlife Sanctuary (Borrieset *et al.* 2002), but much of northern Thailand has been hunted out. In China, healthy populations of *T. p. shanicus* survive mainly in Gaoligongshan Nature Reserve and Tongbiguan Nature Reserve, and healthy populations of *T. p. crepuscula* survive mainly in Nangunhe Nature Reserve, Ailaoshan Nature Reserve, Wuliangshan Nature Reserve, Daxueshan Nature Reserve, Huanlianshan Nature Reserve, and Xishuanbanna Nature Reserve (Zhang *et al.* 2002). Overall, the population is declining globally and is predicted to decline further (Molur *et al.* 2003).

Threats and conservation measures

The species is threatened by habitat fragmentation and human interference especially due to the establishment of tea gardens and paper mills, timber plantations, livestock ranching, shifting agriculture, firewood collection, charcoal production, and human settlement (Molur *et al.* 2003). Interspecific competition from exotics, pollution, inbreeding, and local trade in the animals for zoos and as food are other threats faced by the species (Molur *et al.* 2003).

The species is listed as Endangered in the IUCN Red List of Threatened Species (2008) because its population is at risk of becoming extinct or threatened by anthropogenic activities. It is also listed as CITES Appendix II species in order to control the illegal trade in the region. Further, it is given priority in national legislation as being listed under Schedule I, part I of the Indian Wildlife (Protection) Act (amended up to 2002). In Bangladesh it is listed as Schedule III in the Bangladesh Wildlife (Preservation) (Amendment) Act, 1974. It is listed as Category I under wildlife Protection Act, 1989 in China, and has been a completely protected species in Myanmar since 1994, though a priority for this species is survey work in order to determine the current status of populations there. It is listed on Appendix 1B of Decree 32 (2006) in Vietnam.

Besides *in-situ* conservation measures the species has been identified by the Central Zoo Authority (CZA), India, as one of the 73 species for conservation breeding in Indian zoos. The co-ordinating institution for the conservation breeding of Phayre’s leaf monkey in India is Sepahijala Zoological Park, Agartala.

Status in captivity

The species is held at two institutions in India with a total of 27 (6.14.7) specimens according to the ZIMS database. The CZA inventory (Table 1) indicates the presence of 28 (7.12.9) specimens, at 2 Indian zoos while the data made available by holding zoos for the compilation of the studbook includes 31 (7.15.9) specimens at two locations, with one birth in April 2018.

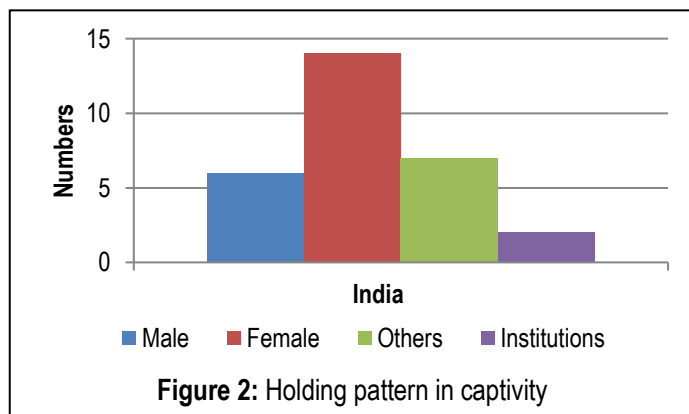


Table 2: Status of Phayre's leaf monkey in Indian zoos

Zoo Name	Species360 (31/03/2018)				CZA Inventory (31/03/2018)				Studbook *			
	Male	Female	Unsexed	Total	Male	Female	Unsexed	Total	Male	Female	Unsexed	Total
Bannerghatta Zoological Garden National Park *	1	2	0	7	2	2	0	4	2	2	1	5
Sepahijala Zoological Park *	5	12	7	24	5	10	9	24	5	13	8	26
Total	6	14	7	27	7	12	9	28	7	15	9	31

* Data included in the SPARKS database on the basis of information provided by holding zoos

Methods

Pedigree data was collected by means of mailed questionnaires sent to zoos requesting information for each captive specimen and from ZIMS (Zoological Information Management System, 2014). Data was entered in Single Population Analysis and Records Keeping System (SPARKS v 1.66) (ISIS 2004) and subsequently exported to population management program PMxv 1.2 (Ballou *et al.* 2010) for further data analysis.

Scope of the Studbook

- The studbook includes all specimens present in Indian zoos for which records were available from holding institutions. The same was validated from the CZA inventory (2017 – 2018) and ZIMS platform of the Species360 website.
- The data provided by holding zoos (as of 30April 2018) was included in the SPARKS database. It; however differs from information included in the CZA inventory for 2017 – 2018 (Table 1) and uploaded by holding institutions on the ZIMS platform.
- The mnemonics present in the SPARKS software were used as names for individual institutions; while for those institutions for which mnemonics were not present in the SPARKS Software, mnemonics were assigned based on their location listed on the CZA Website and the same are listed in the location glossary (Appendix IV). The mnemonic India was used for all specimens acquired from the wild.

Analysis

Demographic Status

Historical Population

The studbook includes a total of 47 (15.21.11) specimens that have been housed at two Indian zoos. The first recorded entry of the species in captivity was at Sepahijala Zoological Park in 1997, with a wild origin female being acquired by the zoo, the first male entered captivity in 1999. Growth in the population has been due to both the acquisition from the wild and captive births. The recent past has witnessed an increase in the number of animals born in captivity. Wild origin specimens; [23 (11.12.0)]

form 49% of the captive population. A total of 24 (4.9.11) births have occurred in captivity accounting for approximately 51% of the total population. The captive births are attributed to 21(9.12) i.e. approximately 45% of the captive population. The population since its inception has also witnessed 16 (8.6.2) deaths. The sex ratio is female biased. Figure 3 and Table 3 summarize the trends of the historical population while Annexure I includes detailed event-wise information on individual specimens.

Living Population

The living population includes 31 (7.15.9) specimens housed at two institutions; with 11 (3.8.0) wild origin specimens. Approximately 35% or 11 (2.9.0) animals are proven breeders in the living population. Table 4 summarizes the status of the living population while Annexure II provides location-wise specimen details of the living individuals. A perusal of Table 1 and Annexure II reveals the presence of approximately 84% of the population at Sepahijala Zoological Park.

Population Vital Rates

The population is currently increasing at a rate of approximately 2.4% annually. The captive population has a generation time of 10.3 years, a consequence of its natural history as the species reaches sexual maturity at approximately 6 years. The increasing population trend is also reflected in the projected population of approximately 39.4 specimens after 20 years.

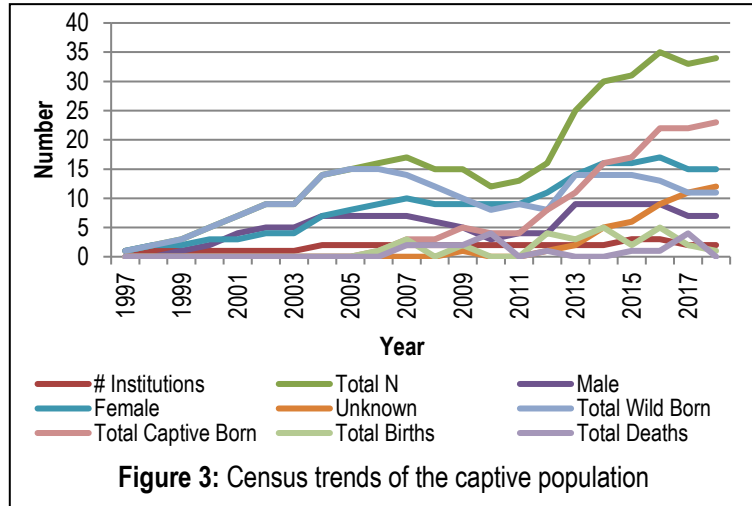


Figure 3: Census trends of the captive population

Table 3: Summary of the Historical Population

	Males	Females	Unknown	Total
Studbook size	15	21	11	47
Acquisition from wild	11	12	0	23
Deaths	8	6	2	16
Breeding individuals	9	12	0	21
Captive born	4	9	11	24

Table 4: Summary of living population

	Males	Females	Unknown	Total
Living	7	15	9	31
Wild-born	3	8	0	11
Captive-born	4	7	9	20
Breeding	2	9	0	11

Table 5: Vital rates of the captive population

	Males	Females	Total
λ : Population growth rate	1.024	1.001	1.012
T: Generation time	9.4yrs	11.1yrs	10.3yrs
N 20: Projected population after 20 yrs	15.5	24.0	39.4

Age Distribution

Age distribution of 22 (7.15) known age and sex living specimens indicates a female bias. The living population includes 24 (6.12.6) animals in reproductively active age classes (5 – 17years Figure 4). An additional 5 (1.1.3) specimens of pre-reproductive age are also present in the population, while 2 females are reproductively senescent. The presence of a large proportion of the population in the reproductively active and pre-reproductive age classes and female bias indicates its capability for rapid growth. The population; however, remains unstable due to the absence of specimens in several age classes in both sexes.

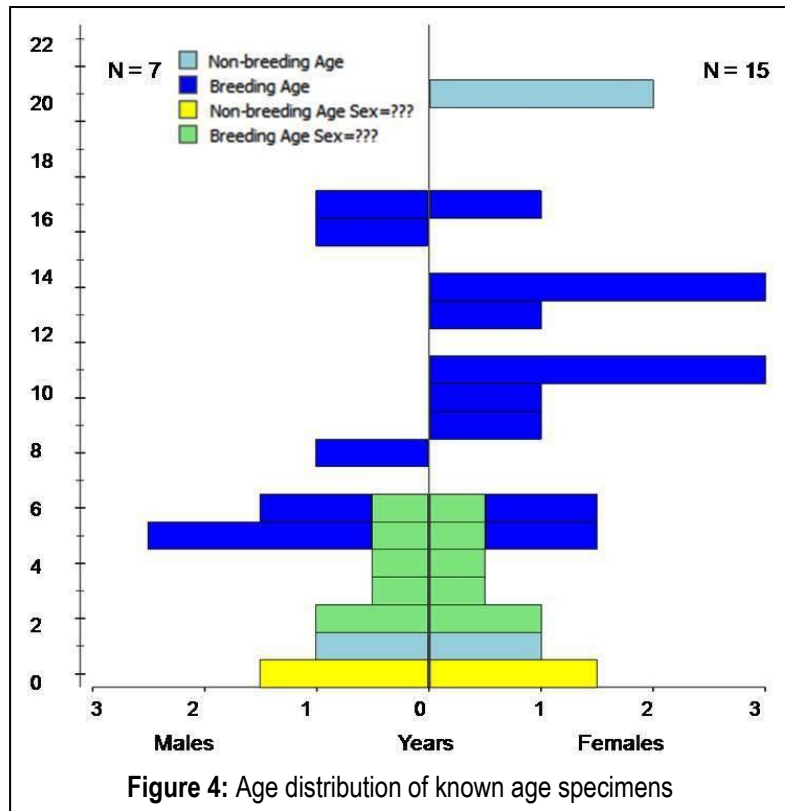


Figure 4: Age distribution of known age specimens

Genetic Status

Table 6 summarizes the genetic status of the living population. Analysis indicates that it originates from 12 founders although the 23 (11.12) wild origin specimens were included population since inception. The living population of 31 specimens retains 91.98% of the genetic diversity brought in by 12 founders that are represented in the current population. The unequal representation of the 12 founders in the living population has resulted in the population having the founder genome equivalents of only 6.23 wild origin specimens. The population has a low level of relatedness between individuals in the captive population as is indicated by the absence of inbreeding and the value of population mean kinship.

Table 6: Genetic Summary of the current population

Genetic parameters	Current
Founders	12
Living Animals	34
Percent Ancestry Known	94
Gene Diversity (GD)	0.9198
Founder Genome Equivalent (FGE)	6.23
Mean Inbreeding (F)	0.000
Population mean kinship (Mk)	0.0802
Ne/N	0.1793

Pairing Recommendations

The pairing recommendations (table 6) for the species in captivity have been arrived at based on 'Mate Suitability Index' (Box 1 for details) that assesses changes in genetic diversity, differences in mean kinship and inbreeding coefficient as result of each pairing choice being exercised. Pairing recommendations have been made keeping in view the need for rapid growth of the population and the social structure of the species while retaining the maximum possible genetic diversity in the captive population.

Table 7: Pairing recommendations

Sire	Sire Location	Dam	Dam Location	F	dGD	MSI
29	Sepahijala	13	Sepahijala	0	0.0279	1
11	Sepahijala	18	Sepahijala	0	0.0167	1
11	Sepahijala	19	Sepahijala	0	0.0187	1
29	Sepahijala	20	Sepahijala	0	0.03	1
12	Bannergkata	24	Bannergkata	0	0.0254	1
29	Sepahijala	25	Sepahijala	0	0.0306	1
11	Sepahijala	20	Sepahijala	0	0.0193	2
48	Bannergkata	24	Bannergkata	0	0.0297	2
48	Bannergkata	8	Sepahijala	0	0.0276	3
48	Bannergkata	47	Sepahijala	0	0.0295	3
32	Sepahijala	26	Sepahijala	0	0.0299	4
48	Bannergkata	27	Sepahijala	0	0.0298	4
48	Bannergkata	30	Sepahijala	0	0.0297	4
32	Sepahijala	22	Sepahijala	0	0.0301	5
34	Sepahijala	33	Sepahijala	0	0.0282	5

Box 1: Mate Suitability Index (MSI)

It is a numerical genetic assessment of a male-female pair that incorporates several variables into one ranking (MSI range is 1 to 7, with 1 being the most genetically beneficial).

The default value in the table is the *MSI* (Mate Suitability Index) value for each male –female pair. *MSI* is a composite score that integrates four genetic components into a single index:

Delta GD (dGD): Change in gene diversity (GD) of the population if one offspring is produced by the pair. Positive dGD increases the GD of the population, while negative dGD decreases GD.

Differences in MK values (MKDiff): Difference in the genetic value (mean kinship value) of the male and female. Breeding a pair with a large MKDiff is detrimental because it combines under-represented and over-represented genetic lines.

Inbreeding coefficient (F): Inbreeding coefficient of any offspring resulting from the pair (i.e., the kinship value for the pair). Inbreeding is considered to be detrimental to the fitness of the resulting offspring.

Unknown ancestry: The amount of unknown ancestry in the male and female. Incomplete pedigree information means that the genetic value and relatedness of a pair cannot be accurately calculated.

- 1 = very beneficial (genetically) to the population;
- 2 = moderately beneficial,
- 3 = slightly beneficial;
- 4 = slightly detrimental,
- 5 = detrimental, should only be used if demographically necessary
- 6 = very detrimental (should be considered only if demographic considerations override preservation of genetic diversity)
- “-“= very highly detrimental (should not be paired, due to high level of kinship of pair)

Using Pairwise Info

The default table of *MSI* values for pairs can be used to quickly assess the relative genetic value of a pair, subset of pairs, potential mates for one individual, and many other valuable data when making breeding recommendations. This can be especially helpful to quickly explore options for pairing individuals at one facility that houses numerous individuals of each sex or to quickly identify an alternative suitable mate if a recommended breeding fails.

Source: Traylor-Holzer, K. (ed.). 2011.

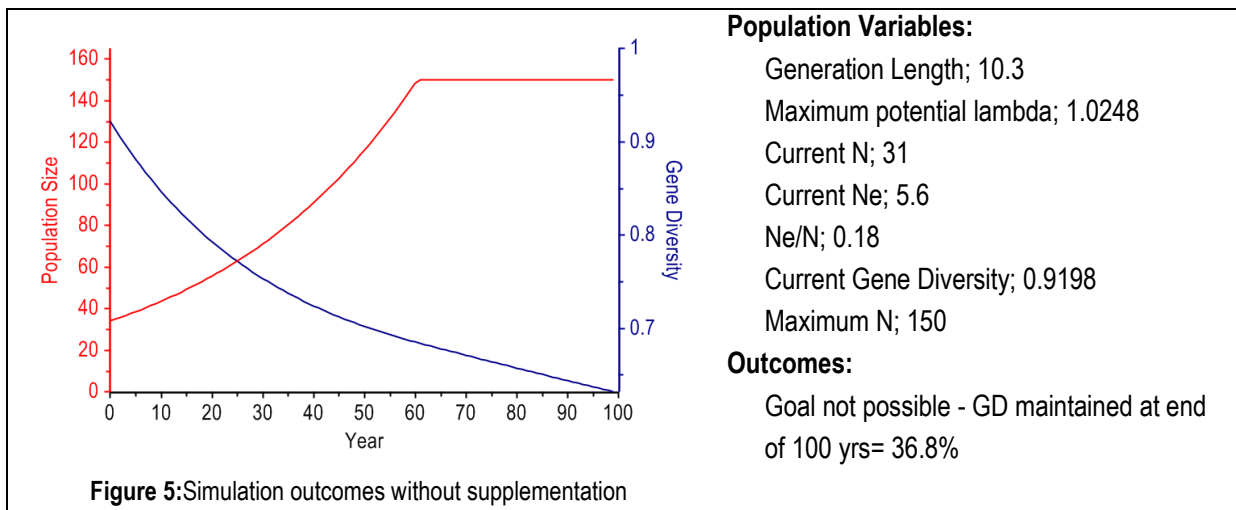
Targets for Population Management

The current captive population of Phayre's leaf monkey includes 31 (7.15.9) individuals. It includes 11 (3.8) wild origin specimens while retaining the founder genome of 12 founders. The population is currently increasing with a λ of 1.012 per annum. The population retains a significant proportion of genetic diversity (91.98% introduced from 12 founders). Individuals comprising the population are distantly related (Mean Inbreeding: 0.000 and Population mean kinship: 0.0802). The small size of the current population and presence of a large proportion of individuals at a single location necessitate management interventions to ensure rapid population growth.

Multiple simulations were run using PMx to determine the fate of the current population for assessing the effect of management interventions that result in an increased population growth rate desired for achieving demographic stability and supplementation with effective founders for ensuring genetic viability; over the next 100 years. The outcomes of the scenarios that were run without change and with changes (supplementation with effective founders and increasing the population growth rate) that ensure a genetically viable and demographically stable population over the next 100 years are presented below.

Scenario I:

The simulation was run using the current population variables without supplementation with additional animals while increasing the current population size (31) to a maximum of 150 individuals. The outcomes indicate that the population in captivity is unlikely to achieve conservation goals and would retain only 63% of the genetic diversity introduced by the 12 founders. The population variables used and the outcomes of the simulation are presented in Figure 5.



Scenario II:

The outcomes of the simulation that was run using a population growth rate of 1.050 and a maximum population size of 150 specimens with supplementation by one effective founder every 4 years can ensure achievement of conservation goals. The population is projected to retain 90.4% of the genetic diversity of the present founders and those used for supplementation while ensuring a demographically

stable population. The population and founder related variables, and the simulation outcome are presented as Figure 6.

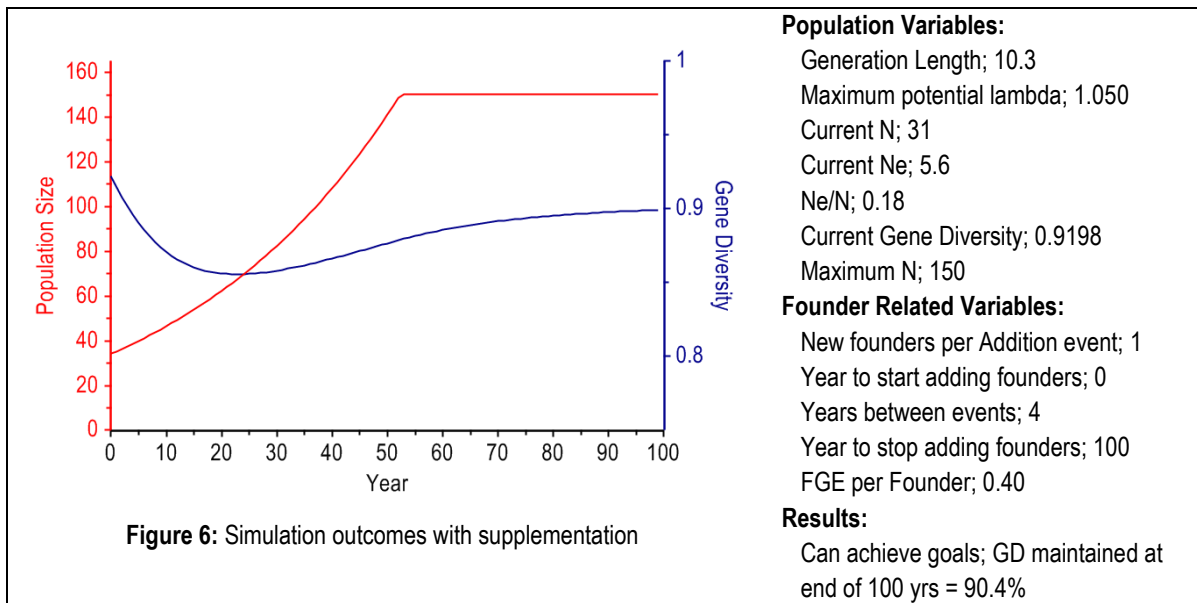


Figure 6: Simulation outcomes with supplementation

Conclusions and Recommendations

Phayre's leaf monkey continue to face threats to their long term survival in their natural habitats across their distribution range and are accordingly listed in the Schedule I of the Wildlife Protection Act of India. The threats faced by the species remain operational and the populations across their range are showing a declining trend. Maintenance of demographically stable and genetically viable *ex-situ* populations is thus crucial for ensuring the continued survival of the species.

A review of the status of the current captive population in Indian zoos based on analysis of available pedigree records indicates that the population is growing at a slow rate ($\lambda = 1.012$). The population remains biased towards females with a limited number of proven breeders, with a small population size. It retains a significant proportion of the genetic diversity (91.98%) of 12 founders currently represented in the population. The founder genome is unequally represented as is indicated by the founder genome equivalents (6.23) with a low level of relatedness ($F = 0.000$; $MK = 0.0802$) in the current population.

Simulations run using PMx software indicate that supplementation with one effective founder every four years with the present population growth rate and increasing the population to 150 specimens can ensure that the population remains viable over the next 100 years.

Management interventions aimed at increasing the present size of the captive population and creation of additional species specific infrastructure to house the growing population can ensure achievement of *ex-situ* conservation goals for the species.

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Annexure I

Historical population of Phayre's leaf monkey (*Trachypithecus phayrei*) in Indian Zoos

Stud# LocalID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
1 BULTI 00065921B1 SL-1 SL02	F	~ 1996	WILD	WILD	INDIA SEPAHIJAL BANNERGHA	~ 1 Dec 1998 14-Dec-98 27-Jul-15	Capture Transfer Transfer
2 Anjana SL-2	F	~ 1997	WILD	WILD	INDIA SEPAHIJAL	~ 1 Jun 1997 18-Jun-97 18-Aug-07	Capture Transfer Death
3 Ruma 0006593AB8 SL-4	F	~ 1997	WILD	WILD	INDIA SEPAHIJAL	~10 Jul 2005 28-Jul-05	Capture Transfer
4 BISHU 0006B71CF7 SL-3	M	~ 1998	WILD	WILD	INDIA SEPAHIJAL	~ 1 Aug 1999 17-Aug-99 13-Dec-16	Capture Transfer Death
5 NIMAI 0006B7199B SL-5	M	~ 1999	WILD	WILD	INDIA SEPAHIJAL	~20 Oct 2001 25-Oct-01 14-Apr-17	Capture Transfer Death
6 Jhuma SL-7	F	????	WILD	WILD	INDIA SEPAHIJAL	~ 1 Oct 2000 25-Oct-00 27-Dec-09	Capture Transfer Death
7 PALLAB SL-6	M	~ 2000	WILD	WILD	INDIA SEPAHIJAL	~ 1 Dec 2000 20-Dec-00 21-Dec-10	Capture Transfer Death
8 SHARMISTA 0006B7DBE6 SL-13	F	~ 2001	WILD	WILD	INDIA SEPAHIJAL	~ 1 Feb 2002 12-Feb-02	Capture Transfer
9 Tapas 0006B77C9EA SL-8	M	~ 2001	WILD	WILD	INDIA SEPAHIJAL	~20 Oct 2002 25-Oct-02 10-Jan-12	Capture Transfer Death
10 Dugu 0006B7F2AD SL-10	M	~ 2001	WILD	WILD	INDIA SEPAHIJAL	~15 Dec 2001 20-Dec-01 10-Apr-10	Capture Transfer Death
11 AKBAR 956000002200193 SL27	M	14-Mar-01	WILD	WILD	INDIA SEPAHIJAL	~ 1 Dec 2013 19-Dec-13	Capture Transfer
12 MADHAB SL41	M	14-Mar-02	WILD	WILD	INDIA SEPAHIJAL BANNERGHA	~ 1 Aug 2013 19-Aug-13 27-Jul-15	Capture Transfer Transfer

Stud# LocalID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
13 RAKHI 956000002151701 SL47	F	10-Jan-04	WILD	WILD	INDIA SEPAHIJAL	~10 Jan 2004 19-Aug-13	Capture Transfer
14 Santu 0006B7E82A SL-9	M	~ 2004	WILD	WILD	INDIA SEPAHIJAL	~ 2 Dec 2004 18-Dec-04 13-Jul-08	Capture Transfer Death
15 Rajesh 0006B71BBA SL-11	M	~ 2004	WILD	WILD	INDIA SEPAHIJAL	~ 1 Dec 2004 18-Dec-04 21-Sep-09	Capture Transfer Death
16 SAMPA SL-14	F	~ 2004	WILD	WILD	INDIA SEPAHIJAL	~12 Dec 2004 24-Dec-04 01-Jan-10	Capture Transfer Death
17 MALINA 0006B737A2 SL-12	F	~ 2004	WILD	WILD	INDIA SEPAHIJAL	~12 Dec 2004 24-Dec-04 20-Mar-08	Capture Transfer Death
18 BHABITA 0006B7EFB0 SL33	F	10-Mar-04	WILD	WILD	INDIA SEPAHIJAL	~ 2 Jul 2013 19-Jul-13	Capture Transfer
19 SAJANI 956000002194588 SL25	F	14-Mar-04	WILD	WILD	INDIA SEPAHIJAL	~ 1 Aug 2013 19-Aug-13	Capture Transfer
20 MOUMITA 956000002199969 SL48	F	10-Jan-05	WILD	WILD	INDIA SEPAHIJAL	~ 1 Aug 2013 19-Aug-13	Capture Transfer
21 SL26 PARIMAL	M	01-Jun-05	WILD	WILD	SEPAHIJAL INDIA SEPAHIJAL	01-Jun-11 ~ 1 Aug 2013 27-Feb-17	Transfer Capture Death
22 SL-15 RINA 0006590E01	F	11-Nov-06	10	6	SEPAHIJAL	11-Nov-06	Birth
23 SL-16	F	15-Feb-07	15	2	SEPAHIJAL	15-Feb-07 18-Oct-07	Birth Death
24 SL-17 RESHMI 0006B718CC SL01	F	01-Mar-07	14	16	SEPAHIJAL BANNERGHA	01-Mar-07 27-Jul-15	Birth Transfer
25 LIPIKA 956000002449962 SL-22	F	05-Apr-07	WILD	WILD	INDIA SEPAHIJAL	~ 1 Aug 2010 07-Aug-10	Capture Transfer

Stud# LocalID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
26 SL-18 CHUMKI 00065903B6	F	25-Dec-07	10	6	SEPAHIJAL	25-Dec-07	Birth
27 SL-19 RISHA 0006B72830	F	13-Mar-09	10	8	SEPAHIJAL	13-Mar-09	Birth
28 SL-20	?	13-Apr-09	7	1	SEPAHIJAL	13-Apr-09 27-Nov-10	Birth Death
29 SAMIR SL44	M	14-Mar-10	WILD	WILD	INDIA SEPAHIJAL	~ 2 Aug 2013 19-Aug-13	Capture Transfer
30 SL-23 SHANKARI 956000002182564	F	15-Feb-12	5	22	SEPAHIJAL	15-Feb-12	Birth
31 SL-24	?	04-Mar-12	5	8	SEPAHIJAL	04-Mar-12	Birth
32 SL34 KISHORE 956000002194717	M	14-Mar-12	5	8	SEPAHIJAL	14-Mar-12	Birth
33 SL37 KABITA 956000002193369	F	02-Oct-12	UNK	8	SEPAHIJAL	02-Oct-12	Birth
34 SL39 BHANU	M	24-Jan-13	21	26	SEPAHIJAL	24-Jan-13	Birth
35 SL38 JOYDEB	M	13-Mar-13	21	27	SEPAHIJAL	13-Mar-13	Birth
36 SL-25	?	28-May-13	4	3	SEPAHIJAL	28-May-13	Birth
39 KANJIKA	F	27-Jan-14	5	22	SEPAHIJAL	27-Jan-14 27-Feb-17	Birth Death
41	?	10-Mar-14	4	20	SEPAHIJAL	10-Mar-14	Birth
42 SL42	?	18-Feb-15	21	8	SEPAHIJAL	18-Feb-15	Birth
43 SL43	?	24-Feb-15	21	26	SEPAHIJAL	24-Feb-15 18-May-15	Birth Death
44 SL50	?	05-Apr-16	4	20	SEPAHIJAL	05-Apr-16	Birth
46 SL45	?	01-Jun-16	21	26	SEPAHIJAL	01-Jun-16	Birth
47 SL46	F	09-Sep-16	29	30	SEPAHIJAL	09-Sep-16	Birth

Stud# LocalID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
48 SL04 KUSHAL	M	31-Jul-16	4	1	BANNERGHA	31-Jul-16	Birth
49 SL05	?	23-Apr-18	UNK	UNK	BANNERGHA	23-Apr-18	Birth
50	?	02-Dec-17	34	33	SEPAHIJAL	02-Dec-17	Birth
51	?	22-Dec-17	29	22	SEPAHIJAL	22-Dec-17	Birth
Total: 47 (15.21.11)							

Living population of Phayre's leaf monkey (*Trachypithecus phayrei*) in Indian Zoos

Stud# LocalID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
Bannerghata Biological Park, Bangalore							
1 BULTI 00065921B1 SL-1 SL02	F	~ 1996	WILD	WILD	INDIA SEPAHIJAL BANNERGHA	~ 1 Dec 1998 14-Dec-98 27-Jul-15	Capture Transfer Transfer
12 MADHAB SL41	M	14-Mar-02	WILD	WILD	INDIA SEPAHIJAL BANNERGHA	~ 1 Aug 2013 19-Aug-13 27-Jul-15	Capture Transfer Transfer
24 SL-17 RESHMI 0006B718CC SL01	F	01-Mar-07	14	16	SEPAHIJAL BANNERGHA	01-Mar-07 27-Jul-15	Birth Transfer
48 SL04 KUSHAL	M	31-Jul-16	4	1	BANNERGHA	31-Jul-16	Birth
49 SL05	?	23-Apr-18	UNK	UNK	BANNERGHA	23-Apr-18	Birth
Total: 5 (2.2.1)							
Sepahijal Zoological Park, Agartala							
3 Ruma 0006593AB8 SL-4	F	~ 1997	WILD	WILD	INDIA SEPAHIJAL	~10 Jul 2005 28-Jul-05	Capture Transfer
8 SHARMISTA 0006B7DBE6 SL-13	F	~ 2001	WILD	WILD	INDIA SEPAHIJAL	~ 1 Feb 2002 12-Feb-02	Capture Transfer
11 AKBAR 956000002200193 SL27	M	14-Mar-01	WILD	WILD	INDIA SEPAHIJAL	~ 1 Dec 2013 19-Dec-13	Capture Transfer
13 RAKHI 956000002151701 SL47	F	10-Jan-04	WILD	WILD	INDIA SEPAHIJAL	~10 Jan 2004 19-Aug-13	Capture Transfer
18 BHABITA 0006B7EFB0 SL33	F	10-Mar-04	WILD	WILD	INDIA SEPAHIJAL	~ 2 Jul 2013 19-Jul-13	Capture Transfer
19 SAJANI 956000002194588 SL25	F	14-Mar-04	WILD	WILD	INDIA SEPAHIJAL	~ 1 Aug 2013 19-Aug-13	Capture Transfer
20 MOUMITA 956000002199969 SL48	F	10-Jan-05	WILD	WILD	INDIA SEPAHIJAL	~ 1 Aug 2013 19-Aug-13	Capture Transfer

Stud# LocalID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
22 SL-15 RINA 0006590E01	F	11-Nov-06	10	6	SEPAHIJAL	11-Nov-06	Birth
25 LIPIKA 956000002449962 SL-22	F	05-Apr-07	WILD	WILD	INDIA SEPAHIJAL	~ 1 Aug 2010 07-Aug-10	Capture Transfer
26 SL-18 CHUMKI 00065903B6	F	25-Dec-07	10	6	SEPAHIJAL	25-Dec-07	Birth
27 SL-19 RISHA 0006B72830	F	13-Mar-09	10	8	SEPAHIJAL	13-Mar-09	Birth
29 SAMIR SL44	M	14-Mar-10	WILD	WILD	INDIA SEPAHIJAL	~ 2 Aug 2013 19-Aug-13	Capture Transfer
30 SL-23 SHANKARI 956000002182564	F	15-Feb-12	5	22	SEPAHIJAL	15-Feb-12	Birth
31 SL-24	?	04-Mar-12	5	8	SEPAHIJAL	04-Mar-12	Birth
32 SL34 KISHORE 956000002194717	M	14-Mar-12	5	8	SEPAHIJAL	14-Mar-12	Birth
33 SL37 KABITA 956000002193369	F	02-Oct-12	UNK	8	SEPAHIJAL	02-Oct-12	Birth
34 SL39 BHANU	M	24-Jan-13	21	26	SEPAHIJAL	24-Jan-13	Birth
35 SL38 JOYDEB	M	13-Mar-13	21	27	SEPAHIJAL	13-Mar-13	Birth
36 SL-25	?	28-May-13	4	3	SEPAHIJAL	28-May-13	Birth
41	?	10-Mar-14	4	20	SEPAHIJAL	10-Mar-14	Birth
42 SL42	?	18-Feb-15	21	8	SEPAHIJAL	18-Feb-15	Birth
44 SL50	?	05-Apr-16	4	20	SEPAHIJAL	05-Apr-16	Birth
46 SL45	?	01-Jun-16	21	26	SEPAHIJAL	01-Jun-16	Birth
47 SL46	F	09-Sep-16	29	30	SEPAHIJAL	09-Sep-16	Birth
50	?	02-Dec-17	34	33	SEPAHIJAL	02-Dec-17	Birth
51	?	22-Dec-17	29	22	SEPAHIJAL	22-Dec-17	Birth
Total: 26 (5.13.8)							
Total Living: 31 (7.15.9)							

Annexure III

Pedigree Chart Report of Phayre's leaf monkey (*Trachypithecus phayrei*) in Indian Zoos

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                                     Studbook Number: 1
=====
WILD                                                                    WILD
                                                                    Sex: Female
                                                                    Birth Date:    ~ 1996
                                                                    Last Location: BANNERGHA
                                                                    House Name:    BULTI
                                                                    Tattoo:
                                                                    Tag/Band:

dam \  /
     \ /
      1
  
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                                     Studbook Number: 2
=====
WILD                                                                    WILD
                                                                    Sex: Female
                                                                    Birth Date:    ~ 1997
                                                                    Last Location: SEPAHIJAL (dead)
                                                                    House Name:    Anjana
                                                                    Tattoo:
                                                                    Tag/Band:

dam \  /
     \ /
      2
  
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                                     Studbook Number: 3
=====
WILD                                                                    WILD
                                                                    Sex: Female
                                                                    Birth Date:    ~ 1997
                                                                    Last Location: SEPAHIJAL
                                                                    House Name:    Ruma
                                                                    Tattoo:
                                                                    Tag/Band:

dam \  /
     \ /
      3
  
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                                     Studbook Number: 4
=====
WILD                                                                    WILD
                                                                    Sex: Male
                                                                    Birth Date:    ~ 1998
                                                                    Last Location: SEPAHIJAL (dead)
                                                                    House Name:    BISHU
                                                                    Tattoo:
                                                                    Tag/Band:

dam \  /
     \ /
      4
  
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                                     Studbook Number: 5
=====
WILD                                                                    WILD
                                                                    Sex: Male
                                                                    Birth Date:    ~ 1999
                                                                    Last Location: SEPAHIJAL (dead)
                                                                    House Name:    NIMAI
                                                                    Tattoo:
                                                                    Tag/Band:

dam \  /
     \ /
      5
  
```

NATIONAL STUDBOOK PHAYRE'S LEAF MONKEY (*TRACHYPITHECUS PHAYREI*) – II EDITION

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 6
=====
WILD                                                    WILD
                                                    Sex: Female
                                                    Birth Date:   ???
Last Location: SEPAHIJAL (dead)
House Name: Jhuma
Tattoo:
Tag/Band:

dam \      /
     \    /
      \  /
       \ /
        V
         6
    
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 7
=====
WILD                                                    WILD
                                                    Sex: Male
                                                    Birth Date:   ~ 2000
Last Location: SEPAHIJAL (dead)
House Name: PALLAB
Tattoo:
Tag/Band:

dam \      /
     \    /
      \  /
       \ /
        V
         7
    
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 8
=====
WILD                                                    WILD
                                                    Sex: Female
                                                    Birth Date:   ~ 2001
Last Location: SEPAHIJAL
House Name: SHARMISTA
Tattoo:
Tag/Band:

dam \      /
     \    /
      \  /
       \ /
        V
         8
    
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 9
=====
WILD                                                    WILD
                                                    Sex: Male
                                                    Birth Date:   ~ 2001
Last Location: SEPAHIJAL (dead)
House Name: Tapas
Tattoo:
Tag/Band:

dam \      /
     \    /
      \  /
       \ /
        V
         9
    
```

```

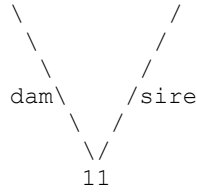
=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 10
=====
WILD                                                    WILD
                                                    Sex: Male
                                                    Birth Date:   ~ 2001
Last Location: SEPAHIJAL (dead)
House Name: Dugu
Tattoo:
Tag/Band:

dam \      /
     \    /
      \  /
       \ /
        V
        10
    
```

NATIONAL STUDBOOK PHAYRE'S LEAF MONKEY (*TRACHYPITHECUS PHAYREI*) – II EDITION

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 11
 =====

WILD

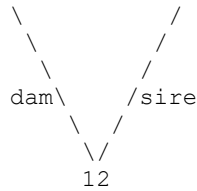


WILD

Sex: Male
 Birth Date: 14 Mar 2001
 Last Location: SEPAHIJAL
 House Name: AKBAR
 Tattoo:
 Tag/Band:

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 12
 =====

WILD

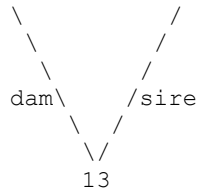


WILD

Sex: Male
 Birth Date: 14 Mar 2002
 Last Location: BANNERGHA
 House Name: MADHAB
 Tattoo:
 Tag/Band:

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 13
 =====

WILD

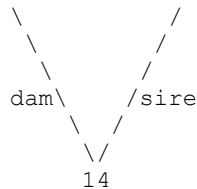


WILD

Sex: Female
 Birth Date: 10 Jan 2004
 Last Location: SEPAHIJAL
 House Name: RAKHI
 Tattoo:
 Tag/Band:

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 14
 =====

WILD

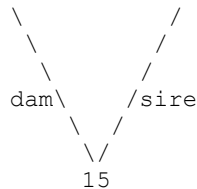


WILD

Sex: Male
 Birth Date: ~ 2004
 Last Location: SEPAHIJAL (dead)
 House Name: Santu
 Tattoo:
 Tag/Band:

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 15
 =====

WILD



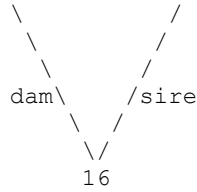
WILD

Sex: Male
 Birth Date: ~ 2004
 Last Location: SEPAHIJAL (dead)
 House Name: Rajesh
 Tattoo:
 Tag/Band:

NATIONAL STUDBOOK PHAYRE'S LEAF MONKEY (*TRACHYPITHECUS PHAYREI*) – II EDITION

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 16
 =====

WILD

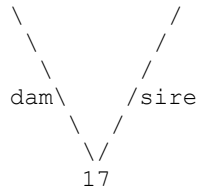


WILD

Sex: Female
 Birth Date: ~ 2004
 Last Location: SEPAHIJAL (dead)
 House Name: SAMPA
 Tattoo:
 Tag/Band:

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 17
 =====

WILD

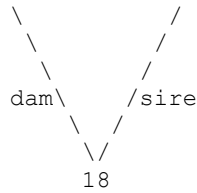


WILD

Sex: Female
 Birth Date: ~ 2004
 Last Location: SEPAHIJAL (dead)
 House Name: MALINA
 Tattoo:
 Tag/Band:

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 18
 =====

WILD

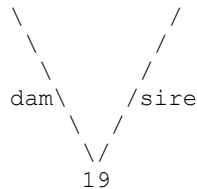


WILD

Sex: Female
 Birth Date: 10 Mar 2004
 Last Location: SEPAHIJAL
 House Name: BHABITA
 Tattoo:
 Tag/Band:

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 19
 =====

WILD

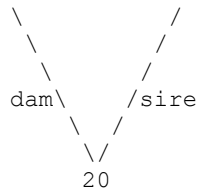


WILD

Sex: Female
 Birth Date: 14 Mar 2004
 Last Location: SEPAHIJAL
 House Name: SAJANI
 Tattoo:
 Tag/Band:

=====
 Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 20
 =====

WILD



WILD

Sex: Female
 Birth Date: 10 Jan 2005
 Last Location: SEPAHIJAL
 House Name: MOUMITA
 Tattoo:
 Tag/Band:

NATIONAL STUDBOOK PHAYRE'S LEAF MONKEY (*TRACHYPITHECUS PHAYREI*) – II EDITION

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 21
=====
WILD                                                    WILD
                    \                               /
                    dam\                           /sire
                    \                               /
                    21
Sex: Male
Birth Date: 1 Jun 2005
Last Location: SEPAHIJAL (dead)
House Name: PARIMAL
Tattoo:
Tag/Band:
    
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 22
=====
WILD                                                    WILDWILDWILD
                    \                               /
                    dam\                           /sire
                    \                               /
                    6      +
JhumaDugu
                    \                               /
                    dam\                           /sire
                    \                               /
                    22
Sex: Female
Birth Date: 11 Nov 2006
Last Location: SEPAHIJAL
House Name: RINA
Tattoo:
Tag/Band:
+ Wild-caught...
    
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 23
=====
WILD                                                    WILDWILDWILD
                    \                               /
                    dam\                           /sire
                    \                               /
                    2      +
Anjana
                    \                               /
                    dam\                           /sire
                    \                               /
                    23
Rajesh
Sex: Female
Birth Date: 15 Feb 2007
Last Location: SEPAHIJAL (dead)
House Name:
Tattoo:
Tag/Band:
+ Wild-caught...
    
```

```

=====
Taxon Name: TRACHYPITHECUS PHAYREI                      Studbook Number: 24
=====
WILD                                                    WILDWILDWILD
                    \                               /
                    dam\                           /sire
                    \                               /
                    16      +
                    SAMPA
                    \                               /
                    dam\                           /sire
                    \                               /
                    24
Sex: Female
Birth Date: 1 Mar 2007
Last Location: BANNERGHA
House Name: RESHMI
Tattoo:
Tag/Band:
+ Wild-caught...
    
```

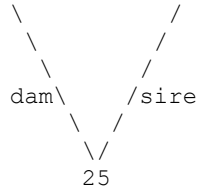
NATIONAL STUDBOOK PHAYRE'S LEAF MONKEY (*TRACHYPITHECUS PHAYREI*) – II EDITION

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 25

=====

WILD



WILD

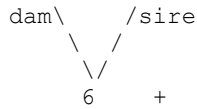
Sex: Female
 Birth Date: 5 Apr 2007
 Last Location: SEPAHIJAL
 House Name: LIPIKA
 Tattoo:
 Tag/Band:

=====

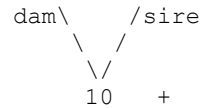
Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 26

=====

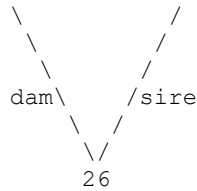
WILD



WILDWILDWILD



JhumaDugu



Sex: Female
 Birth Date: 25 Dec 2007
 Last Location: SEPAHIJAL
 House Name: CHUMKI
 Tattoo:
 Tag/Band:

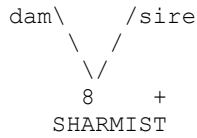
+ Wild-caught...

=====

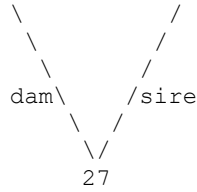
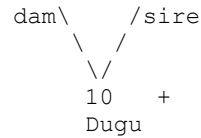
Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 27

=====

WILD



WILDWILDWILD



Sex: Female
 Birth Date: 13 Mar 2009
 Last Location: SEPAHIJAL
 House Name: RISHA
 Tattoo:
 Tag/Band:

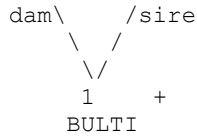
+ Wild-caught...

=====

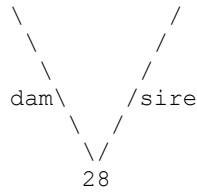
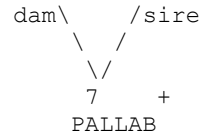
Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 28

=====

WILD



WILDWILDWILD



Sex: Unknown
 Birth Date: 13 Apr 2009
 Last Location: SEPAHIJAL (dead)
 House Name:
 Tattoo:
 Tag/Band:

+ Wild-caught...

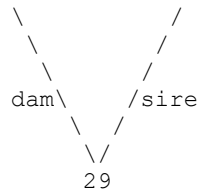
NATIONAL STUDBOOK PHAYRE'S LEAF MONKEY (*TRACHYPITHECUS PHAYREI*) – II EDITION

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 29

=====

WILD

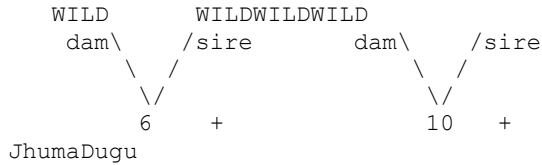


WILD
Sex: Male
Birth Date: 14 Mar 2010
Last Location: SEPAHIJAL
House Name: SAMIR
Tattoo:
Tag/Band:

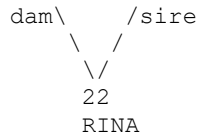
=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 30

=====

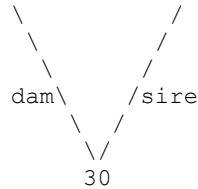


JhumaDugu



RINA

WILD WILD



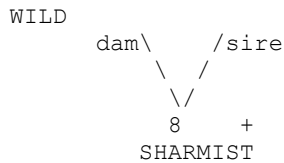
WILD WILD
Sex: Female
Birth Date: 15 Feb 2012
Last Location: SEPAHIJAL
House Name: SHANKARI
Tattoo:
Tag/Band:

+ Wild-caught...

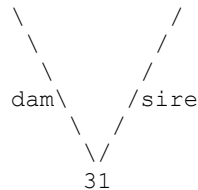
=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 31

=====



SHARMIST



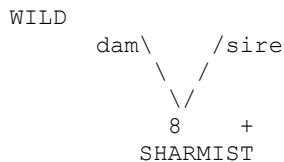
WILD WILD
Sex: Unknown
Birth Date: 4 Mar 2012
Last Location: SEPAHIJAL
House Name:
Tattoo:
Tag/Band:

+ Wild-caught...

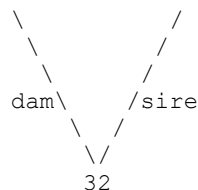
=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 32

=====



SHARMIST



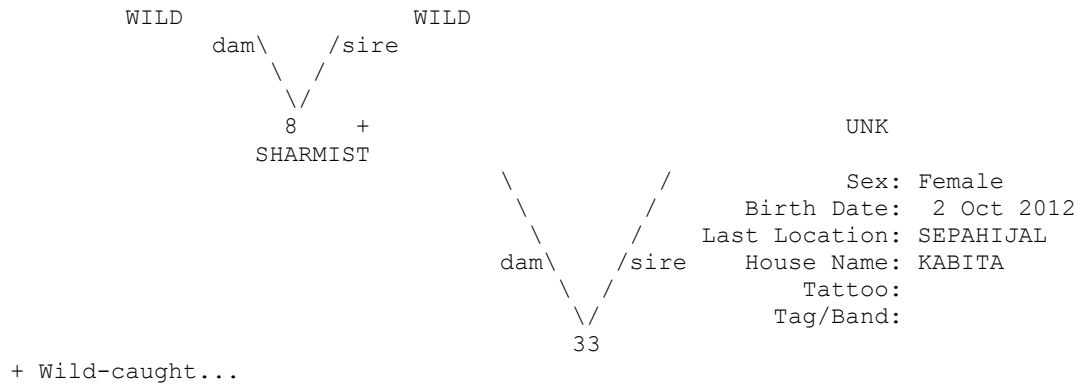
WILD WILD
Sex: Male
Birth Date: 14 Mar 2012
Last Location: SEPAHIJAL
House Name: KISHORE
Tattoo:
Tag/Band:

+ Wild-caught...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 33

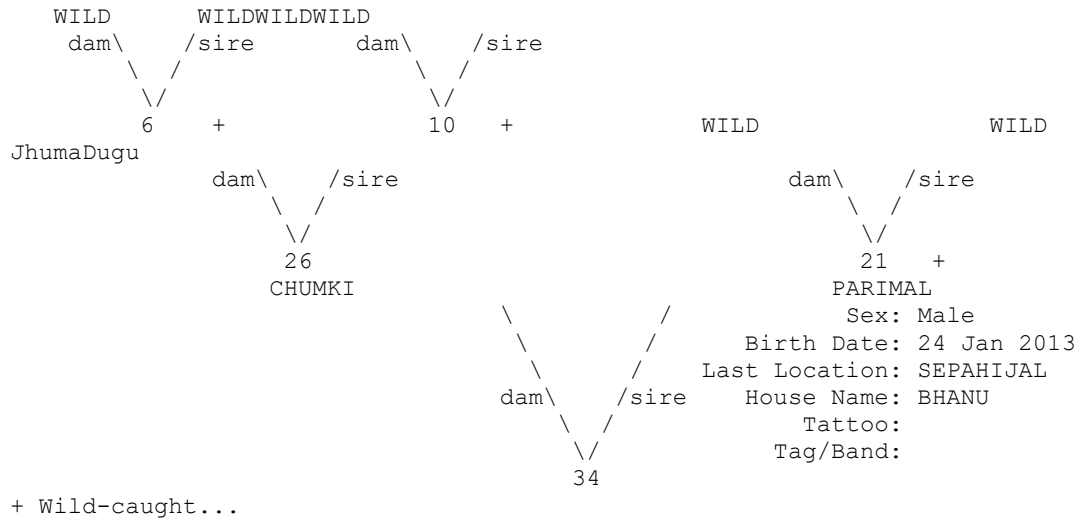
=====



=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 34

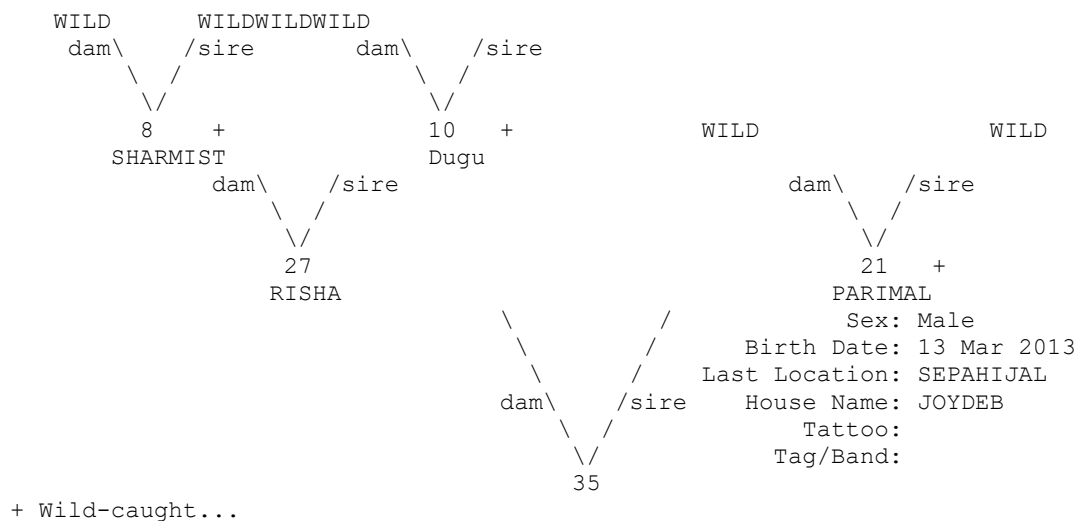
=====



=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 35

=====

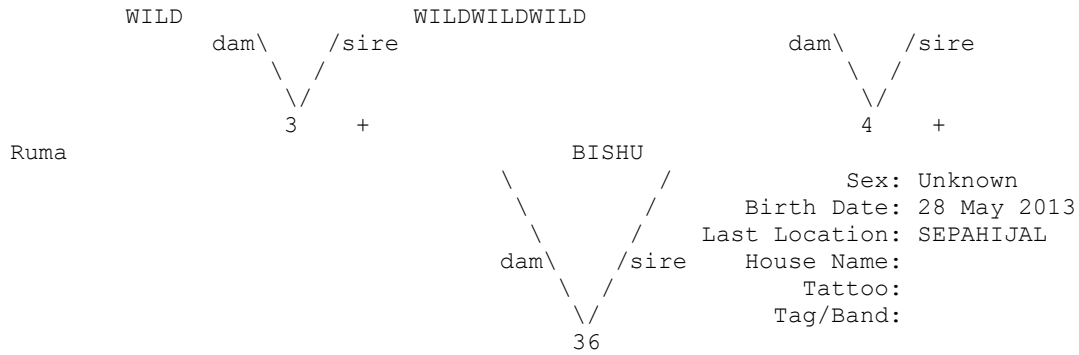


NATIONAL STUDBOOK PHAYRE'S LEAF MONKEY (*TRACHYPITHECUS PHAYREI*) – II EDITION

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 36

=====

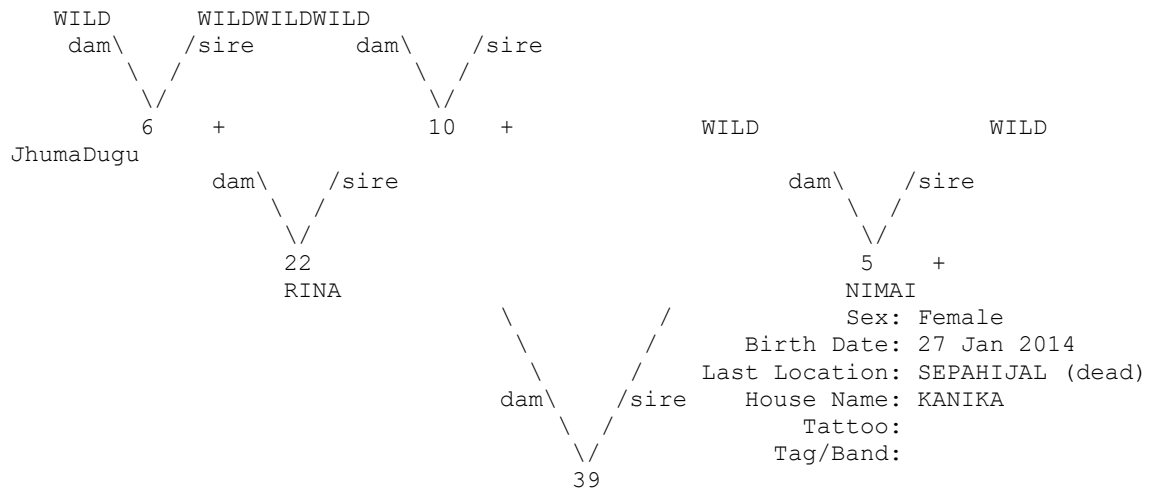


+ Wild-caught...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 39

=====

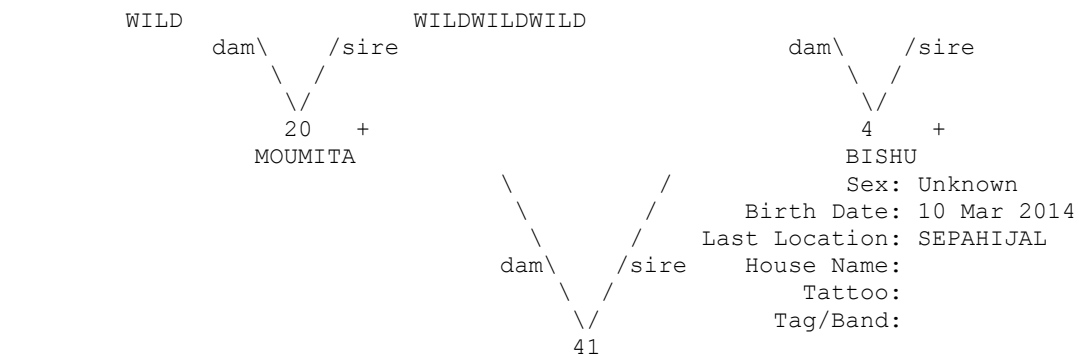


+ Wild-caught...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 41

=====

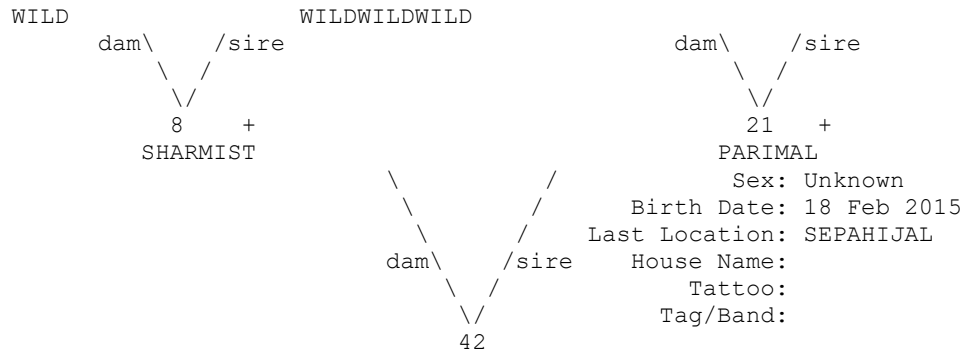


+ Wild-caught...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 42

=====

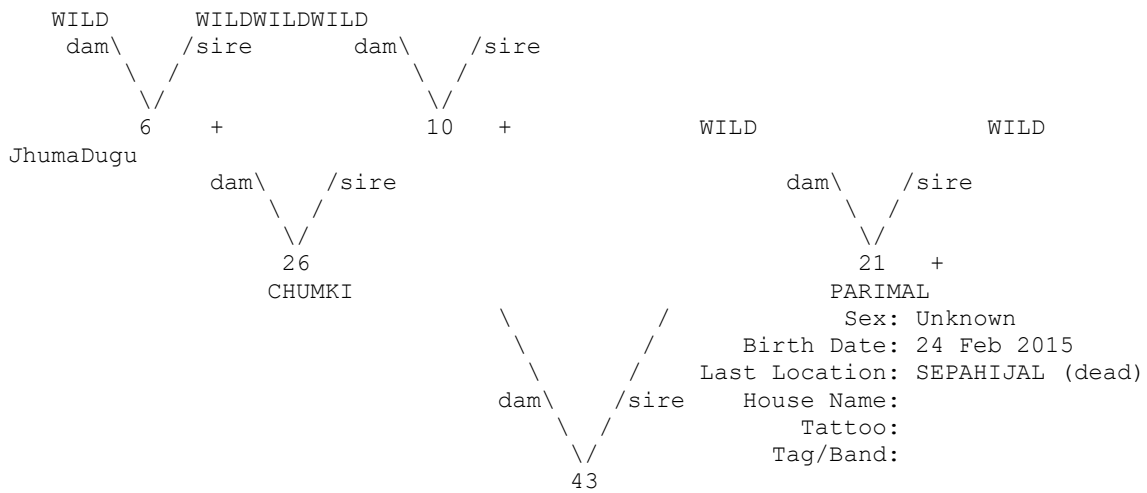


+ Wild-caught...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 43

=====

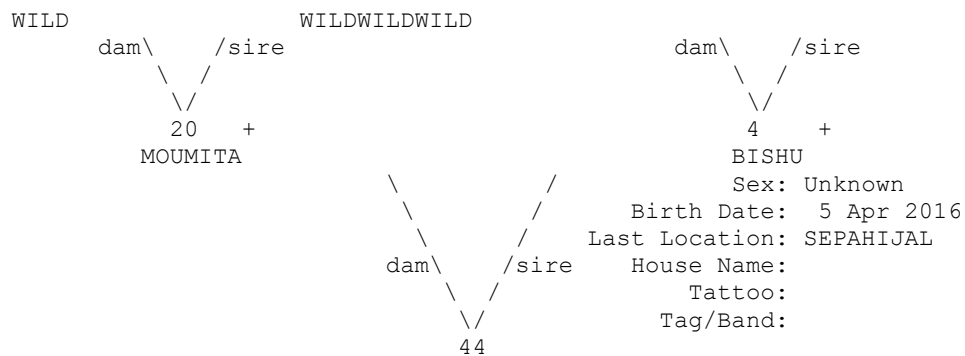


+ Wild-caught...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 44

=====



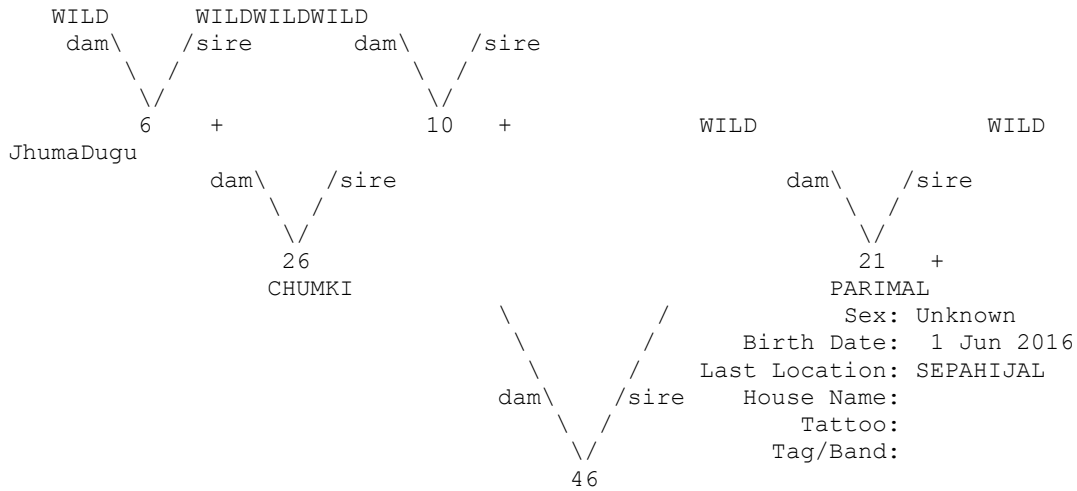
+ Wild-caught...

NATIONAL STUDBOOK PHAYRE'S LEAF MONKEY (*TRACHYPITHECUS PHAYREI*) – II EDITION

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 46

=====

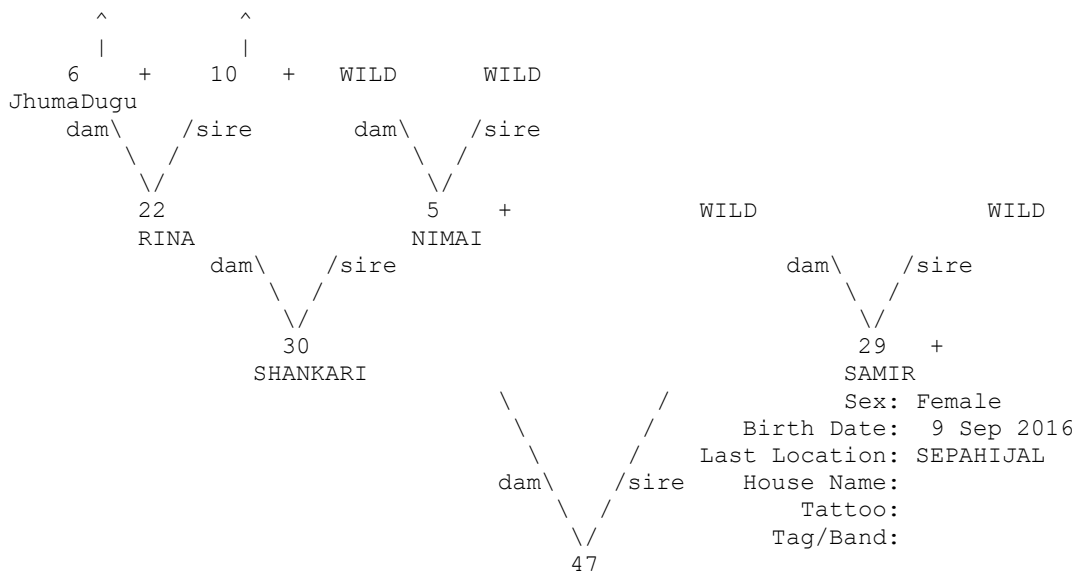


+ Wild-caught...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 47

=====



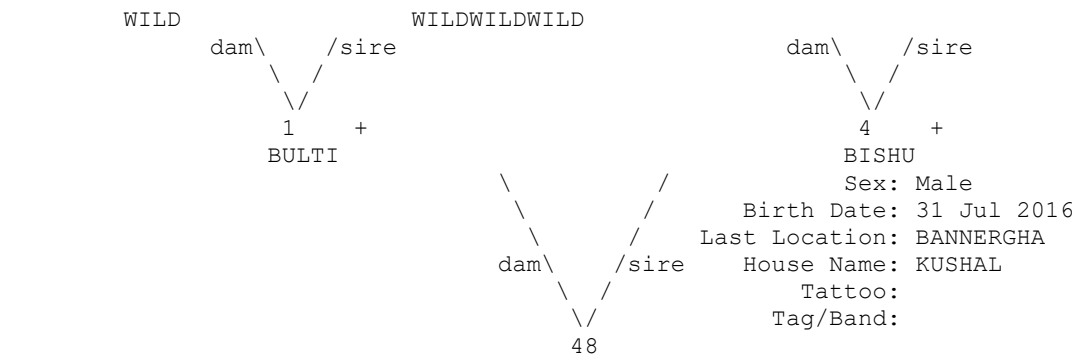
+ Wild-caught...

^ Pedigree continues beyond top of page...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 48

=====



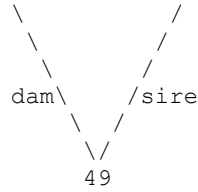
+ Wild-caught...

=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 49

=====

UNK



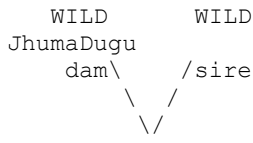
UNK

Sex: Unknown
 Birth Date: 23 Apr 2018
 Last Location: BANNERGHA
 House Name:
 Tattoo:
 Tag/Band:

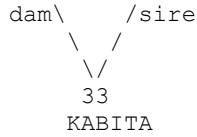
=====

Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 50

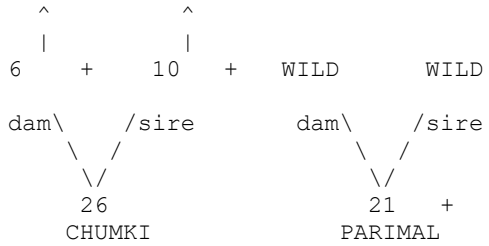
=====



SHARMIST



UNK



```

      dam\  /sire
           \  /
            34
           BHANU
    
```

Sex: Unknown
 Birth Date: 2 Dec 2017
 Last Location: SEPAHIJAL
 House Name:
 Tattoo:
 Tag/Band:

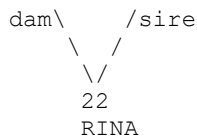
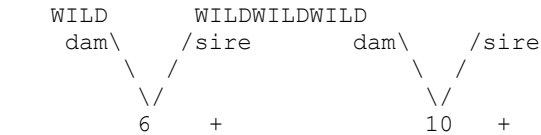


+ Wild-caught...
 ^ Pedigree continues beyond top of page...

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Taxon Name: TRACHYPITHECUS PHAYREI Studbook Number: 51

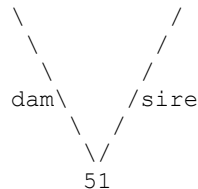
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WILD      WILD
dam\      /sire
  \      /
   29
  SAMIR
    
```

Sex: Unknown
 Birth Date: 22 Dec 2017
 Last Location: SEPAHIJAL
 House Name:
 Tattoo:
 Tag/Band:



+ Wild-caught...

Annexure IV**Location Glossary Phayre's leaf monkey studbook**

Mnemonic	Zoo Name
Sepahijal	Sepahijala Zoological Park
Bannegha	Bannerghata Biological Park
India	Location of wild caught specimens