

NATIONAL STUDBOOK

Clouded Leopard (*Neofelis nebulosa*): III Edition

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National Studbook of Clouded Leopard (*Neofelis nebulosa*) III Edition

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FOREWORD

Clouded leopard is threatened by the rapid destruction of habitats and extensive poaching across its distribution range. Maintaining genetically viable and demographically stable ex-situ populations in captivity can ensure their sustained survival. This can be ensured by using pedigree information contained in studbooks that form the key to understanding the demographic and genetic structure of populations and taking corrective actions as required for effective management of captive populations. Studbooks also provide an insight into the mating choices that can be exercised to maximize retention of genetic diversity.

The Central Zoo Authority (CZA) has initiated a conservation breeding program for threatened species in Indian zoos. As a part of this endeavor the Wildlife Institute of India has been carrying out the task of compilation and update of studbooks of identified species in Indian zoos.

As a part of the project outcomes, the WII has compiled and updated the National studbook of Clouded leopard (*Neofelis nebulosa*) III Edition in Indian zoos. The population management recommendations contained in the studbook should form the basis for the long term management of the species in captivity.

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Lady Hydari Park Animal Land, Shillong
Nagaland Zoological Park, Dimapur
Padmaja Naidu Himalayan Zoological Park, Darjeeling
Sanjay Gandhi Biological Park
Sepahijala Zoological Park, Agartala

TABLE OF CONTENTS

Species Information	1
Status in Captivity	4
Methods	5
Scope of the Studbook.....	5
Analysis	5
Demographic Status.....	5
Genetic Status.....	7
Pairing Recommendations	7
Targets for Population Management	8
Conclusions and Recommendations	10
References.....	11
Annexure I - Historical population	14
Annexure II - Living population.....	19
Annexure III - Pedigree Report	21
Annexure IV - Location Glossary.....	37

CLOUDED LEOPARD

(*Neofelis nebulosa*)

Species Information

Taxonomy

Phylum	Chordata
Class	Mammalia
Order	Carnivora
Family	Felidae
Sub-family	Pantherinae
Genus	<i>Neofelis</i> (Gray 1867)
Species	<i>Neofelis nebulosa</i> (Griffith 1821)

The genus *Neofelis* was traditionally considered to be a monotypic genera with a single species *Neofelis nebulosa* (Griffith 1821), including four subspecies, *N. n. diardi* (Cuvier 1823), *N. n. macrosceloides* (Hodgson in Gray 1853), *N. n. nebulosa*, and *N. n. brachyura* (Swinhoe 1862). Pocock (1917) and Wilting *et al.* (2007) commented on the limited understanding of the taxonomy and phylogeny of the species.

Cladistic studies based on osteological and dental characters of felids suggest that clouded leopard is the most basal Pantherinae and lineages of *Neofelis* and *Panthera* diverged approximately 6 million years ago (MYA) (Johnson and O'Brien 1997; Mattern and McLennan 2000; Yu and Zhang 2005; Johnson *et al.* 2006). Based on morphometric analysis of pelages by Kitchener *et al.* (2006) and genetic analysis by Buckley-Beason *et al.* (2006), the taxonomic status of the species was revised. Two of the sub-species *N. n. nebulosa* and *N. n. diardii* were elevated to full species status and renamed as *Neofelis nebulosa*, restricted to mainland Southeast Asia and *Neofelis diardi*, inhabiting the islands of Sumatra and Borneo respectively. The other two subspecies were discarded following this revision. Based on mtDNA and microsatellite data, Wilting *et al.* (2007) confirmed the reproductive isolation of *N. diardii* from *N. Nebulosa* and confirmed their status as distinct species.

Physical features

Clouded leopards are medium-sized felid, with males weighing from 16 to 18 kg and females weighing between 11.5 to 13.5 kg (Grassman *et al.* 2005, Austin and Tewes 1999). They have distinct cloud shaped patches on their pale-yellow to brown coloured fur that camouflages them in dense forests (Sunquist and Sunquist 2002). An elongated long tail, large paws and flexible joints in their hind feet

assists them in arboreal life (Sunquist and Sunquist 2002). They are also unique in possessing the longest canine teeth in proportion to their size of all cats (Brakefield 1993).

Habitat and Ecology

The preferred habitat of the species is dense evergreen forest (Fletcher 2000); however they are also reported from other habitats, like, scrub, grassland, dry tropical forests, mangrove swamps, hill evergreen forest and mixed deciduous forests (Nowell and Jackson 1996). They are found in the Himalayas up to 2,500 - 3,000 m. Clouded leopards are solitary and predominantly nocturnal with crepuscular activity peaks (Griffiths 1993, Sunquist and Sunquist 2002, Grassman *et al.* 2005, Austin *et al.* 2007). They are adapted to both arboreal and terrestrial modes of life (Grassman *et al.* 2005, Azlan *et al.* 2009); however studies suggest clouded leopards to be more terrestrial (Rabinowitz *et al.* 1987; Dinerstein and Mehta 1989; Austin and Tewes 1999) with the use of trees mainly for resting (Rabinowitz *et al.* 1987; Davies 1990). Home ranges of radio-collared clouded leopards (N=2 and N=4) in Khao Yai National Park and Phu Khieo Wildlife Sanctuary, Thailand were estimated at 25.7 km² - 42 km² (Austin *et al.* 2007) and 22.9 km²-49.1 km² (Grassman *et al.* 2005) respectively. In Khao Yai National Park, they had a mean daily movement of 976m (Austin *et al.* 2007).

Clouded leopards are predatory carnivores with a diverse prey base. They have been reported to prey on primates such as pig-tailed macaques, slow loris and gibbons in Thailand (Nowell and Jackson 1996, Grassman *et al.* 2005). In Malaysia, the prey species includes palm civets, gray leaf monkeys, birds, squirrels, fish, porcupines, sambar deer, barking deer, mouse deer, and wild boar (Sunquist and Sunquist 2002). Muntjac, and Argus pheasant form the main prey base in Nepal (Nowell and Jackson 1996). Limited information on their hunting behaviour is available; it is however believed that clouded leopards stalk their prey along the ground and ambush them from the trees (Fletcher 2000).

Social and breeding behaviour

Limited information on the behaviour of the species in the free ranging condition exists in literature due to its secretive nature and the dense habitat it prefers. Most reports are anecdotal (Selous and Banks 1935), based on sighting reports or studies in captivity (Yamada and Durrant 1989; Nowell and Jackson 1990). Clouded leopards exhibit variability in estrous cycle length. They can be both induced and spontaneous ovulators and estrous is not easily recognizable due to their secretive behaviour (Howard *et al.* 1996; Pelican *et al.* 2006). Many females do not show marked behavioural changes while others display lordosis, treading and rolling (Fazio 2010).

Females have a mean gestation length of 89.2 days and the estrous cycle takes place for 24 days with estrous lasting for 6 days (Brown *et al.* 1995). Behavioural observations of captive Clouded leopards showed that reproductively successful individuals were more responsive and vocal and spent less time out of sight and more time resting (Brown *et al.* 1995). A variety of "territorial" behaviours were exhibited by the reproductively successful males, such as "patrolling" and "defecation". Studies by Wildt *et al.*

(1986) and Yamada and Durrant (1989) suggest peak reproductive activity to occur during October to February.

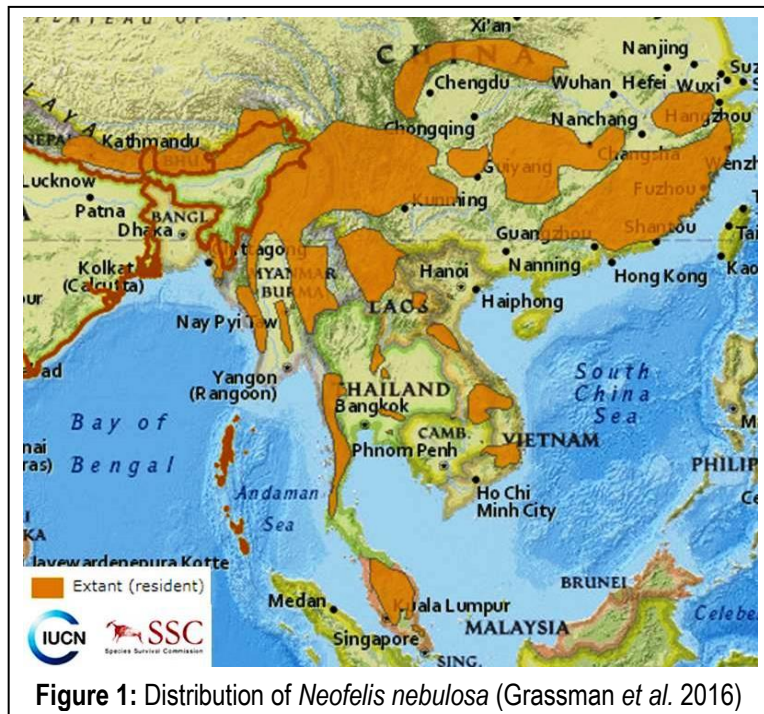
A problem commonly faced by zoos holding clouded leopards is the incompatibility between paired individuals leading to injuries and even killing of the females by the males. Additionally less than 20% of adult females listed in the ‘International Clouded Leopard Studbook’ have reproduced successfully (Yamada and Durrant 1989). Studies suggest that pairing males and females at a young age, while still pre-pubertal and preferably before six months, help them bond better (Baudy 1971, Geidel and Gensch 1976, Fletchall 2007). Hand-reared cubs are calmer and have been found to be better suited for captive propagation (Wielebnowski *et al.* 2002). However, the utility of such animals for *ex-situ* conservation is questionable as this can lead to the creation of behavioural artefacts of captivity leaving the animals unfit for natural reproduction.

Table 1: Life history traits of Clouded leopards

Age at first reproduction	22-36 months
Mean gestation length	89.2 days
Birth seasonality	March-August (in captivity in China)
Litter size	2-3 cubs/litter
Life-span	11 years; 16-17 years in captivity

Distribution

The range of clouded leopards extends from eastern and southern foothills of the Himalayas in Nepal (Dinerstein and Mehta 1989), through Bhutan and India (Arunachal Pradesh, Sikkim; Assam) (Mishra *et al.* 2006) south to Myanmar, southern China, Taiwan, Vietnam, Laos, Thailand, peninsular Malaysia (Azlan and Sharma 2006; Wilting *et al.* 2006) and Cambodia (Sunquist and Sunquist 2002). They historically had a wide distribution in China, south of the Yangtze, but limited information on recent records from China are available



(Wozencraft *et al.* 2008). It has also been reported from Bangladesh (Khan 2004), however; it is extinct

in Taiwan (Anon. 1996). The Sundaland clouded leopards *Neofelis diardi* are found in the islands of Sumatra and Borneo (Buckley-Beason *et al.* 2006, Kitchener *et al.* 2006).

Threats and conservation status

The species is threatened by habitat destruction and degradation resulting in prey-base reduction, and poaching for trade in body parts and pelts. The animals are also killed for meat for exotic dishes throughout Asia and Europe (Low 1991, Nowell and Jackson 1996 Hearn *et al.* 2008). The species was classified as “vulnerable” by the International Union for Conservation of Nature (IUCN) Endangered Species commission due to an estimated population of less than 10,000 mature individuals in the wild, with a predicted or observed declining trend (Grassman *et al.* 2016) and due to exploitation and a decline in area and quality of habitat (Nowell and Jackson 1996). It has been listed on Appendix I by the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) (UNEP-WCMC, 2009) which prohibits international trade of this species. In India it is listed in Schedule I of the Indian Wildlife (Protection) Act, 1972.

Status in Captivity

The species is held at 81 institutions globally with a total of 291 (136.154.1) specimens, while 3 institutions house 14 (9.5.0) specimens in India according to the ZIMS database. The CZA inventory (Table 2) indicates the presence of 17 (10.7.0) specimens, at 5 Indian zoos. The data provided by holding zoos for the compilation of the studbook includes 16 (9.7.0) specimens at 5 locations.

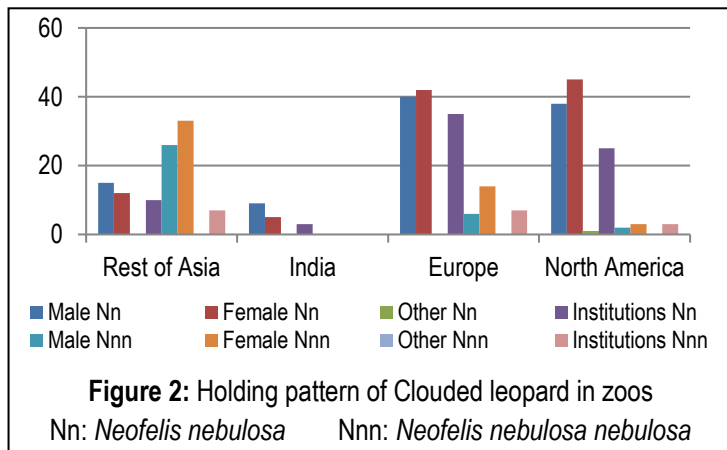


Table 2: Status of Clouded Leopard in zoos

Zoo Name	Species360				CZA Inventory				Studbook			
	Male	Female	Unk	Total	Male	Female	Unk	Total	Male	Female	Unk	Total
Aizawl Zoo, Aizawl	0	0	0	0	1	1	0	2	1	1	0	2
Biological Park, Itanagar	2	1	0	3	2	1	0	3	2	1	0	3
Lady Hydari Park Animal Land, Shillong	0	0	0	0	0	1	0	1	0	1	0	1
Padmaja Naidu Himalayan Zoological Park, Darjeeling	1	0	0	1	1	0	0	1	1	0	0	1
Sepahijala Zoological Park, Agartala	6	4	0	10	6	4	0	10	5	4	0	9
Total	9	5	0	14	10	7	0	17	9	7	0	16

Methods

Data on individual history was collected by means of questionnaires, zoo visits and from the websites of CZA and Species360. Questionnaires were sent to the institutions housing Clouded leopard in India, requesting information for each captive specimen. Data was entered in the Single Population Analysis and Records Keeping System (SPARKS v 1.66) (ISIS 2004) and subsequently exported to population management programme PMx v 1.2 (Ballou *et al.*, 2011) for further analysis.

Scope of the Studbook

- The CZA inventory was used as a benchmark for population estimates (Table 2); however, the information made available by holding institutions was used for update of the SPARKS database.
- The studbook includes all specimens present in Indian zoos for which records were available from holding institutions. The information on holding at each institution was verified from the taxon report of the species from the Species360 website for institutions that have uploaded information about their collection 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, the same 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 historical population includes a total of 59 (30.26.3) specimens that have been housed at 11 Indian zoos. The first recorded entry of the species in captivity was at Ahmedabad in 1985 with 2 specimens of unknown sex and origin. Wild origin specimens; [24 (16.8.0)] form 40.67% of the captive population. A total of 35 (14.18.3) births have occurred in captivity accounting for 59.32% of the total population. The captive births are attributed to 10 (3.7) with 16.94% of the captive population being

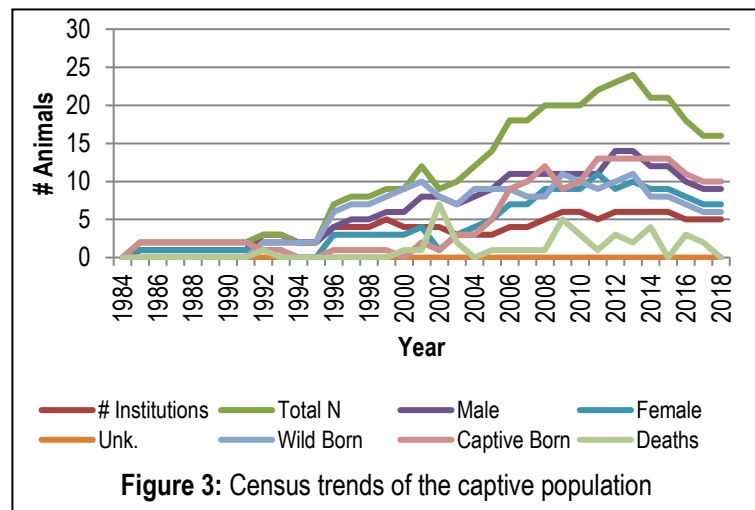


Figure 3: Census trends of the captive population

Table 3: Summary of the Historical Population

	Males	Females	Unknown	Total
Studbook size	30	26	3	59
Acquisition from wild	16	8	0	24
Captive birth	14	18	3	35
Deaths	21	19	3	43
Breeding individuals	3	7	0	10
Lost to follow up/ released	0	2	0	2

reproductively active. The population since its inception has also witnessed 43 (21.19.3) deaths. 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 16 (9.7.0) specimens housed at five institutions; with 6 (3.3.0) wild origin specimens. Only 6.25% or 1 (0.1) animal is a proven breeder in the living

Table 4: Summary of living population

	Males	Females	Unknown	Total
Living	9	7	0	16
Wild-born	3	3	0	6
Captive-born	6	4	0	10
Breeding	0	1	0	1

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 56.25% of the population at Sepahijala Zoological Park.

Population Vital Rates

The population is stable at its current size, with a marginal growth rate of 0.7%; however, females show a declining trend. The declining population trend is also reflected in the projected population after 20 years with

Table 5: Vital rates of the captive population

	Males	Females	Total
λ : Population growth rate	1.038	0.977	1.007
T: Generation time	11.4	5.6	8.5
N 20: Population after 20 years	3.8	1.5	5.4

a further loss of approximately 12 individuals from the population. The accuracy of the life table analysis carried out to arrive at the conclusions is limited by the small number of known age and sex specimens in the population.

Age Distribution

Age distribution of 16 (9.7) known age living specimens indicates a male bias. The living population includes 7 (4.3) animals of known age and sex in reproductively active age classes (7 – 12 years for males and 5 – 10 years for females Figure 4). It also shows the presence of 3 (1.2) specimens of either sex in the post-reproductive age class, while 4 (4.0) specimens are of pre-reproductive age. The age structure of the captive population indicates a declining and demographically unstable population due an absence of neonates that limits recruitments through captive births besides the absence of specimens in most age classes.

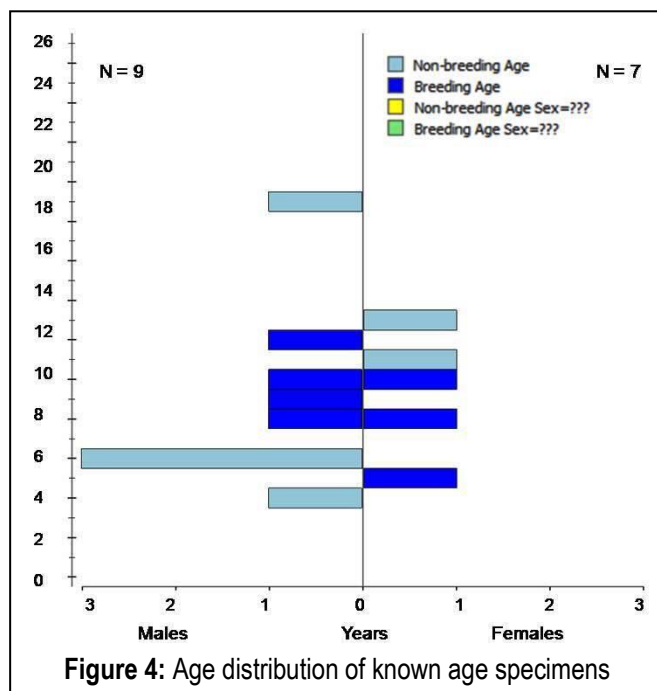


Figure 4: Age distribution of known age specimens

Genetic Status

Table 6 summarizes the genetic status of the living population. Analysis indicates that it originates from 5 founders although the population includes 6 (3.3) wild origin specimens. The living population of 16 specimens retains 82.53% of the genetic diversity brought in by these 5 founders. The unequal representation of the 5 founders in the living population has resulted in the population having the founder genome equivalents of only 2.86 wild origin specimens. The population is characterized by breeding between related individuals with a high level of relatedness between individuals as is reflected by the values of population mean kinship (0.175). The poor representation of the small founder base and high degree of relatedness between individuals is a cause for concern.

Table 6: Genetic Summary of the current population

Genetic parameters	Current
Founders	5
Living Animals	16
Percent Ancestry Known	100%
Gene Diversity (GD)	0.8253
Founder Genome Equivalent (FGE)	2.86
Mean Inbreeding (F)	0.00
Population mean kinship (Mk)	0.175
Ne/N	0.00

Pairing Recommendations

The pairing recommendations (table 7) 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. The small population size and limited mating choices available necessitate the use of individual sires for pairing with multiple dams. It is suggested that efforts to form pairs for such specimens should be initially made on site or at the closest location; the animals may be transferred for pairing to other locations subsequently. All pairing efforts should be preceded by appropriate socialization with supervised introductions.

Table 7: Pairing recommendations

Dam		Sire		F	dGD	MSI
# NSB	Location	# NSB	Location			
00036	Itanagar	00044	Sepahijala	0.0000	0.0430	1
00051	Shillong	00042	Itanagar	0.0000	0.0573	1
00061	Aizawl	00044	Sepahijala	0.0000	0.0659	1
00055	Sepahijala	00042	Itanagar	0.0000	0.0548	4
00033	Sepahijala	00052	Sepahijala	0.0313	0.0542	4
00035	Itanagar	00042	Itanagar	0.0000	0.0236	6

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 Clouded leopard includes 16 (9.7) individuals. It includes 6(3.3) wild origin specimens of which five are effective founders. The population is currently increasing with a λ of 1.007 per annum. The population retains a limited amount of genetic diversity (82.53% introduced from 5 founders) and includes closely related individuals (Mean Inbreeding: 0.00 and Population mean kinship: 0.175). Achieving conservation goals for the population is thus of critical importance.

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 retaining the current population size (16). The outcomes indicate that the population in captivity is likely to become extinct within 25 years due to the current rate of decline. The population variables used and the outcomes of the simulation are presented in Figure 5.

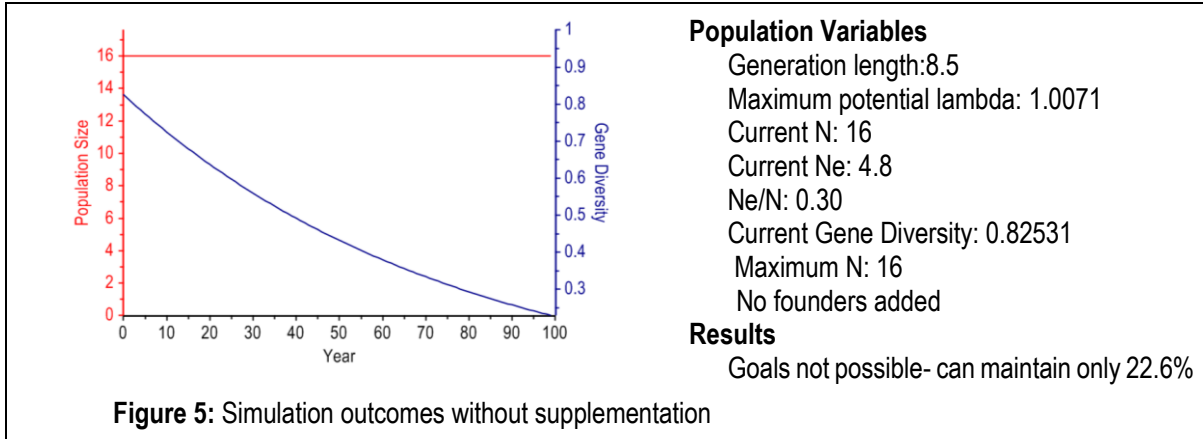


Figure 5: Simulation outcomes without supplementation

Scenario II:

The outcomes of the simulation that was run using a maximum potential lambda of 1.050 and a maximum population size of 100 specimens with supplementation by 1 effective founder every 4 years provided a population that was able to achieve the goals of maintaining 90% genetic diversity and a demographically stable population. The population and founder related variables, and the simulation outcome is presented as Figure 6. The increase in population growth rate can be achieved by ensuring that all reproductively active specimens get an opportunity to contribute to the growth of the population. The inclusion of additional effective founders should target lineages that are over-represented to ensure maximum genetic diversity in the captive population.

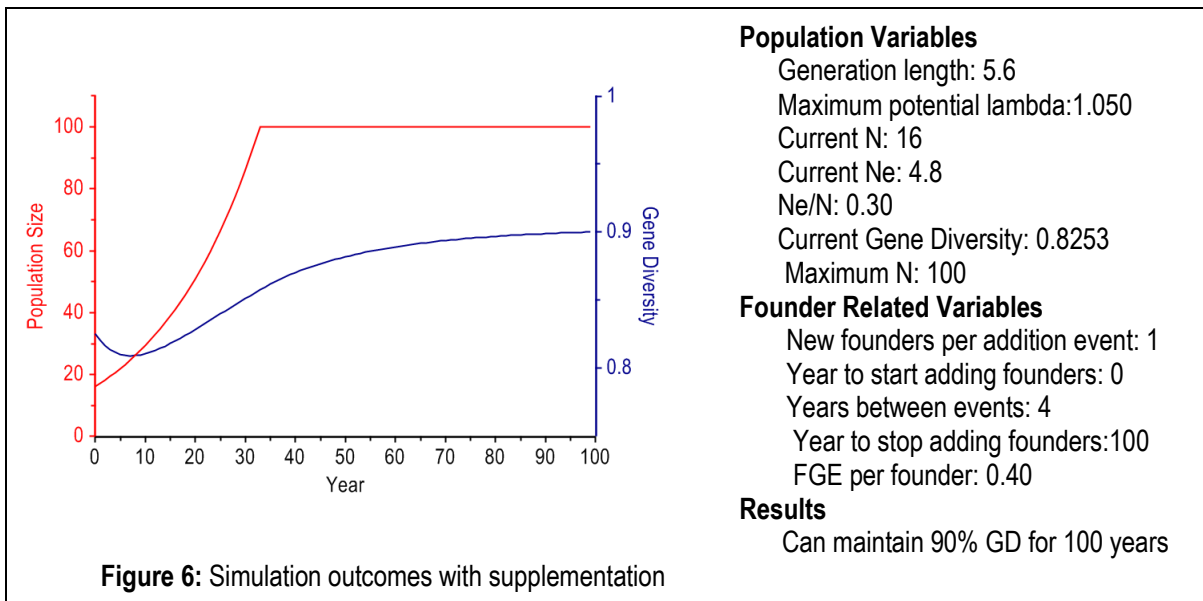


Figure 6: Simulation outcomes with supplementation

Conclusions and Recommendations

Clouded leopard 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 of 16 (9.7) in Indian zoos based on analysis of available pedigree records indicates that it is currently stable. It further retains limited genetic diversity (82.53%) originating from 5 founders. Unequal representation of founder genome as indicated by the founder genome equivalents (2.86), a high level of relatedness (MK = 0.175) and limited recruitment in the current population are threats that need to be addressed urgently.

Analysis of the pedigree database shows:

1. The population is characterized by a consistently small size, poor growth rate ($\lambda = 1.007$), limited reproductive output and a single female that is a proven breeder.
2. The population retains 82.53% of the genetic diversity originating from a small founder base (N = 5).
3. The continued small population size limits mating choices and has resulted in a population consisting of closely related individuals (MK = 0.175).

The limited breeding success of individuals suggests that the housing and husbandry practices followed need to be reviewed and modified. Holding institutions also need to address the incompatibility issues (also mentioned in literature) that can lower the reproductive potential of the species in captivity. Acquisition of new founders should be initiated only after addressing the housing, husbandry and incompatibility issues.

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Historical Population of Clouded leopard (*Neofelis nebulosa*) in Indian Zoos

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
00001 BADAL 0006B7391D	M	????	WILD	WILD	INDIA ASSAM	01-Jul-92 01-Jul-92 03-Sep-10	Capture Transfer Death
00002 CLO-1 NANDAN 0006B73987	M	~ 1992	WILD	WILD	INDIA SEPAHIJAL	???? 10-Feb-92 09-Sep-17	Capture Transfer Death
00003 RAJA	M	????	WILD	WILD	INDIA PATNA	26-Jul-96 26-Jul-96 08-Sep-03	Capture Transfer Death
00004 CLO-2 TAJU 0006B7E31B	M	~ 1994	WILD	WILD	INDIA SEPAHIJAL	25-Nov-97 26-Nov-97 03-Apr-09	Capture Transfer Death
00005 CLO-3 SHILPI	F	????	WILD	WILD	INDIA SEPAHIJAL	09-Jun-00 09-Jun-00 30-Jul-06	Capture Transfer Death
00006 CLO-4 RITUL	F	~ 1996	WILD	WILD	INDIA SEPAHIJAL	20-Aug-96 20-Aug-96 04-Mar-02	Capture Transfer Death
00007 CLO-5 MANTU	M	~ 1997	WILD	WILD	INDIA SEPAHIJAL INDIA	30-Oct-00 30-Oct-00 ????	Capture Transfer Ltf
00008 CLO-6 ALAM	M	15-May-96	WILD	WILD	INDIA SEPAHIJAL	15-May-96 15-May-96 28-Mar-02	Capture Transfer Death
00009 CLO-11 SUMITA	F	16-May-96	WILD	WILD	INDIA SEPAHIJAL	16-May-96 16-May-96 01-Apr-02	Capture Transfer Death
00010 CLO-8 MINU	F	13-Jun-01	00002	00005	SEPAHIJAL	13-Jun-01 05-Apr-02	Birth Death
00011 CLO-7 KHALED	M	13-Jun-01	00002	00005	SEPAHIJAL	13-Jun-01 01-Jul-01	Birth Death
00012 CLO-9 AR-ZPI-CL-5 DESHI 000647C7D9	M	~ 1999	WILD	WILD	INDIA SEPAHIJAL ITANAGAR	~ 1999 16-Jul-01 20-Sep-12	Capture Transfer Transfer

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
00013 CLO-10 GHAURA 0006B7F07E	M	~ 1997	WILD	WILD	INDIA SEPAHIJAL	23-Jul-01 23-Jul-01 15-Aug-14	Capture Transfer Death
00014 CLO-12	?	01-Mar-02	00004	00006	SEPAHIJAL	01-Mar-02 01-Mar-02	Birth Death
00015 CLO-13	?	01-Mar-02	00004	00006	SEPAHIJAL	01-Mar-02 01-Mar-02	Birth Death
00016 RAJA 0006B71CE9	M	????	WILD	WILD	INDIA ASSAM	04-Mar-02 04-Mar-02 18-Oct-10	Capture Transfer Death
00017 CLO-14 SUPRIYA	F	19-Jul-02	00004	00005	SEPAHIJAL	19-Jul-02 29-Aug-02	Birth Death
00018 CLO-16 REHANA 0006B8A0B6	F	04-May-03	00004	00005	SEPAHIJAL	04-May-03 11-Sep-12	Birth Death
00019 CLO-17 SUBASH	M	04-May-03	00004	00005	SEPAHIJAL	04-May-03 30-Jul-03	Birth Death
00020 CLO-15 RESHMI 0006B887B1	F	04-May-03	00004	00005	SEPAHIJAL	04-May-03 15-Jun-17	Birth Death
00021 CLO-18 SIDDIK 0006B8AEFC	M	23-Mar-04	WILD	WILD	INDIA SEPAHIJAL	23-Mar-04 23-Mar-04 29-Feb-08	Capture Transfer Death
00022 CLO-19 RANI	F	~ Apr 2004	WILD	WILD	INDIA SEPAHIJAL	24-Apr-04 25-Apr-04 22-Sep-07	Capture Transfer Death
00023 CLO-20 ASOKE	M	27-Mar-05	00013	00005	SEPAHIJAL	27-Mar-05 23-Sep-05	Birth Death
00024 CLO-21 PRITI 0006B886CO	F	27-Mar-05	00013	00005	SEPAHIJAL DARJEELIN	27-Mar-05 27-Mar-09 27-May-14	Birth Transfer Death
00025 CLO-22 ZIMMI 0006B883AC	M	27-Mar-05	00013	00005	SEPAHIJAL	27-Mar-05 04-Apr-09	Birth Death

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
00027 CLO-24 PALLABI 0006B8952A	F	24-Apr-06	00002	00020	SEPAHIJAL	24-Apr-06 06-Jul-09	Birth Death
00028 CLO-23 SANJIT 0006B7F06A	F	24-Apr-06	00002	00020	SEPAHIJAL	24-Apr-06	Birth Ltf
00029 CLO-25 RAHUL 0006B899A8	M	13-May-06	00004	00018	SEPAHIJAL	13-May-06 03-Apr-09	Birth Death
00030 CLO-26 28002 NIBASH 0006B88A82	M	29-May-06	00002	00018	SEPAHIJAL DARJEELIN	29-May-06 27-Mar-09	Birth Transfer
00032 CLO-27 PARUL 0006B88836	F	29-May-06	00002	00018	SEPAHIJAL AIZAWL	29-May-06 19-Mar-13 15-Apr-13	Birth Transfer Death
00033 CLO-28 PRATIVA 0006B73COD	F	19-Mar-07	00004	00022	SEPAHIJAL	19-Mar-07	Birth
00034 CLO-29 MANMOHAN 000647B34D	M	21-Jun-08	00013	00020	SEPAHIJAL AIZAWL	21-Jun-08 19-Mar-13	Birth Transfer
00035 CLO-30 MAYABATI 000647C7D9	F	21-Jun-08	00013	00020	SEPAHIJAL ITANAGAR	21-Jun-08 20-Sep-12	Birth Transfer
00036 TEI JENNY 000647D471	F	~ Jun 2005	WILD	WILD	INDIA AIZAWL SEPAHIJAL	???? 18-Jul-06 23-Mar-13	Capture Transfer Transfer
00037	M	????	UNK	UNK	INDIA AHMEDABAD	???? 04-Apr-85 14-Apr-92	Birth Transfer Death
00038	F	????	UNK	UNK	INDIA AHMEDABAD KANPUR	???? 04-Apr-85 ~ 1994	Birth Transfer Ltf
00039 CLO-23 MEERA KUMARI	F	24-Apr-06	00002	00020	SEPAHIJAL	24-Apr-06	Birth Ltf

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
00040 RANI	F	????	WILD	WILD	INDIA DIMAPUR	~ Jul 2008 ~ Jul 2008 23-Dec-10	Capture Transfer Death
00041 MEGH 00064F38D0	M	~ 1995	WILD	WILD	INDIA SEPAHIJAL	???? 23-Feb-09 20-May-14	Capture Transfer Death
00042 KALU	M	~ Mar 2009	WILD	WILD	INDIA ITANAGAR	04-Apr-09 04-Apr-09	Capture Transfer
00043 FIODER	M	????	WILD	WILD	INDIA DIMAPUR	16-Apr-09 16-Apr-09 21-Mar-11	Capture Transfer Death
00044 PRASANTA	M	~ 2009	WILD	WILD	INDIA SEPAHIJAL	25-Aug-10 25-Aug-10	Capture Transfer
00045 CLO-39 SRITI	F	14-Mar-10	00013	00020	SEPAHIJAL	14-Mar-10	Birth
00046 CLO-35 SATHI	F	23-Mar-09	00013	00020	SEPAHIJAL	23-Mar-09 03-May-12	Birth Death
00047 KHAMSUNG	M	????	WILD	WILD	INDIA GANGTOK	02-Nov-10 02-Nov-10 12-Dec-16	Capture Transfer Death
00048 CLO-37 LILY 6590805	F	14-Apr-11	00002	00033	SEPAHIJAL	14-Apr-11 15-Dec-12	Birth Death
00049 JOY/JUI 000647D94C	M	14-Apr-11	00002	00033	SEPAHIJAL	14-Apr-11 24-Nov-16	Birth Death
00050 JITEN/JULY 0006584EBA	F	01-Jul-11	00002	00020	SEPAHIJAL	01-Jul-11 25-Nov-16	Birth Death
00051 165	F	????	WILD	WILD	INDIA SHILLONG	18-Jan-12 19-Jan-12	Capture Transfer
00052 CLO-42 RAJA	M	19-Mar-12	00002	00046	SEPAHIJAL	19-Mar-12	Birth
00053 CLO-43 MANGAL 6586218	M	02-Jun-12	00013	00020	SEPAHIJAL	02-Jun-12	Birth
00054 CLO-44 ABHI 00064F2626	M	02-Jun-12	00013	00020	SEPAHIJAL	02-Jun-12	Birth

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
00055 00CL44 JUBEDA 956000002	F	24-Apr-13	00002	00033	SEPAHIJAL	24-Apr-13	Birth
00056 KRISHN KRISHNA	M	30-Mar-14	00013	00020	SEPAHIJAL	30-Mar-14	Birth
00057 CL0138 CLO-31	M	????	WILD	WILD	INDIA DARJEELIN SEPAHIJAL	???? 22-Feb-09 23-Feb-09 20-May-14	Capture Transfer Transfer Death
00058 CLOUDY	F	????	UNK	UNK	INDIA DARJEELIN	???? 21-Aug-96 18-Mar-00	Birth Transfer Death
00059 MEGH	M	????	UNK	UNK	ITANAGAR DARJEELIN	???? 22-Nov-01 18-Mar-09	Birth Transfer Death
00060 CLO-46	?	08-Jun-13	00013	00020	SEPAHIJAL	08-Jun-13 14-Jul-13	Birth Death
00061 JENNY 0006B88837	F	????	WILD	WILD	INDIA AIZAWL	???? 22-Jul-13	Capture Transfer
TOTALS: 59 (30.26.3)							

Living Population of Clouded leopard (*Neofelis nebulosa*) in Indian Zoos

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
Aizawl Zoological Park, Aizawl							
00034 CLO-29 MANMOHAN 000647B34D	M	21-Jun-08	00013	00020	SEPAHIJAL AIZAWL	21-Jun-08 19-Mar-13	Birth Transfer
00061 JENNY 0006B88837	F	????	WILD	WILD	INDIA AIZAWL	???? 22-Jul-13	Capture Transfer
Total: 2 (1.1.0)							
Padmaja Naidu Himalayan Zoological Park, Darjeeling							
00030 CLO-26 28002 NIBASH 0006B88A82	M	29-May-06	00002	00018	SEPAHIJAL DARJEELIN	29-May-06 27-Mar-09	Birth Transfer
Total: 1 (1.0.0)							
Biological Park, Itanagar							
00012 CLO-9 AR-ZPI-CL-5 DESHI 000647C7D9	M	~ 1999	WILD	WILD	INDIA SEPAHIJAL ITANAGAR	~ 1999 16-Jul-01 20-Sep-12	Capture Transfer Transfer
00035 CLO-30 MAYABATI 000647C7D9	F	21-Jun-08	00013	00020	SEPAHIJAL ITANAGAR	21-Jun-08 20-Sep-12	Birth Transfer
00042 KALU	M	~ Mar 2009	WILD	WILD	INDIA ITANAGAR	04-Apr-09 04-Apr-09	Capture Transfer
Total: 3 (2.1.0)							
Sepahijala Zoological Park, Agartala							
00033 CLO-28 PRATIVA 0006B73COD	F	19-Mar-07	00004	00022	SEPAHIJAL	19-Mar-07	Birth
00036 TEI JENNY 000647D471	F	~ Jun 2005	WILD	WILD	INDIA AIZAWL SEPAHIJAL	???? 18-Jul-06 23-Mar-13	Capture Transfer Transfer
00044 PRASANTA	M	~ 2009	WILD	WILD	INDIA SEPAHIJAL	25-Aug-10 25-Aug-10	Capture Transfer
00045 CLO-39	F	14-Mar-10	00013	00020	SEPAHIJAL	14-Mar-10	Birth

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
SRITI							
00052 CLO-42 RAJA	M	19-Mar-12	00002	00046	SEPAHIJAL	19-Mar-12	Birth
00053 CLO-43 MANGAL 6586218	M	02-Jun-12	00013	00020	SEPAHIJAL	02-Jun-12	Birth
00054 CLO-44 ABHI 00064F2626	M	02-Jun-12	00013	00020	SEPAHIJAL	02-Jun-12	Birth
00055 00CL44 JUBEDA 956000002	F	24-Apr-13	00002	00033	SEPAHIJAL	24-Apr-13	Birth
00056 KRISHNA	M	30-Mar-14	00013	00020	SEPAHIJAL	30-Mar-14	Birth
Total: 9 (5.4.0)							
Lady Hydari Park Zoo, Shillong							
00051 165	F	????	WILD	WILD	INDIA SHILLONG	18-Jan-12 19-Jan-12	Capture Transfer
Total: 1 (0.1.0)							
Total Living: 16 (9.7.0)							

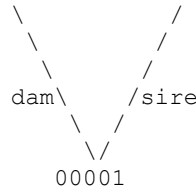
PEDIGREE CHART REPORT

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Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00001

=====

WILD



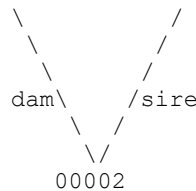
WILD
Sex: Male
Birth Date: ????
Last Location: ASSAM (dead)
House Name: BADAL
Tattoo:
Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00002

=====

WILD



WILD
Sex: Male
Birth Date: ~ 1992
Last Location: SEPAHIJAL (dead)
House Name: NANDAN
Tattoo:
Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00003

=====

WILD



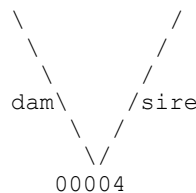
WILD
Sex: Male
Birth Date: ????
Last Location: PATNA (dead)
House Name:
Tattoo:
Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00004

=====

WILD



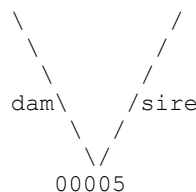
WILD
Sex: Male
Birth Date: ~ 1994
Last Location: SEPAHIJAL (dead)
House Name: TAJU
Tattoo:
Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00005

=====

WILD



WILD
Sex: Female
Birth Date: ????
Last Location: SEPAHIJAL (dead)
House Name: SHILPI
Tattoo:
Tag/Band:

NATIONAL STUDBOOK OF CLOUDED LEOPARD (*NEOFELIS NEBULOSA*) – III EDITION

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=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00006
=====
WILD                                                WILD
                                                Sex: Female
                                                Birth Date: ~ 1996
                                                Last Location: SEPAHIJAL (dead)
                                                House Name: RITUL
                                                Tattoo:
                                                Tag/Band:

      \      /
      \  dam\ /sire
       \    /
        \  /
         \ /
          V
         00006
    
```

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=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00007
=====
WILD                                                WILD
                                                Sex: Male
                                                Birth Date: ~ 1997
                                                Last Location: INDIA
                                                House Name: MANTU
                                                Tattoo:
                                                Tag/Band:

      \      /
      \  dam\ /sire
       \    /
        \  /
         \ /
          V
         00007
    
```

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=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00008
=====
WILD                                                WILD
                                                Sex: Male
                                                Birth Date: 15 May 1996
                                                Last Location: SEPAHIJAL (dead)
                                                House Name: ALAM
                                                Tattoo:
                                                Tag/Band:

      \      /
      \  dam\ /sire
       \    /
        \  /
         \ /
          V
         00008
    
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=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00009
=====
WILD                                                WILD
                                                Sex: Female
                                                Birth Date: 16 May 1996
                                                Last Location: SEPAHIJAL (dead)
                                                House Name: SUMITA
                                                Tattoo:
                                                Tag/Band:

      \      /
      \  dam\ /sire
       \    /
        \  /
         \ /
          V
         00009
    
```

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=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00010
=====
WILD      dam\      /sire      WILD      dam\      /sire      WILD
      \    /      \    /      \    /      \    /      \    /
       \  /      \  /      \  /      \  /      \  /
        \ /      \ /      \ /      \ /      \ /
         V        V        V        V        V
        00005 +   00002 +
        SHILPI   NANDAN
                Sex: Female
                Birth Date: 13 Jun 2001
                Last Location: SEPAHIJAL (dead)
                House Name: MINU
                Tattoo:
                Tag/Band:

      \      /
      \  dam\ /sire
       \    /
        \  /
         \ /
          V
         00010
    
```

+ Wild-caught...

=====
 Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00023
 =====

WILD	dam\ \ /	WILD	/sire	WILD	dam\ \ /	WILD	/sire
	00005 + SHILPI				00013 + GHAURA		
					Sex: Male		
					Birth Date: 27 Mar 2005		
					Last Location: SEPAHIJAL (dead)		
					House Name: ASOKE		
					Tattoo:		
					Tag/Band:		
				dam\ \ /			
				00023			

+ Wild-caught...

=====
 Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00024
 =====

WILD	dam\ \ /	WILD	/sire	WILD	dam\ \ /	WILD	/sire
	00005 + SHILPI				00013 + GHAURA		
					Sex: Female		
					Birth Date: 27 Mar 2005		
					Last Location: DARJEELIN (dead)		
					House Name: PRITI		
					Tattoo:		
					Tag/Band:		
				dam\ \ /			
				00024			

+ Wild-caught...

=====
 Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00025
 =====

WILD	dam\ \ /	WILD	/sire	WILD	dam\ \ /	WILD	/sire
	00005 + SHILPI				00013 + GHAURA		
					Sex: Male		
					Birth Date: 27 Mar 2005		
					Last Location: SEPAHIJAL (dead)		
					House Name: ZIMMI		
					Tattoo:		
					Tag/Band:		
				dam\ \ /			
				00025			

+ Wild-caught...

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=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00034

=====

```

WILD      WILD      WILD      WILD
dam\     /sire    dam\     /sire
  \     /        \     /
  00005 +        00004 +
  SHILPI         TAJU
   dam\         /sire
    \     /
    00020
    RESHMI
      \     /
      dam\   /sire
        \   /
        00034
+ Wild-caught...
    
```

WILD WILD
dam\ /sire
00013 +
GHAURA
Sex: Male
Birth Date: 21 Jun 2008
Last Location: AIZAWL
House Name: MANMOHAN
Tattoo:
Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00035

=====

```

WILD      WILD      WILD      WILD
dam\     /sire    dam\     /sire
  \     /        \     /
  00005 +        00004 +
  SHILPI         TAJU
   dam\         /sire
    \     /
    00020
    RESHMI
      \     /
      dam\   /sire
        \   /
        00035
+ Wild-caught...
    
```

WILD WILD
dam\ /sire
00013 +
GHAURA
Sex: Female
Birth Date: 21 Jun 2008
Last Location: ITANAGAR
House Name: MAYABATI
Tattoo:
Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00036

=====

```

WILD
      \     /
      dam\   /sire
        \   /
        00036
+ Wild-caught...
    
```

WILD
Sex: Female
Birth Date: ~ Jun 2005
Last Location: SEPAHIJAL
House Name: JENNY
Tattoo:
Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00037

=====

```

UNK
      \     /
      dam\   /sire
        \   /
        00037
+ Wild-caught...
    
```

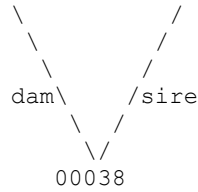
UNK
Sex: Male
Birth Date: ????
Last Location: AHMEDABAD (dead)
House Name:
Tattoo:
Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00038

=====

UNK

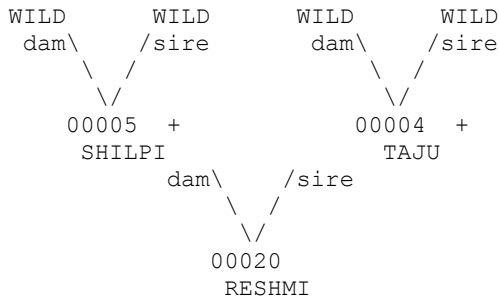


UNK
 Sex: Female
 Birth Date: ????
 Last Location: KANPUR
 House Name:
 Tattoo:
 Tag/Band:

=====

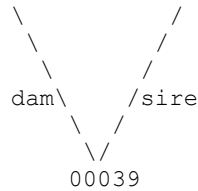
Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00039

=====



WILD WILD
 dam\ /sire
 \ /
 \ /
 V
 00002 +
 NANDAN
 Sex: Female
 Birth Date: 24 Apr 2006
 Last Location: SEPAHIJAL
 House Name: MEERA KUMARI
 Tattoo:
 Tag/Band:

+ Wild-caught...

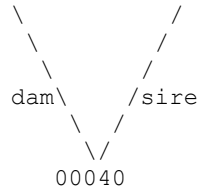


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Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00040

=====

WILD



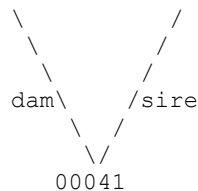
WILD
 Sex: Female
 Birth Date: ????
 Last Location: DIMAPUR (dead)
 House Name: RANI
 Tattoo:
 Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00041

=====

WILD



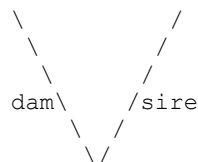
WILD
 Sex: Male
 Birth Date: ~ 1995
 Last Location: SEPAHIJAL (dead)
 House Name: MEGH
 Tattoo:
 Tag/Band:

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00042

=====

WILD



WILD
 Sex: Male
 Birth Date: ~ Mar 2009
 Last Location: ITANAGAR
 House Name: KALU
 Tattoo:
 Tag/Band:

00042

```
=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00043
=====
WILD                                                WILD
                                                Sex: Male
                                                Birth Date:   ????
Last Location: DIMAPUR   (dead)
House Name: FIODER
Tattoo:
Tag/Band:

      WILD
      dam\  /sire
      \    /
       \  /
        \ /
         V
        00043
```

```
=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00044
=====
WILD                                                WILD
                                                Sex: Male
                                                Birth Date:   ~ 2009
Last Location: SEPAHIJAL
House Name: PRASANTA
Tattoo:
Tag/Band:

      WILD
      dam\  /sire
      \    /
       \  /
        \ /
         V
        00044
```

```
=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00045
=====
WILD dam\  /sire  WILD dam\  /sire  WILD dam\  /sire  WILD dam\  /sire
00005 +          00004 +          WILD          WILD
SHILPI          TAJU
dam\  /sire
 \    /
  \  /
   \ /
    V
   00020
  RESHMI

      WILD
      dam\  /sire
      \    /
       \  /
        \ /
         V
        00013 +
        GHAURA
        Sex: Female
        Birth Date: 14 Mar 2010
Last Location: SEPAHIJAL
House Name: SRITI
Tattoo:
Tag/Band:

+ Wild-caught...

      WILD
      dam\  /sire
      \    /
       \  /
        \ /
         V
        00045
```

```
=====
Taxon Name: NEOFELIS NEBULOSA                      Studbook Number: 00046
=====
WILD dam\  /sire  WILD dam\  /sire  WILD dam\  /sire  WILD dam\  /sire
00005 +          00004 +          WILD          WILD
SHILPI          TAJU
dam\  /sire
 \    /
  \  /
   \ /
    V
   00020
  RESHMI

      WILD
      dam\  /sire
      \    /
       \  /
        \ /
         V
        00013 +
        GHAURA
        Sex: Female
        Birth Date: 23 Mar 2009
Last Location: SEPAHIJAL (dead)
House Name: SATHI
Tattoo:
Tag/Band:

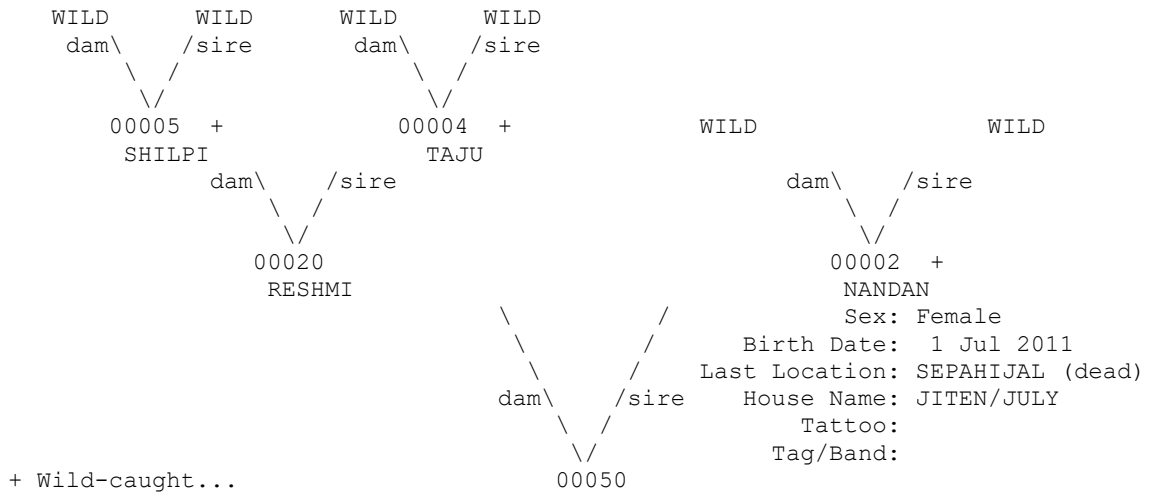
+ Wild-caught...

      WILD
      dam\  /sire
      \    /
       \  /
        \ /
         V
        00046
```


=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00050

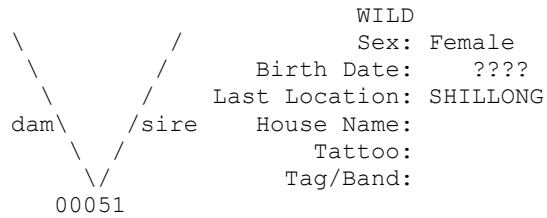
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Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00051

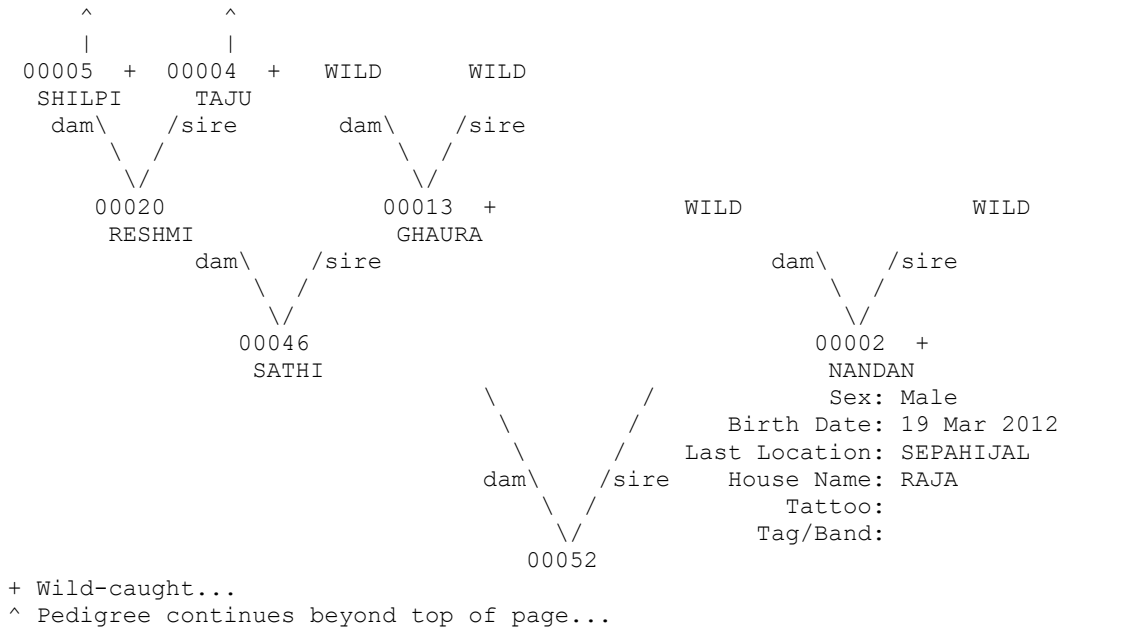
=====



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Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00052

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=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00056

=====

```

WILD      WILD      WILD      WILD
dam\      /sire    dam\      /sire
  \      /        \      /
  00005 +        00004 +
  SHILPI          TAJU
  dam\          /sire
   \      /
   00020
  RESHMI

WILD      WILD
dam\      /sire
  \      /
  00013 +
  GHaura
  Sex: Male
  Birth Date: 30 Mar 2014
  Last Location: SEPAHIJAL
  House Name: KRISHNA
  Tattoo:
  Tag/Band:

+ Wild-caught...
                                dam\      /sire
                                 \      /
                                 00056
    
```

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00057

=====

```

WILD
dam\      /sire
  \      /
  00057

WILD
Sex: Male
Birth Date: ???
Last Location: SEPAHIJAL (dead)
House Name:
Tattoo:
Tag/Band:
    
```

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00058

=====

```

UNK
dam\      /sire
  \      /
  00058

UNK
Sex: Female
Birth Date: ???
Last Location: DARJEELIN (dead)
House Name: CLOUDY
Tattoo:
Tag/Band:
    
```

=====

Taxon Name: NEOFELIS NEBULOSA Studbook Number: 00059

=====

```

UNK
dam\      /sire
  \      /
  00059

UNK
Sex: Male
Birth Date: ???
Last Location: DARJEELIN (dead)
House Name: MEGH
Tattoo:
Tag/Band:
    
```


Location Glossary

MNEMONIC	Location
AHMEDABAD	Kamla Nehru Zoological Garden, Ahmedabad
AIZAWL	Aizawal Zoological Park, Aizawal
ASSAM	Assam State Zoo cum Botanical Garden, Guwahati
DARJEELIN	Padmaja Naidu Himalayan Zoological Park, Darjeeling
DIMAPUR	Nagaland Zoological Park, Dimapur
GANGTOK	Himalayan Zoological Park, Gangtok
INDIA	All wild origin animals
ITANAGAR	Biological Park, Itanagar
KANPUR	Kanpur Zoological Park, Kanpur
PATNA	Sanjay Gandhi Biological Park, Patna
SEPAHIJAL	Sepahijala Zoological Park, Agartala
SHILLONG	Lady Hydari Park Zoo, Shillong