National Studbook of Hoolock Gibbon (*Hoolock hoolock*)

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

केन्द्रीय चिड़ियाघर प्राधिकरण
Central Zoo Authority

December 2009

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Studbook compiled and analysed by

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Aizawl Zoo, Aizawl
Biological Park, Itanagar
Mini Zoo, Roing
Mini Zoo, Miao

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Authors

Contents

Hoolock Gibbon: Biology and Status

Taxonomy		
	Kingdom	**Animalia**
	Phylum	**Chordata**
	Class	**Mammalia**
	Order	**Primates**
	Family	**Hylobatidae**
	Genus	***Hoolock***
	Species	***hoolock***
	Species Authority	**Harlan, 1834**
	Local Name	**Ulluck (Hindi)**

Hoolock gibbon, a small arboreal ape inhabits tropical mixed deciduous and evergreen forests up to an altitude of 1400m. The distribution ranges from Assam in India to other contiguous regions, further eastwards in India, Bangladesh and Myanmar. The species exhibits marked sexual dimorphism, live in small cohesive family groups and are strictly monogamous. The family groups maintain well defined territories. Their loud vocalization is believed to be related to the maintenance of these territories.

Taxonomy

The Hoolock gibbon has undergone several taxonomic revisions in recent past. It was initially described by Harlan (1834). Classical literature refers to all gibbons to be belonging to the genus *Hylobates* with *Siamang* as an exception. Groves (1968 and1972) following Ellerman and Scott (1951) provided genus *Hylobates* with three subgenera; *Symphalangus*, *Nomascus* and *Hylobates* Prouty et.al(1983) based on fossil evidence of a gibbon found in China revised the genus of Hoolock to *Bunopithecus*. Subsequently Mootnick and Groves (2005) revised the taxonomy of the species further and placed it in a monotypic genera *Hoolock* based on differences in anatomy and patterns of sexual dimorphism. The species is now referred to as *Hoolock hoolock* (Harlan, 1834).

Behaviour and Biology

Hoolock gibbon exhibits distinct sexual dimorphism with the adult males being completely black while females are golden in colour. Both males and females have dark faces and white brows. Vocalizations are loud and have an extensive repertoire. Males have higher pitched calls when compared to females. Adults have heights of 45- 64 cm and weigh between 6 – 9 kg. They attain sexual maturity at approximately 7 years. Monogamous groups are formed and mating takes place during early monsoon. The young ones are born after a gestation period of 195- 210 days in winter.

Hoolock gibbon is mainly arboreal spending most of their active time in the canopy, coming to the ground very rarely. They rest in the lower forests layer. Their diet consists of fruits, leaves, flowers, insects and bird eggs. They have well defined daily activity patterns. They start foraging with the onset of the day and continue till noon avoiding the midday heat by moving to lower layers, resuming activity as the day cools and returning to roosting trees by sundown.

Social organization

They are found in small monogamous groups comprising of a mated pair and offspring. The groups have strong bond formation and indulge in various social activities like grooming and playing. Strong mother infant bonding has been observed. A neonate clings to its mother's belly and feeds for up to 6 months. As the infant grows older it starts foraging and playing with other members of the group of age when weaning takes place. However it returns to sleep with mother till another infant is born. Each group has well defined territories. These are advertised by loud vocalizations. Vocalizations also serve to keep contact with each other as the group disperses to forage. Aggressive interactions occur when territories overlap or when a group enters the territory of another.

Distribution

Hoolock Gibbon was formerly distributed in mixed deciduous and evergreen forests of north- eastern India, Bangladesh, and Myanmar. Its current distribution range is

restricted between south of river Brahmaputra and river Irrawaddy in Myanmar. In India it is found in the states of Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland and Tripura (Sati and Alfred 2001).

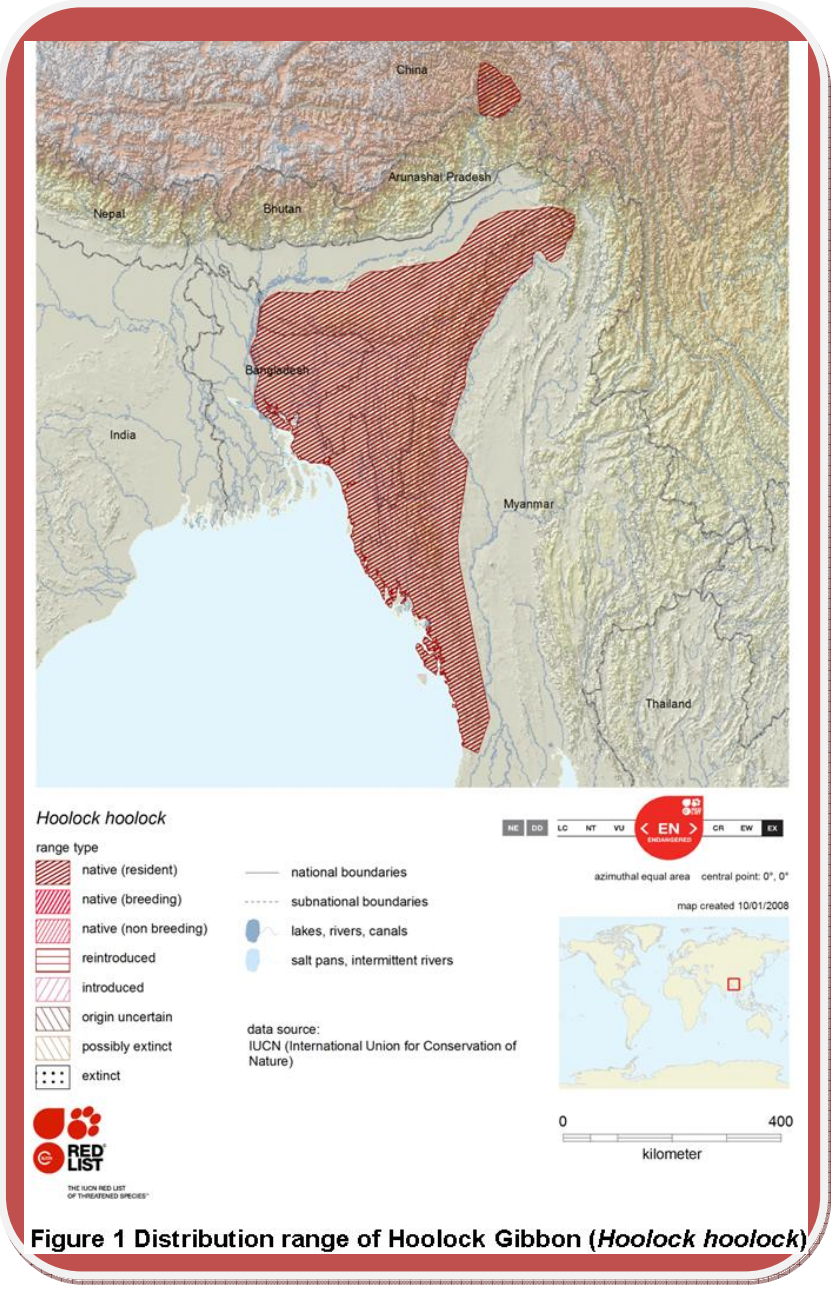

Figure 1 Distribution range of Hoolock Gibbon (*Hoolock hoolock*)

Threats

Hoolock gibbons are mainly an arboreal species. Habitat destruction and fragmentation have both caused a severe decline in their population. In addiction, the species faces severe hunting pressure for bush meat and use in traditional medicine. Shifting cultivation and opening up of large forest areas for commercial cultivation are largely responsible for their degraded habitats.

Status

Hoolock gibbon are listed in Schedule I Part I of the Wild Life (Protection) Act, 1972 and classified as Endangered (Endangered A2acd+3cd+4acd ver 3.1 (1994)) in the 2009 IUCN Red List of Threatened Species, and listed on Appendix I of CITES. The high level of threat faced by them has prompted Mittermeier et al (2007) to place them in the list of 25 most threatened primate species of the world.

Scope of the studbook

The present studbook compiles and analyses data for the Indian zoos.

Methods

The data for the present studbook was collected through mailed questionnaires and the CZA website (cza.nic.in). Data for Manipur Zoological Park, Imphal and Lucknow Zoological Park, Lucknow has not been included in the present studbook as the same was not received and is unavailable at both the CZA and ISIS websites. The data collected was entered in SPARKS 1.5 and analyzed using SPARKS 1.5 and PM 2000.

Status in Captivity (India)

The species is currently distributed across 9 zoos in India and the current population is 40. 2 individuals each from Lucknow Zoological Park and Manipur Zoological Garden have not been included in the present studbook as data for the same has not been received from the zoos.

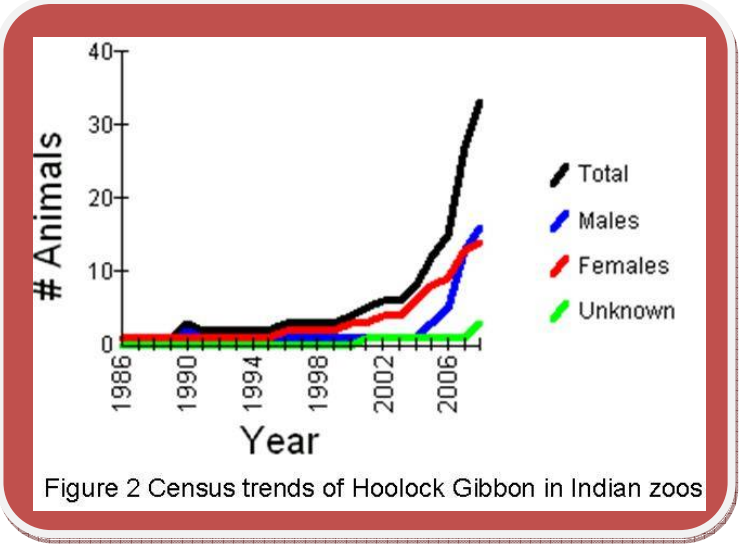

Figure 2 Census trends of Hoolock Gibbon in Indian zoos

Table 1 Population status of hoolock gibbon in Indian zoos

Name of the Zoo	Male	Female	Unknown	Total
Assam State Zoo cum Botanical Garden, Guwahati	1	1	0	2
Lucknow Zoological Park, Lucknow*	1	1	0	2
National Zoological Park, Delhi	0	1	0	1
Sepahijala Zoological Park, Tripura	1	3	0	4
Manipur Zoological Garden, Imphal*	1	1	0	2
Aizawl Zoo, Aizawl	4	4	1	9
Biological Park, Itanagar	10	5	2	17
Mini Zoo, Roing	0	0	1	1
Mini Zoo, Miao	0	1	0	1
Total	**18**	**17**	**4**	**40**

* Data based on Central Zoo Authority inventory for the year 2008 – 2009 (cza.nic.in).

Table 2 Location wise listing of live Hoolock Gibbon (*Hoolock hoolock*) in Indian Zoos

Sl. No.	Home Name and Transponder No.	National Studbook No.	International Studbook No.	Sex	Sire	Dam	Birth Date	Location	Date	Event	Remarks
National Zoological Park, Delhi											
1.	Unk7	00002		Female	Unk	Unk	~ 1986	Dacca Delhi	~ 1986 6 Apr 1990	Birth Transfer	
0.1.0 (0)											
Assam State Zoo cum Botanical Garden, Guwahati, Assam											
2.	Montu	00003		Male	Wild	Wild	????	India Assam	12 Feb 1990 12 Feb 1990	Capture Transfer	
3.	Mini	00015		Female	Wild	Wild	????	India Assam	27 Jul 2005 27 Jul 2005	Capture Transfer	
1.1.0 (2)											
Sepahijala Zoological Park, Agartala, Tripura											
4.	Laxmi	00004		Female	Wild	Wild	~ 1986	India Sepahijala	10 Apr 1996 10 Apr 1996	Capture Transfer	
5.	Saraswati	00010		Female	Wild	Wild	~ 1999	India Sepahijala	2 Jun 2002 2 Jun 2002	Capture Transfer	
6.	Manika	00014		Female	Wild	Wild	????	India Sepahijala	13 May 2005 13 May 2005	Capture Transfer	
7.	Narayan	00036		Male	Wild	Wild	????	India Sepahijala	22 Feb 2008 22 Feb 2008	Capture Transfer	
1.3.0 (4)											
Aizawl Zoo, Aizawl, Mizoram											
8.	Buangi	00005		Female	Wild	Wild	????	India Aizawl	6 Mar 2000 6 Mar 2000	Capture Transfer	
9.	Mary	00011		Female	Wild	Wild	????	India Aizawl	18 Jan 2004 18 Jan 2004	Capture Transfer	
10.	Zovi	00012		Female	Wild	Wild	????	India Aizawl	7 Feb 2004 7 Feb 2004	Capture Transfer	
11.	Buka	00013		Male	Wild	Wild	????	India Aizawl	28 Apr 2005 28 Apr 2005	Capture Transfer	
12.	Bawiha	00016		Male	Wild	Wild	????	India Aizawl	5 Feb 2006 5 Feb 2006	Capture Transfer	
13.	Nutei	00018		Female	Wild	Wild	????	India Aizawl	6 Feb 2006 6 Feb 2006	Capture Transfer	

Sl. No.	Home Name and Transponder No.	National Studbook No.	International Studbook No.	Sex	Sire	Dam	Birth Date	Location	Date	Event	Remarks
14.	Duma	00020		Male	Wild	Wild	????	India Aizawl	25 Sep 2006 25 Sep 2006	Capture Transfer	
15.	Bankawia	00021		Male	Wild	Wild	????	India Aizawl	12 Oct 2006 12 Oct 2006	Capture Transfer	
16.	Seni	00041		?	Wild	Wild	????	India Aizawl	???? ????	Capture Transfer	
4.4.1 (9)											
Mini Zoo, Roing, Arunachal Pradesh											
17.	Unk1	00009		?	Wild	Wild	????	India Roing	12 May 2001 12 May 2001	Capture Transfer	
0.0.1 (1)											
Biological Park, Itanagar, Arunachal Pradesh											
18.	Linggi	00022		Male	Wild	Wild	????	India Itanagar	12 Mar 2007 12 Mar 2007	Capture Transfer	
19.	Dello	00023		Female	Wild	Wild	????	India Itanagar	12 Mar 2007 12 Mar 2007	Capture Transfer	
20.	Yasum	00024		Female	Wild	Wild	????	India Itanagar	12 Mar 2007 12 Mar 2007	Capture Transfer	
21.	Baby	00025		Male	Wild	Wild	????	India Itanagar	12 Mar 2007 12 Mar 2007	Capture Transfer	
22.	Lagder	00026		Male	Wild	Wild	????	India Itanagar	15 Mar 2007 15 Mar 2007	Capture Transfer	
23.	Rukmini	00027		Female	Wild	Wild	????	India Itanagar	15 Mar 2007 15 Mar 2007	Capture Transfer	
24.	Nega	00028		Male	00026	00027	????	India Itanagar	???? 15 Mar 2007	Birth Transfer	
25.	10/H/05	00029		Male	Wild	Wild	4 Dec 2005	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	
26.	Yapa	00030		Female	Wild	Wild	????	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	
27.	Mithum	00031		Male	Wild	Wild	????	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	
28.	Taping	00032		Male	Wild	Wild	????	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	
29.	Pintu	00033		Male	Wild	Wild	????	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	

Sl. No.	Home Name and Transponder No.	National Studbook No.	International Studbook No.	Sex	Sire	Dam	Birth Date	Location	Date	Event	Remarks
30.	Deomali	00034		Male	Wild	Wild	????	India Itanagar	20 Jan 2008 20 Jan 2008	Capture Transfer	
31.	Cute	00037		Male	Wild	Wild	????	India Itanagar	23 Feb 2008 23 Feb 2008	Capture Transfer	
32.	Mishmi	00038		Female	Wild	Wild	????	India Itanagar	23 Feb 2008 23 Feb 2008	Capture Transfer	
33.	Anga	00039		?	00026	00027	5 Jul 2008	Itanagar	5 Jul 2008	Birth	
34.	Jimmy	00040		?	00028	00024	22 Sep 2008	Itanagar	22 Sep 2008	Birth	
10.5.2 (17)											
Lady Hydari Animal Park, Shillong, Meghalaya											
35.	None _____	00042		?	Wild	Wild	????	India Shillong	???? ????	Capture Transfer	
0.0.1 (1)											
Mini Zoo, Miao, Arunachal Pradesh											
36.	Unk5	00043		Female	Wild	Wild	????	India Miao	???? ????	Capture Transfer	
0.1.0 (1)											

Table 3 Historical listing of live Hoolock Gibbon (*Hoolock hoolock*) in Indian Zoos

Sl. No.	Home Name and Transponder No.	National Studbook No.	International Studbook No.	Sex	Sire	Dam	Birth Date	Location	Date	Event	Remarks
1.	Unk6	00001		Male	Unk	Unk	????	Dacca Delhi	???? 6 Apr 1990 20 Feb 1991	Birth Transfer Death	
2.	Unk7	00002		Female	Unk	Unk	~ 1986	Dacca Delhi	~ 1986 6 Apr 1990	Birth Transfer	
3.	Montu	00003		Male	Wild	Wild	????	India Assam	12 Feb 1990 12 Feb 1990	Capture Transfer	
4.	Laxmi	00004		Female	Wild	Wild	~ 1986	India Sepahijala	10 Apr 1996 10 Apr 1996	Capture Transfer	
5.	Buangi	00005		Female	Wild	Wild	????	India Aizawl	6 Mar 2000 6 Mar 2000	Capture Transfer	
6.	Hangi	00006		?	Wild	Wild	????	India Aizawl	???? ???? 19 Jul 2004	Capture Transfer Death	
7.	Te-A	00007		Male	Wild	Wild	????	India Aizawl	???? ???? 31 Dec 2004	Capture Transfer Death	
8.	Vala	00008		?	Wild	Wild	????	India Aizawl	???? ???? 28 Dec 2006	Capture Transfer Death	
9.	Unk1	00009		?	Wild	Wild	????	India Roing	12 May 2001 12 May 2001	Capture Transfer	
10.	Saraswati	00010		Female	Wild	Wild	~ 1999	India Sepahijala	2 Jun 2002 2 Jun 2002	Capture Transfer	
11.	Mary	00011		Female	Wild	Wild	????	India Aizawl	18 Jan 2004 18 Jan 2004	Capture Transfer	
12.	Zovi	00012		Female	Wild	Wild	????	India Aizawl	7 Feb 2004 7 Feb 2004	Capture Transfer	
13.	Buka	00013		Male	Wild	Wild	????	India Aizawl	28 Apr 2005 28 Apr 2005	Capture Transfer	
14.	Manika	00014		Female	Wild	Wild	????	India Sepahijala	13 May 2005 13 May 2005	Capture Transfer	
15.	Mini	00015		Female	Wild	Wild	????	India Assam	27 Jul 2005 27 Jul 2005	Capture Transfer	

Sl. No.	Home Name and Transponder No.	National Studbook No.	International Studbook No.	Sex	Sire	Dam	Birth Date	Location	Date	Event	Remarks
16.	Bawiha	00016		Male	Wild	Wild	????	India Aizawl	5 Feb 2006 5 Feb 2006	Capture Transfer	
17.	Unk3	00017		Male	Wild	Wild	????	India Tura	8 Sep 2005 8 Sep 2005 28 Jun 2006	Capture Transfer Death	
18.	Nutei	00018		Female	Wild	Wild	????	India Aizawl	6 Feb 2006 6 Feb 2006	Capture Transfer	
19.	Unk	00019		Female	Wild	Wild	????	India Tura	31 Mar 2006 31 Mar 2006 24 Sep 2006	Capture Transfer Death	
20.	Duma	00020		Male	Wild	Wild	????	India Aizawl	25 Sep 2006 25 Sep 2006	Capture Transfer	
21.	Bankawia	00021		Male	Wild	Wild	????	India Aizawl	12 Oct 2006 12 Oct 2006	Capture Transfer	
22.	Linggi	00022		Male	Wild	Wild	????	India Itanagar	12 Mar 2007 12 Mar 2007	Capture Transfer	
23.	Dello	00023		Female	Wild	Wild	????	India Itanagar	12 Mar 2007 12 Mar 2007	Capture Transfer	
24.	Yasum	00024		Female	Wild	Wild	????	India Itanagar	12 Mar 2007 12 Mar 2007	Capture Transfer	
25.	Baby	00025		Male	Wild	Wild	????	India Itanagar	12 Mar 2007 12 Mar 2007	Capture Transfer	
26.	Lagder	00026		Male	Wild	Wild	????	India Itanagar	15 Mar 2007 15 Mar 2007	Capture Transfer	
27.	Rukmini	00027		Female	Wild	Wild	????	India Itanagar	15 Mar 2007 15 Mar 2007	Capture Transfer	
28.	Nega	00028		Male	00026	00027	????	India Itanagar	???? 15 Mar 2007	Birth Transfer	
29.	10/H/0 5	00029		Male	Wild	Wild	4 Dec 2005	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	
30.	Yapa	00030		Female	Wild	Wild	????	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	
31.	Mithum	00031		Male	Wild	Wild	????	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	
32.	Taping	00032		Male	Wild	Wild	????	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	

Sl. No.	Home Name and Transponder No.	National Studbook No.	International Studbook No.	Sex	Sire	Dam	Birth Date	Location	Date	Event	Remarks
33.	Pintu	00033		Male	Wild	Wild	????	India Itanagar	4 Dec 2007 4 Dec 2007	Capture Transfer	
34.	Deomali	00034		Male	Wild	Wild	????	India Itanagar	20 Jan 2008 20 Jan 2008	Capture Transfer	
35.	Unk4	00035		Male	Wild	Wild	????	India Tura	21 Jan 2008 16 Feb 2008 16 Feb 2008	Capture Transfer Death	
36.	Narayan	00036		Male	Wild	Wild	????	India Sepahijala	22 Feb 2008 22 Feb 2008	Capture Transfer	
37.	Cute	00037		Male	Wild	Wild	????	India Itanagar	23 Feb 2008 23 Feb 2008	Capture Transfer	
38.	Mishmi	00038		Female	Wild	Wild	????	India Itanagar	23 Feb 2008 23 Feb 2008	Capture Transfer	
39.	Anga	00039		?	00026	00027	5 Jul 2008	Itanagar	5 Jul 2008	Birth	
40.	Jimmy	00040		?	00028	00024	22 Sep 2008	Itanagar	22 Sep 2008	Birth	
41.	Seni	00041		?	Wild	Wild	????	India Aizawl	???? ????	Capture Transfer	
42.	None _____	00042		?	Wild	Wild	????	India Shillong	???? ????	Capture Transfer	
43.	Unk5	00043		Female	Wild	Wild	????	India Miao	???? ????	Capture Transfer	

Totals: 20.16.7 (43)

Population planning and recommendations

The genetic summary of the captive Hoolock gibbon population in Indian zoos is presented in table 4. Though the population is characterized by its high potential to be a viable population, very little breeding has actually occurred.

Table 4 Genetic summary of the captive hoolock gibbon population

	Current	*Potential*
Founders	3	29
fge	1.64	32.00
Founder Genomes	2.00	32.00
Surviving		
GD	0.6944	0.9844
GV	0.0000	
MK	0.3056	
Mean F	0.0000	
Percent Known	75.0	

Genetic Diversity (GD) The heterozygosity expected in a population if the population were in Hardy-Weinberg equilibrium. Gene diversity is calculated from allele frequencies, and is the heterozygosity expected in progeny produced by random mating. The proportional gene diversity (as a proportion of the wild or source population) is the probability that two alleles from the same locus sampled at random from the population will be identical by descent.

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

Founder Genome Equivalents (fge) The number of equally represented founders with no loss of alleles (retention = 1) that would produce the same gene diversity as that observed in the living, descendant population. Equivalently, the number of animals from the source population that contain the same gene diversity as does the descendant population. The gene diversity of a population is 1 - 1 / (2 * fge). In Goals, FGE is the number of founder genomes that will be incorporated into the population for each new founder added. A fge of .4 means that each new founder only contributed 40% of a founder genome to the population.

The low levels of fecundity may be an outcome of drawbacks in enclosure design or improper feeding regime as hoolock gibbons are primarily an arboreal species spending most of the active time in the canopy layer foraging.

Table 5 Ordered list of mean kinship by sex

Males						Females				
Studbook No.	**Mean Kinship**	**% Known**	**Age**	**Location**		**Studbook No.**	**Mean Kinship**	**% Known**	**Age**	**Location**
00003	0.000	100.0	0	Assam		00002	0.500	0.0	23	Delhi
00009	0.000	100.0	U0	Roing		00004	0.000	100.0	24	Sepahijala
00013	0.000	100.0	0	Aizawl		00005	0.000	100.0	0	Aizawl
00016	0.000	100.0	0	Aizawl		00009	0.000	100.0	U0	Roing
00020	0.000	100.0	0	Aizawl		00010	0.000	100.0	10	Sepahijala
00021	0.000	100.0	0	Aizawl		00011	0.000	100.0	0	Aizawl
00022	0.000	100.0	0	Itanagar		00012	0.000	100.0	0	Aizawl
00025	0.000	100.0	0	Itanagar		00014	0.000	100.0	0	Sepahijala
00026	0.208	100.0	0	Itanagar		00015	0.000	100.0	0	Assam
00028	0.333	100.0	0	Itanagar		00018	0.000	100.0	0	Aizawl
00029	0.000	100.0	4	Itanagar		00023	0.000	100.0	0	Itanagar
00031	0.000	100.0	0	Itanagar		00024	0.083	100.0	0	Itanagar
00032	0.000	100.0	0	Itanagar		00027	0.208	100.0	0	Itanagar
00033	0.000	100.0	0	Itanagar		00030	0.000	100.0	0	Itanagar
00034	0.000	100.0	0	Itanagar		00038	0.000	100.0	0	Itanagar
00036	0.000	100.0	0	Sepahijala		00039	0.292	100.0	U1	Itanagar
00037	0.000	100.0	0	Itanagar		00040	0.292	100.0	U1	Itanagar
00039	0.292	100.0	U1	Itanagar		00041	0.000	100.0	U0	Aizawl
00040	0.292	100.0	U1	Itanagar		00042	0.000	100.0	U0	Shillong
00041	0.000	100.0	U0	Aizawl		00043	0.000	100.0	0	Miao
00042	0.000	100.0	U0	Shillong						

Unsexed individuals and individuals past their prime were excluded from the pairing choices from table 5 while carrying out pairings. The results of pairings are presented in table 6. All the pairs show an inbreeding coefficient of 0.000 indicating no inbreeding would occur as a result of the pairings. Thus it is possible to pair any of the animals. However, while implementing pairings due consideration must be given to mutual compatibility, relocation of animals and formation of social groups.

Table 6 Pairs recommended for breeding

Sire	Dam	Inbreeding coefficient	Sire	Dam	*Inbreeding coefficient*
00013	00005	0.000	00028	00018	*0.000*
00013	00010	0.000	00028	00023	*0.000*
00013	00011	0.000	00028	00024	*0.000*
00013	00012	0.000	00028	00027	*0.250*
00013	00014	0.000	00028	00030	*0.000*
00013	00015	0.000	00028	00038	*0.000*
00013	00018	0.000	00029	00005	*0.000*
00013	00023	0.000	00029	00010	*0.000*
00013	00024	0.000	00029	00011	*0.000*
00013	00027	0.000	00029	00012	*0.000*
00013	00030	0.000	00029	00014	*0.000*
00013	00038	0.000	00029	00015	*0.000*
00016	00005	0.000	00029	00018	*0.000*
00016	00010	0.000	00029	00023	*0.000*

Sire	Dam	Inbreeding coefficient	Sire	Dam	*Inbreeding coefficient*
00016	00011	0.000	00029	00024	*0.000*
00016	00012	0.000	00029	00027	*0.000*
00016	00014	0.000	00029	00030	*0.000*
00016	00015	0.000	00029	00038	*0.000*
00016	00018	0.000	00031	00005	*0.000*
00016	00023	0.000	00031	00010	*0.000*
00016	00024	0.000	00031	00011	*0.000*
00016	00027	0.000	00031	00012	*0.000*
00016	00030	0.000	00031	00014	*0.000*
00016	00038	0.000	00031	00015	*0.000*
00020	00005	0.000	00031	00018	*0.000*
00020	00010	0.000	00031	00023	*0.000*
00020	00011	0.000	00031	00024	*0.000*
00020	00012	0.000	00031	00027	*0.000*
00020	00014	0.000	00031	00030	*0.000*
00020	00015	0.000	00031	00038	*0.000*
00020	00018	0.000	00032	00005	*0.000*
00020	00023	0.000	00032	00010	*0.000*
00020	00024	0.000	00032	00011	*0.000*
00020	00027	0.000	00032	00012	*0.000*
00020	00030	0.000	00032	00014	*0.000*
00020	00038	0.000	00032	00015	*0.000*
00021	00005	0.000	00032	00018	*0.000*
00021	00010	0.000	00032	00023	*0.000*
00021	00011	0.000	00032	00024	*0.000*
00021	00012	0.000	00032	00027	*0.000*
00021	00014	0.000	00032	00030	*0.000*
00021	00015	0.000	00032	00038	*0.000*
00021	00018	0.000	00033	00005	*0.000*
00021	00023	0.000	00033	00010	*0.000*
00021	00024	0.000	00033	00011	*0.000*
00021	00027	0.000	00033	00012	*0.000*
00021	00030	0.000	00033	00014	*0.000*
00021	00038	0.000	00033	00015	*0.000*
00022	00005	0.000	00033	00018	*0.000*
00022	00010	0.000	00033	00023	*0.000*
00022	00011	0.000	00033	00024	*0.000*
00022	00012	0.000	00033	00027	*0.000*
00022	00014	0.000	00033	00030	*0.000*
00022	00015	0.000	00033	00038	*0.000*
00022	00018	0.000	00034	00005	*0.000*
00022	00023	0.000	00034	00010	*0.000*
00022	00024	0.000	00034	00011	*0.000*
00022	00027	0.000	00034	00012	*0.000*
00022	00030	0.000	00034	00014	*0.000*
00022	00038	0.000	00034	00015	*0.000*
00025	00005	0.000	00034	00018	*0.000*
00025	00010	0.000	00034	00023	*0.000*
00025	00011	0.000	00034	00024	*0.000*
00025	00012	0.000	00034	00027	*0.000*
00025	00014	0.000	00034	00030	*0.000*

Sire	Dam	Inbreeding coefficient	Sire	Dam	*Inbreeding coefficient*
00025	00015	0.000	00034	00038	*0.000*
00025	00018	0.000	00036	00005	*0.000*
00025	00023	0.000	00036	00010	*0.000*
00025	00024	0.000	00036	00011	*0.000*
00025	00027	0.000	00036	00012	*0.000*
00025	00030	0.000	00036	00014	*0.000*
00025	00038	0.000	00036	00015	*0.000*
00026	00005	0.000	00036	00018	*0.000*
00026	00010	0.000	00036	00023	*0.000*
00026	00011	0.000	00036	00024	*0.000*
00026	00012	0.000	00036	00027	*0.000*
00026	00014	0.000	00036	00030	*0.000*
00026	00015	0.000	00036	00038	*0.000*
00026	00018	0.000	00037	00005	*0.000*
00026	00023	0.000	00037	00010	*0.000*
00026	00024	0.000	00037	00011	*0.000*
00026	00027	0.000	00037	00012	*0.000*
00026	00030	0.000	00037	00014	*0.000*
00026	00038	0.000	00037	00015	*0.000*
00028	00005	0.000	00037	00018	*0.000*
00028	00010	0.000	00037	00023	*0.000*
00028	00011	0.000	00037	00024	*0.000*
00028	00012	0.000	00037	00027	*0.000*
00028	00014	0.000	00037	00030	*0.000*
00028	*00015*	*0.000*	*00037*	*00038*	0.000

Inbreeding Coefficient (F) – It is the probability that the two alleles at a genetic locus are identical by descent from an ancestor common to both parents. The mean inbreeding coefficient of a population will be the proportional decrease in observed heterozygosity relative to the expected heterozygosity of the founder population.

The goals report could not be run in PM2000 as most of the individuals are of unknown age and fecundity of both males and females is very low.

Demography

Census

Census report obtained from PM2000 for captive Hoolock gibbon in Indian zoos is presented in table 7 and shows a low level of captive births throughout the history of the species in captivity. The larger part of the captive population comprises of individuals of wild origin, who have the potential to contribute to the population but are yet to do so.

Table 7 Census of captive population of Hoolock gibbon in Indian zoos

Year	Total	Males	Females	Unsexed	Wild Born	Captive Born
1986	1	0	1	0	0	1
1987	1	0	1	0	0	1
1988	1	0	1	0	0	1
1989	1	0	1	0	0	1
1990	3	2	1	0	1	2
1991	2	1	1	0	1	1
1992	2	1	1	0	1	1
1993	2	1	1	0	1	1
1994	2	1	1	0	1	1
1995	2	1	1	0	1	1
1996	3	1	2	0	2	1
1997	3	1	2	0	2	1
1998	3	1	2	0	2	1
1999	3	1	2	0	2	1
2000	4	1	3	0	3	1
2001	5	1	3	1	4	1
2002	6	1	4	1	5	1
2003	6	1	4	1	5	1
2004	8	1	6	1	7	1
2005	12	3	8	1	11	1
2006	15	5	9	1	14	1
2007	27	13	13	1	25	2
2008	33	16	14	3	29	4

Life table

A perusal of table 7 reveals poor fecundity (Mx) levels for both males and females. None of the births occurring in the captive population could be attributed to known age individuals. The absence of known age individuals also makes it difficult to arrive on any value for the various demographic parameters. The various variables listed in table 7 are described in box below.

Table 8 Life table of hoolock gibbon in captivity in Indian zoos

CLASS	MX MALE	NMXM	MX FEMALE	NMXF	QX MALE	NQXM	QX FEMALE	NQXF	PX MALE	LX MALE	PX FEMALE	LX FEMALE
1	0	1	0	2	0	1	0	2	1	1	1	1
2	0	0.3	0	1.3	0	0.3	0	1.3	1	1	1	1
3	0	1	0	1	0	1	0	1	1	1	1	1
4	0	0.99	0	2	0	0.99	0	2	1	1	1	1
5	0	0	0	2	0	0	0	2	1	1	1	1
6	0	0	0	2	0	0	0	2	1	1	1	1
7	0	0	0	2	0	0	0	2	1	1	1	1

CLASS	MX MALE	NMXM	MX FEMALE	NMXF	QX MALE	NQXM	QX FEMALE	NQXF	PX MALE	LX MALE	PX FEMALE	LX FEMALE
8	0	0	0	2	0	0	0	2	1	1	1	1
9	0	0	0	2	0	0	0	2	1	1	1	1
10	0	0	0	2	0	0	0	2	1	1	1	1
11	0	0	0	2.5	0	0	0	2.5	1	1	1	1
12	0	0	0	2	0	0	0	2	1	1	1	1
13	0	0	0	2	0	0	0	2	1	1	1	1
14	0	0	0	2	0	0	0	2	1	1	1	1
15	0	0	0	2	0	0	0	2	1	1	1	1
16	0	0	0	2	0	0	0	2	1	1	1	1
17	0	0	0	2	0	0	0	2	1	1	1	1
18	0	0	0	2	0	0	0	2	1	1	1	1
19	0	0	0	2	0	0	0	2	1	1	1	1
20	0	0	0	2	0	0	0	2	1	1	1	1
21	0	0	0	2	0	0	0	2	1	1	1	1
22	0	0	0	2	0	0	0	2	1	1	1	1
23	0	0	0	2	0	0	0	2	1	1	1	1
24	0	0	0	1.14	0	0	0	1.14	1	1	1	1
25	0	0	0	0	0	0	0	0	1	1	1	1
0	0	0	0	0	0	0	0	0	1	1	1	1

Males	Females
T = 0	T = 0
Ro = 0.000	Ro = 0.000
λ = 0.000	λ =0.000
r = 0.000	r = -0.000

Gestation Period: 203 days
(0 deaths out of 2 arriving within 30 days of birth date)
37 specimens of unknown age ignored.
0 birth events to known age parents tabulated for Mx.
(Average of 0 births to female parents and 0 births to male parents.)
0 death events with known age tabulated for Qx...

Fecundity Rate [Mx] The average number of same-sexed young born to animals in that age class. The fecundity rates provide information on the age of first, last, and maximum reproduction.

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

Generation Length [T] defined as the average age at which a female (or male) produces offspring. It is not the age of first reproduction. Males and females often have different generation lengths.

Net Reproductive Rate [Ro] if each animal were to replace itself each generation, the net reproductive rate would be 1.00 and the population would remain the same size. A growing population has an Ro greater than 1.0 and a declining population less than 1.0.

Growth Rate per Year [lambda] a year growth rate of 1.11 means a 11% per year increase.

Intrinsic Rate of Increase [r] the exponential rate at which a population with a stable age distribution grows.

Age structure

Table 9 and figure 3 present the age structure of the population. The values below actual and stable for males and females refers to the current hoolock gibbon captive population values and modeled population for maintaining a stable population respectively. They also suggest the number of individuals of both sexes in each age class required to maintain a demographically stable population at the current population size of known age individuals.

Table 9 Age structure of captive hoolock gibbon in Indian zoos

	Males		Females	
Age(x)	Actual	Stable	Actual	Stable
0	0	0.44	0	0.16
1	1	0.44	1	0.16
2	0	0.44	0	0.16
3	0	0.44	0	0.16
4	1	0.22	0	0.16
5	0	0.00	0	0.16
6	0	0.00	0	0.16
7	0	0.00	0	0.16
8	0	0.00	0	0.16
9	0	0.00	0	0.16
10	0	0.00	1	0.16
11	0	0.00	0	0.16
12	0	0.00	0	0.16
13	0	0.00	0	0.16
14	0	0.00	0	0.16
15	0	0.00	0	0.16
16	0	0.00	0	0.16
17	0	0.00	0	0.16
18	0	0.00	0	0.16
19	0	0.00	0	0.16
20	0	0.00	0	0.16
21	0	0.00	0	0.16
22	0	0.00	0	0.16
23	0	0.00	1	0.16
24	0	0.00	1	0.08
25	0	0.00	0	0.00

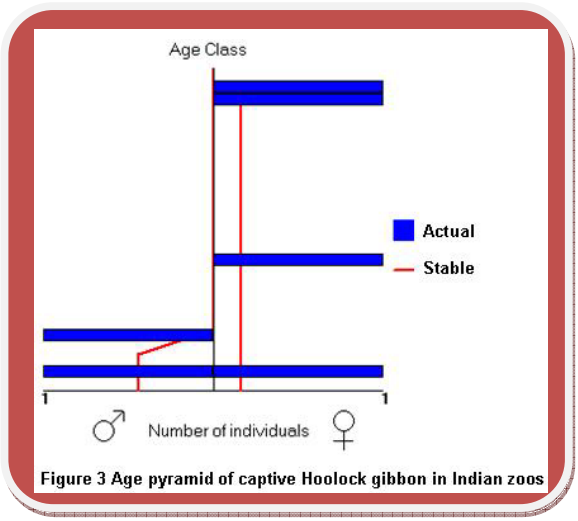

Figure 3 Age pyramid of captive Hoolock gibbon in Indian zoos

Population summary

Total Males	18.5
Total Females	17.5
Unknown Age Males	16.5
Unknown Age Females	13.5

Population projections

Population projections for the captive Hoolock gibbon population in Indian zoos was generated using PM2000 with the objective of achieving a population of 100 demographically viable individuals over the next 10 years and subsequent maintenance of this population at a level of 100 individuals for further 10 years. Table 10 summarizes

the number of births and pairs required each year for achieving this objective. Summary of the number of births and the number of individuals required in each age class over the next 20 years is presented in table 11 and figure 4.

Table 10 Births and pairs required for maintaining a stable population

Year	# Births	# Pairs
0	18.87239	37.7
1	7.288929	14.6
2	7.750271	15.5
3	8.261242	16.5
4	10.54527	21.1
5	12.99431	26.0
6	10.90802	21.8
7	11.92	23.8
8	13.47037	26.9
9	15.59683	31.2
10	5.975581	12.0

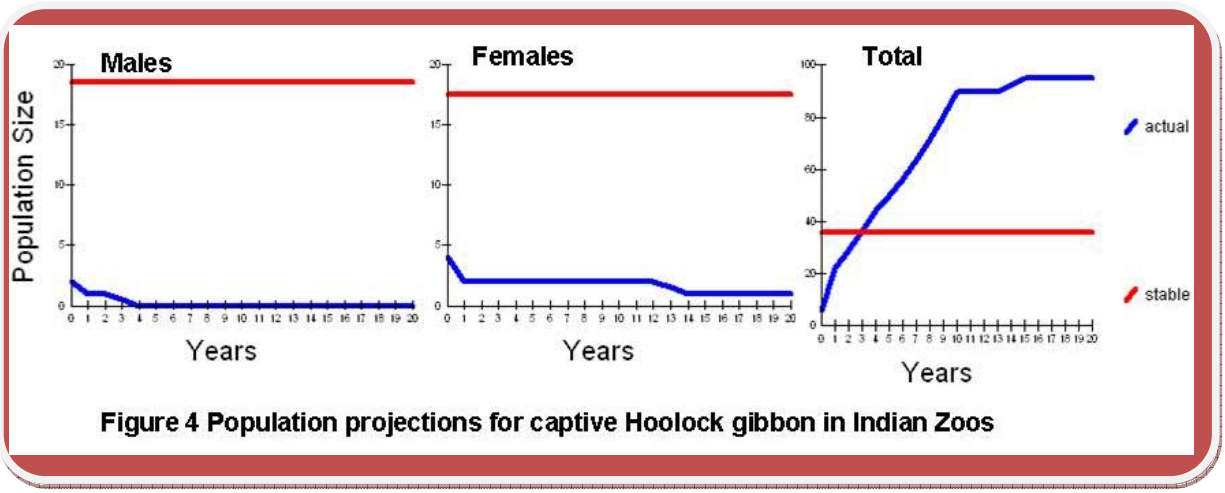

Figure 4 Population projections for captive Hoolock gibbon in Indian Zoos

Table 11 Population projections for the captive Hoolock gibbon population in Indian zoos

Years		0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00
# Born		0.00	18.87	7.29	7.75	8.26	10.55	12.99	10.91	11.92	13.47	15.60	5.98	5.71	6.35	10.27	8.39	2.92	3.01	4.15	4.66	2.83
Age Class	0.00	0.00	18.87	7.29	7.75	8.26	10.55	12.99	10.91	11.92	13.47	15.60	5.98	5.71	6.35	10.27	8.39	2.92	3.01	4.15	4.66	2.83
	1.00	2.00	0.00	18.87	7.29	7.75	8.26	10.55	12.99	10.91	11.92	13.47	15.60	5.98	5.71	6.35	10.27	8.39	2.92	3.01	4.15	4.66
	2.00	0.00	2.00	0.00	18.87	7.29	7.75	8.26	10.55	12.99	10.91	11.92	13.47	15.60	5.98	5.71	6.35	10.27	8.39	2.92	3.01	4.15
	3.00	0.00	0.00	2.00	0.00	18.87	7.29	7.75	8.26	10.55	12.99	10.91	11.92	13.47	15.60	5.98	5.71	6.35	10.27	8.39	2.92	3.01
	4.00	1.00	0.00	0.00	1.50	0.00	14.15	5.47	5.81	6.20	7.91	9.75	8.18	8.94	10.10	11.70	4.48	4.28	4.76	7.70	6.29	2.19
	5.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45	5.96	6.74	7.80	2.99	2.85	3.17	5.13	4.20
	6.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45	5.96	6.74	7.80	2.99	2.85	3.17	5.13
	7.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45	5.96	6.74	7.80	2.99	2.85	3.17
	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45	5.96	6.74	7.80	2.99	2.85
	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45	5.96	6.74	7.80	2.99
	10.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45	5.96	6.74	7.80
	11.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45	5.96	6.74
	12.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45	5.96
	13.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50	5.45
	14.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27	6.50
	15.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13	5.27
	16.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88	4.13
	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64	3.88
	18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44	3.64
	19.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	9.44
	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
	21.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	23.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	24.00	1.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00
	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**6.00**	**22.37**	**29.16**	**36.41**	**44.17**	**50.00**	**56.45**	**63.60**	**71.52**	**80.29**	**90.00**	**90.00**	**90.00**	**90.00**	**92.50**	**95.00**	**95.00**	**95.00**	**95.00**	**95.00**	**95.00**

Genetics

Table 4 summarizes the genetic values of the captive population of Hoolock gibbon in Indian zoos. The current values refer to the existing values of genetic variables whereas the potential values refer to hypothetical values if all individuals in the population contribute equally to the population. The captive Hoolock gibbon population comprises largely of wild origin individuals and if all individuals contribute to the population the genetic viability would be much more enhanced then compared to the existing population.

Founder statistics

Table 12 summarizes the founder statistics of the captive Hoolock gibbon population in Indian zoos. As yet only 2 females (00024 and 00027) and one male (00026) have contributed their genes to the captive population. The remaining individuals have yet to make any genetic contribution to the population.

Table 12 Founder statistics of hoolock gibbon in Indian zoos

Studbook#	Sex	Age	Representation	Contribution	Allele Retent.	Potential Ret.	Descendants
00003	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00005	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00009	U	-1	0.0000	0.0000	0.0000	1.0000	0.00
00011	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00012	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00013	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00014	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00015	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00016	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00018	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00020	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00021	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00022	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00023	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00024	F	-1	0.1667	0.5000	0.5000	1.0000	1.00
00025	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00026	M	-1	0.4167	1.2500	0.7410	1.0000	3.00
00027	F	-1	0.4167	1.2500	0.7605	1.0000	3.00
00030	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00031	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00032	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00033	M	-1	0.0000	0.0000	0.0000	1.0000	0.00

Studbook#	Sex	Age	Representation	Contribution	Allele Retent.	Potential Ret.	Descendants
00034	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00036	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00037	M	-1	0.0000	0.0000	0.0000	1.0000	0.00
00038	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00041	U	-1	0.0000	0.0000	0.0000	1.0000	0.00
00042	U	-1	0.0000	0.0000	0.0000	1.0000	0.00
00043	F	-1	0.0000	0.0000	0.0000	1.0000	0.00
00004	F	24	0.0000	0.0000	0.0000	1.0000	0.00
00010	F	10	0.0000	0.0000	0.0000	1.0000	0.00
00029	M	4	0.0000	0.0000	0.0000	1.0000	0.00

Table 13 summarizes the genetics of live individuals in the captive population. All individuals are characterized by low MK.

Table 13 Genetic summary of the living hoolock gibbon population in Indian zoos

Stud Book #	Sex	Sire	Dam	Age	Location	Vx	% Known	F	MK	KV	GU-All	GU - Descend	Prob Lost	FOKE	# Offspring	Local ID
00003	Male	Wild	Wild	0	Assam	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Montu
00005	Female	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Buangi
00009	Unsexed	Wild	Wild	0	Roing	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Unk1
00011	Female	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Mary
00012	Female	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Zovi
00013	Male	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Buka
00014	Female	Wild	Wild	0	Sepahijala	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Manika
00015	Female	Wild	Wild	0	Assam	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Mini
00016	Male	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Bawiha
00018	Female	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Nutei
00020	Male	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Duma
00021	Male	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Bankawia
00022	Male	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Linggi
00023	Female	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Dello
00024	Female	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0833	0.0000	0.5000	-1.0000	1.0000	1.00	1	Yasum
00025	Male	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Baby
00026	Male	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.2083	0.0000	0.2590	-1.0000	1.0000	2.50	2	Lagder
00027	Female	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.2083	0.0000	0.2395	-1.0000	1.0000	2.50`	2	Rukmini
00030	Female	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Yapa
00031	Male	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Mithum
00032	Male	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Taping
00033	Male	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Pintu
00034	Male	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Deomali
00036	Male	Wild	Wild	0	Sepahijala	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Narayan
00037	Male	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Cute
00038	Female	Wild	Wild	0	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Mishmi
00041	Unsexed	Wild	Wild	0	Aizawl	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Seni
00042	Unsexed	Wild	Wild	0	Shillong	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	_____
00043	Female	Wild	Wild	0	Miao	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Unk5
00004	Female	Wild	Wild	24	Sepahijala	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Laxmi
00002	Female	Unk	Unk	23	Delhi	---	---	---	---	---	---	---	---	---	0	Unk7
00010	Female	Wild	Wild	10	Sepahijala	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	Saraswati
00029	Male	Wild	Wild	4	Itanagar	0.00	100.0	0.0000	0.0000	0.0000	1.0000	-1.0000	1.0000	0.00	0	10/H/05
00028	Male	00026	00027	0	Itanagar	0.00	100.0	0.0000	0.3333	0.0000	0.0000	0.2585	1.0000	4.00	1	Nega
00039	Unsexed	00026	00027	1	Itanagar	0.00	100.0	0.0000	0.2917	0.0000	0.0000	0.5015	1.0000	3.50	0	Anga
00040	Unsexed	00028	00024	1	Itanagar	0.00	100.0	0.0000	0.2917	0.0000	0.0000	0.5000	1.0000	3.50	0	Jimmy

The inbreeding report was run in PM2000 and is presented in table 14. The present population has no inbreeding depression in it as a large part of the population is of wild origin.

Table 14 Inbreeding statistics of the captive hoolock gibbon in Indian zoos

Studbook #	Sex	Age	Location	% Known	F
00001	Male	0	Delhi	0	0.0000
00002	Female	23	Delhi	0.0	0.0000
00003	Male	0	Assam	100.0	0.0000
00004	Female	24	Sepahijala	100.0	0.0000
00005	Female	0	Aizawl	100.0	0.0000
00006	Unsexed	0	Aizawl	100.0	0.0000
00007	Male	0	Aizawl	100.00	0.0000
00008	Unsexed	0	Aizawl	100.0	0.0000
00009	Unsexed	0	Roing	100.0	0.0000
00010	Female	10	Sepahijala	100.0	0.0000
00011	Female	0	Aizawl	100.0	0.0000
00012	Female	0	Aizawl	100.0	0.0000
00013	Male	0	Aizawl	100.0	0.0000
00014	Female	0	Sepahijala	100.0	0.0000
00015	Female	0	Assam	100.0	0.0000
00016	Male	0	Aizawl	100.0	0.0000
00017	Male	0	Tura	100.0	0.0000
00018	Female	0	Aizawl	100.0	0.0000
00019	Female	0	Tura	100.0	0.0000
00020	Male	0	Aizawl	100.0	0.0000
00021	Male	0	Aizawl	100.0	0.0000
00022	Male	0	Itanagar	100.0	0.0000
00023	Female	0	Itanagar	100.0	0.0000
00024	Female	0	Itanagar	100.0	0.0000
00025	Male	0	Itanagar	100.0	0.0000
00026	Male	0	Itanagar	100.0	0.0000
00027	Female	0	Itanagar	100.0	0.0000
00028	Male	0	Itanagar	100.0	0.0000
00029	Male	4	Itanagar	100.0	0.0000
00030	Female	0	Itanagar	100.0	0.0000
00031	Male	0	Itanagar	100.0	0.0000
00032	Male	0	Itanagar	100.0	0.0000
00033	Male	0	Itanagar	100.0	0.0000
00034	Male	0	Itanagar	100.0	0.0000
00035	Male	0	Tura	100.0	0.0000
00036	Male	0	Sepahijala	100.0	0.0000
00037	Male	0	Itanagar	100.0	0.0000
00038	Female	0	Itanagar	100.0	0.0000
00039	Unsexed	1	Itanagar	100.0	0.0000
00040	Unsexed	0	Itanagar	100.0	0.0000
00041	Unsexed	0	Aizawl	100.0	0.0000
00042	Unsexed	0	Shillong	100.0	0.0000
00043	Female	0	Miao	100.0	0.0000

Conclusion

Hoolock gibbons are small arboreal apes inhabiting mixed deciduous and evergreen forests in north-eastern India, Bangladesh and Myanmar. They have been classified as endangered in the 2009 IUCN Red List and are also in the list of 25 most threatened primates of the world. They are monogamous animals living in small family groups.
In captivity the species is found in seven zoos in the country with a population size of only 40 individuals.

The species has a poor breeding history in captivity in Indian zoos. However, the species has a number of animals which have the potential to contribute their genes to the captive population. The individuals in captivity have no inbreeding depression as yet and even if a significant part of the potential captive population can be utilized for conservation breeding, the population has the potential to achieve demographic stability and genetic viability, thereby achieving the goals of any conservation breeding effort.

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Appendix I

Pedigree Chart Report Hoolock Gibbon Studbook

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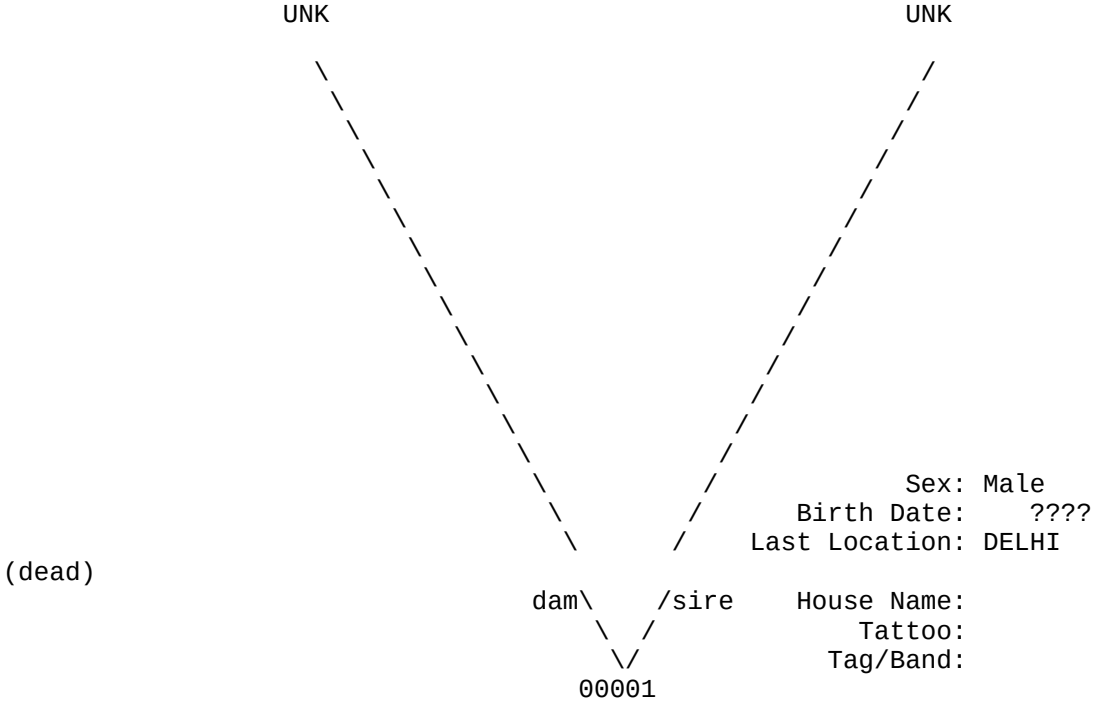

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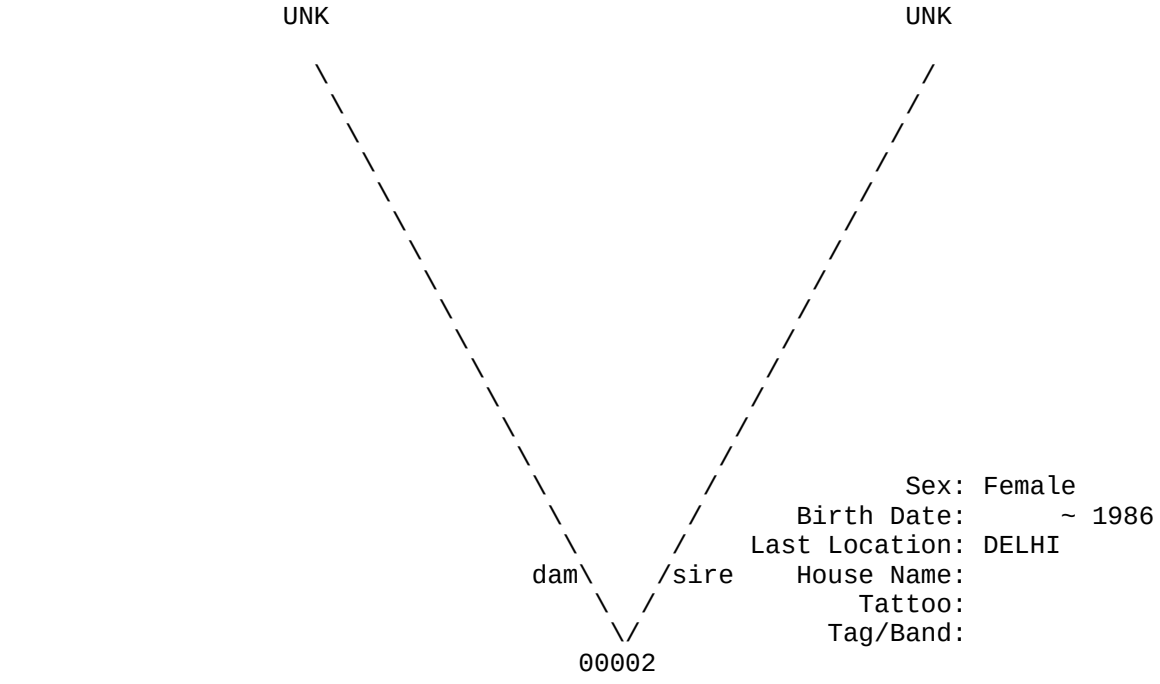

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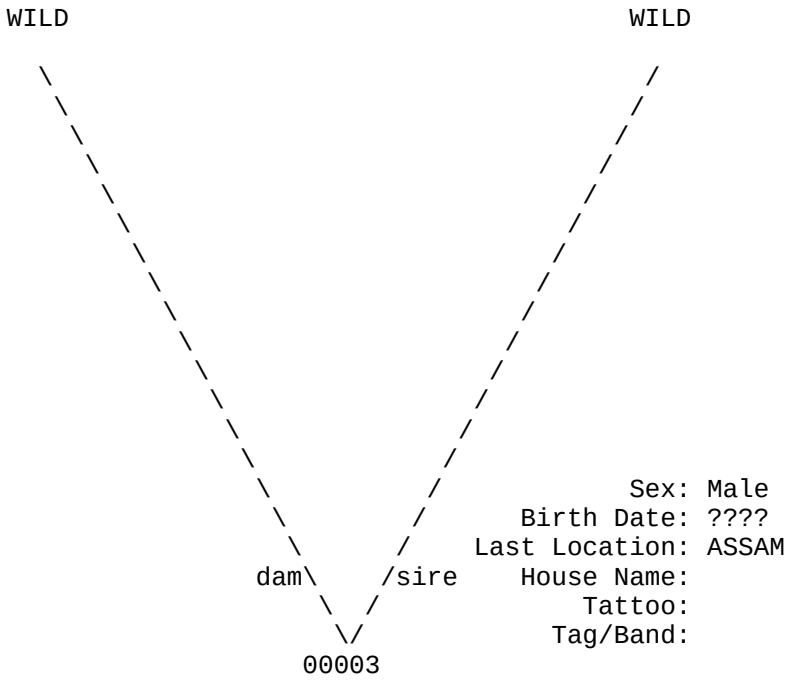

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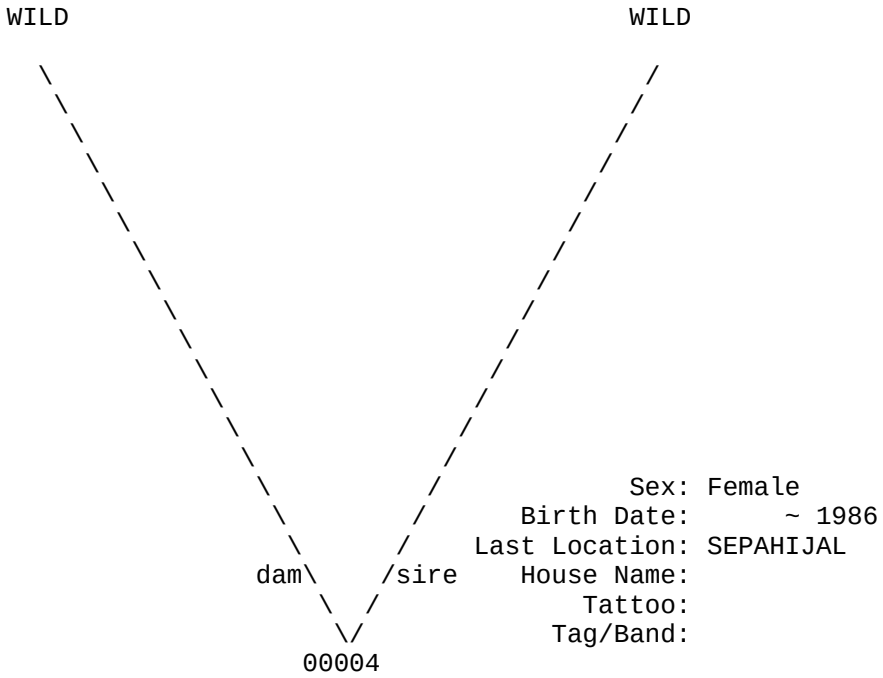

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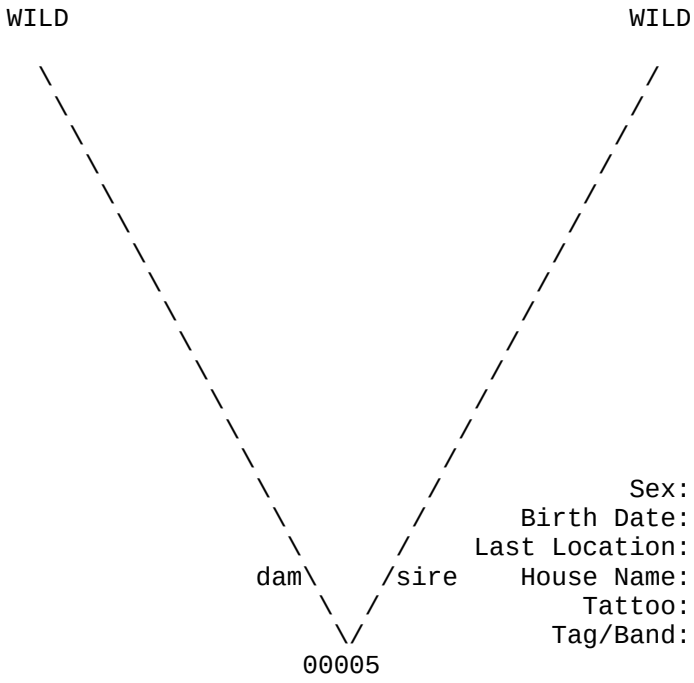

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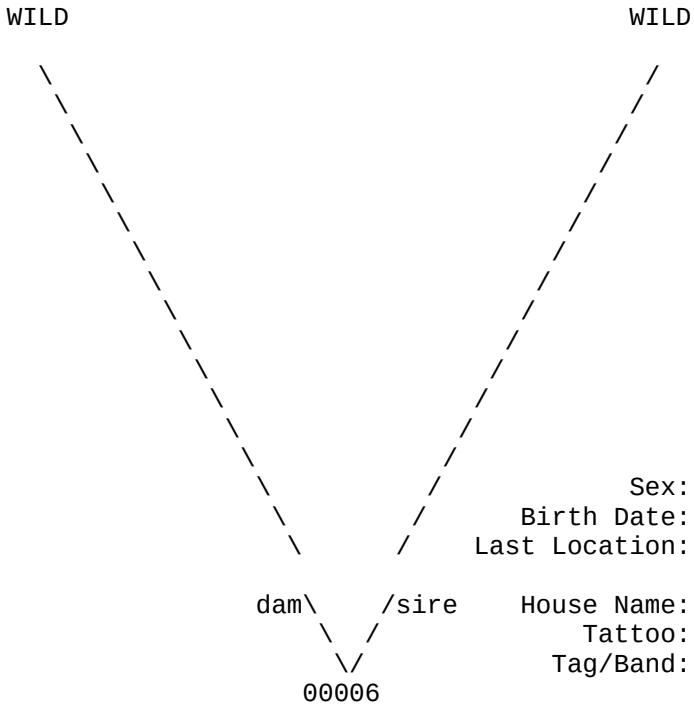

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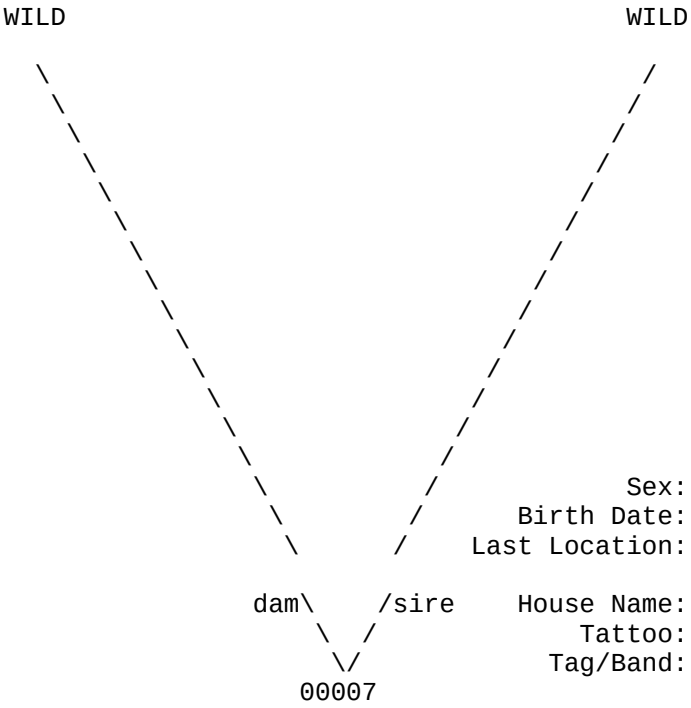

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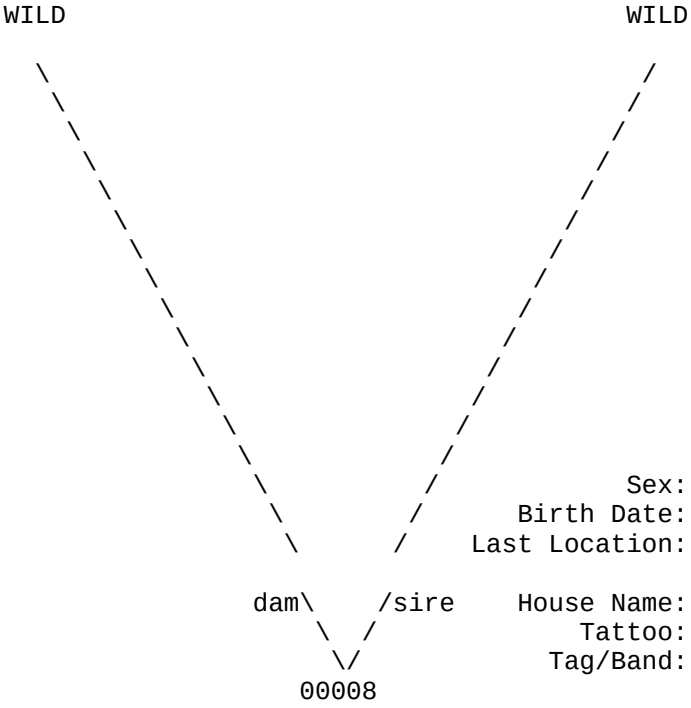

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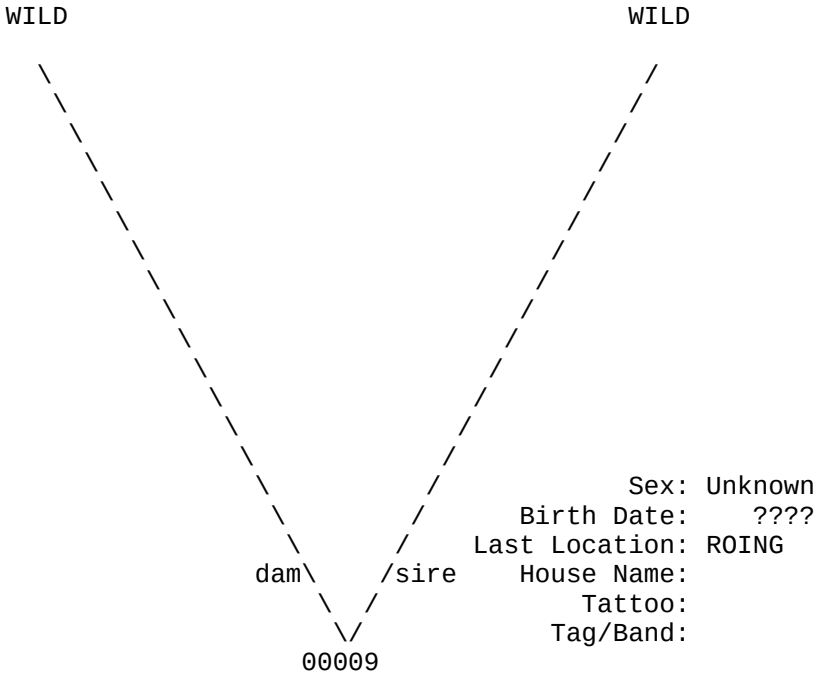

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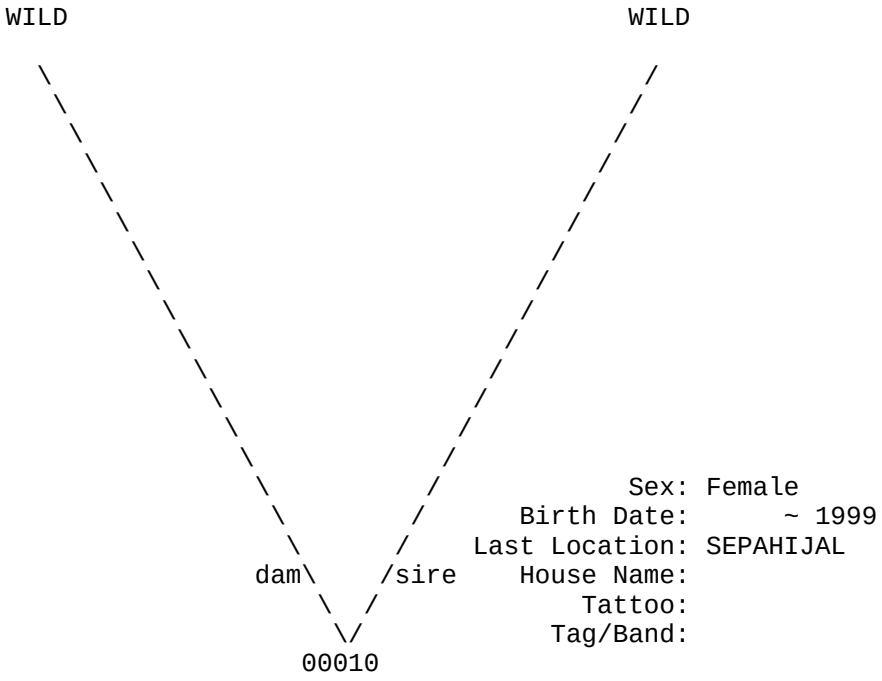

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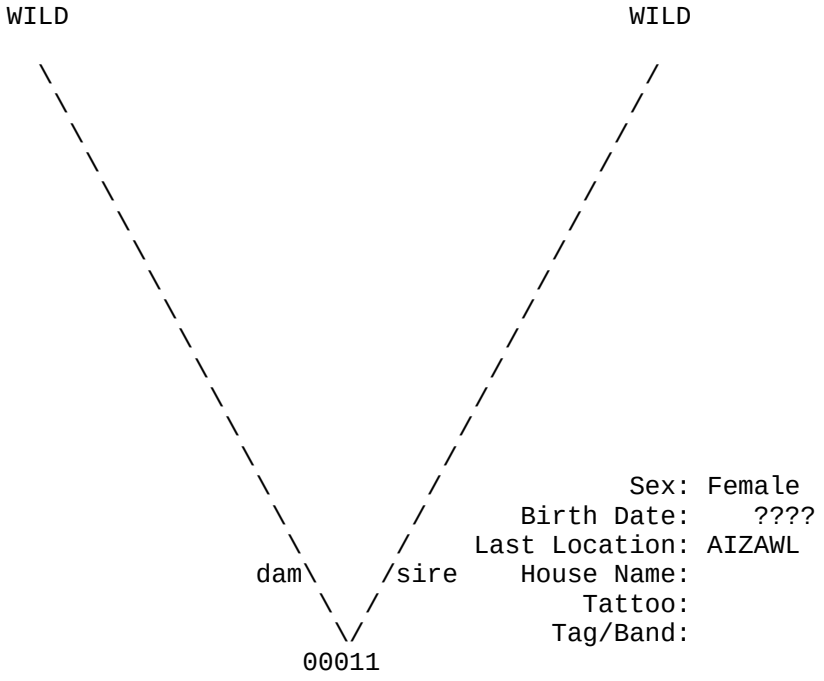

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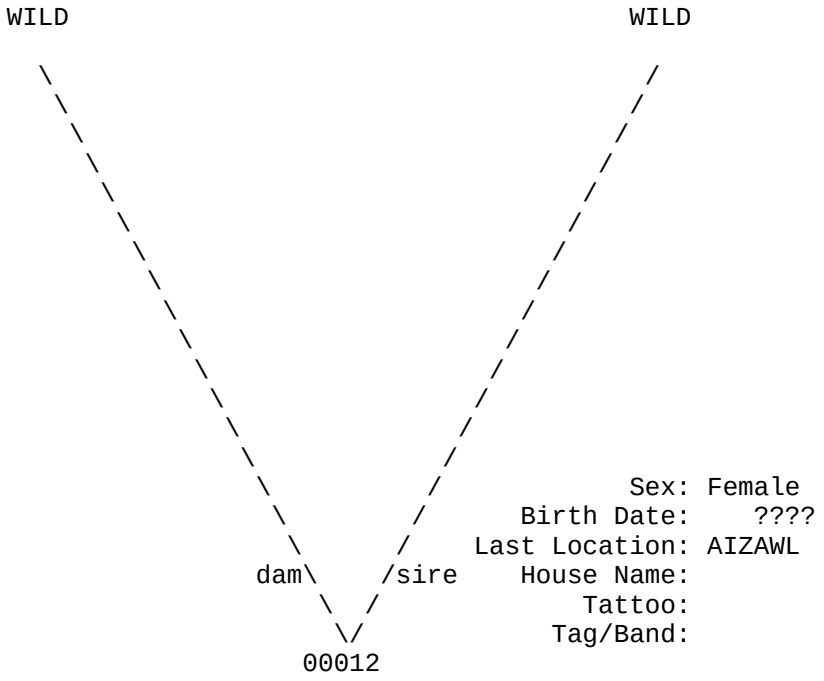

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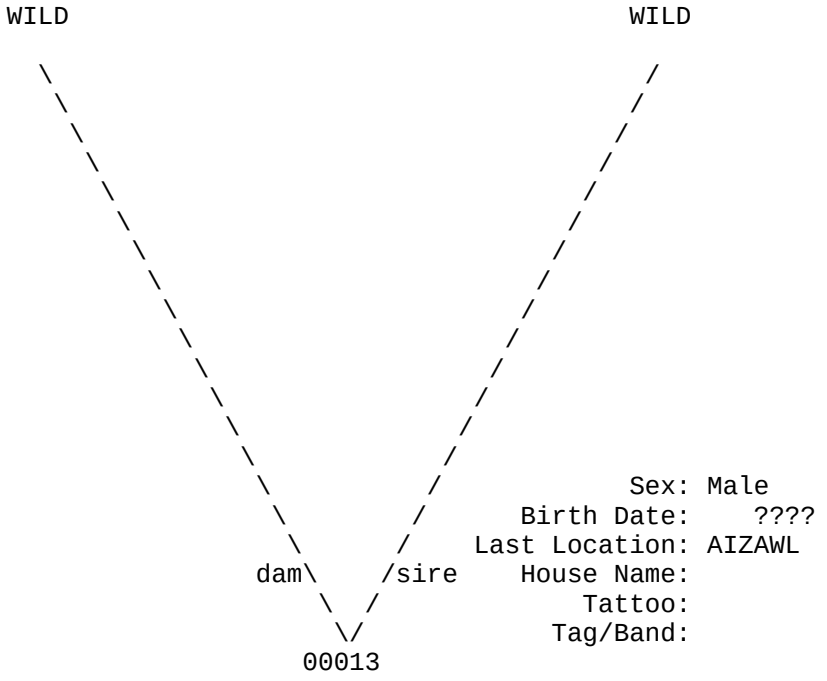

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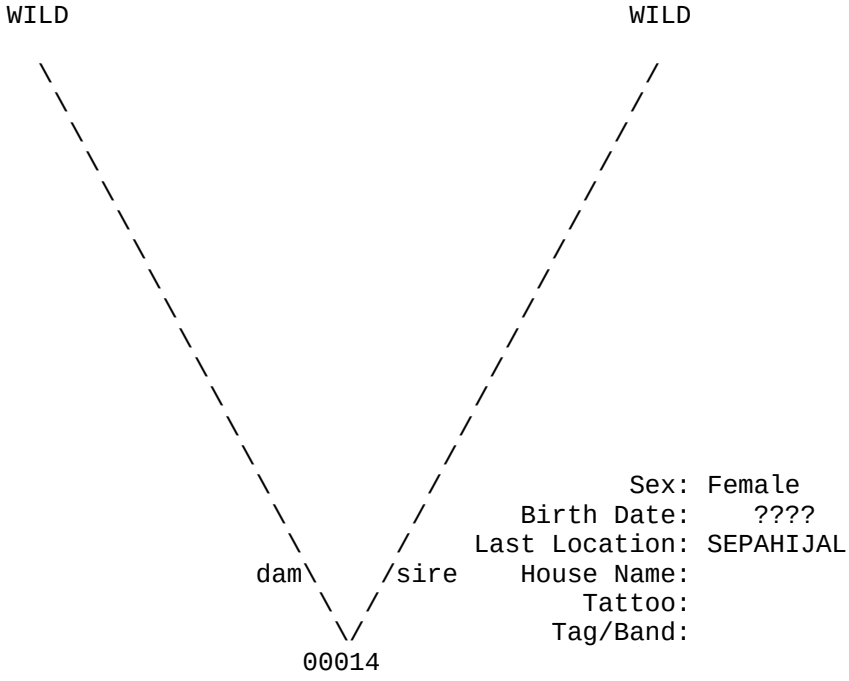

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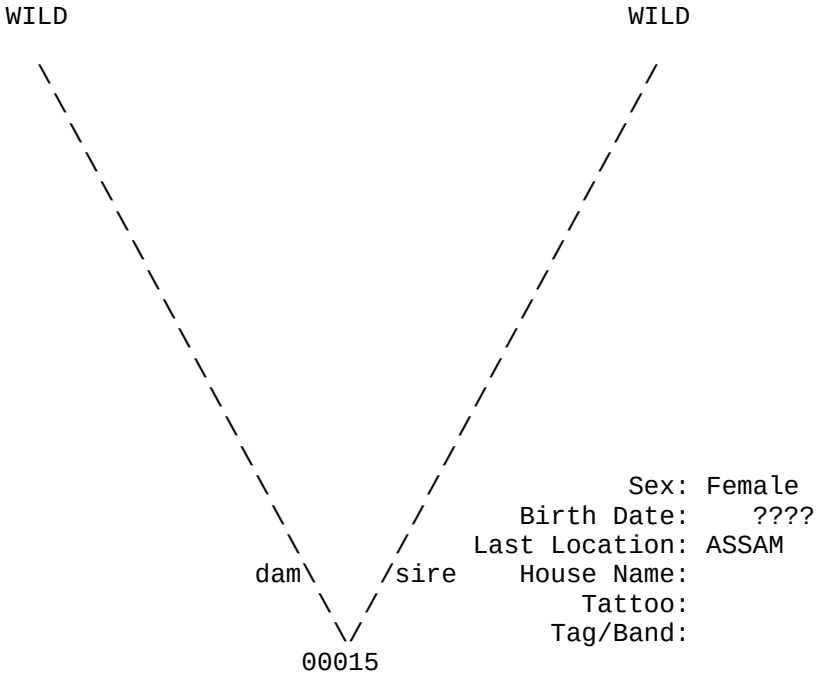

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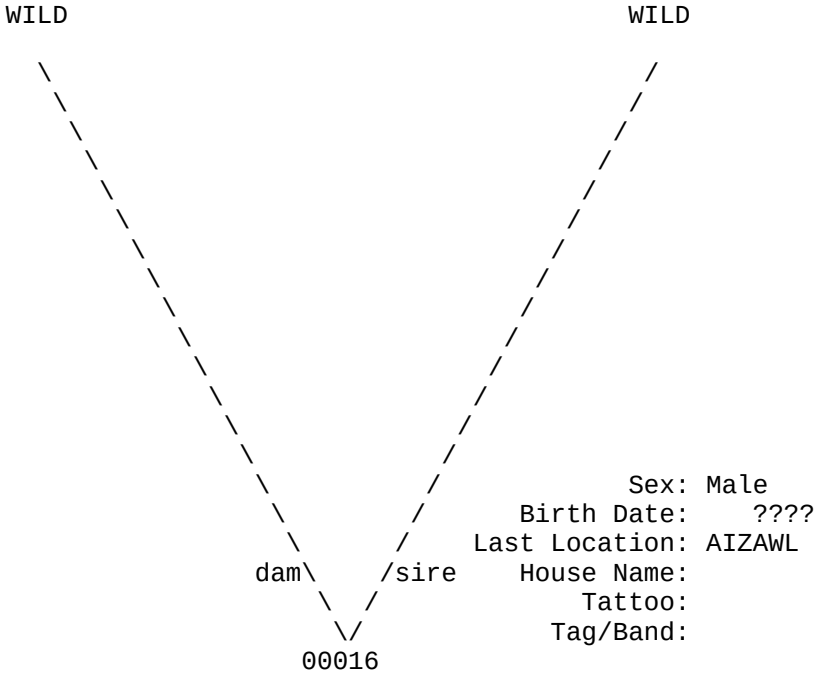

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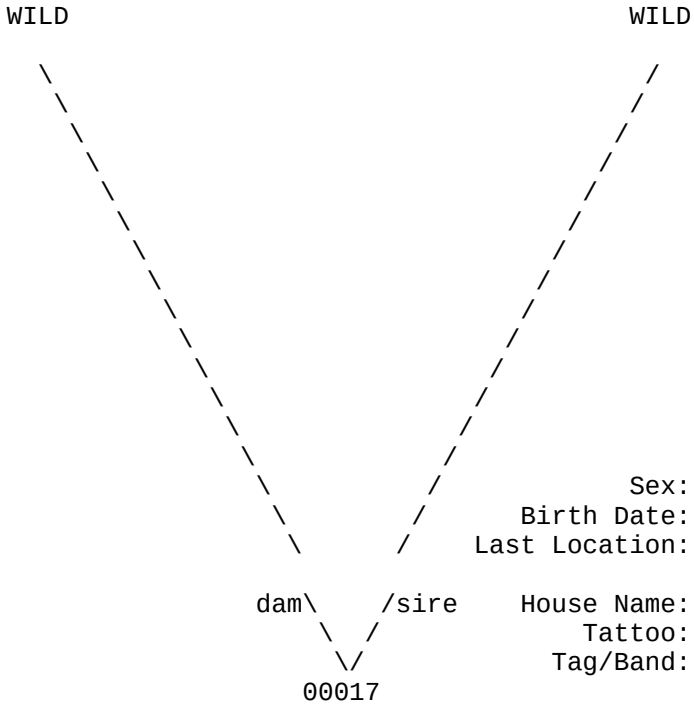

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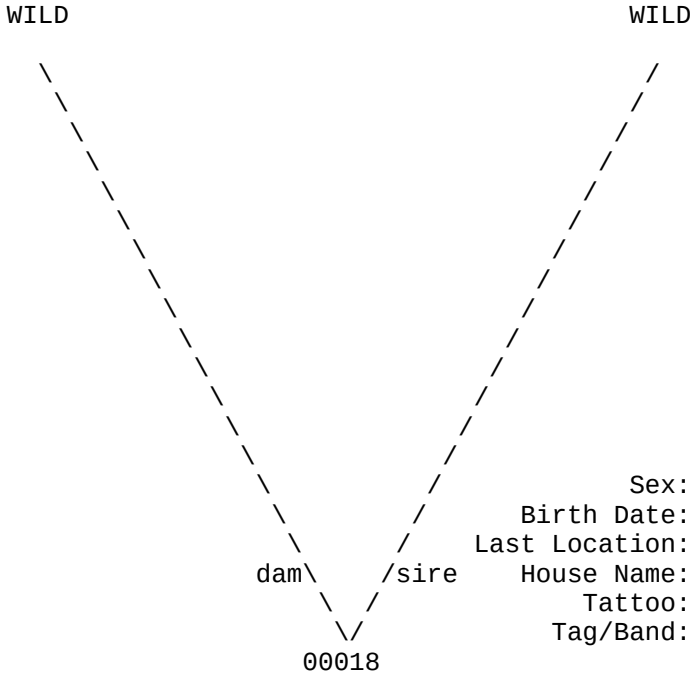

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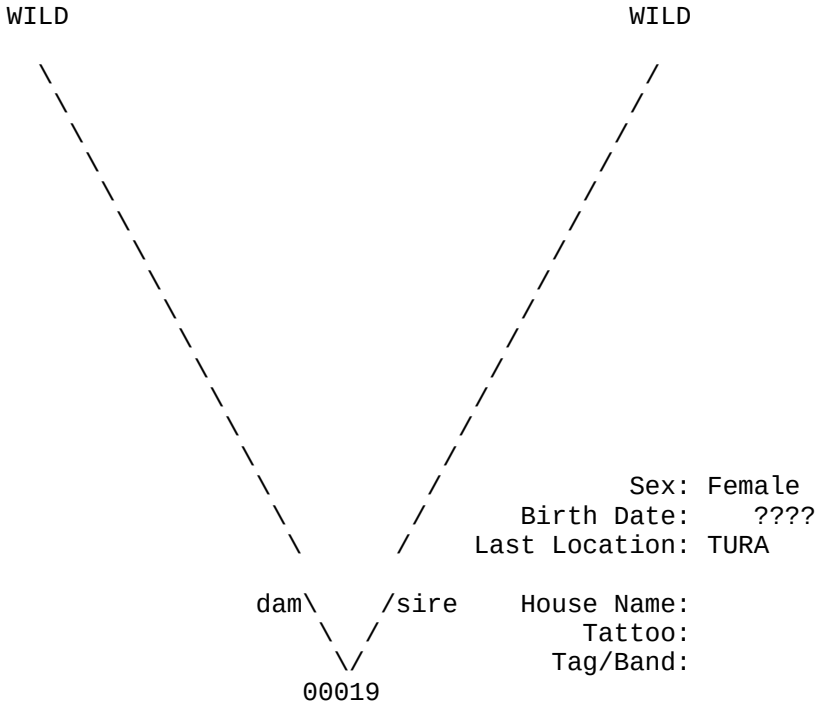

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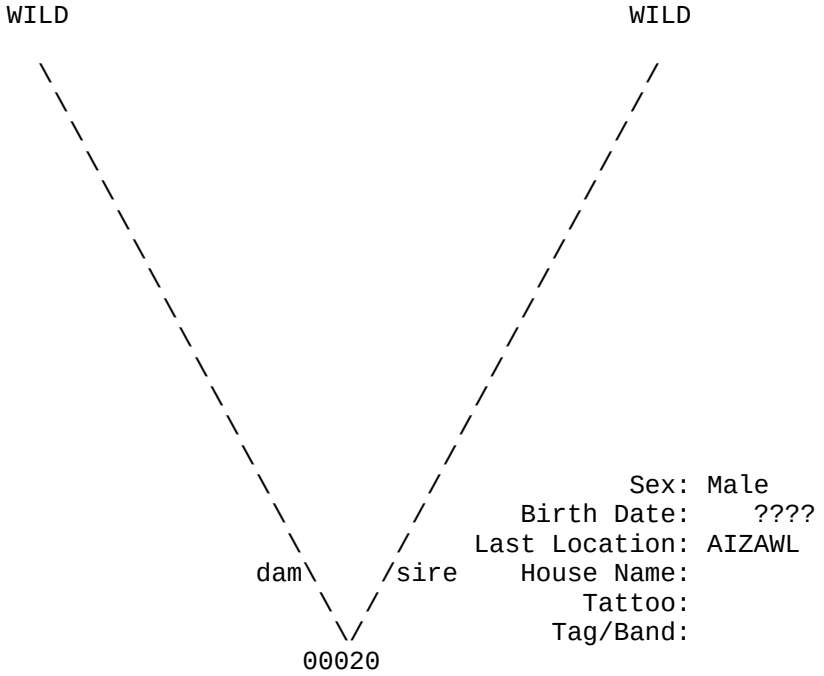

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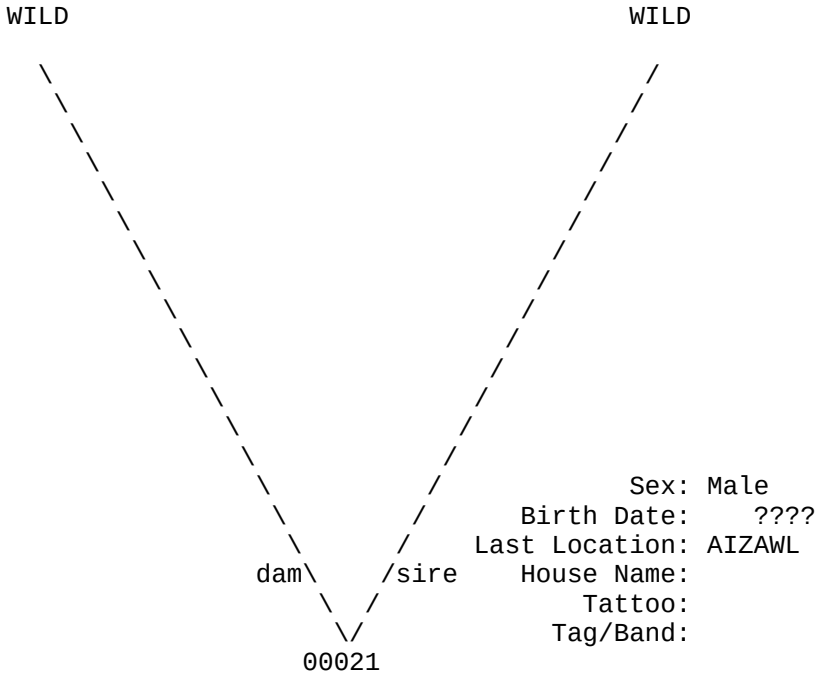

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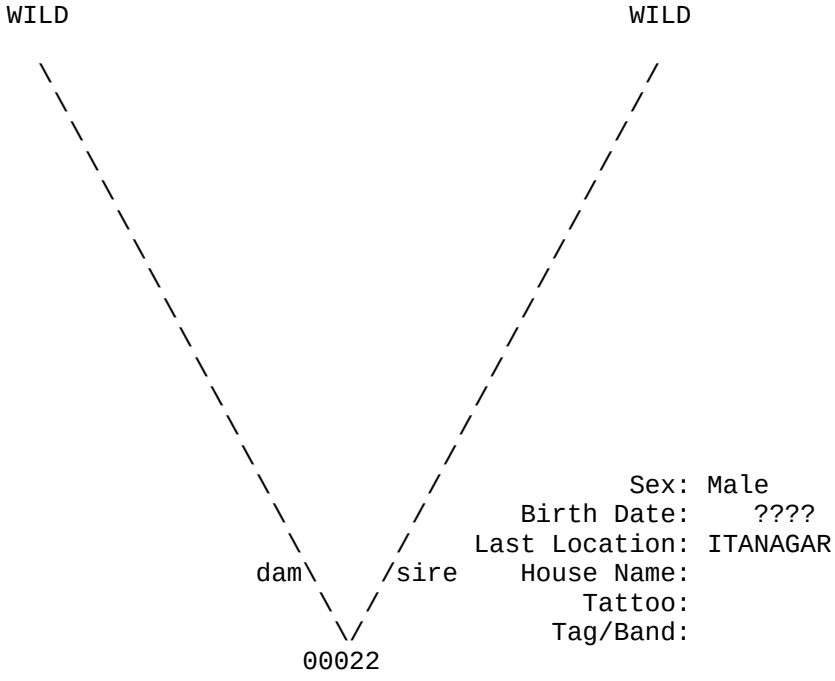

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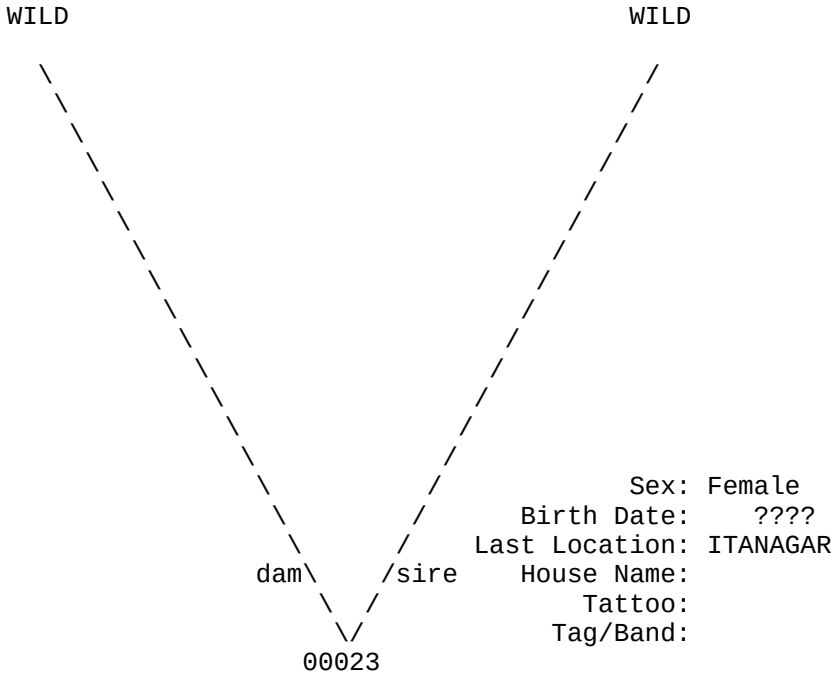

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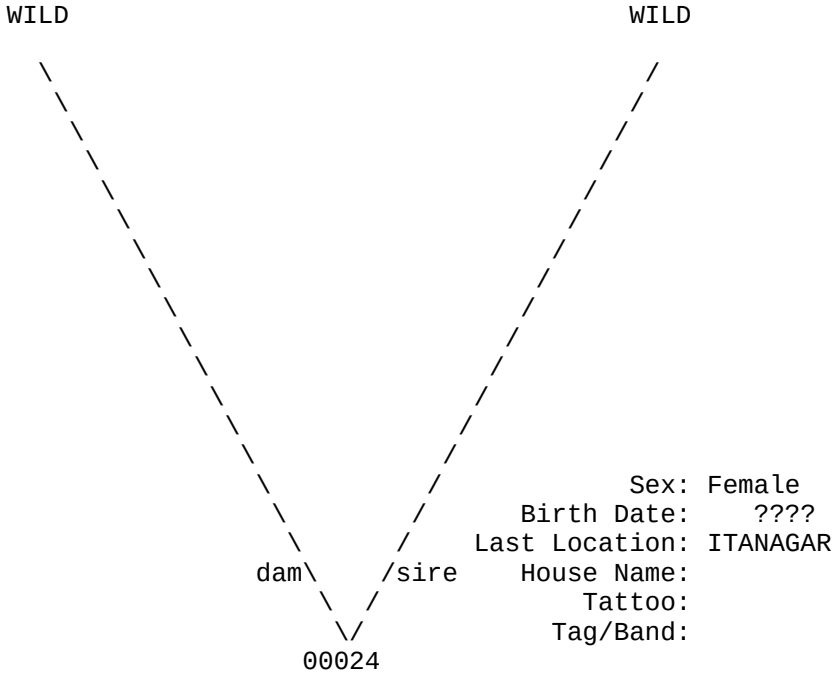

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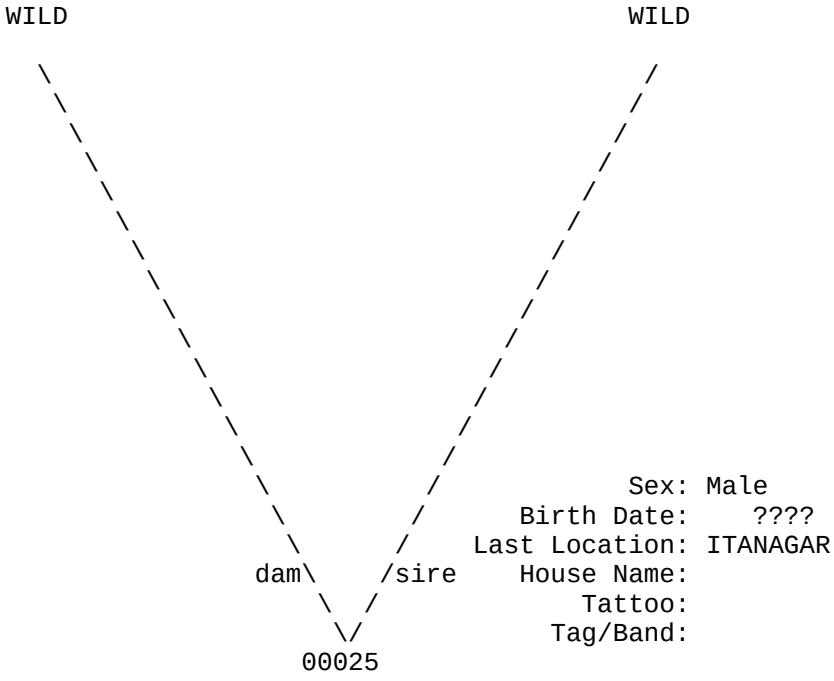

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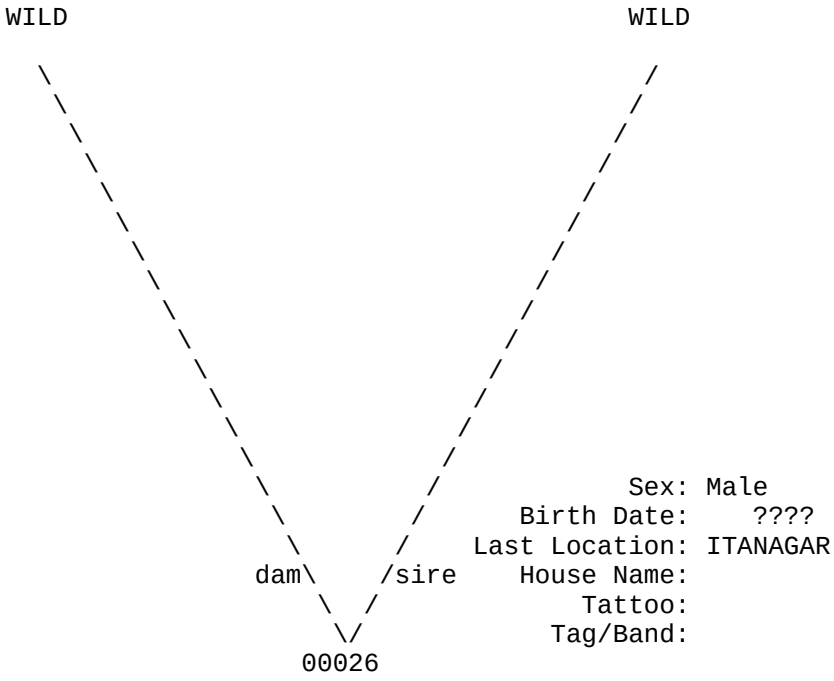

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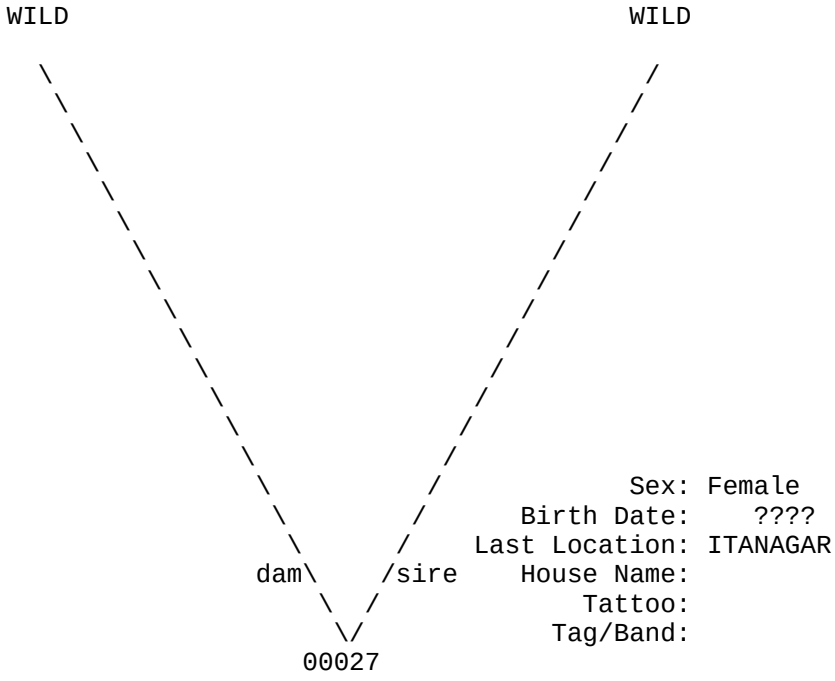

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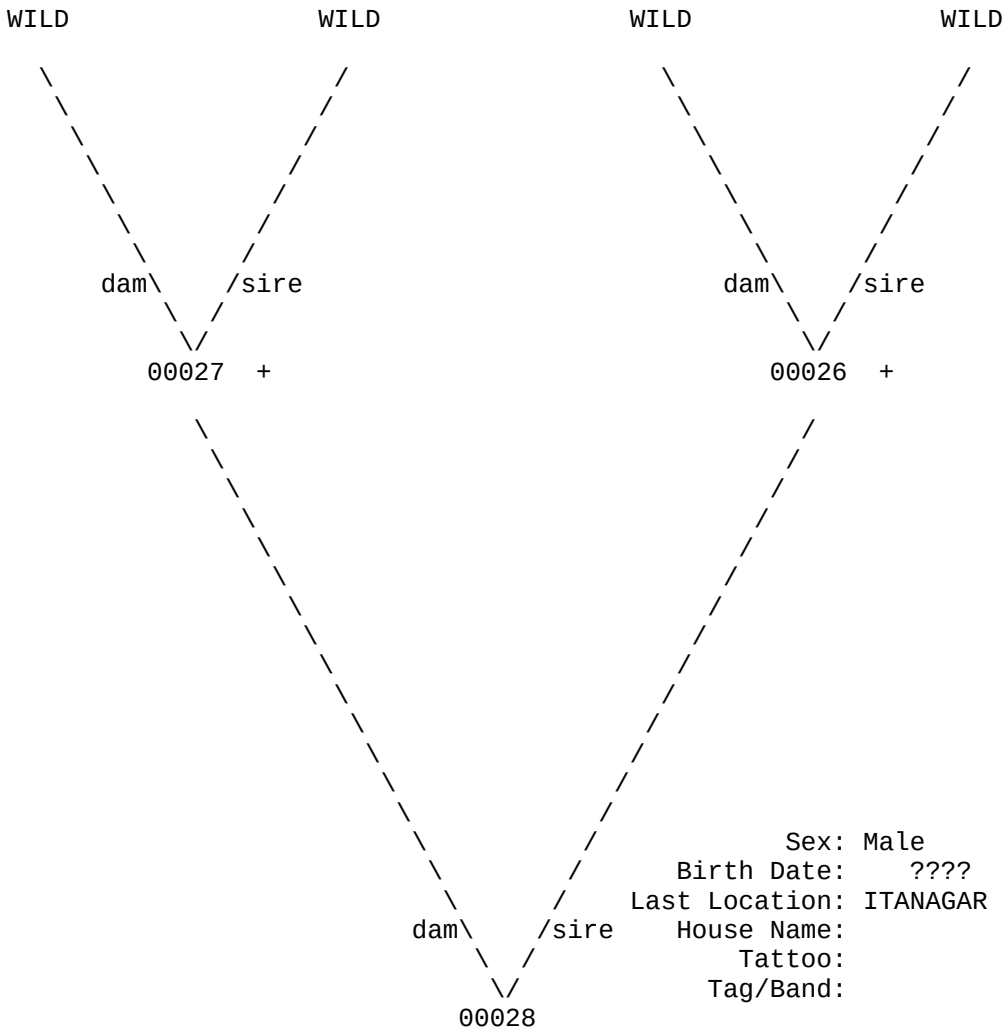

+ Wild-caught...

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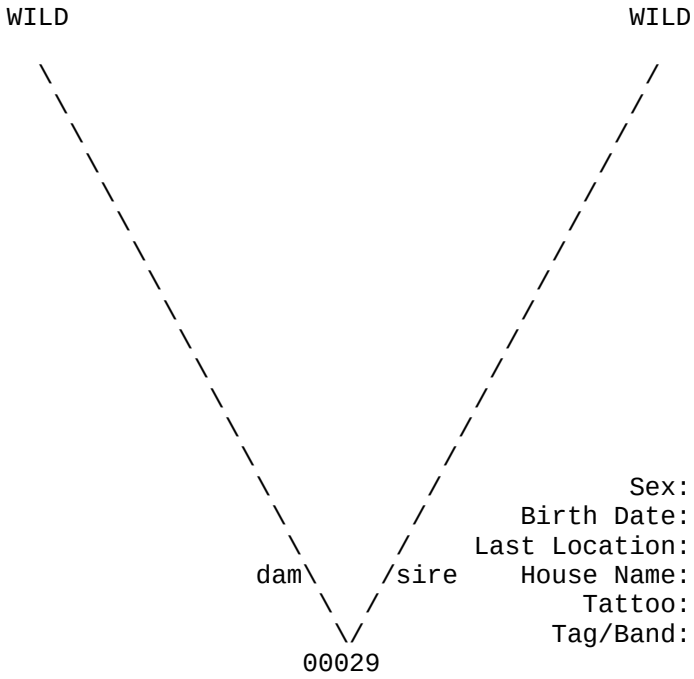

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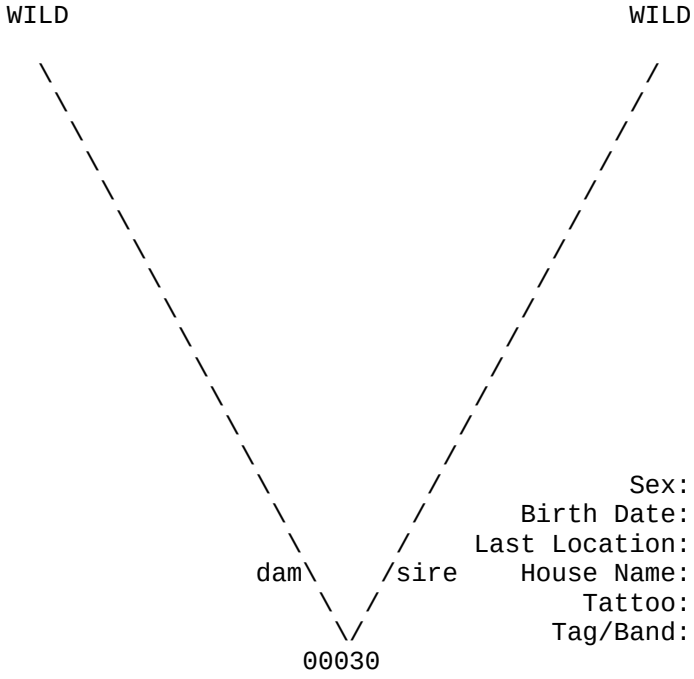
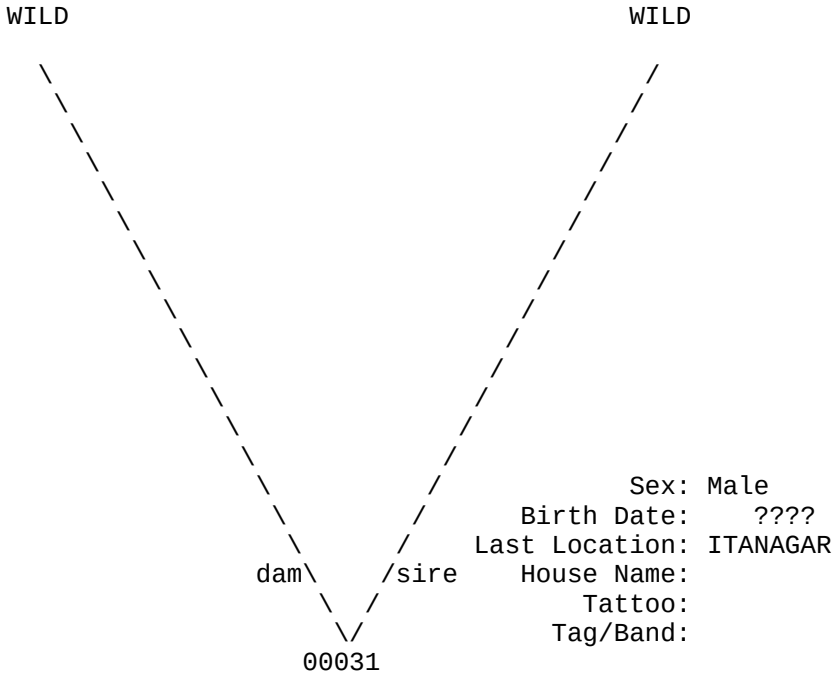
Birth Date: 4 Dec 2005
Last Location: ITANAGAR
House Name:
Tattoo:
Tag/Band:

Studbook Number: 00030



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

Studbook Number: 00031



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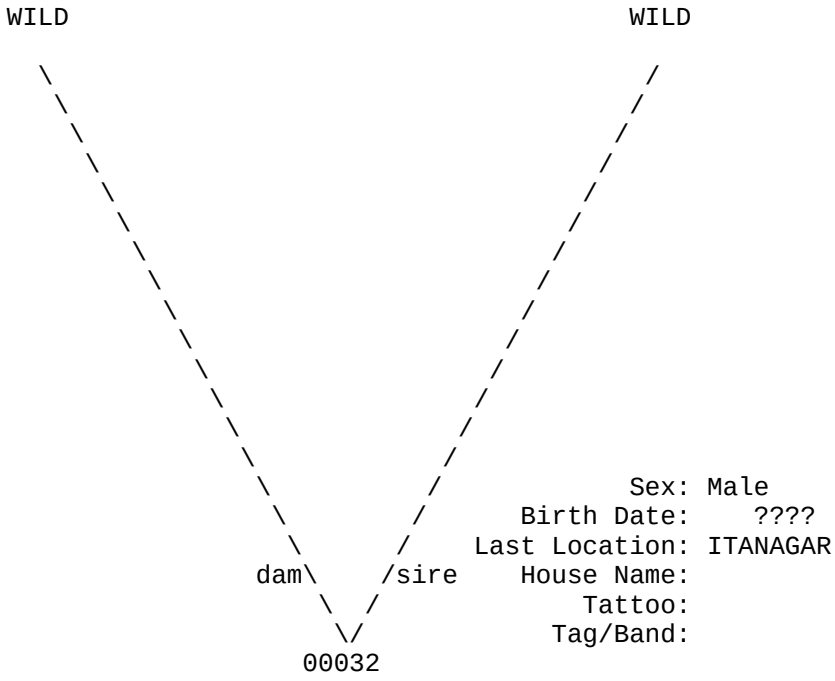

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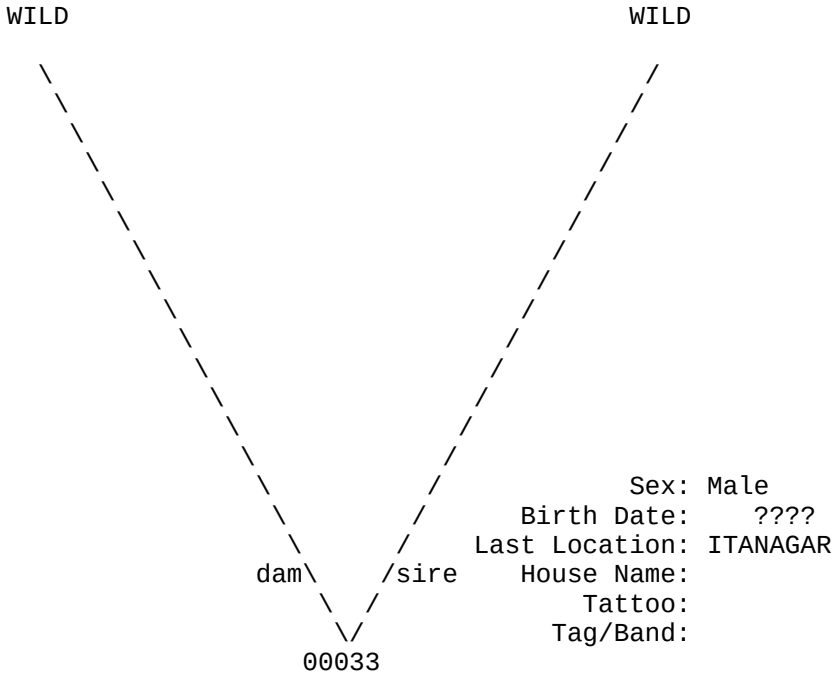

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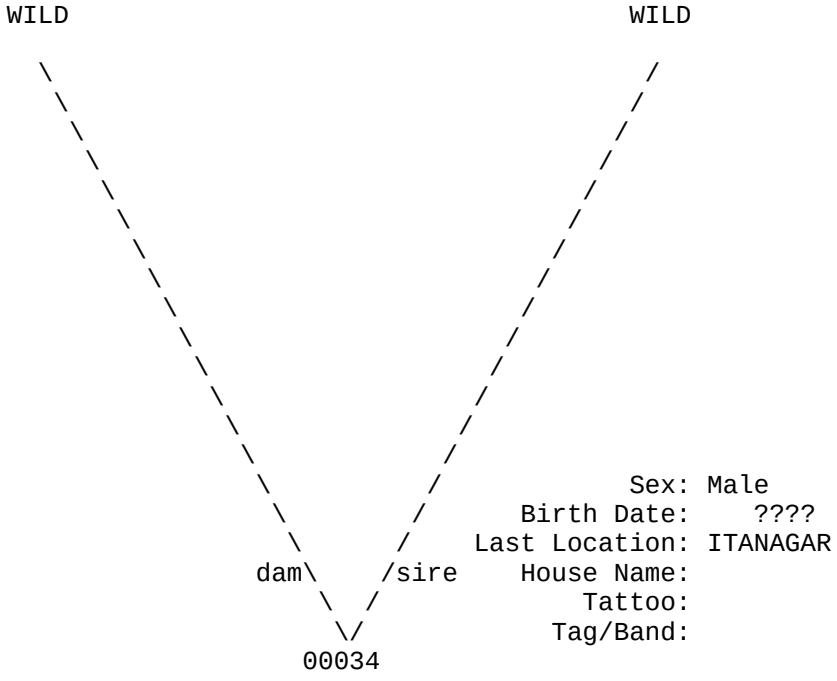

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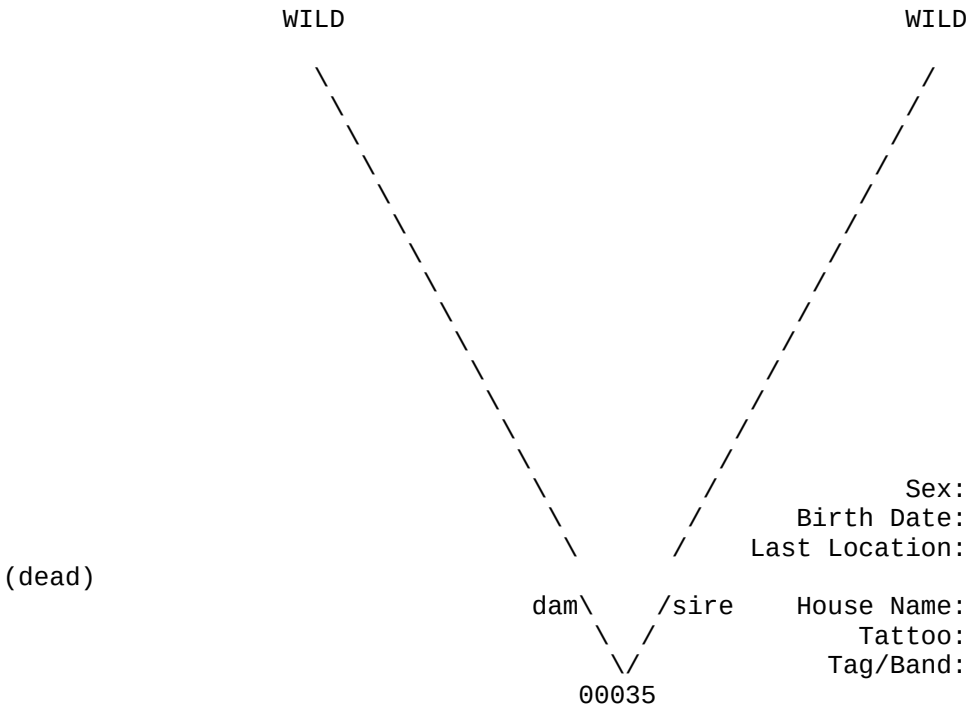

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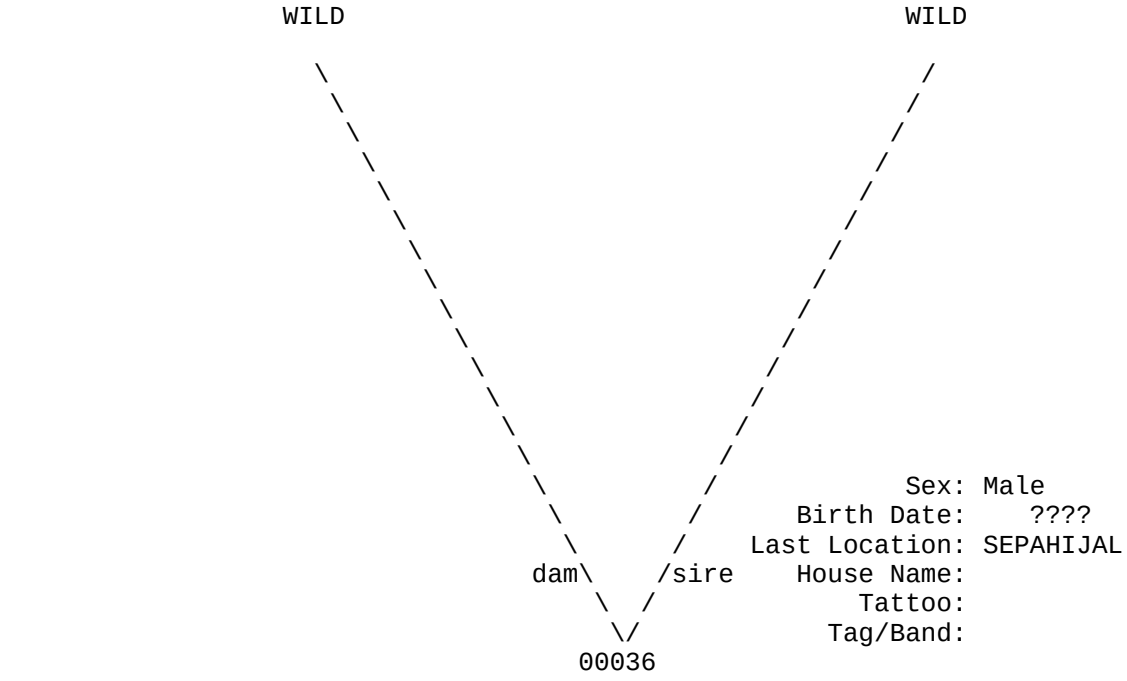

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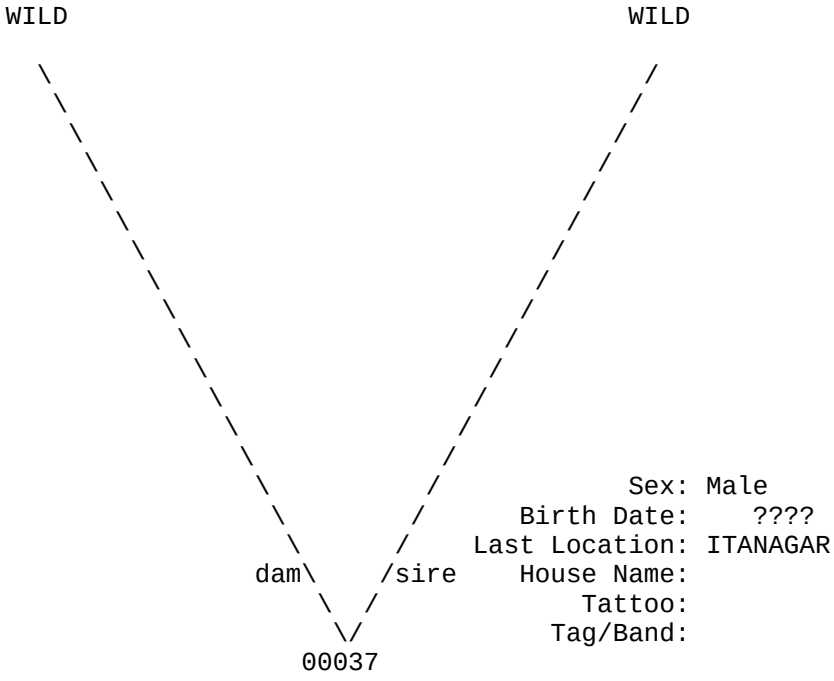
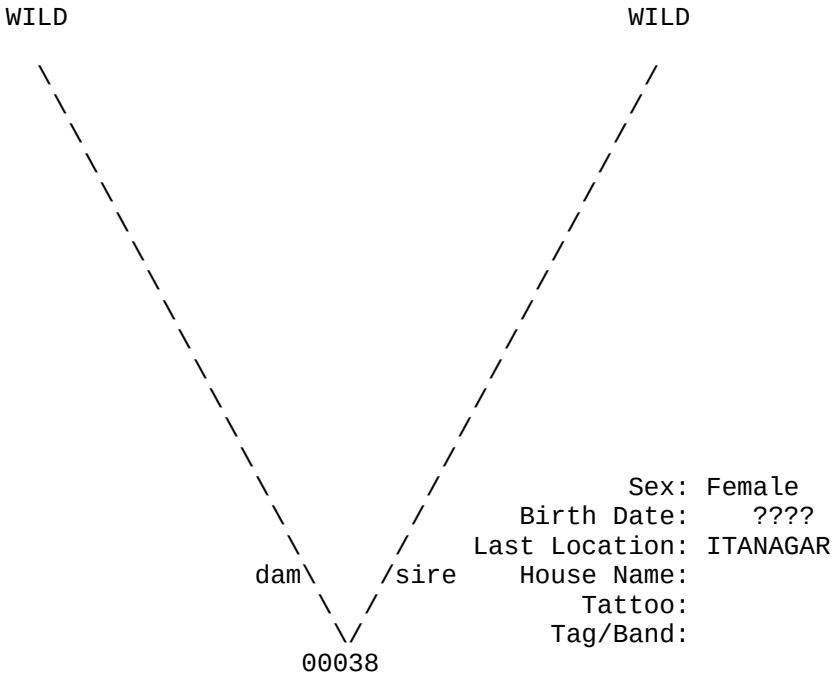


Studbook Number: 00038



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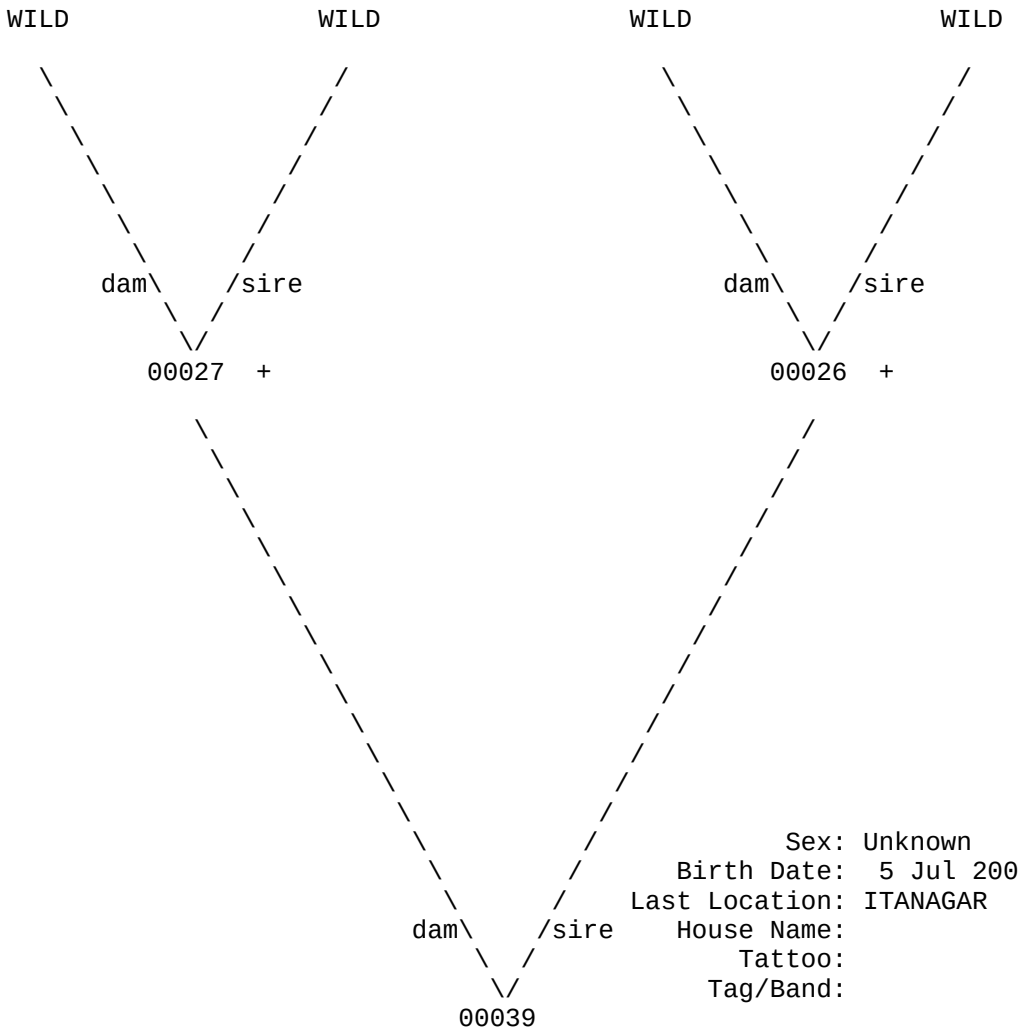
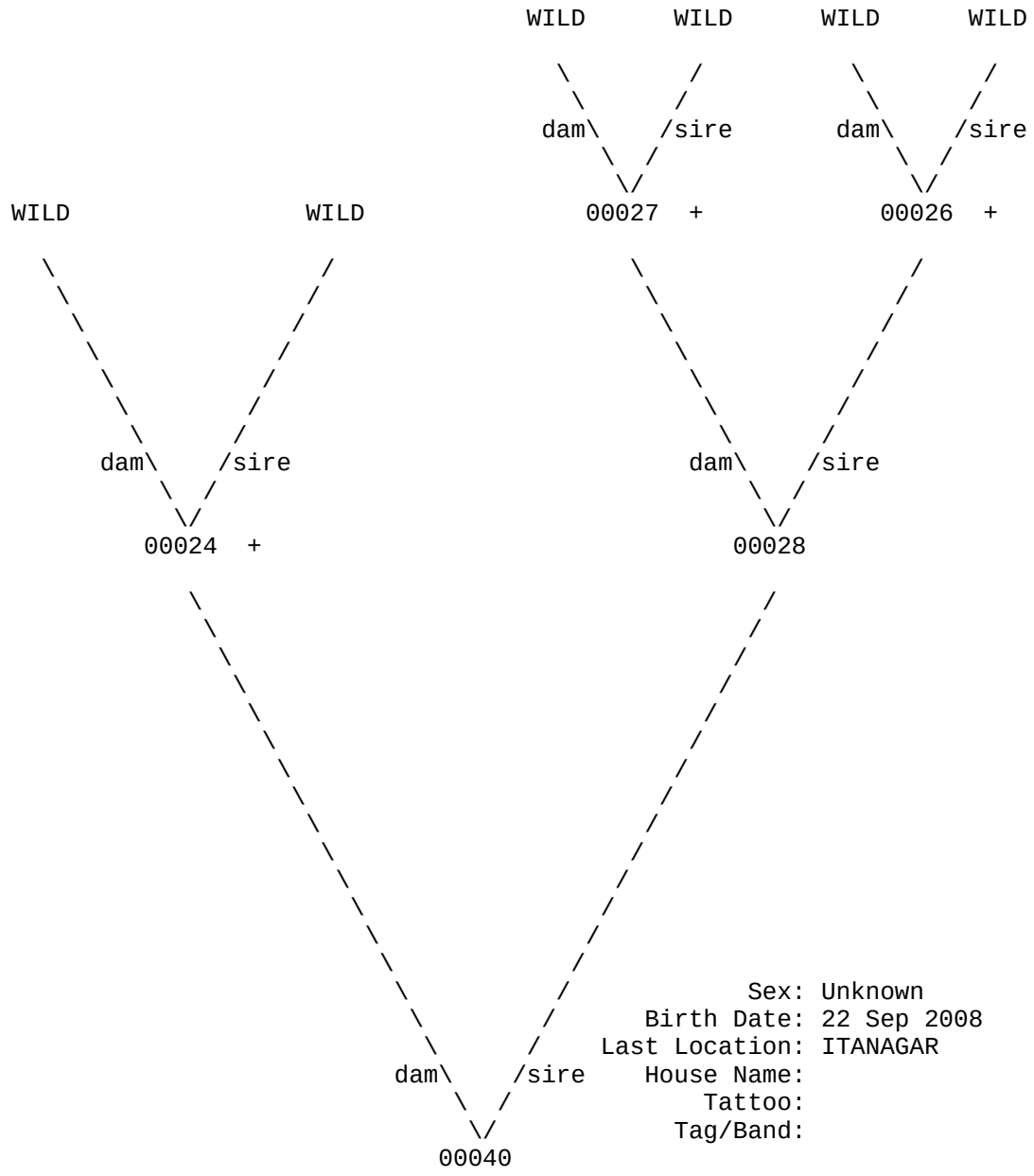


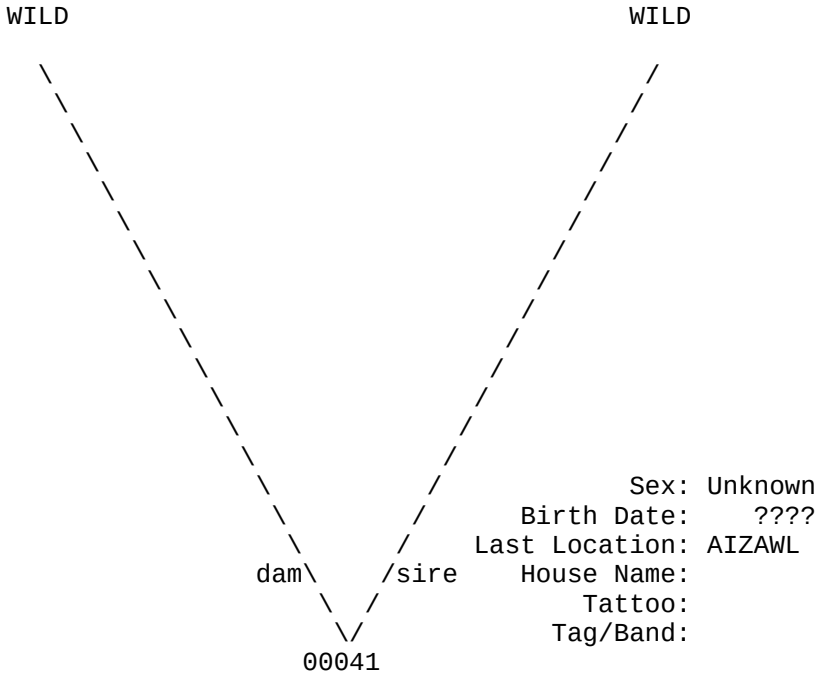
+ Wild-caught...

Studbook Number: 00040



+ Wild-caught...

Studbook Number: 00041



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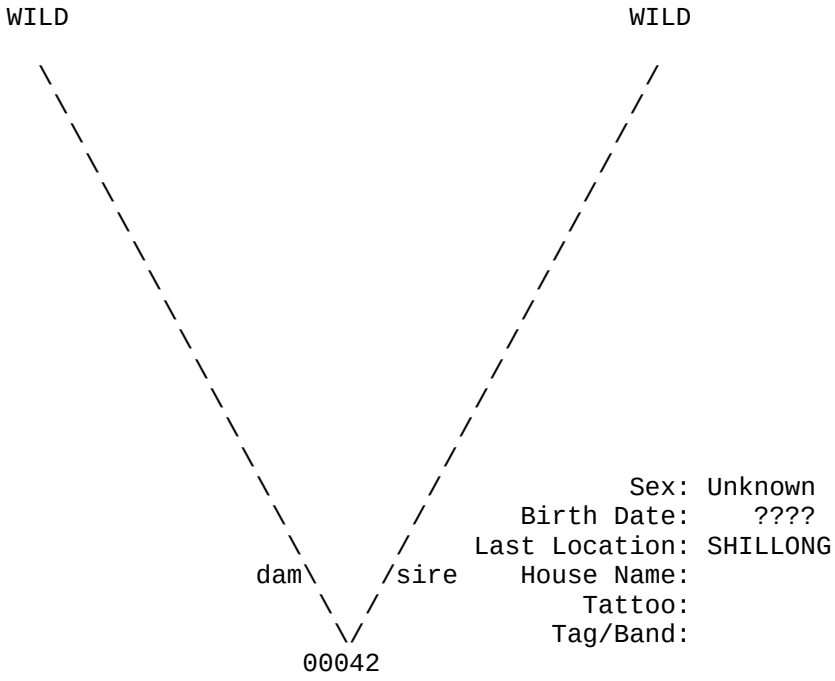

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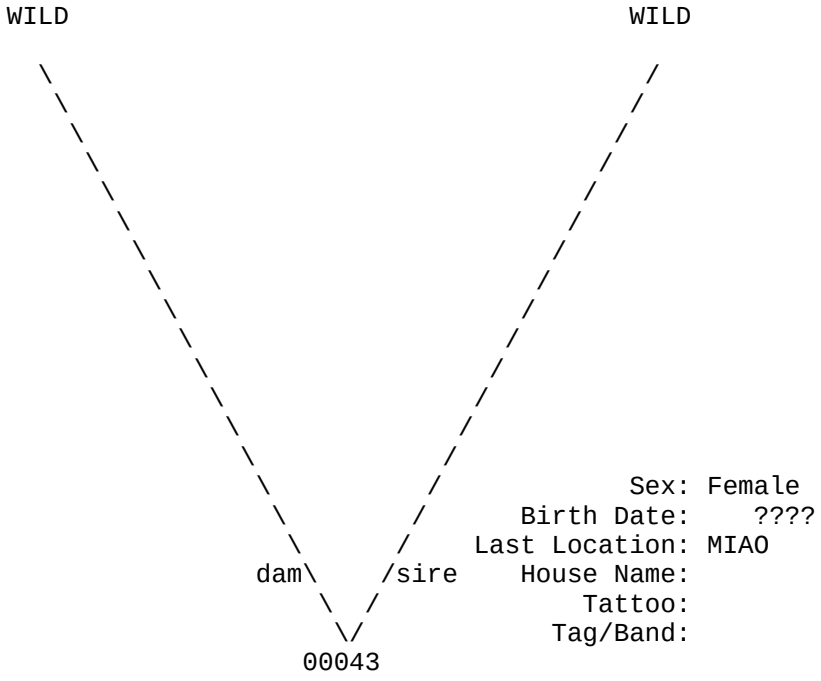

Compiled by: Anupam Srivastav thru Wildlife Institute of India
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