NATIONAL STUDBOOK

Indian Pangolin (*Manis crassicaudata*) II Edition

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Central Zoo Authority

National Studbook
Indian Pangolin (*Manis crassicaudata*) II Edition

Part of the Central Zoo Authority sponsored project titled "Development and Maintenance of Studbooks for Selected Endangered Species in Indian Zoos" awarded to the Wildlife Institute of India vide sanction order: Central Zoo Authority letter no. 9-2/2012-CZA(NA)/418 dated 7th March 2012

PROJECT TEAM

Dr. Parag Nigam
Principal Investigator

Dr. Anupam Srivastav
Project Consultant

Ms. Nilofer Begum
Junior Research Fellow

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FOREWORD

Extensive poaching coupled with habitat loss; fragmentation and degradation are limiting the wild populations of Indian pangolins and rendering them increasingly vulnerable to extinction. Ex-situ conservation for insurance and future restocking/ reintroduction offers an opportunity for ensuring their long-term survival. Pedigree information contained in studbooks forms the basis for scientific management and ensures long term genetic viability and demographic stability of such populations.

The Central Zoo Authority (CZA) in collaboration with zoos in India has initiated a conservation breeding program for threatened species in Indian zoos. As a part of this endeavour a Memorandum of Understanding has been signed with the Wildlife Institute of India for compilation and update of studbooks of identified species in Indian zoos.

As part of the project outcomes the WII has compiled the National Studbook of Indian Pangolin (*Manis crassicaudata*) in Indian zoos II edition. The recommendations contained in the studbook can form basis for the long term management of the species in captivity.

(Dr. D. N. Singh, I.F.S.)
Member Secretary
Central Zoo Authority

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Central Zoo Authority
Dr. D. N. Singh, IFS, Member Secretary
Dr. Brij Kishor Gupta, Evaluation and Monitoring Officer
Dr. Devender Thakur, Scientific officer
Mr. Ajay Kumar T., Evaluation and Monitoring Assistant
Mr. R.S. Rawat, Finance Officer
Ms. Natasha Sethi Vashisth, Technical Assistant
Mr. Vivek Goyal, Computer Personnel

Wildlife Institute of India
Dr. V.B. Mathur, Director
Dr. G. S. Rawat, Dean Faculty of Wildlife Sciences
Dr. P.K. Malik, Scientist-G & Head, Department of Wildlife Health Management
Dr. Bitapi C. Sinha, Scientist G & Research Coordinator
Mr. Virendra Sharma, Technical Assistant, Department of Wildlife Health Management

Zoo Directors, Biologists, Curators and Veterinarians
Nandankanan Zoological Park, Bhubaneswar

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INDIAN PANGOLIN

(*Manis crassicaudata*)

Species Information

Pangolins are insectivorous mammals inhabiting tropical and subtropical forests, dry woodlands, and open savannah regions in Africa and Asia (Nowak 1991). The French name "Pangolin" is derived from the Malayan phrase, "pengulin", which refers to the animal's unusual defensive posture of rolling up into a tight ball. *Manis crassicaudata* is a medium-sized mammal, with a streamline elongated body and tail covered with large overlapping scales rather than fur. Various anatomical adaptations enable it for an exclusive myrmecophagous diet.

Taxonomy

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Mammalia
Order	Pholidota
Family	Manidae (Gray 1827)
Genus	*Manis* (Linnaeus 1758)
Species	*crassicaudata* (É. Geoffroy Saint-Hilaire 1803)

Pangolins were previously classified with the New-world xenarthrans (anteaters, armadillos and sloths) in the Order Edentata; however, they have now been recognized as taxonomically distinct and the similarities are considered to have resulted from convergent evolution (de Jong 1998 Murphy *et al.* 2001, Delsuc *et al.* 2001). Taxonomic revisions have placed all pangolins in the order pholidota. The order has limited diversity (Rose 2001) and includes a single family manidae having three extant genera; *Manis* for the Asian pangolins, *Smutsia* for the African ground pangolins and *Phataginus* for the African tree pangolins (Gaudin *et al.* 2009). Molecular genetics based phylogenetic analyses also support the monophyly of the three genera and the basal division between the families Maninae and Smutsiinae (Hassanin *et al.* 2015).

The Genus, *Manis* is characterised by the presence of well developed pinnae, hair layered between scales that are retained in adults (Macdonald 2006) and a median row of scales that continue to the end of the tail (Patterson 1978). Pangolins species extant in India include the Indian or thick-tailed pangolin,

M. crassicaudata (Geoffroy 1803) and the Chinese or Formosan pangolin, *M. pentadactyla* (Linnaeus 1758) with distribution of both overlapping in northern India (Roberts and Vielliard, 1971).

M. crassicaudata and *M. pentadactyla* can be differentiated with the former having larger scales and smaller ear pinnae, 11-13 rows of body scales compared to 15-18 rows in the latter and a terminal scale on the ventral side of the tail in the former (Ogilvie and Bridgwater, 1967; Pocock, 1924). The latter has a post-anal depression in the skin, and a distinct narrowing of the tail toward the end; both characteristics are absent in *M. crassicaudata* (Pocock, 1924).

Morphology

Indian Pangolin is sexually dimorphic with males being up to 90% heavier than their counterparts (Payne and Francis 1998). The entire body except the foot pads, ventral side of the head and trunk, and inner surface of the limbs are covered by scales. Parts not covered by scales have a sparse cover of white or gray hairs. The scales are made of fused hair, originate from the thick skin, and continue to grow from the base throughout life (Aiyappan, 1942). The skin and scales make up 1/4 to 1/3 of total body mass (Kingdon, 1974). The scales provide limited insulation and protection from external parasites; however, they require no grooming, deter predators, and protect the animals from underbrush and sharp rocks in the burrow walls. As a defense the Indian pangolin rolls into a tight sphere presenting only its scales to predators (Heath 1995).

Table 1: Morphometrics of Indian Pangolin

Characteristics	Range
Head to body length (adult)	60-75 cm Prater (1980)
Head to body length (new-born)	30 cm
Tail length (adult)	40-55 cm
Tail length (new-born)	12.5 cm
Body weight (adult)	8-9 kg
Body weight (new-born)	230-240 gm

Source*: Grzimek (1990)

Adaptations for myrmecophagy include absence of teeth, a long protrusible and sticky tongue to lap up prey, conical head and nose and absence of external ear (Macdonald 2006, Francis 2008). The ability to close ear canals (Lekagul and McNeeley 1988) and specialised muscles that close the nostrils during feeding and thick eye lids (Nowak 1991, Macdonald 2006) are the other adaptations. The forelegs are large with robust claws for digging burrows and excavate nests or mounds (Payne *et al*. 1985, Payne and Francis 1998). The stomach is bi-chambered and specialised to masticate the chitinous exoskeleton of ants and termites (Sweeney 1956, Smithers 1983, Legakul and McNeely 1988, Nowak 1991, Swart *et al*. 1999).

Distribution

The distribution of the species extends from eastern Pakistan, through India from the Himalayan foothills, sporadically throughout the plains to southern India (excluding the north-east), southern Nepal and Sri Lanka (Tikader 1983, Schlitter 2005, Srinivasulu and Srinivasulu 2012). Historically, they have been reported from south-west China (Yunnan Province) (Heath 1995) and several districts of Bangladesh; however they are reported to be locally extinct in both countries (Heath 1995).

Figure 1: Distribution of Indian Pangolin
Source: (Baillie *et al.* 2014)

Habitat

The species has been reported from a variety of habitat types that include open grasslands, scrub and rain forests, and near human settlements (Zoological Survey of India 2002). In Pakistan Indian pangolins have been reported to prefer hilly terrains as compared to other habitat types (Roberts 1977). The habitat preferences for the species have been found to be closely associated to the presence of plant species like *Zizyphus mauritiana, Acacia nilotica, Zizyphus nummularia, Prosopis cineraria* and *Lantana camara,* possibly due to the availability of termite mounds and ant's colonies on the soil below and on the trunks of these tree species (Mahmood *et al.* 2014).

Behavioural Ecology

The elusive, burrow-dwelling and nocturnal behaviour (Mishra and Panda 2010) of pangolins and their occurrence in relatively low densities, has limited studies on their behavioural-ecology and activity patterns (Prater, 1980). Predominantly terrestrial; however they have been reported to climb trees while chasing ants (Heath 1995) and inhabiting the canopy layer in tropical evergreen rain forests of Sri Lanka (Israel *et al*., 1987). Locomotion is primarily quadrupedal walking, with back arched and both trunk and tail parallel to above the ground (Israel *et al.* 1987, Prater 1980). Senses of vision and hearing are reported to be poorly developed; however, olfactory senses are well developed (Israel *et al.* 1987). Olfaction is used for locating prey and plays an important role in intra-specific relations (Prater 1980).

Feeding and nutrition

Pangolins are obligate myrmecophages (Redford 1987) foraging on eggs, young and adults of ants and termites (Prater 1980, Roberts 1977, Yang *et al.* 2007, Mahmood *et al*. 2013) with a preference for insect eggs over adults (Prater 1980). The most favoured food sources have been reported to be leaf nests containing eggs and adults of large red ants (Heath 1995, Mahmood *et al.* 2013).

Items such as small pebbles, clay, sand, plant matter swallowed along with the food assist the grinding activity of the stomach (Grzimek 1990, Heath 1995, Macdonald 2006). Being nocturnal, pangolins primarily rely on their sense of smell to locate the nests of termites or ants (Israel *et al.* 1987, Mohapatra and Panda 2014b). Feeding is determined by the availability of ant and termite prey close to the soil surface nest and prey is consumed using their specialised tongue.

These animals have historically been difficult to maintain in captivity, due to their specialist, myrmecophagous diet, limited understanding of their wild social and reproductive behaviour (Challender 2011, Crandall 1964, Tenaza and Schultz 1977, Yang *et al*. 2007, Pattnaik 2008). Dietary husbandry for pangolins with special reference to Taipei Zoo was reviewed by Yang *et al*. (2007) and Hua *et al*. (2015). They concluded that replacement diets with an increase in volume of high protein insects, multivitamin and mineral supplements resulted in improved appetite, palatability with animals adapting to the replacement feed more rapidly. Several zoos have developed recipes for artificial diets, (Chevenix-Trench 1922, Crandall 1964, Ogilve and Bridegwater 1967, Yadav 1973, Ramakantha 1992, Lal-Mohan 1997) but keeping pangolins on such substitute food has been difficult. However, the very first confirmed captive breeding of pangolins (Acharjyo and Mohapatra 1978) was recorded on a diet that included live termites.

In India, a feed consisting of red weaver ants (*Oecophylla smaragdina*) with their eggs and alternatively minced boiled poultry eggs, mixed with milk powder, when ants are not available, has been established at the Nandankanan Zoological Park (Mohapatra and Panda 2014a).

Burrowing

Burrows are critical for the species as they provide a stable micro-climate for thermoregulation and micro-habitat for breeding and avoiding bad weather and predators (Prater 1980, Mohapatra and Panda 2013, Mohapatra *et al.* 2014b). The burrow depth varying with soil type, ranging from 2 m in rocky soil to 6 m in loose soil (Prater, 1980) with the opening being closed with soil after entry. Burrows vary in different habitats depending on the soil composition; wet soils were preferred for digging by pangolins at Nandankanan (Mohapatra and Panda 2014b). Two main types of burrows have been reported for wild Indian pangolins in Pakistan; feeding burrows (depth= 20.3-36.8 cm, width= 20.3-24.1 cm) and living burrows (depth= 132-157.7 cm, width= 23-30.5 cm) which are abandoned after few months and new ones are dug close to available resources (Mahmood *et al.* 2013).

Under captive conditions in India, four different types of burrows have been observed with variable size and complexity *viz.* Type I- single tunnel with one opening, Type II- single tunnel with opening at both ends, Type III- single branched tunnel with multiple openings and Type IV- reticulated tunnel with multiple openings (Mohapatra *et al.* 2014b).

Activity pattern

During a study on the behaviour of six captive Indian pangolins, Mishra and Panda (2010) reported that major proportion of the total active time was spent in walking in the enclosure (59.34±22.33%), followed by feeding (14±4.32%) and other activities like exploration (6.59±3.91%), digging (3.67±3.65%), bipedal stand (2.3±1.73%), secretive (1.84±0.83%), drinking (0.72±0.56%), climbing (0.68±0.64%), coiling

(0.61±0.43%) and bathing (0.18±0.06%). While they were recorded to be intermittently active between 17:00-5:00 hours (with a shorter active period ending by 23:00 hours) the peak activity period was recorded between 2000 to 2100 hours (Mohapatra and Panda 2014a).

Social interactions

The species is solitary (Roberts 1977), except during mating season, when the sexes occupy the same burrow (Roberts 1977, Prater 1980). Olfactory cues from droppings, urine and secretions from posterior glands are used for marking territories, the latter also serve to carry information about con-specifics, dominance, possible mates and are important in mother-offspring relationships (Grzimek 1990). Pangolin vocalisations, usually not well distinguished (mainly puffs and hisses) are unlikely to be used in intra-specific relationships (Grzimek 1990, Macdonald 2006).

Reproduction

Limited information is available on the reproductive behaviour of Indian pangolins in the wild (Mahmood et al. 2015). Several zoos have maintained the species; however, only a few have been successful in breeding them *viz.* Calcutta zoo, (Jarvis 1965), Oklahoma zoo (Ogilvie and Bridgwater 1967), Nandankanan Zoological Park (Acharjyo and Misra 1972, Acharjyo and Mohapatra 1978, Pattnaik 2008).

Sexual interactions between a mating pair comprise of courtship, approaching, chasing, mounting, copulation and retreat (Mohapatra and Panda 2014c). Copulation takes place in a dorso-lateral mounting position and lasts for 2.5 to 7 minutes. Upon termination of copulation, the pair move away separately and at times retreat to rest. They are believed to reproduce all year round with births occurring throughout the year, except during May and June (Prakash 1960, Acharjyo and Misra 1972, Acharjyo and Mohapatra 1978, Acharjyo 2000, Prater 1980, Pattnaik 2008). Indian pangolins usually give birth to single offspring (Israel 1987) but twinning has been reported on occasions (Prater 1980). The gestation period for the species has been estimated to be between 65-70 days (Zoological Survey of India 2002) and 80 days (Roberts 1977).

Indian pangolins like Chinese pangolins, do not exhibit external signs of pregnancy (Heath and Vanderlip 1988, Mohapatra and Panda 2014a), and both sexes of the pair occupy the same burrow along with their offspring (Zoological Survey of India 2002). Acharjyo and Misra (1972) noted that newborn pangolins were well developed; weighing around 235 g and measuring about 30 cm in length, with eyes open, soft flexible scales with gray hair interspersed in between and ability to crawl immediately after birth.

Maternal care in the Indian pangolin appears to last for around three months (in captivity) wherein the baby resides inside the burrow (Mohapatra and Panda 2014b). The young is carried onto its mother's tail throughout the period of maternal care during which the mother introduces it to the different parts of the enclosure (Phillips 1928, Israel *et al.* 1987). The mother is usually very protective towards the young and intermittently inspects the baby when it is at a distance (Mohapatra and Panda 2014b). When threatened,

she folds her offspring under her body with her tail (Phillips 1928). Young pangolins become independent at five to eight months of age, and are believed to reach sexual maturity at 2 years (Dickman 1984).

Details of the life history traits of the species from various sources are summarized in table 2.

Table 2: Life-history traits of the Indian Pangolin

Age at sexual maturity	2 years (Dickman 1984)
Gestation period	65 - 70 days (Hayssen and Tienhoven 1993; ZSI 2002); > 80 days (Roberts 1977); 165 days (Panda *et al.* 2010)
Birth seasonality	Throughout the year except May and June (Pattnaik 2008).
Litter size	1-2 (Israel *et al*., 1987; , Roberts 1977; Prater 1980)
Weaning age	5-8 months (Mohapatra and Panda 2014a)
Maximum longevity	In wild – unknown In captivity – > 13.5 years (Jones 1977)

Threats and conservation measures

The species is subject to intense poaching for its meat, alleged medicinal properties and use of scales for curios (CITES 2000, Misra and Hanfee 2000, Challender 2011, Mahmood *et al.* 2012) leading to population declines. The species is therefore listed as endangered in the IUCN Red List of Threatened Species (Baillie *et al*. 2014); under the Schedule I of the Wildlife (Protection) Act 1972 of India and included in Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

An action plan for their conservation (Challender 2014) recommends efforts directed at developing an understanding of the species, training of enforcement agencies and stresses on the need for their conservation breeding. The plan emphasizes on the need of developing protocols for their conservation breeding, rehabilitation and reintroduction protocols

Status in Captivity

The studbook records the presence of the sub-species at 12 zoos in India with a current population of 88 (39.33.16) individuals. A perusal of the Species360 website reveals the presence of 60 (25.19.16) specimens at 10 Institutions in India. Globally the sub-species is housed at four institutions lying in the Asian region. The inventory of the Central Zoo Authority (2017 – 2018) records the presence of the species at 17 institutions with a population size of 97 (38.35.24).

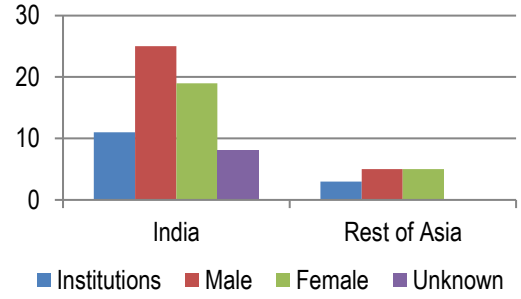

Figure 2: Status of Indian Wolf in captivity

Table 3: Current Status of Indian Pangolins in Indian Zoos

Zoological Parks	ZIMS Taxon report				CZA Inventory				Studbook			
	Male	Female	Unsexed	Total	Male	Female	Unsexed	Total	Male	Female	Unsexed	Total
Dr. Sivaram Karanth Biological Park, Mangaluru	1	0	0	1	0	0	0	0	0	0	0	0
Nandankanan Zoologial Park, Bhubaneswar	4	10	0	14	2	4	1	7	3	10	2	15
Deer Park, Kandaleru	0	0	0	0	4	1	0	5	0	0	0	0
Total	5	10	0	15	6	5	1	12	3	10	2	15

Methods

Pedigree data was collected by means of questionnaires, zoo visits and from the websites of CZA and ZIMS (Zoological Information Management System). Questionnaires were sent to the institutions housing Indian pangolins 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). Detailed demographic and genetic analysis was not performed due to the small size of the population and unavailability of dates of events and parentage records.

Scope of the studbook and data quality

The National Studbook is a chronology of the population of Indian pangolins (*Manis crassicaudata*.) held in Indian zoos. The studbook includes the historical as well as the living list of individuals, current till March 2018.

- Data used for development of the studbook are based on information made available by the holding zoos and contains historical information from 1995 onwards (CZA website and zoo records).
- Records for Nanadankanan Zoological Park were entered in the SPARKS Database on the basis of information made available by the zoo and that uploaded by it on the ZIMS Platform of the Species360 website.
- The specimens held at Dr. Sivaram Karanth Biological Park, Mangaluru and Deer Park, Kandaleru, were not included in the SPARKS Database as records for the same were not made available by the zoos. Additionally, the specimens at Deer Park, Kandaleru appear in the CZA inventory of 2017 – 2018 (Opening Balance); however no records of the presence of animals is present for the periods 2016 – 2017 and 2015 – 2016.

Analysis

Historical Population

Census Trends

The historical population in Indian zoos includes 63 (20.35.8) individuals recorded from seven institutions that includes 43 (13.28.2) wild-born and 20 (7.7.6) captive-born individuals. The based census trends of the population (Figure 3) indicate the population till 2005 consisted only of wild origin animals when the first birth occurred. The population subsequent to 2005 also includes only a small proportion of specimens of captive origin. The census trends indicate a female bias since inception. It also suggests that the population has persistently remained small.

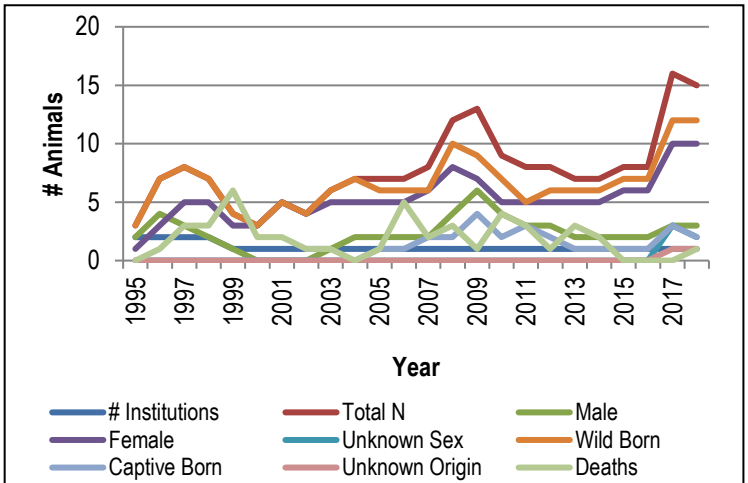

Figure 3: Census trends

Table 4: Summary of the historical population

	Males	Females	Unknown	Total
Studbook size	20	35	8	63
Acquisition from wild	13	28	2	43
Deaths	14	25	6	45
Breeding individuals	3	7	0	10
Lost to follow up/ released	3	0	0	3

The historical population is summarized in table 4 and the specimen-wise details of the historical population are presented in Annexure I.

Living population

As on March, 2018, the captive population of Indian Pangolins consists of 15 (3.10.2) animals including 3 (1.0.2) captive-born and 12 (2.10.0) wild-born individuals housed in one facility. The living population is summarized in table 5 and details are presented in Annexure II.

Table 5: Summary of living population

	Males	Females	Unknown	Total
Living	3	10	2	15
Wild-born	2	10	0	12
Captive-born	1	0	2	3
Breeding	1	3	0	4

Age distribution

The age and sex of 6 (2.4.0) out of the 15 living individuals were known; the age-structure of the population is depicted in Figure 5. Based on the dates of entry in the zoo, longevity of the wild-born individuals in captivity was calculated. The living population consists of 5 (2.3) in the reproductive age class i.e. 7-15 years. The low recruitment rate of the population is reflected in the age distribution of the population with an absence of specimens in the reproductive age classes. A perusal of available information indicates absence of reproductive activity in specimens born in captivity, with all the reproductive activity being limited to wild caught specimens. The age distribution of the captive population of Indian pangolin indicates a severely declining population due to an absence of specimens across the pre-reproductive and reproductive age-classes.

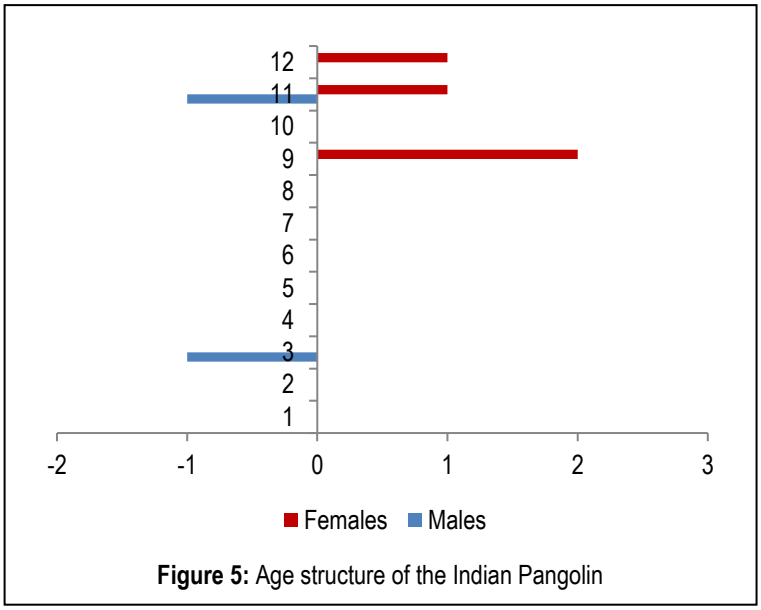

Figure 5: Age structure of the Indian Pangolin

Limitations

Paucity of data for events and parentage, and the small population size limit further demographic and genetic analysis. It also limits the establishment of targets for population management and pairing choices that can be exercised.

Conclusions and Recommendations

Indian pangolin is severely threatened with extinction due to intense poaching and is accordingly listed as Endangered in the IUCN Red List. The survival of the species is therefore dependent on intensive interventions that include intensive protection of surviving populations and *ex-situ* management aimed at initial establishment of an insurance population. Subsequent efforts aimed at managing populations large enough to provide viable surpluses for restocking/ reintroduction. A review of literature has; however, revealed the challenges of captive husbandry particularly nutrition to be a major limitation for the effective management of the pangolin species in captivity.

Nandankanan Zoological Park, Bhubaneswar is the lone captive facility holding a breeding population; however, a review of the population indicates the following:

a. Small population size of the captive population.

b. Female biased sex ratio with limited reproductive output limited to wild origin specimens.

c. Limited recruitment in the captive population that does not compensate the mortality rate.

The above factors are suggestive of a declining population that is unlikely to fulfil the objectives of the *ex-situ* conservation program for the species.

The population trends and review of literature suggest the need for intensive efforts focussed on establishing husbandry protocols for effective *ex-situ* management of the species. The efforts should be directed at providing:

i. Appropriate housing that ensures minimal stress for the animals.

ii. Meeting nutritional requirements while ensuring palatability and digestibility.

iii. Health care focused at addressing the high mortality in captive born individuals.

iv. Additional animals of wild origin needed to kick start the *ex-situ* conservation effort should be acquired subsequent to standardization of housing and husbandry protocols.

References

Acharjyo, L.N. (2000). Management of Indian pangolin in captivity. *In:* The managing committee (eds.), Souvenir, 125 years of Calcutta zoo (1875-2000). Zoological Garden, Alipore, Calcutta: 27–30.

Acharjyo, L.N. and Misra, R. (1972). Birth of Indian pangolin (*Manis crassicaudata*) in captivity. Journal of the Bombay Natural History Society, 69: 174–175.

Acharjyo, L.N. and Mohapatra, S. (1978). A note on breeding and longevity of Indian pangolin (*Manis crassicaudata*) in captivity. Journal of the Bombay Natural History Society, 75: 921–922.

Aiyappan, A. (1942). Notes on the pangolin (*Manis crassicaudata*). Journal of the Bombay Natural History Society, 43: 254-257.

Baillie, J., Challender, D., Kaspal, P., Khatiwada, A., Mohapatra, R. & Nash, H. (2014). *Manis crassicaudata*. The IUCN Red List of Threatened Species 2014: e.T12761A45221874.http://dx.doi.org/10.2305/IUCN.UK.2014-2.RLTS.T12761A45221874.en . Downloaded on 5 November 2015.

Challender, D.W.S. (2011). Asian Pangolins: increasing affluence driving hunting pressure. TRAFFIC Bulletin, 23(3): 92–93.

Challender, D.W.S., Waterman, C. and Baillie, JEM. (2014). Scaling up pangolin conservation. IUCN SSC Pangolin Specialist Group Conservation Action Plan. Zoological Society of London, London, UK.

Chevenix-Trench, C.G. (1922). Notes on a young Indian pangolin or scaly anteater *Manis crassicaudata*. Journal of the Bombay Natural History Society, 24: 590.

CITES. (2000). Prop. 11.13. *Manis crassicaudata, Manis pentadactyla, Manis javanica*. Transfer from Appendix II to Appendix I (India, Nepal, Sri Lanka, United States). Available at: http://www.cites.org/eng/cop/11/prop/13.pdf.

Crandall, L. S. (1964). The management of wild mammals in captivity. Chicago and London: University of Chicago Press.

de Jong W. W. (1998). Molecules remodel the mammalian tree. Trends in Ecology and Evolution, 13: 270- 275.

Delsuc, F, Catzeis, F, Stanhope, M. and Douzery, E. (2001). The evolution of armadillos, anteaters and sloths depicted by nuclear and mitochondrial phylogenies: implications for the status of the enigmatic fossil Eurotamandua. Proceedings of the Royal Society of London Series B Biological Sciences, 268 (1476):1605-15.

Dickman, C.R. (1984). Anteaters. *In:* Macdonald, D. (ed.). The encyclopaedia of mammals. Facts on File, New York, 780 – 781.

Francis, C. M. (2008). A field guide to the mammals of South-east Asia, New Holland Publishers (UK) Ltd.

Gaudin, T.J., Emry, R.J. and Wible, J.R. (2009). The phylogeny of living and extinct pangolins (Mammalia, Pholidota) and associated taxa: A morphology based analysis. J Mammal Evol;16:235-30

Geoffroy Saint-Hilaire, É. (1803). Catalogue des mammifères du Muséum National d'Histoire Naturelle. Muséum National d'Histoire Naturelle, Paris, 272 pp.

Grzimek, B. (1990). Grzimek's Encyclopedia of Mammals, 5th volume, McGraw-Hill, New York.

Hassanin. A., Hugot. J.P., Jansen van Vuuren B. (2015). Comparison of mitochondrial genome sequences of pangolins (Mammalia, Pholidota). C R Biol.;338: 260–5. ScienceDirect. Available from: http://dx.doi.org/10.1016/j.crvi.2015.02.003

Hayssen VD, Van Tienhoven A (1993). Asdell's patterns of mammalian reproduction: a compendium of species-specific data. Cornell University Press, Ithaca, New York, 658–659.

Heath, M.E. and Vanderlip, S.L. (1988). Biology, husbandry and veterinary care of captive Chinese pangolins (*Manis pentadactyla*). Zoo Biology, 7: 293–312.

Heath, M.E. (1995). *Manis crassicaudata*. Mammalian species, 513: 1–4.

Hua, L., Gong, S., Wang, F., Li, W., Ge, Y., Li, X., Hou, F. (2015). Captive breeding of pangolins: current status, problems and future prospects ZooKeys 507: 99 – 114 doi: 10.3897/zookeys.507.6970

ISIS (International Species Information System). (2004). SPARKS 1.54: Single Population Analysis and Records Keeping System. Eagan, MN: International Species Information System. Available from: www.isis.org

Israel, S., Sinclair, T., Grewal, B. and Hoefer, H.J. (1987). Indian wildlife. APA Productions (HK) Ltd., Hong Kong.

Jarvis, C. (1965). Mammals breed in captivity. International Zoo Yearbook, 5: 330–349.

Jones, M.L. (1977). Longevity of mammals in captivity. International Zoo Yearbook, 19:16-19.

Kingdon, J. (1974). East African Mammals, Volume 1. University of Chicago Press, Chicago, Illinois, 446

Lal-Mohan, R.S. (1997). *Manis crassicaudata* of Malabar-ecology and status. Zoos' Print XII (11): 33–34.

Lekagul, B. and McNeeley, J. A. (1988). Mammals of Thailand, Darnsutha Press, Bangkok.

Linnaeus C. (1758). Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis . Tomus I, editor. Holmiae, Laurentii Salvii; Available from: http://www.biodiversitylibrary.org/bibliography/542#/summary

MacDonald, D. W. (2006). The Encyclopedia of Mammals, 2nd Edition, Oxford University Press.

Madsen, O., Scally, M., Douady, C. J., Kao, D. J., DeBry, R. W., Adkins, R., Amrine, H. M., Stanhope, M. J., de Jong, W. W. and Springer, M. S. (2001). Parallel adaptive radiations in two major clades of placental mammals. Nature, 409: 610-614.

Mahmood, T., Hussain, R., Irshad, N., Akrim, F. and Nadeem, M.S. (2012). Illegal mass killing of Indian Pangolin (*Manis crassicaudata*) on Potohar Region, Pakistan. Pakistan Journal of Zoology, 44 (5): 1457-1461.

Mahmood, T., Jabeen, K., Hussain, I. and Kayani, A.R. (2013). Plant species association, burrow characteristics and the diet of the Indian pangolin, *Manis crassicaudata*, in the Potohar plateau, Pakistan. Pakistan Journal of Zoology, 45(6): 1533-1539.

Mahmood, T., Irshad, N. and Hussain, R. (2014). Habitat Preference and Population Estimates of Indian Pangolin (*Manis crassicaudata*) in District Chakwal of Potohar Plateau, Pakistan. Russian Journal of Ecology, 45(1): 70–75.

Mahmood, T., Irshad, N., Hussain, R., Akrim, F., Hussain, I., Anwar, M., Rais, M. and Nadeem, M.S. (2015). Breeding habits of the Indian pangolin (*Manis crassicaudata*) in Potohar Plateau, Pakistan. Mammalia: 1-4.

Mishra, S. and Panda, S. (2010). Nocturnal behaviour of Indian pangolin (*Manis crassicaudata*) in captivity. Indian Zoo Year Book, VI: 128–136.

Misra, M. and Hanfee, N. (2000). Pangolin distribution and trade in East and Northeast India. *TRAFFIC Dispatches,* 14: 4-5.

Mohapatra, R. K. and Panda, S. (2013). Behavioural sampling techniques and activity pattern of Indian Pangolin *Manis crassicaudata* (Mammalia: Manidae) in captivity. Journal of Threatened Taxa, 5(17): 5247–5255.

Mohapatra, R. K. and Panda, S. (2014a). Husbandry, behaviour and conservation breeding of Indian pangolin. Folia Zoologica, 63: 73–80.

Mohapatra, R. K., Panda, S. and Nair, M. V. (2014b). Architecture and microclimate of burrow systems of Indian pangolins in captivity. Indian Zoo Year Book, VIII: 12-24.

Mohapatra, R. K. and Panda, S. (2014c). Behavioural Descriptions of Indian Pangolins (*Manis crassicaudata*) in Captivity. International Journal of Zoology, 1-7.

Murphy, W. J., Eizirik, E., Jonhson, W. E., Zhang, Y. P., Ryder, O. A. and O'Brien, S. J. (2001). Molecular phylogenetics and the origins of placental mammals. Nature, 409: 614-618.

Nowak, R. M. (1991). Walker's Mammals of the World, 5th edition, The John Hopkins University Press. Baltimore and London.

Ogelvie, P.W. and Bridgwater, D.D. (1967). Notes on breeding of an Indian pangolin at Oklahoma Zoo. International Zoo Yearbook, 7: 116–118.

Panda, S., Mishra, S., Mishra, A.K. and Mohapatra, S.N. (2010). Nandankanan faunal diversity. Nandankanan Biological Park, Forest and Environment Department, Government of Odisha: 28.

Patterson, B. (1978). Pholidota and Tubulidentata. *In:* Maglio, V.J. and Crooke, H.B.S. (eds.). Evolution of African Mammals, 268-278. Harvard University Press, Cambridge.

Pattnaik, A.K. (2008). Enclosure design and enrichment key to the successful conservation breeding of Indian pangolin (*Manis crassicaudata*) in captivity. Indian Zoo Year Book, V: 91–102.

Payne, J., Francis, C. M. and Phillips, K. (1985). A field guide to the mammals of Borneo. The Sabah Society with the World Wildlife Fund Malaysia. pp. 332

Payne, J. and Francis, C.M. (1998). A field guide to the mammals of Borneo. The Sabah Society, Kota Kinabalu, pp. 332.

Phillips, W.W.A. (1928). A note on the habits of the Indian pangolin (*Manis crassicaudata*). Spolia Zeylan, 14: 333.

Pocock RI. (1924). The external characters of the pangolins (Manidae). Proc Zool Soc London. 94:707–18

Prakash, I. (1960). Breeding of mammals in Rajasthan desert, Indian Journal of Mammalogy, 41(3): 386 – 389.

Prater, H.S. (1980). The book of Indian animals. Oxford University Press, New Delhi.

Ramakantha, V. (1992). A note on pangolin in Manipur. WII News-letter 7: 19.

Redford, K. H. (1987). Ants and termites as food: patterns of mammalian myrmecophagy. *In* Genoways, H. H. (Ed.). Current mammalogy, New York, Plenum Press.

Roberts, T.J. (1977). The mammals of Pakistan, 2nd edition, Oxford University Press, Karachi, Pakistan, pp. 525.

Roberts, T. J., and Vielliard. J. (1971). Commentaires sur le grand pangolin Indien *Manis crassicaudata.* Mammalia, 35: 610-613.

Rose, K. D. (2001). Edentata and Pholidota. Encyclopedia of Life Sciences, 1-7.

Sanyal, R.B. (1892). A Hand-Book of the Management of Animals in. Captivity in Lower Bengal Calcutta: Committee for the Management of the Zoological Garden, Bengal Secretariat Press.

Schlitter, D.A. (2005). Order Pholidota. *In:* Wilson D.E. and Reeder, D.M. (eds.). Mammal Species of the World: A Taxonomic and Geographic Reference, 530-531. Johns Hopkins University Press, Baltimore, MD, USA.

Smithers, R. H. N. (1983). The mammals of the Southern African subregion. Pretoria: University of Pretoria cited in Swart, J. M., Richardson, P. R. K. and Ferguson, J. W. H. (1999). Ecological factors affecting the behaviour of pangolins (*Manis temminckii*). Journal of the Zoological Society of London 247: 281-292.

Srinivasulu, C. and Srinivasulu, B. (2012). South Asian Mammals. Their Diversity, Distribution, and Status. Springer, New York.

Swart, J. M., Richardson, P. R. K. and Ferguson, J. W. H. (1999). Ecological factors affecting the behaviour of pangolins (*Manis temminckii*). Journal of the Zoological Society of London, 247: 281-292.

Sweeney, R. C. H. (1956). Some notes on the feeding habits of the ground pangolin, *Smutsia temminckii* (Smuts). Ann Mag. Nat. Hist. 12th ser. 9: 893-896 cited in Swart, J. M., Richardson, P. R. K. and Ferguson, J. W. H. (1999). Ecological factors affecting the behaviour of pangolins (*Manis temminckii*). Journal of the Zoological Society of London, 247: 281-292.

Tenaza, R. R. and Schultz, T. A. (1977). Natural and synthetic diets for Pholidota, pp. 549-553 in CRC Handbook series in nutrition and food. M. Recheigl, Jr., ed. Cleveland, CRC Press cited in Heath, M. E. (1987). Twenty four-hour variations in Activity, Core temperature, Metabolic Rate, and Respiratory Quotient in Captive Chinese Pangolins. Zoo Biology, 6: 1-10.

Tikader, B.K. (1983). Threatened Animals of India. Zoological Survey of India, Calcutta, India.

Yadav R.N. (1973). Rearing of Indian pangolin. Indian Zoo Bulletin, 1: 6.

Yang, CW., Chen, S., Chang, C-Y., Lin, M., Block, E., Lorentsen, R., Chin, J. S. C., and Dierenfeld, E. S. (2007). History and Dietary Husbandry of Pangolins in captivity, Zoo Biology, 26(3): 223-230.

Zoological Survey of India. (2002). Pangolins (Mammalia: Pholidota) of India. *ENVIS* Newsletter, Vol. 9 (No. 1 and 2).

Annexure I

Historical Population of *Manis crassicaudata*

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
00001	M	????	WILD	WILD	INDIA CALCUTTA	~ Apr 1995 ~ Apr 1995 20-Aug-98	Capture Transfer Death
00002	M	????	WILD	WILD	INDIA CALCUTTA	~ Jun 1995 ~ Jun 1995 31-Aug-99	Capture Transfer Death
00003	F	????	WILD	WILD	INDIA NANDANKAN	30-Jul-95 30-Jul-95 06-May-96	Capture Transfer Death
00004 MURALI	M	????	WILD	WILD	INDIA NANDANKAN INDIA	22-Mar-96 22-Mar-96 21-May-00	Capture Transfer Release
00005 SUMATI	F	????	WILD	WILD	INDIA NANDANKAN INDIA NANDANKAN	???? 27-Mar-96 21-May-00 31-Aug-00 31-Aug-00 15-May-07	Capture Transfer Release Capture Transfer Death
00006	M	????	WILD	WILD	INDIA NANDANKAN	18-Jul-96 18-Jul-96 02-Oct-97	Capture Transfer Death
00007	F	????	WILD	WILD	INDIA NANDANKAN	27-Jul-96 27-Jul-96 01-Dec-96	Capture Transfer Death
00008	F	????	WILD	WILD	INDIA NANDANKAN	09-Oct-96 09-Oct-96 21-Apr-97	Capture Transfer Death
00009	F	????	WILD	WILD	INDIA NANDANKAN	14-Mar-97 14-Mar-97 05-May-02	Capture Transfer Death
00010	F	????	WILD	WILD	INDIA CALCUTTA	~ Jun 1997 ~ Jun 1997 28-Sep-99	Capture Transfer Death
00011	F	????	WILD	WILD	INDIA NANDANKAN	26-Jul-97 26-Jul-97 19-Aug-97	Capture Transfer Death
00012	F	????	WILD	WILD	INDIA NANDANKAN	06-Nov-97 06-Nov-97 25-Mar-98	Capture Transfer Death
00013	?	03-Jan-98	00004	00005	NANDANKAN	03-Jan-98 03-Jan-98	Birth Death
00014	F	????	WILD	WILD	INDIA NANDANKAN	26-Oct-98 26-Oct-98 26-Mar-99	Capture Transfer Death
00015	?	19-Jan-99	00004	00005	NANDANKAN	19-Jan-99 19-Jan-99	Birth Death

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
00016	F	????	WILD	WILD	INDIA NANDANKAN	15-Jun-99 15-Jun-99 16-Apr-00	Capture Transfer Death
00017	F	????	WILD	WILD	INDIA NANDANKAN	11-Aug-99 11-Aug-99 11-Aug-99	Capture Transfer Death
00018 AAZP1	M	????	WILD	WILD	INDIA MADRAS	12-Mar-00 12-Mar-00 01-Nov-00	Capture Transfer Death
00019 0006A2AA6F	F	????	WILD	WILD	INDIA NANDANKAN	16-Jul-00 16-Jul-00	Capture Transfer
00020	M	07-Jan-01	UNK	00005	NANDANKAN	07-Jan-01 22-Jun-01	Birth Death
00021	?	????	WILD	WILD	INDIA CHATBIR Z	~ 2001 ~ 2001 31-Jul-01	Capture Transfer Death
00022 PNG-6 98102057373	F	????	WILD	WILD	INDIA NANDANKAN	25-Mar-01 25-Mar-01 19-Apr-09	Capture Transfer Death
00023 PNG-2 0006A2ACA3	F	????	WILD	WILD	INDIA NANDANKAN	05-Aug-01 05-Aug-01 03-Nov-10	Capture Transfer Death
00024	F	????	WILD	WILD	INDIA NANDANKAN	~16 Mar 2003 17-Mar-03 13-Oct-11	Capture Transfer Death
00025 PNG-7 0006A29238	M	????	WILD	WILD	INDIA NANDANKAN	14-Apr-03 14-Apr-03 09-Jan-11	Capture Transfer Death
00026	F	24-Oct-03	UNK	24	NANDANKAN	24-Oct-03 04-Dec-03	Birth Death
00027	M	????	WILD	WILD	INDIA NANDANKAN INDIA	29-Dec-04 29-Dec-04 03-Feb-05	Capture Transfer Release
00028 9810205778	M	22-Sep-05	UNK	UNK	NANDANKAN	22-Sep-05 25-Jul-10	Birth Death
00029	F	08-Dec-05	UNK	UNK	NANDANKAN	08-Dec-05 09-Dec-05	Birth Death
00030	F	02-Feb-06	UNK	UNK	NANDANKAN	02-Feb-06 07-Feb-06	Birth Death
00031	F	????	WILD	WILD	INDIA KANPUR	~ 2006 ~ 2006 ~ 2006	Capture Transfer Death
00032	F	????	WILD	WILD	INDIA KANPUR	~ 2006 ~ 2006 ~ 2006	Capture Transfer Death
00033	?	????	WILD	WILD	INDIA PIMPRI	19-Nov-06 19-Nov-06 21-Nov-06	Capture Transfer Death
00034	M	11-Dec-06	UNK	UNK	NANDANKAN	11-Dec-06 22-Dec-06	Birth Death

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
00035	M	14-Jan-07	UNK	00023	NANDANKAN	14-Jan-07 14-Jan-07	Birth Death
00036 PNG-3 00068283F9	F	????	WILD	WILD	INDIA NANDANKAN	09-Nov-07 09-Nov-07 08-Nov-14	Capture Transfer Death
00037 PNG-6A 98102057484	F	16-Nov-07	00025	00022	NANDANKAN	16-Nov-07 24-Mar-10	Birth Death
00038 PNG-4 0006A2A395	F	????	WILD	WILD	INDIA NANDANKAN	02-Jan-08 02-Jan-08	Capture Transfer
00039 PNG-5 0006A2A13A	M	????	WILD	00038	INDIA NANDANKAN	02-Jan-08 02-Jan-08 18-Nov-10	Capture Transfer Death
00040 PNG-2A	F	04-Mar-08	00025	00023	NANDANKAN	04-Mar-08 08-Mar-08	Birth Death
00041	?	22-Apr-08	UNK	UNK	NANDANKAN	22-Apr-08 22-Apr-08	Birth Death
00042 PNG-4A	F	22-Apr-08	UNK	00038	NANDANKAN	22-Apr-08 22-Apr-08	Birth Death
00043 PNG-9 98102056160	F	????	WILD	WILD	INDIA NANDANKAN	17-Sep-08 17-Sep-08	Capture Transfer
00044 PNG-8 98102058378	M	????	WILD	WILD	INDIA NANDANKAN	20-Sep-08 20-Sep-08	Capture Transfer
00045 P473 98102055473	M	17-Jul-09	00025	00023	NANDANKAN	17-Jul-09	Birth
00046 00071515FE	M	28-Aug-09	00025	00038	NANDANKAN	28-Aug-09 24-Aug-13	Birth Death
00047	F	03-Aug-11	UNK	00043	NANDANKAN	03-Aug-11 01-May-12	Birth Death
00048 100114	M	~ 2008	WILD	WILD	INDIA MANGALORE	06-Oct-11 07-Oct-11	Capture Ltf
00049	M	????	WILD	WILD	INDIA NANDANKAN	~ 9 Oct 2011 11-Oct-11 13-Oct-11	Capture Transfer Death
00050	F	????	WILD	WILD	INDIA NANDANKAN	06-Jul-12 ~ 6 Jul 2012 29-Jul-13	Capture Transfer Death
00051 PNG10 00074D5A63	F	????	WILD	WILD	INDIA NANDANKAN	~ 2 Apr 2013 03-Apr-13	Capture Transfer
00052	M	03-Nov-14	00044	00051	NANDANKAN	03-Nov-14 08-Nov-14	Birth Death
00053 PNG17	?	28-Jul-17	UNK	00061	NANDANKAN	28-Jul-17	Birth
00054	?	28-Jul-17	UNK	UNK	NANDANKAN	28-Jul-17	Birth
00055	?	31-Dec-17	00044	00043	NANDANKAN	31-Dec-17	Birth

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
PANG13						02-Jan-18	Death
00056 PANG-1 PANGR1	M	~ Jun 2009	WILD	WILD	INDIA ROURKELA NANDANKAN	~ 9 Jun 2013 16-Jun-13 28-Jun-13 30-Jun-13	Capture Transfer Transfer Death
00057 PNG11	F	01-Oct-14	WILD	WILD	INDIA NANDANKAN	???? 09-Oct-14	Capture Transfer
00058 PNG12	F	~ 1 May 2015	WILD	WILD	INDIA NANDANKAN	???? 07-May-15	Capture Transfer
00059 PNG14	M	~ 1 Jun 2017	WILD	WILD	INDIA NANDANKAN	???? 23-Jun-17	Capture Transfer
00060 PNG15	F	~ 1 Jun 2017	WILD	WILD	INDIA NANDANKAN	11-Jun-17 13-Jun-17	Capture Transfer
00061 PNG16	F	????	WILD	WILD	INDIA NANDANKAN	~ 1 Jun 2017 09-Jun-17	Capture Transfer
00062 PNG18	F	????	WILD	WILD	INDIA NANDANKAN	???? 20-Aug-17	Capture Transfer
00063 PNG19	F	~ 1 Sep 2017	WILD	WILD	INDIA NANDANKAN	~ 3 Sep 2017 06-Sep-17	Capture Transfer
TOTALS: 63 (20.35.8)							

Annexure II

Living Population of *Manis crassicaudata*

Stud# Local ID Name Transponder	Sex	Birth Date	Sire	Dam	Location	Date	Event
Nandankanan Zoological Park, Bhubaneswar							
00019 0006A2AA6F	F	????	WILD	WILD	INDIA NANDANKAN	16-Jul-00 16-Jul-00	Capture Transfer
00038 PNG-4 0006A2A395	F	????	WILD	WILD	INDIA NANDANKAN	02-Jan-08 02-Jan-08	Capture Transfer
00043 PNG-9 98102056160	F	????	WILD	WILD	INDIA NANDANKAN	17-Sep-08 17-Sep-08	Capture Transfer
00044 PNG-8 98102058378	M	????	WILD	WILD	INDIA NANDANKAN	20-Sep-08 20-Sep-08	Capture Transfer
00045 P473 98102055473	M	17-Jul-09	00025	00023	NANDANKAN	17-Jul-09	Birth
00051 PNG10 00074D5A63	F	????	WILD	WILD	INDIA NANDANKAN	~ 2 Apr 2013 03-Apr-13	Capture Transfer
00053 PNG17	?	28-Jul-17	UNK	00061	NANDANKAN	28-Jul-17	Birth
00054	?	28-Jul-17	UNK	UNK	NANDANKAN	28-Jul-17	Birth
00057 PNG11	F	01-Oct-14	WILD	WILD	INDIA NANDANKAN	???? 09-Oct-14	Capture Transfer
00058 PNG12	F	~ 1 May 2015	WILD	WILD	INDIA NANDANKAN	???? 07-May-15	Capture Transfer
00059 PNG14	M	~ 1 Jun 2017	WILD	WILD	INDIA NANDANKAN	???? 23-Jun-17	Capture Transfer
00060 PNG15	F	~ 1 Jun 2017	WILD	WILD	INDIA NANDANKAN	11-Jun-17 13-Jun-17	Capture Transfer
00061 PNG16	F	????	WILD	WILD	INDIA NANDANKAN	~ 1 Jun 2017 09-Jun-17	Capture Transfer
00062 PNG18	F	????	WILD	WILD	INDIA NANDANKAN	???? 20-Aug-17	Capture Transfer
00063 PNG19	F	~ 1 Sep 2017	WILD	WILD	INDIA NANDANKAN	~ 3 Sep 2017 06-Sep-17	Capture Transfer
Total Living: 15 (3.10.2)							

Annexure III

Pedigree Chart Report Indian Pangolin Studbook

```
==========================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00001
==========================================================================
                WILD                                    WILD
                              \          /              Sex: Male
                               \        /       Birth Date:    ????
                                \      /     Last Location: CALCUTTA  (dead)
                              dam\    /sire    House Name:
                                  \  /             Tattoo:
                                   \/            Tag/Band:
                                 00001

==========================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00002
==========================================================================
                WILD                                    WILD
                              \          /              Sex: Male
                               \        /       Birth Date:    ????
                                \      /     Last Location: CALCUTTA  (dead)
                              dam\    /sire    House Name:
                                  \  /             Tattoo:
                                   \/            Tag/Band:
                                 00002

==========================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00003
==========================================================================
                WILD                                    WILD
                              \          /              Sex: Female
                               \        /       Birth Date:    ????
                                \      /     Last Location: NANDANKAN (dead)
                              dam\    /sire    House Name:
                                  \  /             Tattoo:
                                   \/            Tag/Band:
                                 00003

==========================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00004
==========================================================================
                WILD                                    WILD
                              \          /              Sex: Male
                               \        /       Birth Date:    ????
                                \      /     Last Location: INDIA
                              dam\    /sire    House Name: MURALI
                                  \  /             Tattoo:
                                   \/            Tag/Band:
                                 00004

==========================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00005
==========================================================================
                WILD                                    WILD
                              \          /              Sex: Female
                               \        /       Birth Date:    ????
                                \      /     Last Location: NANDANKAN (dead)
                              dam\    /sire    House Name: SUMATI
                                  \  /             Tattoo:
                                   \/            Tag/Band:
                                 00005
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00006
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Male
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00006

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00007
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Female
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00007

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00008
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Female
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00008

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00009
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Female
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00009

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00010
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Female
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: CALCUTTA  (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00010
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00011
================================================================================
                 WILD                                    WILD
                                  \          /           Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                     00011

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00012
================================================================================
                 WILD                                    WILD
                                  \          /           Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                     00012

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00013
================================================================================
       WILD                WILD                WILD                WILD
             dam\    /sire                               dam\    /sire
                 \  /                                        \  /
                  \/                                          \/
                00005  +                                    00004  +
                 SUMATI                                      MURALI
                                  \          /           Sex: Unknown
                                   \        /      Birth Date:  3 Jan 1998
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                     00013
+ Wild-caught...

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00014
================================================================================
                 WILD                                    WILD
                                  \          /           Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                     00014
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00015
================================================================================
       WILD                WILD                WILD                WILD
             dam\    /sire                           dam\    /sire
                 \  /                                    \  /
                  \/                                      \/
                00005  +                                00004  +
                 SUMATI                                  MURALI
                                \          /             Sex: Unknown
                                 \        /      Birth Date: 19 Jan 1999
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
+ Wild-caught...                   00015

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00016
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Female
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00016

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00017
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Female
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00017

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00018
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Male
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: MADRAS    (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00018

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00019
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Female
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00019
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00020
================================================================================
       WILD                WILD
             dam\    /sire
                 \  /
                  \/
                00005  +                                UNK
                 SUMATI
                                  \          /           Sex: Male
                                   \        /      Birth Date:  7 Jan 2001
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
+ Wild-caught...                     00020

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00021
================================================================================
                 WILD                                   WILD
                                  \          /           Sex: Unknown
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: CHATBIR Z (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00021

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00022
================================================================================
                 WILD                                   WILD
                                  \          /           Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00022

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00023
================================================================================
                 WILD                                   WILD
                                  \          /           Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00023

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00024
================================================================================
                 WILD                                   WILD
                                  \          /           Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00024
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00025
================================================================================
                 WILD                                    WILD
                                  \          /           Sex: Male
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                     00025

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00026
================================================================================
       WILD               WILD
             dam\    /sire
                 \  /
                  \/
                00024  +                                 UNK
                                  \          /           Sex: Female
                                   \        /      Birth Date: 24 Oct 2003
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
+ Wild-caught...                     00026

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00027
================================================================================
                 WILD                                    WILD
                                  \          /           Sex: Male
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: INDIA
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                     00027

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00028
================================================================================
                 UNK                                     UNK
                                  \          /           Sex: Male
                                   \        /      Birth Date: 22 Sep 2005
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                     00028

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00029
================================================================================
                 UNK                                     UNK
                                  \          /           Sex: Female
                                   \        /      Birth Date:  8 Dec 2005
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                     00029
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00030
================================================================================
                UNK                                       UNK
                                 \          /             Sex: Female
                                  \        /      Birth Date:  2 Feb 2006
                                   \      /    Last Location: NANDANKAN (dead)
                                 dam\    /sire    House Name:
                                     \  /             Tattoo:
                                      \/            Tag/Band:
                                    00030

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00031
================================================================================
                WILD                                      WILD
                                 \          /             Sex: Female
                                  \        /      Birth Date:    ????
                                   \      /    Last Location: KANPUR    (dead)
                                 dam\    /sire    House Name:
                                     \  /             Tattoo:
                                      \/            Tag/Band:
                                    00031

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00032
================================================================================
                WILD                                      WILD
                                 \          /             Sex: Female
                                  \        /      Birth Date:    ????
                                   \      /    Last Location: KANPUR    (dead)
                                 dam\    /sire    House Name:
                                     \  /             Tattoo:
                                      \/            Tag/Band:
                                    00032

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00033
================================================================================
                WILD                                      WILD
                                 \          /             Sex: Unknown
                                  \        /      Birth Date:    ????
                                   \      /    Last Location: PIMPRI    (dead)
                                 dam\    /sire    House Name:
                                     \  /             Tattoo:
                                      \/            Tag/Band:
                                    00033

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00034
================================================================================
                UNK                                       UNK
                                 \          /             Sex: Male
                                  \        /      Birth Date: 11 Dec 2006
                                   \      /    Last Location: NANDANKAN (dead)
                                 dam\    /sire    House Name:
                                     \  /             Tattoo:
                                      \/            Tag/Band:
                                    00034
```

```
 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00035
 ================================================================================
        WILD                WILD
              dam\    /sire
                  \  /
                   \/
                 00023  +                                UNK
                                  \          /           Sex: Male
                                   \        /      Birth Date: 14 Jan 2007
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
+ Wild-caught...                     00035

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00036
 ================================================================================
                  WILD                                WILD
                                  \          /           Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00036

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00037
 ================================================================================
        WILD                WILD                WILD                WILD
              dam\    /sire                             dam\    /sire
                  \  /                                      \  /
                   \/                                        \/
                 00022  +                                 00025  +
                                  \          /           Sex: Female
                                   \        /      Birth Date: 16 Nov 2007
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
+ Wild-caught...                     00037

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00038
 ================================================================================
                  WILD                                WILD
                                  \          /           Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00038
```

```
 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00039
 ================================================================================
        WILD                WILD
              dam\    /sire
                  \  /
                   \/
                00038  +                                 WILD
                                \          /             Sex: Male
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
+ Wild-caught...                        00039

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00040
 ================================================================================
        WILD                WILD                WILD                WILD
              dam\    /sire                           dam\    /sire
                  \  /                                    \  /
                   \/                                      \/
                00023  +                                 00025  +
                                \          /             Sex: Female
                                 \        /      Birth Date:  4 Mar 2008
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
+ Wild-caught...                        00040

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00041
 ================================================================================
                 UNK                                 UNK
                                \          /             Sex: Unknown
                                 \        /      Birth Date: 22 Apr 2008
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00041

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00042
 ================================================================================
        WILD                WILD
              dam\    /sire
                  \  /
                   \/
                00038  +                                 UNK
                                \          /             Sex: Female
                                 \        /      Birth Date: 22 Apr 2008
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
+ Wild-caught...                        00042
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00043
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Female
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00043

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00044
================================================================================
                 WILD                                    WILD
                                \          /             Sex: Male
                                 \        /      Birth Date:    ????
                                  \      /    Last Location: NANDANKAN
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
                                   00044

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00045
================================================================================
       WILD                WILD                WILD                WILD
             dam\    /sire                           dam\    /sire
                 \  /                                    \  /
                  \/                                      \/
               00023  +                                00025  +
                                \          /             Sex: Male
                                 \        /      Birth Date: 17 Jul 2009
                                  \      /    Last Location: NANDANKAN
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
+ Wild-caught...                   00045

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00046
================================================================================
       WILD                WILD                WILD                WILD
             dam\    /sire                           dam\    /sire
                 \  /                                    \  /
                  \/                                      \/
               00038  +                                00025  +
                                \          /             Sex: Male
                                 \        /      Birth Date: 28 Aug 2009
                                  \      /    Last Location: NANDANKAN (dead)
                                dam\    /sire    House Name:
                                    \  /             Tattoo:
                                     \/            Tag/Band:
+ Wild-caught...                   00046
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00047
================================================================================
       WILD                WILD
             dam\    /sire
                 \  /
                  \/
                00043  +                                UNK
                                  \          /          Sex: Female
                                   \        /      Birth Date:  3 Aug 2011
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
+ Wild-caught...                     00047

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00048
================================================================================
                  WILD                                  WILD
                                  \          /          Sex: Male
                                   \        /      Birth Date:      ~ 2008
                                    \      /    Last Location: MANGALORE
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00048

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00049
================================================================================
                  WILD                                  WILD
                                  \          /          Sex: Male
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00049

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00050
================================================================================
                  WILD                                  WILD
                                  \          /          Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00050

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00051
================================================================================
                  WILD                                  WILD
                                  \          /          Sex: Female
                                   \        /      Birth Date:    ????
                                    \      /    Last Location: NANDANKAN
                                  dam\    /sire    House Name:
                                      \  /            Tattoo:
                                       \/           Tag/Band:
                                    00051
```

```
 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00052
 ================================================================================
        WILD                WILD                WILD                WILD
              dam\    /sire                           dam\    /sire
                  \  /                                    \  /
                   \/                                      \/
                00051  +                                00044  +
                                  \          /             Sex: Male
                                   \        /      Birth Date:  3 Nov 2014
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
+ Wild-caught...                    00052

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00053
 ================================================================================
        WILD                WILD
              dam\    /sire
                  \  /
                   \/
                00061  +                                UNK
                                  \          /             Sex: Unknown
                                   \        /      Birth Date: 28 Jul 2017
                                    \      /    Last Location: NANDANKAN
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
+ Wild-caught...                    00053

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00054
 ================================================================================
                 UNK                                     UNK
                                  \          /             Sex: Unknown
                                   \        /      Birth Date: 28 Jul 2017
                                    \      /    Last Location: NANDANKAN
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
                                    00054

 ================================================================================
 Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00055
 ================================================================================
        WILD                WILD                WILD                WILD
              dam\    /sire                           dam\    /sire
                  \  /                                    \  /
                   \/                                      \/
                00043  +                                00044  +
                                  \          /             Sex: Unknown
                                   \        /      Birth Date: 31 Dec 2017
                                    \      /    Last Location: NANDANKAN (dead)
                                  dam\    /sire    House Name:
                                      \  /             Tattoo:
                                       \/            Tag/Band:
+ Wild-caught...                    00055
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00056
================================================================================
                WILD                                      WILD
                                \          /              Sex: Male
                                 \        /       Birth Date:  ~ Jun 2009
                                  \      /     Last Location: NANDANKAN (dead)
                                dam\    /sire     House Name:
                                    \  /              Tattoo:
                                     \/             Tag/Band:
                                   00056

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00057
================================================================================
                WILD                                      WILD
                                \          /              Sex: Female
                                 \        /       Birth Date:  1 Oct 2014
                                  \      /     Last Location: NANDANKAN
                                dam\    /sire     House Name:
                                    \  /              Tattoo:
                                     \/             Tag/Band:
                                   00057

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00058
================================================================================
                WILD                                      WILD
                                \          /              Sex: Female
                                 \        /       Birth Date:~ 1 May 2015
                                  \      /     Last Location: NANDANKAN
                                dam\    /sire     House Name:
                                    \  /              Tattoo:
                                     \/             Tag/Band:
                                   00058

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00059
================================================================================
                WILD                                      WILD
                                \          /              Sex: Male
                                 \        /       Birth Date:~ 1 Jun 2017
                                  \      /     Last Location: NANDANKAN
                                dam\    /sire     House Name:
                                    \  /              Tattoo:
                                     \/             Tag/Band:
                                   00059

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00060
================================================================================
                WILD                                      WILD
                                \          /              Sex: Female
                                 \        /       Birth Date:~ 1 Jun 2017
                                  \      /     Last Location: NANDANKAN
                                dam\    /sire     House Name:
                                    \  /              Tattoo:
                                     \/             Tag/Band:
                                   00060
```

```
================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00061
================================================================================
                 WILD                                    WILD
                                \           /            Sex: Female
                                 \         /      Birth Date:    ????
                                  \       /    Last Location: NANDANKAN
                                dam\     /sire    House Name:
                                    \   /             Tattoo:
                                     \/             Tag/Band:
                                   00061

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00062
================================================================================
                 WILD                                    WILD
                                \           /            Sex: Female
                                 \         /      Birth Date:    ????
                                  \       /    Last Location: NANDANKAN
                                dam\     /sire    House Name:
                                    \   /             Tattoo:
                                     \/             Tag/Band:
                                   00062

================================================================================
Taxon Name: MANIS CRASSICAUDATA                  Studbook Number:  00063
================================================================================
                 WILD                                    WILD
                                \           /            Sex: Female
                                 \         /      Birth Date:~ 1 Sep 2017
                                  \       /    Last Location: NANDANKAN
                                dam\     /sire    House Name:
                                    \   /             Tattoo:
                                     \/             Tag/Band:
                                   00063
```

Annexure IV

Location Glossary

Mnemonic	Zoo Name
CALCUTTA	Alipore Zoological Garden, Kolkatta
CHATBIR Z	M.C. Zoological Park, Chat-bir, Mohali
INDIA	All wild origin specimens
KANPUR	Kanpur Zoological Park, Kanpur
MADRAS	Arignar Anna Zoological Park, Chennai
MANGALORE	Dr. Sivaram Karanth Pilikula Biological Park, Mangalore
NANDANKAN	Nandankanan Zoological Park, Bhubaneswar
PIMPRI	Nisargakavi Bahinabai Chaudhary Zoo, Pimpri-Chinchwad
ROURKELA	Indira Gandhi Park, Rourkela