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**PROJECT PROPOSAL FOR THE
DEVELOPMENT AND MAINTENANCE OF
STUDBOOKS FOR SELECTED ENDANGERED
SPECIES IN INDIAN ZOOS**

**By
Wildlife Institute of India
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**Submitted To
Central Zoo Authority
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Project Personnel

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Duration of Project:	Five years from the date of commencement.
Financial implications (Rs.): of the project	5597050/-/- Rupees. Fifty-five lakhs, ninety seven thousand and fifty only

Background

Zoo and aquarium animal populations contribute to conservation efforts through maintaining insurance populations in captivity and reintroduction programs, conservation research, and as ambassadors on behalf of natural habitats; Unfortunately, the number of species that is extinct, or, nearly extinct, in the wild increases every day Many of these species will soon, or already exist only in captive breeding facilities, for these species, zoos and aquariums are the last bastions against extinction.

Development and maintenance of self-sustaining animal populations are essential to the realization of institutional and regional goals; few facilities have the space to house self-sustaining populations of vertebrates so there is great reliance on cooperative breeding and, management programs. These cooperative programs can provide the resources necessary to develop and maintain self-sustaining populations. Scientifically sound genetic and demographic management is essential to the development and maintenance of self-sustaining captive populations; this scientific approach to management underlies most cooperative, and many institutional, management programs.

Studbooks form the basis for genetic and demographic management of populations in zoos. These managed species are the most important to the educational, research, conservation, and recreational missions of zoos. Studbooks were initiated to provide accurate, up to date information in a standard format that could easily be used for genetic and demographic analyses of a single population. Quantitative analyses of data in a studbook are used to develop a management plan that is carried out through specific recommendations for each specimen in the population. Without studbooks, it would be virtually impossible to manage populations scientifically. Genetic and demographic recommendations for population management are only as good as the data upon which they are based.

Studbooks are the pedigree records of a specific group of animals. It includes information on all animals that have ever lived in captivity and their ancestors in the region, which come under the ambit of that studbook. Each animal is assigned a unique numerical identifier or studbook number that allows for constructing pedigrees for genetic analyses and determination of age of individuals for demographic analyses. The studbook records all the events in an animal's life from birth to death, including the details of time and locations where the animal was transferred. Studbooks; initially developed to manage thoroughbred horses were in the 20th century adapted to managing captive populations of threatened species. Analysis of information contained in studbooks allows for determination of pairing choices (planning mating and transfer of animals to different facilities) to ensure genetic viability. Making of demographic predictions; thereby ascertaining demographic stability of these populations. They also provide data for archival research e.g. identify age/location specific problems. The maintenance of a studbook is a dynamic process requiring continuous update of data to enable corrections in planning as the target population keeps changing.

The maintenance of studbooks is a dynamic ongoing activity as new animals are born or acquired and the old animals die or are transferred out. It is essential that an annual or once in two years update be carried out depending on the quantum of

changes. It is also essential that the studbooks be revised every five years to incorporate changes in the captive population and accordingly modify the population management plans. The time frame of update and revisions is based on the experience in the compilation of studbooks in the earlier project and the update process as outlined in 'Managing Zoo Populations: compiling and analyzing studbook data by Wilcken, J. and Lees, C. 1998' (see box below).

Compiling data

The studbook keeper is responsible for recording the data required in the desired format that is, using the SPARKS computer program to create an electronic database.

Informing the management process

The studbook keeper is responsible for keeping the studbook up to date, and for making the most recent updates available to those responsible for the species management. In this way, whenever management decisions are needed, they can be made in the context of the most recent developments in the population.

Publishing the data

Finally the studbook keeper is responsible for publishing the studbook. Different studbook authorities will have different publishing requirements and will demand updates at different intervals.

Introduction

The Wildlife Institute of India was awarded a project by the Central Zoo Authority in November 2006 for the update of existing studbooks of Asiatic lion, Bengal tiger, Indian Rhinoceros and Lion tailed macaque and initiation of new studbooks for Tibetan Wolf, Gaur - Indian bison, Nilgiri Langur, Red/ Lesser Panda, Snow Leopard, Bhutan Grey Peacock Pheasant, Wild Dog (Dhole), Clouded leopard, Wild Ass and Hoolock gibbon. The project has been completed and the final report of the same has been submitted to the Central Zoo Authority. While initiating the project it was envisaged that the zoos would acquire the necessary technical expertise and have necessary human resources with them by the completion of the project to enable the WII to hand over the task of compilation of studbooks to the coordinating zoos for the species. However; the necessary expertise continues to remain absent in Indian zoos.

It is therefore proposed that a National Studbook Cell as envisaged in 'Annexure-31 Note on "Roles Zoos Need to Play" in Zoos in India Legislation, Policy, Guidelines and Strategies' published by the Central Zoo Authority be created in a project mode in the WII with funding support from the CZA that would cater to the maintenance of studbooks and develop species specific management plans in captivity based on the conservation needs of the species. This cell would also provide requisite technical expertise to the CZA and Indian zoos in managing the conservation breeding programmes of the identified species.

Work Proposed

It is therefore proposed that the WII shall continue to maintain the existing studbooks that have been already prepared. It is also proposed to bring in new species into the studbook program to facilitate their planned breeding programmes. The details of the species for which studbooks will be updated are summarized in

table 1 while table 2 summarizes the details of new species which are proposed to be included for initiation of studbooks.

Table 1: Status of species in captivity for updating of studbooks

Sl. No.	Species	WPA Status	IUCN Red List Status	Status in Captivity	No. of Zoos	Studbook submitted month/ year
1.	Felids					
1.1	Asiatic lion (<i>Panthera leo persica</i>)	Schedule I	Endangered	64.77.4.145	17	April, 2011
1.2	Bengal tiger (<i>Panthera tigris tigris</i>)	Schedule I	Endangered	121.151.10.282	53	December, 2011
1.3	Snow leopard (<i>Uncia uncia</i>)	Schedule I	Endangered	6.4.0.10	4	August, 2009
1.4	Clouded leopard (<i>Neofelis nebulosa</i>)	Schedule I	Vulnerable	9.7.4.20	6	December, 2009
2.	Canids					
2.1	Wild dog (<i>Cuon alpinus</i>)	Schedule II	Endangered	13.12.0.25	6	June, 2010
2.2	Tibetan wolf (<i>Canis lupus chanco</i>)	Schedule I		9.16.0.25	4	August, 2009
3.	Small mammals					
3.1	Red panda (<i>Ailurus fulgens</i>)	Schedule I	Vulnerable	15.10.25	2	July, 2009
4.	Primates					
4.1	Lion tailed macaque (<i>Macaca silenus</i>)	Schedule I	Endangered	29.24.5.58	13	September, 2011
4.2	Nilgiri langur (<i>Trachypithecus johnii</i>)	Schedule I	Vulnerable	8.11.4.23	6	May, 2011
4.3	Hoolock gibbon (<i>Hoolock hoolock</i>),	Schedule I	Endangered	18.18.5.41	9	December, 2009
5.	Mega-herbivores					
5.1	Rhinoceros (<i>Rhinoceros unicornis</i>)	Schedule I	Vulnerable	19.12.0.31	11	February, 2010
5.2	Indian bison (<i>Bos gaurus</i>)	Schedule I	Vulnerable	19.12.0.31	13	April, 2010
6.	Herbivores					
6.1	Wild ass (<i>Equus hemionus</i>)	Schedule I	Endangered	9.6.0.15	2	August, 2010
7.	Aves					
6.1	Grey peacock pheasant (<i>Polyplectron bicalcaratum</i>)	Schedule I	Least concern	6.7.26.39	7	November, 2010

Table 2: Status of species in captivity for initiating new studbooks

Sl. No.	Species	WPA Status	IUCN Red List Status	Status in Captivity	No. of Zoos
1.	Canids				
1.1	Grey wolf (<i>Canis lupus pallipes</i>)	Schedule I	Status not available	15.19.4.38	11
2.	Small mammals				
2.1	Indian pangolin (<i>Manis crassicaudata</i>)	Schedule I	Near threatened	0.1.4.5	3
3.	Primates				
3.1	Pig-tailed monkey (<i>Macaca nemestrina</i>)	Schedule I	Vulnerable	8.11.6.25	6
3.2	Stump tailed monkey (<i>Macaca</i>	Schedule II	Vulnerable	29.24.5.58	11

	arctoides)	(part I)			
3.3	Phayre's leaf monkey / Spectaled langur; (<i>Trachypithecus phayrei</i>)	Schedule I	Endangered	5.7.0.12	1
3.4	Golden langur (<i>Trachypithecus geei</i>)	Schedule I	Endangered	5.2.0.7	1
4.	Herbivores				
4.1	Swamp deer (<i>Rucervus duvauceli</i>)	Schedule I	Vulnerable	31.45.86.162	15
4.2	Sangai (<i>Rucervus eldii eldii</i>)	Schedule I	Endangered	46.70.65.181	16
4.3	Mouse deer (<i>Moschiola indica</i>)	Schedule I	Least concern	6.14.3.23	6
4.4	Chinkara (<i>Gazella gazelle benneti</i>)	Schedule I	Least concern	44.65.32.141	18
4.5	Chowsingha (<i>Tetracerus quadricornis</i>)	Schedule I	Vulnerable	61.81.36.178	26
4.6	Serow (<i>Capricornis thar</i>)	Schedule I	Near threatened	4.4.0.8	4
4.7	Blue sheep (<i>Pseudois nayaur</i>)	Schedule I	Least concern	3.3.0.6	1
5.	Aves				
5.1	Nicobar pigeon (<i>Caloenas nicobarica</i>)	Schedule I	Near threatened	1.1.21.23	3
5.2	Cheer pheasant (<i>Catreus wallichi</i>)	Schedule I	Vulnerable	17.16.0.33	4
5.3	Himalayan monal (<i>Lophophorus impejanus</i>)	Schedule I	Least concern	23.12.2.37	8
5.4	Western tragopan (<i>Tragopan melanocephalus</i>)	Schedule I	Vulnerable	14.9.0.23	2
5.5	Long billed vulture (<i>Gyps indicus</i>)	Schedule I	Endangered	11.11.51.73	4
5.6	Slender billed vulture (<i>Gyps tenuirostris</i>)	Schedule I	Endangered	5.5.8.18	1
5.7	White backed – Bengal vulture (<i>Gyps bengalensis</i>)	Schedule I	Endangered	22.18.107.147	9

Aims and objectives of the project

The project aims to develop population management plans for identified species in captivity in Indian zoos and conservation breeding centres using pedigree information.

This objective can be best achieved by a periodic update of existing studbooks; initiation and maintenance of studbooks for all species that have been identified for conservation breeding.

Methodology

Data collection: For compiling studbook of each species the data will be collected from the Indian zoos holding that species, by means of mailed questionnaire survey, personal visits and CZA website. It is anticipated that the Central Zoo Authority would facilitate the collection of pedigree data from holding zoos/ centres.

Data entry: Collected data will be entered in SPARKS 1.5 software and studbook reports generated.

Data analysis: Subsequently, the SPARKS dataset will be exported to PM2000 by creating ~.prn and ~.ped files for demographic and genetic analyses in pm2000. The results of the analysis carried out using demographic analysis features of PM2000 will provide us with insights into the growth rates of the population; the age classes with maximum likelihood of mortality; and the age classes with maximum probability of individuals to breed or fecundity. It will also provide us with an insight into the current age distribution of the living individuals of known age in captivity. While the genetic analyses features would provide information on the genetic diversity being retained by the current population, the likelihood of individuals being inbred and the

relationship of each individual animal with every other animal in the population (mean kinship).

Data interpretation: The results of the above analysis will be used to develop population management plans for the species in captivity.

Expected Outcomes of the Project

It is expected that the project would be able to develop population management plans for the ex-situ conservation of the identified thirty-four (updating – 14; initiation – 20) species.

Work Plan

The data for studbooks which have been compiled in the earlier project have been updated till October 2011 based on availability of pedigree information from zoos. The data for these studbooks would continue to be updated annually while the revisions of the studbook and the population management plan in captivity will be carried out as per the schedule given in table 3 below. The schedule provides a tentative time line and is subject to the availability of data from zoos/CZA.

Table 3: Schedule for revision of studbooks compiled in the earlier project

S.no.	Species	Published in	Studbook to be revised by
1.	Red Panda (<i>Ailurus fulgens</i>)	July, 2009	July, 2014
2.	Snow Leopard (<i>Uncia uncia</i>)	August, 2009	August, 2014
3.	Tibetan wolf (<i>Canis lupus chanco</i>)	August, 2009	August, 2014
4.	Clouded Leopard (<i>Neofelis nebulosa</i>)	December, 2009	December, 2014
5.	Hoolock Gibbon (<i>Hoolock hoolock</i>)	December, 2009	December, 2014
6.	One horned Rhinoceros (<i>Rhinoceros unicornis</i>)	February, 2010	February, 2015
7.	Gaur (<i>Bos gaurus</i>)	April, 2010	April, 2015
8.	Asiatic wild dog (<i>Cuon alpinus</i>)	June, 2010	June, 2015
9.	Indian Wild Ass (<i>Equus hemionus khur</i>)	August, 2010	August, 2015
10.	Grey peacock pheasant (<i>Polyplectron bicalcaratum</i>)	November, 2010	November, 2015
11.	Asiatic Lion (<i>Panthera leo persica</i>)	April, 2011	April, 2016
12.	Nilgiri Langur (<i>Trachypithecus johnii</i>)	May, 2011	May, 2016
13.	Lion Tailed Macaque (<i>Macaca silenus</i>)	September, 2011	September, 2016
14.	Bengal tiger (<i>Panther tigris tigris</i>)	December, 2011	December, 2016

Table 4: Schedule for compilation and update of new studbooks

Sl. No	Activity	Year 1	Year 2	Year 3	Year 4	Year 5
1.	Initiation of studbooks and development of population management plans of Grey wolf, Indian pangolin, Pig tailed macaque, Stump tailed macaque, Phayre's leaf monkey and Golden langur					
2.	Initiation of studbooks and development of population management plans of Swamp deer, Sangai, Mouse deer, Chinkara, Chowsingha, Serow, and Blue sheep					
3.	Update of studbooks of Grey wolf, Indian pangolin, Pig tailed macaque, Stump tailed macaque, Phayre's leaf monkey and Golden langur					
4.	Initiation of new studbooks and development of population management plans of Nicobar pigeon, Cheer pheasant, Himalayan monal, Western Tragopan					
5.	Initiation of new studbooks and development of population management plans of Swamp deer, Sangai, Mouse deer, Chinkara, Chowsingha, Serow, and Blue sheep					
6.	Initiation of new studbooks and development of population management plans of Long billed vulture, Slender billed vulture, White backed vulture.					
7.	Update of all studbooks and review of population management plans based on changes in the population size and individuals					
8.	Final report writing					

BUDGET

Budget Summary

Details	Year 1	Year 2	Year 3	Year 4	Year 5	Amount (Rs.)
Salaries	624000/-	624000/-	648000/-	648000/-	648000/-	3192000/-
Travel	100000/-	100000/-	150000/-	100000/-	150000/-	600000/-
Stationary	95000/-	95000/-	95000/-	95000/-	295000/-	675000/-
Equipment	300000/-	0	0	0	0	300000/-
Miscellaneous and contingencies	20000/-	20000/-	20000/-	20000/-	20000/-	100000/-
Total	1531784/-	1231784/-	1305784/-	1255784/-	1505784/-	4867000/-
Institutional Charges @15%						730050/-
Grand Total						5597050/-

Justification for Recruitment of Project Personnel:

Conservation of various species of wild animals facing threats to their survival in the free ranging condition is one of the primary mandates of zoos. The conservation breeding of species in captivity is best managed by developing population management plans based on pedigree information contained in studbooks. The Wildlife Institute of India has already demonstrated that it can address the technical issues involved in the planning process by completing the task of development of population management plans for species identified for conservation breeding with adequate data as part of the earlier project. Zoos in India and other institutions do not have as yet the technical manpower and expertise required to do this planning process. The availability of manpower with relevant expertise is also limited.

It is therefore proposed to hire the services of a Project Consultant with relevant requisite experience for guiding and developing the population management plans for the identified species and a junior/senior research fellow to carry out the work. The essential and desirable qualifications for the project personnel are as under.

Essential Qualifications for Project Personnel

Sl. No.	Name of Post	Essential Qualifications	Desirable Qualifications	Age Limit
1.	Project Consultant	Doctoral Degree in Zoology or Wildlife Sciences	Candidate with Ph.D. Degree in Wildlife Science / Conservation. Research experience in field of animal ecology behavioural sciences, population management and understanding of management of captive animals and ex situ conservation	50 years
2.	Junior/Senior Research Fellow	Masters Degree in Zoology or Wildlife Sciences	Proficiency in use of computers	28 years

Detailed budget breakup – year-wise

Details	Year 1	Year 2	Year 3	Year 4	Year 5	Amount (Rs.)
Salaries						
Project Consultant	480000/-	480000/-	480000/-	480000/-	480000/-	2400000/-
Fellowship of 1 Junior/Senior Research Fellow @ Rs. 12000/- 14000/-per month	144000/-	144000/-	168000/-	168000/-	168000/-	792000/-
	624000/-	624000/-	648000/-	648000/-	648000/-	3192000/-
Travel						
Travel of PI and research personnel to captive facilities	50000/-	50000/-	50000/-	50000/-	50000/-	250000/-
Participation in trainings, conferences and workshops (National and International)	50000/-	50000/-	100000/-	50000/-	100000/-	350000/-
	100000/-	100000/-	150000/-	100000/-	150000/-	600000/-
Stationary						
Stationary and compilation and printing of studbooks	75000/-	75000/-	75000/-	75000/-	75000/-	375000/-
Final report printing	0	0	0	0	200000/-	200000/-
Books and periodicals	20000/-	20000/-	20000/-	20000/-	20000/-	100000/-
	95000/-	95000/-	95000/-	95000/-	295000/-	675000/-
Equipment						
Computers and peripherals.	200000/-	0	0	0	0	200000/-
Office establishment	100000/-	0	0	0	0	100000/-
	300000/-	0	0	0	0	300000/-
Miscellaneous and contingencies	20000/-	20000/-	20000/-	20000/-	20000/-	100000/-
Total	1531784/-	1231784/-	1305784/-	1255784/-	1505784/-	4867000/-
Institutional Charges @15%						730050/-
Grand Total						5597050/-