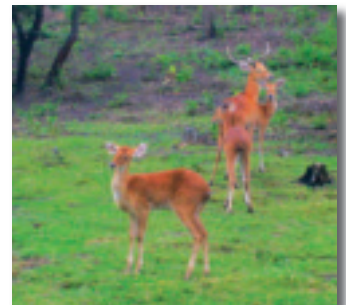


# Proceedings of International Conference on “India’s Conservation Breeding Initiative”

**21st to 24th February, 2008  
New Delhi (India)**



Organised by



**CENTRAL ZOO AUTHORITY**

(A Statutory body under the Ministry of Environment & Forests, Government of India)

Bikaner House, Annexe VI  
Shahjahan Road, New Delhi-110011, India  
Website: <http://www.cza.nic.in>  
E-mail: [cza@nic.in](mailto:cza@nic.in)  
Phone No. ++91-11-23381585, 23070375, 23073072  
Fax: ++91-11-23386012

*All rights reserved. Reproduction and dissemination of material in this proceedings for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders, provided the source is fully acknowledged and appropriate credit given. Reproduction of material in this proceedings product for other commercial purposes is prohibited without written permission of the publisher. Applications for such permission should be addressed to the Member Secretary, Central Zoo Authority or e-mailed to [cza@nic.in](mailto:cza@nic.in)*



The Central Zoo Authority would like to thank all the speakers and participants in making this publication a rich source of information.

*Published by*  
Central Zoo Authority, New Delhi  
2008

*Compiled, Edited & Designed by*  
Dr. Brij Raj Sharma  
Dr. Naim Akhtar  
Dr. Brij Kishor Gupta  
Central Zoo Authority

*Disclaimer*  
The views expressed in this publication do not necessarily represent those of the Central Zoo Authority.

We regret errors or omissions, if any that we may have unintentionally made.

# Contents

---

Page No.

- 05 - 07** International conference on “India’s conservation breeding initiative”:An overview -  
Dr. B.R. Sharma, Member Secretary, Central Zoo Authority
- 08 - 14** Concept paper on Conservation Breeding of Endangered Wild Animal Species in India
- 15 - 20** Detail programme of the conference
- 21** **Inauguration session (23rd Feb., 2008)**
- 22 - 24** Welcome address by Dr. B.R. Sharma, Member Secretary Central Zoo Authority, India
- 25 - 27** Address by Shri P.R. Mohanti, DGF & SS, Ministry of Environment & Forests, Govt. of India
- 28 - 30** Address by Dr. Robert C Lacy, Chairman CBSG/SSC/IUCN
- 31 - 33** Address by Professor Gordon McGregor Reid, President, WAZA
- 34 - 36** Inaugural address by the Chief Guest Thiru S. Reghupathy, Minister of State for Environment &  
Forest (Forests & Wildlife) & Chairman, CZA
- 37 - 38** Vote of Thanks by Shri D.N. Singh, Director, National Zoological Park & MS/IZA
- 38** Release of the Central Zoo Authority Publications:
- 39** **Training Sessions I (21st Feb., 2008)**
- 40 - 53** In-situ-ex-situ linkage-Wildlife conservation in India- Dr. R.B. Lal, IGF (WL) & Director Wildlife  
Preservation, Ministry of Environment & Forests, Govt. of India
- 54 - 70** Zoos in India-legislation, regulations, policy and guidelines- Dr. Brij Raj Sharma, Member Secretary,  
CZA
- 71 - 106** Laboratory for Conservation of Endangered Species (LaCONES) and Biotechnological  
interventions in conservation breeding of wild animals- Dr. S. Shivaji, Deputy Director, Centre  
for Cellular and Molecular Biology and In-Charge Laboratory for Conservation of Endangered  
Species (LaCONES), Hyderabad (A.P)
- 107 - 128** National Referral Centre and Physical health check-up/care of wild animals in Indian zoos-  
Dr. D. Swarup, Principal Scientist, Indian Veterinary Research Institute and Coordinator, National  
Referral Centre (NRC), Bareilly, (UP)
- 129** **Training Session II (21st Feb., 2008)**
- 130 - 146** Environmental enrichment; History, philosophy and concepts- Dr. David Shepherdson,  
Oregon Zoo, USA
- 147 - 167** The environment of environmental enrichment- Ms. Valerie Hare, The Shape of Enrichment.  
Inc., USA
- 168 - 191** Environmental planning- Ms. Valerie Hare, The Shape of Enrichment. Inc., US
- 192 - 215** A scientific evaluations of environmental enrichment:An effective tool for reducing stereotypic  
behaviour- Dr. David Shepherdson Oregon Zoo, USA

# Contents

---

Page No.

**216 Training Session III (22nd Feb., 2008)**

- 217 - 226** Modern animal records keeping for zoos- Dr. Nate Flesness, Executive Director, ISIS
- 227 - 245** National studbook (Herdbook) of identified wild animal species in India- Shri B.C. Choudhary, Wildlife Institute of India
- 246 - 257** Use of Zoological Information Management System (ZIMS) in Indian Zoos- Dr. Nate Flesness, Executive Director, ISIS
- 258 - 260** Indian zoos joining ISIS- Dr. Nate Flesness Executive Director ISIS
- 261 - 261** Discussion on Indian Zoo's joining of ZIMS/ISIS

**262 Training Session IV (22nd Feb., 2008)**

- 263 - 289** Conservation breeding-Challenges and Protocols- Dr. Robert C Lacy, Chairman, Conservation Breeding Specialist Group of SSC, IUCN
- 290 - 316** Managing populations for conservations breeding- Dr. Jonathan D Ballou, Smithsonian's National Zoological Park, Washington, USA

**317 Conference Session (23-24th Feb., 2008)**

- 318 - 342** Conservation breeding- India's Initiative- Dr. Brij Raj Sharma, IFS, Member Secretary, CZA
- 343 - 369** Zoo conservation in the Indian context- Professor Gordon McGregor Reid, President, WAZA
- 370 - 380** Conservation breeding scenario of wild animals species in India and possibilities- Shri S.K Patnaik, IFS Adl. Principal Chief Conservator of Forests & Chief Wildlife Warden (Retd.) Orissa, India
- 381 - 398** Conservation breeding-A Global view- Dr. Robert C Lacy, Chairman, Conservation Breeding Specialist Group of SSC, IUCN
- 399 - 413** Global cooperation in Captive breeding- Dr. Jonathan D Ballou Smithsonian's National Zoological Park, Washington, USA

**414 Working Group Sessions - Discussions and Recommendations**

- 415 - 416** Working group formation and Introduction of the topics- Ms. Sally Walker
- 417 - 421** Working group- I ( Carnivores)
- 422 - 425** Working group- II (Herbivores)
- 426 - 434** Working group- III (Primates/Bears)
- 435 - 438** Working group- IV (Birds)
- 439 - 441** Working group -V (Reptiles and Amphibians)
- 442 - 446** General recommendations

**447 Closing Session (24th Feb., 2008)**

- 448 - 449** Concluding remarks by Ms. Meena Gupta, Secretary, Ministry of Environment & Forests, Govt. of India
- 450 - 468** Images and moments
- 469 - 477** Indian Zoos joining ISIS/ZIMS Annexure
- 478 - 481** List of participants including addresses - Foreign
- 482 - 486** List of participants including addresses - Indian
- 487 - 494** Constitution of Indian Zoo Association

# International Conference on “India's Conservation Breeding Initiative”: An Overview

**Dr. B.R. Sharma**  
**Member Secretary, Central Zoo Authority**

India is among the 12 mega biodiversity countries of the world. Due to degradation of habitat from expansion in agriculture and human settlements and poaching, status of wild populations in the field is on the decline and many species are on the verge of extinction in many parts of the country. 4.58% of the total geographic land comprising of 96 national parks and 510 wildlife sanctuaries is under protection for wildlife. In addition to that there are 180 recognized zoological parks having around 40,000 wild animals in captivity in the country.

Zoos in India are regulated as per the Recognition of Zoo Rules, 1992 under the provisions of the Wild Life (Protection) Act, 1972 and are guided by the National Zoo Policy, 1998. The Central Zoo Authority was established by the Government of India in the year 1992 to oversee the functioning of Zoos in the country and to provide them technical and other inputs to come up to the desired level of management. There are 180 recognized Zoos in India, of which, 62 are major Zoos. The Central Zoo Authority has been instrumental in physical closing of 260 wild animal holding facilities as these facilities were found to be poorly created and managed.

The main objective of Zoos under the National Zoo Policy, 1998 is to strengthen the national efforts in conservation of rich biodiversity of the country, particularly the wild fauna, which can be achieved by supporting the conservation of endangered wild animal species by giving species which have no chance of survival in wild, a last chance through coordinated breeding under ex-situ

conditions and raise stocks for rehabilitating them in wild, as and when it is appropriate and desirable. The National Wildlife Action Plan (2002-2016) also lays emphasis on the role of Zoos for ex-situ breeding of endangered species of wild fauna and their rehabilitation in the wild as per the IUCN guidelines for reintroduction. The Central Zoo Authority has been identified under the Plan as one of the organizations for developing capabilities in this field. Today when wildlife habitats are under severe pressure and large number of species of wild animals have become endangered, the Zoos have not only to sustain their own populations but also augment the depleting population of endangered species in the wild.

It has been decided in the Central Zoo Authority that the Indian Zoos must have at least 100 (Target of 250 in captivity in world of which 100 must be in India) physically, genetically and behaviourally healthy individuals of each critically endangered wild animal species with less than few hundreds/ thousands (or say less than 2500) individuals left in the wild. Species with localized distribution get preference in the scheme of things. Proper captive stock to continue display, to act as insurance for the exigencies and for reintroduction/ release in wild, in case needed, form very base of conservation breeding programme in India. The ex-situ conservation breeding of endangered species in India is a joint venture of in-situ and ex-situ wildlife managers. It is a need based activity. The in-situ wildlife managers identify the species which need immediate intervention in form of ex-situ conservation breeding and also the habitats for which

the activity is proposed. Taking corrective measures to address the cause of earlier decline/ extinction of the wild populations of the targeted species is one of the important components of the programme. The existing Zoos are the other major component of the programme as there is huge infrastructure and trained/ experienced manpower available over there to deal with the issue.

Two to four Zoos in the habitat range of the targeted species take part in the breeding programme, whereas, the breeding facilities in the form of off-display conservation breeding centres are created only in one (coordinating Zoos) to two Zoos of the region. Other Zoos in addition to the coordinating and participating Zoos continue to display the species in naturalistic enclosures. Possibility of identifying around 25 founders is assessed from existing captive population in Indian Zoos. Efforts are made to acquire suitable founders from rescue centres, foreign Zoos and even from wild to initiate the programme or to induce new blood in the existing captive populations. The target is as already mentioned, to have at least 100 physically, genetically and behaviourally healthy and identifiable individuals with animal history cards of each species in captivity of which less than 2500 individuals are left in the wild. The Central Zoo Authority is providing funds for creation of off-display Conservation Breeding Centres (CBC) and engagement of technical manpower for preparation of Conservation Breeding Management Plan (CBMP) for each identified species in coordinating Zoos. The Wildlife Institute of India has been entrusted the work of preparation and updating the national studbooks/ herd books of all the targeted species including marking and preparing animal history cards of all the participating individuals. A National Referral Centre has been established at Indian Veterinary Research Institute, Bareilly to provide super speciality services and diagnostic facilities to the Zoos for

physical health check-up and health care of the animals. A Laboratory for Conservation of Endangered Species (LaCONES) for biotechnological interventions has been established at Hyderabad for doing genetic fingerprinting of the founders and others. World Association of Zoos & Aquariums/ Conservation Breeding Specialist Group (CBSG)/ SSC/ IUCN have also been requested to be engaged and support the activity. All the major Zoos in India are joining ISIS/ ZIMS.

63 different critically endangered wild animal species have been identified for adoption under coordinated planned conservation breeding programme in India. Keeping the above in view, the Central Zoo Authority conceptualized the International Conference for the Indian Zoo Directors inviting the zoo personnel from abroad particularly from the zoos interested and working with wild animals species of Indian sub-continent. The conference was held in National Agriculture Science Centre, of Indian Council of Agriculture Research, New Delhi from 21<sup>st</sup> to 24<sup>th</sup> February, 2008. During the first two days of the Conference i.e. 21<sup>st</sup> and 22<sup>nd</sup> February, the Indian participants were given lessons on the importance of in-situ – ex-situ linkage, functioning of Central Zoo Authority, Laboratory for Conservation of Endangered Species (LaCONES), National Referral Centre (NRC), enrichment of enclosures, Record keeping (ISIS/ZIMS, National Studbooks) and various aspects of conservation breeding through national and international resource persons. The second part of the Conference was devoted i.e. 23<sup>rd</sup> and 24<sup>th</sup> February, 2008 to the Conference Session where zoo directors from India and abroad discussed the issues related to India's conservation breeding initiative, need of global cooperation to make it successful and other issues related to conservation breeding of identified endangered wild animal species. Working group discussion sessions were organized by dividing the participants into 5 different working groups

to deal with carnivores, herbivores, primates/bears, birds and reptiles/ amphibians. One of the major event of the Conference was launching of Indian Zoos Association (IZA) with all the major recognized Indian zoos as well as zoo professional associations as members.

The Central Zoo Authority received tremendous response from the world zoo community as 98 participants from countries like Australia, USA, UK, Czech Republic, United Arab Emirates, Finland, France, Germany, Holland, Hungary, Japan, Russia, Sri Lanka, Sweden, Switzerland, Thailand and of course from India attended the conference. Except the resource persons, rest of the international participants attended the conference at their own expenses. The local hospitality was provided by the Central Zoo Authority.

Presence of the Minister of State for Environment & Forests (Forests & Wildlife)/ Chairman, Central Zoo Authority; Director General of Forests, Ministry of Environment & Forests, Government of India during the Inaugural Session and the Secretary, Ministry of Environment & Forests, Government of India and Director General of Forests, Ministry of Environment & Forests, Government of India in the Closing Session explains the importance Government of India assigns to the conservation breeding programme and presence of Dr. Robert C Lacy, Chairman, CBSG and Prof. Gordon Reid, President, World Association of Zoos & Aquariums along with 43 participants from abroad all through Conference measures of the interest of the world zoo community into the programme/ conference.

# “Concept paper on *In-situ ex-situ* linkage - Conservation Breeding of Endangered Wild Animal Species in India”

**Dr. B.R. Sharma**  
**Member Secretary, Central Zoo Authority**

India's 328.7 million hectare of land mass, occupies 2.4% of world's total land area. The population of India at 1027 million (in 2001) constituted about 16.7% of world's population. There are more than 500 million cattle and poultry in the country.

The total area under forest cover in India is 77.47 million hectare, which is 23.57% of the total land area. 606 Protected Areas comprising 96 national parks and 510 wildlife sanctuaries with overlapping of 28 tiger reserves and 25 elephant reserves cover an area of 15.59 million hect. and making up about 4.58% of the total geographic area and 22.12% of total forest cover of the country. In addition to that, there are 180 recognized Zoological Parks having around 40,000 wild animals in captivity in the country.

India is among the 12 mega biodiversity countries of the world. 350 species of mammals, 1224 of birds, 408 of reptiles, 197 of amphibians, 2546 of fishes, 57548 of insects and 46286 species of plants found in India form 8% of the world's diversity of life forms.

The country stands out as a treasure trove of natural wealth despite countless obstacles to their conservation. Habitat loss has been due to severe biotic pressure, diversion of forest land for non-forestry purposes or illegal occupation, degradation of habitat, fragmentation of habitat. Problems are manifold.

There is an urgent need to conserve its forests and wildlife.

The Government of India has always been sensitive to this and taken several initiatives towards preservation of forests and wildlife in the country from time to time.

The first regular policy statement relating to forestry in India was issued in 1894. After independence, a new National Forest Policy was enunciated in the year 1952, which substantially removed the angularities of the earlier Policy of 1894. The 1952 Policy was replaced by the National Forest Policy of 1988 and has been adopted by all the States.

Forest legislation in India dates back to 1865 when the first Indian Forest Act was passed. This Act was later revised in 1878. The process continued till the currently applicable Indian Forest Act of 1927. The Wild Life (Protection) Act, 1972 was enacted to give proper shape to wildlife conservation in the country. This Act was amended in 1982, 1986, 1991, 1993, 2003 and 2006 to make it more comprehensive. The Forest (Conservation) Act was enacted in 1980 with a view to check indiscriminate diversion of forest land for non-forestry purposes.

The Central Zoo Authority was created by the Government of India in the year 1992 through an amendment of the Wild Life (Protection) (Amendment 1991) Act, 1972. The main objective is to oversee the functioning of Zoos in the country and to enforce minimum standards and norms for upkeep and health care of animals in Indian Zoos so that the Zoos come up to standards where they can complement and strengthen the national efforts in conservation of wild fauna of the country.

The need for ex-situ conservation of wild fauna as one of the main objectives for management of Zoos was realized by the Government of India soon after independence and the then Indian Board for Wildlife (now the National Board for Wildlife) made important recommendations in this regard. An Expert Committee on Management of Zoos was set up in November, 1972 and its recommendations were accepted in June, 1973, which still have relevance in the current period. The National Wildlife Action Plan of 1983 again emphasized the role of ex-situ conservation in national conservation efforts. The National Wildlife Action Plan (2002-2016) also lays emphasis on the role of Zoos for ex-situ breeding of endangered species of wild fauna and their rehabilitation in the wild as per the IUCN guidelines for reintroduction. The Central Zoo Authority has been identified under the Plan, as one of the organizations for developing capabilities in this field.

To give proper direction and thrust to the management of Zoos in the country, the National Zoo Policy was framed and adopted by the Government of India in the year 1998. The main objective of the Zoos under the National Zoo Policy is to complement and strengthen the national efforts in conservation of rich bio-diversity of the country, particularly the wild fauna. This objective can be achieved by supporting the conservation of endangered species by giving species, which have no chance of survival in the wild, a last chance through coordinated breeding under ex-situ conditions and raise stocks for rehabilitating them in wild, as and when, it is appropriate and desirable. Conservation education and research for conservation of wildlife are other objectives of Zoos enshrined in the National Zoo Policy.

Today when wildlife habitats are under severe pressure and a large number of species of wild animals have become endangered, the Zoos have not only to sustain their own populations, but also have to work to augment

the depleting populations of endangered species in the wild. Keeping in view of these facts, a group of experts was formed by the Central Zoo Authority just after its creation in 1992 with a mandate to prepare a strategy for conservation breeding of endangered species in Indian Zoos. The group identified about 35 mammals, birds and reptiles for their probable captive breeding in identified Zoos. The Chief Wild Life Warden's of the States within the natural distribution of the species, were selected as coordinators for the species under the programme. Responsibility for maintaining of the studbook for select endangered species was also given to Zoos. However, because of varied ownership patterns of the Zoos and divergent nature of animal collections, not much was achieved.

Taking note of the past success and failure of ex-situ breeding of endangered species in Indian Zoos, the issue was again taken up for discussion in the meeting of the Central Zoo Authority in the year 2005.

This was felt that Indian Zoos have to have at least 100 properly and scientifically bred and physically, genetically and behaviourally healthy individuals of each endangered wild animal species in captivity to act as insurance cover in case of population loss of the species in the wild. Having proper captive stocks to continue display, have properly bred animals to act as insurance and for reintroduction or release in the wild in case needed, form very base of planned coordinated conservation breeding in India.

In spite of all efforts in the past, the conservation breeding of identified endangered species could not be implemented in toto in Indian Zoos as the number of animals of such species in Indian Zoos was either small or the Zoos did not have the species in captivity. Another reason was non-availability of technical personnel to monitor the programme as well as financial resources to

run the programmes. To bring in a holistic development of Zoos in India and to achieve the main objective of Zoos as Centres which can compliment the national effort of wildlife conservation in India, we need to infuse more technical and scientific culture in operation of our Zoos and change the general perception of Zoos from being mere picnic spots to more of a scientific institutions.

All the Zoos in India are equipped with small veterinary facilities along with veterinary personnels as per the classification of the Zoo and as per the standards and norms under the Recognition of Zoo Rules, 1992. The Zoos have also been asked to develop mechanism with local veterinary colleges/ universities/ hospitals in the region to provide specialized services and diagnostic facilities to them. Indian Veterinary Research Institute, Bareilly has been identified as a National Referral Centre (NRC) to provide super specialty services and diagnostic facilities to the Indian Zoos to deal with the issue of health care of wild animals, training of Zoo veterinarians and conducting research on health care and nutrition of wild animals in captivity.

The coordinating and participating Zoos have been asked to construct appropriate enclosures for the targetted wild animal species to fulfill their physical and behavioural needs. The coordinating Zoo for each targetted species has also been requested to create off-display conservation breeding facility either in the Zoo compound or as satellite facility. School of Planning & Architecture (SPA), New Delhi has been assigned the study on Zoo Design and Architecture to help the Zoos in this regard. In order to infuse new technology in the field of reproduction and molecular characterization of endangered species, a Laboratory (Laboratory for Conservation of Endangered Species – LaCONES) has been established at Hyderabad. A Memorandum of Understanding (MoU) has been signed with the Wildlife

Institute of India, Dehradun for preparation and updating of National Studbooks for the identified endangered wild animal species being taken up for Conservation Breeding Programme. The Zoos are also being provided funds in form of small grant fellowships to organize studies to deal with the local issues and the coordinating Zoos have been asked to engage technical manpower for preparation of Conservation Breeding Management Plan (CBMP) for the targetted species. All these initiatives are being made to modify and equip the Zoos for taking up this great responsibility and participate in Conservation Breeding Programme. ISIS –ZIMS Authorities have also been contacted to assist the Indian Zoos in data compilation and recordkeeping.

The ex-situ conservation breeding of endangered species in India is a joint venture of in-situ and ex-situ wildlife managers. This is a need based activity. The Chief Wild Life Wardens and protected area managers had been requested to identify the species which need immediate intervention in the form of ex-situ conservation breeding for the protected areas under their control. Wildlife Wings of the State Governments have been requested to conduct time to time census of wild animals in collaboration with scientific institutions and non government organizations to assess the field conditions as well as identify animal species which need help from Zoos. Another component of the programme is identification of the Protected Area having wild population of the proposed species/ re-introduction site in the vicinity of the conservation breeding facility. The in-situ managers of the protected areas will be taking corrective measures to address the cause of decline/ extinction of wild population of the targetted species in its natural habitat. Analyzing suitability of the wild habitat for the targetted species, the number of animals left in the habitat, assessing and analysing the cause of decline/ loss of number of animal species and the inputs required for

the improvement of the habitat in the form of habitat manipulation to make it more suitable for the target species and protection required in case the cause is found to be hunting, trapping etc. form major component of the programme. It was decided that critically endangered wild animal species with few hundreds/ thousands (or say less than 2500) left in the wild need to be taken up for ex-situ conservation breeding in the Zoos on immediate basis in the country. Species with localized distribution should get preference in the scheme of things.

The existing Zoos are the other major component of the programme as there is huge infrastructure and trained manpower available there to deal with the issue. One major Zoo just next to the natural habitat of the targeted species has been given responsibility as co-ordinating Zoo for each the identified species. Two to four Zoos (participating Zoos) in the habitat range of the targeted species will take part in the breeding programme of the targeted species. Conservation breeding facility in the form of off display centre (if the appropriate land is available in the Zoo compound) or in the form of satellite facility will be created only in one (coordinating Zoo) to two Zoos of the region. Other Zoos in the country in addition to the coordinating Zoo and participating Zoos may continue to display the species in naturalistic enclosures.

The possibility of identifying around 25 animals as founders will be assessed from the existing captive population in Indian Zoos. Efforts will be made to acquire suitable founders from rescue centres and foreign Zoos to initiate the programme or to induce new blood into the existing founder population. If required, the Government of India will also be approached for allowing acquisition of animals of wild origin from the rescue centres or from wild for initiation/ continuation of breeding programmes. The target is to have atleast 250 properly bred and physically, genetically and behaviourally healthy individual of each targeted species in the world in captivity of which

at least 100 must be in India. Sequence of steps to be taken up under the planned coordinated Conservation Breeding Programme of critically endangered wild animal species in India is:

1. Identification of species.
2. Approximate number of animals of the species in the wild.
3. Number of animals of the species in captivity in Indian Zoos.
4. Identification of coordinating Zoos.
5. Identification of participating Zoos.
6. Existence of animal enclosures in coordinating, participating and other Zoos.
7. Existence/ creation of off-display enclosure for conservation breeding in coordinating Zoo.
8. Identification of founders.
9. Marking of founders (transponders, ear tags or rings).
10. Preparation of animal history cards of the identified founders by the Zoos.
11. Compilation of Studbook by the National Studbook Keeper, (Wildlife Institute of India, Dehradun/ co-ordinating zoos).
12. Liaison with the International Studbook Keeper of the species (if any).
13. Possibility of acquiring the founders from foreign Zoos (if required) and details of the Zoos from where founders can be acquired.
14. Physical health check-up of the founders using the veterinary hospital in the Zoo as well as National Referral Centre (Indian Veterinary Research Institute, Bareilly).
15. Genetic health check-up of the founders using blood samples or body parts with help from LaCONES, Hyderabad.
16. Engagement of Technical Personnel in the coordinating Zoo.
17. Preparation of conservation breeding management plan of the species.

The creation of appropriate housing facility in the form of off-display conservation breeding centre/ satellite facility along with the project office in the coordinating Zoos will be funded by the Central Zoo Authority on 100% basis. The maintenance of the conservation breeding facility will be the sole responsibility of the Zoo Operators/ State Governments.

More than 90% of the recognized Zoos in the country are operated or controlled by the State Forest/ Wildlife Departments. These are also managing the in-situ facilities that make the coordination between the in-situ and ex-situ wildlife conservation activities much easier.

Help of the national/ international organization, institutions, NGOs and related bodies will also be sought to make the programme successful. World Association of Zoos & Aquariums (WAZA) will also be requested to support the activity as part of Global Species Management Programme (GSMP). Conservation Breeding Specialist Group of SSC-IUCN will also be engaged in the activity. The wild animals bred as part

of the coordinated conservation breeding activity, will occasionally be released in the identified habitats following IUCN guidelines for the purpose involving Reintroduction Specialized Group of SSC-IUCN. The main purpose of this is to have hands on experience and develop the mechanism for such operations, so that the same can be used in case of exigencies in formal release operations, Zoos may have to conduct in future.

Present stock of wild animals of the commoner species from unplanned breeding of unknown lineage or prolific breeding species in Indian Zoos again of doubtful lineage will be phased out and replaced by the individuals of the desirable species bred and kept in more planned and scientific ways, which are physically, genetically, behaviourally healthy and can be used as future insurance for the cases of exigencies. The conservation breeding programme is not necessarily to breed the animals of the targeted species for reintroduction in the wild straight only but to have proper stock for display in the Zoos and to have the right animals as an insurance for exigencies and for experimental release in the wild.

## List of the identified endangered wild animal species to be taken up for the planned coordinated Conservation Breeding giving details of the coordinating Zoos, participating Zoos and the number of animals of the species in captivity in India

Sl. No.	Name of the Species	Name of the coordinating Zoo	Names of the participating Zoos	Number of animals of the species in captivity in India
1.	Asiatic lion ( <i>Panthera leo</i> )	Junagarh	Hyderabad, Bhopal, New Delhi, Rajkot	80
2.	Bengal tiger ( <i>Panthera tigris</i> )	Bhopal	New Delhi Hyderabad, Bhubaneswar, Chhatbir, Chennai	255
3.	Snow leopard ( <i>Panthera uncia</i> )	Darjeeling	Leh, Kufri, Nainital, Gangtok	18
4.	Clouded leopard ( <i>Panthera nebulosa</i> )	Sepahijala	Guwahati	14
5.	Asiatic cheetah ( <i>Acinonyx jubatus venaticus</i> )	Junaga rh	--	--
6.	Golden cat ( <i>Catopuma temmincki</i> )	Guwahati		3
7.	Tibetan wolf ( <i>Canis lupus laniger</i> )	Darjeeling	Gangtok, Nainital, Kufri	21
8.	Grey wolf ( <i>Canis lupus</i> )	Junagarh		
9.	Wild dog ( <i>Cuon alpinus</i> )	Visakhapatnam	Chennai	30
10.	Brown bear ( <i>Ursus arctos</i> )	Kufri	Leh	2
11.	Sun bear ( <i>Helarctos malayanus</i> )	Aizawl	Guwahati	2
12.	Red panda ( <i>Ailurus fulgens</i> )	Darjeeling	Gangtok, Yachuli	18
13.	Binturong ( <i>Arctictis binturong</i> )	Sepahijala	Guwahati, Aizawl	13
14.	Smooth coated otter ( <i>Lutrogale perspicillata</i> )	Ahmedabad		
15.	Malabar giant squirrel ( <i>Ratufa indica</i> )	Pilikula	Chennai, Pune	
16.	Pangolin ( <i>Lepus nigricollis</i> )	Bhubaneswar	--	8
17.	Lion tailed monkey ( <i>Macaca silenus</i> )	Chennai	Mysore, Trivandrum	60
18.	Pig-tailed monkey ( <i>Macaca nemestrina</i> )	Sepahijala	Guwahati	18
19.	Stump tailed monkey ( <i>Macaca radiate</i> )	Aizawl	Guwahati	51
20.	Phayre's leaf monkey ( <i>Trachypithecus phayrei</i> )	Sepahijala	--	14
21.	Crab eating monkey ( <i>Macaca fascicularis</i> )	Chidiyatapu (Port Blair)	--	12
22.	Nilgiri langur ( <i>Semnopithecus johnii</i> )	Chennai	Mysore	27
23.	Golden langur ( <i>Trachypithecus geei</i> )	Guwahati	Island near Guwahati	14
24.	Capped langur ( <i>Trachypithecus pileatus</i> )	Rangapahar	--	6
25.	Hoolock gibbon ( <i>Hoolock leuconedys</i> )	Itanagar	Aizawl, Guwahati, Sepahijala	11
26.	Indian One-horned Rhinoceros ( <i>Rhinoceros unicornis</i> )	Guwahati	Patna, New Delhi, Kanpur	36
27.	Indian bison ( <i>Bos gaurus</i> )	Mysore	Chennai, Bondla	37
28.	Wild ass ( <i>Equus hemionus khur</i> )	Junagarh	--	11
29.	Himalayan tahr ( <i>Hemitragus jemlahicus</i> )	Gangtok	Darjeeling, Kufri, Chopta	3
30.	Nilgiri tahr ( <i>Nilgiritragus hylocrius</i> )	Ooty	--	1
31.	Markhor ( <i>Capra falconeri</i> )	Pehalgaon	--	-
32.	Blue sheep ( <i>Pseudois nayaur</i> )	Gangtok	Darjeeling	-
33.	Serow ( <i>Nemorhaedus sumatraensis</i> )	Guwahati	Manipur	6
34.	Swamp deer ( <i>Cervus duvauceli</i> )	Kanpur	Jaldapara WLS	115
35.	Thamin deer ( <i>Cervus eldi</i> )	Manipur	Guwahati, Kolkata, New Delhi	177
36.	Mouse deer ( <i>Tragulus meminna</i> )	Hyderabad	Bhubaneswar	13
37.	Musk deer ( <i>Moschus chrysogaster</i> )	Chopta	Gulmarg, Gangtok, Kufri	11
38.	Hangul ( <i>Cervus elaphus hanglu</i> )	Shikargah	--	1
39.	Chiru ( <i>Pantholops hodgsonii</i> )	Leh	--	2
40.	Pygmy hog ( <i>Sus salvanius</i> )	Basistha	Guwahati	112
41.	Himalayan monal ( <i>Lophophorus impejanus</i> )	Manali	Darjeeling, Gangtok	23
42.	Blood pheasant ( <i>Ithaginis cruentus</i> )	Gangtok	Darjeeling	--

43.	Cheer pheasant ( <i>Catreus wallichi</i> )	Chail	Almora	48
44.	Hume's pheasant ( <i>Symaticus humiae humiae</i> )	Aizawl	--	4
45.	Grey Peacock pheasant ( <i>Polyplectron bicalcaratum</i> )	Guwahati	Kolkata, Darjeeling	60
46.	Sclater's (mishmi) monal ( <i>Lophophorus sclateri sclateri</i> )	Yachuli	--	--
47.	Tibetan eared pheasant ( <i>Crossoptilon harmani</i> )	Yachuli	--	--
48.	Temminck tragopan ( <i>Tragopan temminckii</i> )	Yachuli	--	--
49.	Blyth's tragopan ( <i>Tragopan blythii</i> )	Kohima	--	12
50.	Western tragopan ( <i>Tragopan melanocephalus</i> )	Sarahan	--	8
51.	Styr tragopan ( <i>Tragopan satyra</i> )	Darjeeling	Gangtok	2
52.	Grey jungle fowl ( <i>Gallus sonnerati</i> )	Tirupati	--	33
53.	Red jungle fowl ( <i>Gallus gallus gallus</i> )	Morni	Chail, New Delhi, Aizawl	209
54.	Malabar grey hornbill ( <i>Ocyroceros griseus</i> )	Kodanadu (Kerala)	Hyderabad	
55.	Malabar pied hornbill ( <i>Anthraceroceros coronatus</i> )	Kodanadu (Kerala)	Hyderabad	
56.	Vultures (White backed Vulture, Himalayan Griffon Vulture, etc.)	Pinjore	Hyderabad, Bhopal, Junagarh, Bhubaneswar, Rajabhatkhawa, Guwahati	93
57.	Falcons (Eagles, Hobbies, Kestral, Harrier, accipiter, etc.)	Chhatbir	Jaipur	3
58.	Bustards (Great Indian bustard, Lesser florican, Bengal florican, Hubara bustard)	--	--	1
59.	Nicobar pigeon ( <i>Caloenas nicobarica</i> )	Chidiyatapu, Port Blair	Ahmedabad, Kolkata	42
60.	King cobra ( <i>Ophiophagus Hannah</i> )	Pilikula	Bangalore, Mammalapuram	35
61.	Water monitor ( <i>Varanus salvator</i> )	Chidiyatapu, Port Blair	Mammalapuram	40
62.	Painted roof turtle ( <i>Kachuga kachuga</i> )	Kukrail	Mammalapuram	2
63.	Himalayan salamander ( <i>Tyletrotiton verrucosus</i> )	Darjeeling	--	

# International Conference on “India's Conservation Breeding Initiative” 21st to 24th February, 2008, New Delhi (India)

## Detail Programme

Date/Time	Subject	Resource Person
<b>20<sup>th</sup> February, 2008 (Wednesday)</b>		
3.30 PM – 5.30 PM	(i) Indian Zoo Directors' Meeting with Member Secretary, Central Zoo Authority (ii) About ZIMS – Dr. Brij Kishor Gupta, Central Zoo Authority	<b>At Training Room (NASC)</b>
(i) The complementary breakfast for all the foreign delegates staying at Hotel Ashok will be provided at the Coffee Shop of the Hotel. (ii) The lunch is arranged by the Central Zoo Authority for all the participants staying at Hotel Ashok at “Darbar” (Hotel Ashok).		
<b>21<sup>st</sup> February, 2008 (Thursday)</b>		
(i) For the foreign delegates staying at Hotel Ashok are requested to have early complementary breakfast served at the Coffee Shop. (ii) The overseas participants shall leave at 8.30 AM by bus from the Hotel The Ashok to Agra for sight seeing and visit to Agra Bear Rescue Facility. The bus will be back at Hotel by 9.30 PM on the same day. (iii) Late dinner has been organized for all the participants at Coffee Shop in the Hotel Ashok.		
8:30 AM – 9:00 AM	<b>Registration (Indian Zoo Directors)</b>	
		<b>Venue- Lecture Hall</b>
9:20 AM – 9:50 AM	In-situ & ex-situ linkage- Wildlife Conservation in India	Dr. R. B. Lal, IGF (WL) & Director, Wildlife Preservation, Govt. of India
9:50 AM – 10:40 AM	Zoos in India – legislation, regulations, policy & guidelines	Dr. B. R. Sharma, Member Secretary, Central Zoo Authority, India
10:40AM – 11:00 AM	<b>Tea break</b>	
11:00AM – 11:50 AM	LaCONES and biotechnological interventions in Conservation Breeding of wild animals	Dr. S. Shivaji, Deputy Director, Centre for Cellular and Molecular Biology, and In-Charge, Laboratory for Conservation of Endangered Species (LaCONES), Hyderabad
11:50AM – 12:40 PM	National Referral Centre and Physical Health Check-up/ care of wild animals in Indian Zoos	Dr. D. Swarup, Coordinator, National Referral Centre, Indian Veterinary Research Institute, Bareilly
12:40 PM– 01:30 PM	<b>Lunch break</b>	
01:30PM-5:10PM	<b>SESSION – I : ENVIRONMENTAL ENRICHMENT</b>	
01:30 PM – 2:20 PM	The history, philosophy and concept of environmental enrichment in Zoos	Dr. David John Shepherdson, Conservation Program Scientist, Oregon Zoo, USA

2:20 PM – 3:10 PM	Environment of environmental enrichment	Ms. Valarie Hare, Associate Editor, The shape of Enrichment Inc. USA
3:10 PM – 3:30 PM	<b>Tea break</b>	
3:30 PM – 4:20 PM	Enrichment Planning	Ms. Valarie Hare, Associate Editor, The Shape of Enrichment Inc. USA
4:20 PM – 5:10 PM	A Scientific evaluation of Environmental enrichment	Dr. David John Shepherdson, Conservation Program Scientist, Oregon Zoo, USA
<b>22<sup>nd</sup> February, 2008 (Friday)</b>		
<p>(i) The complementary breakfast for the delegates staying at Hotel Ashok is being provided at the Coffee Shop of the Hotel.                  (ii) All interested delegates are requested to assemble in the Hotel Ashok Lobby at 9.00 AM as visit to National Zoological Park Delhi and Historical monuments in and around Delhi has been arranged for the Foreign Participants.                  (iii) The buses will be back to the Hotel at 6.00 PM.                  (iv) There will be a bus to pick up from the Hotel Ashok at 6.30 PM to the Ice Breaker Venue.</p>		
9:00AM-12:40PM	<b>SESSION – II : RECORD KEEPING</b>	
9:00 AM – 9:50 AM	Managing Zoos using Modern record keeping systems	Dr. Nate Flesness, Executive Director, International Species Information Systems (ISIS), Minnesota, USA
9:50 AM – 10:40 AM	National Stud/ Herd Book of identified Wild animals species in India	Sh. B.C. Choudhary, Director, Wildlife Institute of India, Dehradun
<b>10:40AM–11:00 AM</b>	<b>Tea break</b>	
11:00 AM – 11:50 AM	Use of Zoological Information Management System (ZIMS) in Indian Zoos	Dr. Nate Flesness, Executive Director, ISIS Mr. Syed Hasan, Dy. Executive Director, ISIS
11:50 AM – 12:40 PM	Discussion on Indian Zoo's joining of ZIMS	Dr. Nate Flesness, Executive Director, ISIS Mr. Syed Hasan, Dy. Executive Director, ISIS
<b>12:40PM–1:30 PM</b>	<b>Lunch break</b>	
1:30PM-3:10PM	<b>SESSION – III : SMALL POPULATION MANAGEMENT</b>	
1:30 PM – 2:20 PM	Conservation Breeding – Challenges and Protocols	Dr. Robert C Lacy, Chairman, Conservation Breeding Specialist Group (SSC/IUCN), USA
2:20 PM – 3:10 PM	Managing populations for Conservation Breeding	Dr. Jon D Ballou, Research Scientist, Smithsonian's National Zoological Park, Washington DC, USA
3:10 PM – 3:30 PM	<b>Tea break</b>	
3:30 PM – 5:10 PM	Discussion and Recommendation	
7.00 PM – 8.00 PM	<b>Ice braker (Indian and Foreign delegates)</b>	Podium Lawn, NASE Complex, New Delhi
8.00 PM Onwards	<b>Dinner</b>	To be hosted by the Hon'ble Minister of State for Environment & Forests & Chairman, CZA at Podium Lawn, NASC Complex, New Delhi
<b>23<sup>rd</sup> February, 2008 (Saturday)</b>		
The oversees delegates are requested to assemble in Ashok Hotel Lobby at 8.30 AM there will be a bus service to the venue of the Conference.		
8:30 AM – 9:30 AM	Registration (all participants form India and abroad)	
9:30AM– 10:40 AM 9.30 AM-9.40 AM 9.40 AM-9.45 AM 9.45 AM-9.55 AM 9.55 AM-10.05 AM 10.05 AM-10.15AM 10.15 AM-10.30AM 10:30 AM-10:35AM 10.35 AM-10.40AM	Inauguration Welcoming the guests and lighting of Lamp Welcome address by Dr. B. R. Sharma, Member Secretary, Central Zoo Authority Address by Sh. P. R. Mohanty, DGF & SS, Ministry of Environment & Forests, Government of India, New Delhi Address by Dr. Robert Lacy, Chairman, Conservation Breeding Specialist Group, SSC/IUCN Address by Dr. Godon Mc Gregor Reid, President, World Association of Zoos & Aquariums Inaugural address by the Chief Guest, Thiru S. Reghupathy, Hon'ble Minister of State for Environment & Forests and Chairman, Central Zoo Authority Release of CZA's Publications on Barrier Designs for Zoos by Dr. Brij Kishor Gupta & Indian Zoo Year Book, 2008 Vote of thanks by Shri D. N. Singh, Director, National Zoological Park, New Delhi and Secretary, Indian Zoos Association	<b>Venue: Symposia Hall</b>
10:40AM–11:00AM	<b>High Tea</b>	

11:00AM-12:40PM	<b>TECHNICAL SESSION – I (Chairman: Sh. S. C. Sharma)</b>	<b>Venue – Symposia Hall</b>																		
11:00AM–11:50AM	Conservation Breeding – India's initiative	Dr. B. R. Sharma, Member Secretary, Cenral Zoo Authority																		
11:50AM–12:40PM	World perspective of conservation breeding of wild animal species of Indian Sub-Continent	Dr. Gordon McGregor Reid, President, WAZA & DG, Chester Zoo, UK																		
12:40 PM–1:30 PM	<b>Lunch break</b>																			
1:30PM--3:10PM	<b>TECHNICAL SESSION – II (Chairman: Dr. Gordon Reid)</b>	<b>Venue – Lecture Hall</b>																		
1:30 PM – 2:20 PM	Need for Global co-operation in management of small populations in Zoo for wildlife conservation	Dr. Jon Ballou Research Scientist, Smithsonian's National Zoological Park, Washington DC, USA																		
2:20 PM – 3:10 PM	Working groups formation and introduction to the topics Working groups: i. Conservation Breeding of Carnivore----- Naim Akhtar ii. Conservation Breeding of Herbivore-----Kartick Satyanarayan iii. Conservation Breeding of Primates Omnivores----- Brij Kishor Gupta iv. Conservation Breeding of Birds----- Vibhu Prakash v. Conservation Breeding of Reptiles & Amphibians----- -B. C. Choudhary	Ms. Sally Walker, Zoo Outreach Organization (India) (Facilitator)																		
3:10 PM – 3:30 PM	<b>Tea break</b>																			
3:30 PM – 5:10 PM	<b>Working Group – I [HERBIVORES]</b>  Coordinator: S. C. Sharma Presenter: Kartick Satyanarayan Recorder: Manoj Kumar	<b>Venue : Committee Room- I</b>																		
	<table border="1"> <thead> <tr> <th>Time of the presentation</th> <th>3.30 PM-4.20PM</th> <th>4.20PM-5.20PM</th> </tr> </thead> <tbody> <tr> <td>Species to be undertaken</td> <td>Nilgiri tahr</td> <td>Rhinoceros</td> </tr> <tr> <td></td> <td>Himalayan tahr</td> <td>Gaur</td> </tr> <tr> <td></td> <td>Markhor</td> <td>Wild ass</td> </tr> <tr> <td></td> <td>Blue sheep</td> <td></td> </tr> <tr> <td></td> <td>Serow</td> <td></td> </tr> </tbody> </table>	Time of the presentation	3.30 PM-4.20PM	4.20PM-5.20PM	Species to be undertaken	Nilgiri tahr	Rhinoceros		Himalayan tahr	Gaur		Markhor	Wild ass		Blue sheep			Serow		
Time of the presentation	3.30 PM-4.20PM	4.20PM-5.20PM																		
Species to be undertaken	Nilgiri tahr	Rhinoceros																		
	Himalayan tahr	Gaur																		
	Markhor	Wild ass																		
	Blue sheep																			
	Serow																			
	<b>Working Group – II [CARNIVORES]</b>  Coordinator: S. K. Patnaik Presenter: Naim Akhtar Recorder: Sunita Pradhan	<b>Venue : Lecture Hall</b>																		
	<table border="1"> <thead> <tr> <th>Time of the presentation</th> <th>3.30 PM-4.20PM</th> <th>4.20PM-5.20PM</th> </tr> </thead> <tbody> <tr> <td>Species to be undertaken</td> <td>Asiatic lion</td> <td>Snow leopard</td> </tr> <tr> <td></td> <td>Bengal tiger</td> <td>Clouded leopard</td> </tr> <tr> <td></td> <td></td> <td>Asiatic Cheetah</td> </tr> </tbody> </table>	Time of the presentation	3.30 PM-4.20PM	4.20PM-5.20PM	Species to be undertaken	Asiatic lion	Snow leopard		Bengal tiger	Clouded leopard			Asiatic Cheetah							
Time of the presentation	3.30 PM-4.20PM	4.20PM-5.20PM																		
Species to be undertaken	Asiatic lion	Snow leopard																		
	Bengal tiger	Clouded leopard																		
		Asiatic Cheetah																		
	<b>Working Group – III [PRIMATES/BEARS]</b>  Coordinator: A. K. Sinha Presenter: Brij Kishor Gupta Recorder: Ravi Kumar Singh	<b>Venue: Training Room</b>																		
	<table border="1"> <thead> <tr> <th>Time of the presentation</th> <th>3.30 PM-4.20PM</th> <th>4.20PM-5.20PM</th> </tr> </thead> <tbody> <tr> <td>Species to be undertaken</td> <td>Lion tailed macaque</td> <td>Nilgiri langur</td> </tr> <tr> <td></td> <td>Pig tailed macaque</td> <td>Golden langur</td> </tr> <tr> <td></td> <td>Stump tailed macaque</td> <td>Capped langur</td> </tr> </tbody> </table>	Time of the presentation	3.30 PM-4.20PM	4.20PM-5.20PM	Species to be undertaken	Lion tailed macaque	Nilgiri langur		Pig tailed macaque	Golden langur		Stump tailed macaque	Capped langur							
Time of the presentation	3.30 PM-4.20PM	4.20PM-5.20PM																		
Species to be undertaken	Lion tailed macaque	Nilgiri langur																		
	Pig tailed macaque	Golden langur																		
	Stump tailed macaque	Capped langur																		

**Working Group – IV [BIRDS]**

**Venue: Conference Room**

Coordinator: Vinod Rishi  
 Presenter: Vibhu Prakash  
 Recorder: Anupam Srivata

Time of the presentation	3.30 PM-4.20PM	4.20PM-5.20PM
Species to be undertaken	Cheer pheasant	Scalter's monal
	Hume's pheasant	Himalayan monal
	Grey peacock pheasant	Tibeten eared pheasant
	Blood pheasant	Bustard

**Working Group–V [REPTILES/AMPHIBIANS/BIRDS OF PREY]**

**Venue: Committee Room - II**

Coordinator: B.Vijayaraghavan  
 Presenter: B. C. Choudhary  
 Recorder: Kartick Vasudevan

Time of the presentation	3.30 PM-4.20PM	4.20PM-5.20PM
Species to be undertaken	King cobra	Water monitor
	Other species of snakes	Other species of lizards
		Turtles/Terrapins

The bus will leave the Conference Venue at 5.30 PM the Hotel Ashok. The delegates are requested to be ready by 6.45 PM as there will be a bus service at 7.00 PM to pick up all the delegates to the dinner hosted by the Indian Zoos Association.

8:00 PM onward	Dinner	To be hosted by the Indian Zoo Directors Association, at Lawn of International Guest House, NASC Complex, New Delhi
----------------	--------	---

24<sup>th</sup> February, 2008 (Sunday)

The delegates are requested to assemble in Ashok Hotel Lobby at 8.30 AM there will be a bus service to the venue of the Conference.

9.:00AM- 10:40AM	<b>Technical Session – III (Chairman: Ms. Sally Walker)</b>	<b>Venue : Lecture Hall</b>
9:00AM to 9:50 AM	Conservation breeding scenario of wild animal species of Indian Sub-Continent and possibilities	Sh. S. K. Patnaik Principal Chief Conservator of Forests (Retd.), Orissa
9:50AM– 10:40 AM	Conservation Breeding- Global Overview	Dr. Robert C Lacy, Chair IUCN/SSC Conservation Breeding Specialist Group
10:40AM–11:00AM	<b>Tea break</b>	

11:00AM-12:40 PM	<b>Working Group Discussions</b>	
	<b>Working Group – I [HERBIVORES]</b>	
	Coordinator: S. C. Sharma Presenter: Kartick Satyanarayan Recorder: Manoj Kumar	
	<b>Time of the presentation</b>	<b>11.00AM-11.50AM</b> <b>11.50AM-12.40PM</b>
	Species to be undertaken	Swamp deer      Pigmy hog Thamin deer      Hangul Mouse deer      Chiru Musk deer      Malabar giant squirrel

**Working Group – II [CARNIVORES]**

**Venue: Lecture Hall**

Coordinator: S. K. Patnaik  
 Presenter : Naim Akthar  
 Recorder: Sunita Pradhan

Time of the presentation	11.00AM-11.50AM	11.50AM-12.40PM
Species to be undertaken	Golden cat	Binturong
	Tibetan wolf	Pangolin
	Wild dog	Malabar giant squirrel

**Working Group – III [PRIMATES/BEARS]**

**Venue: Training Room**

Coordinator: A.K. Sinha  
 Presenter: Brij Kishor Gupta  
 Recorder: Ravi Kumar Singh

Time of the presentation	11.00AM-11.50AM	11.50AM-12.40PM
Species to be undertaken	Hollock gibbon	Brown bear
	Phayre's leaf monkey	Sun bear
	Crab eating monkey	Red panda

**Working Group – IV [BIRDS]**

**Venue: Conference Room**

Coordinator: Vinod Rishi  
 Presenter: Vibhu Prakash  
 Recorder: Anupam Srivastav

Time of the presentation	11.00AM-11.50AM	11.50AM-12.40PM
Species to be undertaken	Western tragopan	Nicobar pigeon
	Blyth's tragopan	Malabar grey hornbill
	Temminck tragopan	Malabar pied hornbill
	Satyr tragopan	

**Working Group–V [REPTILES/AMPHIBIANS/BIRDS OF PREY]**

**Venue: Committee Room - II**

Coordinator: B. Vijayaraghavan  
 Presenter: B. C. Choudhary  
 Recorder: Kartick Vasudevan

Time of the presentation	11.00AM-11.50AM	11.50AM-12.40PM (SPECIAL SESSION)
Species to be undertaken	Himalayan salamander	Vultures (White backed, Slender billed, Long billed vultures)
	Nyctibatrachus species	Falcons (Eagles, Kestrels, Harriers, Accipiters etc)
	Other species of frogs	

12:40PM– 1:30 PM	<b>Lunch break</b>	
1:30 PM – 2:40 PM	<b>Discussion on individual species of interest by working sub-groups</b>	
2:40 PM – 3:00 PM	<b>Tea break</b>	
3:00 PM – 5:30 PM	<b>CLOSING SESSION (Chairman: Ms. Meena Gupta)</b>	<b>Venue – Lecture Hall</b>
3:00 PM – 5:30 PM	Working group presentations, discussion & recommendations	Sh. P. R. Mohanty Dr. Robert Lacy, Dr. Gordon Reid, Sh. S. C. Sharma, Sh. S. K. Patnaik, Ms. Sally Walker & Dr. B. R. Shrama on the dais
<p>(i) A bus service for the delegates staying at Hotel Ashok will depart at 5.30 PM from Conference Venue to the Hotel.                  (ii) All the delegates are requested to be ready by 6.45 PM in the Hotel Ashok Lobby, the bus shall leave at 6.45 PM to the venue of the farewell dinner to be hosted by Indian Zoos Association.                  (iii) The bus service for the local participants staying at NASC shall also leave the International Guest House at 6.45 PM to the venue of the farewell dinner.</p>		
7:15 PM Onwards	<b>FAREWELL DINNER</b>	To be hosted by the Indian Zoos Association <b>Venue:</b> Uppal's Orchid Hotel, Near IGI Airport, National Highway 8, New Delhi – 110 037

# Inaugural Session



## Welcome address by Dr. B.R. Sharma, Member Secretary, Central Zoo Authority

23rd February, 2008.



Namaskar and very Good Morning.

*Hon'ble Minister of State, Environment & Forests, Government of India and Chairman, Central Zoo Authority, Thiru. S. Regupathyji; Director General of Forests and Special Secretary, Government of India; Shri P.R. Mohantiji; President, World Association of Zoos & Aquariums and Director General, Chester Zoo, U.K.; Professor Gordon Reid; Chairman, Conservation Breeding Specialist Group of SSC/ IUCN; Dr. Robert C. Lacy; Director, National Zoological Park, New Delhi, Shri D.N. Singh; Members, Central Zoo Authority; senior colleagues; distinguished guests, delegates from Zoos from India and abroad, media persons, my colleagues from Central Zoo Authority and National Zoo, New Delhi, Ladies & Gentlemen, I have the honour to extend most hearty welcome to you all to this all important conference.*

It is a dream come true and I am really nervous while standing over here. I am having a hard time believing that it is my 11<sup>th</sup> year in the zoo business. Here the time go by so fast, it seems that every hour it is again time for breakfast. Good thing, I always enjoyed breakfast.

I started out as a forester, then as a wild lifer, before I entered Zoos as a manager. I will never forget how amazed I was at the diversity of varying view points and attitudes within the profession. After more than ten years, I came to the conclusion that it makes life interesting, different, often annoying. I would be lying to myself, if I do not admit up that while this profession is one of the most rewarding and satisfying thing a person could do for a living, it is also one of the most stressful environment in existence. You do not need to be mad to be in this profession, but this really helps, if you are.

Given the scale of global habitat destruction, climate change and an increasing human population, it is more important than ever to ask, if zoos are having anything more than a minimum impact on conservation. Has captive breeding made any difference between survival and extinction for endangered species? In some cases, yes, it definitely has. Can more be done? Yes, and it should be. Can captive breeding solve all conservation problems or preserve all endangered species? No, of course not. No one should think it can, nor promote it as such. I have got to be honest about my own point of view, of course I am a forester whose principle academic interest is wildlife conservation and management. I believe that Zoos are important contributors to efforts to conservative biological biodiversity, but I also try to be realist about what can and cannot be done in a Zoo, no matter how big it may be. Zoos are working against the tide of extinction, one species at a time. Because the focus of zoos is primarily individual species, this is where they have the greatest impact. Zoos, especially have recognized that they have limited space and resources and have directed those resources to considerable effect in specific cases. In some cases, Zoos are almost the only institutions directing any conservation effort to critical situations. In effect, the success of Zoos as the refuse of last resort for critically endangered species is an indication of the staggering failure of the agencies responsible for conservation where it really should happen : at the habitat and ecosystem levels.

As nature, Zoos are also dynamic and must, therefore, continually improve themselves or risk decline. During the last century long period of uncertainty, captive breeding has emerged as a pro-active conservation strategy. There is, however, perpetual misunderstanding about conservation breeding, about what it is, what it accomplishes – and very importantly what it is not. Is it conservation, or is mere another form of human exploitation. Biologists have long offered conciliatory recognition to conservation breeding as a species conservation technique of last resort. However, this implication of desperation has been all too often transmitted to mean “last minute” as well, last resort at the last minute means handing over a very tall order, guarding the last few specimens on earth, use them to work out all the husbandry details and save species from extinction at the same time.

Management to best reduce the risk of extinction requires the establishment of supporting captive populations early, preferably when the wild population is still in thousands. Vertebrate taxa with the current census below few hundred or thousand individuals in the wild require close and swift cooperation between field conservationists and captive breeding specialists. The power of captive breeding as a conservation strategy has been greatly underestimated and perhaps not surprisingly so, at this point in history. Diligent efforts in the science and organization of captive breeding is a phenomenon of only the last two decades. The zoo profession has led the development of this strategy, but has purposely slowed the progress while entertaining the opinions of those who debate the value of captive breeding.

We can already predict that 21<sup>st</sup> century conservation efforts will preserve habitats in varying degrees of fragmentations and wildlife conservation will need to be creative with broken systems. Species survival will emerge as a clearly separate agenda from habitat preservation, a global experiment in biospheric rescue, where the lines between nature and captivity will be blurred. The so-called strategy of last resort still promises many miracles of survivals where extinction might otherwise occur. But amidst the promises, captive breeding is also a grim reminder of nature's needless ongoing destruction and conspicuous target for those, who would deny that an era of last resort is upon us.

I hope we will have very fruitful discussions and will go back with very clear concept regarding the potential of conservation breeding of endangered species in the Zoos.

I would once again welcome all honorable guests, resource persons, participants, and hope that they will have pleasant memorable stay in this Capital City of India. Welcome to you all.



**Address by Shri P. R. Mohanty  
Director General of Forests & Special Secretary  
Ministry of Environment & Forests,  
Government of India**

**23rd February, 2008.**



*Hon'ble Minister of State, Environment and Forests, Government of India; Thiru S. Reghupathyji; President, World Association of Zoos and Aquariums; Prof. Gordon Reid; Chairman, Conservation Breeding Specialist Groups of SSC/IUCN, Dr. Robert C. Lacy; Member Secretary, Central Zoo Authority, Dr. B. R. Sharma; Director, National Zoological Park, New Delhi, Sh. D. N. Singh; Other distinguished guests, resource persons, delegates, colleagues from the Ministry of Environment and Forests, media persons; ladies and gentlemen.*

I am extremely happy to be here with all of you at the International Conference on India's Conservation Breeding Initiative. Our country has been richly endowed by nature in terms of great diversity of physical environment. From Indian Ocean to lofty Himalayas and beyond to the cold deserts of Ladakh, the physiognomic diversity and a myriad of climatic situations give rise to countless habitats across the length and breadth of the country. This unparalleled natural bounty places India among the twelve Mega-Biodiversity countries of the world.

Historically, forests have been recognized as one of the most important natural resources and constitute a major land-use in India. The scientific management of forests in India is one of the oldest in the world, beginning about 150 years ago. The National Forest Policies of 1952 and 1988 have constantly laid emphasis on the sustainable management of forests, which are under the control of the States/Union Territories. The subject matters of 'forest and protection of wild animals and birds' being in the 'Concurrent List' of the Constitution of India, the broad policy framework and umbrella legislation are enacted by the Government of India in consultation with the States. In India the States have their own forest laws and regulations for managing these resources under the overall ambit of legislation enacted by the Government of India. The Government of India has fixed target for increasing the forest and tree cover of the country from 23.68% at present to 33% by 2012.

The paradigms of forest management have shifted from sustained yield management to forest ecosystem management. National Forest Commission was set up in 2003 to assess the policy and legal framework and their impact on the society in a holistic manner, examine current status of forest administration and forestry institutions to meet emerging needs of the society and suggest ways to make the administration more effective.

The Government of India also has systematic development of forestry education and training in India which is one of the oldest in the world. Initially the officers of the Imperial Forest Service were trained in France, Germany and the United Kingdom. In India, the training of forest officers began in 1878. The Indian Forest Service (IFS) was created in 1966 with higher duties and responsibilities to maintain uniform standards of forest management throughout the country. To provide more educational facilities to the candidates interested in pursuing careers in forests the Government of India has created Indira Gandhi National Forest Academy at Dehradun and several such other institutes in the country. These institutes have earned the reputation of being the best in Afro-Asian region.

Trade in Wildlife Products, which includes both flora and fauna, has been an important factor in changing the political set up in many parts of the world from the early times of the history. India is one of the founding parties to the CITES. Legal trade which is non-determined to sustained survival of a species is regulated through the export and import permits issued by the CITES Management Authority in the Country.

Since Vedic times, the forest management in India is founded on the strong concept of conserving the nature and its pristine wealth for posterity. Participation of communities has been incorporated in planning forest management in India. The forests provide a wide range of benefits, in addition to timber, fuel wood, fodder and wide range of other benefits. They also provide much environmental services like hydrological benefits, soil conservation, and prevention of sedimentation, flood control, carbon sequestration, and fresh air generation etc. which are not easily perceived.

We have Wildlife Institute of India with a mandate to produce a cadre of trained wildlife managers, scientific people for nature conservation and field biologists who could collect scientific information on wildlife and Protected Areas for effective management.

Pressures of an enlarged and impoverished population and industrial development have taken a heavy toll on natural areas, causing pronounced shrinkage and degradation. New found market pressures on a host of non-wood forest produce including the medicinal plants has led to not just their depletion, but often the collection practices are destructive and damaging to the habitat. As a result many ecosystems and species of flora and fauna have come to be endangered. Simultaneously we are increasingly witnessing the dwindling aquifers, declining farm productivity and accelerated impoverishment of people, especially in these natural regions. The current levels of field conservation are not adequate to contain these adverse trends, especially because the communities living in and around protected areas are among the most disadvantaged due to inadequate and inappropriate inputs in rural development and welfare programmes hereto. Their dependence on natural bio-resources is substantial and for concurrently ensuring their well-being and also safeguarding the natural ecosystems, new 'landscape' based strategies for ecologically sustainable rural development (ecodevelopment) are called for.

In this scenario our zoos also have to play a very important role. If the animals in a zoo do not get the basic requirement of space for their movement and exercise and are deprived of hygienic conditions, the zoo cannot be termed as a modern zoo. The living animals have to be treated on a different footing than routine construction and development programmes. The zoos have to pass on to its visitors a sense of awareness and compassion relating to animals. The very establishment of zoos now is associated with the idea to protect near extinct animals and to educate people especially children in this regard. There are also some underlying factors which have led the zoos in a dilemma. Massive improvements in animal management techniques and enclosure design, as well as an ever increasing knowledge of individual species requirements, have led to highly successful breeding rates in most zoos.

Lastly, I would like to emphasize that Wildlife Conservation is too important a task to be treated lightly or ritualistically. The ethos of our culture put an ethical responsibility towards other species created by Mother Nature and one of indicators of our progress is how well we care for our natural resources and biodiversity. With these remarks I extend my best wishes to everyone present for very meaningful deliberations.

## Address by Dr. Robert C Lacy, Chairman Conservation Breeding Special Group/SSC/IUCN

23rd February, 2008



*I would like to thank Dr. Brij Raj Sharma, Member Secretary, CZA, and Chief Guest Hon'ble Minister Mr. S. Reghupathy, who gave me this opportunity in this inaugural session to welcome you to this very important conference. I am glad to be here today to represent Conservation Breeding Specialist Group of the Species Survival Commission of the IUCN. The IUCN is a union of more than 1000 members of governmental and non- governmental agencies that work together to help to protect the natural world on which we all depend. The CBSG exists within the IUCN as an organization of more than 500 conservation experts who provide expertise in managing wildlife populations to governments, zoos, and others involve in conservation.*

A meeting of more than 100 chairs of specialist groups of SSC/IUCN was held in Abu Dhabi last week. Representatives to the other Specialist Groups along with the Program Officers of Species Survival Commission, staff of IUCN Regional Offices, representatives of other commissions of the IUCN, and the top leadership of IUCN took part in the meeting. One key message of that meeting was that work of the governments and non-governmental organizations to protect wild animal species and nature have not been sufficient. Conservation measures such as classifying the levels of endangerment, putting fences around parks, stopping poaching, and controlling invasive species are absolutely necessary, but they are not enough. We know this because species continue to go extinct at a rate that is becoming faster all the time. We are in a biodiversity crisis. The SSC is therefore working to develop better ways to do species conservation, and it has established subcommittees, task forces, and advisory groups to help determine what we need to do differently.

Another key message at the SSC Chairs meeting was that all parts of the IUCN need to, and are willing to, work together much more often and more effectively to slow the loss of species. As part of that effort, many of the conservation groups represented at the SSC meeting stated that they needed to begin to work with the zoo community. They need to add conservation breeding as another tool to help with the conservation of the species that they care so much about. For those of you who have sensed before the tensions between the zoo community, wildlife agencies, and conservation organizations, it is perhaps quite remarkable that these often feuding groups are now saying that they need each other. However, we have to keep in mind that they want to make sure that zoos are doing more to help with species conservation and not doing anything that could further endanger any species. Fortunately, we have the same goals for zoos.

We also must recognize that zoos are not yet doing the right things or doing enough to be an effective component of overall species conservation. We know that we are not doing enough because we are losing species and populations from our zoos at the same time that some of them are in trouble in the wild. As just a few examples, Markhor – a wonderful wild goat species from the Kashmir and a few mountainous areas to the west of India – are dying out in USA zoos because they do not have enough unrelated animals and not enough zoos are yet willing to work together to build a good breeding program for this endangered species. I think that this species is somewhat doing better in European zoos, but there are not yet any in Indian zoos. Other species that have had problems in USA zoos include the Asiatic lion and the lion-tailed macaque, but other Indian species such as the snow leopard are doing well in scientifically managed breeding programs. I expect that our colleagues who came here from other regions will be able to tell us about species for which they need help, and species for which they can help others.

I can assure you that the Conservation Breeding Specialist Group of the IUCN is ready and eager to work with you. We can provide expertise and training in methods of animal population management. We can facilitate the collaborations among regional and national zoo associations that wish to work together to develop global conservation breeding programs for species. We can provide linkages to other parts of the IUCN that might be important to you, such as the Reintroduction Specialist Group and Animal Health Specialist Group and taxonomic Specialist Groups, which include experts in everything from felids to crocodylians to pheasants to frogs. I can offer this CBSG expertise to you because it is not just me or the few CBSG staff who are ready to provide technical advice. Instead, it is the network of more than 500 conservation professionals and the institutions that they represent who are eager to work with their colleagues.

Although the CBSG and others – including the International Species Information System (ISIS), the World Association of Zoos and Aquariums (WAZA), and individual institutional partners – are willing to share expertise and to enter into collaborative arrangements, the real work and the important work to establish and maintain conservation breeding programs for our fragile and irreplaceable species lies with you. Zoos will not be willing, and should not be willing, to exchange protocols and expertise if that only means that pieces of paper change hands, but there is no real meaningful interest in improving animal care. Institutions should not exchange animals until they are sure that the animals will

be going into organized and well-managed conservation breeding programs, so that they can continue to contribute to the long-term sustainability of the global population for the species. Institutions will not be interested in receiving animals for breeding programs unless the animals are accompanied by the critical data documenting the source and histories of those animals. A new animal added to a breeding program cannot become a valued breeder unless we know its family tree and we can be certain about its taxonomy.

This is a very important conference. I must commend and acknowledge the vision of Dr. Brij Sharma and the CZA, the Wildlife Institute of India, and the National Zoological Park in New Delhi, in accepting the big task of protecting the irreplaceable wildlife of India for the future. They see that through collaborations among institutions within the country and with zoos in other countries the zoos of India can take steps that are needed to succeed. By working together, we can help identify species that need protection in conservation breeding programs, we can bring together the founder animals needed to start such programs, we can begin the data collection and record keeping that is needed to manage conservation breeding programs, we can establish the goals and protocols for globally coordinated programs, and we will succeed in protecting the species for future generations.

I also must commend and thank all of the participants who have come here from so many countries. It must be that you also share this vision of working together to achieve common goals. I hope that there will soon be more conferences like this, with more countries inviting experts from around the world to work with them to develop conservation breeding programs that benefit the local zoos and people, the wildlife, and all the participants. Conservation breeding initiatives will be different in each country, because the needs and opportunities and cultures are different. But two things are fundamentally the same everywhere: First, around the world, wildlife are in trouble, and that means that zoos are in trouble (because without wild animals zoos cannot exist), and it also means that we have both responsibility and opportunity to change the future for many species. The second thing that will be the same everywhere is that we will successfully meet this challenge if and only if we share expertise and work together. I look forward to the next such meeting, maybe in Thailand or Kazakhstan or Estonia with Indian colleagues there to share their experiences.

Thank you very much!!!

## Address by Prof. Gordon McGregor Reid President of the World Association of Zoos and Aquariums (WAZA)

23rd February, 2008



*I should first acknowledge and warmly thank our distinguished hosts who represent the Government of India: Thiru S. Reghupathy, Honorable Minister of State for Environment & Forests; Sh. P.R. Mohanty, DGF and SS, Ministry of Environment & Forests; Sh. D.N. Singh, Director, National Zoological Park, New Delhi and Secretary, Indian Zoos Association; Dr Brij Kishor Gupta, CZA and, of course our 'leading light' Dr. Brij R. Sharma, Member Secretary of the Central Zoo Authority of India. Dr Sharma and his many colleagues have worked extremely hard to make possible this excellent International Conference on India's Conservation Breeding Initiative. I should also acknowledge the many distinguished contributors from overseas notably including: Dr Robert Lacy; Dr John Ballou; Dr Nate Flesness; Valerie Hare and Dr David Sheperdson.*

As President I am here representing WAZA, the World Association of Zoos and Aquariums, which represents some 1,300 zoos, directly or through its regional associations. WAZA is proud to count the CZA as a member, which is definitely prospering under Dr Sharma and his team. Also in the WAZA family are the South Asian Zoos Association for Regional Cooperation (SAZARC) and the organisation for Zoo Outreach in India (ZOO), both growing superbly with a little help from my old friends and colleagues Sally Walker and Sanjay Molur.

I have long been a great admirer of Indian wildlife. As a wee boy in Scotland aged 9, my zoological career started in a small way with the Common Indian Stick Insect. These stick insects are now widely used in school classrooms and biology laboratories throughout the world. I begged my teacher to let me have a few and was delighted to note that the insects liked to eat prickly bramble plants, locally available in abundance. However, when I first cleaned out the large jam jar that I kept them in, the insects appeared to be dead, which concerned me greatly. I imagined I had somehow failed as a zookeeper and started losing confidence in my animal husbandry skills. Then I experienced great joy and excitement as they suddenly resurrected themselves all over my bedroom carpet (this is what stick insects do, active one minute, 'playing dead' the next). Unfortunately, this joy in my re-vitalised insect population was not shared with my mother when she came into to my room! She became progressively more uncomfortable (and so did all the other mothers in the neighborhood) when I started breeding and distributing stick insects by the hundreds. I really needed to share the joy with all my friends. I soon discovered that breeding animals, no matter how small, can have a tremendous impact.

My growing enthusiasm for wildlife led me to avidly read great piles of natural history books. From my cold wintry home in Scotland I marveled at the strange, exotic creatures living in warm faraway lands, notably including Great Indian rhinos, Bengal tigers and Indian elephants. I did not imagine that one day I would be fortunate enough to see such animals in nature and to work with them in Chester Zoo my home institution. Glasgow, where I lived, did not at that time have a zoo worthy of the name. So I pestered my father to take me on a big adventure to see the animals in Edinburgh zoo. Today, I still remember my first encounters with Bengal tigers and Indian elephants ... I could hardly believe the size and power of these animals. I was absolutely hooked on wildlife from then on.

There was no room for big animals but I managed to populate my home with a dog, hamsters, mice, budgerigars, slugs, minnows, frogs, tadpoles and much else besides. My bedroom menagerie steadily grew. Aged 10, I developed a real fascination with aquatic life. Seeing this, a kind old uncle built me my first tropical freshwater fish tank, using angle-iron, glass and putty (no pet shop tanks were affordable in those days). The first fishes that I kept were Indian zebra danios (*Danio rerio*), now found everywhere around the world in aquariums, zoos, laboratories and as beautiful inhabitants in the home aquarium. I managed to get them to breed and exhibited the offspring at the Annual Show of the Scottish Aquarium Society. To my delight, my youthful breeding efforts (or rather those of my magnificent Indian fishes!) were rewarded with an inscribed silver cup, The Waterlife Trophy.

At a later stage in my career, I joined the British Museum of Natural History in London as a PhD research student. I worked on the taxonomy of tropical-old-world fishes including species of *Labeo* familiar in India. Naturally, I referred to the fish and amphibian research papers of great Indian zoologists such as the late Professor Sundar L. Hora. These are just a few examples of the Indian scientists and Indian animals large and small that have served to greatly inspire me. I am sure that they have inspired lots of others, including many people in this auditorium. Today the wonder and beauty of Indian wildlife, both animals and plants, represents an incredible natural heritage, not just for India but for the entire world. Hence, we must all work together to conserve it.

Of course, there are major challenges in stemming the dramatic decline of biodiversity in India. To address declines we increasingly need to focus on ecosystem services, considerations of human development and poverty alleviation and the genetic management of entire small populations (or 'meta-populations') of critically endangered animals. This needs to be done according to higher-level collaborative plans, with the support of zoos and the CZA and in close cooperation with wildlife agencies. The overall objective is to breed animals, raise healthy offspring and maintain a natural variability. This is as apposed to simply keeping hybrid animals unrepresentative of wild stock. Genetically representative natural zoo populations are an 'insurance policy' against the loss of species in the wild. They also create the option of reintroduction to nature when conditions are right.

Here today to help us pursue this goal are many experts: zoological, veterinary, biological, wildlife, licensing, forestry, information technology, political and others. It is heartening to see that they are young and old, male and female, from India and overseas. This mixed and talented gathering will help us work our way forward, as an Indian national and international team, through the technical, administrative and other complexities in organising successful breeding programmes.

Of course, underpinning all of this is the need for excellent animal welfare including behavioural enrichment. Given that the early Indian ruler Ashoka the Great was probably the first person in history to establish the principles of kindness to animals and a concern about their conservation, we are certainly in the right country to continue to pursue these great ideals. Ashoka (whose wheel-like Chakra is incorporated in the modern national flag of India) was an Emperor of the Mauriya Dynasty and ruled between 273 and 222 BC. Rejecting an earlier period of militaristic aggression, Ashoka moved to establish non-violent and humane national policies, where unnecessary slaughter or mutilation of animals was outlawed and wildlife became protected. He is acclaimed for constructing hospitals for both animals and people and for developing herbal medicines to treat both.

The contemporary Indian (and indeed global) zoo community is relatively small. However, current social science research indicates that it only takes 5% of any one population to bring about major social change. This is sometimes called the '5% tipping point'. People with plenty of energy and skill are, therefore, at a great advantage!

I perceive that there is a huge amount of energy and talent in the conference participants and in the Indian zoo world. Hence there is every prospect of our reaching and passing the 5% 'tipping point' to bring about the much-needed beneficial and lasting change in conservation breeding practice. This conference will get us all off to an excellent start.

It remains to again thank our generous hosts, the Indian Government, the Central Zoo Authority and the National Zoo in New Delhi, for kindly arranging what will be, I am sure, a most successful meeting.



**Address by Chief Guest**  
**Thiru S. Reghupathy, Minister of State, Environment & Forests (Forests & Wildlife) and Chairman, Central Zoo Authority**

**23rd February, 2008**



*Shri P. R. Mohanti, Director General of Forests & Special Secretary, Government of India; Professor Gordon Reid, President, World Association of Zoos and Aquariums; Dr. Robert Lacy, Chairman, Conservation Breeding Specialist Group of SSC/IUCN; Dr. B. R. Sharma, Member Secretary, Central Zoo Authority; Sh. D. N. Singh, Director, National Zoological Park, New Delhi; Other distinguished guests, participants, press, ladies and gentlemen.*

It is a matter of great privilege for me to welcome you all to the International Conference on "India's Conservation Breeding Initiatives". I am particularly grateful to all of you for taking out time for this conference. Your presence here and guidance today will be a source of strength and inspiration to us in the pursuit of the difficult task of preservation of our wild flora and fauna.

India possesses a distinct identity, not only because of its geography, history and culture but also because of great diversity of its natural eco-systems. Indian subcontinent is the meeting point of three of the eight global 'Centres of Origin of Life', that is the Indo-Malayan, the Eurasian and the Afro Tropical realms. These two attributes combined together have given our country its variety of life forms making amongst the 12 mega-biodiversity regions of the world and it contains two of the world's 25 biodiversity hotspots-so-called for the extraordinary high levels of species richness and endemism, and threatened status.

Many of you may know not be aware of the fact that India's initial wildlife protected areas were not set up by the government, or by kings and sultans. They were created by the ordinary people, by indigenous or tribal communities who set aside parts of landscape for cultural, ethical or economic reasons. There are literally thousands of such areas in India. These include forest groves, village tanks, Himalayan grasslands and individual species (such as langur, nilgai, elephant and ficus species).

No where in the world will one come across an incident which took place in 1730 in which 363 men, women and children of the Bishnoi community in India laid down their lives at the hands of the then rule of Jodhpur state to prevent felling of Kehjri trees. This tradition of sacrifice for the sake of nature exists among the Bishnois continues even today. There are numerous such examples in our country, of community initiatives for preservation of forests and wildlife. One of the manifestations of this cultural tradition is seen in preservation of about 13270 'sacred groves' across the country by the people. These sacred groves are repositories of gene pools of valuable plant and animal life.

Our efforts in the past have paid dividends and our achievements in the field of wildlife conservation are noteworthy. With less than 3% land area, 16% of human population and equally large livestock population of the world, India supports about 50% of the world tiger population and 60% of Asian elephants and rhino population and only surviving population of Asiatic lion. Having said so, it is necessary to mention that gains of conservation of 70s and 80s are now showing a slippage in the face of mounting threats from illegal wildlife trade. On a global scale, the illegal trade in wildlife is horrific. In dollar terms, it is likely to be second only to the illicit drug trade.

Pressures of an enlarged and impoverished population and industrial development have also taken a heavy toll of forest areas, causing pronounced shrinkage and degradation, which has adversely affected wildlife leading to fragmentation in the species populations and genetic bottlenecks. As biological diversity is in crisis and we face an extinction spasm at the end of the 20th century and into the 21st.

We have to consider the recommendations of the National Wildlife Action Plan 2002-2016 and the National Zoo Policy, 1998 which were adopted by the Government of India and implement them in letter and spirit.

All of us know that over the last two centuries zoos has been evolving and many are now in a position where they can contribute to the conservation biology. Originally menageries, concerned with displaying in cages a broad range of taxonomically diverse animals, zoological institutions became parks with the emphasis on showing animals displaying species-typical behaviours in habitat enclosures, cooperating with other zoos and developing zoo-keeping as a profession.

Currently zoos are on their way to becoming Conservation Breeding Centres – institutions and communities where problems solving science in the context of biological diversity can occur – with an emphasis on environments and

ecosystems, with their visitors encountering animals and plants in immersion exhibits, and with a focus on biodiversity conservation and multi-institutional organizational networks. In particular zoos offer a rare venue for researchers and the public to meet and communicate, providing a platform for interpreting the outcomes of research and its implications for conservation action.

I am happy to inform you that a Species Recovery Plan – an initiative of Government of India has been in action to support the endangered species and their in situ and ex situ conservation.

Recently Conservation Action Plans for conservation of Vultures and Bustards have been prepared as a followed up. The Ministry and Central Zoo Authority have also agreed to support the creation of conservation breeding centres for vultures at five different locations in the country and for Bustards too.

Over last few years, the Ministry has also been quiet concerned about the state of zoos in the country. Keeping in view of the fact that regular technical and scientific personnel are not available in our zoos, a 'Centre for Zoo Science' has been mooted to be established at the National Zoological Park, Delhi during the next plan period. I am confident that once functional, the zoos in India will be able to come up to our expectations and be in a position to compliment the efforts of the wildlife conservation in the country by giving species, which have no chance of survival, through coordinated breeding under ex-situ conditions and raise stocks for their rehabilitation in wild.

Though the task of preservation of wildlife is daunting but there are many positive factors like greater public and media concern, environmental awareness among the children and youth. It is now upto us to integrate these factors in a constructive way in our development process in keeping with our heritage and traditional conservation ethos and restore the ecological balance to the extent possible. We in the Ministry of Environment and Forests are prepared and look forward to doing our part. We also look forward to working with all of you to preserve the endangered biological heritage of our country.

As zoos continue to develop their conservation, research and education potential into the next millennium they can become Centres for Conservation Breeding and make an important contribution to stemming the loss of biological diversity and ecosystem function.

With the ideas and inputs of this conference I am sure that India will open a new vision for itself. I am confident that the endangered species in captivity in India and outside are managed to maximize retention of genetic diversity over long period, the captive populations can provide individuals for reintroduction. If not, the surplus animals will establish the ex-situ populations of endangered species for research, animal exchange and yielding knowledge that can be applied to conservation in the wild.

With these words, I inaugurate this programme of conference and experience sharing and wish success to the Conference. I shall look forward to a meaningful and productive interactive sessions.

## Vote of Thanks by Sh. D.N. Singh, Director, National Zoological Park & Secretary, Indian Zoos Association

23rd February, 2008



*Hon'ble Minister of State for Forests & Wildlife, Government of India, Thiru S. Regupathy ji; Sri P.R. Mohanty, Director General of Forests and Special Secretary to the Government of India, Ministry of Environment & Forests; Dr Godon Reid, President, World Association of Zoos & Aquariums; Dr Robert Lacy, Chairman, Conservation Breeding Specialist Group of IUCN; Dr B.R. Sharma, Member Secretary, Central Zoo Authority of India; Distinguished and Most Valued Guests from India and abroad; Media representatives; Participants and Resource persons of the Workshop; Ladies and gentlemen,*

It is a great honor and privilege to be called upon to propose a Vote of Thanks on this historic occasion to our Hon'ble Minister who is also Chairman of the Central Zoo Authority. Our Hon'ble Minister has always accorded top priority to the ex-situ and in-situ conservation initiatives. His presence today inspite of his extremely busy schedules is a great source of motivation to us. We are extremely grateful to him to have acceded to our request for inaugurating the event. I, on behalf of, we organizers, participants of this Workshop and also on my personal behalf, extend our grateful thanks to him for his encouragement. I assure you Sir, that all of us will join hands to meet the emerging challenges in the ex situ conservation of the endangered species of wildlife in India. Sir, on behalf of all zoos of the country, I assure you that we shall contribute towards making our organizations in India, more dynamic, responsive and sensitive to the needs of the conservation fraternity in the country.

I wish to thank the DG Forests and Special Secretary to the Government of India for his unstinted support for this workshop. We are thankful to you, Sir, for gracing the function and sharing with this august audience your vision of conservation breeding for our country.

We are grateful to Mr Godon Reid, President of WAZA for his presence and words of encouragement. His able guidance in matters pertaining to zoos has encouraged us. I thank him for his kindness, his interest and his support.

My heartfelt thanks are to Dr Robert Lacy, Chairman, CBSG of IUCN for his stewardship, support, vision and commitment for conservation breeding initiatives all over the world. Sir, your valuable contribution, guidance and encouragement has given a new impetus to our work.

I would like to put on records our special thanks to Dr B.R. Sharma, Member Secretary, CZA for his pains and efforts followed by sincere work to accept the challenge of the planned ex- situ conservation breeding of 63 endangered species of our country, in a scientific manner.

I would like to thank all our honored guests from abroad for their presence and participation.

I will fail in my duty if I do not put on record my deep appreciation for the Members of the Central Zoo Authority. Their kind support has made this workshop a reality.

I thank all senior officers and our esteemed invitees for their kind presence on this occasion.

We owe special gratitude to the officials of the Indian Council of Agricultural Research, the audio – visual staff, and all officials of the Central Zoo Authority and the National Zoological Park who have worked hard, and are still working hard to ensure that this occasion becomes a memorable success.

Last but not the least; I would like to thank the Members of the media, for their keen interest in covering the event.

I thank you all for your attention, thanks for coming.

# **Training Sessions I**

## **In-situ-ex-situ linkage-Wildlife conservation in India**

**Dr. R.B. Lal, IGF (WL) & Director Wildlife Preservation,  
Ministry of Environment & Forests, Govt. of India**

## **Zoos in India-legislation, regulations, policy and guidelines**

**Dr. Brij Raj Sharma, Member Secretary, CZA**

## **Laboratory for Conservation of Endangered Species (LaCONES) and Biotechnological interventions in conservation breeding of wild animals**

**Dr. S. Shiwaji, Deputy Director, Centre for Cellular and Molecular Biology and In-Charge Laboratory for Conservation of Endangered Species (LaCONES), Hyderabad (A.P)**

## **National Referral Centre and Physical health check-up/care of wild animals in Indian zoos**

**Dr. D. Swarup, Principal Scientist, Indian Veterinary Research Institute and Coordinator, National Referral Centre (NRC), Bareilly, (UP)**



## In-situ ex-situ linkage- Wildlife Conservation in India



Dr. R.B. Lal, IFS  
Inspector General of Forests  
(Wildlife) and Director  
Wildlife Preservation,  
Ministry of Environment &  
Forests, Govt. of India

The presentation provided insight in wildlife conservation scenario in India-the resources, problems, initiatives, failures and successes. The subject matter was presented with due emphasis on need for integration of in-situ and ex-situ conservation of wildlife.



## **In-situ – ex-situ linkage – wildlife conservation in India**

### **India**

- 328.7 million hec. of land mass  
i.e. 2.4% of world's total area
- 1027 million (2001 census) people and  
500 million cattle.

## India's forests and biodiversity

77.47 million hec. of forest cover i.e. 23.57% of total land area with

- 350 species of mammals
- 1224 of birds
- 408 of reptiles
- 197 of amphibians
- 2546 of fishes
- 57548 of insects &
- 46284 species of plants  
form 8% of world's biodiversity

## People

- Love and respect for nature and natural resource is part of our tradition, our culture and our religions.
- What we had and still have is conserved not only because of our Governments, our legislation, our policy, but by the people, as they have that respect for nature and brotherly feeling for fellow living beings.

## Forest Policy

- The first regular forest policy statement in India was issued in 1894.
- After independence, a new National Forest Policy was enunciated in 1952.
- And finally replaced by the National Forest Policy of 1988.

## Forest Legislation

- Forest legislation in India dates back to 1865, which was later revised in 1878.
- Process continued till the currently application Indian Forest Act of 1927.
- The Forest (Conservation) Act was enacted in 1980 to check diversion of forest land to non-forestry activities.

## Wildlife Legislation

- The Wild Life (Protection) Act came into being in 1972 to give proper shape to wildlife conservation in the country.
- The Act has later been amended in 1982, 1986, 1991, 1993, 2003 and 2006 to make it more comprehensive.

## National Wildlife Action Plan

- The first National Wildlife Action Plan was adopted in 1983.
- Presently, the National Wildlife Action Plan (2002-2016) is in operation and is guiding in deciding the priorities for wildlife conservation.

## Constraints to wildlife conservation

Countless obstacles to conservation

- Severe biotic pressure
- Degradation of habitat
- Fragmentations of habitats
- Diversion of forest land for non-forest purposes.
- Illegal occupation/ encroachments
- Hunting/ poaching and many more.

- The Government of India has always been sensitive to this and has taken several initiatives towards preservation of forests and wildlife from time to time.
- There is an urgent need to conserve India's forests and wildlife.

## **In-situ wildlife conservation**

606 Protected Areas comprising

- 96 National Parks
- 510 Wildlife Sanctuaries.

With overlapping of 28 tiger reserves and 25 Elephant Reserves cover an area of 15.159 million hec. i.e. 4.58 of total geographic area and/ or 22.12% of total forest area of the country.

## **In-situ wildlife conservation**

- Yes, all the efforts to protect the wildlife in its wild home are on.
- Stress on eco-system based conservation of wildlife.

## Ex-situ wildlife conservation

There are many wild animal species which are critically endangered, may be because of

- Very specific/ special needs which are no more available
  - Habitat loss
  - Over-harvesting, hunting, poaching etc.
- And are in need of outside help.

## Ex-situ wildlife conservation

- The Government of India has always acknowledge it.
- The Indian Board for Wildlife (now National Board for Wildlife) in its very first meeting in 1952 made important recommendations in this regard.
- An Expert Committee on management of Zoos was set up by the Government of India in November, 1972 and its recommendation accepted in June, 1973, which still have relevance.

## Central Zoo Authority

- The Central Zoo Authority was established by the Government of India in the year 1992 through an amendment of the Wild Life (Protection) Act, 1972.
- Main objectives was to oversee the functioning of Zoos and enforce minimum standards and norms for upkeep and health care of animals in Indian Zoos and to provide them technical and other assistance for improvement.

## Central Zoo Authority

- The Central Zoo Authority is a twelve member statutory body headed by a chairman.
- Minister-in-charge, Forests and wildlife Government of India is presently ex-officio Chairman of the Authority.
- Member Secretary, Central Zoo Authority is the Chief Executive Officer of the Authority.

## **The Regulation of Zoo Rules, 1992**

- There are 51 prescribed standards and norms for zoos in India.
- The Rules prescribe, type of housing facilities, health care, hygiene, feeding and overall upkeep of the animals, the minimum number of trained personnel to be posted, visitor facilities and others.

## **National Zoo Policy, 1998**

- To give proper direction and thrust to the management of Zoos in the country, the National Zoo Policy was framed and adopted by the Government of India in the year 1998.
- The main objective of the Zoos under the National Zoo Policy is to complement and strengthen the national efforts in conservation of rich biodiversity of the country, particularly, the wild fauna.

## National Zoo Policy, 1998

This objective can be achieved by zoos through the following protocol.

- Coordinated conservation breeding of critically endangered species in ex-situ conditions.
- Conservation education
- Research for conservation and if resources permit, to act as Rescue Centres.

## National Wildlife Action Plan

- The National Wildlife Action Plan, 1983 emphasized the role of ex-situ conservation in national conservation efforts.
- The National Wildlife Action Plan (2002-2016) also lays emphasis on the role of Zoos for ex-situ breeding of endangered species of wild fauna and their rehabilitation in the wild as per the IUCN guidelines for reintroduction.

## Species Recovery Plan

- Wild animal species which are losing ground faster than general decline because of loss of specific habitats, special needs, and over exploitation and have become endangered need special attention. May be species specific approach for their conservation.
- There are some ongoing projects in India like Project Tiger, Project Elephant etc. to deal with such issues.

## Species Recovery Plan

- In the XI Five Year Plan (2007-2012), the Government of India has come up with a special scheme known as Species Recovery Plan (SRP) to deal with the conservation of these wild animal species.
- Special efforts will be made for their recovery in the wild.
- Ex-situ conservation breeding in captive conditions and their later release/ re-introduction in the wild is a major component of the scheme.

## Species Recovery Plan

- for Asiatic lion, Snow leopard, Bustards, Vultures, Hangul, Dolphins have already been initiated.
- More species may have to be taken up under the scheme in future.

- Conservation Breeding Programme of critically endangered wild animal species is a step in the direction.
- It is a need based joint venture of in-situ and ex-situ wildlife managers.

- So, I leave it over here.

Conservation Breeding Programme of endangered wild animal species in India is being taken up as separate presentation by Member Secretary, Central Zoo Authority during the Conference.

Thanks !



## Zoos in India-legislation, regulations, policy and guidelines



Dr. Brij Raj Sharma, IFS  
Member Secretary  
Central Zoo Authority, Ministry of  
Environment & Forests, Govt. of India

Dr. B.R. Sharma elaborated the mandate, functioning and policies of the Central Zoo Authority. Fundamental issues on the improvement of zoos and initiatives of the Central Zoo Authority were discussed. Directors of Indian zoos interacted with Dr. Sharma with their queries.





## Central Zoo Authority

(A statutory body under the  
Ministry of Environment and Forests, Government of India)



## Central Zoo Authority

### Objectives

Central Zoo Authority was established in February, 1992, with the objective of preventing mushrooming of ill planned zoos in the country, as well as, for overseeing the management of zoos and providing them necessary technical and other inputs to come up to the desired level of management.

## Central Zoo Authority

### Functions



The functions assigned to the Authority under the Wild Life (Protection) Act, are:

- to specify the minimum standards for housing, upkeep and veterinary care of the animals kept in zoos;
- to evaluate and assess the functioning of the zoos with respect to the prescribed standards or norms;
- to recognise or derecognise zoos;
- to identify endangered species of wild animals for purposes of captive breeding and assigning responsibility in this regard to a zoo;
- to coordinate the acquisition, exchange and loaning of animals for breeding purpose;

## Central Zoo Authority

### Functions



- to ensure maintenance of studbooks of endangered species of wild animals bred in captivity;
- to identify priorities and themes with regard to display of captive animals in zoos;
- to coordinate training of zoo personnel in India and outside India;
- to coordinate research in captive breeding and educational programmes for the purposes of zoos;
- to provide technical and other assistance to zoos for their proper management and development on scientific lines;
- to perform such other functions as may be necessary to carry out the purposes of this Act with regard to zoos.



## Central Zoo Authority Constitution

- The Central Zoo Authority is a twelve-member body headed by a Chairman. The MOS (Environment & Forests) is presently ex-officio Chairman of the Central Zoo Authority. Member Secretary, Central Zoo Authority is the Chief Executive Officer of the Authority.



## Central Zoo Authority Establishment

- There are 15 regular and contractual scientific/ administrative personnel to assist the Member Secretary in discharge of his duties. The administrative office of the Central Zoo Authority is presently located at Bikaner House, Shahjahan Road, New Delhi.



## Central Zoo Authority Functioning

- To carry out the functions of the Authority, two Committees namely, Administrative Committee & Technical Committee and one Expert Group on Zoo Designing has been constituted.



## Central Zoo Authority Achievements

- Recognition of Zoo Rules 1992 formulated for fixing up the standards and norms for management of zoos in the country.
- National Zoo Policy - 1998 adopted.
- Guidelines on better upkeep, housing and health care of wild animals in zoos prescribed.



## Recognition of Zoo Rules, 1992

There are 51 prescribed standards and norms. The Rules prescribe type of housing facilities, healthcare, hygiene, feeding and overall upkeep of the animals, the minimum number of trained personnel to be posted in zoo, visitor facilities and others.



## National Zoo Policy

- To give proper direction and thrust to the management of Zoos in the country, the National Zoo Policy was framed and adopted by the Government of India in the year 1998.
- The main objective of the Zoos under the National Zoo Policy is to complement and strength the national efforts in the conservation of rich biodiversity of the country, particularly the wild fauna.



## National Zoo Policy

Zoos can achieve this by supporting the conservation of endangered species by giving species, which have no chance of survival in wild, a last chance through coordinated breeding under ex-situ conditions and raise stocks for rehabilitating them in wild as and when it is appropriate and desirable.



## National Zoo Policy

Zoos are also required to inspire amongst visitors empathy for wild animals, an understanding and awareness about the need for conservation of natural resources and for maintaining the ecological balance.



## National Zoo Policy

Opportunities for carrying out scientific studies useful for conservation in general and creation of data base for sharing between the agencies involved in in-situ and ex-situ conservation are also the objectives enshrined in the policy.



## National Zoo Policy

Besides the aforesaid objectives, the Zoos will continue to function as rescue centres for rescued/ orphaned wild animals subject to the availability of appropriate housing and upkeep infrastructure. Where appropriate housing and upkeep is not available, the Government would ascertain setting up rescue facilities in off display areas of the Zoo subject to the availability of land.



## Classification of zoos

For the purpose of deciding standards and norms for recognition, the zoos, on the basis of number and species of animals and number and species of endangered wild animals have been classified as large, medium, small and mini zoos.



## Accreditation of zoos

- A total of 509 application for accreditation as zoos received by Central Zoo Authority. 19 large, 11 medium, 29 small, 76 mini, 22 rescue centers and 23 circuses (total 180 facilities) have been recognized as zoos.



## Improvement of Zoos

- MoEF, GOI provides grants-in-aid to Central Zoo Authority for its functioning.
- Central Zoo Authority provide financial assistance for improvement of recognized public sector Zoos in the country.



## Financial Assistance

Creation of better animal housing, veterinary facilities, research and training related activities are financed on 100% basis by Central Zoo Authority, whereas development of infrastructure like boundary wall, electricity network, water distribution, road / footpaths, sewage disposal, signage and visitors facilities are shared with zoo operator on 50:50 basis



## Health care of animals

All the zoos in India are equipped with basic veterinary facilities along with veterinary personnel as prescribed in Recognition of Zoo Rules 1992



## Providing access to better veterinary facilities and services

- Health Advisory Committees
- Mechanism with local Veterinary Colleges at the State/ Regional level
- National Referral Centre at Indian Veterinary Research Institute Bareilly (UP).



## Conservation Breeding

It has been decided to take up the planned *ex-situ* conservation breeding programmes of the endangered species with wild population within few hundreds/ thousands and less than 100 animals in captivity in Indian Zoos.



## Conservation Breeding

One zoo next to natural habitat of the identified species has been assigned the responsibility to act as coordinating zoo.

Two to four Zoos in the range area of the targeted species take part in the breeding programme, whereas off-display conservation breeding facilities are created only in one or two Zoos of the region.



## Conservation Breeding

The protected areas having wild population/ proposed reintroduction site in the vicinity of the ex-situ conservation breeding facility are identified so that the corrective measures can also be initiated to address to the cause of decline/ extinction of wild population of the species in its natural habitat in the meantime.



## Conservation Breeding

There are many ongoing conservation breeding programmes in the Zoos or specially created facilities for the purposes in the country. Conservation breeding of Snow leopard and Red panda in Darjeeling Zoo, Asiatic lion in Junagarh, Lion tailed macaque in Chennai, Pygmy hog in Guwahati and Western Tragopan in Himachal Pradesh are some of the ongoing programmes.



## Research : National level studies

- The Central Zoo Authority has signed Memorandum of Understanding (MoU) with SPA, IVRI, CEE, WII, CCMB/ LacONES and again with IVRI to initiate studies in some areas of Zoo Management.



## Research : Small Grant Fellowships

- The Central Zoo Authority is also providing funds in the form of Small Grant Fellowships to the Zoos to organize studies to address to the local issues related to ex-situ wildlife conservation at the Zoo level.



## Research : LaCONES

- In order to infuse new technology in the field of ex-situ wildlife conservation, a Laboratory for Conservation of Endangered Species (LaCONES) has been established at Hyderabad in collaboration with other Departments. The facility is working on genetic analysis of captive stock, frozen zoo and assisted reproduction techniques.



## Human Resource Development

- Central Zoo Authority regularly organize short term training programmes for different level Zoo personnel in India and abroad.
- Theme based Workshops and Seminars are also organized by the Authority from time to time.



## Rescue & Rehabilitation of Circus Animals

- Central Zoo Authority has established seven rescue centers for rehabilitation of wild animals whose performance has been banned in circuses at Chennai, Bangalore, Tirupati, Visakhapatnam, Jaipur, Bhopal and South Khairbari. More than 400 lions and tigers have been rehabilitated in these rescue centers. The authority is also funding the maintenance including food in these centers.



## Central Zoo Authority Centre for Zoo Sciences

- On initiative of the Central Zoo Authority, MoEF, GOI has approved creation of Centre for Zoo Sciences in New Delhi. The modalities for the creation of the Centre for Zoo Sciences are being finalized.



## Central Zoo Authority website & MIS

- You can visit us at our Website [www.cza.nic.in](http://www.cza.nic.in) to know more about us
- A Management Information System (MIS) has been developed in the Authority Office for more efficiency and transparency in the functioning of the Central Zoo Authority.





## Laboratory for Conservation of Endangered Species (LaCONES) and Biotechnological interventions in Conservation Breeding of Wild Animals



Dr. S. Shivaji  
Deputy Director, Centre for Cellular and Molecular Biology and In-Charge Laboratory for Conservation of Endangered Species (LaCONES)  
Hyderabad (A.P)

Dr. Shivaji briefed the participants on the newly established “Laboratory for Conservation of Endangered Species (LaCONES)” of the Centre for Cellular and Molecular Biology, Hyderabad and its role in genetic health analysis of captive stock of wild animals, frozen zoo, and in development of techniques on Assisted Reproduction (AR) for the wild animals.

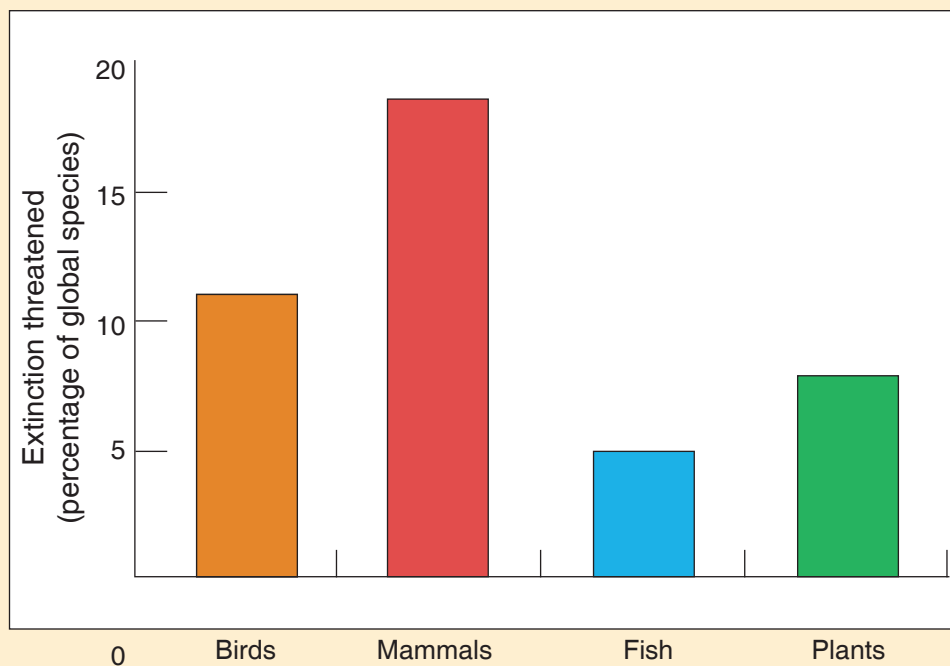


## LABORATORY FOR CONSERVATION OF ENDANGERED SPECIES (LaCONES)



Department of Biotechnology, Govt. of India  
 Central Zoo Authority, Govt. of India  
 Department of Biotechnology, Govt. of A.P.  
 Council for Scientific and Industrial Research

## PROPORTION OF THE GLOBAL NUMBER THAT ARE THREATENED WITH EXTINCTION





## TIGER NUMBER

1900 – 40,000  
 2008 – 2,500  
 Estimated loss 1 / day

*The tiger will be virtually extinct in the wild by 2025.*

Whiskers – tooth-ache  
 Brain – laziness and pimples  
 Bones - rheumatism, weakness, paralysis  
 Tail - skin diseases  
 Eye ball - epilepsy

Tiger Skin: \$15,000  
 Tiger Bone: \$1,250 per kg  
 A Bowl Of Tiger Penis Soup: \$320

**\$6 Billion Annual turnover estimated by Interpol.**  
**The illegal wildlife trade is now widely recognized as the world's second largest racket (after drugs)!**



Only in Gir forest  
 Gujarat

Population :  
 1913 – 20  
 2002 - 375

## ASIATIC LION

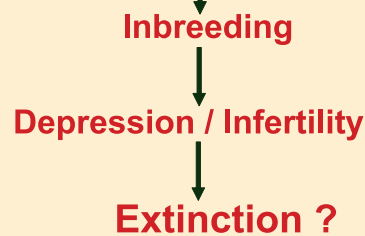


## DEFINITION OF THE PROBLEM

### DECIMATION OF WILD LIFE



### Fragmentation of habitats and populations



### INBREEDING DEPRESSION

“Normally refers to the the effects of deleterious recessive genes which accumulate in individuals following continuous mating between close relatives”



## OBJECTIVES

1. To monitor genetic variation by DNA based methods
2. To develop protocols for semen collection, artificial insemination, IVF , embryo transfer and cloning
3. To establish gene, cell and tissue bank of wild animals

## EXPECTED OUTCOME

1. Determination of relatedness and the degree of inbreeding depression which will help in designing breeding programs
2. The identification of animals with high genetic variation and with good semen and hormonal profiles
3. The development of non-invasive methods for population studies

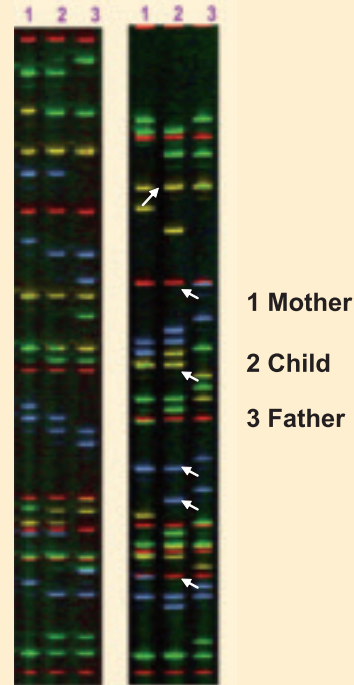
Contd...

4. The establishment of gene resource bank of endangered animals
5. The establishment of techniques in assisted reproduction
6. Human resource development in wildlife molecular ecology and reproductive biology
7. Training zoo personnel and wildlife managers for effective management of wildlife

## MONITORING OF GENETIC VARIATION

DNA fingerprinting  
 Microsatellites  
 Mitochondrial D-Loop  
 MHC loci  
 Cytochrome b

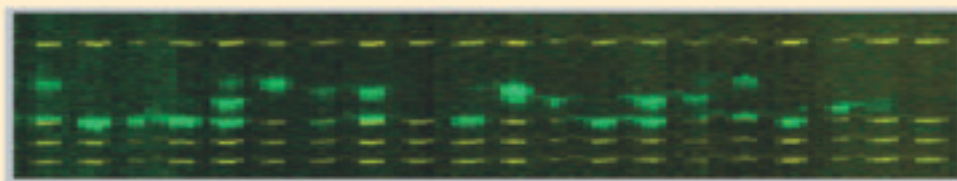
PATERNITY /  
 FORENSIC



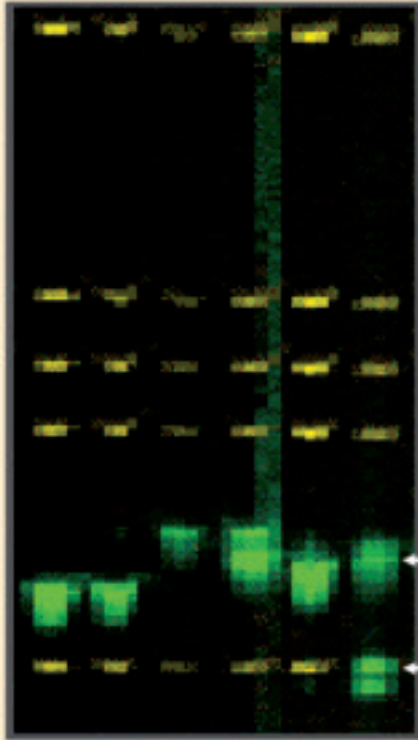
## GENETIC VARIATION IN BIG CATS

- Screened Lions (n = 30) and Leopards (n = 30) with 16 markers
- Microsatellite markers developed indicated distinct allelic variation in Asiatic lions as well as in leopards

Asiatic lion



## Polymorphism at Fca90 locus of Tigers



## OTHER ANIMALS STUDIED

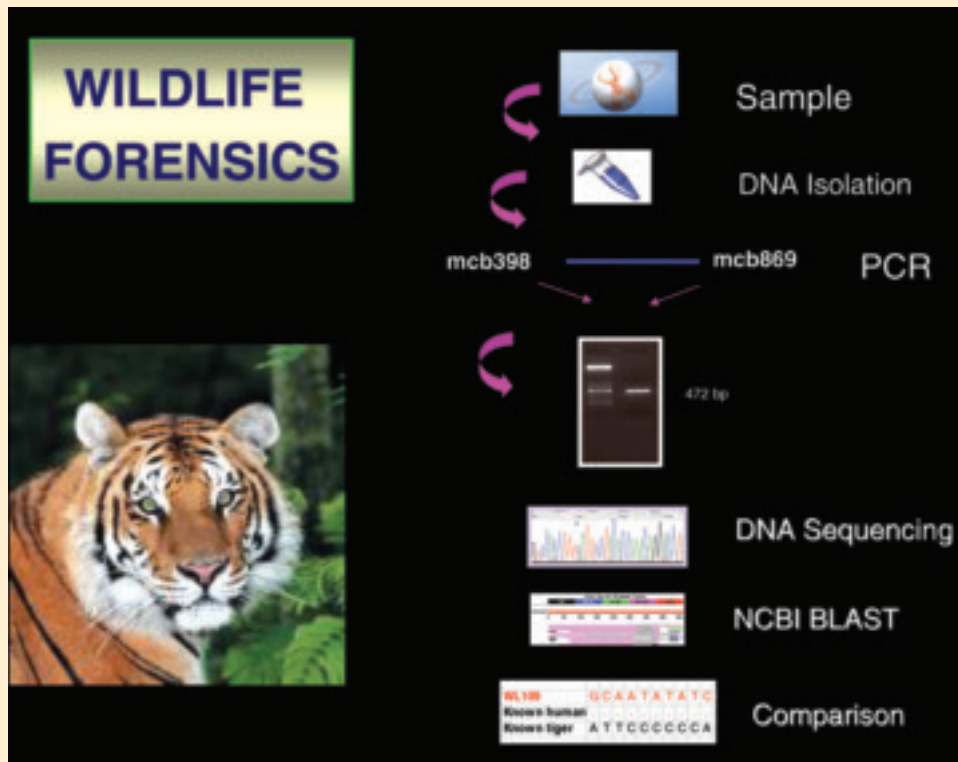


## WHAT HAVE BEEN THE SPIN-OFFS ?

- ♣ ***Genetic counseling***
- ♣ ***Wildlife forensics***
- ♣ ***Rehabilitation of animals***
- ♣ ***Tiger census from scats***

## A FEW INTERESTING CASES

- \* **The skinning of sakhi the tiger**
- \* **The prowling leopard in Chennai**
- \* **The peacock or chicken story?**
- \* **Camel bone or elephant tusk?**
- \* **Home for star tortoise.**



## ANIMALS IDENTIFIED USING UNIVERSAL PRIMER

1. Leopard (*Panthera pardus*)
2. Human (*Homo sapiens*)
3. Chital Deer (*Cervus axis*)
4. Female Elephant (*Elephas maximus*)
5. Tiger (*Panthera tigris*)
6. Nilgai (*Boselaphus tragocamelus*)
7. Indian Gaur (*Bos gaurus*)
8. Samber Deer (*Cervus unicolor*)
9. Cat (*Felis catus*)
10. Male Elephant (*Elephas maximus*)
11. Dog (*Canis familiaris*)
12. Peacock (*Pavo cristatus*)

13. Chicken (*Gallus gallus*)
14. Wild boar (*Sus scrofa*)
15. Animal Similar to Temminck's red colobus (*Colobus spp.*)
16. Civet (*Viverra spp.*)
17. Striped hyena (*Hyaena hyaena*)
18. Water buffalo (*Bubalus bubalis*)
19. Animal Similar to chimpanzee monkey (*Pan troglodytes*)
20. Goat (*Capra hircus*)
21. Sheep (*Ovis aries*)

## LIST OF ENDANGERED ANIMALS WHICH COULD BE IDENTIFIED USING UNIVERSAL PRIMER

1. Leopard (*Panthera pardus*)
2. Chital Deer (*Cervus axis*)
3. Elephant (*Elephas maximus*)
4. Tiger (*Panthera tigris*)
5. Nilgai (*Boselaphus tragocamelus*)
6. Indian Gaur (*Bos gaurus*)
7. Samber Deer (*Cervus unicolor*)
8. Peacock (*Pavo cristatus*)
9. Chicken (*Gallus gallus*)
10. Wild boar (*Sus scrofa*)
11. Temminck's red colobus (*Colobus spp.*)
12. Civet (*Viverra spp.*)
13. Striped hyena (*Hyaena hyaena*)
14. Water buffalo (*Bubalus bubalis*)
15. Chimpanzee monkey (*Pan troglodytes*)
16. Powerful Owl (*Ninox strenua*)
17. Rufous Owl (*Ninox rufa*)
18. Morepork Owl (*Ninox novaeseelandiae*)
19. Shenandoah salamander (*Plethodon shenandoah*)
20. Galapagos Tortoises (*Geochelone nigra*)
21. Flat-tailed Tortoise (*Pyxis planicauda*)
22. Gopher Tortoise (*Gopherus polyphemus*)
23. Simian jackal (*Canis simensis*)

24. Gray Wolf (*Canis lupus*)
25. Lion (*Panthera leo*)
26. Gangatic dolphin
27. Crocodile
28. Black buck (*Antelope cervicapra*)
29. King Cobra (*Naja naja*)
30. Hippocampus
31. Hippopotamus
32. Barking Deer (*Muntiacus crinifrons*)
33. Muntjak (*Muntiacus muntjak*)
34. Fea's muntjac (*Muntiacus feae*)
35. Chinese muntjac (*Muntiacus reevesi*)
36. *Megamuntiacus vuquangensis*
37. Mule deer (*Odocoileus hemionus*)
38. *Cervus elaphus wallichi*
39. Chinese water deer (*Hydropotes inermis*)
40. Bushbuck (*Tragelaphus scriptus*)
41. *Beatragus hunteri*
42. Eld's deer (*Cervus eldi*)
43. *Cervus nippon yesoensis*
44. Pere David's deer (*Elaphurus davidianus*)
45. *Cervus canadensis nelsoni*
46. *Axis porcinus porcinus*
47. *Alces alces pfitzmayeri*
48. East Caucasian tur (*Capra cylindricornis*)

Contd...

- |  |   |
|--|---|
| 49. Celebes rusa deer ( <i>Cervus timorensis macassanicus</i> )            | 77. dhole ( <i>Cuon alpinus</i> )                             |
| 50. Persian fallow deer ( <i>Dama mesopotamica</i> )                       | 78. African hunting dog ( <i>Lycan pictus</i> )               |
| 51. Schomburgks deer ( <i>Cervus schomburgki</i> )                         | 79. Corsac fox ( <i>Vulpes corsac</i> )                       |
| 52. Fallow deer ( <i>Cervus dama</i> )                                     | 80. Pampas fox ( <i>Pseudalopex gymnocercus</i> )             |
| 53. Reindeer ( <i>Rangifer tarandus</i> )                                  | 81. Arctic fox ( <i>Alopex lagopus</i> )                      |
| 54. White-tailed deer ( <i>Odocoileus virginianus</i> )                    | 82. Crab-eating fox ( <i>Dusicyon thous</i> )                 |
| 55. <i>Viverra megaspila</i>   | 83. Small-eared dog ( <i>Atelocynus microtis</i> )            |
| 56. Large Indian civet ( <i>Viverra zibetha</i> )                          | 84. Kit fox ( <i>Vulpes velox</i> )                           |
| 57. Clouded leopard ( <i>Neofelis nebulosa</i> )                           | 85. Green peafowl ( <i>Pavo muticus</i> )                     |
| 58. <i>Poiana richardsonii</i>   | 86. Four-horned antelope ( <i>Tetracerus quadricornis</i> )   |
| 59. Ringed seal ( <i>Phoca hispida</i> )                                   | 87. Abbott's duiker ( <i>Cephalophus spadix</i> )             |
| 60. Ribbon seal ( <i>Phoca fasciata</i> )                                  | 88. Yellow-backed duiker ( <i>Cephalophus silvicultor</i> )   |
| 61. Eurasian lynx ( <i>Lynx lynx</i> )                                     | 89. Tamaraw ( <i>Bubalus mindorensis</i> )                    |
| 62. African palm civet ( <i>Nandinia binotata</i> )                        | 90. Markhor ( <i>Capra falconeri</i> )                        |
| 63. Small Indian civet ( <i>Viverricula indica</i> )                       | 91. Eland ( <i>Tragelaphus oryx</i> )                         |
| 64. Small-spotted genet ( <i>Genetta genetta</i> )                         | 92. Proboscis monkey ( <i>Nasalis larvatus</i> )              |
| 65. Weddell seal ( <i>Leptonychotes weddellii</i> )                        | 93. Rhesus monkey ( <i>Macaca mulatta</i> )                   |
| 66. Impala ( <i>Aepyceros melampus</i> )                                   | 94. Orangutan ( <i>Pongo pygmaeus</i> )                       |
| 67. Nubian ibex ( <i>Capra nubiana</i> )                                   | 95. Celebes crested macaque ( <i>Macaca nigra</i> )           |
| 68. <i>Dugong dugong</i>   | 96. Golden snub-nosed monkey ( <i>Pygathrix roxellana</i> )   |
| 69. Side-striped jackal ( <i>Canis adustus</i> )                           | 97. Mueller's gibbon ( <i>Hylobates muelleri</i> )            |
| 70. Golden jackal ( <i>Canis aureus</i> )                                  | 98. Seba's short-tailed bat ( <i>Carollia perspicillata</i> ) |
| 71. Ethiopian wolf ( <i>Canis simensis</i> )                               | 99. Asian palm civet ( <i>Paradoxurus hermaphroditus</i> )    |
| 72. Coyote ( <i>Canis latrans</i> )  | 100. Small-spotted genet ( <i>Genetta genetta</i> )           |
| 73. Little yellow-shouldered bat ( <i>Sturnira lilium</i> )                | 101. <i>Parahyaena brunnea</i>                                |
| 74. Ethiopian wolf ( <i>Canis simensis</i> )                               | 102. Spotted hyena ( <i>Crocuta crocuta</i> )                 |
| 75. Eastern African black-backed jackal ( <i>Canis mesomelas elongae</i> ) | 103. Malagasy civet ( <i>Fossa fossana</i> )                  |
| 76. Argentine gray fox ( <i>Pseudalopex griseus</i> )                      | 104. Marine otter ( <i>Lontra felina</i> )                    |
|  | 105. Eastern roe deer ( <i>Capreolus pygargus</i> )           |

## ESTIMATING THE NUMBER OF WILD TIGERS BY DNA PROFILING OF FAECAL SAMPLES

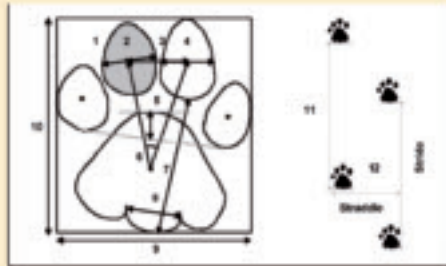


### Methods

- ♣ Pugmark method
- ♣ Camera trap mark and recapture method
- ♣ DNA based method using scats

## PUGMARK METHOD

Paw prints of tigers individual specific



Paw and stride measurement made to identify individuals.

### Advantages :

Easy, fast and no need for an expert.



### Disadvantages :

- No pugmarks on rocky and grass lands.
- Pugmarks vary with animal gait.
- Pugmarks vary with observer's skill.

## DNA BASED METHOD USING SCATS

### Advantages:

- Accurate, easy to collect and store scats
- Can be used in conjunction with GPS to map the population
- Can be used in remote areas
- Can provide population estimation and genetic diversity

### Disadvantages:

- Error due to genetic homozygosity
- Error due to allelic drop out
- Time consuming and need for a good lab



## CAMERA TRAP MARK AND RECAPTURE METHOD

1. Tiger stripes are individual-specific.
2. Infra-red triggered cameras placed in the forest photograph the flanks of tigers.
3. Populations are estimated by mark-recapture models.

### Advantages

Reliable and accurate

### Disadvantages

Cannot be used in inaccessible areas

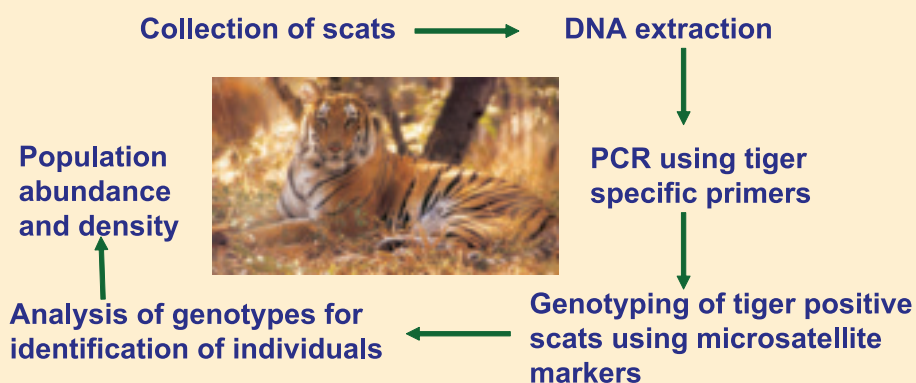
Expensive

Time consuming

Requires more manpower



## VALIDATION OF METHODOLOGY



Reference	Animal	Source
Bellemain <i>et al</i> (2005)	Brown bears	Scat
Banks <i>et al</i> (2003)	Hairy-nosed wombat	Hair and scat
Eggert <i>et al</i> (2003)	Forest Elephant	Dung
Frantz <i>et al</i> (2003)	Badger	Scat
Lucchini <i>et al</i> (2003)	Wolf	Scat
Prugh <i>et al</i> (2003)	Coyote	Scat
Pigott <i>et al</i> (2006)	Rock wallaby	Scats
Dallas <i>et al</i> (2003)	Eurasian Otter	Scat

## FROM GENOTYPE TO POPULATION NUMBER

The 1/0 matrix based on genotypes is used as an input to model abundance using CAPTURE.

CAPTURE uses Jackknife models to estimate abundance with 95% confidence interval assuming unequal capture probability of all animals

Estimate of abundance from the Mh-Jackknife for Tadoba  
=  $12 \pm 2.4$  tigers

Density = 2.9 tigers / 100km<sup>2</sup>

Density similar to the estimates from camera trap and prey density analysis.

## COLLECTION AND STORAGE OF SAMPLES

- \* **What samples can be examined?**  
Whole blood, blood stains, hairs, bones, meat, skin pieces, tooth pulp etc.
- \* **What should be the quantity of the sample?**  
As much as possible.
- \* **How to store and transport the samples?**
  - (i) 4°C, for storing for 1 to 2 days.  
-20°C to -70°C for storing more than 2 days.
  - (ii) Blood samples should be collected with EDTA
  - (iii) Dry samples should be collected in clear envelopes and stored in a cool and dry place or in frozen condition.
  - (iv) Autopsy specimens should be properly wrapped in aluminium foil, closed in polythene bags & frozen quickly.

**Contd...**

- \* **Can cooked and putrefied samples also be examined?**  
Yes.
- \* **Who is the forwarding authority?**  
Any investigation officer (Government or private).
- \* **Is there any specific proforma for submission of samples?**  
Storage condition of the sample, date of collection, forwarding letter etc.
- \* **What, if the scientific evidence is to be submitted to the court?**  
The case should be forwarded through the forensic laboratory.
- \* **What is the current fee for analysis?**  
Rs. 3,000 per sample payable to the Director, CCMB.

**What is assisted reproduction?**

**“Intervention of mankind to improve the fertility status and reproductive performance of an organism”**

**IMPORTANCE OF AR**

- Conservation of endangered species
- Maintenance of genetic variation
- To facilitate breeding in captive condition

**AR METHODS**

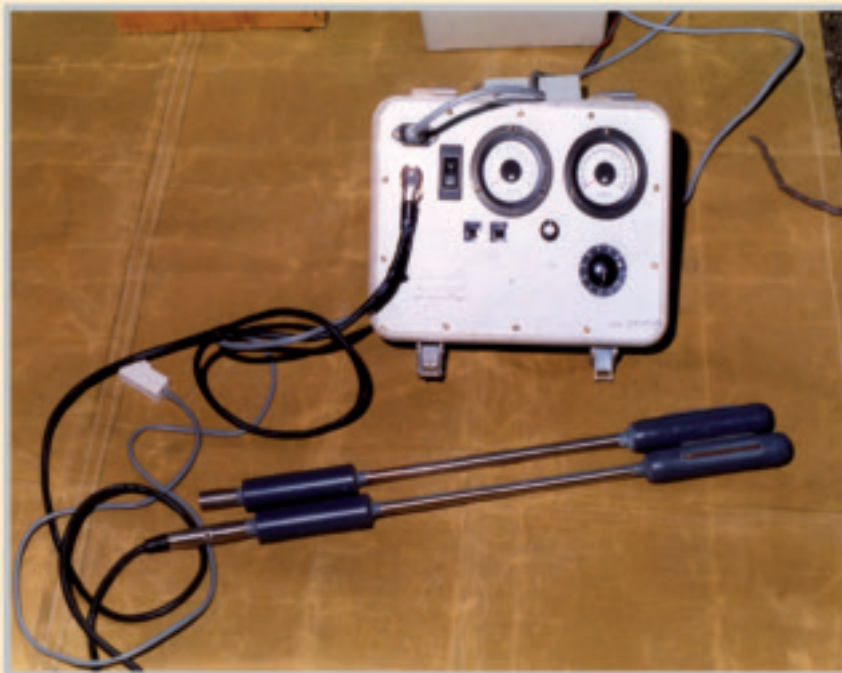
- Semen collection
- Semen cryopreservation
- Artificial insemination
- IVF
- ET
- Cloning



## TRANQUILISED TIGER



## PROBE + ELECTROEJACULATOR



## SEMEN COLLECTION



## LION SEMEN COLLECTION



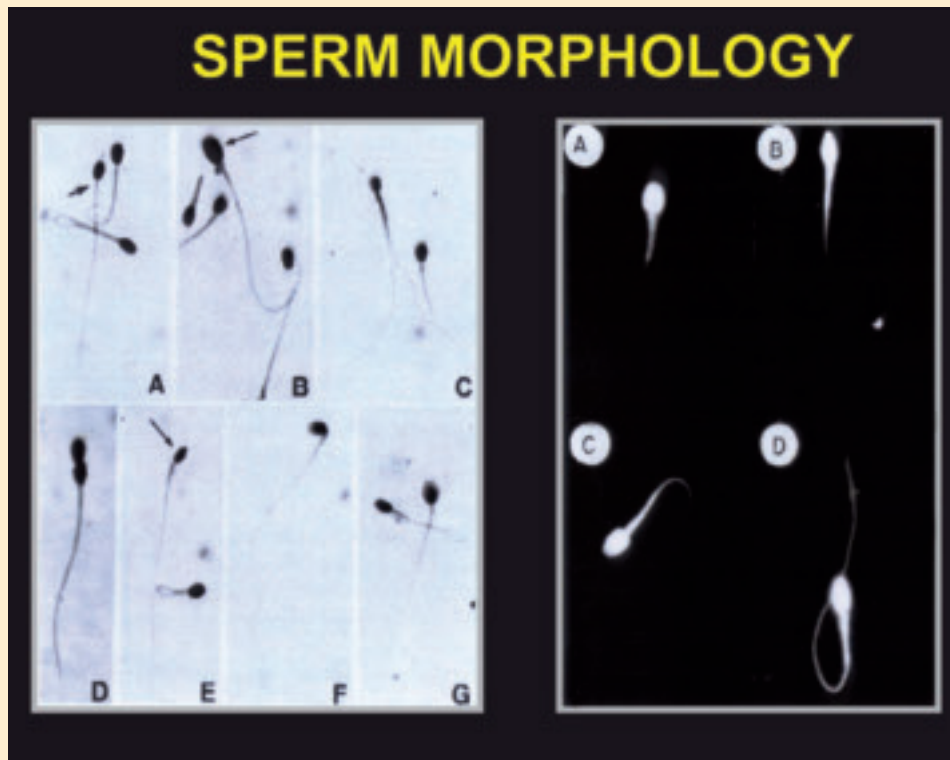
## LEOPARD SEMEN COLLECTION



## SEMEN AND HORMONAL ANALYSIS IN BIG CATS

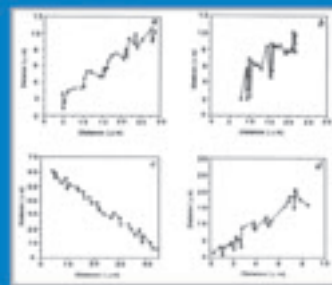


	TIGER	LION	LEOPARD
Number	16	22	18
pH	7.6	7.8	7.5
Volume	1.5	3.9	1.6
Motility (%)	47	63	57
Sperm conc. ( $\times 10^6$ )	42	52	52
Normal sperm (%)	79	79	72
Testosterone (pg / ml)	1729	1849	894



### ESTABLISHMENT OF GENE BANK

↓  
**CRYOPRESERVATION**



**SPERM**

**TISSUE**

**OOCYTES / EMBRYOS**

STANDARDISED

TO BE STANDARDISED

	Sperm motility (%)	
	Before cryopreservation	Post thaw
Tiger	11	25
Lion	5	30
Leopard	6	32

## ARTIFICIAL INSEMINATION IN MEGA CATS

Species	AI	Females(n)	Proven fertile
LION	22	15	5
LEOPARD	9	7	2

### WHAT EVADES SUCCESS OF AI ?



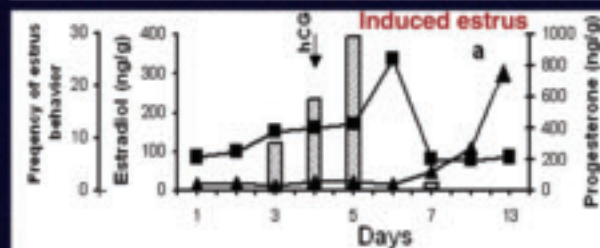
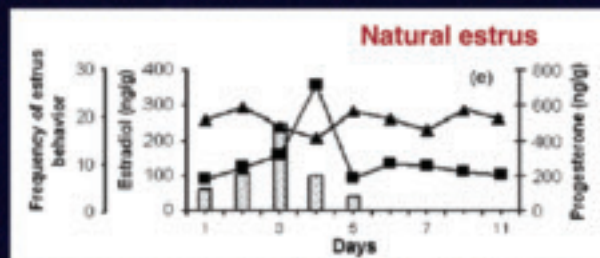
(Gestation period :  
103 - 110 days)

- \* Delay in transportation of sperm due to sedation
- \* Transport of oocytes delayed?
- \* Endometrial receptivity?
- \* Fertility status?
- \* Post AI management (care) and follow up!

## FECAL STEROID MONITORING IN THE ASIATIC

### Conclusions :

- \* A significant correlation seen between estrus behaviour and estradiol concentration.
- \* No increase in progesterone during natural estrous because lions are mating induced ovulators.
- \* Progesterone increase observed during induced estrus.



Number of animals = 5 in natural and 10 in induced.

- (●) Fecal estradiol
- (▲) Fecal progesterone
- (□) Behavioural activities

**BUT...**

**Commercially available kits fail to detect fecal steroid metabolites in many species because**

- non-specific
- very low quantity
- cross react with other metabolites
- different forms in urine and faeces



**Therefore, studies have been initiated to identify major fecal steroid metabolites in endangered animals**

**To develop species or group specific immunoassays to monitor reproductive function in lions, tigers, leopards, deers etc.**

## ASSISTED REPRODUCTION IN WHITE-BACKED VULTURE



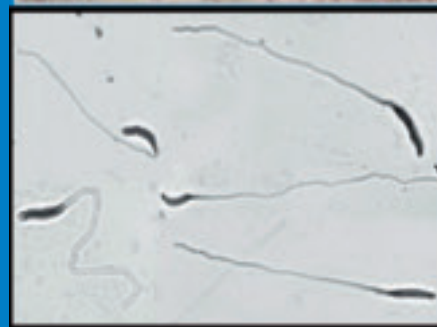
**Decline in population 90%**

**due to :**  
poisoning,  
pesticides,  
lack of food,  
infectious disease  
diclofenac etc.

**Objectives :** To standardize a method for semen collection.  
To evaluate semen characteristics.  
To carry out artificial insemination

## White-backed Vulture

Parameter	Mean	Range
Volume (ml)	1.7	0.2 - 3.2
pH	7.6	7.2 - 8.5
Motility (%)	55.2	50 - 70
Concentration ( $\times 10^6$ )	95.2	10 - 496
Abnormal (%)	30.8	20 - 50



## POST MORTEM AND BLOOD SMEAR FINDINGS

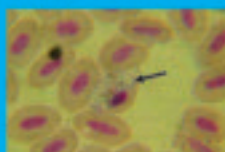
Sept., 2004 – April, 2005 – 18 deaths – 4 suitable for PM  
 Sept., 2005 – April, 2006 – 13 deaths – 8 suitable for PM



Unc acid chalky crystals on all the organs.



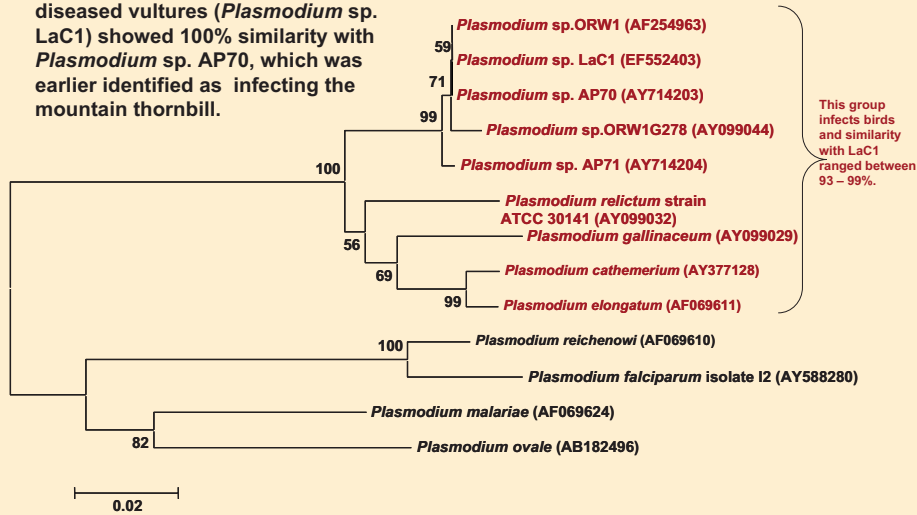
Conjunctiva pale suggestive of anaemia.



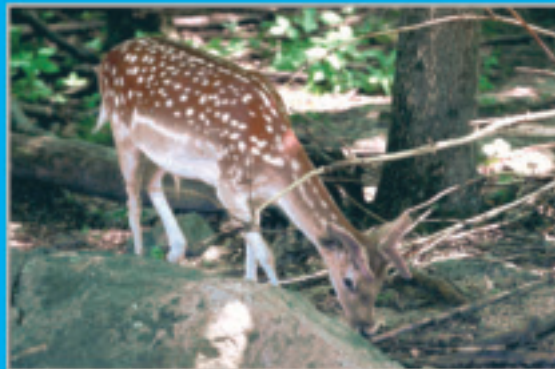
Presence of intra-erythrocytic *Plasmodium* schizonts

## AMPLIFICATION OF THE CYTOCHROME B GENE IN THE 12 DEAD VULTURES

Amplified product of 502 bp from diseased vultures (*Plasmodium* sp. LaC1) showed 100% similarity with *Plasmodium* sp. AP70, which was earlier identified as infecting the mountain thornbill.



## ASSISTED REPRODUCTION IN SPOTTED DEER



Spotted deer as a model for other critically endangered deer species (Manipur brow-antler deer, Musk deer, Swamp deer)

## SUCCESSFUL ARTIFICIAL INSEMINATION IN SPOTTED DEER

Inseminations – 6

Result : pregnancies  
1 (live birth)  
1 (dead foetus)



## Assisted Reproduction in an Endangered Black buck (*Antelope cervicapra*)



Schedule I, (Endangered) IWPA, 1972



**A model system for endangered Antelopes**  
(Nilgiri Tahr, Himalayan Tahr, Indian Gazelle, Chausingha etc.)

## SEMEN COLLECTION IN BLACK BUCK

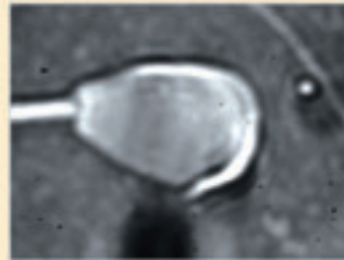


**Anaesthesia**  
 Xylazine 0.25 mg/kg  
 +  
 Ketamine 2.0 mg/kg

**Reversal**  
 Tolazoline 2.0 mg/kg

(12- animals; 95 ejaculates)

Semen Volume (ml)	5.3 ± 0.2
Semen pH	7.1 ± 0.1
Total motility (%)	73.7 ± 1.1
Progressive motility (0-5 scale)	4.1 ± 0.1
Sperm concentration (M/ml)	224 ± 6.9
Sperm viability (%)	77.5 ± 1.1
Intact sperm acrosomes (%)	82.6 ± 1.1
Sperm pleiomorphism (%)	19.1 ± 1.1



## ENDOSCOPE-GUIDED TRANSCERVICAL ARTIFICIAL INSEMINATION

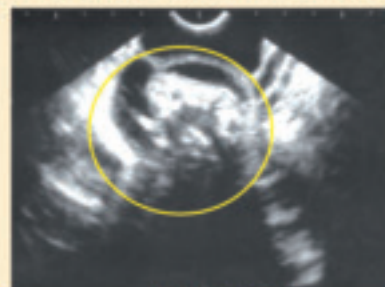
PGF $\alpha$  → Artificial insemination after 72 hours and 96 hours



## ULTRASONOGRAPHIC DETECTION OF PREGNANCY



(55 days)



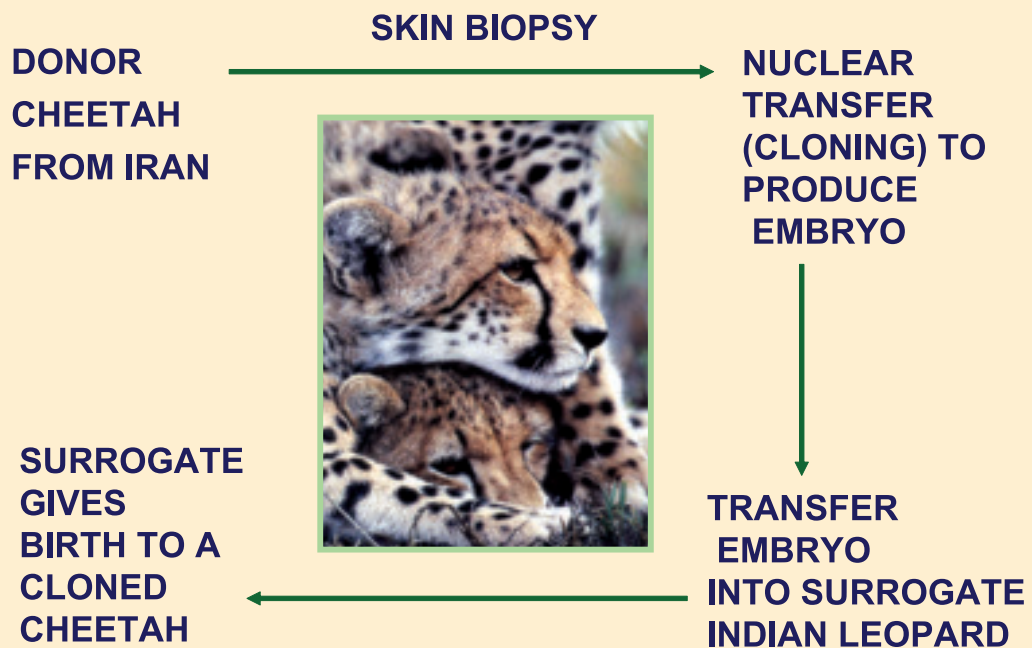
(125 days)

### BIRTH OF ENDANGERED BLACK BUCK FAWN (BLACKY) BY ARTIFICIAL INSEMINATION



August 23, 2007

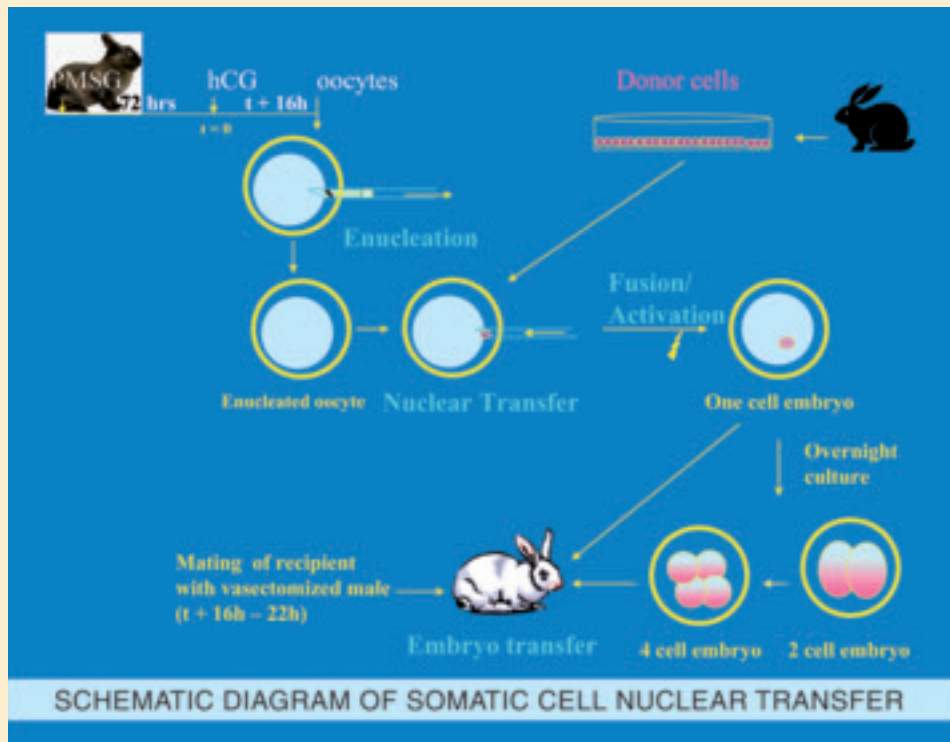
### CLONING OF THE INDIAN CHEETAH



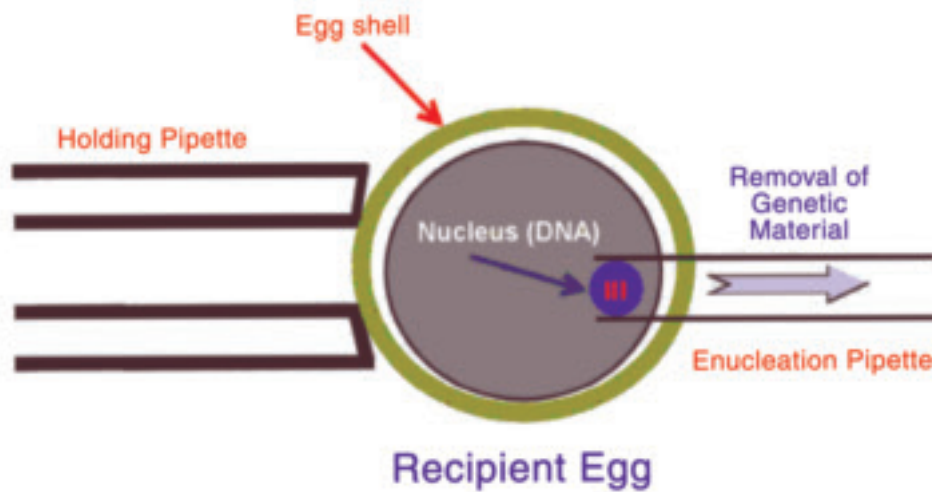


**IN VITRO DEVELOPMENT OF IN VIVO FERTILIZED AND SOMATIC CELL NUCLEAR TRANSFERRED RABBIT EMBRYOS**

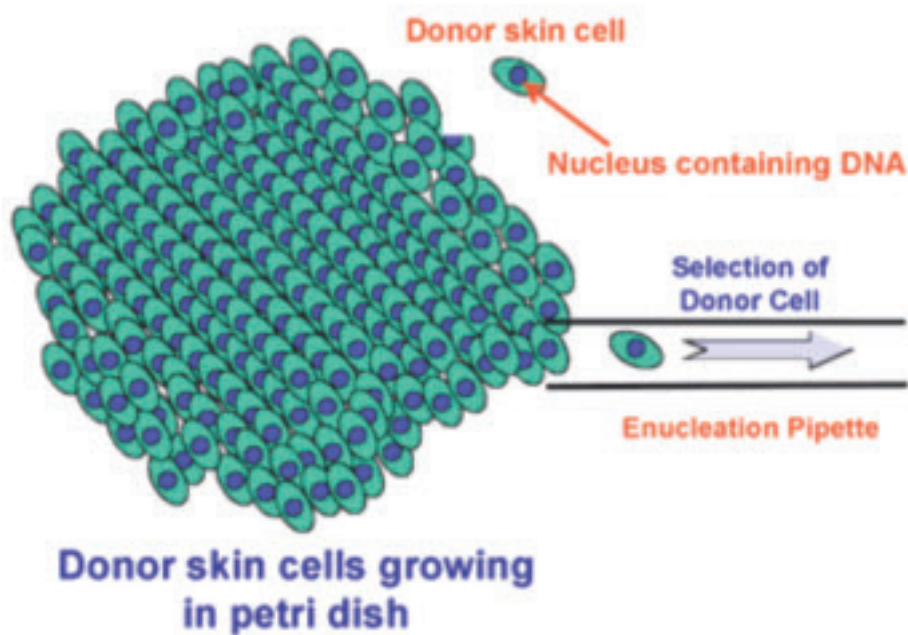
Donor cell type	Fused (%)	2-cell (%)	Morula (%)
In-vivo fertilized	--	42 (100)	42 (100)
Cumulus cells	122/171 (71.34)	69 (56.55)	27 (39.13)
Fibroblast cells – at confluence	71/98 (72.44)	50 (70.42)	22 (44.00)



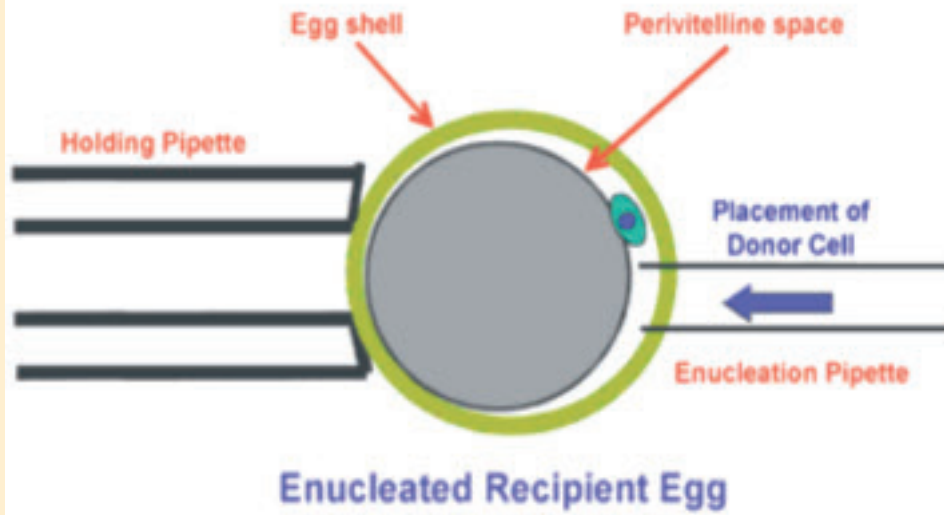
### Step 1 - Enucleation of the Recipient Egg



### Obtaining the Donor's Genetic Code

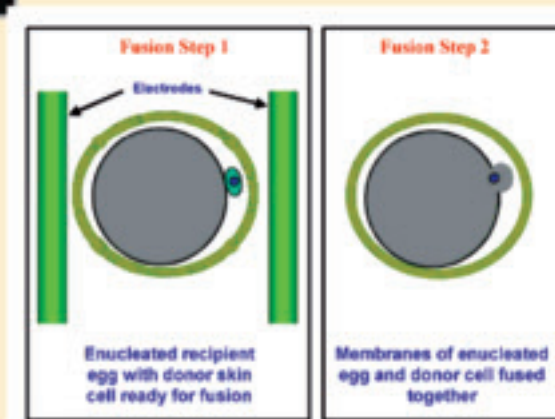


### Step 2 - Transfer of the Donor Cell Into the Recipient Egg



**CELL FUSION EQUIPMENT**

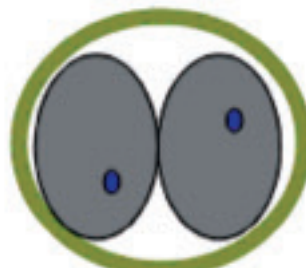
### Step 3 - Fusion of the Donor cell to the Recipient Egg



### Step 4- Culturing the Resulting Cloned Embryo in the Incubator



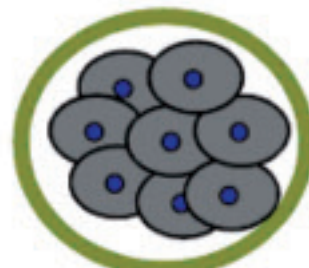
1-cell stage embryo



2-cell stage embryo



4-cell stage embryo



8-cell stage embryo

Enucleation

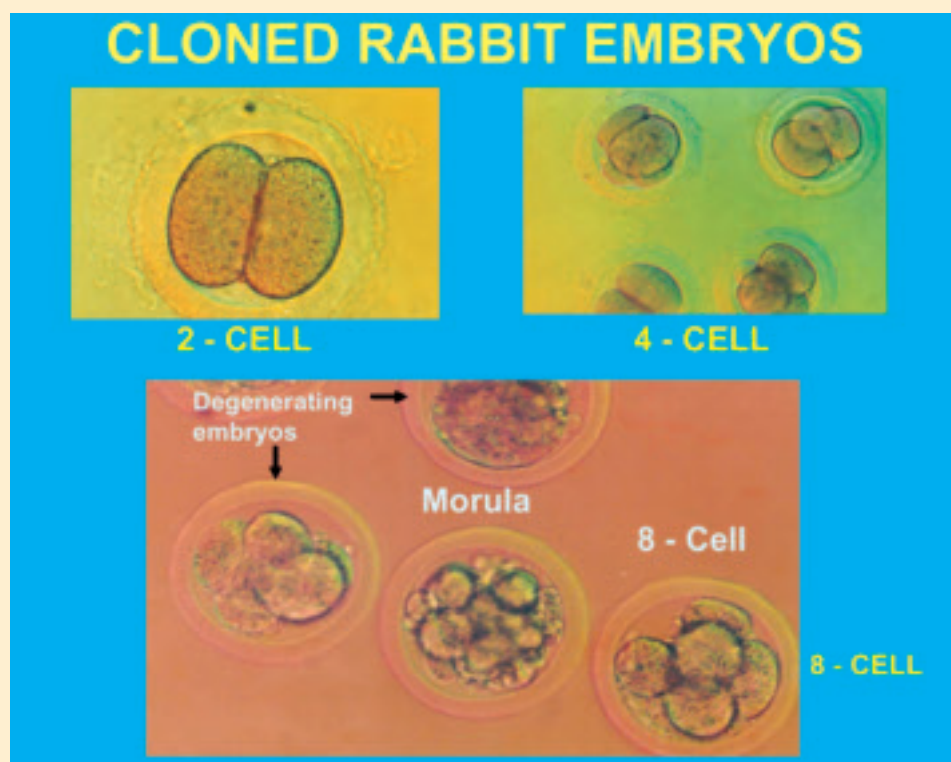


M-II and polar body in injection pipette



Transplanted cell in the perivitelline space of the enucleated oocyte





**IN VITRO DEVELOPMENT OF IN VIVO FERTILIZED AND SOMATIC CELL NUCLEAR TRANSFERRED RABBIT EMBRYOS**



Donor cell type	Fused (%)	2-cell (%)	Morula (%)	Blastocyst (%)
In-vivo fertilized	--	42 (100)	42 (100)	36 (85.00)
Cumulus cells	122/171 (71.34)	69 (56.55)	27 (39.13)	12 (17.39)
Fibroblast cells – at confluence	71/98 (72.44)	50 (70.42)	22 (44.00)	12 (24.00)
Fibroblast – starved	35/46 (76.08)	31 (88.57)	16 (51.61)	9 (29.03)

## Achievements so far.....

- Developed species-specific microsatellite markers for lion and tiger
- Developed non-invasive methods for DNA isolation from scat and hair
- Developed an universal primer for forensic use to identify animal species
- Identified the two new species of wolves in India
- Demonstrated that the Ganges river dolphin is probably a 'living fossil'
- The Olive Ridleys' are ancestral to all the other known Ridleys
- Endangered star tortoise confiscated from smugglers have been rehabilitated successfully
- Achieved pregnancy in black buck and cheetal deer
- A molecular DNA-based method has been developed for sexing of birds
- A method was standardized for the collection of semen from the white backed vulture
- Produced 'Spotty', a baby deer and "blacky" a baby black buck using artificial insemination
- Developed a non-invasive technique for estimation of tiger population based on DNA analysis of scat samples

## FUNCTIONAL UNITS FOR NaFCONES

1. Molecular Typing Laboratory\*
2. Operation Theatre
3. *In vitro* Fertilization Lab (Andrology Embryo Processing etc.)
4. Post Mortem Room
5. Gene Bank and Liquid Nitrogen Facility
6. Seminar Hall
7. Animal Handling Facility
8. Library
9. Other Utilities

**TOTAL AREA : 4,100 sq.m.**

LaCONES was dedicated to the nation by  
His Excellency the President  
of India Dr A P J Abdul Kalam on February 1, 2007



LaCONES  
side view

LaCONES  
lounge







## Acknowledgements

Lalji Singh, R.K. Aggarwal, Ajay Gaur, G.  
Umapathy, Sadanand Sontakke,  
B. Sambasiva Rao, A. Sreenivas, Sunil K. Verma,  
K. Ramachandra Rao, Anuradha Reddy,  
B. Jyotsna, K. Srinivas, Thomas Kiran, G. Sapna





## National Referral Centre and Physical health check-up/care of wild animals in Indian Zoos



Dr. D. Swarup, Principal Scientist, Indian Veterinary Research Institute and Coordinator, National Referral Centre (NRC) Bareilly, (U.P)

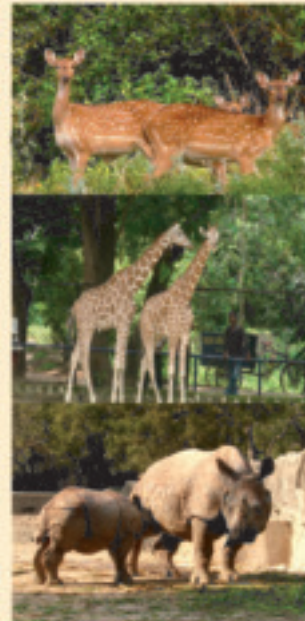
Dr. Swarup presented the overview of the newly established National Referral Centre (NRC) for providing super specialty services and diagnostic facilities for better healthcare of animals in Indian zoos. He also mentioned about the facilities and expertise available with IVRI as National Referral Centre and recent achievements of the National Referral Centre.



## National Referral Centre for the better healthcare of animals in Indian zoos

### Magnificent world of wildlife

- Neolithic nomads of Fertile Crescent started domestication of animals
- Animals with favorable traits domesticated or semi-domesticated
- Other remained free as wild animals fascinating the mankind
- World comprises over 1.2 million fauna spread over 6 zoo-geographic regions



## Health problems of wild animals



- Free range
  - Trauma, injuries, nutritional and metabolic diseases(?)
  - Poisoning and environmental toxicities
  - Infectious diseases



- Captive
  - Trauma, captive myopathies
  - Nutritional deficiencies and metabolic diseases
  - Behavioural disorders
  - Infectious diseases

## Wildlife Healthcare: Issues and challenges

- Insufficient professional and skilled manpower and infrastructure
- Failure in identification and diagnosis of health problems of wild animals
- Limited information on standard therapeutic & prophylactic measures
- Other management issues

## CZA Initiatives

- Establishment of Regional Diagnostic Centers
- Coordination between zoos and veterinary institutions
- Creating National Referral Center facilities at IVRI

## Indian Veterinary Research Institute

- Oldest Veterinary Research Institute (Estd in 1889)
- Functions under ICAR (DARE, GOI)
- Recognized as Deemed University (1984)
- Spread over 6 campuses, 22 Divisions with over 250 scientists, 450 technical and 1400 auxiliary staff and 600 PG scholars
- Only institute with BSL- 4 facility at High Security Animal Disease Lab
- Contributed significantly to animal health management including wildlife



## Mandate

- ⑩ To organize disease based researches/ studies on animal healthcare in zoo related issues
- ⑩ To conduct training of the in service zoo vets to update their knowledge about modern diagnostic and therapeutic methods
- ⑩ To provide veterinary expertise and specialized facilities / services of the institute to CZA recognized zoo under specific emergent situation

## Special Features of MoU

### Article-1

(a) IVRI will provide all its specialized services and diagnostic facilities to all the recognized zoos/rescue centers of the country pertaining to diagnosis and therapeutic measures for infectious and non-infectious disease and healthcare among the wild animals as and when required by the recognized zoos/rescue centers and/ or whenever requested by the Central Zoo Authority

## Special Features of MoU

b) IVRI will organize short term training programmes for Zoo veterinary personnel working in Indian Zoos, on the dates as suggested by CZA and agreed by IVRI. The training programme will cover the topics/ subject as well as faculty as suggested by CZA from time to time in consultation with IVRI

## Special Features of MoU

- (c) IVRI will conduct studies on captive animal health, animal nutrition and related issues or problems being faced by the zoos in this regards. Such studies will be identified by the Central Zoo Authority in consultation with zoo operators & managers and will be assigned to the IVRI

## Special Features of MoU

- (d) Central Zoo Authority will provide recurring expenditure only for one year period from the date of creation of NRC or signing upon of this MOU whichever is earlier. During the period of one year the IVRI shall create all necessary data bank on zoos including the contact details and their address, list and intensity of problems being faced by zoos on animal healthcare other related issues

## Special Features of MoU

- After the period of one year no regular recurring expenditures shall be paid by the Central Zoo Authority, the same should be borne/ paid by the users/requesting parties only

## Special Features of MoU

- On signing of this MOU, the IVRI should come up with the standard rates to be charged for providing all specialized facilities and services and the same should be made available to the Central Zoo Authority and all recognized zoos of the country. The rates may be recurred by IVRI from time to time with intimation to the user agencies

## IVRI Resources being used

Nominated scientist with Laboratory facilities

- Medicine
- Surgery
- Pathology
- Parasitology
- Microbiology
- Virology
- Toxicology
- Nutrition
- Biochemistry
- Biotechnology
- CADRAD & Other disciplines as per specific need

## Physical Health check up proforma

- **Name:** **Identification Mark:**
- **Species:**
- **Age:** **Sex: M/F**
- **Body Weight/Measurements:**
- **History**
- **General Appearance**
  - Skin Coat:
  - Conjunctiva mucosa
  - Peripheral Lymph nodes:
  - Behavior
- 1. **Vital Signs**
  - Temperature
  - Respiration rate
  - Pulse
- 2. **Physical Examination for any abnormalities (Note: Depending upon Species and facility)**
- 3. **Physician Comments:**

## Biosamples and various lab tests for physical health check up

### 1. EDTA/ Heparinized blood (2-5ml) for

- Hemoglobin (g/dL)
- ESR (mm/hr)
- PCV (%)
- RBC (106/ $\mu$ l)
- WBC (103/  $\mu$ l)
- DLC (%):

### 2. Blood smear (fixed) for haemoprotozoa

### 3. Whole blood for clinical biochemistry (5ml without anticoagulant)

- |                  |                 |
|------------------|-----------------|
| i. Total protein | ii. Albumin     |
| iii. Globulin    | iv. Serum ALT   |
| v. Serum AST     | vi BUN          |
| vii. Creatinine  | viii. Uric acid |
| ix. SAP          | x. Calcium      |
| xi Phosphorus    |                 |

## Biosamples and various lab tests for physical health check up

### 4. Skin scrapings for ectoparasites

### 5. Whole blood and Hair samples for heavy metals and minerals estimation (Optional)

- |              |               |
|--------------|---------------|
| i. Magnesium | ii. Zinc      |
| iii. Copper  | iv. Cobalt    |
| v. Iron      | vi. Selenium  |
| vii. Lead    | viii. Cadmium |
| ix. Arsenic  |               |

#### Microbiology:

- i. Tuberculosis: Tuberculin test, PCR (LACONES)
- ii. Serological Test for Leptospirosis Pasturellosis & Brucellosis
- iii. Any other test recommended.



## Foot & Mouth Disease (FMD)

- A viral disease afflicting all cloven footed animals
- Virus can survive up to 1 yr in biological material like bone
- Highly contagious; transmitted by a variety of methods mainly direct contact
- Introduced in new areas (zoos) through pigs, contaminated meat, feed fodders, vehicular transport
- Serious out-break occurred in Kerala zoo causing death of 4 mithuns, 20 black bucks, one nilgai and 1 wild boar and forcing authorities to cull 3 mithuns and 19 wild boars

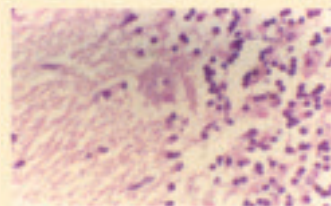


## Management tips

- **Coordinate ring vaccination of susceptible domestic animal population around zoo/National park**
- **Implement strict sanitary and phyto-sanitary measures including proper disposal of wastes**
- **Use disinfection mats and foot dips at the main entrance and enclosure entry**
- **Restrict public / vehicular entry in zoo/ parks**
- **Check source of meat (may be tested for virus)**
- **Cull the susceptible animals at the face of out-break ( especially wild boars)**

## Rabies

- **Oldest known, highly fatal, viral disease of all warm blooded animals throughout the world (except UK, New Zealand, Japan, Hawaii Island)**
- **Transmitted by bite of infected animals**
- **Many wild fauna ( bats, foxes, cats, mongoose) act as vectors depending upon geographic location**
- **Reported mainly from Carnivores in Indian zoos ( first case in Royal Bengal tiger in 1943)**
- **After incubation period ( 2 weeks to several months) animal would show furious, or dumb form of disease**

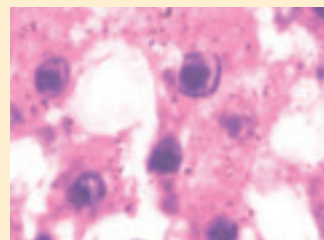


## Management tips

- Immunization of susceptible population (Two doses of killed vaccine at 4 weeks interval at 2-3 month age)
- Enforcement of quarantine rules (period 4-6 months)
- Elimination of stray dogs and cats
- Immediately kill suspected animals
- Submit different part of brain in 10% buffered formol-saline for histopathology and in 50% buffered glycerine saline for mice inoculation
- Mass vaccination of wildlife (feeding oral vaccine through baits) has been found effective in control of rabies (20% reduction after vaccination of foxes in Europe)

## Infectious canine hepatitis

- Contagious viral diseases of carnivores
- Infection occurs via ingestion of material contaminated by urine, faeces or saliva of affected animals
- Identified in bears and wolves in Indian zoos
- Signs – Anorexia, mild to high fever, conjunctivitis, eyes and nose discharge, vomiting and corneal clouding (blue eye)

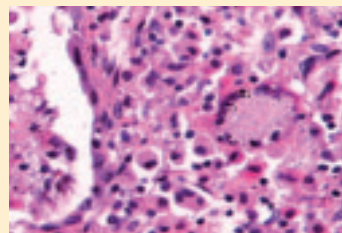


## Management tips

- Immunization recommended in susceptible population using CAV-1 or CAV-2 vaccines at 9-12 weeks age. Revaccination annually
- **Strict sanitary measures**
- Protection of affected animals from bright light
- **Cases could be treated using antibiotic+ dextrose and if possible blood transfusion**

## Tuberculosis

- One of the oldest known bacterial contagious zoonosis
- **More common in elephants, artiodactylous, ursids and primates; also reported in felids and birds**
- Reported from number of zoos in India
- **Signs include chronic weight loss, weakness and emaciation, nasal discharge, low grade fever**



## Management tips

- Identification, segregation and culling of carries
- Tuberculin testing is the best method for screening. Confirmation by ELISA and chest X-ray in primates
- Segregate reactors and on observing chronic weight loss euthanize the animal
- Two drug combination ( Isoniazid+ streptomycin ) and three drug ( Isoniazid+ Refampicin+ Pyrazinamide) or four drug combination ( Isoniazid+ Refampicin+ Pyrazinamide + Ethambutol) may be used

## Leptospirosis

- Caused by several leptospiral serovars; often water born zoonosis
- Wide range of hosts; rodents serve as carries
- Suspected as the cause of heavy mortality at Bear Rescue Center Agra (2006)
- Signs- anorexia, fever, icterus, haemoglobinurea, skin rashes, incoordination and death



## Management tips

- Reducing chances of exposure to rodents and water logging areas
- Immunization at the age of 8-12 weeks
- Isolating affected animals
- In case of leptospirosis is diagnosed treatment and vaccination of all susceptible animals is recommended
- Treatment with Strepto-penicillin and doxycycline along with intensive fluid therapy

## Feline babesiosis

- An intra-erythrocytic protozoan disease ( *Babesia felis*, *B. cati* and *B. pantherae* )
- Transmitted by ticks. Reported in Leopard and tigers from Indian zoos
- Secondary infection of mycoplasma, feline leukemia virus and feline-immunodeficiency virus may be seen
- Signs of anorexia, listlessness, anemia, hemoglobinurea, and pyrexia(?)
- High mortality in tigers reported in Ranchi and Chhatbir zoo recently

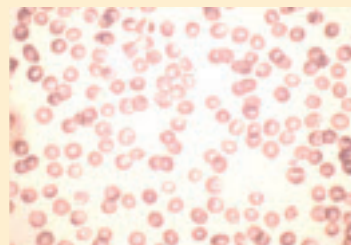
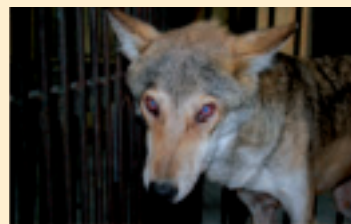


## Management tips

- **Closely monitor animal behavior**
- **Provide proper aid immediately to animals showing deviation from their normal behaviour (anorexia, listlessness)**
- **Keep animals and premises free from ticks**
- **Send immediately blood smears of suspected cases for confirmatory diagnosis**
- **Use specific therapy and avoid stress to animals**
- **Primaquin is the drug of choice; but Diminazine acetate, (Rifampicin+ sulfadiazin+ trimethoprim) and doxycycline are also effective in reducing severity**

## Trypanosomiasis in felids

- **Trypanosoma evansi an extra cellular blood protozoa causes disease**
- **Reported from number of zoos in the country in tigers lions, leopard, jaguar and jungle cats ( at least 17 cases during 1967-2005) and recently in wolves ( 2007)**
- **Transmitted mechanically by flies (Tabanus tropicus)**
- **Signs- - dullness, partial to complete anorexia, incoordination of hind limbs, photophobia, biconchal opacity, respiratory distress, involuntary head shaking, crawling and convulsion prior to death**



## Management tips

- Tryps can be readily identified on examination of blood smear
- **For confirmation send peripheral blood smear, heparinized whole blood and serum**
- Quinapyramine sulfate/ chloride are drugs of choice for prophylaxis and treatment
- **Keep premises clean and use fly repellants**
- Management practices like cleaning of bushes adjoining premises, better sanitation and insecticidal spray on walls of dens help in fly control
- **In endemic areas, prophylactic treatment with quinapyramine sulfate thrice in a year prevents out- breaks**

## Heartworm in felids

- Vector (mosquitoes and lice) borne roundworm (*Dirofilaria immitis*) infection
- Wild felids and dogs are affected
- Parasite inhabits right ventricle and pulmonary artery and vena cava
- Reported in lions, tigers, leopard and golden cats from zoos and in tiger from Dudhawa National Park
- Anorexia, lethargy, coughing, and weight loss may be seen. Often no apparent signs visible and PM findings confirm the infection



## Management tips

- Vector control
- Periodic preventive treatment with Diethyl carbamazine (DEC) or ivermectin prior to mosquito breeding season followed by sero-monitoring



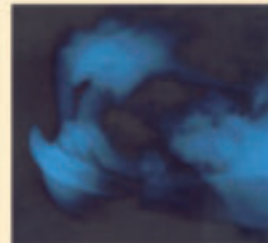
## Other infections



- Pasteurellosis, anthrax colibacillosis , clostridiosis
- Parasitic gastroenteritis in turtles
- Ascariasis, hookworm and other parasitic infestations in felids
- Protozoan parasite (Goussia like )

## Neoplasm

- Malignant tumors are more common than benign in zoo animals
- Adult and aged animals (carnivores) are commonly affected
- More than 32 cases of different tumors recorded in felines in Indian Zoo between 1963-2003
- Ethmoidal neoplasm has been reported in deer



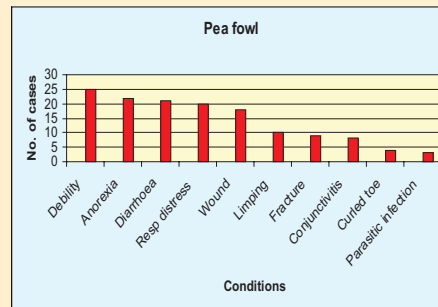
## Poisoning and pollution toxicities



- Common in free range animals
- Due to industrial pollution or contamination of food chain
- Malicious poisoning by poachers/villagers
- Reported incidences of pesticide poisoning in Peacock and Saras cranes in India
- Population crash of vultures due to contamination of bovine carcass
- Poisoning episodes in wild felids in Gujarat and other parts of the country
- Toxicities suspected cause of death in Gharials (?)

## Mortality in Peafowl

- Number of deaths in peacock due to poaching, pesticide toxicity and extreme environment
- Mortality due to heat stroke and cold stress in 2007-08



## Interpretations

- Level of lead was towards higher side (if we compare levels reported in liver/ kidneys and lungs in Chinese alligators, ref. Xu et al,2006); yet it may not be lethal. **May be viewed as a predisposing cause (?)**
- Levels of Cd/ Pb in fish were higher than reported for fish earlier from our lab ( Kumar et al, 2007). Could this be a source of elevated levels in gharials and possible indication of contamination ?
- Presence of protozoan parasites might have contributed to mortality as an ancillary cause

## Other NRC services

- Monitoring health status of endangered animals under conservation and breeding programme launched by CZA
- Toxicological and microbiological quality of feed and diet
- Standardization of dietary regimen
- Specialist Pathological, medical and surgical services
- We need properly collected, preserved samples in optimum transport conditions with proper case history



# **Training Sessions II**

**Environmental enrichment; History, philosophy and concepts-**

**Dr. David Shepherdson, Oregon Zoo, USA**

**The environment of environmental enrichment-**

**Ms. Valerie Hare, The Shape of Enrichment. Inc., USA**

**Environmental planning-**

**Ms. Valerie Hare, The Shape of Enrichment. Inc., USA**

**A scientific evaluations of environmental enrichment:  
An effective tool for reducing stereotypic behaviour-**

**Dr.David Shepherdson, Oregon Zoo, USA**



## Environmental Enrichment: History, Philosophy and Concepts



Dr. David Shepherdson  
Conservation Program Scientist  
Oregon Zoo, USA

This presentation covers environment enrichment including its definition, history, concept, objectives, types, significance and feasibility of environment enrichment in zoos perspective. This also includes efficacy of environment enrichment and adoption of environment enrichment practices in the zoos as a policy by AZA and guiding principles.



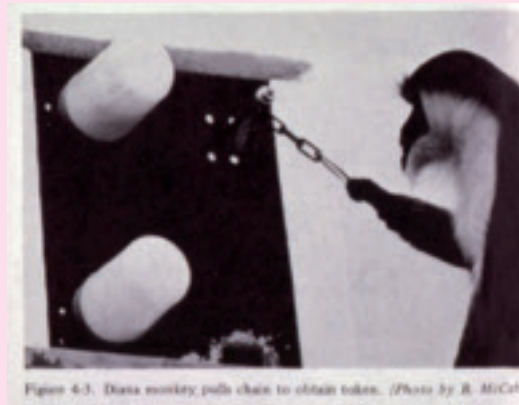
## Environmental Enrichment History, Philosophy and Concepts

### What is it?

- Broadly - Any actions taken to improve animal wellbeing by adding (or even subtracting) key environmental stimuli
- Typically - satisfying behavioral needs and allowing the expression of a full range of natural behaviors - "Behavioral Enrichment"

## History

- Strongly based in Zoo tradition
  - Hediger
  - Morris
  - Markowitz



## Changes In the Last Decade

- Increase of Conceptual/goal based practices and programs
- Increase in Taxon Diversity
- Increase in Sophistication and Variety
- Increase in Resources

## Concepts

- Mimicking nature
- Increasing environmental complexity
- Increasing sensory stimulation
- Meeting behavioral needs
- Removing stressors
- Giving the animal control over environment

## Typical Goals

- Reduce abnormal behavior
- Reduce stress behaviors/physiology
- Increase feeding behavior
- Increase exploration
- Increase range of natural behaviors
- Increase species specific behavior
- Increase use of space
- Increase activity

## Examples



Enrichment through inducing learning and feeding in chimpanzee

## Examples



Enrichment through piling of sand for inducing physical activity and play in elephant

## Examples



Enrichment through feeding puzzle in vulture

## Examples

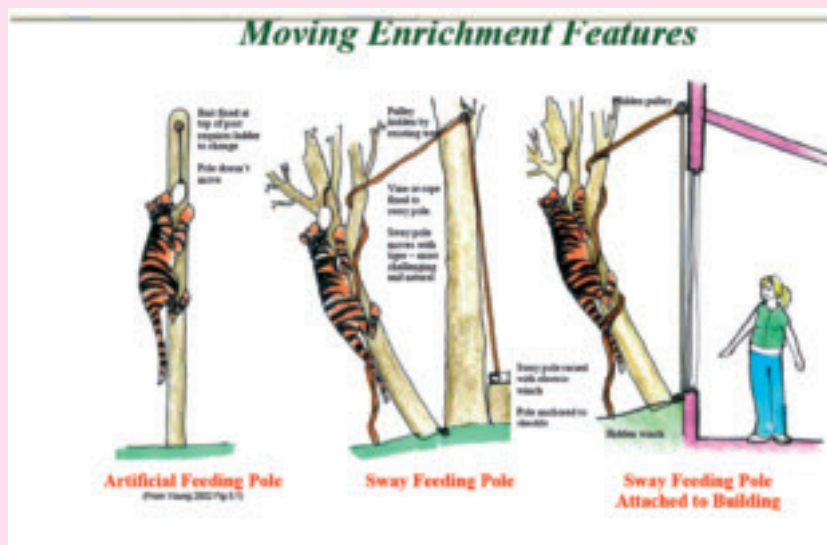


Enrichment through buckets for drinking water in elephants

## Examples



## Examples



Jon Coe Design

## Examples



## Why Important?

- The wellbeing of the animals in our collection is our number one professional & ethical responsibility
  - Fundamental to our mission of connecting people with wildlife
  - Necessary for successful captive breeding
  - Critical to the success of ex-situ conservation

Good

Poor

Welfare

## Ex-Situ Conservation Importance

- Breeding success
- Physiological health
- Ability to cope with stress - psychological health
- Behaviors necessary to survive in wild
- Cultural knowledge

## E.g. California Condor

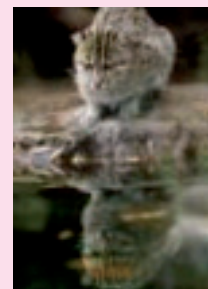
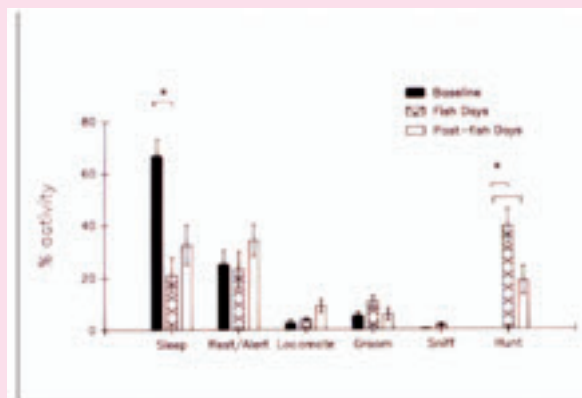
- Feeding skills
- Socialization
- Motor skills
- Power pole aversion
- Absence of humans



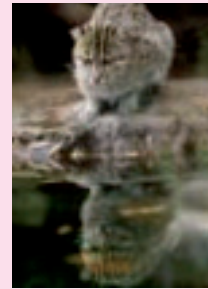
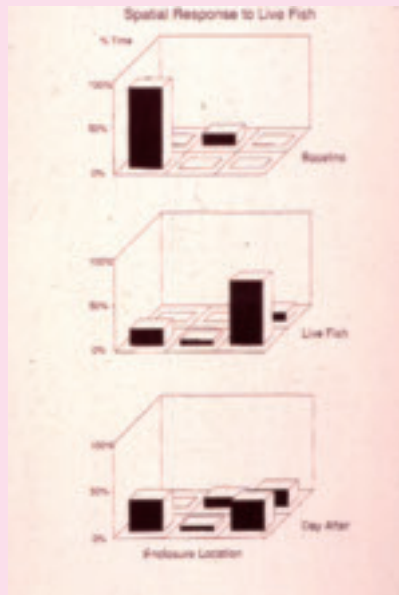
## E.g. Pygmy Rabbit

- Feeding skills
- Climbing skills
- Nest building skills
- Predator Avoidance?

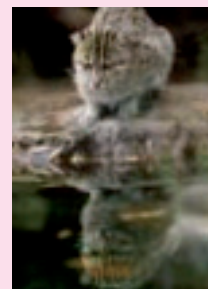
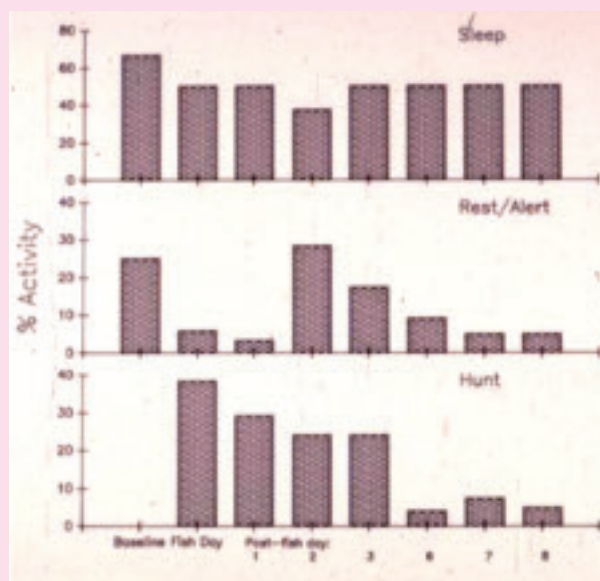
## Does it Work?



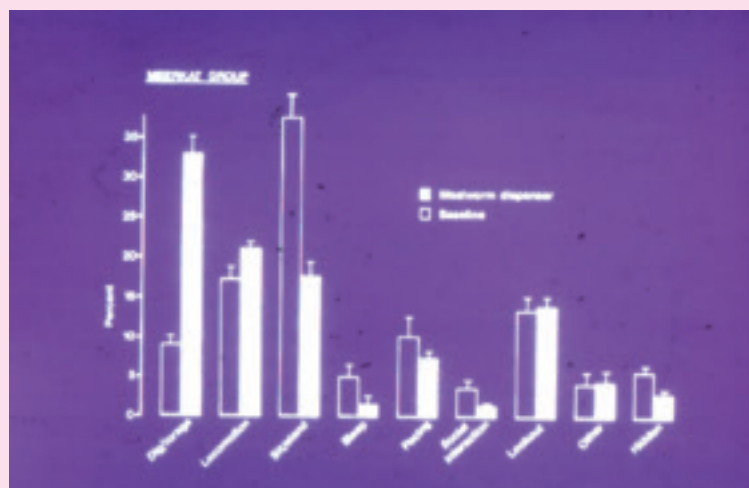
## Does it Work?



## Does it Work?



## Does it Work?



## Some Other Documented Effects

- Reduced abnormal behavior
- Reduced physiological stress
- Changes in neural morphology
- Increased behavioral flexibility
- Increased survival of reintroduced animals
- Increased ability to cope with stress

Environmental Enrichment is now a  
mainstream husbandry activity in AZA  
Zoos

## Key Factors

- USDA 1991 Amendment to the Animal Welfare Act for Primates
- Pressure From Animal Welfare Organizations
- Animal Welfare and Field Research
- Increasing Role of Science in Zoo Animal Husbandry

## Key Factors

- Zoo Research and Publications
- International Environmental Enrichment Conference
- Publication of Proceedings - 2<sup>nd</sup> Nature
- SHAPE of Enrichment News letter
- AZA Listserves
- AZK Handbook



## Vision

"In our vision for the future, every zoo will have a formal program for attending to the psychological needs of their animals through environmental enrichment and related activities"

## Steps to Realizing This Vision

- AZA Behavior Advisory Group Formed
- 1999 Enrichment Working Group formed
- Enrichment Included in AZA Standards
- 2001 Animal Welfare Committee Formed
- AZA training Course established
- Accreditation Standards Upgraded

## Accreditation

A formal written enrichment program is recommended which promotes species-appropriate behavioral opportunities for appropriate taxa. [AC-31]

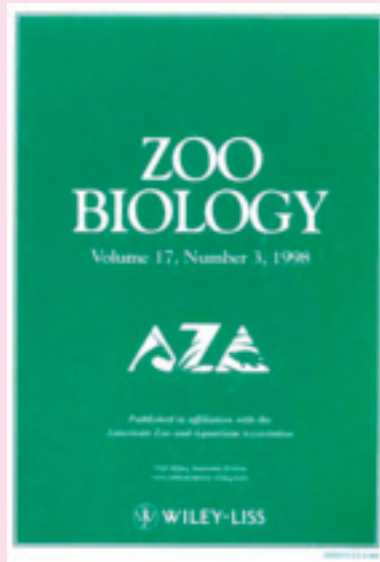
## Elements of An AZA Approved Enrichment Program

- Program Description and Goals
- Planning/Approval process
- Implementation System
- Documentation/Record keeping
- Evaluation and Readjustment

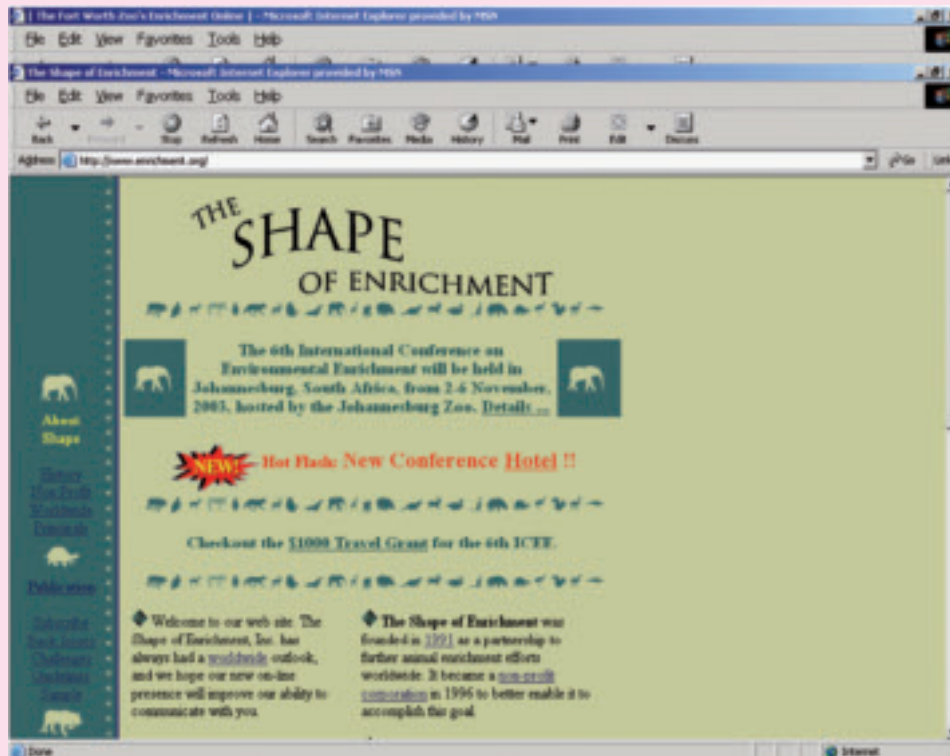
## Guiding Principles

- Holistic in its Approach
- Proactive, Not Reactive
- Defined in Terms of the Animal's Needs
- Applied to all Taxa & all individuals
- Defined/Planned/Executed Systematically
- Integrated with Zoo/Aquarium's Education & Conservation Goals

## Information Resources



Zoo Biology  
 International Zoo Yearbook  
 J. Animal Welfare Science  
 Animal Welfare  
 J. Applied Animal Science  
 Shape of Enrichment





## The Environment of Environmental Enrichment



Ms. Valerie Hare  
Associate Editor, The Shape of Enrichment  
Inc., USA

This presentation covers enrichment definition, its role in changing environment, assistance in expressing animal behaviour and enhancing welfare of animals in captivity, and enrichment categories such as social (con-specific, other animals, people), cognitive (puzzle feeders), physical habitats (enclosure design, furniture), sensory (tactile, visual, olfactory & taste auditory) and food.



# THE ENVIRONMENT OF ENVIRONMENTAL ENRICHMENT

## Enrichment Definition

... A dynamic process for enhancing animal environments within the context of the animals' behavioral biology and natural history. Environmental changes are made with the goal of increasing the animals' behavioral choices and drawing out their species-appropriate behaviors, thus enhancing animal welfare.

AZA/BAG 1999 Enrichment Working Group

## Key Points:

- R **Change to Environment**
- R **Opportunity to Express Behavior**
- R **Enhances Welfare**

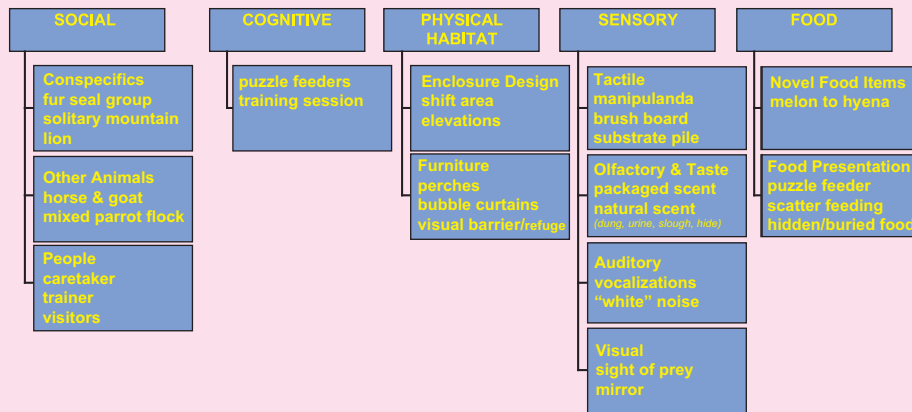
## Key Points:

- R **Change to Environment**

**Environmental Enrichment encompasses ALL aspects of the captive animal's environment**

**5 Categories of Enrichment**

## 5 Enrichment Categories



Not Mutually Exclusive

## Social Enrichment

- R **Conspecific**
- R **Other Animals**
- R **Humans**

## Social ??

Video of klipspringer head -butting a small antelope-shaped topiary.

Does this animal believe it is interacting with a live animal? Unknown! But the head-butt and head-up behaviors displayed are species-typical social behaviors.

## Social - Conspecific



Social enrichment can be provided through keeping the animals in group, a new study suggests these animals are more "courageous" when in a group.



## Social - Conspecific



## Social - Conspecific



Video of giant panda pawing repeatedly through a large pile of alfalfa hay to find the few foliovore biscuits sprinkled within.

## Social - Other Animals



## Social - People (Keeper)



## Cognitive

- R Puzzle Feeder
- R Training Session

## Cognitive - Puzzle Feeder

Video of a ray demonstrating that it has learned to identify food with only the white-colored end of a puzzle feeder.

## Cognitive - Training



## Cognitive

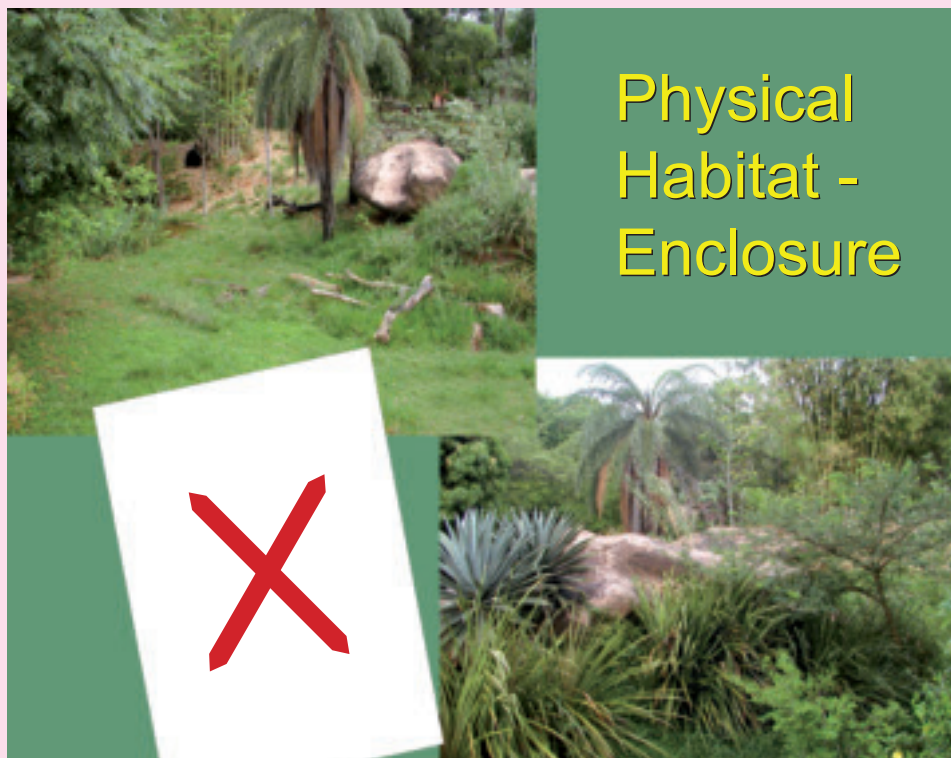


Cognitive enrichment through providing playing item in any form

## Physical Habitat

R Enclosure

R Furniture



## Physical Habitat - Furniture

Video of an elephant pushing its head into an elephant-sized pile of dirt. As Jon Coe once told me “large animals like to have large things to push around!”

## Sensory Enrichment

- R Tactile
- R Olfactory / Taste
- R Auditory
- R Visual

## Sensory - Olfactory / Taste



## Sensory - Tactile

**Video of an octopus trapping air bubbles under its mantle, releasing them, and trapping them again.**

## Sensory – Auditory



Video of orca investigating hula hoops raised and lowered by school children outside the aquarium glass.  
(Port of Nagoya Public Aquarium, Japan)

## Sensory - Visual



Video of a tiger chasing after a remote controlled toy car. The tiger is in an off-exhibit tunnel; the car is outside the tunnel. Not all enrichment must be INSIDE the enclosure!

## Food Enrichment

R Novel Food Items

R Food Presentation

## Food - Novel



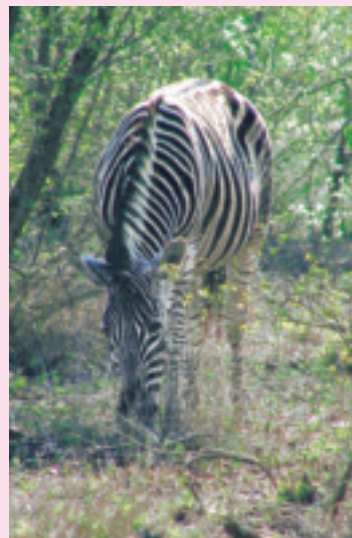
Porcupine: Grape popsicles are a sweet treat

## Food - Novel



## Food Presentation

Many animals spend more active time and/or energy engaged in feeding & foraging than any other behavior.



## Food Presentation - Puzzle Feeder



## Filling Time & Energy in Captivity



### R True Simulations

1. e.g. live fish in otter pools

### R Occupational Opportunities

1. e.g. fish pieces in puzzle feeder
2. Natural vs. species-appropriate

## Occupational Opportunities

- R Scatter feed
- R Substrate pile feed
- R Puzzle feeder



## Food - Presentation (Scatter)



## Food - Presentation (Hidden)



## Food - Presentation (Puzzle)



Video of a ray demonstrating that it has learned to identify food with only the white-colored end of a puzzle feeder.

## Food Presentation - Puzzle Feeder

Video of a feeder box mounted on the outside of the wire cage. The food can be added from the outside the enclosure and a clear plastic cover slid in place to prevent public access. The bear must repeatedly insert its paws through the mesh, into the box, to retrieve the food.

## Food Presentation - Puzzle Feeder

Video of a ray demonstrating that it has learned to identify food with only the white-colored end of a puzzle feeder.

Offering dietary food in an appropriate manner can be one of the most important enrichment options for any animal caretaker.



**THROW AWAY THE DISHES!**

**Conclusion:**  
**Enrichment**  
**Is More**  
**Than Toys**  
**and Puzzle**  
**Feeders!**





## Environmental Planning



Ms. Valerie Hare  
Associate Editor  
The Shape of Enrichment. Inc. USA

This presentation highlights how environmental enrichment programme for various animals can be planned and implemented in the zoos. Resources and logistics of the institution, culture of the area, legalities, animal type, age, and individual temperament of animal, consultation with staff and others, testing of enrichment experiment, material useful to provide enrichment, evaluation and acceptance of enrichment experiment are important aspects of planning and implementation.



# ENRICHMENT PLANNING

## Program vs. Plan

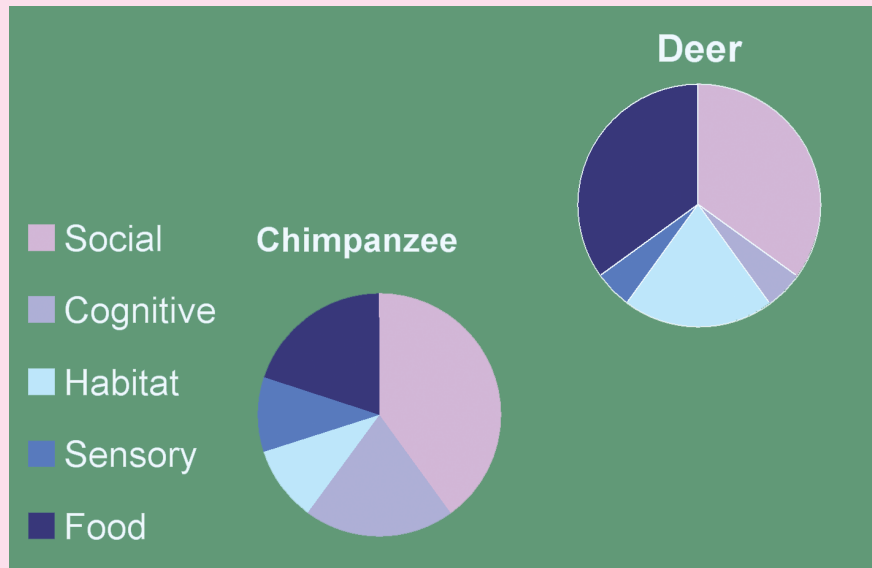
- R** Program = Institution-wide policy and procedures for EE
1. Who is responsible?
  2. What resources are available?
  3. Approval process
- R** Plan = EE strategies for specific animal

## Step-by-Step Enrichment Book

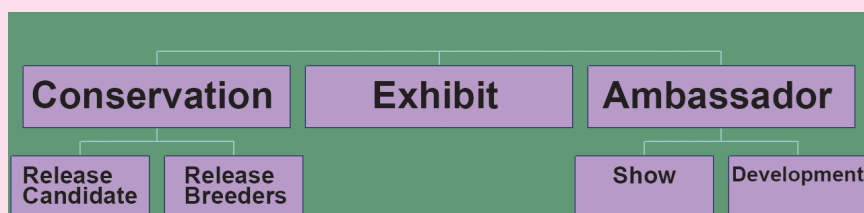
### Enrichment Is:

- R **Institution Specific**  
Resources, Logistics
- R **Culture Specific**  
Cultural Mores, Legalities
- R **Animal Specific**  
Taxa, Age, Animal's Job, Individual

## Taxa



## Animal "Job"



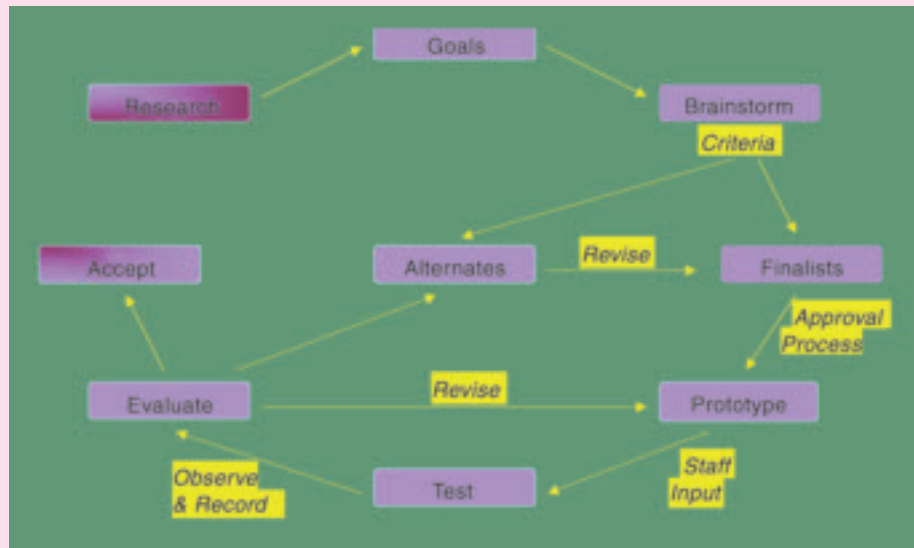


## Enrichment Planning Examples

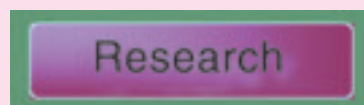
1. Belo Horizonte Zoo, Brazil  
(Shape Flow Chart)
2. National Zoo, South Africa  
(SPIDER)



## EE Plan



## EE Plan



## Research

- R Species
  1. Natural History
  2. Behavioral Biology
- R Individual
  1. History
  2. Animal's "Job"
  3. Daily Schedule, Diet
- R Fact Sheet

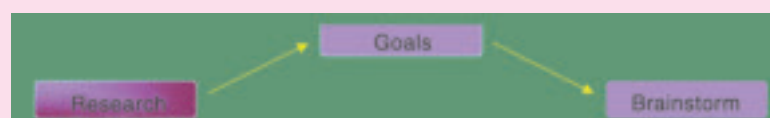
## EE Plan



## Goals

- R Increase exploratory behavior
- R Increase physical fitness
- R Increase behavioral diversity
- R Increase exhibit usage
  
- R Encourage natural feeding behavior
- R Reduce stereotypy
- R Increase foraging time

## EE Plan



## Brainstorm

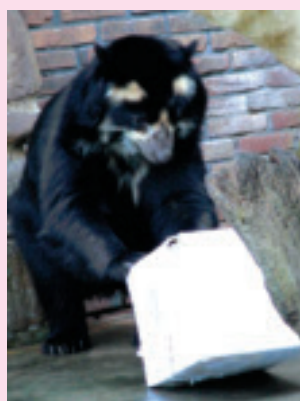
- R Say **WHATEVER** comes to mind!
- R Do **NOT** evaluate ideas
- R Write down **EVERY** idea
  - Elephant feeder



## EE Criteria (a.k.a. Limitations)

- R **Safety**
- R **Resources**
- R **Cannot interfere with show**
- R **Veterinary practices**
- R **The "Look"**

## Artificial



## Artificial Materials

### R Pros:

1. Can clean, disinfect, reuse
2. Harder to destroy
3. Good for back areas or sterile enclosures

### R Cons:

1. Often expensive
2. Give exhibit a "trash dump" look
  - a. Mitigate with theme = man's intrusion
  - b. e.g. reclaimed logging camp (LA Zoo)



Natural

## Natural Materials

### R Pros:

1. Less dangerous
2. Readily available
3. "Look good" in natural enclosures

### R Cons:

1. Can carry germs, insects
2. Can be difficult to work with
3. Easily destroyed

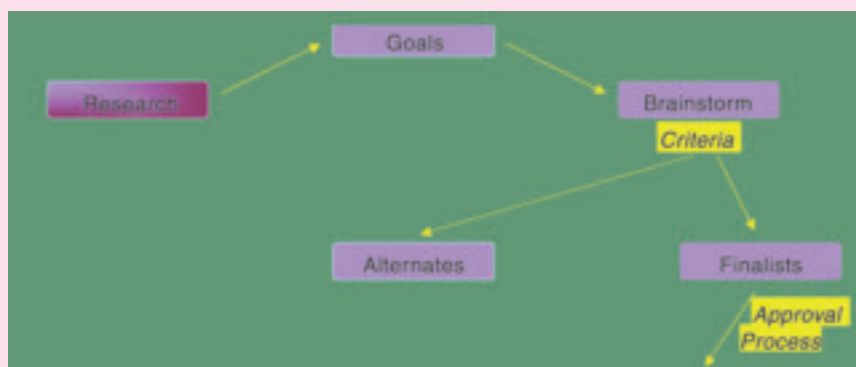
## Natural or Artificial ?



## EE Plan



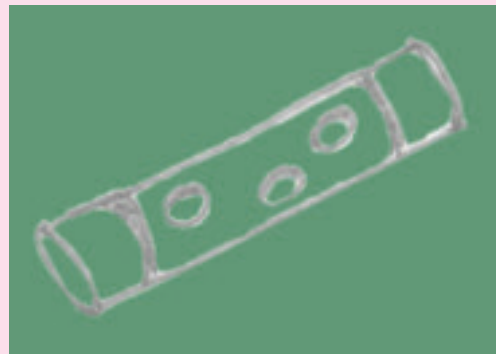
## EE Plan



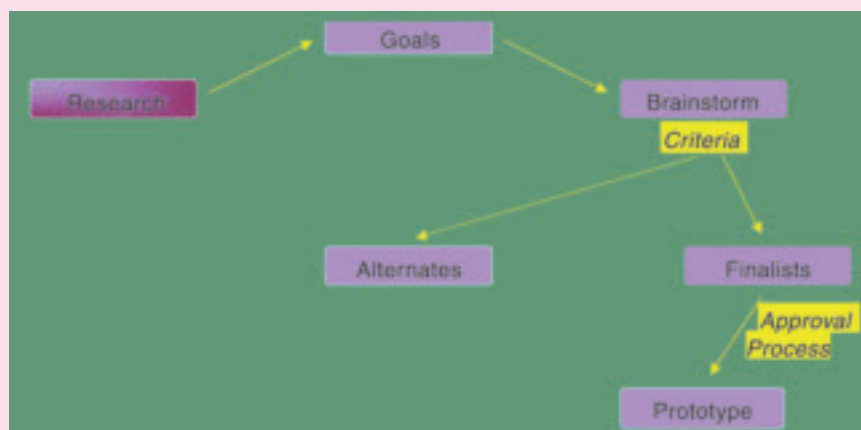
## Sample Approval Request

**R** **Bamboo Feeders.** One or more segments of bamboo with 3 to 4 large (1.5 to 2 inch diameter) holes drilled in them and foliovore biscuits placed inside. These will be offered one or more at a time. At first, they will be placed in easy to reach areas. The difficulty of obtaining them will be steadily increased. Fresh (preferred) or dry bamboo.

1. **Goals:** Mental Stimulation, Prolong Foraging Time
2. **Animal:** All Andean Bears
3. **Areas:** Exhibit, Night Quarters



## EE Plan



## Safety

- R Enriched environment = more danger
- R Accept risk
- R Act to mitigate:  
Try to imagine every way they can interact with enrichment

## Safety Concerns

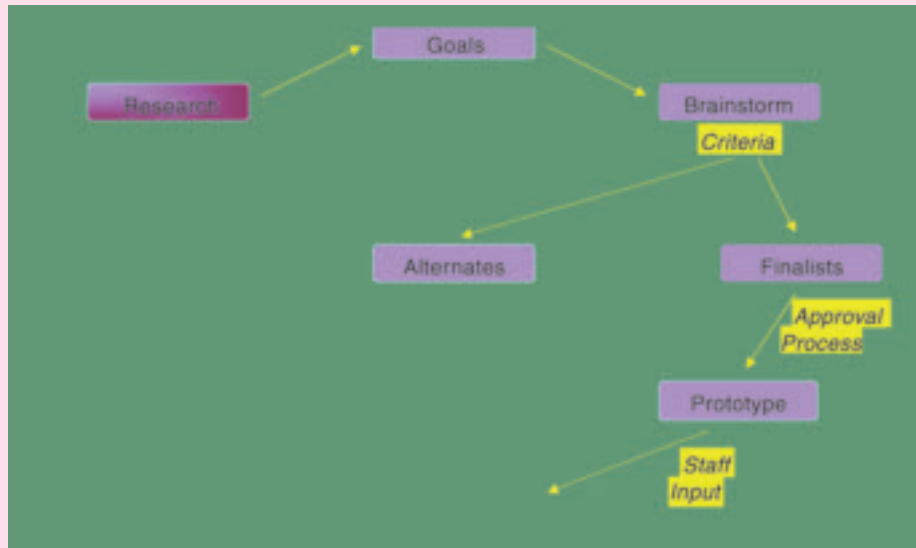
- R Injure themselves
- R Injure other animals, staff, visitors
- R Escape
- R Keeper access

## Common Safety Concerns

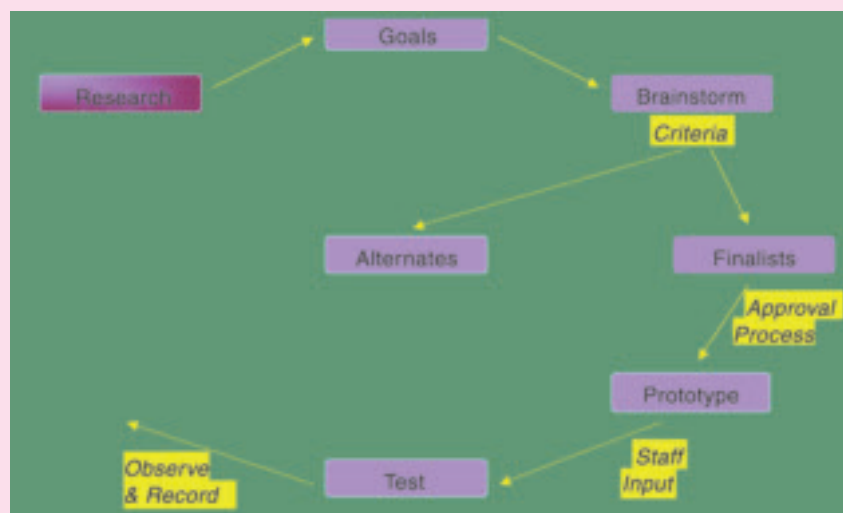
- R Hole size (too small, too big)
- R Limb, head, antler / horn, digit traps
- R Sharp edges / points
- R Strangling (neck, limb)
- R Ingestion
- R Heavy weights
- R Physical restraint
- R Suffocation



## EE Plan



## EE Plan



## Observe & Record

- R For safety, ALL 1st trials MUST be observed
- R Formal / Informal observations, notes, video (someone is there anyway)
  1. Interaction characterization
  2. Behavioral data
  3. Anecdotal notes

## EE Plan



## Use Behavior To Assess:

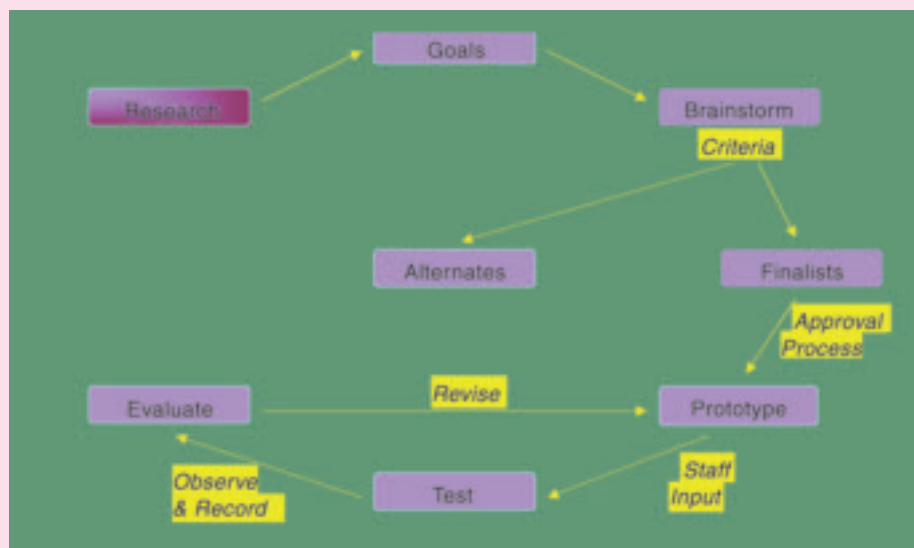
R Safety

If NOT safe, revise and retest

R Effectiveness

If goal NOT achieved, revise and retest

## EE Plan



## Evaluate Design

- R Goal = "approximate the kill" for tiger
- R 1st design = large Boomer Ball® suspended on chain that would unwrap when pulled down, dropping the ball to the ground
- R tested and videotaped
- R review of the tape = interaction was good, but not "satisfying" for tiger
  
- R 2 corrections needed
  1. Tiger could not sink claws or teeth into ball
  2. Need to provide some "pull" against the tiger's efforts

## Evaluating Design (cont.)

- R Material changed from hard, rubber ball to burlap sack stuffed with fig branches and leaves (to allow claws and teeth a purchase)
- R Sack suspended from a garage door spring encased in PVC plastic for safety (to pull against the tiger's efforts)
- R New design extremely successful holding tigers' attention - for details of design see article at [www.enrichment.org / sample / 7\(3\)](http://www.enrichment.org/sample/7(3))

## Informal Analysis

- R Good interaction / interest
- R Not satisfying enough for the tigers
- R Not a good approximation
  
- R Identified the good and bad aspects
- R Redesign
  1. Garage door spring to fight back
  2. Stuffed burlap (hessian) to sink claws & teeth into

## Modified Design

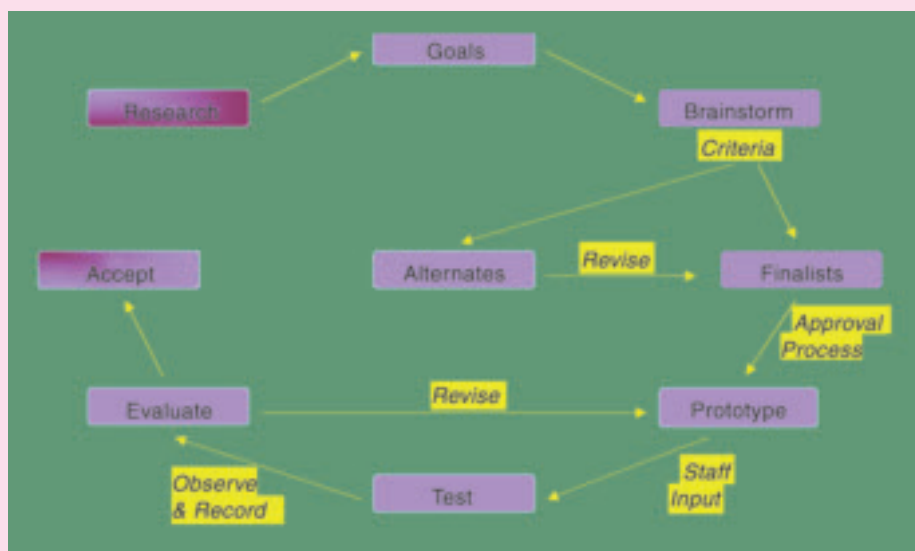


## Use Behavior To Assess:

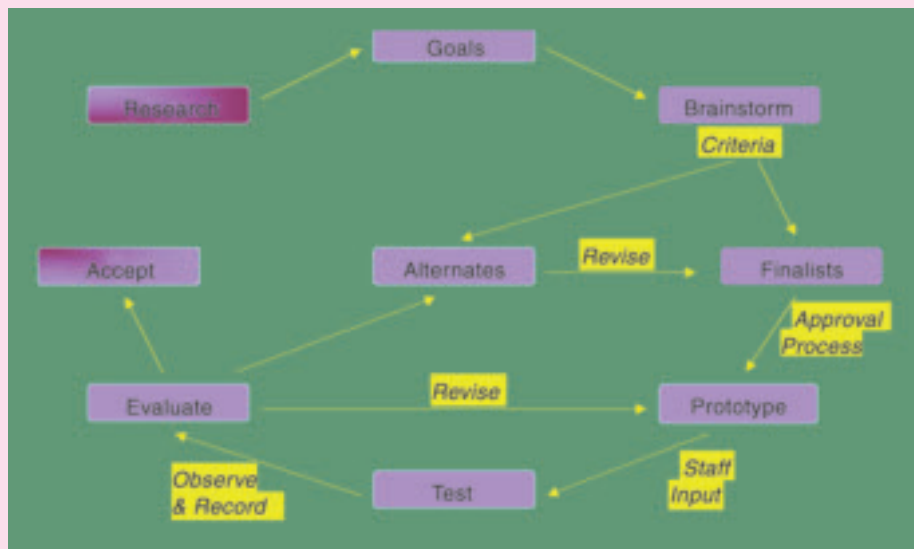
- R Safety
- R Effectiveness

Once goal achieved, add to on-going enrichment plan

## EE Plan



## EE Plan



## Summary

- R EE NOT a luxury or afterthought
- R IS powerful behavior management tool
  1. Make commitment to enrichment
  2. Place appropriate emphasis on enrichment
- R For effective enrichment plan
  1. Goal (address all categories)
  2. Test and Observe
  3. Evaluate
  4. Revise as needed





## **A scientific evaluation of Environment enrichment: An effective tool for reducing stereotypic behaviour-**



Dr. David Shepherdson  
Conservation Program Scientist  
Oregon Zoo, USA

This presentation covers stereotypic behaviour, causes of stereotypic behaviour in zoo animals and how environment enrichment can help in reducing stereotype in animals through case studies. However, stereotype in animals can be reduced by 50-60% through providing environment enrichment and can not be eliminated completely.



## A Scientific Evaluation of Environmental Enrichment:

An effective tool for reducing stereotypic behavior?



## Stereotypic Behavior

- ◆ Repetitive, invariant behavior
- ◆ Abnormal -- do not occur in the wild or are greatly altered in their form, frequency or context

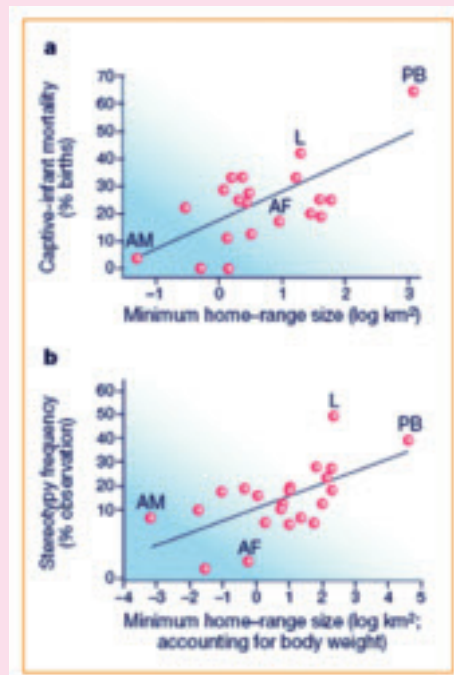


## Why is Stereotypy a Problem for Zoos?

- ◆ Potential indicator of Wellbeing
- ◆ Stress can result in reduced reproduction
- ◆ Reduces the effectiveness of exhibits
- ◆ Potentially reduced survival for animals re-introduced to the wild

## Potential Causes of Stereotypy in Zoos ?

- ◆ Frustrated motivations to perform specific behaviors
- ◆ Lack of sensory stimulation
- ◆ Stress
- ◆ Pathology

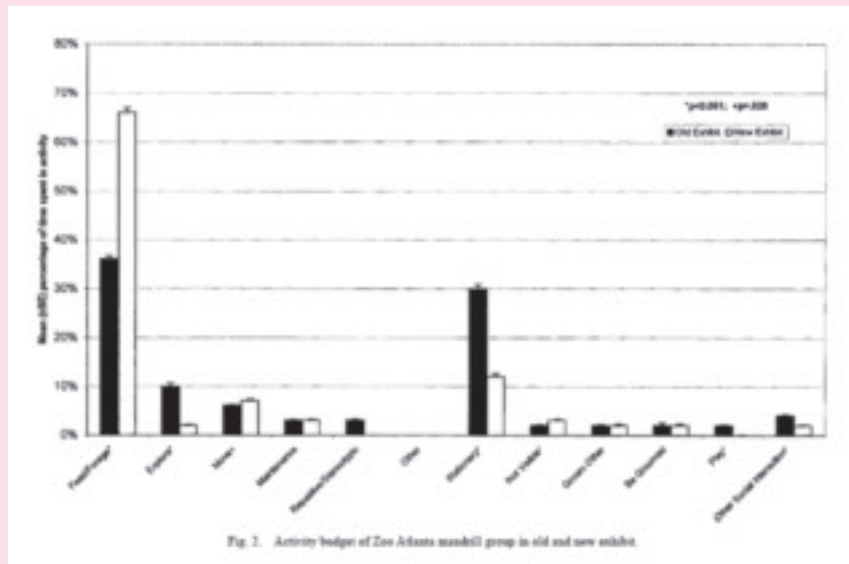


## Review of Literature 25 Studies

Swaigood, R. R., and Shepherdson, D. J. 2006. *Environmental enrichment as a strategy for mitigating stereotypies in zoo animals: a literature review and a meta-analysis.*: In *Stereotypic animal behaviour: Fundamentals and implications to welfare.*, ed. G. Mason, and J. Rushen, 255-84. Wallingford UK: CABI.

Swaigood, R. R., and Shepherdson, D. J. 2005. Scientific approaches to enrichment and stereotypies in zoo animals: What's been done and where should we go. *Zoo Biol.* 24: 499-518.

## Mandrills in new exhibit at Zoo Atlanta



## Giant Panda in Naturalistic Exhibit

TABLE 3. Behavioral comparison between females in the semi-natural and traditional enclosures

Behavior	Semi-natural (N=4)	Traditional (N=3)	P
Eating	25.34 ± 3.49	20.65 ± 5.87	0.28
<u>Stereotyped behavior</u>	<u>0.09 ± 0.05</u>	<u>14.57 ± 4.15</u>	0.03
Playing	16.26 ± 5.18	2.78 ± 1.70	0.15
Grooming	5.32 ± 1.16	3.60 ± 1.47	0.48
Urine marking	0.58 ± 0.11	0.54 ± 0.11	0.72
Anogenital marking	0.08 ± 0.08	0.13 ± 0.07	0.27
Resting	26.40 ± 5.50	28.62 ± 8.24	1.00
Sniffing	0.76 ± 0.16	0.42 ± 0.18	0.15
Exploring	4.50 ± 0.58	5.21 ± 1.19	0.48
Locomotion	19.22 ± 2.33	21.33 ± 1.16	0.48

## Whole Carcass Feeding for Large Cats at Toledo Zoo

TABLE 4. Significance values for overall change in behaviors for all cats pooled (for levels of analysis, see Table 3)

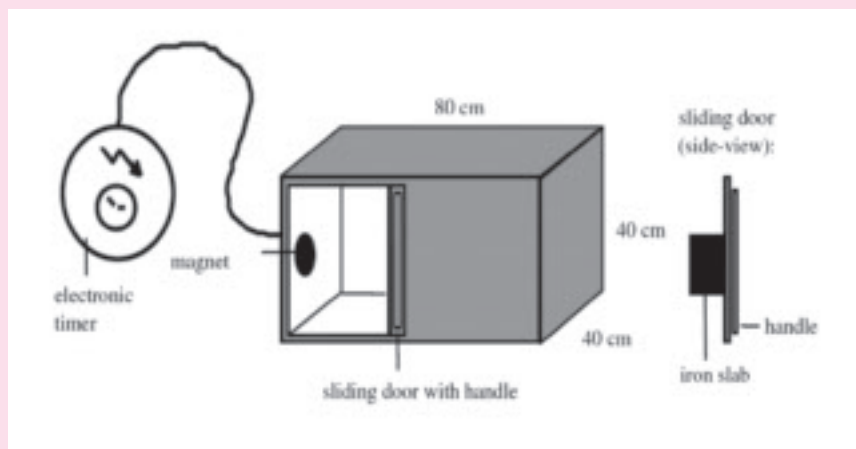
Treatment	Behavior	Level of analysis	P value*	Direction of change (if significant)
Off exhibit	Feed	1	0003	+
		2	0002	+
		3	<0001	+
	Natural	1	1353	+ <sup>†</sup>
		2	1200	+ <sup>†</sup>
		3	2376	- <sup>†</sup>
Stereotypic	1	1180	- <sup>†</sup>	
	2	0900	- <sup>†</sup>	
	3	0022	- <sup>†</sup>	
On exhibit	Natural	1	3021	
		2	6435	
		3	3335	
	Stereotypic	1	8295	
		2	5132	
		3	5550	
	Inactive	1	7194	
		2	8305	
		3	3870	
	Active	1	9034	
		2	1025	
		3	1401	
Hiding	1	0470	+	
	2	0034	+	
	3	0087	+	

\*P values based on Poisson regression and compared to an  $\alpha$  of .05.  
<sup>†</sup>Poisson regression is not significant, but comparison of proportions indicates change did occur.

From McPhee 2002

## Tiger Feeding Device

- Electrical controlled feeding boxes available for 15 minutes twice per day



From: Jenny, S., and Schmid, H. 2002. Effect of feeding boxes on the behavior of stereotyping Amur tigers (*Panthera tigris altaica*) in the Zurich Zoo, Zurich, Switzerland. *Zoo Biol.* 21: 573-84.

## Tiger Feeding Device

TABLE 1. Influence of feeding regime on the behavior of the two tigers

Behavioral categories		Sterotyped pacing	Sleeping	Resting	Locomotion	Others
Female solitary	Conv. feeding	16%	25%	16%	18%	25%
	Box feeding	1%	48%	15%	10%	26%
	<i>P</i>	0.02 <sup>a</sup>	0.01 <sup>a</sup>	0.67	0.02 <sup>a</sup>	0.67
	<i>Z</i>	-2.38	2.52	-0.42	-2.38	-0.42
Male solitary	Conv. feeding	3%	40%	22%	14%	21%
	Box feeding	3%	47%	20%	11%	19%
	<i>P</i>	1.00	0.09	0.41	0.21	0.09
	<i>Z</i>	0.00	-1.12	-0.84	-1.26	-0.42
Female paired	Conv. feeding	7%	13%	23%	26%	31%
	Box feeding	<0.01%	25%	19%	13%	43%
	<i>P</i>	0.01 <sup>a</sup>	0.03 <sup>a</sup>	0.21	0.01 <sup>a</sup>	0.04 <sup>a</sup>
	<i>Z</i>	-2.52	-2.24	-1.26	-2.52	-2.10
Male paired	Conv. feeding	10%	15%	27%	20%	28%
	Box feeding	<0.01%	9%	16%	7%	68%
	<i>P</i>	0.01 <sup>a</sup>	0.09	0.03 <sup>a</sup>	0.02 <sup>a</sup>	0.01 <sup>a</sup>
	<i>Z</i>	-2.52	-1.68	-2.24	-2.38	-2.52

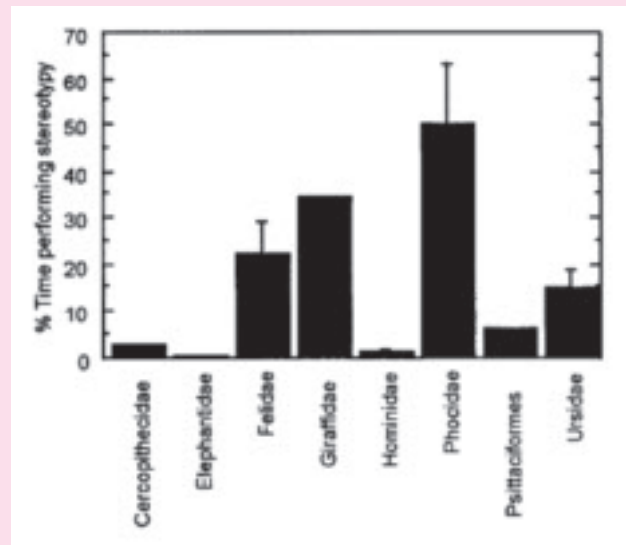
Conventional (conv.) feeding and box feeding data are represented in percentages of mean values, not referring to the statistical values. Eight replications for each tiger and feeding regime were carried out (n=8).

<sup>a</sup>Indicates significant difference at  $P < 0.05$ .

## Types of Enrichment Used

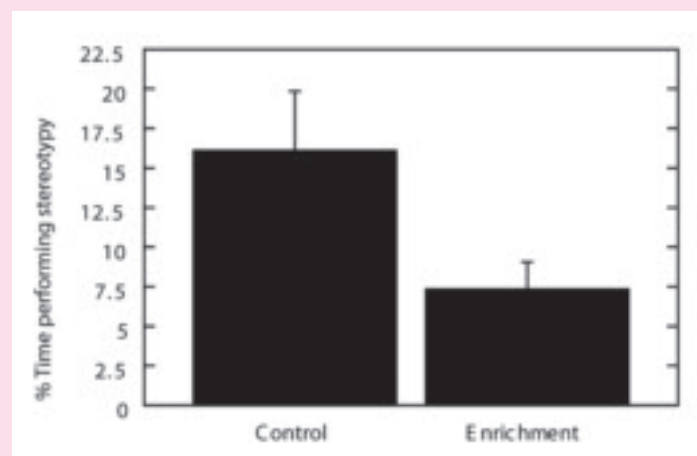
Enrichment type	Frequency	Enrichment type	Frequency
Novel objects	3	Encl. rotation	5
Olfactory	4	Other nonfeeding	3
Training	0	Feeding:	
Major exhibit change:	7	Search time	7
Live vegetation	4	Capture time	3
Shelter	1	Extraction time	10
Climbing structure	2	Processing time	10
Water source	1	Temporal	5
Substrate	3	# feeding times	5
Moveable furnish.	4	Other feeding	0
Unmovable	2		
Increased size	5		

## Which Taxa Most Prone?



From: Swaisgood, R. R., and Shepherdson, D. J. 2005. Scientific approaches to enrichment and stereotypies in zoo animals: What's been done and where should we go. *Zoo Biol.* 24: 499-518.

## How well does enrichment work?

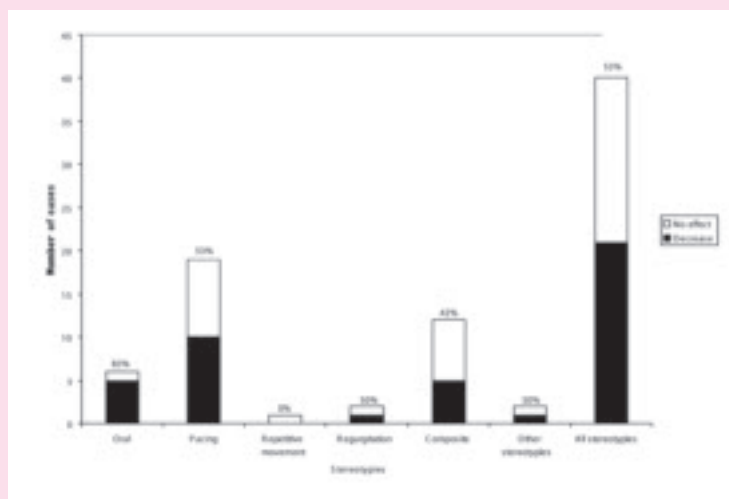


ANOVA:  $F_{1,20}=20.6$ ,  $P=0.0002$

## Never Abolished

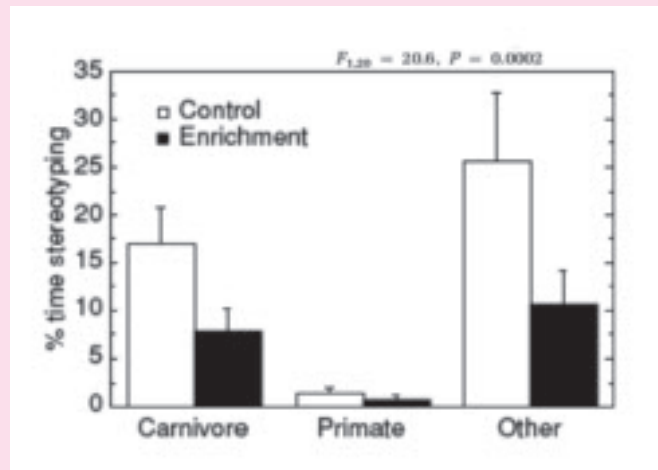


## Effect of Enrichment on Different Stereotypies



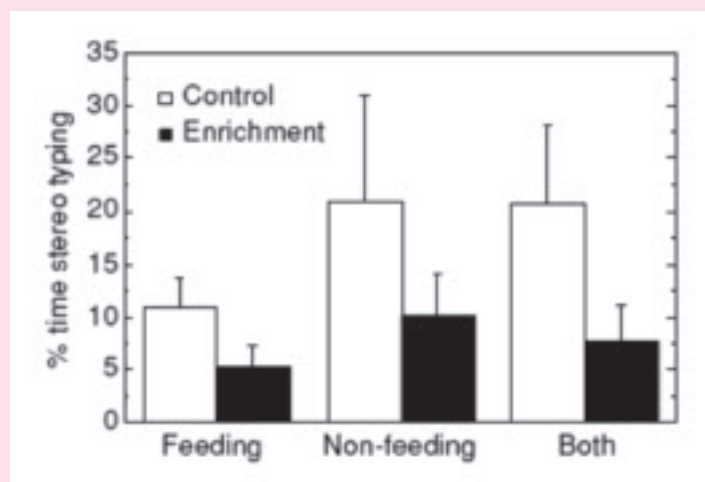
From: Swaisgood, R. R., and Shepherdson, D. J. 2005. Scientific approaches to enrichment and stereotypies in zoo animals: What's been done and where should we go. *Zoo Biol.* 24: 499-518.

## Species Differences in Enrichment Effectiveness



From: Swaisgood, R. R., and Shepherdson, D. J. 2006. *Environmental enrichment as a strategy for mitigating stereotypies in zoo animals: a literature review and a meta-analysis*. In *Stereotypic animal behaviour: Fundamentals and implications to welfare*, ed. G. Mason, and J. Rushen, 255-84. Wallingford UK: CABI.

## Effectiveness of Different Types of Enrichment?



From: Swaisgood, R. R., and Shepherdson, D. J. 2006. *Environmental enrichment as a strategy for mitigating stereotypies in zoo animals: a literature review and a meta-analysis*. In *Stereotypic animal behaviour: Fundamentals and implications to welfare*, ed. G. Mason, and J. Rushen, 255-84. Wallingford UK: CABI.

## Summary of Findings

- ◆ Enrichment reduces Stereotypy 50-60%
- ◆ But stereotypy never eliminated
- ◆ Feeding and non feeding equally effective
- ◆ No difference between species

## Suggested Experimental Design Improvements

- ◆ Increased sample size
- ◆ Repeated measures design (multiple baseline)
- ◆ Full statistical Information (i.e. SE)
- ◆ Full behavioral descriptions
- ◆ Full details of enrichment activities
- ◆ Inclusion of physiological data (e.g. corticoides)
- ◆ Report negative results
- ◆ Conduct long term studies

## Techniques for Assessing Stereotypy in Zoo Animals

- ◆ Multi-Institutional Zoo Studies
- ◆ Physiological Measures of Stress
- ◆ Assessment of Behavior and Temperament

## Case Study: Stereotypic Behavior in Zoo Polar Bears

David Shepherdson, Karen Lewis, Kathy Carlstead, Nancy Perrin, and Karen Bauman

Oregon Zoo  
Honolulu Zoo  
Oregon Health Sciences University  
St. Louis Zoo

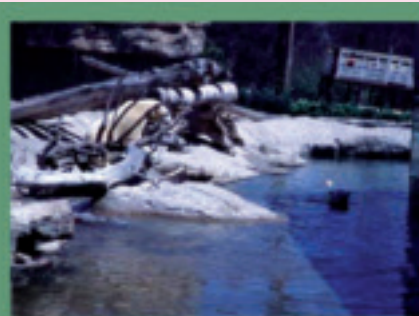
## Objectives

- ◆ Describe Stereotypic Behavior in Zoo Polar Bears
- ◆ Identify the role of environmental, husbandry & temperament factors in the performance of stereotypic behavior
- ◆ Investigate the relationship between physiological measures of stress and stereotypic behavior

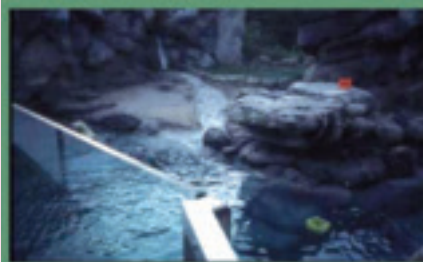


## 20 Partner Zoos, 55 (24.31) Bears

- ◆ Point Defiance, Tacoma
- ◆ San Francisco
- ◆ Los Angeles
- ◆ N. Carolina
- ◆ San Diego Zoo
- ◆ Cleveland
- ◆ Sea World Orlando
- ◆ Sea World San Diego
- ◆ Bronx
- ◆ Central Park, New York
- ◆ Buffalo
- ◆ Seneca Park, Rochester
- ◆ Toledo
- ◆ Toronto
- ◆ St Louis
- ◆ Brookfield
- ◆ Oregon Zoo
- ◆ Philadelphia
- ◆ Como, St. Paul
- ◆ Winnipeg
- ◆ Lake Superior



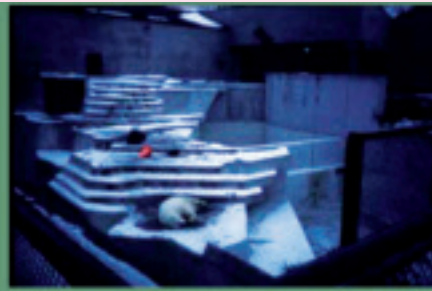
San Diego



N. Carolina



Buffalo



Como



Winnipeg



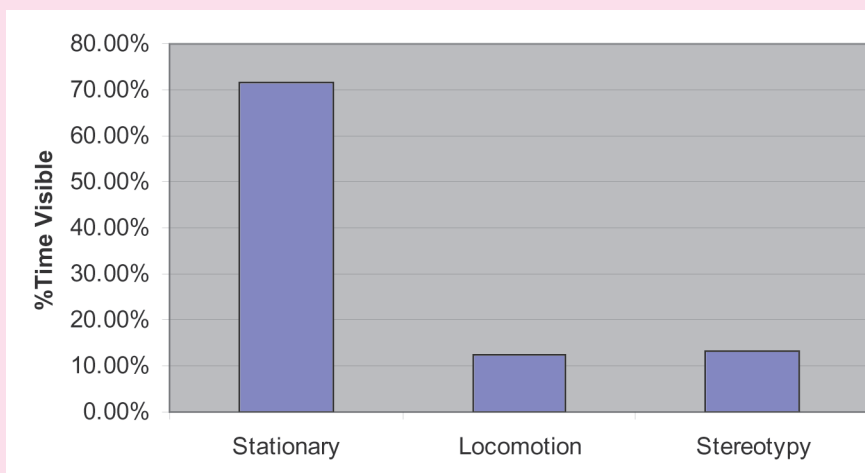
Cleveland

## Measures

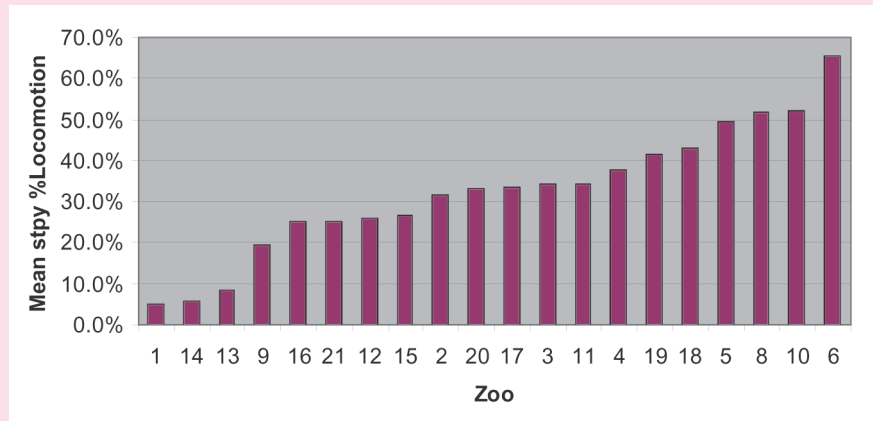
- ◆ Behavior
  - Behavior coded from video taped observation
- ◆ Physiology
  - Bi-weekly fecal samples for one year
- ◆ Temperament
  - Standardised Behavior test
- ◆ Environmental Factors
  - Direct observation, questionnaire & measurement



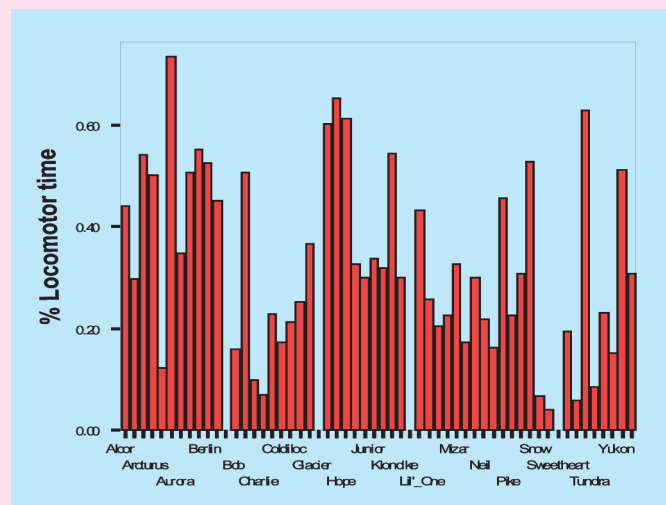
## What do Zoo Polar Bears Do?



## Stereotypy by Zoo



## Stereotypy by Bear



## Stereotypy

Mean Proportion of time engaged in  
Stereotypy  
13.3% (0 - 42.5%)

Proportion of time active engaged in  
Stereotypy  
30.7% (0 - 73%)

## Stereotypy

7% (4/56) of bears did not exhibit any  
stereotypic behavior

32% of bears exhibited stereotypic  
behavior more than 20% of time  
observed (max 42.5%)

## Findings

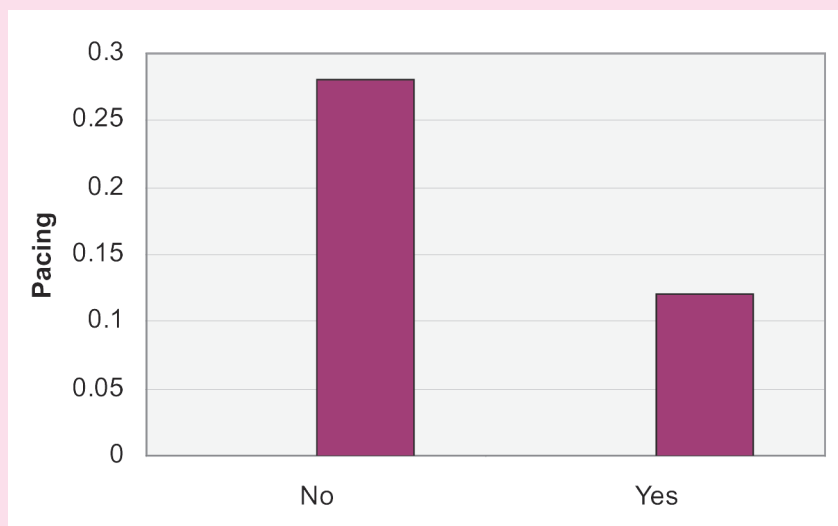
- ◆ Zoo polar bears do indeed spend a large proportion of their active day engaged in locomotor stereotypies
- ◆ There is no significant gender difference

## Explaining The Variation in Stereotypy

	Beta	t	p
Gender	0.203	1.654	.106
Train (yes > no)	-0.290	-2.083	.044
Enrichment	-0.290	-2.202	.034
Interest	-0.273	-1.996	.053
Slow Approach	0.233	1.818	.077

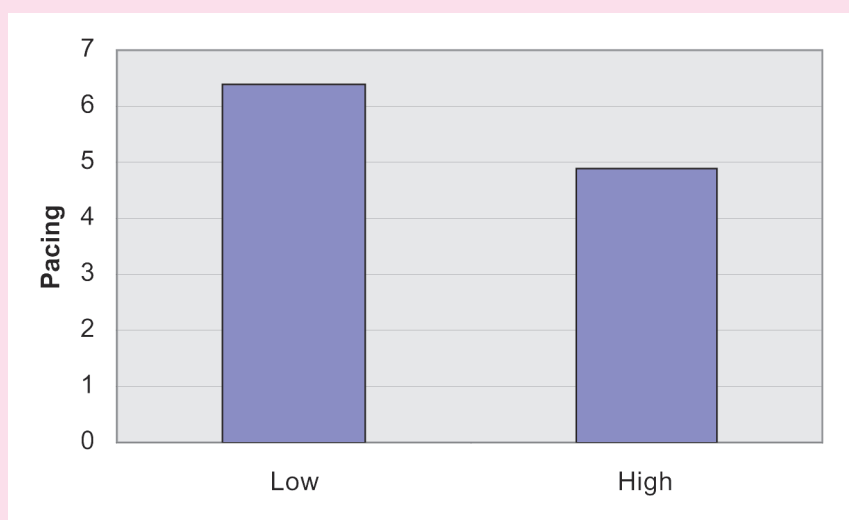
Overall  $R^2 = 0.428$ ,  $df\ 5/39$ ,  $F = 5.844$ ,  $p < 0.001$

## Training



Beta = 0.290, t = -2.083, P = 0.044

## Enrichment



Beta = - 0.290, t = 2.202, P = .034



Use of playing items for reducing stereotypic behaviour

## Non-Significant Environmental Variables

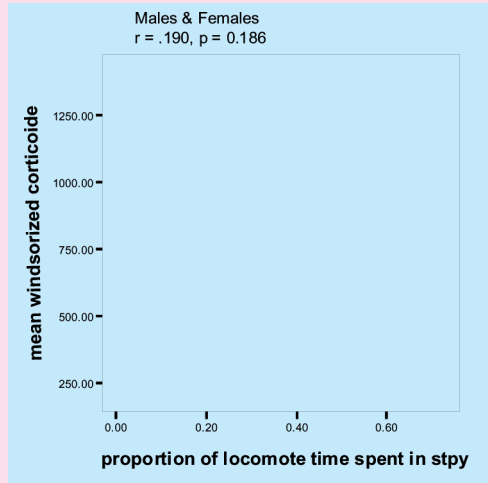
- ◆ No significant Correlations between DV's and:
  - Pool Volume
  - Den Access
  - View From Exhibit
  - Exhibit Complexity
  - Temperature

## Explaining the Variation in Corticoid

	Beta	t	p
Exbt. Area (range 2025 - 8000 sq. ft.)	-0.284	-1.932	0.061
Train	-0.245	-1.715	0.095
Interest	-0.294	-1.923	0.062

Overall  $R^2 = 0.327$ ,  $df\ 5/39$ ,  $F = 5.844$ ,  $p < 0.002$

## Stereotypy & Corticoid



Not significant



## Overall Conclusions

- ◆ Zoo Bears show high rates of stereotypy
- ◆ Improved husbandry (enrichment & training) is key to reducing stereotypic behavior
- ◆ Corticoid levels linked to exhibit area

## Overall Conclusions

- ◆ Temperament characteristics linked to both stereotypic behavior and corticoid levels

# Training Sessions III

**Modern animal records keeping for zoos-**

**Dr. Nate Flesness, Executive Director, ISIS/ZIMS**

**National studbook (Herdbook) of identified wild animal species in India-**

**Shri B.C. Choudhary, Wildlife Institute of India**

**Use of Zoological Information Management System (ZIMS)  
in Indian Zoos-**

**Dr. Nate Flesness, Executive Director, ISIS/ZIMS**

**Indian zoos joining ISIS/ZIMS**

**Dr. Nate Flesness, Executive Director, ISIS/ZIMS and Dr. B.R. Sharma,  
Member Secretary, CZA**



## Modern Animal Records Keeping for Zoos

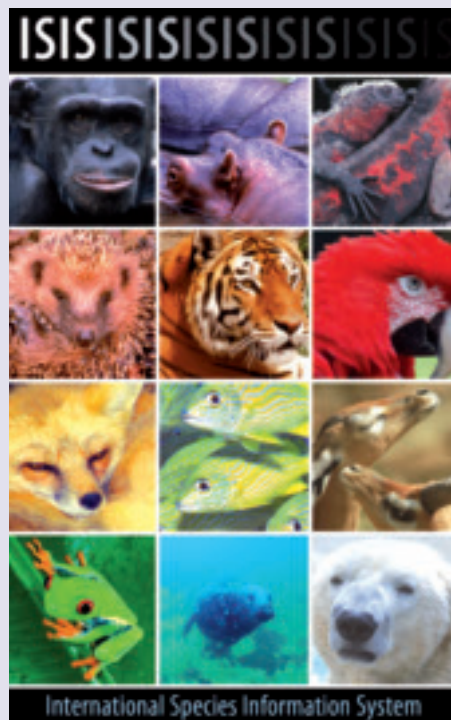


Dr. Nate Flesness  
Executive Director, International Species Information System, Minnesota, USA

This presentation covers need of modern animal recording system, challenges exist in animal management in zoos, contents of animal recording system, inter connectivity of zoos for exchange of ideas & animals, and consultations. What is ISIS, how it works, and ISIS software & applications were also discussed.



# Modern Animal Records Keeping For Zoos



Why Modern (computerized)  
Animal Records?

What Animal Management  
Challenges do you have?

## Modern Animal Management

### Key questions:

- What do we have?
- Is it a hybrid?
- What do other zoos have?
- How is the species doing in zoos?
- Do we need more?
- Do we need less?
- Who is good at breeding them?

### And more questions:

- What zoos are good at rearing them?
- Are they being inbred?
- Who should be mated with who this year?
- Who should be moved to another zoo?
- Who should be moved in?
- Can my staff learn from others?

## More Modern Animal Management Questions:

- Has this animal been vaccinated?
- What diseases are common to this species – so we should watch for them?
- What treatments are effective?
- What dosage?
- What blood/serum lab analysis will help diagnose?
- What is normal value in this species?

## Better Zoo

- Any zoo would be better with a stable healthy population of animals of national importance:
  - Avoiding shortage
  - Avoiding surplus
  - Preventing disease
  - Participating in high-profile breeding programs to protect India's wildlife
  - Being more involved in research and better-connected to academic facilities....

## Six things are needed: three at the zoo, three across India

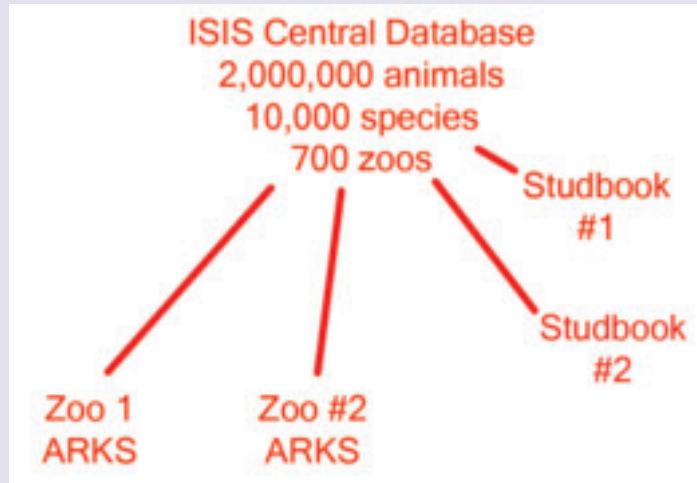
- 1. Individual animal identification system.
- 2. Accurate and current specimen records for each animal – someone on staff responsible for this.
- 3. Other staff trained to report key animal information to the responsible records person.

## Indian Zoo Community needs

- 4. An efficient way to share these animal records - to monitor the population of each species across ZOOS.
- 5. Someone trained to look at the population data, analyze it, make recommendations
- 6. Someone (you or your staff!) listening and acting on the recommendations....!

## ISIS – Current Animal Information Tools

- ISIS' ARKS – records keeping software used by 700 zoos in 73 countries
- ISIS central – shares data contributed by ARKS users monthly – makes it easy for someone to monitor populations
- ISIS' SPARKS – studbook software used worldwide by 900 studbook keepers for >1400 studbooks
- ISIS' MedARKS – veterinary medical records software used at 100 zoos.



### ISIS Current Data Flow

Foundation for studbooks, cooperative management programs  
 Convenient overview of every population

## Why ISIS?

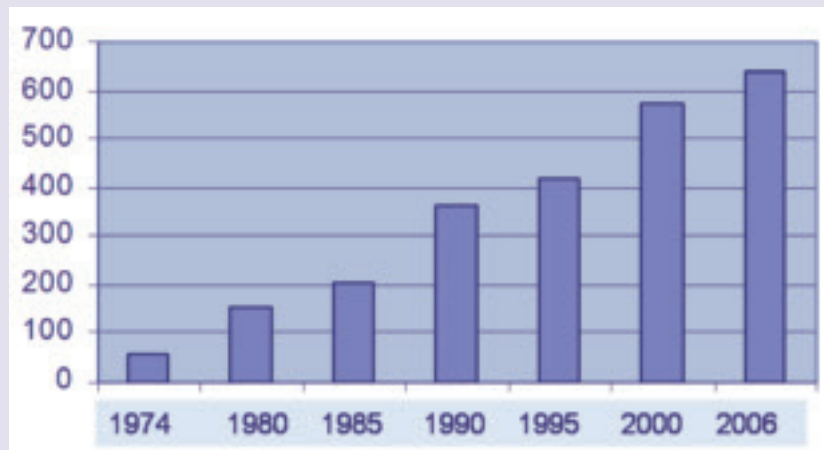
- World-standard
- Owned by 700 members from 73 countries
- Governed by member-elected Board
- Exists just for this animal information purpose
- Access to international data
- Cost-effective
- Recognized by governments and regulatory bodies (CITES)



How did ISIS get 700 zoos to cooperate on 2 million animal records?

- One at a time.
- A new one every 2-3 weeks.
- (for 34 years.....😊.....)
- It works for them.
- They find value in ISIS.
- They all started where you are.

ISIS:  
34 Years of Steady Membership  
Growth



Current ISIS Global Community:  
675 members  
72 Countries  
Europe = N.America!



## ISIS Expansion 2008

India's Central Zoo Authority will sponsor 59 zoos into ISIS!

Discussions with other regions are ongoing.

## Regional ISIS Support

- ISIS strives to provide in-region native-language technical support and training.
- 14 languages are now spoken in the ISIS office. (Including Latin and Techie of course.)
- Top ISIS staff are from Pakistan and India.
- Currently ISIS has staff and reps in Amsterdam (EAZA) Sydney (ARAZPA), and looks forward to similar arrangements in the future in India, Japan, Latin





## National Studbook (Herdbook) of Identified Wild Animal Species in India



Shri B.C. Choudhary  
Scientist  
Wildlife Institute of India

This presentation covers importance of studbook, its content and utility of studbooks in management and exchange of animals for conservation breeding programme. Central Zoo Authority's efforts in preparing studbooks of 63 identified endangered wild animals species and assigning responsibility to the Wildlife Institute of India Dehradun and progress achieved so far were discussed.



## The Preparation of National Studbook (Herdbook) of Identified Wild Animal Species in India



### Record Keeping

An Integral part of Zoo  
Management



## CZA's formats for record keeping

---

**IMPORTANT RECORDS**

**TO BE MAINTAINED**

**BY ZOOS**

## **Why records**

---

**To Achieve major objectives of modern zoos:**

- ❖ **Conservation**
- ❖ **Education**
- ❖ **Research**

### Good record System?

---

- ❖ Comprehensive but not too difficult or time consuming to operate
- ❖ Simple for any one to use
- ❖ Ideally standardized
- ❖ Easy to retrieve
- ❖ Accurate and up- to- date information

**Animals Listed Under SCH-I & SCH-II Wildlife (Protection) Act**

Name of the Zoo \_\_\_\_\_

S . N o	Species	Stock as on 01. 04. _____ M : F : U : T	During the year				Stock as on 31.03 ____ M : F : U : T
			Birth M : F : U	Acquisition M : F : U	Disposal M : F : U	Death M : F : U	
	Birds						
1							
2							
	Total Birds						
	Mammals						
1							
2							
	Total Mammals						
	Reptiles						
1							
2							
	Total Reptiles						
	Total Animals						

M=Male, F= Female, U = Unsexed, T=Total

**Summary of Death Report for the year \_\_\_\_\_**

**Name of the Zoo**

S.No.	Name of the Species	Sex	Date of Death	Cause of Death
	<b>Birds</b>			
1				
2				
	<b>Mammals</b>			
1				
2				
	<b>Reptiles</b>			
1				
2				

**Signature of Veterinary Officer**

**Daily Report For individual animals  
Not applicable for herd living animals**

S. No	Item	Name of the animal/Studbook No./Transponder No.	Sex	Enclosure	Remarks
1	Receipt				
2	Births				
3	Transfer				
4	Mating Activity				
5	Disposal				
6	Death				
7	Diet Change				
8	Other observation				
9	Maintenance required				

10 Prophylactic measures adopted

Signature of Reporting Officer

Signature of Veterinary Officer

General remarks of Director

Action taken

Adapted from – Report of the Expert Committee on Zoo

**Treatment Sheet for individual animal**

Species

S. No.	Date	Name of the animal/Studbook No./Transponder No.	Symptoms (i) Disease (ii) Condition of animal	Diagnosis	Description	Reaction of treatment	Remarks of V.O.

Adapted from – Report of the Expert Committee on Zoo

**Treatment Register  
(to be maintained in the hospital)**

**A. Outdoor patients/Indoor patients**

S. No.	Name of the animal/Studbook No./Transponder No.	Symptom	Diagnosis	Treatment	Remarks

Adapted from – Report of the Expert Committee on Zoo

## CZA's attempt

---

- In 1999 - to compile studbooks for five endangered species housed in various Indian zoos

Asiatic Lion (*Panthera leo persica*)

Indian Tiger (*Panthera tigris*)

Greater One-horned Rhinoceros (*Rhinoceros unicornis*)

Lion-tailed Macaque (*Macaca silenus*)

Golden Langur (*Trachypithecus geei*)

## Studbook

---

A comprehensive and accurate database of records of pedigree of each animal present in captivity

A good record keeping is essential for constructing studbooks

## History

As an aid to stock improvement by facilitating selective breeding

Oldest official Studbook : General studbook for thoroughbred horses, 1791.

Oldest studbook for wild animal species : European Bison. *Bison bonasus*, 1932.

## History

1966 –	8 Mammals
1969 –	21 Studbooks
1979 –	38 Studbooks
1984 –	61 Studbooks
1993 –	>225 Studbooks

Increasing trends in : Number of studbooks and coverage of taxa (From mammals, birds, reptiles, to even a species of snail).

## Studbook contains...

---

- Unique stud number
- Sex
- Parentage
- Birth and death dates
- Transaction history
- Breeding data

## Use of Studbooks

---

### Captive population management

- \* *Decisions about breeding*
- \* *Problem identification in captive population*

### Database for archival research

## Methods

---

Data on genealogy was collected through

- *CZA inventories & data resources*
- *Questionnaires*
- *Personal visits to zoos*

## Analytical tool

---

Compilation and analysis were done by using **Single Population Animal Record Keeping System (SPARKS)** & **Population manager 2000 (PM2000)** software

## Demographic analysis

### Population Summary

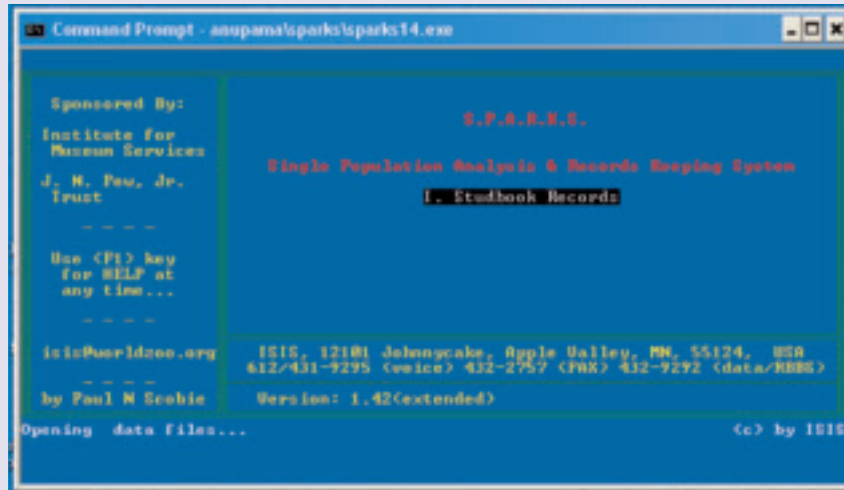
- # of total individuals registered & sex ratio
- # in birth type: Wild or Captive
- # of individuals living or dead

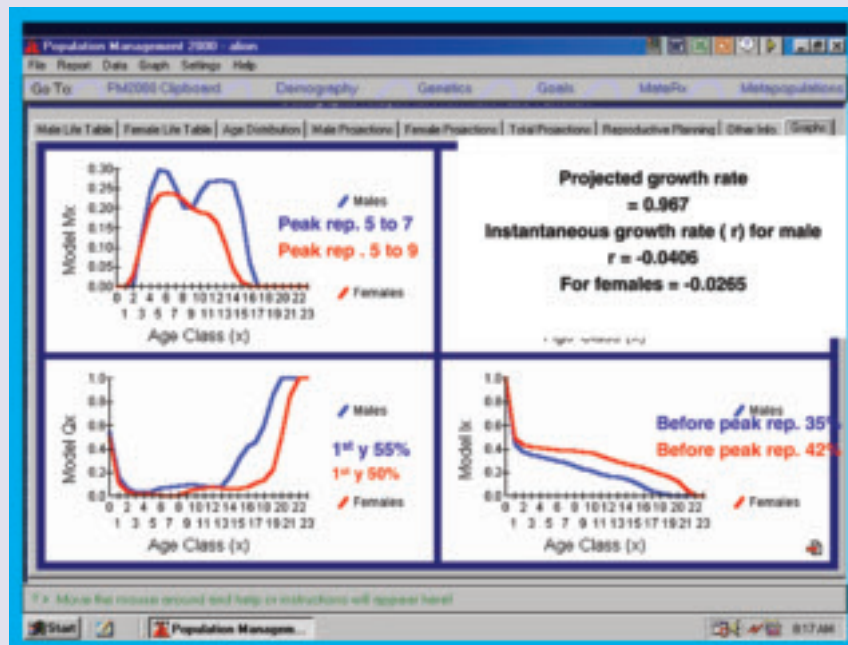
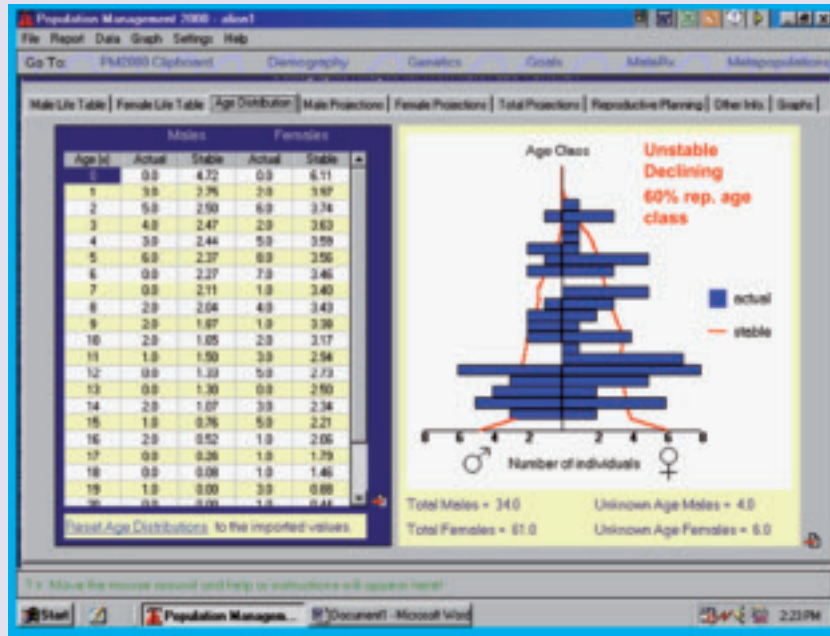
### Breeding Data

- # of individuals bred (living or dead)

Asiatic Lion captive population data as of 30th September 2002

	Male	Female	Unknown sex	Total
<b>Total Registered</b>	224	274	48	546
<b>Total wild caught</b>	29	29	0	58
<b>Total captive born</b>	195	245	48	488
<i>Alive as of 30<sup>th</sup> September 2002</i>				
<b>Wild origin</b>	7	6	0	13
<b>Captive born</b>	25	51	0	76
<b>Total Breeding Animals</b>				
<b>Wild born that have bred</b>	14	19	0	33
<b>Captive born that have bred</b>	20	41	0	61
<i>Living proven breeders (animals who have bred at least once)</i>				
<b>Wild born</b>	3	3	0	6
<b>Captive born</b>	5	17	0	22





## Genetic analysis

---

Inbreeding coefficient of captive stock

Founder representation

Decision making analysis to choose mates to reduce inbreeding

## Caveat

---

Use of SPARKS is limited by quality & quantity of data

## Problems Confronted

- **Inadequate record keeping in the zoos**

Data collection was difficult & data was of varying quality

- **Lack of individual markings → No individual identity possible in most cases**

Identification by cage /enclosures / animal keepers

- **Lack of responses to questionnaires**

Zoos, contacted:	45
Zoos, responded:	10 (after 6 months)
Zoos, visited:	15

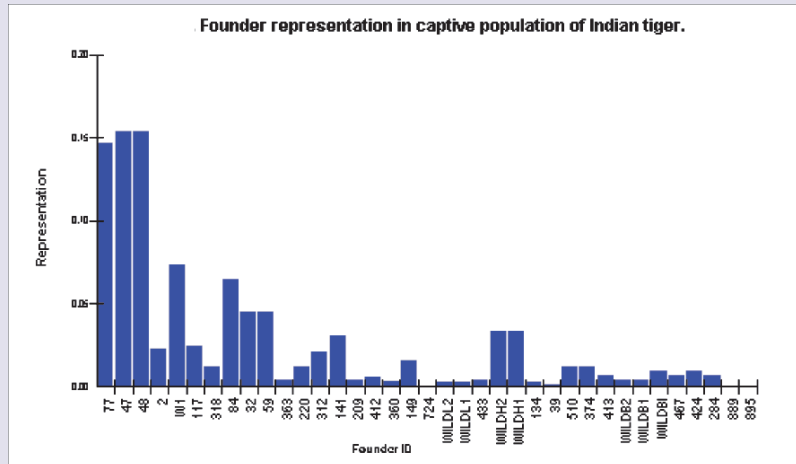


### Studbooks:

The basis of captive breeding programme

### HOW RELEVANT IN THE INDIAN SCENARIO





## Assignment to WII for Preparation of Studbooks

### Update of Studbooks of:

Asiatic Lion
Bengal Tiger
Lion tailed macaque
One horned rhinoceros

### Initiation of Studbooks for:

Wild ass
Nilgiri langur
Hoolock gibbon
Wild dog
Tibetan wolf
Gaur – Indian bison
Snow leopard
Clouded Leopard
Red panda
Bhutan Grey Peacock Pheasant

## Format proposed for collection of studbook/herdbook data

Studbook for \_\_\_\_\_ Institution \_\_\_\_\_

Genus \_\_\_\_\_ Species \_\_\_\_\_ Subspecies \_\_\_\_\_

Stud No.	Sex	Name	Date of Birth	Parentage		Source of animal Captive Bred/ Wild/ Rescued	Events		Date of Death	Post mortem findings and special remarks
				Sire	Dam		From	To		

Please mention transponder ID for animals fitted with PIT tags

## Work Completed

- Designing of simplified questionnaire for collection of studbook data.
- Mailing of questionnaires 88 to zoos holding or have held the target 14 species as per CZA database
- Receipt of Data from 33 zoos.
- 8 zoos have responded that they do not have the species in their custody.
- Issuance of reminders to 47 zoos from where no data is received.
- Evaluation of data.
- Issuance of reminders to 17 zoos from where incomplete data is received.
- Visited Lucknow Zoological Park, Kanpur Zoo, National Zoological Park, Delhi and Jaipur Zoo to collect data.

### Species wise status of data

Sl. No.	Species	Scientific Name	No. of Zoos Holding species	Complete Data Received From (No. of Zoos)	Incomplete Data	Data Awaited From (No. of Zoos)
1.	Asiatic Lion	<i>Panthera leo persica</i>	28	14	3	11
2.	Bengal Tiger	<i>Panthera tigris tigris</i>	56	22	5	29
3.	Lion Tailed Macaque	<i>Macaca silenus</i>	33	12	1	20
4.	Indian Rhinoceros	<i>Rhinoceros unicornis</i>	17	8	1	4
5.	Snow Leopard	<i>Panthera uncia</i>	4	3	0	1
6.	Clouded leopard	<i>Neofelis nebulosa</i>	11	4	0	7
7.	Tibetan Wolf	<i>Canis lupus chanco</i>	5	2	0	3
8.	Wild Dog	<i>Cuon alpinus</i>	7	2	2	3
9.	Nilgiri Langur	<i>Simnopithecus johnii</i>	15	3	1	11
10.	Red Panda	<i>Ailurus fulgens</i>	5	2		3
11.	Hoolock Gibbon	<i>Bunopithecus hoolock hoolock</i>	22	5	0	17
12.	Indian Bison	<i>Bos gaurus</i>	9	5	1	3
13.	Indian Wild Ass	<i>Equus hemionus khur</i>	5	1	0	4
14.	Bhutan Grey Peacock Pheasant.	<i>Polyplectron bicalvatum</i>	Incomplete data has been received for the species from 3 zoos so far and is hence not being described in this report. According to CZA inventory the species is currently distributed across 8 zoos in the country.			

### Expected outcomes of the project

- Compilation of Studbooks/Herdbooks of the Identified endangered faunal types in Indian Zoos
- Development of Captive Breeding Masterplans for the Indian region

## Future Work Strategy

- Issuance of reminders to all zoos who have not responded to the questionnaire and who have provided incomplete data.
- Field visits to zoos for collecting data.
- Training of Zoo staff involved in records keeping during field visits and annual training program being organised by the WII and CZA.
- Data entry and analysis.
- Compilation of studbooks for species for which data is received from all zoos housing the species.

**A fresh Memorandum of Understanding between the Central Zoo Authority and the Wildlife Institute of India is being negotiated for the maintenance of studbooks of 63 endangered faunal types in Indian Zoos**



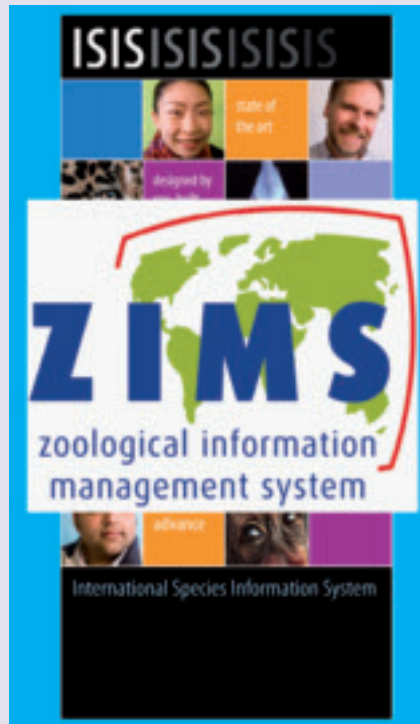
## Use of Zoological Information Management System (ZIMS) in Indian Zoos



Dr. Nate Flesness  
Executive Director, International Species  
Information System, Minnesota, USA

ISIS is developing Zoological Information Management System (ZIMS) software to connect all zoos of world. This presentation covers importance of ZIMS to the zoos in present scenario. It is informed that all existing software of ISIS are being integrated into one software i.e. ZIMS in addition to latest features for managing zoos and population of animals in better way.





## The ZIMS Vision\*

One  
Accurate  
Global  
Real-time  
Web-based  
User-designed  
Community-funded  
Specimen and Collection Management System

*\*Vision was community developed*





## Why ZIMS?

- ZIMS will replace and modernize and integrate ALL previous ISIS tools (ARKS, SPARKS, MedARKS and more).
- ZIMS is coming, but it's a HUGE PROJECT.
- ZIMS is coming, but it's late. Next year sometime.

## Global Collaboration

ZIMS has been designed by more than 500 zoological and aquarium professionals



Arpad Kover  
 Viktor Molnar, DVM  
 Ron Willis  
 Elena Baistrocchi  
 Maria Rodeano  
 Hans Doppel, IT Coordinator  
 Dr. Kristin Leus  
 Marleen Huyghe  
 Peter Galbusera  
 Dr. Philippe Jouk  
 Barbara Outerbridge, Registrar

Jean-Michel Hatt, Prof.Dr.med.vet  
 Dr. Robert Zingg  
 Leszek Antkowiak  
 Magdalena Janiszewska  
 Piotr Cwiertnia  
 Radoslaw Ratajszczak  
 Ryszard Topola  
 Wiktor Zduniak  
 Elio Vicente  
 Joao Falcato, Gen.Curator  
 Patricia Vilarinho



## ZIMS: Better Veterinary Care



- Most wildlife veterinary knowledge comes from our community - zoo and aquarium vets.
- Zoo and Aquarium veterinarians need ready access to diagnostics, effective treatments and dosages for thousands of species.
- Diseases of most concern for each of 10,000 species, are important to be reminded about.
- ISIS new ZIMS will give you access to the most successful treatments and key disease outbreak information from around the world.



## Global Lifetime Animal Number

700 zoos and aquariums in 73 countries will be moving to a new one number per animal per lifetime system.

This new ISIS Global Accession Number will track the animal wherever it moves within the ISIS network. It is like a global studbook number, but for all species.

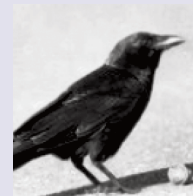




## New World-Wide ZIMS Studbook System

- Studbook keepers will be automatically updated daily by ZIMS (new births, moves, deaths and population overview), no typing required!
- Major benefits to regional associations and studbook keepers from joining in.

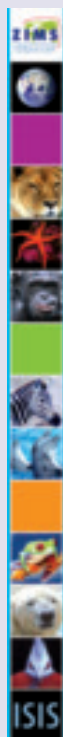
## A New Role for Zoos: Sentinels for Disease

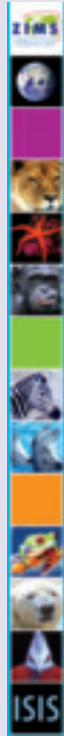


Zoos and Aquariums monitor their animals closely, to care for them.

Linked real-time through ZIMS, ISIS members will be a unique and powerful worldwide network standing watch for wildlife and people.

ZIMS will help detect new and emerging diseases early.





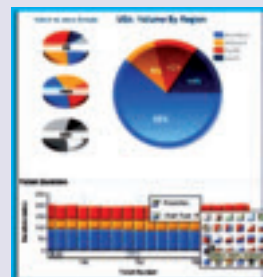
## ZIMS for Aquariums

- Helps life support system monitoring and maintenance
- Tracks water quality measurements
- Tracks groups of animals and where they came from, who they have been with.
- Shares aquatic veterinary best practice



## ZIMS: Modern Executive Management Tool

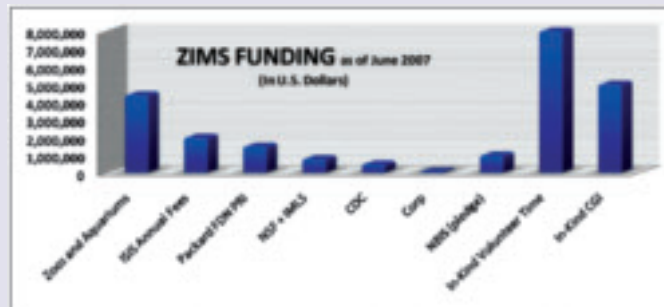
- Plans
- Protocols
- Tasks
- Requests
- Director's dashboard





## A World of Support for ZIMS

ZIMS has been funded mostly by the community who will use it, with significant support from volunteers and philanthropic investment.



## ZIMS Investments

- USD \$4.3 Million donated by 143 zoos and aquariums
- USD \$1.4 million external funding found
- USD \$1.7 million borrowed
- USD \$7 million equivalent in volunteered expert time.
- ~USD \$10 million contributed by software company





ZIMS is currently 2/3 to 3/4 done

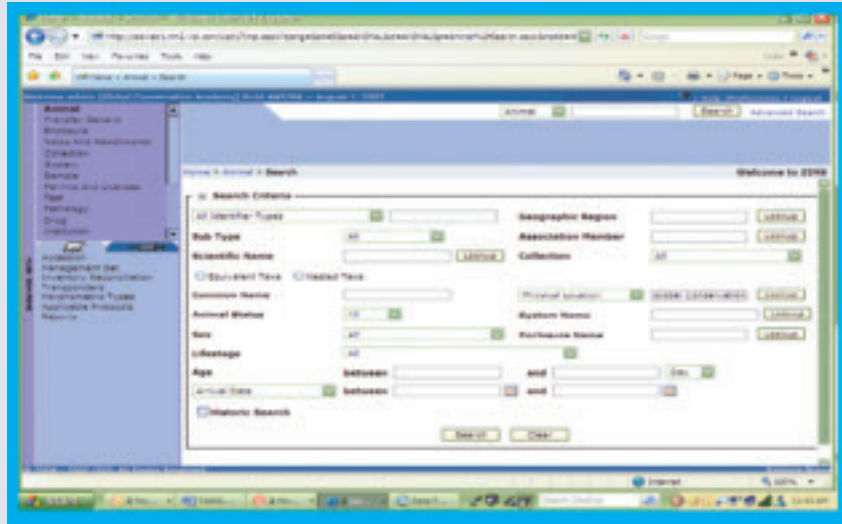
- We are bringing in a new company (the third), to finish it.



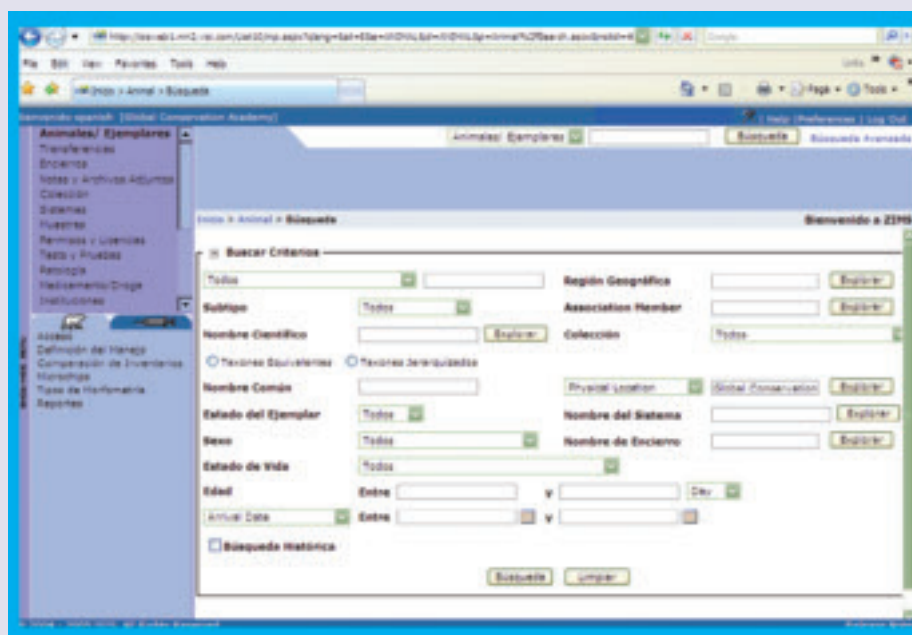
ZIMS has been mostly built here!



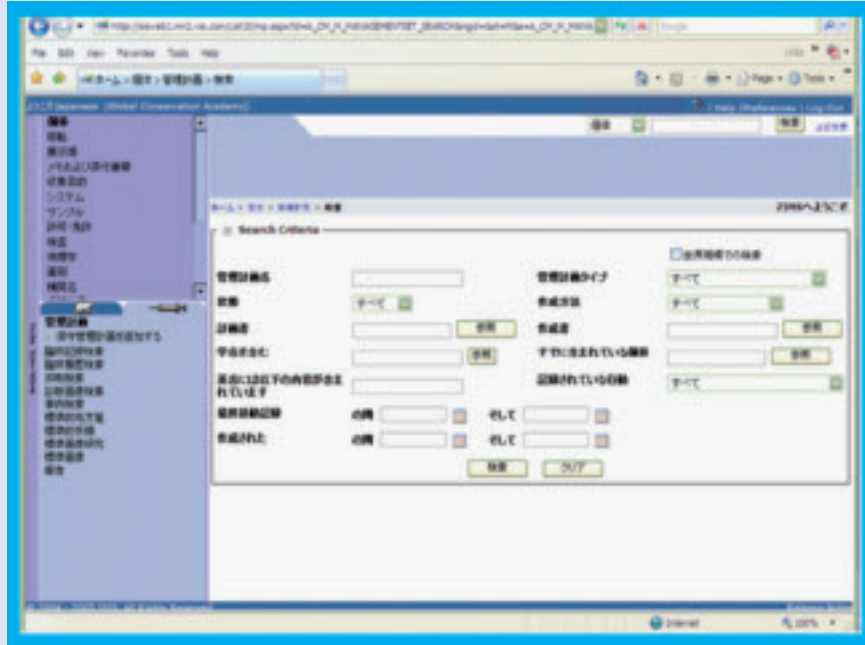
## Currently, ZIMS is in English



## ...Spanish...



...Japanese...



And more languages to come...



# ZIMS demo ...on the ISIS web site

Try it yourself at [www.isis.org](http://www.isis.org)

A large collage of images and text on a blue background. At the top left, a purple box contains the text "state of the art". Below it, a grid of small images includes a woman's face, a globe, and various animals. In the center, the ZIMS logo is displayed, featuring a green world map and the text "ZIMS zoological information management system". To the right, a green box contains the text "designed by you, built for you". At the bottom left, the ISIS logo is shown with the text "International Species Information System". At the bottom right, the text "Thank You" is written in a large, white font.

## ISIS is the organization ZIMS will be the new software

- ZIMS is so huge its hard to describe.
- It will help zoos use information on just about anything animal related.
- Animals, enclosures, veterinary medicine, samples, etc.



## ZIMS Infrastructure needs

- Internet
- Broadband preferred
- Computer
- Marked animals
- Numbered /named enclosures
- Records keeping duties assigned



## Discussion on Indian Zoo's joining of ISIS/ZIMS



Dr. Nate Flesness  
Executive Director, International Species  
Information System, Minnesota, USA

and

Dr. Brij Raj Sharma IFS  
Member Secretary, Central Zoo  
Authority, Ministry of Environment &  
Forest, Govt. of India

As developing of Zoological Information Management System (ZIMS) is in advanced stage (2/3 or can say 3/4 work is completed) so it was decided that Indian zoos meanwhile can join ISIS for its software of ARKS and SPARKS. International Species Information System fix its fee for these software on the basis of visitors and recurring budget in a year of the zoo so figures of visitors and budget was got verified with the directors of respective zoos.



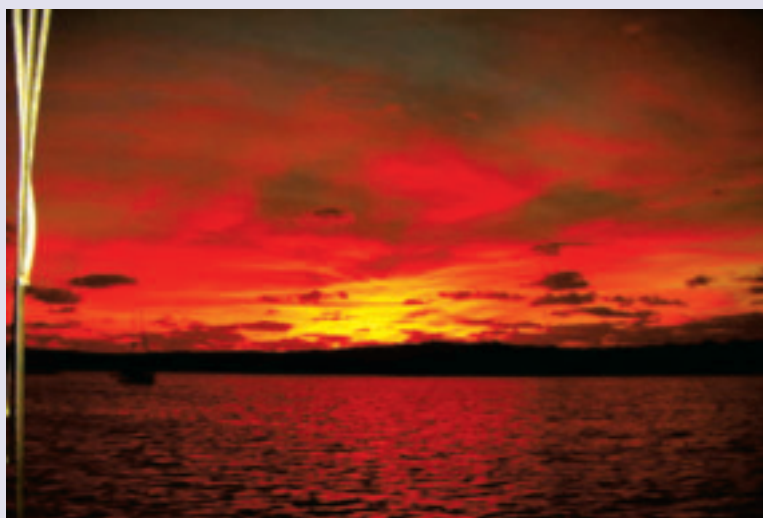
## Discussion on Indian Zoos Joining of ZIMS

### Indian Zoos joining ISIS

- Memberships
- Start with current software (ARKS), move up to ZIMS as soon as ready
- (all data moved automatically)
- Training
  - Start with some?
  - venues
  - Staffing – India will be third biggest group in ISIS!
- Timing

## ISIS is very excited about India

- We can help you keep improving your zoos and helping India's wildlife
- That's all we do.
- Its' the only reason ISIS exists.
- We will be proud to be of service.



## Discussion on Indian Zoos' joining of ZIMS

A discussion session of the Executive Director, ISIS/ZIMS and Member Secretary, Central Zoo Authority with the Directors of the major Indian zoos was organized in the forenoon on major Indian Zoos' joining of ISIS/ ZIMS. The session was piloted by Dr. Nate Flasenness and Dr. B.R. Sharma. The zoo directors were asked to clear queries and doubts with the ISIS management. After detailed discussions, it was felt that, as the completion and final installation of Zoological Information Management System (ZIMS) will take some more time, all the major Indian zoos should become the member of ISIS in the meantime. All the major zoos will acquire ARKS software, whereas Central Zoo Authority, Wildlife Institute of India Laboratory for Conservation of Endangered Species, National Referral Centre (IVRI) and all the coordinating zoos of different identified species will be provided with SPARKS software for initiation and preparation of national studbook of the identified species. It was also decided that the Central Zoo Authority will sponsor the joining of Indian zoos of ISIS or/ and ZIMS at least up to the end of the XI Five Year Plan. At the later stage, if needed the zoos will start bearing their membership fee. It was also decided that the required hands on training programmes for use of ISIS/ ZIMS software be organized at Pune to begin with and such more training programmes on regional basis will continue to be organized as long as found needed. Member Secretary, Central Zoo Authority read out the names of zoos along with the number of annual visitors to each zoo during the year 2006-07 along with the maintenance budget of the zoological parks during the same year for confirmation. Member Secretary also asked each zoo director about the willingness of the zoo to join ISIS/ ZIMS subject to the above conditions. The list of major zoos which agreed to join the ISIS/ ZIMS under the programme is at **Annexure-I**.

The session ended with a request to Executive Director, ISIS to submit the detailed proposal incorporating the financial involvement including for the trainings and supplies of software for a period of five years to the Central Zoo Authority for consideration.

# Training Sessions IV

## **Conservation breeding-Challenges and Protocols-**

**Dr. Robert C Lacy, Chairman, Conservation Breeding Specialist  
Group of SSC, IUCN**

## **Managing populations for conservations breeding-**

**Dr. Jonathan D Ballou, Smithsonian's National Zoological Park  
Washington, USA**



## Conservation breeding- Challenges and Protocols



Dr. Robert C Lacy  
Chairman, Conservation Breeding Group of  
Species Survival Commission/IUCN

The Chairman, Conservation Breeding Specialist of Species Survival Commission of IUCN stressed on the role of ex-situ conservation breeding in wildlife conservation. The goal, objectives, practices, precautions, strength and short coming of conservation breeding were presented to the zoo personnel.





## Conservation Breeding Challenges and Protocols



IUCN's Six Commissions



7,500 volunteers in 179 countries provide technical and scientific advice for biodiversity conservation to governments, international conventions, and conservation organizations.

~105 Taxon-based Specialist Groups	Disciplinary Specialist Groups	Subcommittees & Task Forces
<ul style="list-style-type: none"> <li>Cat</li> <li>Bear</li> <li>Cetacean</li> <li>Hornbill</li> <li>Cycads</li> <li>Seabird</li> <li>Crocodile</li> <li>Freshwater Fish</li> <li>Mollusc</li> <li>Cactus &amp; Succulent</li> <li>Carnivorous Plant</li> <li>and 90 others</li> </ul>	<ul style="list-style-type: none"> <li>Conservation Breeding</li> <li>Sustainable Use</li> <li>Wildlife Health</li> <li>Invasive Species</li> <li>Reintroduction</li> </ul>	<ul style="list-style-type: none"> <li>Marine Species</li> <li>Invertebrates</li> <li>Species Conservation</li> <li>Planning</li> </ul>

### Conservation Breeding Specialist Group

- About 500 volunteer members from 68 countries
- HQ staff of 6 people
- 8 Regional and National Networks
- Supported mostly by zoos and zoo associations
- We exist to help *you* be more effective in species conservation



## What is “conservation breeding?”

“Conservation breeding is a species conservation *strategy*. It employs the *scientifically managed* breeding of threatened wildlife for creation and *maintenance of populations* that serve to enable, support, or enhance the conservation of *wild populations*.”

## What is “conservation breeding?”

- Not just breeding
  - Survival, Nutrition, Behavior, Genetics, etc.
  - But long-term continuity across generations is essential

## Why is conservation breeding needed?

- Our focus is on any population or species in need of special care to ensure its survival



## Convention on Biodiversity 2010 Target

Achieve a significant reduction in the  
rate of biodiversity loss

## Will the 2010 goal be met?

- A reduction in the overall rate of biodiversity loss is unlikely to be achieved by 2010
- Current trends show no sign of a slowdown of biodiversity loss, and drivers of loss such as land use change and climate change are expected to increase further.

## Will the target be met?

- A reduction in the overall rate of biodiversity loss is unlikely to be achieved by 2010
- Current trends show no sign of a slowdown of biodiversity loss, and drivers of loss such as land use change and climate change are expected to increase further.
- By 2010, it is thus crucial to have all necessary structures in place to halt the loss of nature. 2010 will also be the milestone to review progress on the target and define follow-up work.

## India is obviously important!

In top 10 countries for biodiversity

For example, just with amphibians

- 239 species (#11 globally)
- 154 endemic (#13 globally)
- 66 threatened species (#9 globally)

13% of the world's bird species, etc.

## What are the roles of conservation breeding?

- Securing populations of species that are not currently safe in nature



## What are the roles of conservation breeding?

You can re-plant a forest, or restore a grassland, or clean a polluted river, or even restore some coral reefs

It is not easy or fast, and success is not guaranteed, and we are not yet conserving natural areas and processes adequately to ensure the future

But management and restoration are *not even possible* after the species are gone!





## What are the roles of conservation breeding?

- Securing populations of species that are not currently safe in nature
- Enlightening the people about the diversity and beauty and importance of species
- Providing wildlife resources for education and research

## Why do we have animals in our zoos and aquariums?

- Education about wildlife
- Entertainment, enjoying wondrous life
- Scientific research
- Conservation of species

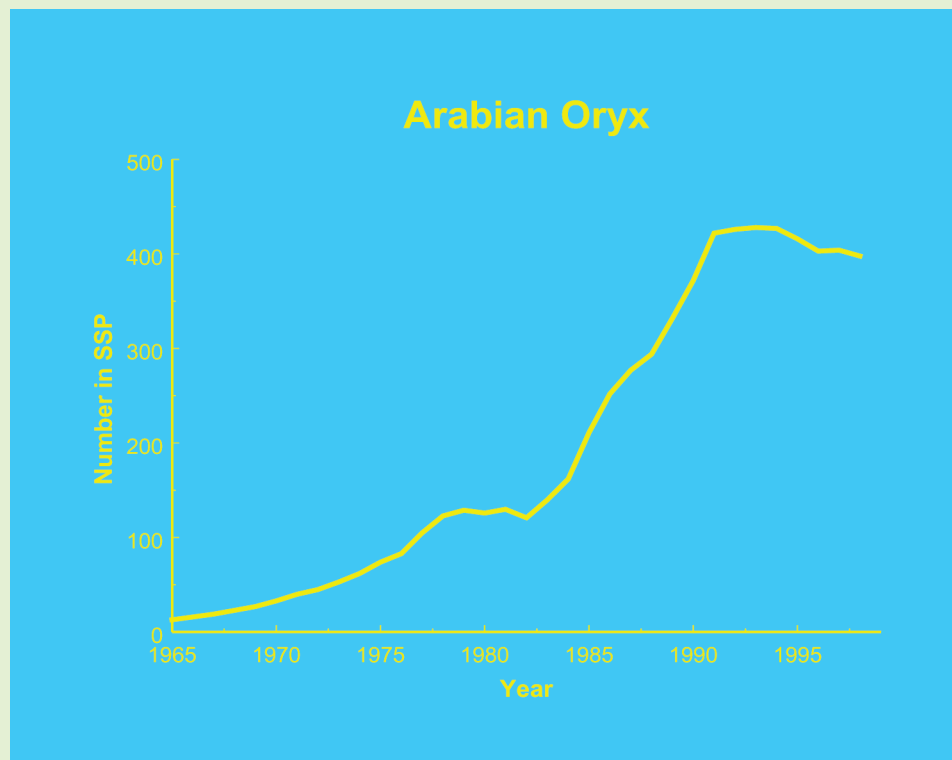
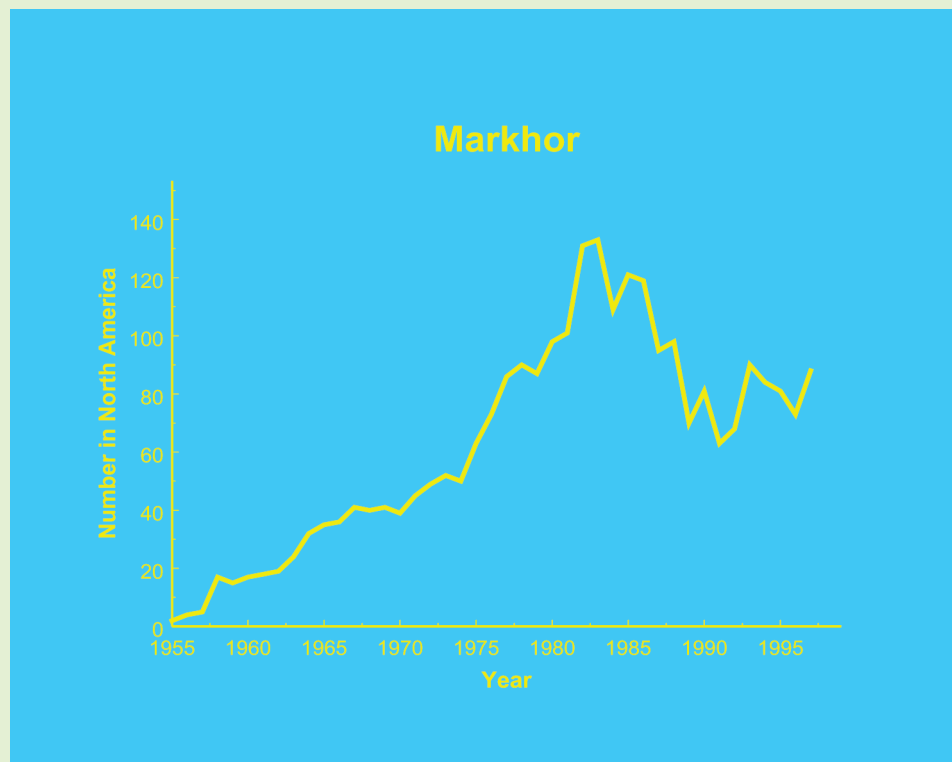
## Why do we have animals in our zoos and aquariums?

- Education about wildlife
- Entertainment, enjoying wondrous life
- Scientific research
- Conservation of species

All of these goals require caring for our animals as individuals *and* for the populations that continue across generations.

## Do Conservation Breeding Programs Work?





## Managed vs. Unmanaged

### Arabian oryx

- N = 13 in 1965
- N = 416 in 1995
- Stable
- 10 founders
- 92% gene diversity
- $N_e/N = 0.30$
- Mean Inbreeding=0.07

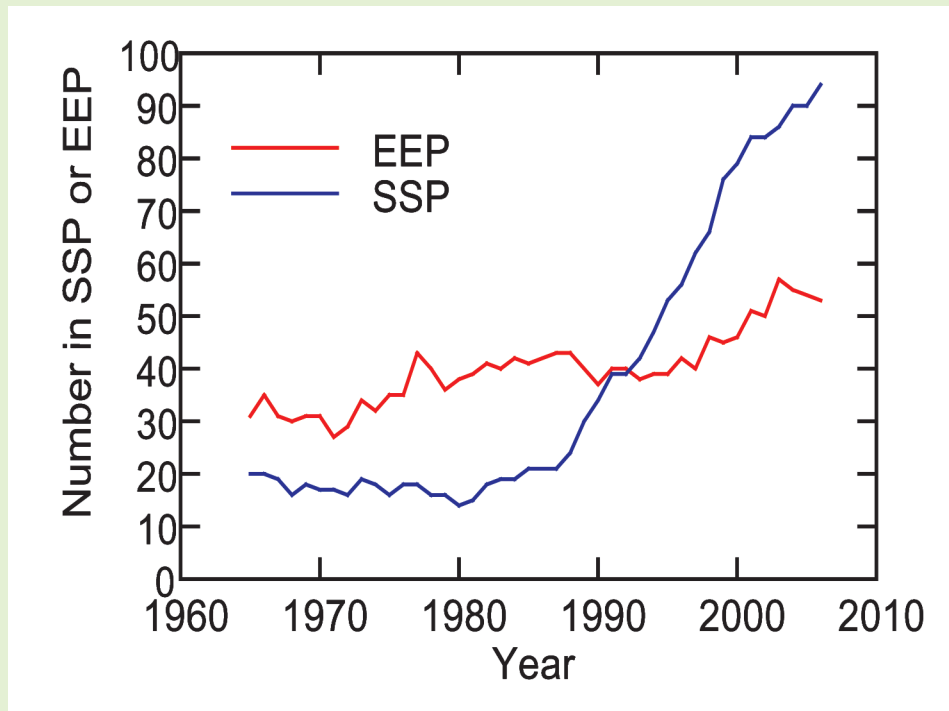
### Markhor

- N = 81 in 1995
- Unstable
- 11 founders
- 86% gene diversity
- $N_e/N = 0.07$
- Mean Inbreeding=0.19
- N = 35 in 1965

### Okapi

*Okapia johnstoni*





## Okapi trends since 1981

### SSP

- N = 15 to N = 94
- 8% annual growth
- 17% calf mortality
- No high inbreeding
- Almost all females used for maximum reproduction

### EEP

- N = 39 to N = 53
- 1% annual growth
- 33% calf mortality
- Some inbreeding
- Some females not used for breeding

## Loss of okapis in EEP

If Europe had SSP survival rates:

17% calf mortality, lower adult mortality, and better breeding

8% annual growth

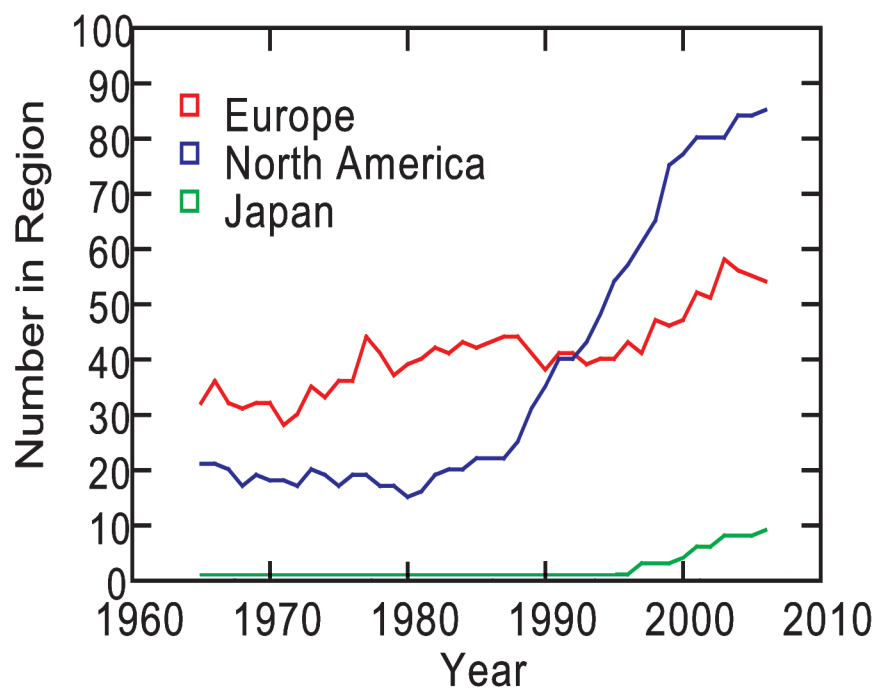
→ N = 243 in 2007

Compounded loss of 190 animals!

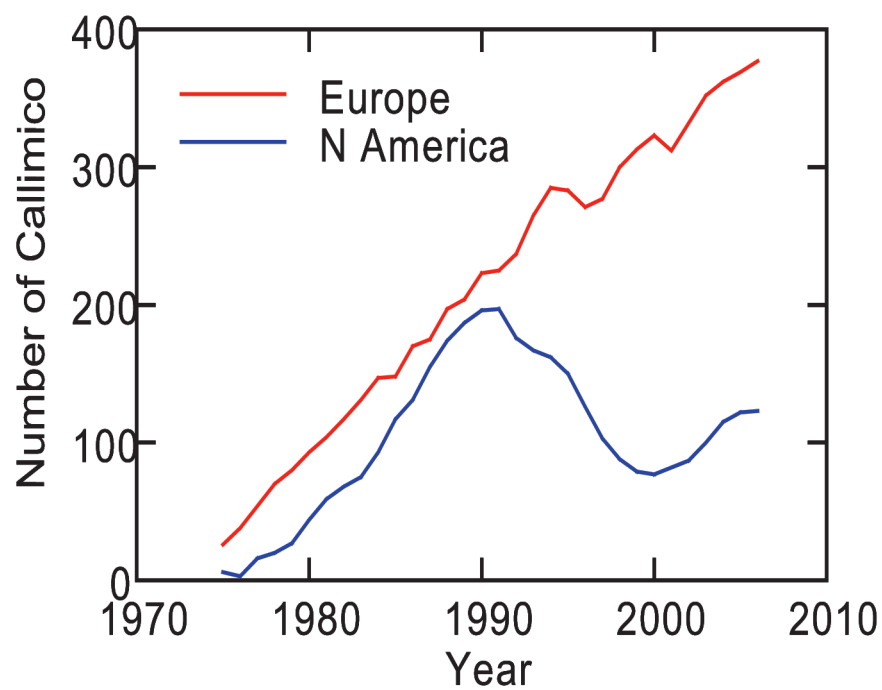
Lost financial value – very, very high!!

Fewer exhibits, fewer zoos with okapis!!!

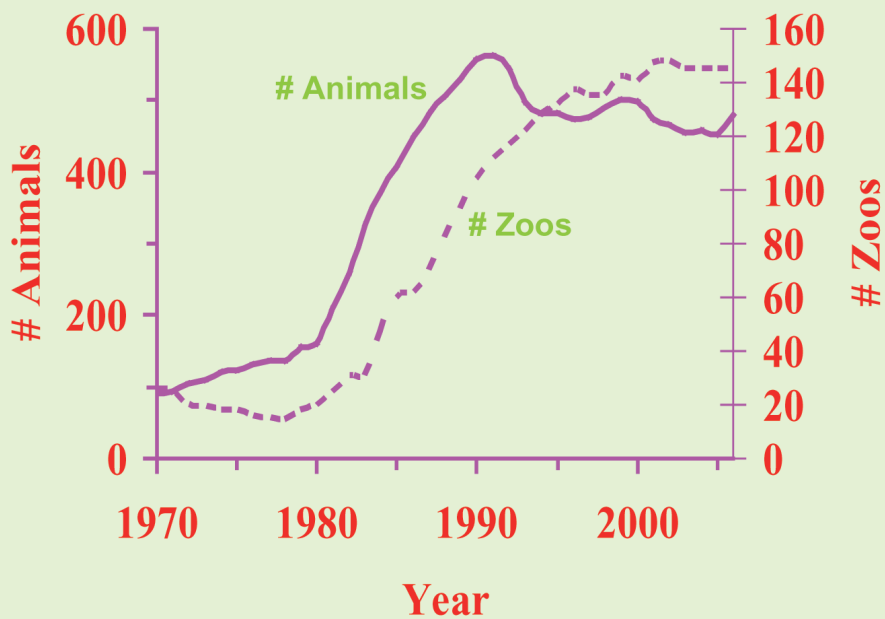
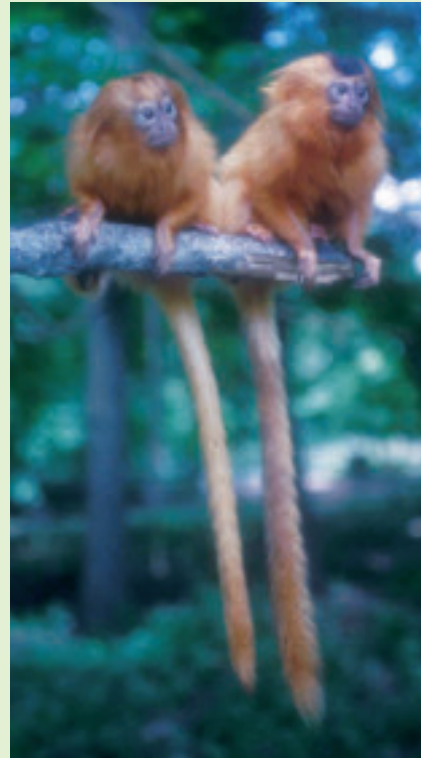
Fewer (no) animals available for export!!!!



*Callimico goeldii*  
Goeldi's monkey



Golden Lion Tamarin  
*Leontopithecus rosalia*



## Captive Breeding Program

Goal: Maintain 500 GLTs in captivity

- Research
- Reservoir
- Ambassadors/education



- 460 GLTs in 150 zoos all over the world
- 80 breeding pairs
- ALL GLT OWNED BY BRAZIL
- Managed globally

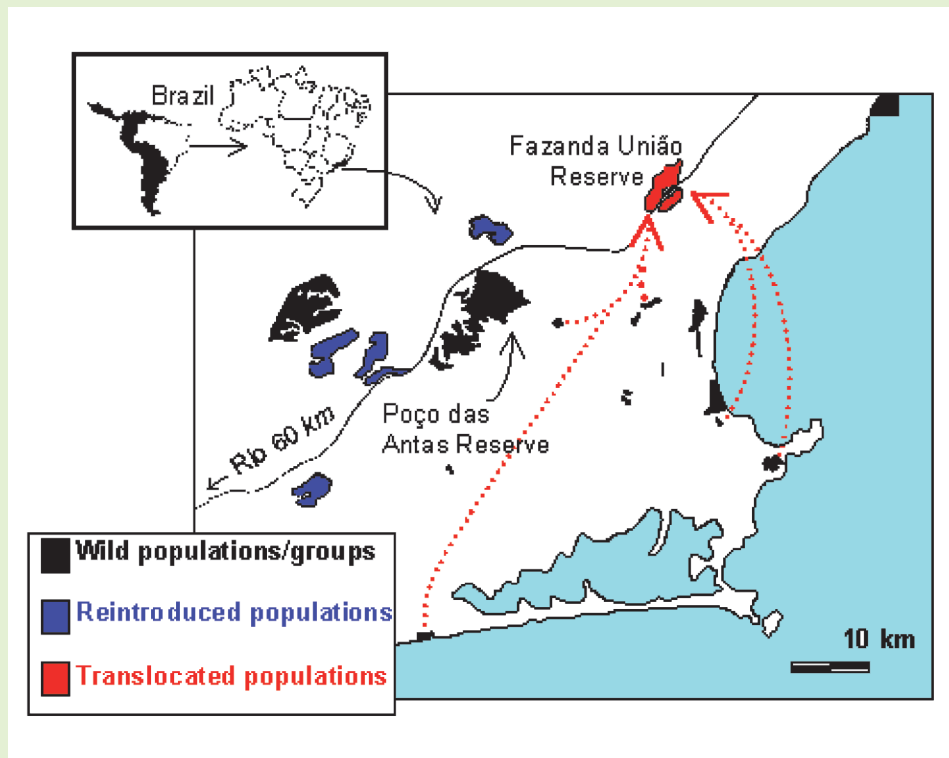


## Components of the GLT Conservation Program

*In situ*  
Golden Lion Tamarin Association

- Ecology Program
- Translocation Program
- Reintroduction Program
- Education





## The *order* of accomplishments

- Recognition of the critical need
- Assessment of the current situation
- Consolidation of enough zoo animals for research on husbandry and breeding
- Research on behavior, social needs, environmental needs, causes of death, etc.
- Maintenance of detailed records
- Development of a scientific and well-managed breeding program
- Development of international collaborations

### The *order* of accomplishments

- Creation of a management group, with involvement and leadership from Brazil
- Transfer of ownership of all captive animals to the Brazilian government
- Development of partnerships with field researchers studying the wild populations
- Research on methods to release animals to the wild successfully
- Experimental releases, with intensive monitoring, and refinement of methods

### The *order* of accomplishments

- Education programs for local communities
- Protection and restoration of habitat
- Ongoing fund-raising internationally
- Re-establishment of wild populations
- Monitoring of health and genetics of wild, with comparisons to captive
- Rescue of isolated animals from disappearing habitat; translocation to safety
- Cessation of releases, due to *success!*
- Programs underway for other tamarin species

## Some lessons learned ...

- Animals in zoos don't manage themselves
- It is useful to have friends
- It is costly and wasteful to *not* manage zoo populations carefully and cooperatively
- Animal population management gives us rewards – helping you do your job well
- Population management allows us to contribute effectively to species conservation
- It is a multi-step process, starting with good animal care

## What are the essential components of conservation breeding?

Genetic management

Data

Pedigree analysis

Access to animals

Planned pairings

Next generation

## But half of pairs refuse to breed!

Next generation  
 Animals ready for breeding  
 Behavior  
 Health  
 Nutrition  
 Environmental conditions



## How do we achieve success in conservation breeding?

- Identification and prioritisation of species
- Good facilities
- Good husbandry
  - Nutrition, behavior, social system, medical care
- Training for staff (and sometimes for animals)
- Data, Records systems
- Management plans
- Partners!

## We all succeed or no one does

- For large animals, no zoo has enough space, money, and other resources to keep a healthy population (250 tigers?)
- For small animals, you need too many animals to keep a stable population (2000 mice!)



## By working together ...

- Share knowledge and expertise
- Share data
- Share animals
- Share problems
- Share training programs
- Share success

## Many partners ...

- Central Zoo Authority
- Indian Zoo Directors Association
- SAZARC
- Other zoo associations
- ISIS
- CBSG and CBSG-South Asia
- Other IUCN Specialist Groups
- World Association of Zoos and Aquariums
- Universities
- Governmental wildlife agencies and NGOs

## Conservation Breeding is not ...

- Needed or useful for every species
- An endpoint in conservation
- Always an international program
- Expensive
- In conflict with good zoo management
- Unresponsive to local needs and skills
- Certain to work
- Easy
- Something that happens on its own

## Conservation Breeding is not ...

- Needed or useful for every species
- An endpoint in conservation
- Always an international program
- Expensive
- In conflict with good zoo management
- Certain to work
- Easy
- Something that happens on its own



## Conservation Breeding is ...

- Needed for *many* species
- A flexible approach to species conservation
- Efficient
- A way to meet your needs
- Proven to work in many species
- Something we know how to do
- Facilitated by available tools and expertise



## Managing populations for conservations breeding



Dr. Jonathan D Ballou  
Research Scientist, Smithsonian's National  
Zoological Park, Washington, USA

This presentation covers conservation breeding, why it should be done, science of population management & its requirement, steps wise progress, minimum size of population required for breeding, management strategies for success and constraints of population management in the zoos etc.





## What is “conservation breeding?”

“Conservation breeding is a species *conservation strategy*. It employs the *scientifically managed* breeding of threatened wildlife for creation and *maintenance of populations* that serve to enable, support, or enhance the conservation of *wild populations*.”

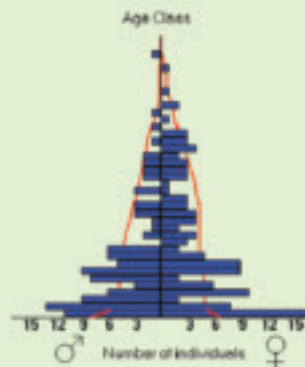
**Captive populations = *insurance***

## Good Insurance Policy = Viable Captive Populations



### 1. Demographically healthy

- Capable of producing a growing population
- Reproduction reliable
- Diseases understood, manageable
- Stable age structure



## 2. Genetically healthy

- High levels of genetic variation
- Low Inbreeding
- Being able to genetically manage the population so diversity can continue to be maintained
  - Knowing the pedigree
  - Having and using molecular genetic analysis to determine paternities
  - Making and following recommendations

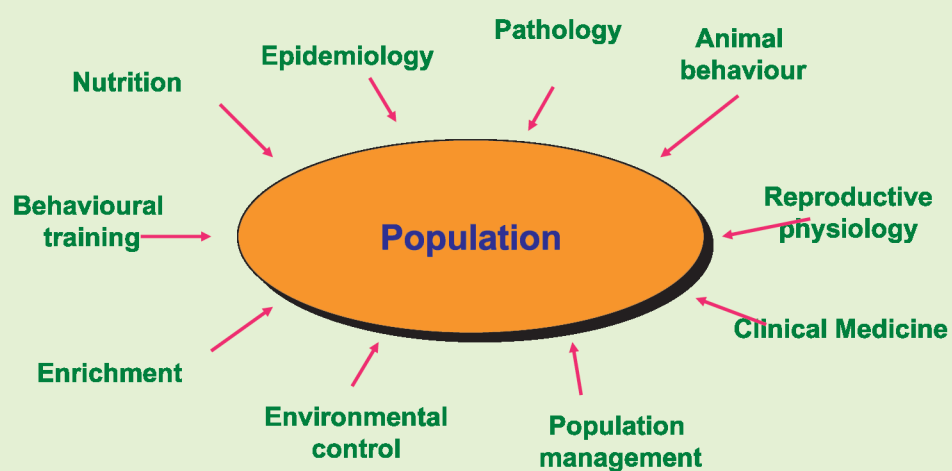
## 3. Capable of supplying suitable animals for a successful and sustainable reintroduction program, if needed

- Produce many animals for release
- Healthy and Disease free
- Reproductively capable
- Behaviorally capable
- Non-inbred
- Represent the genetic diversity of “wild” population, (not domesticated animals)
- IUCN guidelines: need a genetically managed population

*How do we achieve this? What needs to be in place?*

- **An Authority (Government, Zoo association)**
- **Organization: Prioritizing and Programs**
- **Infrastructure**
- **Information: Data and Record Systems**
- **Knowledge**
- **Action**

**Knowledge needed for Conservation Breeding**



## *Science of Population Management*

- **What is the population?**

## *Science of Population Management*

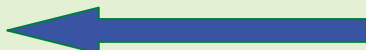
- **What is the population?**

**Define the population to be managed**

**Goal: know, individual-by-individual which animals constitute the managed population**

**What:**

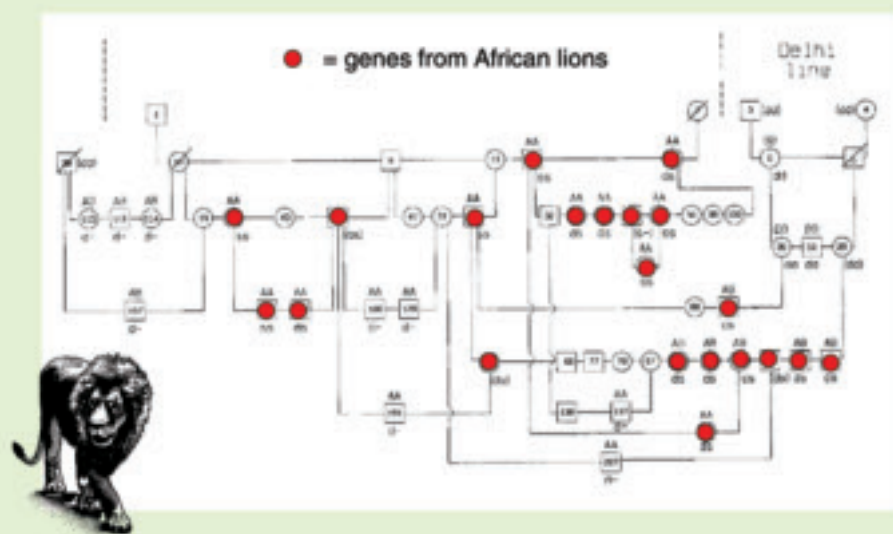
- **Countries?**
- **Associations?**
- **Institutions?**
- **Individuals?**



## Science of Population Management

Taxonomy understood?  
 Source and origin of animals?  
 Molecular genetics?

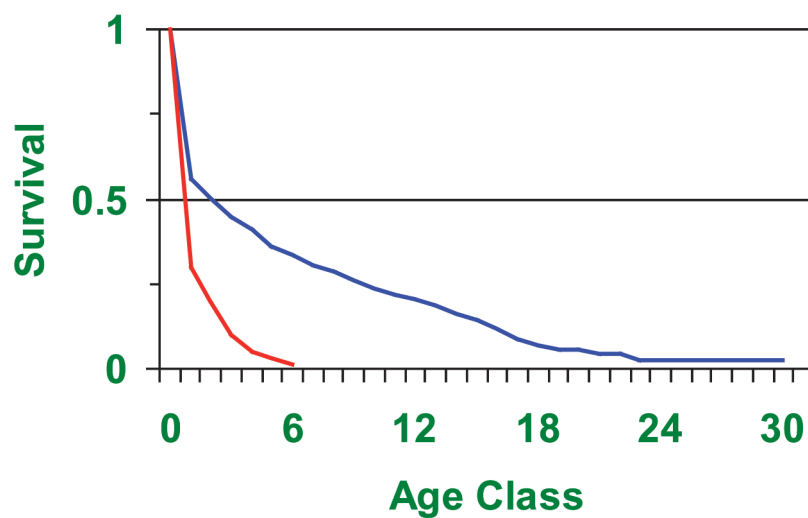
### Asian lion Species Survival Program



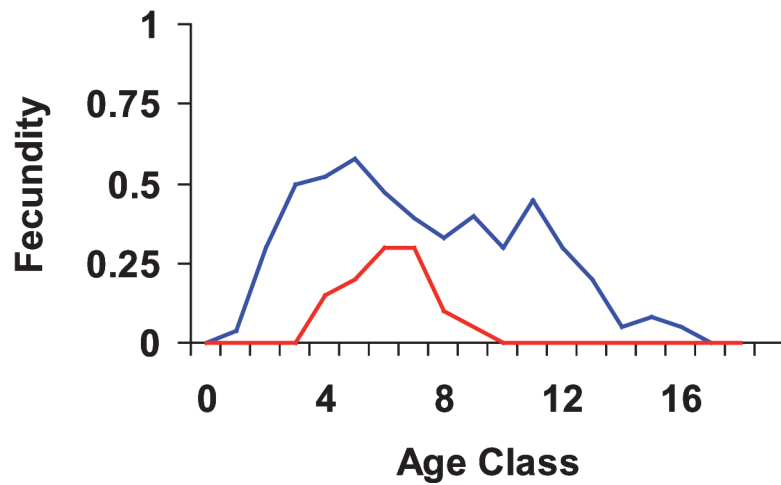
## Science of Population Management

- What is the population?
- What are its characteristics?

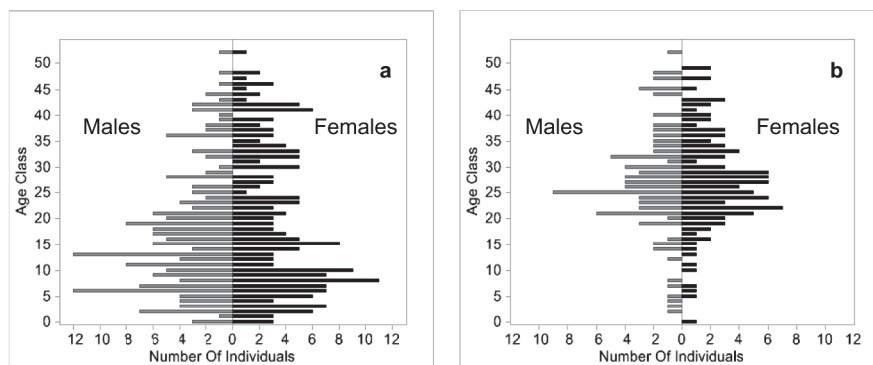
Demographics: Survival rates

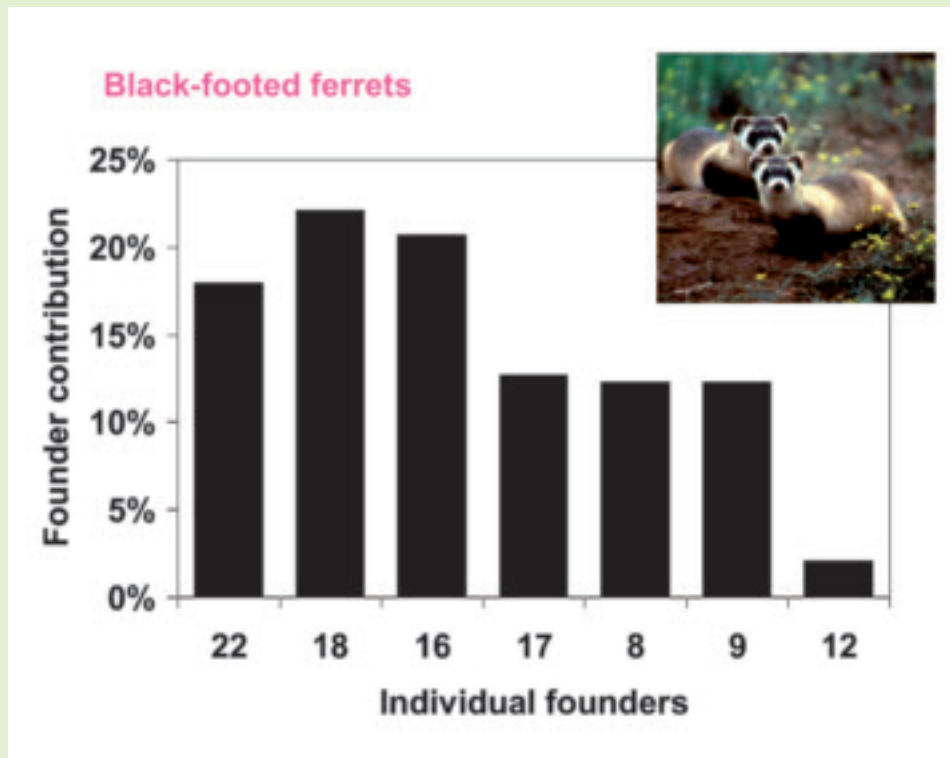
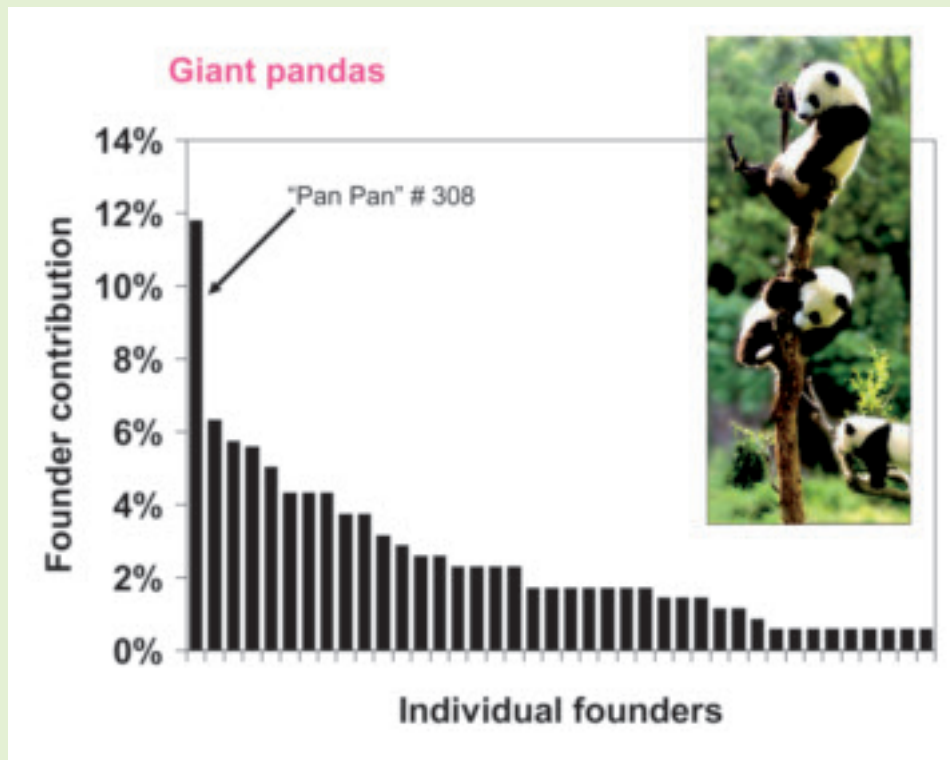


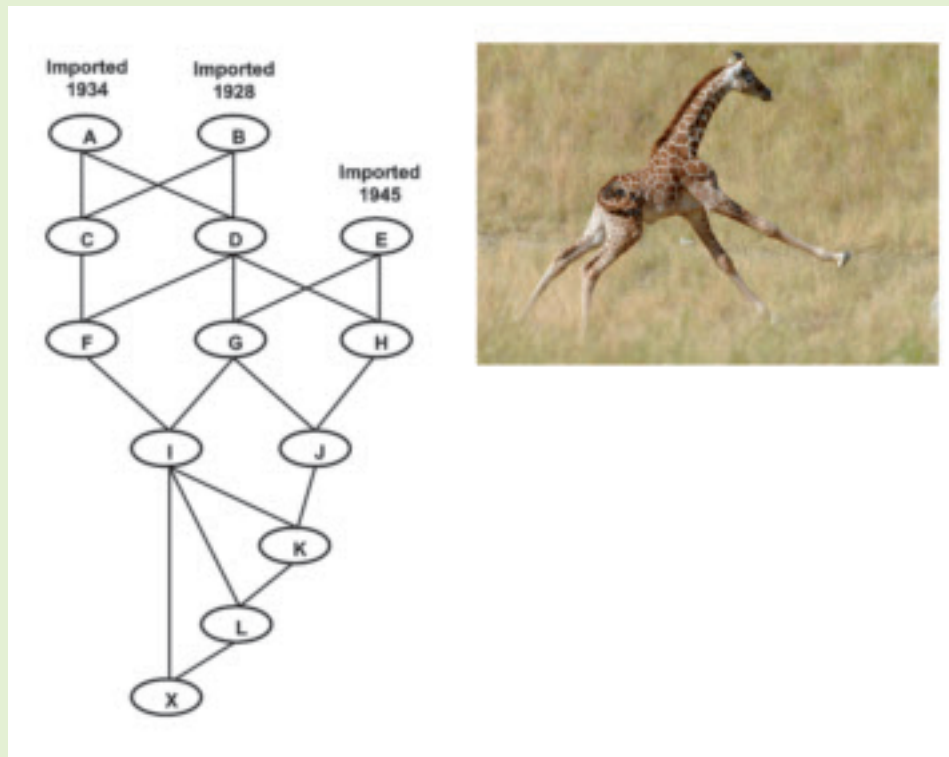
### Demographics: Reproduction



### Age Structure







## *Science of Population Management*

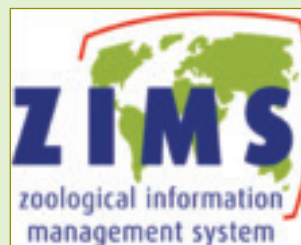
- **What is the population?**
- **What are its characteristics?**
- **Data & record keeping systems**

### ***Studbook: Standardized Pedigree Database***

---

---

- Unique ID Number
- Parentage
- Sex
- Date of birth/death
- Transfer dates and locations
- Identification number/name at sites
- Identifying marks, tattoos, bands, transponder
- Cause of death
- Carcass disposition
- Husbandry, medical, behavioral, rearing comments



### ***Science of Population Management***

- **What is the population?**
- **What are its characteristics?**
- **Record keeping systems in place**
- **Defined objectives**

*“Standard Objectives” of captive breeding programs*

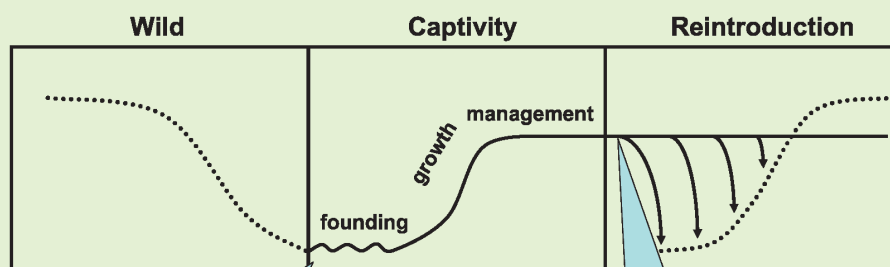
Establish and maintain populations of sufficient size to:

- 1) Maintain demographic stability
  - Self-sustaining
  - Supply needs of reintroduction program

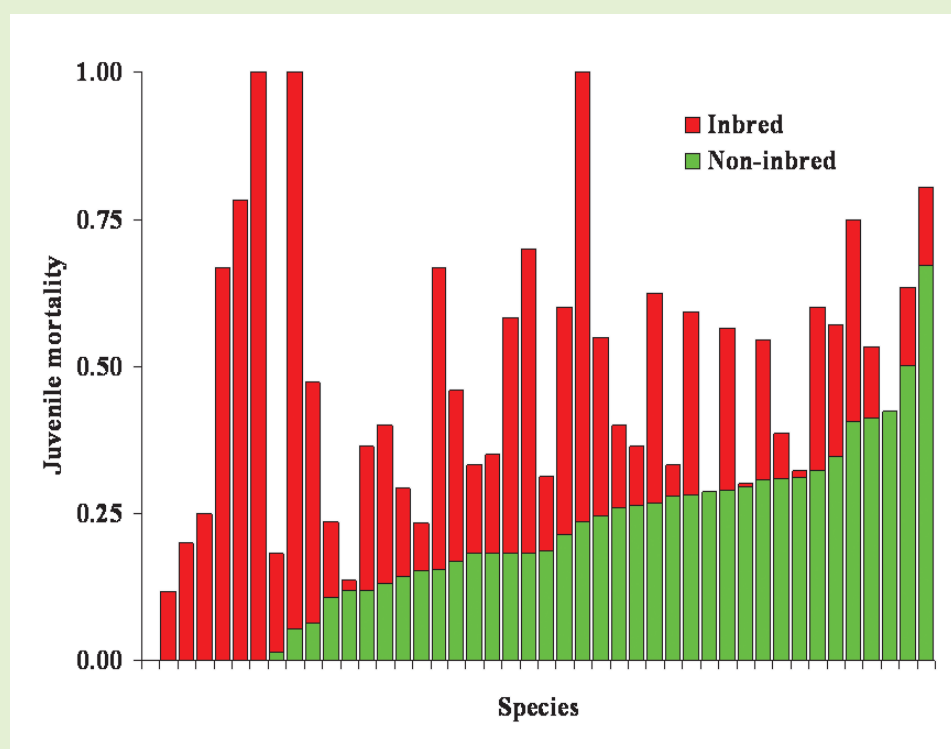


- 2) Retain 90% of the source gene diversity for 100 years

**Captive breeding and reintroduction programs**



Goal: whatever diversity brought from the wild to the captive environment  
 Minimize unwanted changes in captive environment (loss of genetic variation, adaptation to captivity, domestication)



## *Science of Population Management*

- What is the population?
- What are its characteristics?
- Record keeping systems in place
- Defined objectives
- Defined goals

**"Standard Objectives" of captive breeding programs**

Establish and maintain populations of sufficient size to:

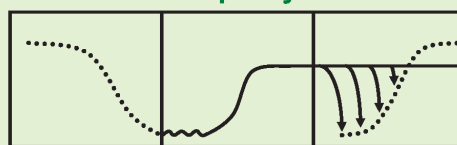
- 1) Maintain demographic stability
  - Self-sustaining
  - Supply needs of reintroduction program



- 2) Retain 90% of the source gene diversity for 100 years

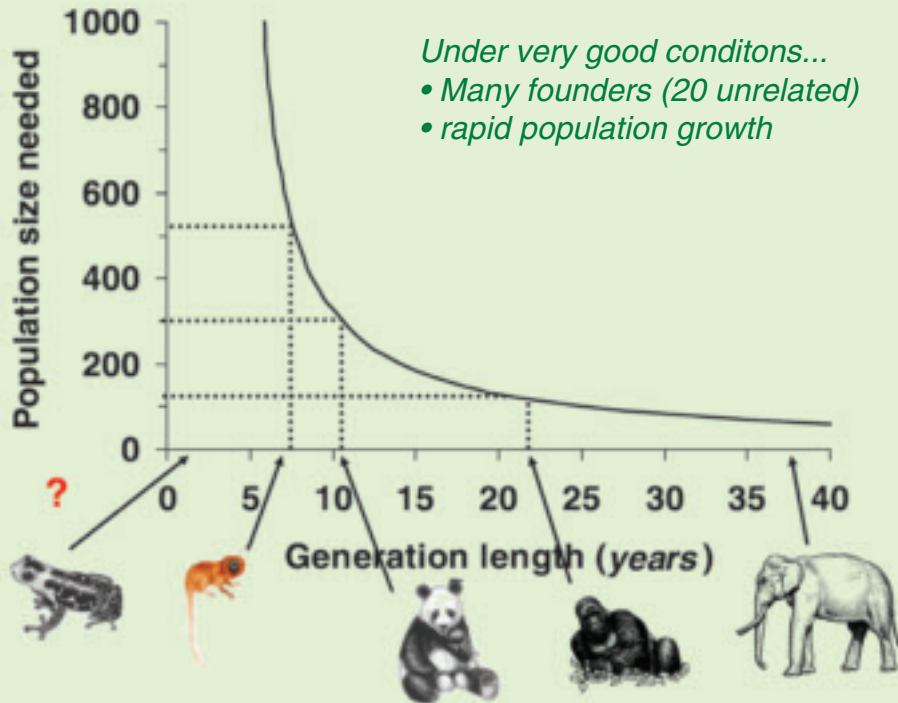
**What population size is needed?**

**Captivity**



Depends on:

- Number of founders
- Biology of the species
- How rapidly can the population grow?
- How well it is managed?

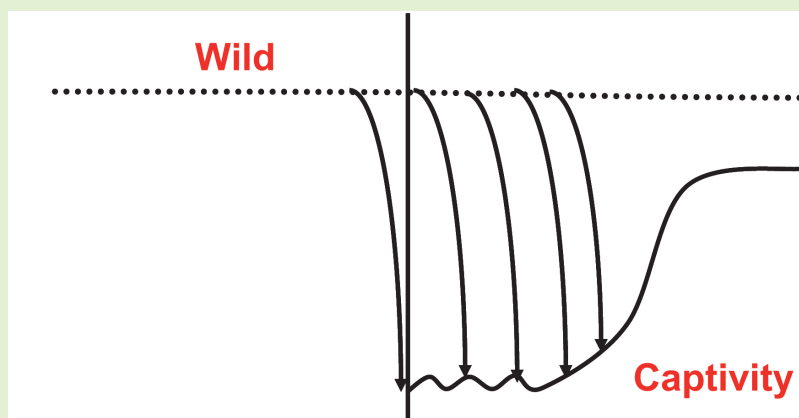


## Science of Population Management

- What is the population?
- What are its characteristics?
- Record keeping systems in place
- Defined objectives
- Defined goals
- Management strategies

## Management strategies for success

- Many founders ( 20+)
- Many zoos (regional, global)
- Demographic management
  - Maintain at target size
  - Only breed a proportion
  - Contraception
- Genetic management
  - Who gets to breed?
  - Determined by pedigree
- Trained population managers



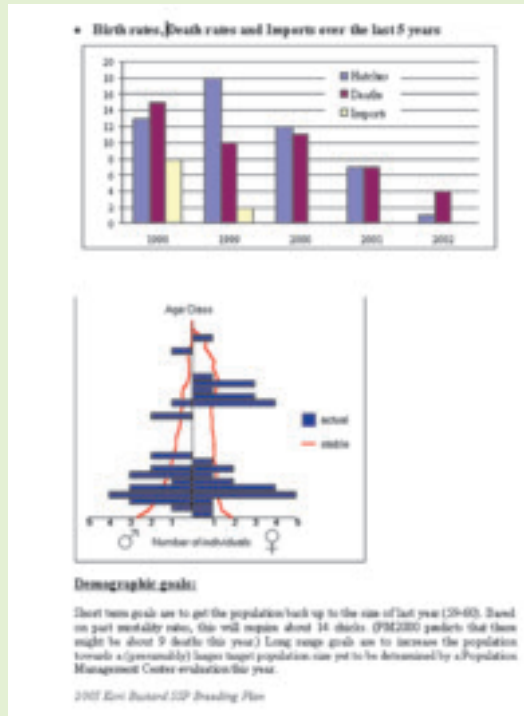
## Management strategies for success



- Many founders ( 20+)
- Many zoos (regional, global) =450 cages
- Demographic management
  - Maintain at target size
  - Only breed a proportion
  - Contraception
- Genetic management
  - Who gets to breed?
  - Determined by pedigree
- Trained population managers

**Masterplan:**  
Annual population analysis  
and recommendations





### 2003/Kori Bustard SSP Breeding Plan

Status: Living on 31 Dec 2002

Stud #	Sex	Hatch Date	Stud #	Dam	Location	Date	Local ID	Event
<b>ATLANTA - Zoo Atlanta, Atlanta, Georgia</b>								
544	M	8 Jun 2001	370	133	DALLAS ATLANTA	8 Jun 2001	01D912	Hatch
						23 May 2002	A20002	Transfer
547	M	29 Sep 2001	143	113	NZF-WASH ATLANTA	29 Sep 2001	214849	Hatch
						11 Aug 2002	A20020	Transfer
Totals: 2.0.0 (2)								

#### Recommendation for 2003

- Maintain males until females become available.

#### AUDUBON - Audubon Park Zoological Garden, New Orleans, Louisiana

139	F	~ 1986	WILD	WILD	AFRICAN	~ 1988	NONE	Capture
					GRND PRAI	~ 1988	23282	Transfer
					OMAHA	8 Dec 1988	5257	Transfer
					AUDUBON	28 Apr 1999	2550	Loan to
384	M	20 Sep 1997	66	80	PHOENIX AUDUBON	20 Sep 1997	8365	Hatch
						17 Jun 1998	2317	Transfer
400	F	22 Aug 1998	94	113	NZF-WASH AUDUBON	22 Aug 1998	214132	Hatch
						28 Apr 1999	2551	Loan to
437	M	28 Sep 1999	94	113	NZF-WASH AUDUBON	28 Sep 1999	214404	Hatch
						17 Oct 2000	100004	Loan to
Totals: 2.2.0 (4)								

#### Recommendation for 2003

- Send 139 to Miami Metrozoo for breeding with 66.
- Receive 438 from St.Catherine's and maintain flock as exhibit only.



## *Science of Population Management*

- What is the population?
- What are its characteristics?
- Record keeping systems in place
- Defined objectives
- Defined goals
- Management strategies
- Annual plan
- **Species Management Team**

## *Species management team*



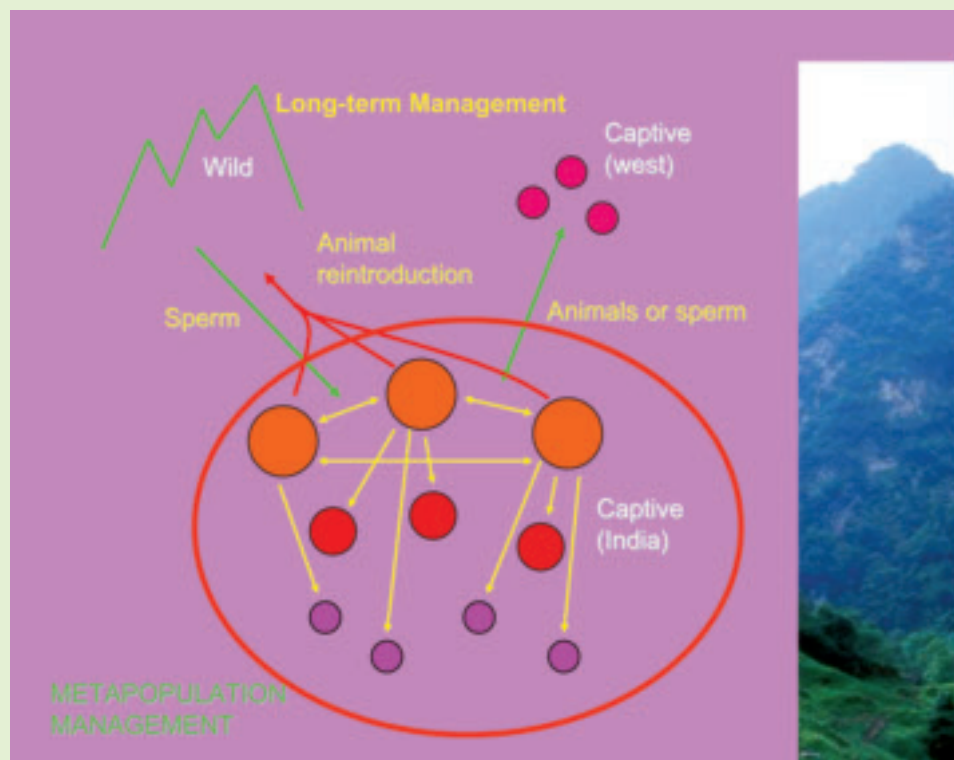
- **Ex-situ Species Manager**
  - Studbook keeper
  - Species coordinator

## *Science of Population Management*

- **What is the population?**
- **What are its characteristics?**
- **Record keeping systems in place**
- **Defined objectives**
- **Defined goals**
- **Management strategies**
- **Species Management Team**

## *How do we achieve this? What needs to be in place?*

- **An Authority (Government, Zoo association)**
- **Organization: Prioritizing and Programs**
- **Infrastructure**
- **Information: Data and Record Systems**
- **Knowledge**
- **Action**



## Self-sustaining

- Capable of maintaining/growing size without addition of wild-caught founders
- Want captive population “capable of supporting the wild population”
- NOT: captive population that relies on the wild population

## How do we achieve a viable captive population?

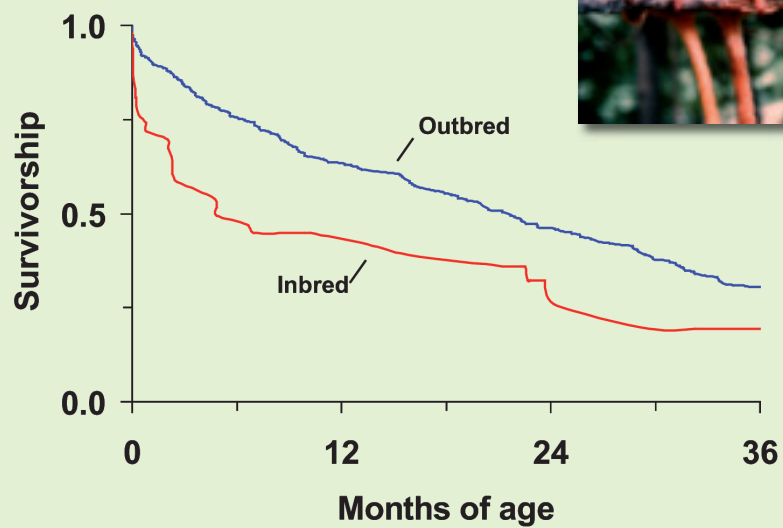
- Identification and prioritisation of species
- Good facilities
- Good husbandry
  - Nutrition, behavior, social system, medical care
- Training for staff (and sometimes for animals)
- Data, Records systems
- Management plans
- Partners!



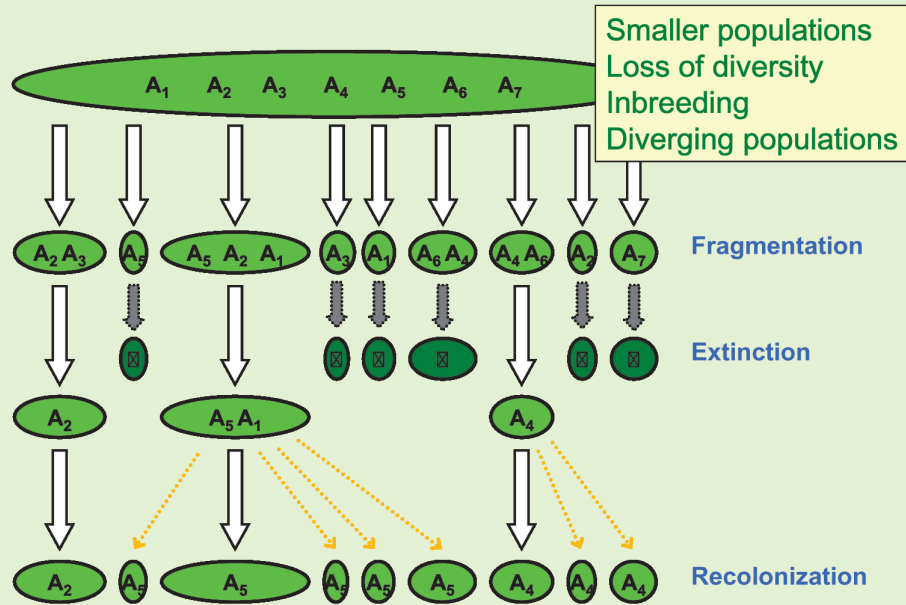
**Golden lion tamarin**  
*Leontopithecus rosalia*



**Inbreeding depression in wild golden lion tamarins**

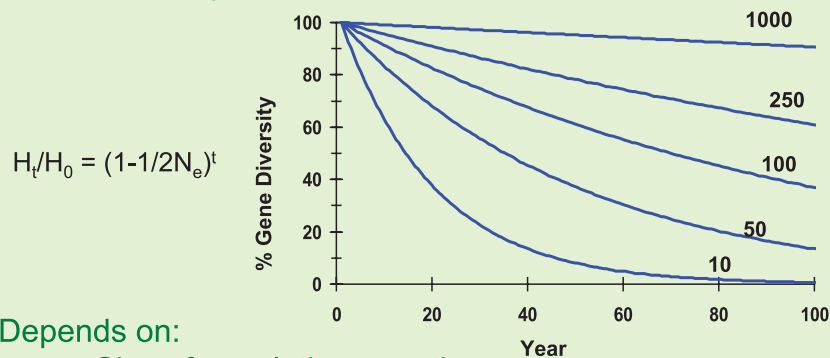


### Fragmentation and Genetics



### Problem:

Start with genetic representation brought in by the founders. Unless add new founders, it will be downhill for here... How quickly?



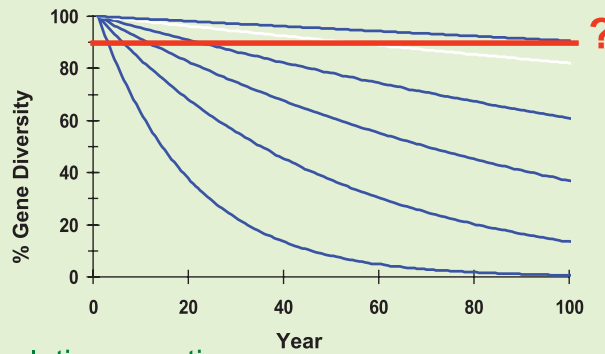
Depends on:

- Size of population over time
- How effectively managed (effective population size)
- Generation length

**Problem:**

Start with genetic representation brought in by the founders.  
 Unless add new founders, it will be downhill for here...  
 How quickly?

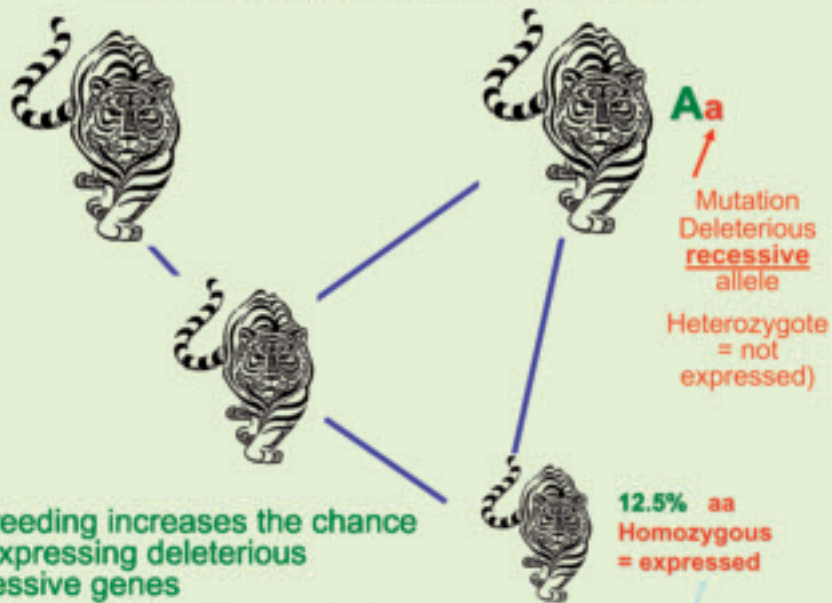
**Want 90%  
 at end of  
 100 years**



Depends on:

- Size of population over time
- How effectively managed (effective population size)
- Generation length

**Inbreeding: Father/Daughter**



# Conference Sessions

## **Conservation breeding- India's Initiative-**

**Dr. Brij Raj Sharma, IFS, Member Secretary, CZA (India)**

## **Zoo conservation in the Indian context-**

**Professor, Gordon McGregor Reid, President, WAZA**

## **Conservation breeding scenario of wild animal species in India and possibilities-**

**Shri S.K Patnaik, IFS Adl. Principal Chief Conservator of Forests & Chief Wildlife Warden (Retd.), Orissa, India**

## **Conservation breeding-A Global view-**

**Dr. Robert C Lacy, Chairman, Conservation Breeding Specialist Group**

## **Global cooperation in captive breeding-**

**Dr. Jonathan D Ballou  
Smithsonian's National Zoological park, Washington, USA**



## Conservation Breeding- India's Initiative



Dr. Brij Raj Sharma, IFS  
Member Secretary  
Central Zoo Authority (India)

Member secretary Central Zoo Authority presented the current scenario of wildlife conservation, wildlife legislation, adoption of zoo rules, national zoo policy and role of Central Zoo Authority in ex-situ conservation in India. He further elaborated conceptualization of conservation breeding programme, establishment of LaCONES, National studbook cell, joining of ZIMS by Indian zoos, and successive stages of conservation breeding and future vision.



## Conservation Breeding – India's Initiative



### India

- 328.7 million hec. of land mass i.e. 2.4% of world's total area
- 1027 million (2001 census) people and 500 million cattle.



## India's forests and biodiversity

77.47 million hec. of forest cover i.e. 23.57% of total land area with

- 350 species of mammals
  - 1224 of birds
  - 408 of reptiles
  - 197 of amphibians
  - 2546 of fishes
  - 57548 of insects &
  - 46284 species of plants
- form 8% of world's biodiversity



## People

- Love and respect for nature and natural resource is part of our tradition, our culture and our religions.
- What we had and still have is conserved not only because of our Governments, our legislation, our policy, but by the people, as they have that respect for nature and brotherly feeling for fellow living beings.



## Forest Policy

- The first regular forest policy statement in India was issued in 1894.
- After independence, a new National Forest Policy was enunciated in 1952.
- And finally replaced by the National Forest Policy of 1988.



## Forest Legislation

- Forest legislation in India dates back to 1865, which was later revised in 1878.
- Process continued till the currently application Indian Forest Act of 1927.
- The Forest (Conservation) Act was enacted in 1980 to check diversion of forest land to non-forestry activities.



## Wildlife Legislation

- The Wild Life (Protection) Act came into being in 1972 to give proper shape to wildlife conservation in the country.
- The Act has later been amended in 1982, 1986, 1991, 1993, 2003 and 2006 to make it more comprehensive.



## National Wildlife Action Plan

- The first National Wildlife Action Plan was adopted in 1983.
- Presently, the National Wildlife Action Plan (2002-2016) is in operation and is guiding in deciding the priorities for wildlife conservation.



## Constraints to wildlife conservation

Countless obstacles to conservation

- Severe biotic pressure
- Degradation of habitat
- Fragmentation of habitat
- Diversion of forest land for non-forest purpose.
- Illegal occupations/ encroachments
- Hunting/ poaching and many more.



## Needs

- There is an urgent need to conserve India's forests and wildlife.
- The Government of India has always been sensitive to this and has taken several initiatives towards preservation of forests and wildlife from time to time.



## In-situ wildlife conservation

606 Protected Areas comprising

- 96 National Parks
- 510 Wildlife Sanctuary

With overlapping of 28 tiger reserves and 25 Elephant Reserves cover an area of 15.159 million hec. i.e. 4.58% of total geographic area and/ or 22.12% of total forest area of the country.



## In-situ wildlife conservation

- Yes, all the efforts to protect the wildlife in its wild home are on.
- Stress on eco-system based conservation of wildlife.



## Ex-situ wildlife conservation

There are many wild animal species which are critically endangered may be because of

- Very specific/ special needs which are not available
  - Habitat loss
  - Over-harvesting, hunting, poaching etc.
- And are in need of outside help.



## Ex-situ wildlife Conservation

- The Government of India has always acknowledge it.
- The Indian Board for Wildlife (now National Board for Wildlife) in its very first meeting in 1952 made important recommendations in this regard.
- An Expert Committee on management of Zoos was set up by the Government of India in November, 1972 and its recommendation accepted in June, 1973, which still have relevance.



## Central Zoo Authority

- The Central Zoo Authority was established by the Government of India in the year 1992 through an amendment in the Wild Life (Protection) Act, 1972.
- Main objectives was to oversee the functioning of Zoos and enforce minimum standards and norms for upkeep and health care of animals in Indian Zoos and to provide them technical and other assistance for improvement.



## Central Zoo Authority

- The Central Zoo Authority is a twelve member statutory body headed by a chairman.
- Minister-in-charge, Forests and wildlife Government of India is presently ex-officio Chairman of the Authority.
- Member Secretary, Central Zoo Authority is the Chief Executive Officer of the Authority.



## The Regulation of Zoo Rules, 1992

- There are 51 prescribed standards and norms for zoos in India.
- The Rules prescribe, type of housing facilities, health care, hygiene, feeding and overall upkeep of the animals, the minimum number of trained personnel to be posted, visitor facilities and others.



## National Zoo Policy, 1998

- To give proper direction and thrust to the management of Zoos in the country, the National Zoo Policy was framed and adopted by Government of India in the year 1998.
- The main objective of the Zoos under the National Zoo Policy is to complement and strengthen the national efforts in conservation of rich biodiversity of the country, particularly, the wild fauna.



## National Zoo Policy, 1998

This objective can be achieved by zoos through the following protocol.

- Coordinated conservation breeding of critically endangered species in ex-situ conditions.
- Conservation education
- Research for conservation and if resources permit, to act as Rescue Centre.



## National Wildlife Action Plans

- The National Wildlife Action Plan, 1983 emphasized the role of ex-situ conservation in national conservation efforts.
- The National Wildlife Action Plan (2002-2016) also lays emphasis on the role of Zoos for ex-situ breeding of endangered species of wild fauna and their rehabilitation in the wild as per the IUCN guidelines for reintroduction.



- The **Central Zoo Authority** just after its establishment in 1992 formed an Expert Group for preparing a strategy for conservation breeding of endangered species in Indian Zoos.
- Species in need were identified, species co-ordinators made and responsibilities for maintenance of stud books were assigned.
- But because of many factors, not much could have been achieved, except few successes here and there.



## Efforts

- May be it was too early and we were not ready for it in 1992.
- Taking note of the past successes and failures, the issue was again taken up for discussions in the Central Zoo Authority in the year 2005.
- We have done lot of soul searching and homework on the issue in last three years.



## Initiative - Sub-Committee on Conservation Breeding

- A Five member Sub-Committee on Conservation Breeding was constituted in the Central Zoo Authority to prepare a concept paper for consideration by the Authority.
- The Chief Wild Life Wardens, in-situ wildlife managers were requested to propose the names of the wild animal species to be taken up under the programme.
- The Sub-Committee had four sittings and considered different proposals.



## Initiative – meetings with in-situ managers

- Many meetings with the Chief Wild Life Wardens, in-situ managers, zoo directors have been organized at Guwahati, Ooty, Ahmedabad, New Delhi to finalize the details.
- A concept paper has been prepared on ex-situ Conservation Breeding of endangered wild animals in India. The Central Zoo Authority has finally approved the draft in July, 2007.



## Initiative- Ex-situ Conservation Breeding

- The Zoos in India have been provided basic veterinary care facilities in the Zoos.
- Health Care Advisory Committees and mechanism for getting sophisticated diagnostic facilities and services from the local veterinary institutes/ hospitals have also been requested at the zoo level.
- A National Referral Centre has been established at Indian Veterinary Research Institute, Bareilly (UP) for providing super-speciality services and diagnostic facilities to the Zoos.



## Initiatives - LaCONES

- A Laboratory for Conservation of Endangered Species (LaCONES) for biotechnological interventions has been established at Hyderabad for doing genetic fingerprinting of the founder populations and others. The Laboratory is also working as frozen Zoo and is experimenting on assisted reproduction (AR) in wild animals including cloning.



## Initiative – National Studbook Cell

- All the founders under the breeding programme are being marked for identification by tagging, ringing or micro-chipping. The Wildlife Institute of India, Dehradun has been assigned the responsibility of training as well as assisting the zoos in preparing the animal history cards and National studbook/ herdbooks of all the identified species in the programme.
- We hope to come out with first compilation of National stud/ herd books of all the targetted species under one cover by the end of March, 2008.



## Initiative – Joining of ZIMS

- All the major Zoos (57 Nos.) in India are joining ZIMS/ ISIS. We are in the process of finalizing the details.
- These initiatives are to modify and equip the Zoos to take up this great responsibility.



## Objective

It is felt that the Indian Zoos have to have at least 100 properly bred and physically, genetically and behaviourally healthy individuals of all the identified wild animal species in captivity to

- Have proper captive stock for display
- As insurance cover in case population of the species collapses in the wild.
- Trail releases of the spill over stock in the wild for developing expertise.



## Objective

- And to bring in holistic development of Zoos in India to become centre, even nucleus which can compliment the national efforts in conservation of wildlife.
- And to infuse more technical and scientific culture in operation of zoos.
- And to change the general perception of zoos from being mere picnic spots, to extension of wildlife conservation activities.



## Ex-situ Conservation Breeding

- The conservation breeding programme in India is a joint venture of in-situ and ex-situ wildlife managers. It is a need based activity.
- The Chief Wild Life Wardens and Protected Area Managers have to identify the species which need immediate intervention in the form of ex-situ conservation breeding for the areas under their control.



## Ex-situ Conservation Breeding

- Wildlife Wings of the States/ Union Territories have to conduct time to time census of the targetted wild animals species and its related species in their areas to assess the status of the wild animals species, as well as to analyze the condition of its habitat.
- The in-situ wildlife managers need to identify the Protected Areas having/ had wild population of the proposed species/ re-introduction site.
- The in-situ managers also have to take corrective measures to address the cause of decline of the wild population of the targetted species in the natural habitat.



## Ex-situ Conservation Breeding

- Analyzing suitability of the wild habitat for the targetted species, its present condition, assessing the causes of earlier decline, inputs required for improvement of the habitat and its protection form major components of the programme.



## Ex-situ Conservation Breeding

- It is felt that critically endangered wild animal species with few hundreds/ thousands (or say 2500) left in the wild need to be taken up for ex-situ conservation breeding in the Zoos on immediate basis.
- Species with localized distribution should get preference in the scheme of things.



## Ex-situ Conservation Breeding

- The existing Zoos are the right places for the ex-situ conservation breeding programme as there is huge infrastructure and trained manpower available over there to deal with the issue.
- One major zoo just next to the natural habitat of the identified species and having expertise and infrastructure has been identified as co-ordinating zoo for each species.
- Two-four Zoos in the habitat range of the targetted species will take part in the breeding programme as participating Zoos.



## Ex-situ Conservation Breeding

- Conservation breeding facilities in the form of off-display conservation breeding centres (if the appropriate land is available in the Zoo compound) or in the form of satellite facilities are being created in co-ordinating Zoos.
- The other Zoos in the country in addition to the coordinating and participating Zoos may continue to display the species in the naturalistic enclosures, if available.



## Ex-situ Conservation Breeding

- The possibility of identifying at least 25 founders is being assessed from the existing captive stock in Indian Zoos. Efforts are being made to acquire suitable founders from Rescue Centres, foreign Zoos and even from wild.
- The target will be to have at least 250 physically, genetically and behaviourally healthy and identifiable individuals with animal history sheets of each targetted species in captivity in the world, of which at least 100 must be in India.



## Ex-situ Conservation Breeding

- The Central Zoo Authority will provide all possible technical, financial and other assistance to the zoos under the programme.
- The creation of appropriate animal housing facilities in the form of off-display conservation breeding centres/ satellite facilities along with the project office will be financed by the Central Zoo Authority on 100% basis.



## Ex-situ Conservation Breeding

- The Central Zoo Authority is also providing funds as Small-Grants Fellowships for engaging technical manpower for preparation of captive breeding management plans for the targetted species.
- The maintenance of the conservation breeding facilities will be the sole responsibility of the Zoo Operators/ State Governments.
- The Central Zoo Authority is also considering providing maintenance expenditure on off-display Conservation Breeding Centres in the coordinating Zoos.



## In-situ ex-situ linkage

- 90% zoos in India are controlled by the Chief Wild Life Wardens of States/ UTs.
  - The Chief Wild Life Wardens in the States/ UTs are also the controlling authorities of all the in-situ wildlife conservation areas.
- That makes the coordination between in-situ and ex-situ activities much easier.



## Species Recovery Plan

- The Government of India has lately realized that the wild animal species which are losing ground faster than general decline in the wild, may be because of loss of specific habitats, special needs, or over exploitation and have become critically endangered need special attention. More species specific approach than general ecosystem based management approach needed for these species.
- There are some such ongoing projects like Project Tiger, Project Elephant etc. in India to deal with such issues.



## Species Recovery Plan

- In the XI Five Year Plan (2007-2012), the Government of India has come up with a special scheme known as Species Recovery Plan (SRP) to deal with these wild animal species.
- Special efforts will be made for their recovery in the wild.
- Ex-situ conservation breeding in captive conditions and their later release/ re-introduction in the wild is a major component of the scheme.



## Species Recovery Plan

- For Asiatic lion, Snow leopard, Bustards, Vultures, Hangul, Dolphins are already in progress.
- More species may have to be taken up under the scheme in future.



## International Co-operation

- National/ international organizations, institutions, NGOs, related bodies and more importantly the Zoo dealing with and interested and invested in the wild animal species of Indian sub-continent are requested to contribute and be art of the programme.
- And we are over here to finalize and formalize such cooperation.



## International Co-operation

- **Conservation Breeding Specialist Group** of SSC/ IUCN with its regional offices is requested to please cooperate in this very ambitious project.
- Though we have not yet formally sent our request, the **World Association of Zoos and Aquariums** is also requested to allow and support the activity as part of Global Species Management Plan (GSMP) for conservation breeding



## International Co-operation

This formalizing and acceptance and joining at global platform will certainly help in

- Making zoos behave more responsibly.
- Making things more transparent.
- Making programme more appreciated by decision makers and opinion builders in India.
- Sharing of experiences, expertise and knowledge of the field easier.
- And not the least exchange and movement of animals to and from India possible.



- It may look like opening up of all the gates in one go or throwing all the Indian Zoos in the deeper side of the pool, but I am sure this is the best way to deal with and learn and succeed and we have the confidence, the conviction to correct and create it.
- We have been working on this for the last 3-4 years. Conceived it. I know conception is always enjoyable. It is the delivery which is painful. Me with all my Indian colleagues are ready for that pain.
- We are seeking co-operation and your presence over here is giving me the feeling of success.

# Thanks !



## Zoo conservation in the Indian context



Professor Gordon McGregor Reid  
President  
World Association of Zoos & Aquariums

Prof. Gordon Reid highlighted the challenges being faced by India for ex-situ and in-situ wildlife conservation and India's natural advantages in achieving conservation breeding, integrated with conservation outreach.



## Zoo Conservation in the Indian Context



### This talk will cover:

- Zoo conservation ... what is it?
- India's conservation challenges
- India's natural advantages in achieving conservation breeding, integrated with conservation outreach

## Conservation ... what is it?

*Conservation is actions that enhance the survival of species and habitats, whether in nature (in situ) or outside the natural habitat (ex situ) including in zoos and aquariums*



## Conserving meta-populations

Increasingly we need to look at the global populations of India's animals, including in zoos



# INDIA'S CONSERVATION CHALLENGES

## Conservation links to population growth



## Conservation links to agricultural and forest-related change



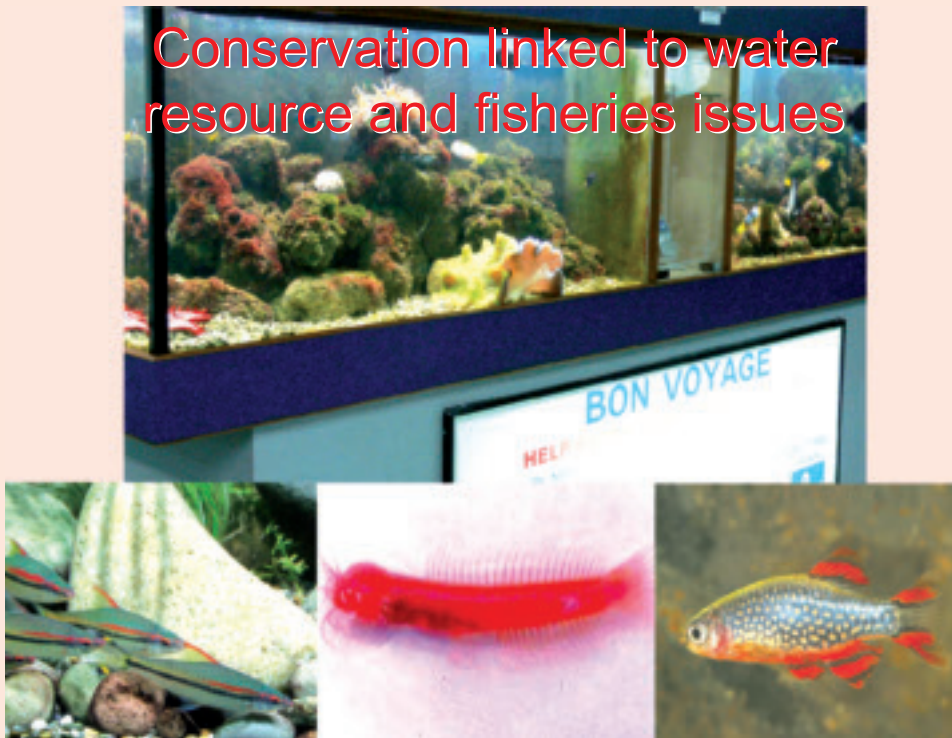
## Conservation links to habitat fragmentation



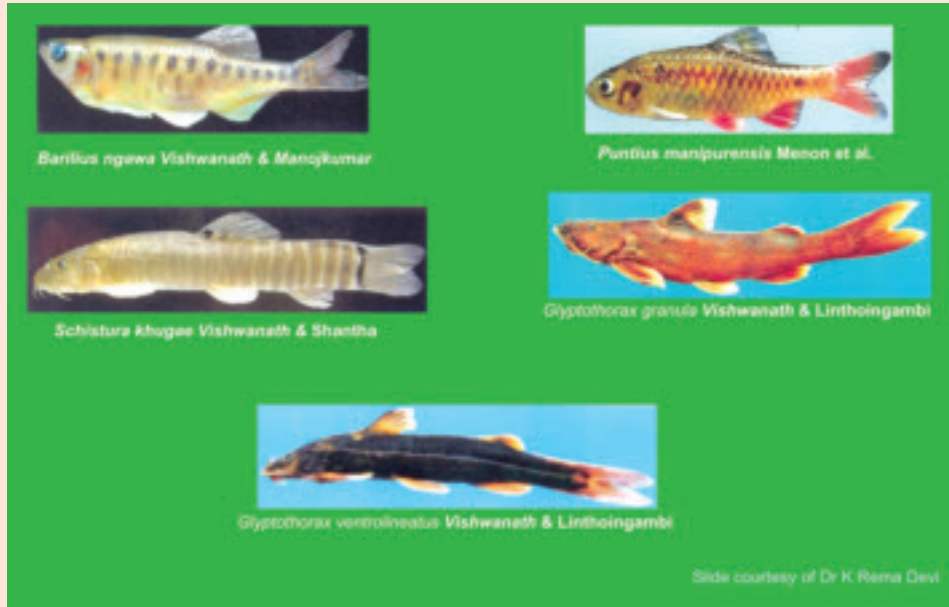
## Conservation linked to water resource and fisheries issues



## Conservation linked to water resource and fisheries issues



## Some new discoveries from North East India



## Conservation links to poaching and illegal animal trade



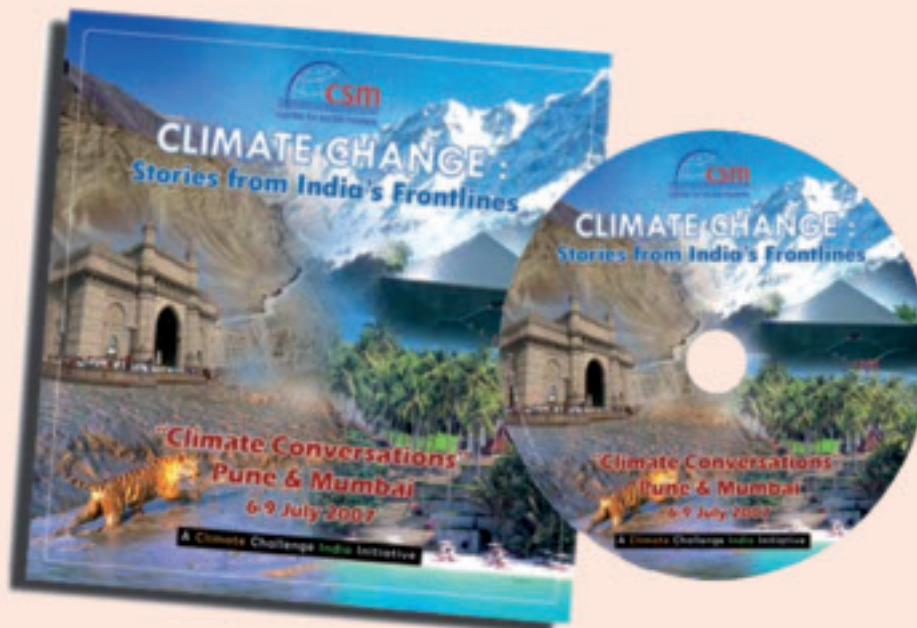
## Conservation links to poaching and illegal animal trade



## Conservation links to conflict between people and animals



## Conservation links to sustainability



## Conservation links to sustainability



## INTEGRATED ZOO CONSERVATION

## INDIA'S NATURAL ADVANTAGES



## India's natural advantages World heritage of biodiversity



## India's natural advantages Long, historical traditions in natural history



J  
O  
U  
R  
N  
A  
L

# India's natural advantages

## Long, historical traditions in natural history



JOURNAL

# India's natural advantages

## Long, historical traditions in animal care





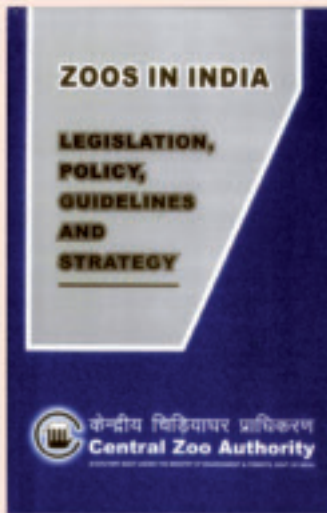
## India's natural advantages

Strong public support for zoos



## India's natural advantages

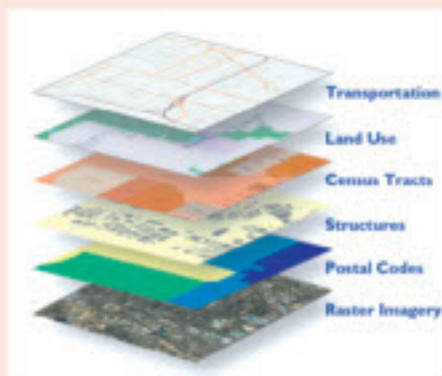
Strong legislative policy for zoos

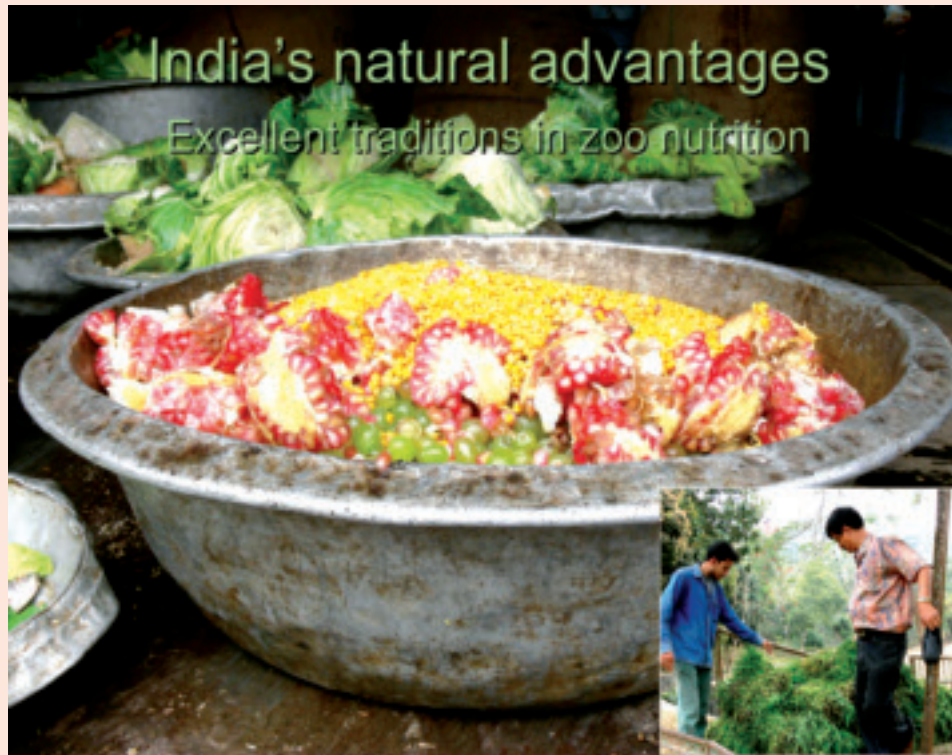


केन्द्रीय चिड़ियाघर प्राधिकरण (भारत)  
**CENTRAL ZOO AUTHORITY (INDIA)**

## India's natural advantages

Strong scientific, veterinary, wildlife and information technology traditions





## India's natural advantages

Strong traditions  
in zoo  
master planning

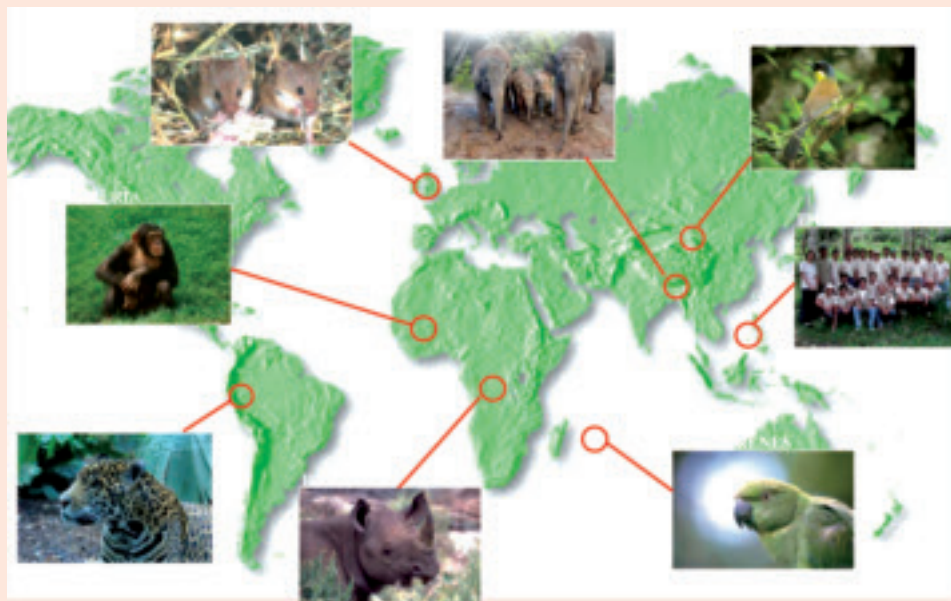


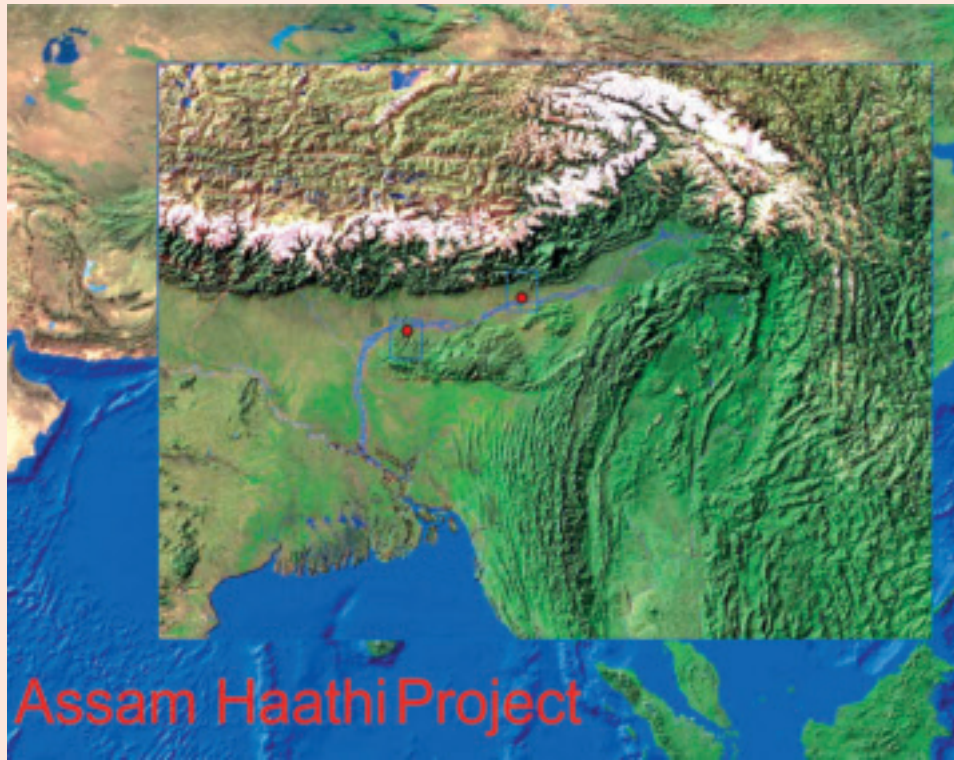


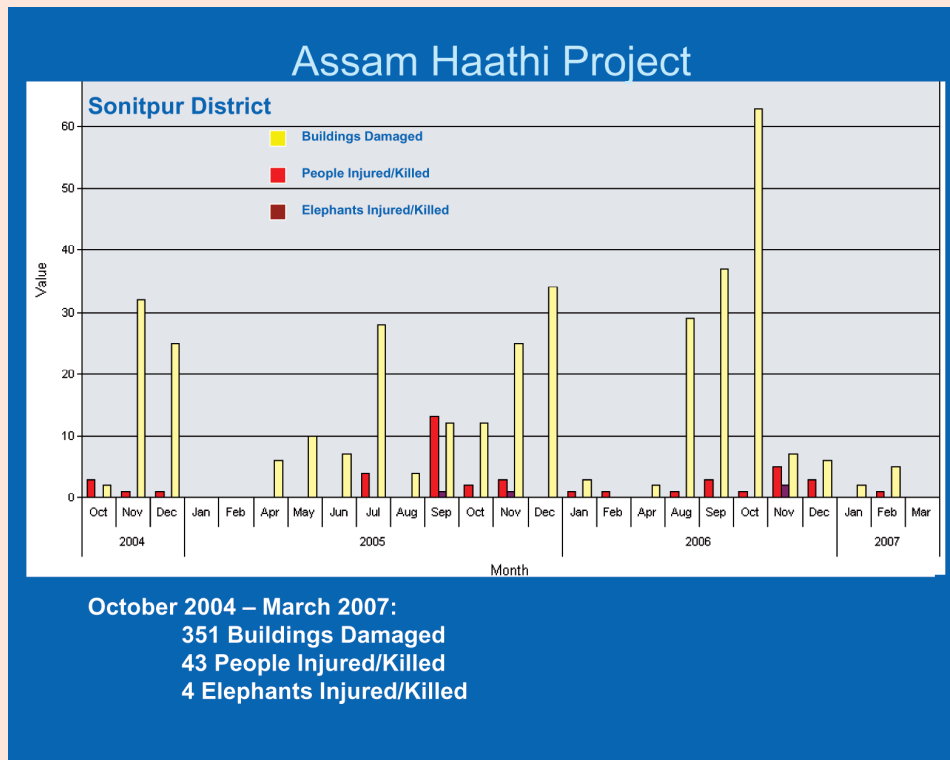
**India's natural advantages**  
Strong traditions in partnering zoos with  
wildlife organisations



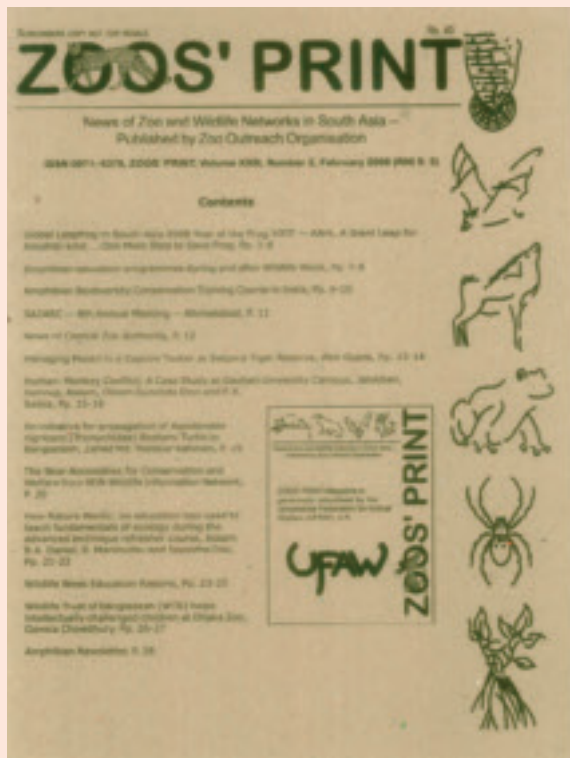
**Assam Haathi Project: zoo/wildlife  
agency cooperation**











India's natural advantages

Strong national association, linked to IUCN Conservation Breeding Specialist Group







## India's natural advantages

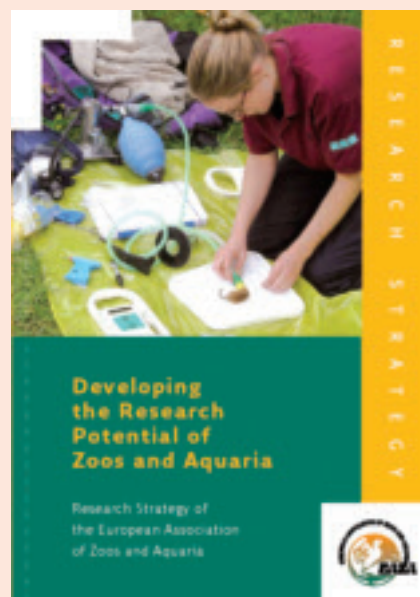
Member of strong world association





## World Zoo & Aquarium Conservation Strategy

Other regional supporting documents, e.g. EAZA Research Strategy





## WAZA & SAZARC conserving frogs

Powerful global Amphibian Ark initiative  
linking WAZA/CBSG/ASG & SAZARC



## Summary

### India

- has a world heritage of animals and plants
- but faces many conservation challenges
- it has many historical and contemporary advantages in addressing these ...
- including an excellent government framework for zoo conservation plus ...
- CZA, ZOO, SAZARC and global friends!



## Conservation breeding scenario of wild animal species in India and possibilities



Shri S.K Patnaik, IFS  
Adl. Principal Chief Conservator of  
Forests & Chief Wildlife Warden (Retd.)  
Orissa India

This presentation highlighted the sequence of events happened in ex-citu conservation breeding programme, initiative taken by Central Zoo Authority and the status of ongoing conservation breeding programme of Rhino, Asiatic lion, Indian tiger, Snow leopard, Indian tiger, Lion tailed macaque, Red panda, Pygmy hog, Western tragopan, Vultures and Red jungle fowl etc.



## Conservation Breeding Scenario of Wild Animal Species in India and Possibilities

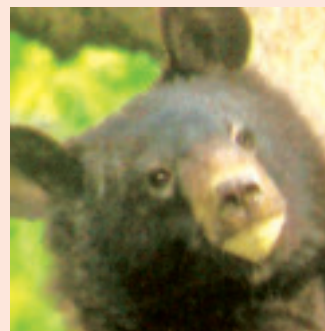


### INDIA

- Geographical area – 3.287 m.sq.kms. (2.4% of world)
- Forest cover – 0.637 m.sq.kms. (19.39% of land)

### Protected Areas:

- Sanctuaries & N.P. – 586
- Tiger Reserves – 36
- Elephant Reserves – 25
- Biosphere Reserves – 10
- Ramsar sites – 25
- World Heritage sites - 5



**Biological Diversity**

- 1,26,000 species (known to science) – 7.36% of world 6<sup>th</sup> among 12 mega diversity regions
- Mammals – 350
- Birds – 1224
- Reptiles – 408
- Amphibians – 197
- Fishes – 2546
- Rest of organisms – 1,00,000 species

**Percentage of World population of some endangered mega fauna:**

- Elephants – 65%
- Tigers – 40%
- One horned rhinos – 85%

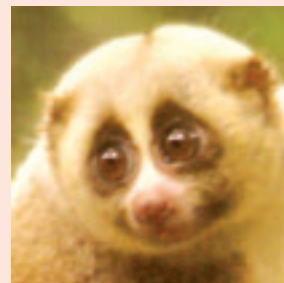


- But human pressures from more than 1 billion people and 0.5 billion livestock threaten existence of this vast diversity
- Though there were several legislation to save our forests and wildlife in the past, the first comprehensive very strong legislation. 'The Wildlife (Protection) Act, 1972' was enacted in 1972 and amended several times to encompass all aspects of wildlife conservation including zoos.



**Sequence of Events:**

- Recommendation of ex-situ conservation – IBWL (1952)
- Setting up Expert Committee – 1972 (Report 1973)
- Establishment of Wildlife Institute of India - 1982
- National Wildlife Action Plan – 1983 (Reiterated ex-situ conservation)
- Central Zoo Authority – 1992
- National zoo policy – Adopted in 1998
- Identification of 63 species
- Chief Wildlife Wardens of range states as coordinators
- Did not make head way due to varied ownership of zoos
- National Wildlife Action Plan – 2002-16 – breeding rehabilitation – IUCN guidelines
- CZA meeting – 27<sup>th</sup> January 2005 formation of sub-committee
- 5 member sub-committee formed
- 5 member recommended on 24<sup>th</sup> July 2005
- CZA accepted on 19<sup>th</sup> July 2005

**The accepted recommendation are:**

- Continuation of breeding programme of snow leopard, red panda, piggy log & Asiatic lion as at present.
- Others can be taken up in consultation of the state governments and where facilities are available
- Wildlife Institute of India to maintain stud books
- 100% funding by CZA
- Collaboration with national / international associations and individuals



**Strategy:**

- Joint venture of in-situ and ex-situ managers
- Identification of species needing intervention – CWLW
- Regular census to ascertain status in wild
- Identify P.A. for re-introduction
- Corrective measures against decline / extinction
- Identification of 2-4 zoos with off display facilities
- Preference for very small number in wild
- Preference for localized species
- Identification of about 25 founders / assistance from foreign zoos / acquisition from wild

**Initiatives taken by CZA:**

- Improvement of veterinary and referral facilities associating various institutes / universities
- Scientific studies on different areas of zoo management
- Small grant fellowships
- Annual award for innovative work
- Assisted reproduction
- Conservation education (zoo education master plan training)
- Up gradation of professional skill



**Conservation Breeding Programmes Crocodiles (FAO – 1975)****Gharial:**

- Male gharial brought from Frankfurt on breeding loan
- Mated with local females at Nandankanan in large 1,80,000 ltrs pool
- Off-springs for the first time in captive breeding in 1980

**Mugger & Eutuarine Crocodile:**

- Several conservation and research centres were established in different parts of the country
- A training center was set up for training forest officers is crocodile conservation and wildlife management was set up at Hyderabad

**Asiatic Lion:**

- The species is critically endangered with slightly above 350 animals in the wild in Gir forests of Gujarat. Total population including captive ones is less than 480.
- Chennai, Ahmedabad, Kanpur and Bhopal were initially selected and 14 animals transferred there from Junagarh zoo.
- 19 animals were transferred to other zoos from Junagarh.
- There are 186 births (1995 to 2003) of which 143 in Junagarh.
- Maximum mortality reported between 0-6 months.
- Off display facility supported by CZA in Junagarh.
- Kuno sanctuary (M.P.) proposed for re-introduction.



**Indian Tiger:**

- Tiger received attention with creation of 'Project Tiger' in 1973.
- Recent status survey has placed the number at 1411 only.
- Director, Nandankanan (S. K. Patnaik) was nominated as National Coordinator.
- 29 wild caught tigers identified and many micro-chipped.
- Few transfers took place for meeting with CZA assistance.
- It could not proceed further.
- This programme was discontinued in 2005.

**Snow Leopard:**

- Darjeeling Zoo in an ideal setting started breeding since 1983.
- Conceptualization by Ms. Helen Freman.
- Pair of unrelated leopards brought from Zurich Zoo in 1986.
- Another pair came from U.S. in 1989.
- 2 female cubs born in 1989.
- 2 female (wild) rescued from J&K in 2000.
- So far 40 births.
- Transferred to Shimla, Nainital & Gangtok to have 4-5 captive population.



**Lion – tailed macaque:**

- Considering proximity to its home range, Chennai, Mysore and Thiruvanthapuram zoo were selected for initiating breeding programme (40 animals).
- Director, Chennai zoo is the coordinator.
- Technical support by Dr. Mawa Singh and Dr. Ajith Kumar.
- Decided to augment the number with young females (25-30) from other zoos.
- 13 animals proposed to be brought from San Dingo Zoo.

**Red Panda:**

- Initiated in Darjeeling zoo with (1:3 animals) in 1989 as a part of Global Captive Breeding Master Plan.
- A male was brought from Rotterdam in 1983.
- First successful breeding 1994 (2 cubs).
- 2:1 animals came from Europe in 1994.
- 3 more animals added between 94 to 96.
- 40 births in last 10 years in Darjeeling.
- Pair sent to Gangtok zoo have started breeding
- Re-introduction to the wild has started



**Pigmy Hog:**

- There are less than 150 individuals in the Himalayan foot hills of north east India (Manas and Bamadi).
- Programme started in 1996 at Basistha (Guwahati) in collaboration with IUCN/SSC Pigs picarius, Hippo Specialist Group, Durrel Wildlife Protection Trust, MoEF, Forest Department, Assam.
- From 6 animals from Manas it has reached 75 - the only captive population in the world.
- Grass land restoration is part of the programme.
- Second centre is planned as security.

**Western Tragopan:**

- Conservation breeding of the species started with support from World Pheasant Association in Sarahan.
- 2 officers trained in Downlands Pheasantry, U.K.
- CZA supported proper enclosure.
- No death after training in U.K. and W.P.A.
- Breeding started with one pair of birds (2004).
- 4 chicks born in 2005 (2 surviving).



**Red Jungle Fowl:**

- This programme started after doubts were expressed regarding purity of red jungle fowl.
- Through cross reference with preserved specimens it was found that the zoo specimens phenotypically represent them.
- Programme started in 2001 in Delhi zoo with support from WPA & CZA.
- They were kept segregated from other fowls.
- Present population is 25 from 5 founders.
- Mormi in Haryana has also succeeded.
- Soft release has been done.

**Vulture:**

- 3 Indian species (*Gyps bengalensis*, *G. indicus*, *G. tencirostris*) population crashed by 90% in 1990.
- Conservation centre started in Pinjore, Haryana (BNHS, Birdlife International, Royal Society for protection of birds, London Zoological Society, Forest Department helped).
- Center has taken action to procure sufficient founders.
- Target release of 100 pairs of each species in next 15 years.
- CZA supported off display facilities at Bhopal, Bhubaneswar, Hyderabad and Junagarh.



- In all 63 endangered species have been identified for conservation breeding in Indian zoos.
- There are many small animals which go unnoticed and threats to their habitats is increasing due to urbanization and other reasons.
- Some examples are Indian Pangolin, mouse deer, ratel, Hornbills, Humes pheasant, Blythes, Tragopan, Golden cat, Grey jungle fowl, Clouded leopard, Hoolok gibbon and water monitor lizard etc. to name a few.
- With gain of experience trained personnel improved facilities increased cooperation between zoos and in-situ managers failures can be rectified and breeding can be successful.



Conservation breeding may be last ray of hope for survival of many endangered species who would otherwise breathe their last.





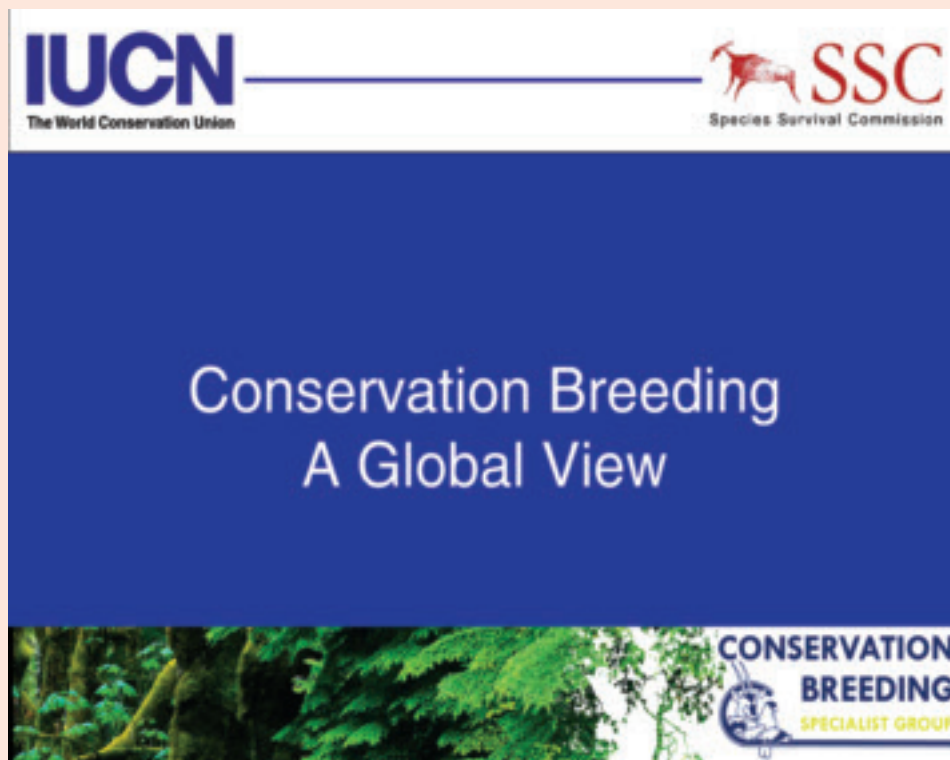
## Conservation Breeding- A Global view



Dr. Robert C Lacy  
Chairman  
Conservation Breeding Specialist Group  
SSC/IUCN

This presentation covers necessity of initiating conservation breeding programme and making it as global activity and future of conservation breeding at global level. It is also highlighted some current regional programmes on conservation breeding in Europe, Australia, Japan, North America and other parts of world.





## Conservation Breeding

“Conservation breeding is a species conservation strategy.

It employs the scientifically managed breeding of threatened wildlife for creation and maintenance of populations that serve to enable, support, or enhance the conservation of wild populations.”

## Conservation Breeding

- An evolving concept
- An evolving profession
- In a changing world

## Conservation Breeding Some current regional programs

- Europe
    - Over 250 EEPs and ESBs
  - Australasia
    - More than 100 ASMPs
  - Japan SSCJ
    - 141 studbooks, 3 levels of management
  - North America
    - Species Survival Plans for 161 species
  - Others
- Total more than 800 species!

## Species Survival Committee Japan

Group A: Require exchanges with other regions, and active cooperation with plans of other regions (31). Koala, Great one-horned rhinoceros

Group B: Maintain the current population in JAZA (37). Finless porpoise

Group C: Promote in-situ and ex-situ conservation of these endangered species in Japan (30). Tsushima leopard cat

## North American (AZA) programs

- Species Survival Plans
  - Mandatory participation by all AZA zoos holding the species, but participation can be in various forms
  - Studbook keeper, species coordinator, management committee, population management advisor, & other advisors
- Population Management Plans
  - Required (min.) for all studbook species
  - Voluntary participation (advisory recommendations)
  - Studbook keeper = (usually) PMP manager, & PM advisor

## Conservation Breeding Regional programs

- Europe EEPs
- Australasia ASMPs
- Japan SSCJ
- North America SSPs
- Others
- *India!*
  - What is the right form of national coordinated conservation breeding program for here?

## Conservation Breeding Global activity

- International Studbooks (182)
- WAZA CIRCC
- GSMPs
- Global or Inter-regional Programs
  - Lion tamarins
  - Bonobo – SSP + EEP
  - Okapis – SSP + EEP + Japan + Congo
  - Other partnerships (red panda, orangutans, Goeldi's monkey, tigers, ...)
- Others ?

## Global Conservation Breeding What works?

- Starts with partnerships of two or a few (not everyone, everywhere, all at once)
- Share goals, concerns, expertise, protocols, training
- Link to field programs
- Driven by a few passionate people, with many friends
- Linked to science
- Good data, intensive monitoring
- Constant focus on improving husbandry
- Takes time, long term commitment to improve, succeed – persistence!

## Regional Collection Planning

- Identify what species you want in your zoos
- Identify what species the government and the people need for you to protect
- Identify what you can do now
- Identify what you hope for the future
- Find out what will be possible in the future
- Communicate!

## Inter-Regional Collection Planning

- Why try to have both orangutan species everywhere?
- Why try to have all tiger subspecies everywhere?
  
- Don't need controlling global authority, just *look for* opportunities
- Do need good communication
  - Data, Methods, Goals

## What is the future?

- Every country takes responsibility for securing its species
- We develop partnerships with colleagues elsewhere who share concern for our species
  - Core breeding program in country
  - Supporting populations elsewhere
  - Jointly build capacity, expertise, populations
- Conservation breeding programs linked to conservation of our most critical resource and our ultimate goal – animals safe in nature
- We communicate regularly and broadly to develop shared goals, and shared expertise
- Doesn't hinder local interests, nor remove responsibility

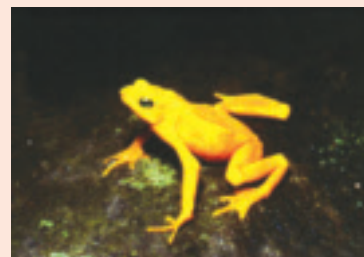
## Amphibian Ark

### *Keeping amphibian species afloat*



## Are they really in trouble?

- 5,743 species of amphibians
  - 43% in decline (2,469 spp.)
  - 31% threatened (1,856 spp.)
  - 120 presumably extinct (since 1980)
  - 23% data deficient (1,294 spp.)
    - Most are probably endangered
- Worse than birds (12%) or mammals (22%)



## What is being done?

- “...it is morally irresponsible to document amphibian declines and extinctions without also designing and promoting a response to this global crisis.”  
Amphibian Conservation Summit



## Emergency Responses

- Rapid response capacity – regionally based teams: field surveys, disease, rescue, treatment and maintenance
- Captive survival assurance programs
- Saving sites about to be lost
- Saving harvested species about to disappear



The only immediate hope of survival for many hundreds of amphibian species will be in *ex situ* assurance populations.



## Amphibian Ark

Recently, the World Association of Zoos and Aquariums (WAZA) has come together with the IUCN Conservation Breeding Specialist Group (CBSG) and ASG to form the Amphibian Ark (AArk) to *help keep threatened amphibian species afloat.*





### What are the AArk partners doing?

- Developing techniques and protocols
- Emergency rescue
- Building expertise
- Long-term care
- Producing animals



#### AARK EX SITU MANAGEMENT GUIDELINES: *Mantella aurantiaca*

Date of completion: February 2005; updated May 2007

Author(s): Craig Walker and Richard Gibson, ZSL

##### BIOLOGY AND FIELD DATA

###### Taxonomy:

Order: ANURA  
 Family: Ranidae  
 Subfamily: Mantellinae  
 Genus: *Mantella*  
 Species: *aurantiaca*  
 Common names: Golden mantella  
 Ginger tree frog  
 Golden frog

Some authors have suggested that the different colour forms may be separate species or sub-species but Henkel and Schmidt (1995) noted that various shades exist sympatrically and to date none have been elevated to species in their own right. Staniszeński (1998) stated that the 'orange', 'yellow', and 'red' types have their own separate distributions within the overall distribution.

The type locality is the population found between Beforona and Moramanga (Mocquard, 1900). The orange form is found in the region of the Torotorofotay swamps, the yellow/orange type in the Beparasy area and the red/orange type in the forests at Anosibe An'Ala and the surrounding vicinity. Staniszeński proposed that this latter form be elevated to sub-species status and in their 1999 paper, based on Staniszeński's description and photographs, Glaw, Vences and Bohme described this form as a valid sub-species naming it *M. aurantiaca rubra* (Staniszeński, 1996). However, since this description was published Staniszeński's "type" specimen was analysed by Vences using allozyme electrophoresis tests; the results of which showed no divergence between the orange, red/orange and yellow/orange types. The sub-species "rubra" is therefore currently considered synonymous with *aurantiaca*.

Unknown Date

MAINTENANCE IN CAPTIVITY
Accommodation
Adult animals:
Enclosure design: Depending on whether a "natural" looking set up is required, as would be likely for a public exhibit, or a "laboratory" one, for ease of maintenance in an off-show breeding set up, many different materials can be utilised:
<p>"Natural" method</p> <p>Substrate: Due to the humidity levels required the substrate should be able to drain freely. To this end a layer of pea gravel at least several centimetres deep should be placed directly onto the bottom of the enclosure. Any very large rocks or logs used as furnishings should be placed in position first to avoid "shifting". With the gravel in place, the accumulated water can be removed either through a drainage hole/pipe or can be pumped out using an aquarium pump (if the water is at a constant level above the height of the pump).</p> <p>A soil substrate can then be placed on top of the gravel. This can be "coir" coconut compost or peat and can be mixed with sand to improve drainage. Again, several centimetres of this should be sufficient unless landscaping demands slopes.</p> <p>Furnishings: As this species climbs well, the use of aerial branching is an ideal method of increasing the area available to the frogs. Live plants can be used and there are many ideal species available commercially. Some, such as bromeliads, will be used for cover by the frogs. Water can simply be presented in an easily removable ceramic or plastic bowl, or in a pond with running water. Small electric pumps are available commercially which are placed into the pool and circulate the water or send it over waterfalls etc. It is important to prevent the possibility of the frogs being drawn into the pump. One method is to have the pump (or just the inlet) covered with a mesh cage, another is to cover the pump with gravel.</p> <p>"Laboratory" method</p> <p>Substrate: Kitchen towels, sponge matting or similar non-toxic materials can be used to cover the floor of</p>

## Emergency responses

- alert from people in the field
- rapid-response teams arrive
- preemptive collections for *ex situ* populations
- e.g., Romer's treefrog, PGF, ARCC, Kihansi
- AArk help
  - Preparatory training
  - Identify crises
  - Organize response
  - Follow through



## Building expertise

- AZA Amphibian Biology & Management
- DWCT Amphibian Biodiversity Conservation
- AArk courses -- Mexico, Ecuador, Colombia
- Who is next?



## Building collaborative partnerships

- Houston Zoo - El Nispero Zoo (Panama)
- Zoo Zurich - Cali Zoo (Colombia)
- St. Louis Zoo - Catolica University (Ecuador)
- Omaha Zoo - Johannesburg Zoo (S Africa)
- London/Chester/Jersey Zoos - Dominica
- Chester - standardized biosecure facilities
- Who is next?



# Telling the public



 **amphibian ark** Amphibian Ark Team Portal

Home

Amphibian Ark Team Portal > Asian Partnerships

## Asian Partnerships

View All Site Content

**Pictures**

- 2008 Year of the Frog Campaign Pack Images

**Lists**

- Amphibian Contacts
- Amphibian Taxa
- Calendar
- Tasks
- Latin American partners
- Asian Partnerships
- Species prioritization - Costa Rica
- Species prioritization, Europe
- Species prioritization - North America and Puerto Rico
- Species prioritization -

Actions	Region	Country	Contact	Position	Institution	Membership	Email
	East Asia	China	Enquan Zhang	Amphian and Reptile Curator	Beijing Zoo	CAZO	malto...
	East Asia	China	Prof. Xia Feng		Chengdu Institute of Biology		malto...
	East Asia	Hong Kong	Michael Lau		Kadoorie Farm & Botanic Gardens		mmilau...



No more of these....



Lot's more of these ...



## So many species, so many components, so many friends!

- Biodiversity crisis isn't over
  - 22% mammal species threatened
  - 12% bird species
  - 31% amphibians
  - Corals, medicinal plants, fresh-water fishes, sharks, reptiles, ...
- Governments and NGOs and concerned public need our help!

## ... so many components

- Husbandry – diets, enclosures, behavior, veterinary care
- Data – individual marking, pedigrees, monitoring health and well-being, shared data
- Analyses – breeding records and survival, pedigrees, diets, taxonomy, genetics

## ... so many friends!

- New tools
  - ISIS/ZIMS
  - PMx
  - Collaboration tools
  - Genetic tests
  - Behavior monitoring and enrichment
- New friends
  - International colleagues!
  - SSC Specialist Groups
  - Universities, students
  - Governmental agencies and NGOs

## So many species, so many components, so many friends!

- We can't do it all at once,
- But we have to get started, be persistent, and help each other.
  
- We can't fail (their lives depend on it! As does the quality of our lives)
- Celebrate successes



## Global Cooperation in Captive Breeding



Dr. Jonathan D Ballou,  
Research Scientist, Smithsonian's National  
Zoological Park, Washington DC, USA

This talk highlighted the need of global cooperation in population management of endangered species for captive breeding, its benefit, component of global program, and strategies to achieve success.





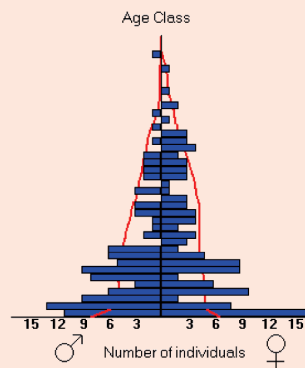
Captive populations = ***insurance***

**Good Insurance Policy =**

**Long term healthy Captive Populations**

## 1. Demographically healthy

Capable of producing a growing population  
 Reproduction reliable  
 Diseases understood, manageable  
 Stable age structure



## 2. Genetically healthy

- Low Inbreeding
- High levels of genetic variation
- Being able to genetically manage the population so diversity can continue to be maintained
  - Knowing the pedigree
  - Having and using molecular genetic analysis to determine paternities
  - Making and following recommendations

### 3. Capable of supplying suitable animals for a successful and sustainable reintroduction program, if needed

- Produce many animals for release
- Healthy and Disease free
- Reproductively capable
- Behaviorally capable
- Non-inbred
- Represent the genetic diversity of "wild" population, (not domesticated animals)
- IUCN guidelines: need a genetically managed population

And, of course

We need to maintain these characteristics over the long term

How long????

## *Components of a Global Program*

- **Authority (WAZA, Government)**
- **Organization and Planning**
- **Infrastructure**
- **Data and Record keeping systems**
- **Knowledge, skills (training)**
- **Action-** making recommendations and implementing them

## *Science of Population Management*

- **What is the population?**
- **What are its characteristics?**
- **Record keeping systems in place**
- **Defined objectives**
- **Defined goals**
- **Management strategies**
- **Species Management Team**

"Standard Objectives" of captive breeding programs

Establish and maintain populations of sufficient size to

1) Maintain demographic stability

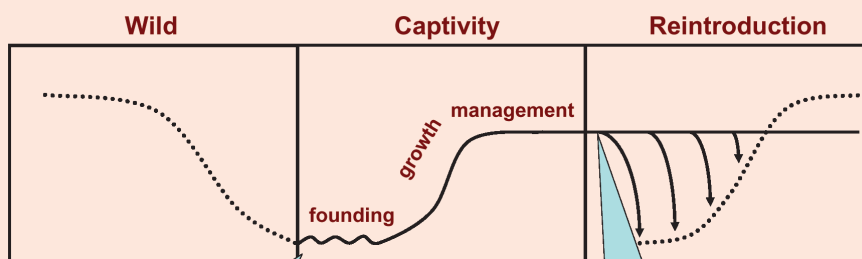
Self-sustaining

Supply needs of reintroduction program

2) Retain 90% of the wild gene diversity for 100 years

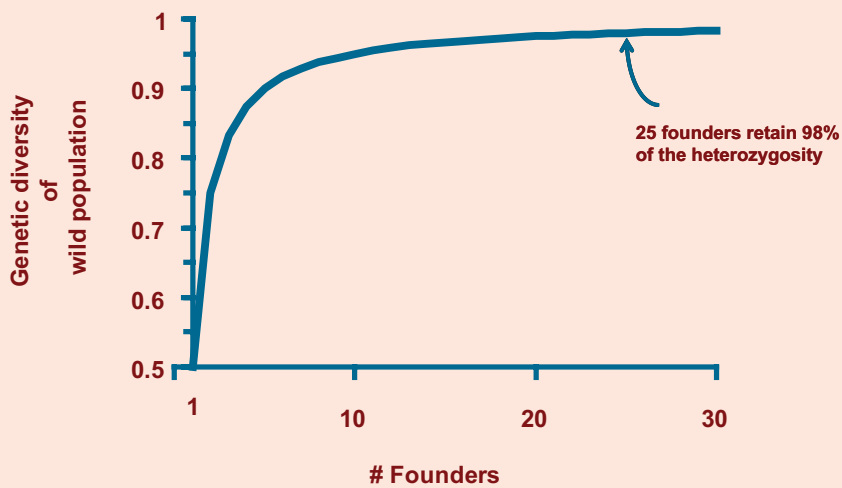
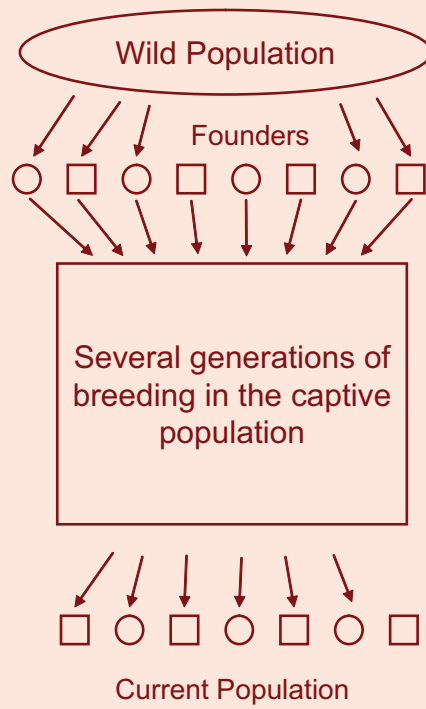


Captive breeding and reintroduction programs



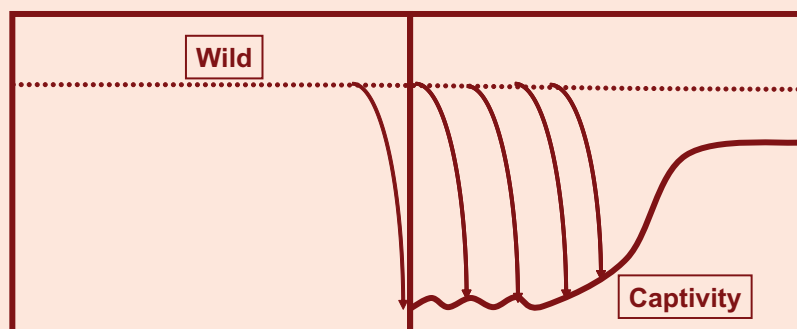
Goal: whatever diversity brought back

Minimize unwanted changes in captive environment (loss of genetic variation, adaptation to captivity, domestication)



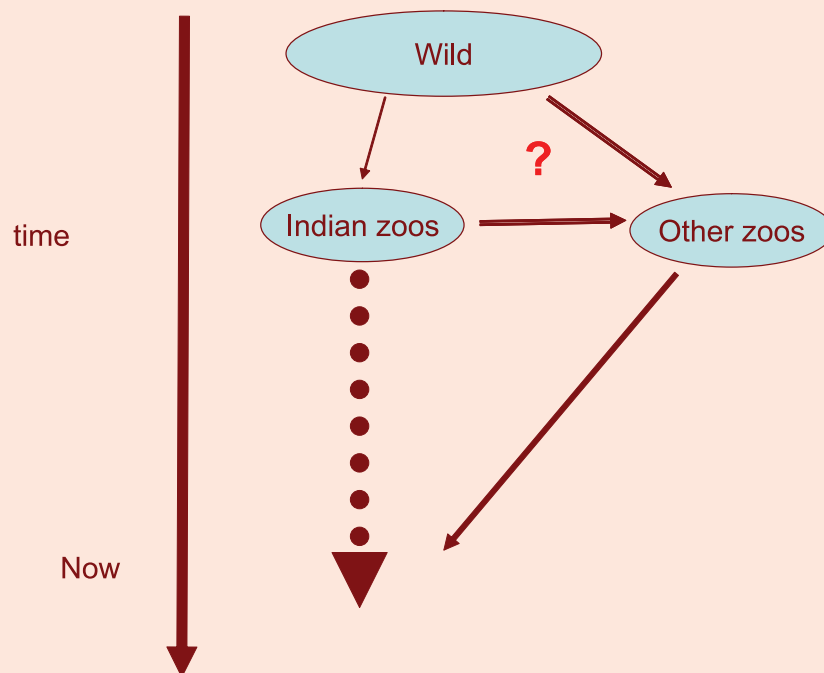
## Where will these founders come from?

- Already in Indian zoos?
- Wild?



## Where will these founders come from?

- Already in Indian zoos?
- Wild?
- Other zoos?

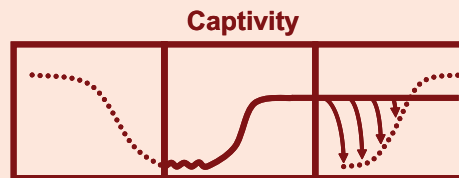




## Management strategies

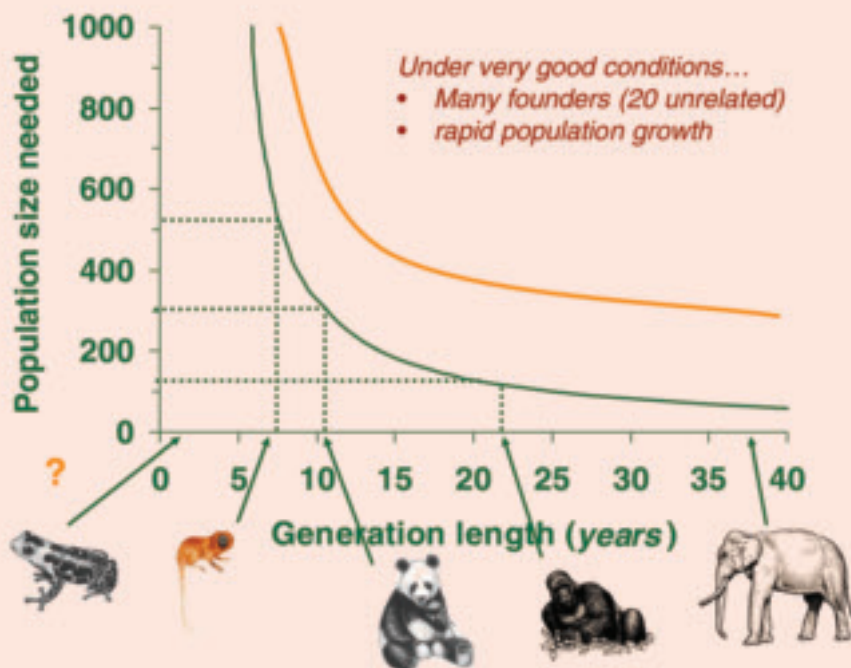
- **Demographic management**
  - Rapidly grow population
  - Once at desired size, only breed a proportion (contraception)
- **Genetic management**
  - Who gets to breed?
  - Determined by pedigree

## What population size is needed?

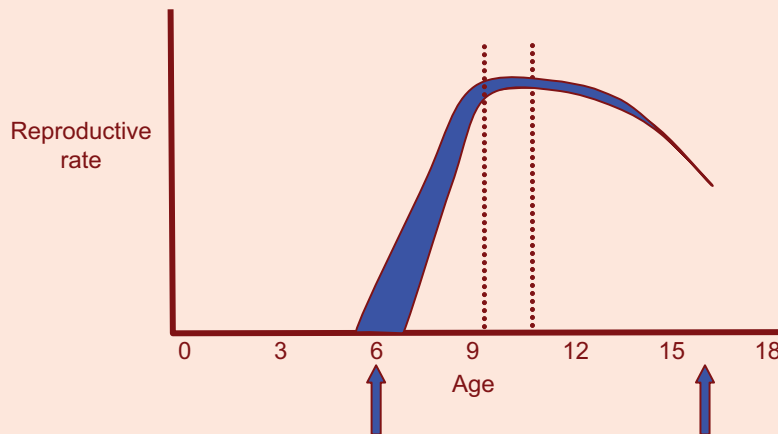


Depends on:

- Number of founders
- Biology of the species
- How rapidly can the population grow?
- How well it is managed?



**Generation Length:  
Average (NOT first) age of reproduction**



**Benefits of international  
population management**  
**Metapopulation Management**

- Larger populations
- Access to more founders
- Fewer genetic problems
- More stable, predictable and lasting populations
- More shared information to help you care for your animals
- Healthier animals, in larger social groups

## ***Components of a Global Program***

- **Authority (WAZA, Government)**
- **Organization and Planning**
- **Infrastructure**
- **Data and Record keeping systems**
- **Knowledge, skills (training)**
- **Action-** making recommendations and implementing them

## **WAZA**

- **Committee for Inter-Regional Conservation Coordination (CIRCC)**
- **Global Species Management Programs (GSMPs)**

**Many International studbooks (182 )**

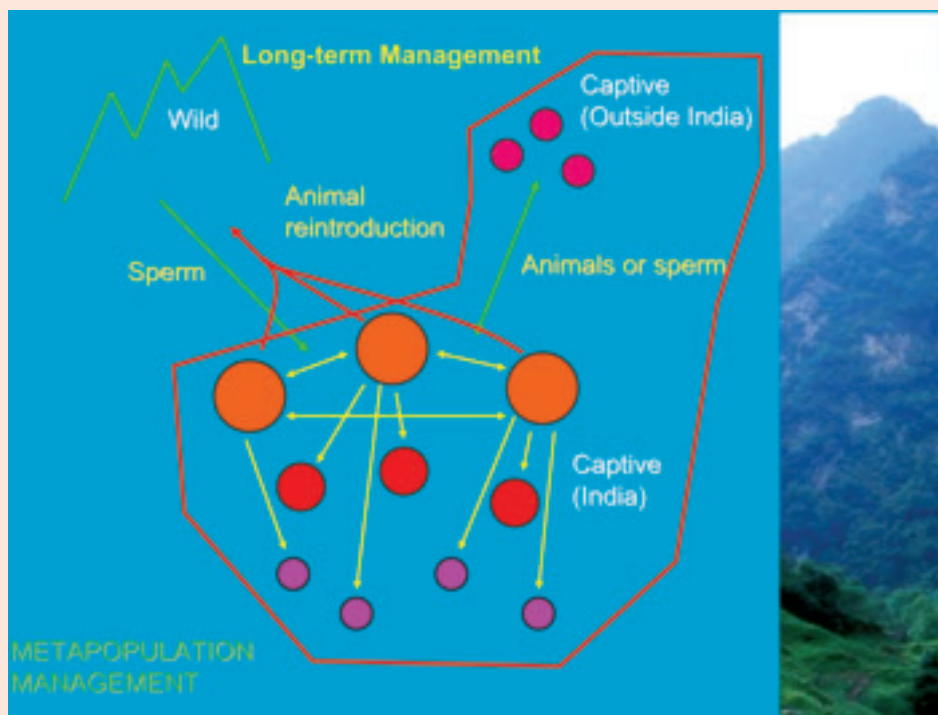
**But few Global Species Management Programs**



## Species management team



- **Ex-situ Species Manager**
  - International Studbook Keeper
  - International Species coordinator
  - Regional coordinators





***How do we achieve this? What needs to be in place?***

- **An Authority (Government, Zoo association)**
- **Organization: Prioritizing and Programs**
- **Infrastructure**
- **Information: Data and Record Systems**
- **Knowledge**
- **Action**

# **Working Group Sessions**

## **Working Group Formation and Introduction to the Topics-**

**Ms. Sally Walker**

## **Conservation Breeding of Carnivores-**

**Dr. Naim Akhtar**

## **Conservation Breeding of Herbivores-**

**Mr. Kartick Satyanarayana**

## **Conservation breeding of Omnivores (Primates & bears)-**

**Dr. Brij Kishor Gupta**

## **Conservation breeding of Birds-**

**Dr. Vibhu Prakash**

## **Conservation breeding of Reptiles and Amphibians-**

**Mr. B. C. Choudhary**



## Working Group Formation and Introduction to the Topics



Ms. Sally Walker  
Zoo Outreach Organization (India)

This talk basically cover rationale for forming working groups, their mandate, and issues to be covered in discussion while taking up of each species working group.



## WORKING GROUP FORMATION AND INTRODUCTION TO THE TOPICS

Ms. Sally Walker of Zoo Outreach Organization, Coimbatore, India facilitated the process of formation of working groups and introduction to the topics. She apprised the participants about the species identified for conservation breeding in India, need for formation of working groups, issues to be taken up for discussions and recommendations. Working group session was kept for discussion for making recommendations on conservation breeding of each identified species, possible collaboration between zoos and related organizations at the global level.

As the time was short, it was not feasible to cover all the 63 species identified for coordinated planned conservation breeding in a single forum for discussion. At the same time, all the participants might not have been interested in all the species. Many of the participants had come to attend the conference to discuss specific issues of specific species related to their zoos. Therefore, it was decided to form five working groups one each on carnivores, herbivores, primates/ bears, birds and reptiles/ amphibians to discuss the issues so that the participants can attend the discussions as per their choices and contribute accordingly.

Brief introduction of each species covering its status and its distribution in the wild, number of individuals in captivity in India, coordinating and participating zoos in India was made by Dr. Naim Akhtar (for carnivores), Mr. Kartick Satyanarayan (for herbivores), Dr. Brij Kishor Gupta (for primates and bears), Dr. Vibhu Prakash (for Birds) and Shri B.C. Choudhury (for Reptile/ amphibians) for their respective groups. All the presenters also apprised the participants about conservation breeding initiatives for each species and invited the participants to join their working groups. It was found that the participants were interested in different species, which are part of different working groups. The timings for discussion on each species were so planned that the participants can jump the working groups to join the species of their interest at the time of discussion. The issues to be discussed in the various working groups were status of animals in captivity in India and abroad, the status of the species in wild, on going conservation breeding programmes in India and abroad, problems being faced in conservation breeding, existing protocols on conservation breeding or husbandry guidelines, preparation and updating of national/ international studbooks, possibility of national or international collaboration, WAZA approval to join Global Species Management programme (GSMP) and other things need to be considered for smooth running of conservation breeding programme of the identified species in the world.

One senior person was assigned the responsibility as working group coordinator with assistance of one presenter and one recorder for smooth working of the working groups. The working groups were requested to come out with suggestions and recommendations for each assigned species to initiate or coordinate planned conservation breeding at the national/ international level. The working groups had three complete sessions for discussions. One member of the working group was requested to present the outcome of the discussion as recommendations to the full session of the conference towards the end. The members of the different working groups also circulated the recommendations through e-mails to come to the final drafts which are placed below:

## Working Group –I (Carnivores)

**Venue : Lecture Hall**

*Coordinator: Sh. S.K. Patnaik*

*Presenter: Dr. Naim Akthar*

*Recorder: Dr. Sunita Pradhan*

*Participants: Dr. S.K. Choudhary (India), Yedje Bayeta Aisham (Kazakhstan), Mukushewa Maria (Kazakhstan), Neil Dorman (UK), V.J. Rana (India), K.B. Markandiah (India), Dr. Ajay Gaur (India), Dr. Sandeep Rattan (India), Dr. Lena Linden (Sweden), Leif Blomquist (Finland), Dr. Reza Khan (Dubai), Prof. Mikos Persanii (Hungary), Nihar Ranjan (India), Rahul Pandey (India), N Mahanta (India), Dr.A.K. Patnaik (India), A.P.A. K Jayalath (Sri Lanka), Dr. Ramani Jyaketh (Sri Lanka)*

### Asiatic Lion (*Panthera leo persica*)

#### Recommendations:

1. Purity of the lions throughout Indian Zoos has to be ascertained through DNA analysis and studbook analysis of wild sourced individuals
2. Microchipping (marking of the animals) of pure Asiatic lions to be completed as soon as possible
3. Exchange of Husbandry guidelines between the European Association of Zoos and India is urgently needed
4. National Indian Stud Book for lion has to be completed
5. Then International Stud book will be taken up.
6. Neil Dorman volunteered to compile the International Studbook initially with input and support from the National Studbook keeper for as long as required, until CZA recommends a Indian based International Studbook Keeper.
7. Joint recommendations on movement of lions may then be made for the Indian and European populations to maintain maximum diversity.
8. More participating zoos are needed in the program, keeping in mind the generation length, and it was estimated that about 150-250 animals should be maintained. More participating zoos should be added to this programme to accommodate the lions. However, as the mortality rate is high, only zoos experienced with lions should be included in the program.
9. Nehru Zoological Park, Hyderabad is keen to join as participating zoo in Asiatic lion Conservation breeding Programme.

Other information: 86 lions in Europe 35 male 51 females in Europe, originated from 9 founders. Future inbreeding problems are likely to occur if new founders are not added. Sakkarbaugh Zoo is willing to maintain national studbook. Sakkarbaugh Zoo has created a second facility for breeding at Dewalia Sarkaria Park in Gujarat.

### Indian Tiger (*Panthera tigris*)

1. This programme should be continue using wild caught ones founders so that the only F1 generation may be used for reintroductions.
2. Identify and microchip the founders.
3. The existing stock to be maintained but not included in the program.
4. Studbook has to be maintained.
5. Off display centers should be created.
6. Tigers of unknown lineages at present in the zoos should be phased out.
7. It is important for husbandry protocols to be prepared for India as a matter of urgency.

Other information: No tigers present in EEP. In US their taxonomic identity still needs to be ascertained. There are a few individuals in the European zoos but their taxonomic identity still has to be ascertained.

### Snow Leopard (*Panthera uncial*)

1. Kashmir will select other appropriate site in Kashmir region for CB instead of Leh because it is more animal welfare orientated society as a “vegetarian” region.
2. It is very important to create Off Display centers.
3. Proper facilities (holistic) to be given to Shimla and Nainital Zoo.
4. All existing stock to be marked/microchipped
5. All animals should have genetic checks as to taxonomic identity.
6. Husbandry guidelines are being prepared by EEP which can then be shared with India.
7. Other Information: 190 at present in EEP, want to increase to 200, Shortage of males in EEP
8. The EEP could send animals to Indian Zoos with prior permission from the species coordinator and species committee.
9. All the participating Indian zoos will need snow leopards as part of the programme and the International Stud book keeper will suggest possibilities for acquiring the animals.
10. Genetic checks is not necessary since there are no subspecies.

### Clouded Leopard (*Panthera nebulosa*)

1. Darjeeling and Imphal Zoos are to be considered as Participating Zoos.
2. It is very important to create Off Display centers for the species.
3. It is very difficult to pair adult clouded leopards. It is recommended that new pairs are started with cubs of approximately six months of age. Dusit Zoo (Thailand) has shared information on the difficulty of pairing and breeding in the zoos clouded leopards.

4. AZA Husbandry guidelines are available: Knoxville Zoo (Tennessee, USA) is to be contacted for copies of these guidelines.
5. Specialized training and experience may be very important for the conservation breeding of clouded leopard.
6. Other information: Knoxville Zoo should be contacted for management guidance.
7. Dusit zoo could be contacted for possible animal movement, subject to prior determination of their taxa at subspecies level.

### Asiatic Cheetah (*Acinonyx jubatus*)

1. A Cheetah enclosure has already been constructed at Sakkarbaugh Zoo (for African cheetah initially in order to gain experience).
2. Off Display centers for this species are very important.
3. Protocols should be obtained from other zoos experienced in Cheetahs.
4. Sakkerbaug Zoo should be given all possible support for this programme from CZA etc.
5. Other information: Allowing animals to select their mate is very important for breeding Cheetah.
6. Other zoos in India have held Cheetahs in the past and a review of their captive history in India would be helpful.
7. Breeding experiences from Pretoria, Whipsnade, and Wassenaar Wildlife Breeding Centre can be shared.

### Golden Cat (*Catopuma temmicki*)

1. Two zoos to continue the Golden Cat program.
2. If breeding is not occurring in Patna Zoo the reasons for this should be determined. If indicated, the animals could be moved to Assam for breeding.
3. Husbandry guidance should be procured from European Zoos and Singapore Zoo.
4. Golden cats also have a similar problem to clouded leopards regarding pairing. They may need special care and attention to breed and breeding techniques should be developed.

Other information: Assam zoo has enclosure for golden cats. They recently had one individual that subsequently died of old age. A site for off display holding facilities has been identified at Assam Zoo. Need 25 founders for the Asian Golden cat. There may be populations in the Malaysian and Indonesian Zoos. Europe and Australia have small populations. There are less than 100 individuals in total in these regions. Literature could be available on the breeding of Golden Cat in India in the compendiums.

### Tibetan Wolf (*Canis lupus laniger*)

1. New founders are urgently needed.
2. It is important to develop off display centers for continued breeding in all the participating facilities
3. Identification should be confirmed if not already known.
4. A physical check up will also be carried out.

5. It's only the Indian Himalayan states from where the animal species could be procured.
6. Husbandry guideline to be prepared by one of the zoos holding the species.
7. It was suggested to have ova from the wild origin wolf in Kufri and given to CCMB for invitro fertilization.
8. Of display centers are requested. These species breed and rear in zoo biologically good public exhibits. Breeding for release need to have no human contact at all-even with keepers.

### Grey Wolf (*Canis lupus*)

1. Breeding well in the Sakkarbaugh Zoo. Wolves have been transferred to 7 zoos.
2. The genetic identity of the wolves in Sakkarbaugh Zoo is known but others have to be determined.
3. Wildlife Institute of India could be involved in this. Dr. Jhalla has carried out extensive research of this sub-species.
4. Males should be transferred to Sakkarbaugh Zoo, agreements to be worked out for the exchanges.
5. Other information: Wolves to be kept in packs rather than in pairs and not individually.
6. It is best to start with a pair and retain offspring from two successive years. Starting with several males and/or females often results in aggression.

This sub-species is not kept in European Zoos

### Wild Dog (*Cuan alpinus*)

1. Animals to be marked. Must standardize the marking technique. Left rump to be selected for microchipping for uniformity
2. Genetic analysis. Taxa to be ascertained.
3. Tirupati Zoo holding the species could be considered as a participating zoo. Some more zoos in South India
4. Develop a protocol for the Wild Dog jointly by the Cheenai and Visak Zoo. Dr. Johnsingh to be consulted on the matter.
5. Other information: European Zoos: Started 2 years ago. There could be a collaboration between the Indian and the European zoos subject to their confirmation of their species and subspecies (taxa). Visak Zoo: Wild animals in the population. A study going on the species.

### Binturong (*Arctictis binturong*)

1. Animals to be marked.
2. Genetic analysis to be done.
3. Ascertain the subspecies if they are to be received from Thailand.
4. Some scientific project and study to be done.
5. Husbandry protocol to be prepared.

### **Indian Pangolin (*Lepus nigricollis*)**

1. Marking (all chipped in Nandankanan Zoological Park) of all animals to be done.
2. Genetic checkup will be done.
3. No of founders to be increased.
4. Any rescued Indian pangolin to be sent to Nandankanan Zoo.
5. Taipei zoo could be contacted for husbandry guidelines.

### **Giant Squirrel (*Ratufa Indica*)**

1. Marking of all animals will be done.
2. Genetic check up will be done
3. Support for off display exhibits in the two facilities will be provided by CZA.
4. Trivandram zoo to be added as participating zoo.
5. Chennai zoo to be considered as Coordinating Zoo as have M Giant Squirrel and Pilakula Biological Park as the Participating Zoo.
6. None found in the foreign zoos.
7. Animals could be found in private custody as they are good pets so such possibility of finding animal should be explored.
8. Rescued animals to be transferred to coordinating and participating zoos.

## Working Group II- Herbivores

### Venue- Committee Room I

Coordinator: Sh. S.C. Sharma

Presenter: Sh. Kartick Satyanarayan

Recorder: Dr. Manoj Kumar

The working group of herbivores taking into consideration the status of population of various species in India and zoos outside India made following recommendation for planned conservation breeding of different species:-

#### 1. Nilgiri Tahr (*Nilgiritragus hylocrius*)

Only one Nilgiri Tahr is available in India i.e. Ooty Deer Park. The zoo hardly has any technical staff. The conservation breeding of the species can only be done if:-

- (a) Off the display housing, upkeep and healthcare facilities are set up at an appropriate site and a wildlife biologist put as in-charge of the facility.
- (b) Appropriate linkages with Chennai Veterinary College and Arignar Anna Zoological Park are developed with the breeding centre.
- (c) 2-3 pairs of Nilgiri Tahr captured from wild to serve as founders stock.
- (d) Highest standards of healthcare and husbandry maintained.

#### 2. Himalayan Tahr (*Hemitragus jemlahicus*)

3 animals of the species are already available with Gangtok Zoo. Some more animals are being imported under a exchange programme from Japan. The animals could be used for breeding programme for ensuring the genetic purity of the animals through DNA profiling. The coordinating zoo should be advised to get technical details i.e. the protocol on housing, upkeep and breeding from Minnesota Zoo. Darjeeling Zoo should remain associated with the breeding programme right from the beginning.

#### (3,4,5) Markhor (*Capra falconeri*), Blue sheep (*Pseudois nayaur*) and Chiru (*Pantholops hodgsonii*)

At present neither any animal of these species are available in captivity nor any data on housing, upkeep and healthcare is available. The group however had feeling that the possibility of China having done some work on breeding of these species are very much there. CZA may use the officers of WAZA to get necessary information from China, which could be used for planned breeding of these species.

In the interim period J & K government should be advised to create an off the display facilities at Pahalgaoon, Leh and Gangtok to house the rescued animals and gain first hand information on the feeding healthcare and upkeep requirement of these species.

### 6. Hangul (*Cervus elaphus hanglu*)

J & K Wildlife Wing had made some efforts to breed the species in the past which have failed to give desired results because of the animals being kept in full public view and no technical support being made available. Central Zoo Authority may consider creating an off the display breeding centre with adequate technical back up for breeding the species. The site for creating the conservation breeding centre the species should be selected in such a manner that the animals are not exposed to high temperature in summer. Indoor housing facilities should also be provided for housing the animals in winter months. J & K Wildlife Wing may be advised to initially to capture 2-3 pair of Hangul to serve as founder stock. The success of the breeding effort of Hangul is crucial for developing substantial ex-situ population to serve as insurance against any natural disaster in the limited habitat area of the species.

### 7. Musk deer (*Moschus chrysogaster*)

The efforts for planned breeding of Musk deer were started in Jammu & Kashmir, Himachal Pradesh and Uttarakhand in early eighty. The programmes of Jammu & Kashmir and Himachal Pradesh have been non starters. The breeding programme of the species in Uttarakhand has also been stagnating due to high rate of mortality, which has been attributed to wrong site selection. However, lack of technical support to maintain desired standards of upkeep and healthcare impacting the programme can not be ruled out. The Chief Wildlife Warden of Uttarakhand informed that new site has been selected for the breeding centre where 2 Musk deer of wild origin are available.

The Group feels that a group of experts on the biology, healthcare and upkeep of the species should critically analyse the data available at the breeding centre and identify the areas of weakness and strength and devise strategies for avoiding the same pit falls at the new centre through appropriate designing of housing facilities and prescribing schedules for feeding and upkeep including sanitation and hygiene. A mechanism should be put in place to involve Sri Nagar/ Kumaon University, WII and IVRI with regular monitoring of the programme. Central Zoo Authority should provide funds for appointing a wildlife biologist for the breeding centre. The Uttarakhand Government should well advised to have the breeding centre within reasonable distance from the headquarter of the Divisional Forest Officer/ Conservator so that close supervision of the activities of the breeding centre can be ensured.

### 8. Serow (*Nemoradus sumetrensis*)

The species has been successfully breeding at Guwahati Zoo. However, the high rate of mortality has been taking a heavy toll of the animals. According to the Inventory issued by the Central Zoo Authority for the year 2006-2007 Guwahati Zoo is left with a single male and a single female. This is well known that incidence of Tuberculosis in Guwahati zoo is quite high. The sanitation and hygienic is also not upto desired standards due the location of the enclosure. The Guwahati Zoo will therefore well advised to create separate breeding facility for the species away from the main zoo. The facility should be designed after getting the mortality date thoroughly analyzed and the areas of weakness being identified and strategy to address the same being developed. Suitability of Guwahati for survival of the species should also be assess.

### 9. Pygmy hog (*Sus salvanius*)

The species has been bred very successfully at Bashistha. More than 100 animals, genetically physically and behaviourally viable for reintroduction in the wild are available. Arrangements for the soft release of the animals have been made. The group is quite impressed with the success of the project. However, it is concerned about the induction of fresh blood into the captive bred stock. The Government may consider granting permission for capture of one pair of wild animals for enhancing the heterozygosity of the captive bred stock for successful release of every 20-25 animals.

### 10. Mouse deer (*Tragulus meminna*)

Mouse deer was bred very successfully in the early nineties at Ahmedabad Zoo. The number of captive bred animals at the zoo reached as high as 36. 4 animals were given by them as breeding loan to Hyderabad zoo and 4 animals to Nandankanan Zoo, Bhubaneswar. In these zoos animals also bred successfully. The population at Ahmedabad collapsed subsequently due to some unidentified disease. The species has bred successfully at Hyderabad Zoo and Bhubaneswar Zoo but the populations appear to be stagnating due to mortality. As the natural habitat range of the species is quite extensive both Hyderabad and Nandankanan Zoo continue to get rescued animals from wild and introduction of new blood in the breeding stock is not a problem. The main priority for successful and planned conservation breeding therefore appears to be improved upkeep and better healthcare through greater scientific and technical consultation. Leipzig Zoo is breeding the species successfully for more than 30 years.

This zoo can also be approached to share the husbandry and healthcare protocol with Indian Zoos. CZA may provide one Research Assistant/ Scientist to Hyderabad, who are the coordinating zoo for the species and have 3:3 Mouse deer for breeding purposes. Genetic screening of the animals should also be done and the animals which are found genetically non viable should be taken out of the programme. The genetic base of the group could be further augmented through reintroduction of rescued animals.

Nandankanan Zoo should also endeavor to provide their collection (1:1 animal) better upkeep and healthcare and augment the number of breeding animals through rescued animals.

### 11 & 12 Swamp deer (*Cervus duvauceli*) and Sangai (*Cervus eldi*)

The two species have been bred by Indian Zoos quite successfully and the number of animals of the two species held in captivity is 177 and 115 respectively. However, the main areas of the worry are the narrow genetic base of the population and the animals being subject to various infectious diseases. The first priority for planned conservation breeding should be detailed health screening and D. N. A. finger printing of the animals at the coordinating and participating zoo. The genetic base of Swamp deer could be strengthening through induction of Rescued animals. However, it would be desirable for LaCONES to take up a scientific programme for assisted reproduction of Sangai through artificial insemination of females with the semen collected from wild animals.

### 13. Indian one-horned rhinoceros (*Rhinoceros unicornis*)

The population has been stagnating in various zoos because of the limited number of females. The breeding success has also been quite low. The species has bred successfully has been limited only to few zoos i.e. Patna, Kanpur and National Zoological Park, Delhi. The advantage of the breeding success have been lost to a great extent due to high rate of mortality. The group discussed at length the aspects of housing, feeding and husbandry of the species. A detailed power point presentation in this regard was made by the Basel Zoo. The species is definitely a candidate for a coordinate breeding programme at a global scale. But to begin with the Indian Zoos should concentrate to make optimal use of the breeding potential of the available females by providing them a compatible male and standardizing and upgrading the husbandry and health protocols for the species. Exchange programme of animals should be carried out in accordance with a scientific plan prepared in consultation with International Studbook Keeper for the species. Basal Zoo was interested in being a partner in the program and offered their expertise in husbandry and preparing a conservation breeding action plan of rhinos for Indian zoos. Cincinnati Zoo's centre for conservation and research of endangered wildlife (CREW) is working in collaboration with LaCONES in developing sperm banking and other scientific techniques that could benefit the breeding and management of this species.

### 14. Wild ass (*Equus hemionus khur*)

The species has been successfully bred by Sakkarbaug Zoo, Junagarh who 8:4 Wild ass. One pair was given by the Zoo to Nehru Zoological Park, Hyderabad. However, the pair has not bred successfully. The main priority for planned conservation breeding of the species, to have more breeding enclosure of the species and to decide the existing population to biologically and socially viable sub groups to be housed in appropriately designed enclosures. Nehru Zoological Park should acquire one or two additional males for being part of the group of the species housed at the Zoo. The feeding and upkeep protocols for the species should also be upgraded in consultation with Sakkarbaug Zoo.

### 15. Indian bison (*Bos gaurus*)

The species has been bred quite successfully by the Mysore Zoo and they have now 8:11 animals with them. The species has also bred successfully at Bondla Zoo at Goa who have 4:4 animals them. Arignar Anna Zoo has 2:2 Gaur with them. The main priorities for planned breeding of the species are:-

- (i) Genetic and health screening of the animals and taking out non viable animals out of the programme.
- (ii) Induction of new blood if so required.
- (iii) Providing animals housing in off the display area, within carrying capacity of the enclosure.
- (iv) Standardizing and upgrading the upkeep and husbandry protocol and healthcare practices at participating zoos under guidance of Mysore Zoo.

## Working group – III Primates/ Bears

*Coordinator: Prof. A. K. Sinha*

*Presenter: Dr. Brij Kishor Gupta*

*Recorder: Dr. Ravi Kumar Singh*

*Participants present: Dr. Lydia Kolter (Germany), Scott Carter (USA), Dr. Masato Takeda (Japan), Christian R. Schmidt (Germany), Dr. C.S. Jaya Kumar (India), Suzanne Boardman (UK), Angela Glatson (Netherlands), Nihar Ranjan (India), Vijay Ranjan Singh (India)*

The working group on Primates/Bears discussed issues related to and developed recommendations for the initiation of conservation breeding programs for endangered primates and bears of the Indian sub-continent. Delegates from the United States, Great Britain, Germany, Holland, Japan and India participated in the discussion. Participants shared their expertise in the management of captive primates and bears, their knowledge of other regional populations and programs and their perspectives with respect to India's conservation opportunities and challenges.

Participants emphasized the importance of ensuring appropriate social and physical environments to both facilitate species-typical behavior, including breeding behaviour, and to ensure the welfare of individual primates and bears. Systematic assessment of management, including enrichment, is needed to evaluate animal responses to husbandry and enrichment practices. It was suggested that desensitization of some animals to husbandry practices may be needed to reduce stress and increase species-typical social behaviour, including breeding. It was further suggested that studies of female reproductive cycles are needed to evaluate reproductive capability of females and improve pairing decisions for breeding.

Several non-Indian delegates shared experiences regarding the need to sustain institutional interest in species in order to maintain long term programs. This was discussed particularly with respect to critically endangered Indian species that have been losing institutions, especially in the U.S and Europe, over the past 10 years, such as Lion-tailed macaques and Sloth bears. Communication with institutions, particularly western institutions, regarding conservation need and links with field country programs were both suggested as ways of helping to sustain international institutional interest.

The non-Indian delegates stressed the importance of the Indian zoo community communicating its priorities with respect to species selection to the international zoo community so that other regions are knowledgeable of Indian priorities and can make regional collection planning decisions that support or enhance India's conservation breeding initiatives. Two endemic langur species not currently being held in other regions, Golden langurs (*Trachypithecus geei*) and Nilgiri langurs (*Trachypithecus johnii*) were discussed as examples and agreed upon by the group as priority species for India that might be expanded to other regions with appropriate communication between India and the international zoo community.

Most of the following species were identified by Central Zoo Authority in its Concept Paper on Conservation Breeding as priority species for the Indian zoo conservation breeding initiative. All species listed here were reviewed by the group and recommendations for each were proposed. Information provided on animals in other regions is taken from ISIS (International Species Information System) unless otherwise noted. ISIS information does not include all animals (many non-zoo holders, e.g. rescue centers, do not report to ISIS) but ISIS information does provide a foundation of knowledge regarding animals that may potentially be a part of a regional or international cooperative program.

### Lion-tailed macaque (*Macaca silenus*)

Arignar Anna Zoological Park (AAZP), Chennai, has been designated the Coordinating Zoo for Lion-tailed macaques. Thiruvananthapuram Zoo and Sri Chamarajendra Zoological Park, Mysore, have been designated Participating Zoos.

Lion-tailed macaques are held in fairly sizable captive populations in 4 regions:

India	59 individuals in 13 institutions
Japan	75 individuals
US	109 individuals in 21 institutions
Europe	~250 individuals

It was suggested that the number of participating institutions in India be increased to better ensure the long term management of the Indian population.

The need for global management of LTMs was stressed. The International Studbook is currently vacant and has been recommended to be eliminated by CBSG CIRCC (?). It is critical that this studbook be reinstated. Scott Carter, US Species Survival Plan Coordinator, will petition to become the International studbook keeper, partnering with an Indian zoo biologist (to be identified by the Coordinating Zoo).

Studbooks for US, Japan and Europe are complete and up-to-date. The Indian regional studbook needs to be updated. A Regional Studbook keeper for India must be identified and the studbook updated.

An international meeting of the regional coordinators was discussed and proposed. AAZP, as the Coordinating Zoo, offered to host the meeting. It was agreed by the participants that a meeting within 18 months is needed. If the Indian studbook can be updated and the International Studbook compiled, this meeting could be targeted for the development of the global master plan. Other issues/topics for the meeting include a regional strategic/master plan for captive LTMs in India, assembly of information on *in situ* status and ongoing field projects and development of a plan for the linkage of the captive program with field research projects, and planning of a workshop on husbandry and management of LTMs. Discussions among individual participants about exchanging animals were discouraged until a

global masterplan is developed. Long term management of the global population requires the cooperation of all four regions and all holding institutions within each region. It is important that all animal transfers, especially those among the regions, are well-coordinated to maximize the benefit to all populations and ensure the long term management of the population.

Several Indian participants reported the number of LTMs in Indian zoos which are not currently maintained in appropriate social groups (many animals are either singly or pair housed), and also the problem of the significantly unbalanced sex ratio of the Indian captive population.

Information about the status of wild populations in three protected areas was presented, including 343 individuals in 43 groups within three protected areas of Koodermukh National Park, Mukambika Wildlife sanctuary and Someshwara reserve forest in Western Ghats. More information about the status of wild populations exists in the most recent CBSG CAMP document. The importance of assembling this information for better knowledge of the wild populations and to communicate to all holding institutions (especially in other regions) was emphasized.

**Recommendations:**

*International Studbook be reinstated and updated*

*Indian Regional studbook be updated and Regional Studbook keeper for India identified*

*Additional participating institutions be designated*

*Workshop to develop global masterplan be conducted in India within 18 months*

**Stump-tailed macaque (*Macaca arctoides*)**

Aizawl Zoo, Mizoram has been designated the Coordinating Zoo, and Assam Zoo, Guwahati has been designated the Participating Zoo.

Stump-tailed macaques are not held in significant numbers in other regions.

India	53 animals in 13 institutions
Europe	13 individuals in 8 institutions
US (AZA)	0 individuals
Japan	10 individuals in 3 institutions
SE Asia	21 individuals in 2 institutions

Stump-tailed macaques are breeding well in Indian zoos. The two largest groups are maintained at Aizawl Zoo and Assam Zoo.

A Population/Habitat Viability Analysis for Stump-tailed macaques is planned in September 2008.

Delegates stressed the importance of India developing a captive conservation breeding program for stump-tailed macaques because other regions are not managing the species in sufficient numbers to sustain long term captive populations.

**Recommendations:**

*India develop a captive breeding program for stump-tailed macaques*

**Pig-tailed macaque (*Macaca nemestrina*)**

Sepahijala Zoological Park, Tripura has been designated the Coordinating Zoo for Pig-tailed macaques. Assam State zoo has been designated the Participating Zoo.

There are two species of pig-tailed macaques, both of which range through much of Southeast Asia but are found in India only in Assam.

India	18 individuals in 4 institutions
Europe	117 individuals in 14 institutions
US (AZA)	0 individuals
Japan	
SE Asia	74 individuals in 4 institutions

Delegates stressed the importance of India developing a captive conservation breeding program for pig-tailed macaques of known provenance. Other regions are not managing the species in sufficient numbers to develop a long term program and the provenance of the animals in other regions is not currently known.

**Recommendations:**

*India develop a captive breeding program for pig-tailed macaques.*

**Crab-eating Macaque (*Macaca fascicularis*)**

Chidiyatapu, Haddo, has been designated the Coordinating Zoo. It is the only institution holding Crab-eating macaques in India.

The species is still fairly numerous across its range and is not currently of conservation concern. Foreign delegates suggested that finite captive space in India may be better utilized to maintain species of greater conservation need,

especially those species not found in significant populations or managed programs in other regions (e.g. Stump-tailed macaques, Pig-tailed macaques).

*Recommendations:*

*India focus on other macaque species of greater conservation need.*

**Nilgiri Langur** (*Trachypithecus johnii*)

Arignar Anna Zoological Park, Chennai, has been designated the Coordinating Zoo and Sri Chamarajendra Zoological Gardens, Mysore, the Participating Zoo for Nilgiri Langurs.

Nilgiri langurs are not currently held in captivity outside India. India maintains 26 individuals in 6 institutions.

Participants stressed the importance of the development of a captive breeding program for this endemic, endangered Indian primate. The species is of significant conservation concern and an assurance population is not being maintained anywhere outside India.

*Recommendations:*

*India develop a captive breeding program for Nilgiri langurs.*

**Golden langur** (*Trachypithecus geei*)

Assam State Zoo, Guwahati, has been designated the Coordinating Zoo and Umananda Island, near Guwahati, has been designated the Participating Captive Facility.

These are the only institutions currently holding Golden langurs (currently totalling 15 individuals) in India. Golden langurs are not held in captivity outside India.

A Population/Habitat Viability Analysis for golden langurs is planned in September 2008.

Participants stressed the importance of a captive breeding program for this endemic, endangered Indian primate. The species is of significant conservation concern and an assurance population is not being maintained anywhere outside India. The development of awareness and education programs about the importance of this endemic primate by Assam State Zoo was encouraged.

**Recommendations:**

India develop a captive breeding program for Golden langurs.

**Capped langur** (*Trachypithecus pileatus*)

Nagaland Zoological Park, Rangapahar, Nagaland has been designated the Coordinating Zoo.

Capped langurs are not held in captivity outside India. 18 individuals are maintained in 5 Indian institutions.

A Population/Habitat Viability Analysis for capped langurs is planned in September 2008.

Participants stressed the importance of the development of a captive breeding program for capped langurs. The species is of significant conservation concern and an assurance population is not being maintained anywhere outside India.

Capped langur known to have several subspecies or mega population ranging from Meghalaya, Tripura neighbouring Bangladesh Assam and NE states. Zoo specimens' at sub species level may be identified.

**Recommendations:**

India develop a captive breeding program for capped langurs.

**Phayre's langur** (*Trachypithecus phayrei*)

Sepahijala Zoological park, Tripura, has been designated the Coordinating Zoo. It is the only Indian Zoo holding Phayre's langurs; it currently holds 18 individuals.

Only one Phayre's langur (an elderly female) is currently held outside India.

**Recommendations:**

India focus its captive conservation efforts on endangered, endemic langurs (e.g. golden langurs, capped langurs, Nilgiri langurs).

**Hoolock gibbon** (*Hylobates hoolock*)

Hoolock gibbons are not held in captivity outside of India. India maintains 15 individuals in 7 institutions.

Measurements taken to connect the canopies of trees to facilitate the movement of gibbons from one place to other was also prioritize.

Identify 3 pairs have been identified for conservation breeding program.

Jayanti Das as an expert for further investigation for breeding program.

recommended for further genetic analysis of subgroups of gibbons present in country before the conservation breeding should start.

A PHVA was conducted in 2006 and report is available with MUCH. Hollock gibbon are in captivity in Dhaka Zoo, Chittgong Zoo and Dulahazera Safari Park in Bangladesh. There are two species of Hollock gibbon i.e Hoolock hoolock (also known as western hoolock gibbon and this is not kept in captivity outside the range countries) and hoolock leuconedys ( also known as Eastern hoolock gibbon and also kept in Gibbon Conservation Centre in California).

As animals in captivity do not seem to be breeding it was suggested to collect all animals together in one institution to allow compatible pairing to occur on the basis of individual choice.

Delegates stressed the importance of India developing a captive conservation breeding program for Hoolock gibbons. The species is of significant conservation concern and an assurance population is not being maintained anywhere outside India.

**Recommendations:**

*India develop captive breeding program.*

**Red panda** (*Ailurus fulgens fulgens*)

Padmaja naidu Himalayan Zoological park, Darjeeling, has been designated the Coordinating Zoo and Himalayan Zoological park, Bulbulay, and the captive facility at Yachuli in Arunachal Pradesh have been designated the Participating Facilities.

Red pandas are managed in large, active breeding programs in Europe and the US. Expansion of the captive program for red pandas in Indian zoos was discussed and encouraged by the participants. Development of a satellite facility in India to both manage red pandas and to prepare them for release was also suggested.

**Recommendations:**

*India expand the captive breeding program for red pandas.*

*Investigate development of a range-area facility to manage pandas and prepare them for release.*

**Sloth bears** (*Melursus ursinus ursinus*)

Sloth bears were not included in the Concept Paper on Conservation Breeding, but were identified by the participants as important for inclusion in India's conservation breeding initiative. Participants recommended that Coordinating and Participating institutions be identified.

The International Studbook for Sloth Bears is currently vacant and has been recommended for elimination by CBSG (CIRCC)?. Participants stressed the importance of maintaining the international studbook, and discussion surrounded the need to identify an international studbook keeper. It was proposed that the NA Regional studbook keeper and a potential candidate in Europe be approached about taking on the international studbook and that an Indian biologist be identified to collaborate and eventually take over the international studbook.

The Indian subspecies of sloth bear is currently recommended for management in a captive program in Europe. The Sri Lankan subspecies is recommended for management in the US.

India	470 individuals in 41 institutions
Europe	12 individuals in 4 institutions
US (AZA)	0 individuals
Japan	0 individuals
SE Asia	2 individuals in 1 institution

**Recommendations:**

- India develop captive breeding program for Indian sloth bears.*
- Coordinating and participating zoos be identified*
- Regional studbook keeper for sloth bears be identified, with the goal of eventually becoming the International Studbook keeper.*

**Malayan sun bears (*Helarctos malayanus*)**

Aizawl Zoo, Mizoram, has been designated the Coordinating Zoo. Assam State Zoo, Guwahati, has been designated the Participating Zoo. According to the Concept Paper on Conservation Breeding, neither institution currently holds sun bears.

Two individuals are currently held at two different zoos (Sri Chamarajendra Zoological Park, Mysore, and Manipur Zoological Garden, Imphal).

India	2 individuals in 2 institutions
Europe	40 individuals in 16 institutions
US (AZA)	24 individuals in 16 institutions
Japan	6 individuals in 3 institutions
SE Asia	17 individuals in 3 institutions

**Recommendations:**

- India develop captive breeding program for Indian form of Malayan sun bears.*

**Himalayan (Asiatic) black bears (*Ursus thibetanus*)**

Asiatic black bears were not included in the Concept Paper on Conservation Breeding, but were identified by the participants as important for inclusion in India's conservation breeding initiative. Asiatic black bears are not recommended for long term programs in either the US or Europe.

Participants recommended that Coordinating and Participating institutions be identified.

India	251 individuals in 53 institutions
Europe	117 individuals in 14 institutions
US (AZA)	0 individuals
Japan	0 individuals
SE Asia	74 individuals in 4 institutions

**Recommendations:**

*India develop captive breeding program for Indian form of Asiatic black bears.*

**Nepalese brown bear (*Ursus arctos isabellinus*)**

Himalayan Nature Park, Kufri, Himachal Pradesh, has been designated the Coordinating Zoo.

Two wild-caught Nepalese brown bears and their two offspring comprise the known-origin population in Indian zoos. At least one of the brown bears currently in captivity in India is a European brown bear (*U. a. arctos*).

Participants suggested that the known-origin Nepalese brown bears in Indian zoos contribute to research on brown bear taxonomy; US participant Jon Ballou provided the name of a researcher at the University of Idaho to the holding zoo. The development of a captive assurance population of known Nepalese brown bears was suggested if animals are available from rescue centers or other captive sources.

India	4 individuals in 1 institution
Europe	10 individuals in 4 institutions (taken from ISIS and from European participant at the meeting)
US (AZA)	0 individuals
Japan	0 individuals
SE Asia	0 individuals in 0 institutions

**Recommendations:**

*Contribute to taxonomic research.*

*Develop captive breeding program( if known-origin animals are available from rescue centers)*

## Working Group IV- Birds

### Venue-Conference Room

Coordinator: *Sh. Vinod Rishi*

Presenter: *Dr. Vibhu Prakash*

Reporter: *Dr. Anupam Srivastav*

#### Participants attended:

*Dr. John Corder (UK), Dr. Michel Saint Jalme (France), Dr. Yoshihiko Takaki (Japan), Shri. A. N. Jha (India), Shri. Paramjit Singh (India), Shri. Satpal Dhiman (India), Shri Harsh Mitter (India), Shri Balkrishna Pillai (India), Shri Guth Lepcha (India), Dr. R. K Sahu (India), Shri. Chukhu Loma (India), Shri. Liankima Lailung (India), Dr. M. S. Karwale (India), Dr. C. B. Patel (India), Shri Dharminder Sharma (India), Dr. P. Arunthathy (Sri Lanka)*

#### Himalayan monal (*Lophophorus impejanus*)

- Dr. John Corder who is already providing the necessary expertise to Himachal Pradesh has agreed to provide the necessary expertise in this regard to the Indian program.
- *In-situ* population are facing the threat of inbreeding due to habitat fragmentation creating several small isolated populations.
- No International Studbook
- Presence of sub-species / populations needs to be investigated since the clouration between the eastern and the western populations is different

#### Blood pheasant (*Ithaginis cruentus*)

- Nine sub-species and it is imperative to clearly identify the subspecies of the birds being brought into captivity to prevent any hybridisation from occurring.
- LaCONES may please be asked to study the taxonomy of the birds being brought into captivity.
- Difficult to manage in captivity and that only Beijing Zoo is breeding a different subspecies
- No International Studbook

#### Cheer pheasant (*Catreus wallichi*)

- Himachal Pradesh has developed competence in breeding the species.
- The World Pheasant Association is committed to provide al necessary technical help in this effort.
- 

#### Hume's pheasant (*Syrmaticus humiae humae*)

- The species is easily maintained in captivity and foreign expertise may not be required.
- The current population has been reported as 8 by Aizawal Zoo.

### Grey Peacock pheasant (*Polyplectron bicalcaratum*)

- The taxonomy of the species needs to be studied to prevent hybridization between subspecies.
- An easy species to maintain in captivity.

### Slater's (mishmi) monal (*Lophophorus sclateri sclateri*)

- Expertise being developed for Himalayan Monal would be helpful in managing the birds before the founder stock is brought into captivity.
- Beijing Endangered Species Breeding Center has 1 animal

### Tibetan eared pheasant (*Crossoptilon harmani*)

- The only successful global effort in this direction so far has been made at Beijing Zoo by Zhang Jing, Curator Birds. International expertise is available from WPA for other species of eared pheasants

### Temminck's tragopan (*Tragopan temminckii*)

- Several Zoos outside India have the species in captivity, of Chinese origin.
- Dr. John Corder and Dr. Michel have agreed to arrange for specimens from foreign zoos.
- Additional founders of wild origin will be required for managing a genetically viable population.

### Blyth's tragopan (*Tragopan blythii*)

- Aizawal Zoo has stated that it willing to be a participating zoo for the species.
- 20 in Europe 5 pairs San Diego
- Dr. Michel from Jardin des Plantes is the International Studbook Keeper for the species.
- The expertise in zoos outside India is available with Cleres Zoo in France and San Diego Zoo in USA.

### Western tragopan (*Tragopan melanocephalus*)

- No expertise for the species is available outside India.
- The 4 breeding pairs in Sarahan are wild caught and can serve as excellent founder stock for the breeding program.
- Additional founders to be included as and when available.
- Breeding program for the species be restricted to high altitude zoos in the country.
- WPA is currently involved and is willing in providing technical expertise for the project in future
- Information recd. From Himachal Pradesh the current population is 17

### Satyr tragopan (*Tragopan satyra*)

- Dr. John Corder has agreed to provide birds for initiating the program
- Wild caught founders being added as and when available.
- The species is present in several zoos outside India.

### Grey jungle fowl (*Gallus sonnerati*)

- European stock comprises of hybrid birds.
- Stock at Tirupati might be hybridised, LaCONES may therefore be entrusted with the task of checking for any hybridisation with domestic breeds.

### Red jungle fowl (*Gallus gallus gallus*)

- The stock present in zoos outside India is hybrid and surpluses available from the Indian programme would be required for a global breeding programme.
- The stock in possession of zoos needs to be checked for any hybridisation with domestic fowl breeds.
- Sunderbans with its vast expanse free of any human habitation might be a possible source of genetically pure stock.
- MC Zoological Park has volunteered to be a participating zoo

### Malabar grey hornbill (*Ocyrceros griseus*)

Visit ISIS website for confirmation of presence outside India

e.g. Chester, Negara Zoo Malaysia, San Diego other species of hornbills.

### Bustards (Great Indian bustard, Lesser florican, Bengal florican, Houbara bustard)

Abu Dhabi has a Breeding center (NARC) which can be used as a source of Houbara Bustard. The species can be used as a model to perfect techniques for other species.

Locations of breeding centers to be identified eg. Jodhpur Zoo is a suggestion for Great Indian Bustard and Houbara Bustard. The Zoos in Maharashtra also need to be explored for setting up of such facilities.

Dr. Michel has agreed to share experiences and provide technical help. Bengal florican followed by lesser florican need to be accorded highest priority for new Conservation Breeding Programmes.

### Nicobar pigeon (*Caloenas nicobarica*)

- Information recd. From Ahmedabad Zoo is 18 in Ahmedabad 2 in Junagarh, 3 in nandankannan, 3 with LaCONES, 1 in Hyderabad Zoo and 1 or 2 in Chidyatapu Zoo
- Ahmedabad Population is an inbred population.
- Common outside India. Unrelated birds may be sourced from outside India (Dr. John Corder)

### Vultures (White backed, Long billed and Slender billed)

Ahmedabad Zoo is willing to be a participating zoo. One conservation breeding centre is in Pakistan. Expertise available with Birds of Prey Trust and ZSL. Most of the Stock in India is Rescued/Wild caught. The Inventory of birds need to be updated. The Govt. of Nepal is also considering a conservation breeding programme. The acquisition of founder stock as per the approved plan should be done at the earliest. Support from RSPB is reiterated. Vultures should have the highest priority for conservation breeding for birds.

### Shaheen Falcon

Expertise at Norden's Ark Sweden for Peregrine Falcon and other zoos, and organizations like Peregrine Fund.

## Working Group V- Reptiles And Amphibians

**Coordinator: Sh. B. Vijayaraghvan**

**Presenter: Sh. B.C. Choudhary**

**Recorder: Dr. Kartick Vasudevan**

The Participants presents:

Dr. Miklos Persanyi (Hungary), Dr. Bob Lacy (USA), Dr. S.K. Mittal (India), Mr. A.K. Patnaik (India), Dr. Gordon Reid (UK), Dr. P. Arunthanthy (Sri Lanka), Mr. Nikhik Whitaker (India), Dr. A.S. Ponnusamy (Sri Lanka), Mr. Dharminder Sharma (India), Mr. Nick Lindsay (UK), Ms. Sally Walker (USA), Mr. Chuku Loma (India), Mr. V.J. Rana (India), Mr. A.K. Jha (India), Mr. Guth Lepcha (India)

### King Cobra (*Ophiophagus Hannah*)

#### Recommendations:

1. Update the information on the captive stock in Indian and International zoos for king cobra of Indian origin.
2. Because of the above reasons, at this point in time we do not think king cobra should be considered as a priority species for conservation breeding. However, partnership with zoos and pharmaceutical companies should be explored to sponsor breeding/anti-venom production program.
3. Robert lacy, Chairman of CBSG recommended that due to adverse experience in North America, King cobra should not be in priority for conservations breeding in Indian zoos.

### Other snakes

#### Recommendations:

1. Take up conservation breeding of rock python *Python molurus molurus* and reticulated python *Python reticulates*.
2. Explore collaboration with International zoos on best practices for breeding of snakes

### Water monitor (*Varanus salvator*)

#### Recommendations:

1. The Nandankanan Zoological Park should be considered as the Coordinating Zoo with the MCBT, Chennai Snake Park as the Participating Zoo.

2. A Zoo from the North East and the Chidiya Tapu Zoo A&N should be considered as Participating Zoo in the program.
3. Explore collaboration with International zoos on best practices for breeding of water monitor

## Other lizards

### Discussion

Karthik: The spiny tailed lizard *Uromastyx hardwickii* should be taken up for conservation breeding because of the intense exploitation of the wild population.

BC Choudhury: The Baroda, Junagarh and Jaipur should be part of the network

### Recommendation

1. The spiny tailed lizard *Uromastyx hardwickii* should be taken up for conservation breeding with the Baroda, Junagarh and Jaipur zoos.

## Chelonians

### Recommendations:

1. The CZA should consider reviving the *Batagur baska* conservation breeding program in Sunderban Tiger Reserve in collaboration with Turtle Survival Alliance, MCBT.
2. WII will provide scientific input in developing the proposal on *Batagur baska*.
3. It is necessary to bring professional inputs from the Turtle Survival Alliance in the conservation breeding of roof turtle, *Kachuga kachuga*.
4. MCBT should be considered as the Coordinating Zoo for Travancore tortoise *Indotestudo travancorica* and Mysore zoo and Trivandrum Zoo should be considered as the Participating Zoo. Other zoos can be approached by the Coordinating Zoo to identify Participating Zoos.
5. For *Aspideretes leithii* Leith's softshell, Hyderabad should be considered as the Coordinating Zoo with MCBT as the Participating Zoo.
6. For *Manouria emy* Asian brown tortoise we suggest that CZA should consider initiating a program for the species in the Zoos of North East India (Manipur Zoo, Sipaijhala zoo in Tripura and Gawahati Zoo)

## Crocodilians

### Recommendations:

1. Ten zoos in the country are breeding the species successfully and have a fairly large number of releasable stock can be sent to International Zoos for creating an insurance stock of the species.

## Himalayan salamander (*Tyletrotiton verrucosus*)

### **Recommendations:**

1. Darjeeling zoo to serve as the coordinating zoo for the species. Sikkim zoo to participate in the program.
2. Need to create amphibian bio-security enclosures in Indian zoos modeled at the Chester Zoo enclosure in Chennai Snake Park, Bannerghatta Zoo and Madras Crocodile Bank. This will figure as the 13<sup>th</sup> Agenda.
3. WII in collaboration with Darjeeling Zoo to jointly carry out a project that in-situ and ex-situ conservation of the species.

## Other Amphibians

### **Recommendations:**

1. We recommend that the choice of *Nyctibatrachus* for conservation breeding may not be appropriate because of the issues raised above. It will be appropriate for CZA to involve participating Zoos such as Chennai Snake Park, Trivandrum Zoo, Madras Crocodile Bank, Mysore Zoo, Pigmy Hog breeding Centre, Sikkim Zoo, Darjeeling Zoo, Kufri Zoo, Nandankanan Zoo and Chidiya Tapu along with Specialists in the field to develop a list of species that can be brought into conservation breeding.
2. All conservation breeding initiative of amphibians in the country should closely tie-up with field researchers. This will allow bring in skills in breeding of amphibians, designing enclosures and monitoring the health of the captive population. CZA and WII will enable collaborations between zoos and research institutions and Universities to collaborate and participate in conservation breeding of amphibians.

## General recommendations from the International Conference on India's Conservation Breeding Initiative held during 21<sup>st</sup> to 24<sup>th</sup> February, 2008 at New Delhi.

The issues related to initiation of conservation breeding of critically endangered wild animal species of Indian sub-continent were deliberated during the Conference. After series of technical sessions and working group discussions, following recommendations are made for consideration of Government of India, Central Zoo Authority, WAZA, CBSG, other related organizations/ agencies, zoos in India and abroad :

- I. All the identified coordinating zoos in India shall select the sites for creation of off-display conservation breeding centres (CBC) in the zoo premises or as satellite facilities. The proper designs for animal enclosures need to be prepared and submitted to the Central Zoo Authority for approval. Help of the experts may need to be taken in selection of sites for conservation breeding centres and preparation of designs of the animal enclosures. The Central Zoo Authority will provide funds on 100% basis for construction of the above conservation breeding centres including the project offices.

All the participating zoos also need to initiate proposals for creation of proper display animal enclosures for all the identified species in their premises (if not already existing).

The Coordinating and participating zoos shall take all possible steps for proper enrichment in the off display conservation breeding centres (CBC) and display animal enclosures to provide for physical, biological and behavioural needs of the animals, housed/ to be housed in these. Help of national/ international experts, behaviour biologists may have to be taken for the same.

**(Action : CZA, Coordinating zoos and participating zoos )**

- II. All individuals of identified species in Indian zoos need to be marked for identification using ear tags, leg bands or micro-chips. Animal history cards for each identified individual need to be prepared in the given Performa. The Wildlife Institute of India, Dehradun in collaboration with Central Zoo Authority will train and assist the zoos in preparation of animal history cards and compile the National Studbooks of all identified species at least upto the year 2010-2011. The Wildlife Institute of India will also take steps for training and preparing the coordinating zoos to take up the responsibility of preparation and updating of National Studbooks of the concerned species from 2010-2011 onwards.

The responsibility of sharing the details with the International studbook keepers relating to National studbooks of the species will be of Central Zoo Authority, Wildlife Institute of India and Coordinating zoos of the species in the same order, at least upto the year 2011.

**(Action : CZA, Wildlife Institute of India and Coordinating Zoos and concerned Zoos)**

- III. All the major zoos and conservation breeding facilities in India shall join ISIS (International Species Information System) with a view to getting access to its proposed Zoological Information Management System (ZIMS). The process shall be completed as early as possible, but latest by March, 2009. The Central Zoo Authority will pay for all the initial costs as well as membership dues of all these facilities, at least upto the year 2012 (XI Five Year Plan period) from the date of joining of ISIS [ZIMS]. Until ZIMS is formally launched, it is felt that Zoos identified to join ZIMS in India may be provided ISIS software (ARKS & SPARKS etc.) and training for better record keeping. The use of these software will prepare them better to adopt the ZIMS whenever available.

**(Action : ZIMS, CZA and Concerned zoos)**

- IV. All the coordinating, participating and other zoos have to take steps for immediate complete health check-ups of all the probable founders. Help of the Regional Referral Centres (local veterinary colleges/ hospitals) and the National Referral Centre (NRC) i.e. Indian Veterinary Research Institute (IVRI), Bareilly have to be taken for the health analysis of the identified individuals/ founders.

**(Action : CZA, IVRI, Coordinating zoos, Participating and Other zoos)**

- V. Blood/ bio samples of the individuals, identified as probable founders need to be sent to Laboratory for Conservation of Endangered Species (LaCONES) for genetic fingerprinting to analyse the heterozygosity level (animals of unknown images/ doubtful cases only). This is required to be done to know about the genetic profile of the animals. The LaCONES will analyse the samples on priority basis and report findings to the Central Zoo Authority, Wildlife Institute of India and the concerned zoos as early as possible. The activity is part of the on-going project of Central Zoo Authority with LaCONES.

**(Action : LaCONES, CZA and Concerned zoos)**

- VI.(a) There is an urgent need to organize meetings (national co-ordination meeting) of the coordinating and participating zoos in India, preferably in the coordinating zoos to finalize the details of the initiation of the breeding programmes for all the identified species (within 31<sup>st</sup> March, 2009).

**(Action : CZA, WII, Coordinating and participating zoos)**

- (b) This is also recommended to organize two to three days' workshops (international workshop) for each identified species in the coordinating zoos involving all the participating zoos in India and abroad and identified experts on the species/ conservation breeding from India and abroad (within three years time).

(Action : CZA, Coordinating zoos)

- VII. The coordinating zoos have to initiate the proposals for engagement of technical personnel/ experts for preparation of conservation breeding management plans (CBMP) for each identified species in India. The process of preparation of CBMP has to be completed within two to three years' time. Central Zoo Authority will fund the activity on 100% basis.

(Action : CZA, Coordinating zoos)

- VIII. The Chief Wildlife Wardens of the States/ Union Territories and in-situ wildlife managers shall be asked to take all possible steps for revival of targeted wild animal species in the wild and/ or take all necessary steps to improve the condition of the natural habitats of targeted species/ re-introduction site to make it viable for the long term survival of the species in wild.

(Action : MoEF, Wildlife Wings of States/ UTs, CZA)

- IX. The Conservation Breeding Specialist Group (CBSG) of SSC/ IUCN and its regional offices shall be requested to organize workshops/ PHVA's in the coordinating zoos for each identified species. The CBSG's PHVA or similar workshops shall be taken up only when sufficient homework has already been done as part of the preparation of conservation breeding management plan (CBMP) for each identified species in Indian zoos (within five years).

(Action : Coordinating zoos, CZA and CBSG)

- X.(a) After organizing the national coordination meetings and international workshops (item VI a+b) for each identified species for initiation of conservation breeding programme, if it is felt that the programme is doing fine, requests may be made to World Association of Zoos & Aquariums (WAZA) to approve and assist the activity as part of the Global Species Management Programme (GSMP).

(Action : Coordinating zoos, CZA, WAZA)

- (b) Indian Zoos Association (IZA) shall apply for the membership of the World Association of Zoos & Aquariums [WAZA]. The Central Zoo Authority shall consider to sponsor the membership of IZA to WAZA at least up to at least XI Five Year plan period.

*(Action : IZA, CZA, WAZA)*

- XI.(a)** For making the conservation breeding programme successful, the concerned zoo personnel, veterinarians and biologists may have to visit the natural habitats of the identified species, and different zoos having expertise of the identified species as part of human resource development activity in India or abroad.

*(Action : CZA, Concerned zoos)*

- (b) There is an immediate need for creation of an Institute of Zoo Sciences in India (Centre for Zoo Science) for proper trainings, human resource development, coordinated research, to act as referral centre and for better coordination among zoos and zoo personnel not only of India but also of all the SAARC countries. This will go in long way in scientific management of zoos in India and whole of South Asia. This will also give a big boost to the conservation breeding programme in the regions.

*(Action : MoEF, CZA, NZP, New Delhi)*

- XII.** All exchanges of animals between Indian zoos as well as zoos abroad shall be considered based on the studbook information about the pedigree and expected contribution from the proposed individual animals in the breeding programme. The coordinating zoos, participating zoos in India and participating zoos abroad will get preference in acquisition of animals and in the same order.

Proposals for exchange of animal species between zoos in India and abroad, which are not part of the conservation breeding programmes, may also be considered if such exchanges help directly or indirectly in facilitating the acquisition of required animals of the targeted species for the ongoing conservation breeding programme.

Government of India may also be approached for permission for acquisition of animals from the wild, if it is found that there is no possibility of initiation and continuation of planned breeding of the desired species from the captive stocks and keeping it mind that zoos provide the insurance for the disappearing species that can be reintroduced from the zoo/captive bred specimens.

*(Action : CZA, Coordinating zoos, participating zoos in India and abroad)*

**XIII.** Amphibians are in deep crisis because of fungus infection and other reasons. It is felt that India is also having similar problems. There is an immediate need to conduct surveys, studies and action is required to be taken based on the outcome of such studies. The Government of India and wildlife related organizations may be asked/ requested to take some action in this regard. Some of the zoos may be identified for taking up ex-situ conservation breeding of some of the amphibians in need of that.

**XIV.** Taxon based Working groups (carnivores, herbivores, primates/ bears, birds, and reptiles/ amphibians) were formed and deliberated the known facts of the species targeted by the Central Zoo Authority. Suggestions of working group have been incorporated to the extent possible.

# Closing Session

Closing session was presided over by Ms. Meena Gupta, Secretary, Ministry of Environment & Forests, Government of India. Shri P.R. Mohanty, Director General of Forests, Ministry of Environment & Forests, Government of India; Shri S.C. Sharma, Retd. Addl. Director General of Forests (WL), Ministry of Environment & Forests, Government of India; Prof. Gordon Reid, Director General, Chester Zoo and President, World Association of Zoos & Aquariums; Dr. Robert Bob Lacy, Chairman, CBSG; Shri S.K. Patnaik, Retd. Adl. Principal Chief Conservator of Forests (WL) and Chief Wild Life Warden, Orissa; Ms. Sally Walker, Zoo Outreach Organization and Dr. B.R. Sharma, Member Secretary, Central Zoo Authority, India shared the dais with Secretary, Ministry of Environment & Forests, Government of India. All the resource persons and participants assembled in the main Symposia Hall of the Conference for the closing session. The presenters of all the working groups deliberated the discussion held in the different working groups and also presented the final recommendations of each working group. Member Secretary, Central Zoo Authority also presented the general draft recommendations from the International Conference on India's Conservation Breeding Initiative to the general assembly for discussion and finalization. The members on the dais responded to the different queries and questions made by the delegates and finally it was decided that the draft recommendations from different working groups shall be circulated to the members of the working groups by e-mail and the final copies of the same will be submitted to the Central Zoo Authority for being part of the Conference proceedings. General recommendations read out by the Member Secretary, Central Zoo Authority were finally accepted and approved by the general assembly for inclusion in the proceeding of the Conference.

Finally, Ms. Meena Gupta, Secretary, Ministry of Environment & Forests, Government of India gave her concluding remarks and thanked all the resource persons and delegates from India and abroad for participating into the conference.



## **Concluding Remarks**

*by*

**Ms. Meena Gupta**

*Secretary, Ministry of Environment &  
Forests, Government of India*



## **International Conference**

*on*

## **“India's Conservation Breeding Initiative”**

*Dear Participants, Good afternoon.*

First of all I must say sorry for not being able to be present all through the conference. Actually I was out of the country and have just returned. I am happy to be with you people in the closing session of the conference. I hope Dr. Sharma and his team must have taken all cares to make your visit and stay comfortable. I can make out from the attendance and discussion which was going on when I entered this hall that the conference must have been quite fruitful.

Government of India has always been very sensitive to the importance of environment, forests and wildlife. After independence many pieces of legislations have been enacted in India for better preservation of the environment and better conservation of forests and wildlife.

India is one of the 12 mega biodiversity countries of the world and holding 8% of the wild biodiversity. Preserving the same is a big challenge and India is well aware of this responsibility.

The history of public zoos in India is about 200 years old. In India, the zoo movement further received impetus after independence. In 1952, the then Indian Board for Wildlife (now re-designated as the National Board for Wildlife) recommended for setting up of a modern zoo at Delhi. This led in setting up of standards for good zoos in the country.

Modernization of Indian Zoos gained momentum after the establishment of the Central Zoo Authority in 1992. The National Zoo Policy was adopted by the Government of India in 1998, so that the very objective of operating zoos in the country is properly projected before our society.

Planned conservation breeding of wild animals species for proper display, to act as insurance for exigencies and for re-introduction or release in the wild if found desirable has been identified as the main objective of the zoos in India in the National Zoo Policy. The Central Zoo Authority has recently decided to co-ordinate all the on going conservation breeding programmes at the national level and also to assist the other zoos to initiate similar programmes for many more wild animal species which are in immediate need of ex-situ conservation assistance. I have been told that the Central Zoo Authority has also taken some important steps like establishment of a Laboratory for Conservation of Endangered Species (LaCONES) at Hyderabad for biotechnological interventions in scientific management of zoos., creation of National Referral Centre at Indian Veterinary Research Institute, Bareilly for better health care of wild animals in captivity. The Authority has also established a National Studbook Cell in Wildlife Institute of India, Dehradun for preparation of national studbooks of wild animal species and record keeping in Indian Zoos. All the major zoos of the country are also joining Zoological Information Management System (ZIMS) an upcoming international software for scientific management and better record keeping in the zoos.

I hope with these developments and better co-ordination with Zoos abroad, the zoos in India will readily achieve their desired objectives. I am very thankful to all of you who have come all way to New Delhi and assembled here to be part of this very important initiative. The Government of India will be greatly benefited and will certainly consider the recommendations, which will come out of the conference.

Thank you.



*Entrance of National Agriculture Science Centre (ICAR), Venue of Conference, New Delhi*



*View of Premises - National Agriculture Science Centre (ICAR), New Delhi*





































## Annexure I

## Indian Zoos Joining ISIS/ZIMS.

S. No.	Name of the Zoo	Years	No. of Visitors (2006-07)	Budget (in Rupees) (2006-07)
1	Indira Gandhi Zoological Park Visakhapatnam Andhra Pradesh - 530 040  Tele(O):0891-2552081/2010500 Mb. 09440810160 Fax No.:0891-2552081 E-Mail: <a href="mailto:zoo_vzg@efs.gov.in">zoo_vzg@efs.gov.in</a>	2006 - 07	3,88,000	2,34,28,000
2	Nehru Zoological Park Forest Department, Bahadur Pura Hyderabad Andhra Pradesh - 500 064  Tele(O): 040-24477355, 9440810162 Fax No.: 040-24473253 E-Mail: <a href="mailto:hydzoorediffmail.com">hydzoorediffmail.com</a>	2006 - 07	16,31,518	5,06,97,104
3	Sri Venkateswara Zoological Park Pudipatla Post, Tirupati Andhra Pradesh - 517 505  Tele(O): 0877-2249235 9440810066 (Mb) Fax No.: 0877-2248029 E-Mail: <a href="mailto:tirupatzoo@yahoo.co.in">tirupatzoo@yahoo.co.in</a>	2006 - 07	2,17,929	1,46,38,300
4	Assam State Zoo Cum Botanical Garden Assam State Zoo Division R.G. Baruah Road, Guwahati Assam - 781 005  Tele(O): 0361-2201363/ 9864055135 Fax No: 0361-2263633 Mail: <a href="mailto:narayan_mahanta@yahoo.co.uk">narayan_mahanta@yahoo.co.uk</a> <a href="mailto:wildassam@indiatimes.com">wildassam@indiatimes.com</a> <a href="mailto:assamstatezoo@yahoo.com">assamstatezoo@yahoo.com</a>	2006 - 07	4,30,462	3,41,71,156
5	Sanjay Gandhi Biological Park Patna , Bihar - 800 001  Tele(O): 0612-2217455, 09431249888 Fax No.: 0612-2217455	2006 - 07	12,30,429	2,49,83,060

**India's Conservation Breeding Initiative**

6	<p>National Zoological Park Mathura Road, New Delhi – 110 003</p> <p>Tele(O): 011-24359825,24358500 9868158629 (M) Fax No.: 011-24352408 E-Mail: <a href="mailto:delhizoo@vsnl.net">delhizoo@vsnl.net</a> <a href="mailto:dnsingh87@yahoo.com">dnsingh87@yahoo.com</a></p>	2006 – 07	13,37,000	5,32,00,000
7	<p>Kamla Nehru Zoological Garden Kankaria, Ahmedabad Gujarat – 380 008</p> <p>Tele(O): 079-25463415 (M) 9327038791 Fax No.: 079-25350926 E-Mail: <a href="mailto:ahmedabadzoo@icenet.net">ahmedabadzoo@icenet.net</a></p>	2005 – 06	14,70,600	1,93,81,000
8	<p>Sakkarbaug Zoo Outside majevadi Gate, Junagadh Gujarat – 362 001</p> <p>Tele(O): 0285-2660235, (M) 9426815189 Fax No.: 0285-2660236 E-Mail: <a href="mailto:cfwild@vsnl.com">cfwild@vsnl.com</a> <a href="mailto:cfwild_adl@sancharnet.in">cfwild_adl@sancharnet.in</a></p>	2006 – 07	8,49,992	2,38,46,000
9	<p>Sri Chamarajendra Zoological Gardens Indira nagar, Mysore Karnataka - 570 010</p> <p>Tele(O):0821-2520302,2440752 (M) 9342113939 Fax No.: 0821-2563494 E-Mail: <a href="mailto:mysorezoo@hotmail.com">mysorezoo@hotmail.com</a> <a href="mailto:zoomysore@gmail.com">zoomysore@gmail.com</a></p>	2006 – 07	19,99,063	5,36,23,000
10	<p>Thiruvananthapuram Zoo Zoological Gardens, Department of Museums and Zoos, Thiruvananthapuram City Kerala - 695 033</p> <p>Tele(O): 0471-2316275/ 2314461 (M) 9447016828 Fax No.: 0471- 2318294 E-Mail: <a href="mailto:museumzoo@sancharnet.in">museumzoo@sancharnet.in</a></p>	2006 - 07	10,18,627	1,10,66,000

**India's Conservation Breeding Initiative**

11	<p>Veermata Jijabai Bhosale Udyan &amp; Zoo Dr. Ambedkar Road Byculla, Mumbai Maharashtra – 400 027</p> <p>Tele(O): 022-23725799,23723578 (M) 9820703194 Fax No.: 022-23759821</p>	2006 - 07	17,09,419	1,94,95,000
12	<p>Rajiv Gandhi Zoological Park &amp; Wildlife research Centre Pune Satara Road Opp. Katraj Dairy At, Katraj Pune Maharashtra – 411 046</p> <p>Tele(O): 020-24367712 (M) 9823374491 Fax No.: 020- 5501104 E-Mail: <a href="mailto:punezoo@vsnl.net">punezoo@vsnl.net</a></p>	2006 - 07	13,25,086	1,14,19,000
13	<p>Nandankanan Zoological Park Mayur Bhawan, Janapath, 251, Saheed Nagar, Bhubaneshwar Orissa - 751 007</p> <p>Tele(O): 0674-2547850, 9937083636(Mb) Fax No.: 0674-2547850 E-Mail: <a href="mailto:director_n@hotmail.com">director_n@hotmail.com</a></p>	2006 - 07	15,07,783	2,90,10,726
14	<p>Mahendra Chaudhury Zoological Park Chattbir, Dist Mohali Punjab - 160 026</p> <p>Fax No.: 0172- 288820 (PP) Zoo : 01762-286303</p>	2006 – 07	3,83,594	1,70,70,248
15	<p>Jaipur zoo, Museum Road Ramniwas Bagh, Jaipur Rajasthan - 302 004</p> <p>Tele(O): 0141-2617319 (M) 9414248780 Fax No.: 0141- 2227832 (CWLW)</p>	2006 – 07	10,16,000	10,25,000
16	<p>Arignar Anna Zoological Park, Vandalur, Chennai, Tamil Nadu – 600 048</p> <p>Tele(O): 044-22750741, 22751089 (M) 9444264128 Fax No.: 04422750741 E-Mail: <a href="mailto:aazp@hotmail.com">aazp@hotmail.com</a> <a href="mailto:Aazp@vsnl.com">Aazp@vsnl.com</a></p>	2006 – 07	11,87,904	1,53,60,000

**India's Conservation Breeding Initiative**

17	Centre for Herpetology Madras Crocodile Bank Trust/Centre Post Bag 4, Mamallapuram Tamil Nadu – 603 104  Tele(O): 041 14-2272447 (M) 9840379164 Fax No.: 041 14-2272958 E-Mail: <a href="mailto:mcbtindia@vsnl.net">mcbtindia@vsnl.net</a>	2006 – 07	8,76,970	43,13,950
18	Sepahijala Zoological Park C/O Wildlife Warden Agartala Tripura - 799 103  Tele(O): 0381-2361225,2361227 Fax No.: 0381 – 2225253 (CWLW)	2006 – 07	1,27,244	83,16,000
19	Kanpur Zoological Park Allen Forest Azad Nagar Kanpur Uttar Pradesh – 208 002 Tele(O): 0512-2560257 Fax No.: 0512-2560257 E-Mail: <a href="mailto:anuj69123@rediffmail.com">anuj69123@rediffmail.com</a>	2006 – 07	4,57,129	30,00,000
20	Lucknow Zoological Park Hazratganj, Lucknow Uttar Pradesh – 226 001 Tele(O): 0522-2239588 Fax No.: 0522-2239588 E-Mail: <a href="mailto:lucknowzoo@yahoo.com">lucknowzoo@yahoo.com</a>	2006 – 07	10,42,095	1,77,00,000
21	Alipore Zoological Garden Alipore Kolkata West Bengal – 700 027  Tele(O): 033-24791150,24399391 9831138533 (M) Fax No.: 033-24791150,24399391 E-Mail: <a href="mailto:calzoo@onlysmart.com">calzoo@onlysmart.com</a>	2006 – 07	18,09,580	6,11,87,564
22	Sayaji Baug Zoo Municipal Corporation Sayaji Bagh Zoo Officer, Vadodra Gujarat – 390 018  Tele(O):0265-2784079 (M) 9879594551 Fax No.: 0265-2433060	2006 – 07	7,30,976	42,50,000

**India's Conservation Breeding Initiative**

23	Bhagwan Birsa Biological Park Doranda, P.B. No. 41 Ranchi Jharkhand - 834 002  Tele(O):0651-2576531,Zoo-2301045 9431359854 (M) Fax No.: 0651-2503655	2006 – 07	2,35,014	97,83,000
24	Bannerghatta Zoological Garden National Park Bangalore Karnataka - 560 083  Tele(O): 080-27828540, 09448007102(M) Fax No.: 080-7828400,7828300 E-Mail: <a href="mailto:bannerghatta@vsnl.net">bannerghatta@vsnl.net</a>	2006 – 07	8,39,717	3,64,10,000
25	Dr. Shivaram Karanth Pilikula Biological Park Pilikula Nisarge Dhama,Vamanjoor Mangalore – 575 028 Karnataka	2006 – 07	5,00,000	50,00,000
26	State Museum & Zoo Superintendent's Quarters State Museum & Zoo Thurissur Kerala - 680 020  Tele(O): 0487-2333056, (M) 9495301904 Fax No.: 0487-2333056	2006 – 07	4,54,545	1,20,82,780
27	Manipur Zoological Garden Govt. of Manipur O/o Chief Conservator of Forests Wildlife, Imphal Manipur – 795 001  Tele(O): 0385-2447029 Tele(R): 0385-2310973	2006 – 07	85,810	18,68,000
28	Chennai Snake Park Trust Rajbhavan Post, Guindy Chennai Tamil Nadu – 600 022  Tele(O): 044-22353623 E-Mail: <a href="mailto:cspt1972@md5.vsnl.net.in">cspt1972@md5.vsnl.net.in</a>	2006 – 07	7,96,925	34,83,915
29	Calcutta Snake Park Conservation Centre And Laboratory 31, Hindustan Park, Calcutta West Bengal – 700 029  Tele(O): 033-24632425 Snake Park	2006 – 07	1,75,785	6,17,575

**India's Conservation Breeding Initiative**

30	<p>Mini Zoo, Haddo (Wildlife Division-I) Port Blair I/C Mini Zoo, Haddo Andaman &amp; Nicobar Islands - 744102</p> <p>Tele(O):03192-232816/233549 Fax No.:03192- 233549 E-Mail: <a href="mailto:cwlv@cal3.vsnl.net.in">cwlv@cal3.vsnl.net.in</a> <a href="mailto:cwlv@vsnl.com">cwlv@vsnl.com</a></p>	2006 – 07	74,981	34,20,000
31	<p>Biological Park Itanagar wildlife Sanctuary Division, Naharalagur Arunachal Pradesh – 791 110</p> <p>Tele(O): 0360-2244416,2203533-34 9436042770(M) Fax No.: 0360-2244416/2212501 E-Mail: <a href="mailto:chukkuloma@yahoo.co.uk">chukkuloma@yahoo.co.uk</a></p>	No response	No response	No response
32	<p>Bondla Zoo Dept. of Wildlife &amp; Ecotourism Junta House, 3<sup>rd</sup> Floor Panaji Goa - 430 401</p> <p>Tele(O): 0832-2312793,2229701 Fax No.: 0832-2224747 E-Mail: <a href="mailto:wildlife@goatelecom.com">wildlife@goatelecom.com</a></p>	2006 – 07	40,507	14,01,928
33	<p>Dr. Shyamaprasad Mukharjee Zoological Garden Sarthana Opposite Sarthana Octroi Naka, Surat Kamrej Road Surat – 395 008 Tel: 0261-2423751/ 2422285 9376844856 (M) Fax: 0261-2422110/ 2451935 E-mail: <a href="mailto:mctigersmc@hotmail.com">mctigersmc@hotmail.com</a> <a href="mailto:mehtadrprafull@yahoo.co.in">mehtadrprafull@yahoo.co.in</a></p>	2006 – 07	9,23,600	65,15,000
34	<p>Rohtak Zoo Govt. of Haryana, Chankyapuri H. No. 69, Near Railway Crossing Delhi Bye Pass Road Rohtak, Haryana</p> <p>Tele(O): 0172-211231 Fax No.:0172- 212191</p>	2006 – 07	1,05,620	12,58,199
35	<p>Himalayan Nature Park (Kufri) Himachal Pradesh Forest Department, Wildlife Division Shimla- 171 002, Himachal Pradesh.</p> <p>Tele(O): 0177-2623993, (M) 9418000160 Fax No.: 0177-2623993</p>	2006 - 07	1,08,931	11,85,000

**India's Conservation Breeding Initiative**

36	Tata Steel Zoological Park Jubilee Park, Jamshedpur, Jharkhand - 831 001  Tele(O): 0657-2424086, 2433918 Fax No.: 0657-2424086 E-Mail: <a href="mailto:tata_zoo@rediffmail.com">tata_zoo@rediffmail.com</a>	2006 – 07	3,88,201	70,00,000
37	Tiger & Lion Safari, Thyarekoppa Wildlife Division, Shimoga Karnataka - 577 201  Tele(O): 08182-222983, 9448131923 (M) Fax No.: 08182-22283 E-Mail: <a href="mailto:dcfwl_smg@hotmail.com">dcfwl_smg@hotmail.com</a>	2006 – 07	1,39,037	64,68,000
38	Gandhi Zoological Park Gwalior Madhya Pradesh - 474 001  Tele(O): 0751-2438344,2326252 (M) 9993320003 Fax No.: 0751-2326252 E-Mail: <a href="mailto:zoogwl@sancharnet.in">zoogwl@sancharnet.in</a>	2006 – 07	2,04,344	76,00,333
39	Kamala Nehru Prani Sanghralalay Zoo Indore Zoo, Indore, Navlakha Madhya Pradesh - 452 001  Tele(O):0731-2700972/2400972 (M) 9329555157 Fax No.: 0731-2434489/2531166	2006 – 07	4,28,246	32,00,000
40	Van Vihar National Park Taty Tope Nagar PB No. 348, Bhopal Madhya Pradesh - 462 003  Tele(O): 0755-2674278 (M) 9229205025 Fax No.: 0755-2674278 E-Mail: <a href="mailto:dirvvp@sancharnet.in">dirvvp@sancharnet.in</a>	2006 – 07	1,84,513	81,05,962
41	Aurangabad Municipal Zoo Sidharth Garden, Near Central Bus Stand Municipal Corporation, Aurangabad, Maharashtra – 431 001  Tele(O): 0240-2331956,2331213 9922432813 (M) Fax No.: 0240-2331213	2006 – 07	5,15,500	39,93,408

**India's Conservation Breeding Initiative**

42	Aizawl zoo Anmingdailova Colony, Aizawl, Mizoram – 796 001	During Dec. 06 to Sept. 07	34,802	48,94,851
43	Indira Gandhi Park Zoo & Deer Park Town Service Department Rourkela Steel Plant. Sector IV, Rourkela Orissa – 769 002  Tele(O): 0661- 2510641-46 extn.-9563 09437222382 (M)	2006 – 07	4,27,950	26,05,805
44	Jodhpur Zoo Umned Prk High Court Road Jodhpur Rajasthan - 342 001  Tele(O): 0291-2635429, 9414136206 (M) Fax No.: 0291 – 2635425 (CF)	2006 – 07	2,64,598	14,00,000
45	Pt.Govind Ballabh Pant High Altitude Zoo Nainital Forest Division P.O.Tallital Nainital Uttaranchal - 263 002  Tele(O): 05942-237927,(M) 9412084469 Fax No.: 05942-236469 E-Mail: <a href="mailto:nainitalzoo@rediff.com">nainitalzoo@rediff.com</a>	2006 – 07	1,28,880	35,00,000
46	Padmaja Naidu Himalayan Zoological Park Jawahar Parabat (West), Darjeeling West Bengal - 734 101  Tele(O): 0354-2254250,2253709(C) (M) 9434021710 Fax No.: 0354-2252522 E-Mail: <a href="mailto:pnhzp@yahoo.com">pnhzp@yahoo.com</a> <a href="mailto:pnhzp@sify.com">pnhzp@sify.com</a>	2006 – 07	2,87,697	2,12,77,051
47	Kanan Pandari Zoo Bilaspur Division, Bilaspur Chattisgarh - 495 001 Tele: 07752-226082 Email. <a href="mailto:dfobsp@rediffmail.com">dfobsp@rediffmail.com</a>	2006	2,92,018	42,00,000
48	Rajkot Municipal Corp. Zoo, Pandit Dindayal Upadhyay Park, Aji Dam, Bhavangare Road, Rajkot, Gujarat – 360 001  Tele(O) : 0281- 2387011 Fax No : 0281-2224258	2006 – 07	4,00,000	30,96,000

**India's Conservation Breeding Initiative**

49.	Pigmyhog Conservation Breeding Centre, Assam	2006-07	-	3500000
50.	Agra Bear Rescue Facility, Agra	2006-07	-	15000000
51.	Maitribagh Zoo, Bhillai, Chhatisgarh	2006-07	50000	1265000
52.	Jawaharlal Nehru Biological Park, Bokaro	2006-07	30000	1000000
53.	Lady Hydari Park and Animal Land, Shillong, Meghalaya	2006-07	200000	2220000
54.	Nagaland Zoological Park, Rangapahar	2006-07	50000	2450000
55.	Manda Zoo, Jammu, Jammu & Kashmir	2006-07	115000	1240000
56.	Himalayan Zoological Park, Bulbuley, Gangtok, Sikkim	2006-07	22852	7500000
57.	Dr. Shivaram Karanth, Pilikula, Biological Park, Mangalore	2006-07	50000	5000000
	<b>Institutions:</b>			
58.	Central Zool Authority, New Delhi	-	-	-
59.	Wildlife Institute of India, Dehradun, Uttarakhand	-	-	-
60.	Indian Veterinary Research Institute, Bareilly	-	-	-
61.	Laboratory for Conservation of Endangered Species, Hyderabad	-	-	-

## List of Foreign Participants

	Name of the Participants	Address	Country
1.	Ms. Sally Walker	Director, South Asian Zoo Association for Regional Cooperation (SAZARC), E-mail: sallywalker@aol.com	India
2.	Dr. Nate Flesness	Executive Director, International Species Information System (ISIS), E-mail: nate@isis.org	USA
3.	Dr. Wisid Wichasilpa	Deputy Director, Zoological Park Organization of Thailand Rama V Road, Dusit, Bangkok 10300 Thailand Ph. No. 81-3-3837-0211/1231	Thailand
4.	Dr. Sumate Kamolnorranath	Director, Research and Conservation Division Zoological Park Organization of Thailand Rama V Road, Dusit, Bangkok 10300 Thailand Ph No. +66-2-282-7111-3 ext 194 E-mail: sumatekamol@yahoo.com	Thailand
5.	Kumek Almenbayev	Director Almati Zoo Kazakhstan E-mail: tair@nursat.kz Ph No. +7 7272 913719 Fax: +7 7272913732	Kazakhstan
6.	Aishan Yedgebayeva	Curator Almati Zoo Ph No. +7 7272 913719 Fax: +7 7272913732	Kazakhstan
7.	Dr. Monica Stoops	Cincinnati Zoo & Botanical Garden, Cincinnati Ohio 45220	USA
8.	Dr. Terri L Roth	Vice President of Conservation & Science, Cincinnati Zoo & Botanical Garden, Cincinnati Ohio 45220 Ph. No. 513/569-8220 Fax No. 513/569-8214 E-mail: terri.roth@cincinnati-zoo.org	USA
9.	Professor Gordon Mc Reid	WAZA President Chester ZOO And Director General North of England Zoological Society Ph. +44(0) 1244 650201 Fax: +44(0) 1244380405	USA
10.	Mr. Neil Dorman	Curator, Twycross Zoo (East Midlands Zoological Society) England P.No. 0044-1827-883122 Passport No. 454775981 E-Mail: neil.dorman@twycrosszoo.org	UK
11.	Dr. Suzanne Boardman	Director, Twycross Zoo (East Midlands Zoological Society) England P.No. 0044-1827-883122 E-Mail: sboardman@wildlifeinformation.org Suzanne.i.boardman@twycrosszoo.org	UK
12.	Mr. Yoshihiko Takaki JAZA	Japanese Association for Zoos & Aquariums Ph. No. 81-3-3837-0211/1231 E-Mail: takagi@parks.or.jp	Japan
13.	Mr. Masato Takeda JAZA	Japanese Association for Zoos & Aquariums E-Mail: ma-takeda@city.osaka.lg.jp	Japan

**India's Conservation Breeding Initiative**

14.	Dr. Robert C lacy	Chairman, IUCN/SSC Population Geneticist/ Conservation Biologist Chicago Zoological Society, Brookfield, IL 60513 USA E-mail: rlacy@ix.netcom.com	USA
15.	Mr. Mati Kaal	Director, Tallinn Zoological Gardens, Tallinna Loomaaed, Ehitajate Tee 150/Paldiski Mnt. 145, 13522 Tallinn, Estonia Ph. No. +372 6943313 Fax: +372 6943311 E-mail: Mati.Kaal@tallinnlv.ee	Estonia
16.	Mr.Vladimir Fainstein	Collection Director Tallinn Zoo Director, Tallinn Zoological Gardens, Tallinna Loomaaed, Ehitajate Tee 150/Paldiski Mnt. 145, 13522 Tallinn, Estonia Ph. No. +372 6943313 Fax: +372 6943311 E-mail:Vladimir.fainstein@tallinnlv.ee	Estonia
17.	Dr. Lydia Kolter	Curator of Ursids & Felids, Zoologischer Garten Koln AG, Riehler Str. 173, 50735 Koln, Germany Ph. No. +49 221 77 85 107 Fax: +49 221 77 85 111 Mobile: + 49 163 55 72 741 E-mail: kolter@koelnerzoo.de	Germany
18.	Dr. O Pagan	Director Basel Zoo, CH 5152 Munchenstein Gruthweg 31 Switzerland Ph. No. 0041 61 2953535/2810005 E-Mail: pagan@zoobasel.ch	Switzerland
19.	Dr.Von Houwald	Curator Basel Zoo, CH 4493 Wenslinger Dorfstrasse 66 Switzerland Ph. No. 0041 61 2953535/2810005 E-mail: vonhouwald@zoobasel.ch	Switzerland
20.	Dr.Vollom Jurg,	Veterinarian, Basel Zoo, CH Malzgasse 14, 4052 Switzerland Ph. No. 0041 61 2953535 Fax: 2810005 E:mail- juerg.voellm@bluewin.ch	Switzerland
21.	Mr. Leif Blomqvist	General Curator of Helsinki Zoo E-mail: Leif.blomqvist@kolumbus.fi	Finland
22.	Ms. Lena M Linden	Director, Nordens Ark, Ay Sateri, 5-45046 Hunnebostrand, Sweden E-Mail: lml@nordensark.se	Sweden
23.	Mr.Vladimir Frolov	Deputy Director Moscow Zoo Passport No. 62No 1219637 Date of Expiratory: 11.07.09 E-mail: salome.zoo@cdt.ru and vladimir.fainstein@tallinnlv.ee	Russia
24.	Dr. David John Shepherdson	Deputy Conservation Division Manager, Oregon Zoo E-mail: david.shepherdson@oregonzoo.org	USA
25.	Ms.Valerie J. Hare	Workshop Coordinator & Associate Editor, The Shape of Enrichment, Inc. 1650 Minden Dr., San Diego, CA 92111 USA +01-858-279-4273 E-mail: hare@enrichment.org	USA
26.	Dr. Christian R. Shimidt	Hochstadter Landstr. 114 D-63454 Hanau-Hohe Tanne Tel/Fax: 0049 06181 84359 E-mail: schmidtzoo@gmx.net	Germany

**India's Conservation Breeding Initiative**

27.	Dr. Mohammed Ali Reza Khan	Head of zoo section public parks and horticulture department, Dubai municipality Post Box 67 Dubai United Arab Emirates facsimile- [00] 9714-3499437 tel- [00] 9714-3027774, 3497280 E-mail: MAKHAN@dm.gov.ae	Dubai
28.	Dr. Jonathan D. Ballou	Research Scientist, National Zoological Park, Washington, DC 20008 E-mail: BallouJ@si.edu	USA
29.	Mrs. Angela Glaston	Curator of Mammals International Studbook Keeper for Red Pandas Rotterdam Zoo Netherlands Ph. No. +31-10-4431410 +31 104431466 (Fax) E-mail: a.glatston@rotterdamzoo.nl	Netherlands
30.	Dr. Persanyi miklos With wife and daughter	Director General, Budapest Zoo and Botanical Garden 1371 Budapest E-mail: persanyi@zoobudapest.com	Hungary
31.	Mr. Nick Lindsey	Zoological Society of London Whipsnade Zoo, Dunstable Bedfordshire LU62LF London UK +44(0)1582 871302 Fax: 44(0) 1582 872649 E-mail: nick.lindsay@zsl.org	UK
32.	Mr. Scott Carter	Director of Conservation and Animal Welfare, Detroit Zoological Society, 8450 W. 10 Mile Road, Poyal Oak, MI 48067 248 541 5717 ext. 3160 Fax: 248 691 4184 E-mail: scarter@detroitzoo.org	USA
33.	Mr. John Corder	World Pheasant Association, UK Downlands Knowle St Giles Chard Somerset TA20 4 AY UK E-mail: jc@pheasant28.freereserve.co.uk	UK
34.	Jose Kok	Ouwehands Dierenpark P.O.. Box 9 NL - 3910 AA Rhenen, The Netherlands Ph No. 0031 317 650200 Fax 0031 317 650200 E-mail: jose.kok@ouwehand.nl	Holland
35.	Dr. Ivan Rehak, CSc.	Assistant Director Prague Zoo 171 00 Praha 7 - Troja U Trojskeho zamku 3/120 171 00 Praha 7 - Troja Czech Republic Telephone/ Fax: +420 737 213 579 / +420 286 582 500 E-mail: ivan.rehak@volny.cz	Czech Republic
36.	Ms. Parichart Tappasut,	ZPO-Lawyer. Zoological Park Organization of Thailand Rama V Road, Dusit Bangkok 10300 Thailand Tel +66-2-282-7111-3 ext 194 Fax +66-2-282-6125, 66-2-282-9104	Thailand
37.	Ms. Mukushewa Maria	Almaty Zoo Kazakhstan E-mail: tair@nursat.kz Ph No. +7 7272 913719 Fax: +7 7272913732	Kazakhstan

38.	Ms. Susie Ellis	Executive Director, International Rhino Foundation 138 Strasburg Reservoir Road, Strasburg, VA 22657 Tel/fax 1-540-465-9595 Cell 1-540-660-4150 E-mail: <a href="mailto:s.ellis@rhinos-irf.org">s.ellis@rhinos-irf.org</a>	USA
39.	Dr. (Mrs.) Ramani Jayalath	Veterinary Surgeon National Zoological Garden Dehiwala Sri Lanka 2712751/3, Fax 2734542 E-mail: <a href="mailto:pinnawela@yahoo.com">pinnawela@yahoo.com</a>	Sri Lanka
40.	Dr. (Mrs) Arundati Ponnasami	Veterinary Surgeon National Zoological Garden Dehiwala Sri Lanka 2712751/3, Fax 2734542 E-mail: <a href="mailto:pinnawela@yahoo.com">pinnawela@yahoo.com</a>	Sri Lanka
41.	Mr. Ashoka Jayalath	Veterinary Surgeon National Zoological Garden Dehiwala Sri Lanka 2712751/3, Fax 2734542 E-mail: <a href="mailto:pinnawela@yahoo.com">pinnawela@yahoo.com</a>	Sri Lanka
42.	Dr. Michel Saint Jalme	Maitre de Conferences, Museum National d'Histoire Naturelle, UMR 5173 MNHN CNRS Paris VI, Menageries du Jardin des Plantes, 57 rue Cuvier, 75005 Paris	France
43.	Ms. Kristy Garad	Western Plains Zoo, Dubbo Australia	Australia

## List of the Indian Participants

S. No.	Name / Designation	Zoo Name
1.	Shri Rahul Pandey, IFS, Curator	Indira Gandhi Zoological Park Visakhapatnam Andhra Pradesh - 530 040 Mb. 09440810160 E-Mail: <a href="mailto:zoo_vzg@efs.gov.in">zoo_vzg@efs.gov.in</a>
2.	Shri K. B. Markandairah, IFS, Executive Director & Dy. Conservator of Forests	Bannerghatta Zoological Garden National Park Bangalore Karnataka - 560 083 Mobile No. 9448007102 E-Mail: <a href="mailto:bannerghatta@vsnl.net">bannerghatta@vsnl.net</a>
3.	Shri Narayan Mahanta Director/DFO	Assam State Zoo, Guwahati Assam India E-Mail: <a href="mailto:Narayan_mohanta@yahoo.co.uk">Narayan_mohanta@yahoo.co.uk</a> <a href="mailto:assamstatezoo@yahoo.com">assamstatezoo@yahoo.com</a>
4.	Shri B. Vijayaraghavan, IAS (Retd.), Chairman	Chennai Snake Park Trust Rajbhavan Post, Guindy Chennai Tamil Nadu – 600 022 E-Mail: <a href="mailto:cspt1972@md5.vsnl.net.in">cspt1972@md5.vsnl.net.in</a>
5.	Shri A. K. Jha, IFS, Director	Padmaja Naidu Himalayan Zoological Park Jawahar Parabat (West), Darjeeling West Bengal - 734 101 Tele(O): 0354-2254250, 2253709(C) (M) 9434021710 Fax No.: 0354-2252522 E-Mail: <a href="mailto:pnhzp@yahoo.com">pnhzp@yahoo.com</a> <a href="mailto:alan_jha@yahoo.co.in">alan_jha@yahoo.co.in</a>
6.	Dr. Sunita Pradhan Scientific Officer	Padmaja Naidu Himalayan Zoological Park, Darjeeling <a href="mailto:sunitaprad@yahoo.com">sunitaprad@yahoo.com</a>
7.	Shri P. K. Verma, Conservator of Forests and Director	Bhagwan Birsa Biological Park Doranda, P.B. No. 41 Ranchi Jharkhand - 834 002 Mobile No. 9431359854
8.	Shri A. K. Bhowmik, TFS, Director	Sepahijala Zoological Park C/O Wildlife Warden Agartala Tripura - 799 103 E-Mail: <a href="mailto:Bhowmik_ak@yahoo.com">Bhowmik_ak@yahoo.com</a>

**India's Conservation Breeding Initiative**

9.	Dr. S. K. Chaudhuri , Director	Alipore Zoological Garden Alipore Kolkata West Bengal – 700 027 Mobile No. 9831 138533 E-Mail: <a href="mailto:calzoo@onlysmart.com">calzoo@onlysmart.com</a>
10.	Shri K. Chandrasheker Pillai, Curator,	Sri Venkateshwara Zoological Park, Tirupati E-Mail: <a href="mailto:tirupatzoo@yahoo.co.in">tirupatzoo@yahoo.co.in</a>
11.	Shri Vijay Ranjan Singh, IFS Executive Director	Sri Chamarajendra Zoological Gardens Indira nagar, Mysore Karnataka - 570 010 Mobile No. 93421 13939 E-Mail: <a href="mailto:mysorezoo@hotmail.com">mysorezoo@hotmail.com</a> <a href="mailto:zoomysore@gmail.com">zoomysore@gmail.com</a>
12.	Shri Liankima Lailung, IFS, In-charge	Aizawl zoo Anmingdailova Colony, Aizawl Mizoram – 796 001 E-Mail: <a href="mailto:llailung@yahoo.co.in">llailung@yahoo.co.in</a>
13.	Shri Dharminder Sharma, IFS Field Director	Mahendra Chaudhury Zoological Park Chattbir, Dist Mohali Punjab - 160 026
14.	Shri R. Hemanth Kumar, IFS Director	Kanpur Zoological Park Allen Forest Azad Nagar Kanpur Uttar Pradesh – 208 002 E-Mail: <a href="mailto:anuj69123@rediffmail.com">anuj69123@rediffmail.com</a> <a href="mailto:hравivarapu@yahoo.com">hравivarapu@yahoo.com</a>
15.	Shri Vivek Pandey, IFS Director	Pt. Govind Ballabh Pant High Altitude Zoo Nainital Forest Division P.O. Tallital Nainital Uttaranchal - 263 002 Tele(O): 05942-237927, (M) 9412084469 Fax No.: 05942-236469 E-Mail: <a href="mailto:nainitalzoo@rediff.com">nainitalzoo@rediff.com</a>
16.	Shri J. S. Chauhan, IFS Conservator of Forests & Director	Van Vihar National Park Tatya Tope Nagar PB No. 348, Bhopal Madhya Pradesh - 462 003 Mobile No. 9229205025 E-Mail: <a href="mailto:dirvvnnp@sancharnet.in">dirvvnnp@sancharnet.in</a> <a href="mailto:dirvvnnp@bsnl.in">dirvvnnp@bsnl.in</a>
17.	Dr. Mir M. Mansoor Chief Wildlife Biologist & Veterinarian	J & K Govt. Jammu E-Mail: <a href="mailto:mmnsur@yahoo.co.in">mmnsur@yahoo.co.in</a> <a href="mailto:mirmansoor2002@yahoo.co.uk">mirmansoor2002@yahoo.co.uk</a>
18.	Shri Chukhu Loma DCWLC Cum Ex-Officio Director	Biological Park Itanagar wildlife Sanctuary Division, Naharalagar Arunachal Pradesh – 791 110 Mobile No. 9436042770 E-Mail: <a href="mailto:chukkuloma@yahoo.co.uk">chukkuloma@yahoo.co.uk</a>

**India's Conservation Breeding Initiative**

19.	Dr. C. S. Jayakumar, Veterinary Surgeon	Thiruvananthapuram Zoo Zoological Gardens, Department of Museums and Zoos, Thiruvananthapuram City Kerala - 695 033 Mobile No. 9447016828 E-Mail: <a href="mailto:museumzoo@sancharnet.in">museumzoo@sancharnet.in</a> <a href="mailto:kumjoy@yahoo.com">kumjoy@yahoo.com</a>
20.	Dr. R. K. Sahu, Zoo Superintendent	Kamla Nehru Zoological Garden Kankaria, Ahmedabad Gujarat – 380 008 Mobile No. 9327038791 E-Mail: <a href="mailto:ahmedabadzoo@icenet.net">ahmedabadzoo@icenet.net</a>
21.	Dr. S. K. Mittal Zoo Officer	Gandhi Zoological Park Gwalior Madhya Pradesh - 474 001  Mobile No. 9993320003 E-Mail: <a href="mailto:zoogwl@sancharnet.in">zoogwl@sancharnet.in</a> <a href="mailto:Mittalskgwalior@yahoo.com">Mittalskgwalior@yahoo.com</a>
22.	Shri Kartick Satyanarayan Co –founder	Wildlife SOS , Defence Colony, New Delhi <a href="mailto:wsos@vsnl.com">wsos@vsnl.com</a>
23.	Shri Nikhil Whitaker Curator	Centre for Herpetology Madras Crocodile Bank Trust/Centre Post Bag 4, Mamallapuram Tamil Nadu – 603 104 Mobile No. 9840379164 E-Mail: <a href="mailto:mcbtindia@vsnl.net">mcbtindia@vsnl.net</a> <a href="mailto:Nikhil.whitaker@gmail.com">Nikhil.whitaker@gmail.com</a>
24.	Dr. Ajit Kumar Pattnaik, IFS Director	Nandankanan Zoological Park Mayur Bhawan, Janapath, 251, Saheed Nagar, Bhubaneswar Orissa - 751 007 Mobile No. 9937083636 E-Mail: <a href="mailto:director_n@hotmail.com">director_n@hotmail.com</a>
25.	Dr. Anupam Srivastav Research associate	Wildlife Institute of India Dehradun <a href="mailto:anupam@wii.gov.in">anupam@wii.gov.in</a>
26.	Dr. Kartick Vasudevan Scientist	Wildlife Institute of India Dehradun <a href="mailto:karthik@wii.gov.in">karthik@wii.gov.in</a>
27.	Shri B. C. Choudhary Scientist	Wildlife Institute of India Dehradun <a href="mailto:bcc@wii.gov.in">bcc@wii.gov.in</a>
28.	Sh. S. C. Sharma Retd. Addl. DGF(WL)	Ministry of Environment & Forests, New Delhi
29.	Dr. Manoj Kumar In charge animals section	National Zoological Park, New Delhi
30.	Prof. (Dr.) A. K. Sinha	Dept. of Zoology, DEI, Agra
31.	Prof. (Dr.) Sant Prakash	Dept. of Zoology, DEI, Agra <a href="mailto:santprakashdr@gmail.com">santprakashdr@gmail.com</a>

**India's Conservation Breeding Initiative**

32.	Shri Bala Sahab Jagzap Dy. Superintendent	Rajiv Gandhi Zoological Park & Wildlife research Centre Pune Satara Road Opp. Katraj Dairy At, Katraj Pune Maharashtra – 411 046 Mobile No. 9823374491 E-Mail: <a href="mailto:punezoo@vsnl.net">punezoo@vsnl.net</a>
33.	Dr. Ravi Kumar Singh Curator	Indira Gandhi Park Zoo & Deer Park Rourkela
34.	Dr. Ajay Gaur	LaCONES Centre for Cellular & Molecular Biology, Uppal Road <a href="mailto:agaur@ccmb.res.in">agaur@ccmb.res.in</a>
35.	Dr. S. Shivaji Dy. Director	LaCONES, Centre for Cellular & Molecular Biology, Uppal Road, Hyderabad
36.	Dr. D. Swarup Principal Scientist & Head In-Charge of Wildlife	Indian Veterinary Research Institute, Izatnagar <a href="mailto:Devendra.swarup@gmail.com">Devendra.swarup@gmail.com</a>
37.	Shri S. Rana, Director	Sakkarbaug Zoo Outside majevadi Gate, Junagadh Gujarat – 362 001 Mobile No. 9426815189 E-Mail: <a href="mailto:directorsbz@ridiffmail.com">directorsbz@ridiffmail.com</a>
38.	Dr. E. Bharucha,	Member, Central Zoo Authority
39.	Shri S. K. Patnaik, IFS	Retd. PCCF, Orissa
40.	Shri Vinod Rishi, IFS	Retd. Director, IGNFA, Dehradun
41.	Dr. Goutam Narayan	Pigmy Hog Conservation Breeding Centre, Guwahati
42.	Shri Harsh Mittal.	Conservator of Forests, Himachal Pradesh Conservator of Forests, Great Himalayan Nature Park Shimshi, Kullu Himachal Pradesh <a href="mailto:Harsh.maotter@nic.in">Harsh.maotter@nic.in</a>
43.	Dr. Vibhu Prakash	Vulture Conservation Breeding Centre, Pinjore <a href="mailto:jatayaprakash@city.com">jatayaprakash@city.com</a>
44.	Shri Rakesh Kumar, IFS Director/DFO	Sanjay Gandhi Biological Park Patna , Bihar - 800 001 <a href="mailto:Zoodir_pat@safy.com">Zoodir_pat@safy.com</a>
45.	Dr. A. Dubey Chief Veterinarian	Maitri Baagh Zoo Bhilai Steel Plant Bhilai, Distt. Durg Chattisgarh - 490 001 Mobile No. 9425244127 E-Mail: <a href="mailto:sailbsp@sancharnet.in">sailbsp@sancharnet.in</a> <a href="mailto:dubeyganesh@hotmail.com">dubeyganesh@hotmail.com</a>
46.	Shri G. Lepcha Director,	Himalayan Zoological Park, Gangtok, Sikkim
47.	Dr. Karawali Superintendent of Gardens I/C	Veer mata Jijabai Bhosale Udyan & Zoo Dr. Ambedkar Road Byculla, Mumbai Maharashtra – 400 027 Mobile No. 9820703194 Email: <a href="mailto:vjbvdyemzoo@yahoo.co.in">vjbvdyemzoo@yahoo.co.in</a>
48.	Shri Paramjit Singh, IFS Conservator of Forests	Nadadevi Biosphere Reserve Uttarakhand

**India's Conservation Breeding Initiative**

49.	Dr. B. R. Sharma, Member Secretary	Central Zoo Authority New Delhi
50.	Dr. Brij Kishor Gupta, Evaluation & Monitoring Officer	Central Zoo Authority New Delhi Email: <a href="mailto:brijkishor68@yahoo.com">brijkishor68@yahoo.com</a>
51.	Dr. Naim Akhtar, Scientific Officer	Central Zoo Authority New Delhi Email: <a href="mailto:akhtar.naim@gmail.com">akhtar.naim@gmail.com</a>
52.	Dr. Sandeep Ratan Veterinary Officer	O/o the PCCF Mist Chamber, Khalni Shimla Himachal Pradesh Himachal Pradesh
53.	Shri. D. N. Singh, IFS Director	National Zoological Park Mathura Road, New Delhi – 110 003 Mobile No. 9868158629 E-Mail: <a href="mailto:delhizoo@vsnl.net">delhizoo@vsnl.net</a> <a href="mailto:dnsingh87@yahoo.com">dnsingh87@yahoo.com</a>
54.	Shri Indrapal Singh Matharo Dy. Chief Wildlife Warden	Udaipur Zoo Rajasthan Forest Department Bari Road Udaipur Rajasthan - 313 001 Mobile No. 9414111090

## CONSTITUTION OF INDIAN ZOOS ASSOCIATION

### I. Preamble:

The public Zoos in India are more than 150 years old and lot of works have been done and being done by individual Zoos in the field of Zoo management. There are more than 180 recognized Zoos in India and being regulated by the Central Zoo Authority, a Statuary body of Ministry of Environment and Forests, Govt. of India. After its establishment in 1992, Central Zoo Authority began various programmes for Zoos to work effectively and in coordinated manner. It has been felt that Zoos hardly interact with each others in managing, rearing, veterinary care and handling of animals, conservation education, research, Zoo related issues, and record keeping and almost rely on Central Zoo Authority, if face problems. Most of the Zoos abroad are not regulated by their respective Governments, rather they have their own associations at National and International level to deal with various issues related to Zoo management. WAZA, AZA, EAZA, SEAZA and SAZARC are some of the better known Zoo related associations who bring Zoos closer to discuss and deal with Zoo related issues. On the similar line, it was felt that Indian zoos should also have their Zoo Association i.e. Indian Zoos Association to deal with zoo related issues.

### II. Memorandum of Association:

1. **Name of the Society:** Indian Zoos Association (IZA).
2. **Registered Office:** The registered office shall be situated in the premises of the National Zoological Park, Mathura Road, New Delhi.
3. **Aims and objectives of the Society:-**
  - a. To organise/ coordinate research/ studies in zoos/ zoos related issues.
  - b. To organise/ coordinate trainings for in service zoo personnel.
  - c. To print zoos related literatures, newsletter etc.
  - d. To deal with Government of India/ Ministry of Environment & Forests/ CZA for welfare of zoos and zoo Personnel.
  - e. To prepare and maintain National Studbooks of zoo animals in India.
  - f. To work for better future of animals, zoo personnel and zoos.
  - g. To coordinate cooperation between zoos & zoos professional.
4. **First Members of the association are as under:**

(as in annexure)

### III. Rules and regulations of the Association:

#### 1. Short title:

These rules may be called the rules of the “**Indian Zoos Association**”.

#### 2. Interpretation:

In these rules the following words and abbreviations shall have the meaning given there in unless there is anything contrary in the subject or context.

- a. “**Zoo**” means all present Zoos, Zoological Gardens and parks recognized by the Central Zoo Authority. They shall be considered as Zoos for the purpose of this Association. Zoo means an organisation and/ or non-profit institution with professional staff which keep and own a collection of wild animals, care for them for purpose of conservation and breeding of wild species and exhibit them to the public for purpose of education and instilling in them love for fellow creatures, on a regular schedule of predictable visiting hours which are convenient and constitute more than a token opening. Further institutions to be recognised as Zoo will be decided by the Executive Committee for consideration for the membership. The decision of the executive committee in this regard shall be final.
- b. “**Wild species or animal**” includes non-domesticated mammals, birds, reptiles, amphibians, fish and invertebrates and their young ones and also in cases of birds and reptiles their eggs.
- c. “**Director**” means a full time chief executive of Zoos, Zoological gardens and parks in India by whatever name known.
- d. “**Zoo professional**” means past and present persons who was or is employed full time in management or senior supervising capacity in a Zoo or a person who has been associated with a Zoo for more than five (5) years as a research scholar on an animal of the zoo or problem specific to a Zoo.
- e. “**Chairman**” shall mean the chairman of the Association elected/ appointed at a General Body or Executive Committee meeting of the Association for the period of two years.
- f. “**Member Secretary**” and treasurer shall be the Director of the National Zoological Park and he shall be responsible for coordinating the functions of the Association including the Executive Committee.
- g. “**Executive Committee**” shall be a 14 members special committee consisting of the Chairman, Member Secretary, five members representing presidents of various zoo professional’s associations (IZDA, IZVA, IZBA, IZKA, IZEA) of the country and six regional coordinators (north, south, west, east, central and north-east) and Executive Director for a period of two years.
- h. **Regional coordinators** shall be elected among the Zoos of respective regions. Only zoo directors shall be eligible to contest for the regional coordinators and vote for the election of regional coordinators.

### 3. Membership:

All memberships shall be made subject to a formal approval of application made in a prescribed form for the relevant membership by the Executive Committee.

#### i. Institutional Members:

All recognised Zoo shall be eligible for membership. Membership fee shall be Rs. 1000/- initially and annual membership fee Rs. 500/-. The Institutional Members (Zoos) can be represented by Officer-in-charge of the Zoos on his authorized nominee/ representative.

#### ii. Association Members:

IZDA, IZVA, IZBA, IZEA, IZKA Association Members can be represented by the President of the professional Associations or his authorized nominee / representative.

Membership fee shall be Rs. 500/- initially and annual membership fee Rs. 200/- thereafter.

#### iii. Affiliate members:

Zoo related organizations or institutions will be affiliate members. Membership fee shall be Rs. 1000/ initially and annual membership fee Rs. 500/-. Affiliate Members shall have to nominate their representatives in writing for the Meeting. Affiliate member will not have any voting right in the meetings of the IZA.

### 4. Voting rights

The Institutional and association members will have voting rights. The Affiliate members shall not enjoy any voting rights. Indian Zoo Association may become member of the World Association of Zoos and Aquariums (WAZA) and any other regional zoos associations, as may be decided by the executive committee. The representative selected or nominated will attend the Meeting/ Training programmes etc organized by WAZA or any other regional Associates.

### 5. Membership due and Services:

- a. Annual membership dues and services shall be established by the Executive Committee in each membership classification from time to time.
- b. All membership dues are payable in advance for the calendar year commencing on the first of January each year.
- c. Termination of Membership: The Executive committee may for causes, suspend or terminate any membership in any classification by a majority vote.

Sufficient cause for suspension or termination of membership shall be a violator of the charter, by-laws or any rule, practice or resolution properly adopted by the Association or any conduct prejudicial to the interests of the Association. Such members shall be notified of the charges by certified mail to the last recorded address at least fifteen (15) days before the next meeting of the Executive committee. The notification shall include the time and place of the meeting of the Executive Committee. The member involved shall have the opportunity to appear in person or by representative to present his defense of the charges before any formal action is taken by the Executive Committee which shall then be final.

## 6. Administration:-

### A. Authority of the Executive Committee

- i. The affairs of the Association shall be managed by the Executive Committee.
- ii. The Executive Committee shall generally carry out and pursue the objects of the Association as set forth in the Memorandum of the Association.
- iii. The Executive Committee may adopt such rules and regulations to manage, administer, direct and control the affairs of the Association as they deem advisable, subject to the rule and regulations, by-laws and orders of the Association.
- iv. The Executive Committee shall have the management of all the affairs and funds of the Association and shall have authority to exercise all the powers of the Association.
- v. The Executive Committee shall establish standing committee to assist in the management of affairs of the Association whenever it is considered necessary.
- vi. The Executive Committee may appoint such agents as they consider necessary to carry out the affairs of the Association.
- vii. No member shall receive compensation (except the Executive Director and his staff) for the services as a member of the Executive Committee.

### B. Duties of the Office bearers:

- i. Chairman:
  - a. To preside over the Annual meeting of the General Body of all members and the Executive Committee.
  - b. He shall have the power to appoint such committees as may be necessary to facilitate the business or activities of the Association.
  - c. He shall have the casting vote in any event, if there shall be an equality of vote on the question to decide by Executive Committee and General Body.

ii. **Member Secretary**

- a. To arrange annual General Body meeting and the meetings of Executive Committee.
- b. To prepare the agenda for each meeting and issue notice of the meeting to all concerned.
- c. To record the proceedings of the meeting and circulate the decisions to all concerned.
- d. To attend to all correspondences of the Association with members and others.
- e. To keep in safe custody all the records of the Association.
- f. To pursue the members and others to carry out action in the implementation of the decisions, resolutions and recommendations passed by the Executive Committee or General Body.
- g. To receive, have custody of and expend the funds of the Association and to manage the properties of the Association.
- h. To maintain the accounts of the Association and report to the Executive Committee the state of accounts from time to time and submit the balance sheet for the previous year.
- i. To prepare and execute detailed plans and programmes for the furtherance of the objectives of the association.
- j. To coordinate the activities of the institutional member for fulfillment of the objectives.
- k. To engage such staff as may be sanctioned by the Executive Committee for correspondence work and maintenance of Accounts and in the conducting of all other business of the Association.

iii. **Regional Coordinator**

- a. Organize and coordinate the activities of the associations in the regions/ at the regional level.
- b. Represent the region in the Executive Committee and its meetings.

iv. **Executive Director**

- a. To arrange annual General Body meeting and the meetings of Executive Committee.
- b. To prepare the agenda for each meeting and issue notice of the meeting to all concerned.
- c. To record the proceedings of the meeting and circulate the decisions to all concerned.
- d. To attend to all correspondences of the Association with members and others.
- e. To keep in safe custody all the records of the Association.
- f. To pursue the members and others to carry out action in the implementation of the decisions, resolutions and recommendations passed by the Executive Committee or General Body.
- g. To receive, have custody of and expend the funds of the association and to manage the properties of the Association.
- h. To maintain the accounts of the Association and report to the Executive Committee the state of accounts from time to time and submit the balance sheet for the previous year.

- i. To prepare and execute detailed plans and programmes for the furtherance of the objectives of the association.
- j. To coordinate the activities of the institutional member for fulfillment of the objectives.
- k. To engage such staff as may be sanctioned by the Executive Committee for correspondence work and maintenance of Accounts and in the conducting of all other business of the Association.

#### 7. Meetings:

- i. Annual General Meeting of all the members shall be held every calendar year. The intervening period between any two meetings should not be more than twelve (12) months.
- ii. The Executive Committee shall hold at least two regular meetings in a calendar year and in no case the intervency period be more than 8 months.
- iii. Every meeting of the Executive Committee and General Body shall be presided over by the Chairman and in his absence a member chosen from amongst themselves by the members present shall preside for the occasion.
- iv. Not less than ten (10) days clear notice of every meeting of the Executive Committee shall be given to each member of the Executive Committee. The accidental omission to give notice to or the non-receipt by any members shall not invalidate the proceedings of the meeting.
- v. The Chairman may himself call or by a requisition in writing signed by him may require the Member-Secretary to call a meeting of the Executive Committee at any time and on the receipt of such a requisition, the Member-Secretary shall forthwith call such a meeting.
- vi. The Annual meeting of the General Body shall be called by the Member Secretary under direction of Chairman. Not less than 30 days notice shall be given of the date, time, place and the general nature of the business to be discussed at such meeting and shall transact the business after acceptance of the chair as follows:-
  - a. Election of members to Executive Committee when due.
  - b. Presentation of Annual Report of the Association by Member-Secretary.
  - c. Presentation of the balance sheet for the previous year by Member-Secretary.
  - d. Such other business as may be brought before the meeting.
  - e. Such other items as may be brought with the permission of the presiding officer.

- vii. One-third of the institutional member shall form the quorum for any meeting of the General Body but for any adjourned meeting only the members present will form the quorum. In the case of the Executive Committee, quorum shall be four (4) members for any official action.
- viii. Member shall be governed by the decision, resolutions, and recommendations at the Annual Meeting and also be those of the Executive Committee.
- ix. Absence of institution members from Annual Meetings for two (2) consecutive years without leave of absence shall make them liable for appropriate action which shall be determined mutually by the Association by a resolution.

#### **8. Funds:**

- i. Funds of the Association shall consist of the following:
  - a. All money received by the Association by way of grants, gifts, endorsements, donations and any other contributions.
  - b. Fees, royalties/ premium and other charges and income received or earned by the Association.
- ii. Funds of the Association shall be deposited in the Association account with any of the Schedules Bank(s) subject however to expenditure/payments of the Association.
- iii. The funds and income of the Association shall be solely utilised towards the achievement of the object of the Association, and no portion of it shall be utilised for payment to members by way of profit, interests, dividends, etc.

#### **9. Accounts and Audit:**

The accounts of the Association shall be maintained as required under the Society Registration Act. The account shall be audited by such person or persons/ firms, etc. as may be appointed by the Executive Committee. The nature of the audit to be applied and the detailed arrangements to be made in regard to the form of accounts for audit shall be prescribed by the Executive Committee.

The financial year of the Association shall be 1<sup>st</sup> April to 31<sup>st</sup> March.

**10. Amendments:**

All amendments, additions, alterations, repeal of any provision to the present rules and relations or the framing of new rules, regulations and bye-laws of the Association shall be carried out at the General Body Meeting provided that notice of the proposed amendment is submitted by the members of the Executive Committee for approval and recommended to the Annual General Body Meeting for discussion and voting by the voting members for approval. Such proposal shall require two-third (2/3) of those voting to approve it to become effective. In such cases a mail ballot shall also be considered valid if received within ten (10) days from the date of meeting of the proposal for voting by the voting members.

**11. Register of members:**

The society shall maintain at its registered office a register of its members and shall enter there in within 15 days after admission of members or the cessation of his membership as the case may be following particulars:

- a) The name and address of the member
- b) The date on which the member was admitted.



































