

Conservation

Learning Objectives

- **The factors affecting biodiversity**
- To include human population growth, agriculture (monoculture) and climate change.

- **The ecological, economic and aesthetic reasons for maintaining biodiversity**
- Ecological, including protecting keystone species (interdependence of organisms) and maintaining genetic resource
- economic, including reducing soil depletion (continuous monoculture)
- aesthetic, including protecting landscapes

In situ and ex situ methods of maintaining biodiversity

- In situ conservation including marine conservation zones and wildlife reserves
- Ex situ conservation including
Seed banks,
Botanic gardens and
Zoos.

International and local conservation agreements made to protect species and habitats

- Historic and/or current agreements, including the Convention on International Trade in Endangered Species (CITES),
- the Rio Convention on Biological Diversity (CBD)

Why are species becoming endangered?

Extinctions have always occurred for a variety of reasons. As the environment changes species will need to adapt or they will become less fit and may disappear. The sabre tooth tiger has evolved and become extinct several times independently of humans. The fossil record is rich in species that are long gone.

However the rate of extinction has increased dramatically in recent history.

- At least 784 recorded extinctions since 1500
- Other undiscovered species are likely to be disappearing without ever being recorded.

Population Growth

- Pollution (linked with climate change)
- Habitat destruction e.g. rainforests needed for land and resources

Agriculture

- Farming. Introduction of monoculture, land clearance
- Hunting e.g. Over-fishing, English wolf(1486) hunted to stop it killing livestock

Climate change

This is likely to be linked with human activity.

Causes loss of habitat

Changing environmental conditions eg water.

Spread of diseases to other regions.



Convention on Biological Diversity

Rio Earth Summit (1992)

Signed by over 150 world leaders with the aim of promoting sustainable development.

- Their aims concentrate on cooperation between governments eg. IVF breeding programmes . Sharing of seed banks
- Countries must try to develop **ex situ** and **in situ** conservation strategies
- **Environmental Impact Assessments** must be carried out prior to major developments

Reasons for Conservation

- Economic

Reducing soil depletion by monoculture

- Ecological

Maintaining a genetic resource eg for medicinal uses

- Aesthetic

Protecting landscapes/species that are admired

In- situ or Ex- Situ

In- Situ Strategies

This aims to reduce the causes of extinction so that biodiversity is maintained.

- Designate protected areas.
- National Parks
- Sanctuaries
- Conservation Reserves
- Community Reserves etc

In Situ Conservation

Benefits

A Healthy Natural Environment. (Balanced Ecosystem, Biologically diverse / Biodiversity)

Sustainable use of the Natural Environment, Reducing the causes of extinction.

Leads to a more secure environmental future which can be enjoyed.

Conservation in the natural environment which provides all species resource requirements, and should take into account of the needs of the indigenous people.

Species are natural & well adapted to habitat & should feed and breed successfully. No special provisions need to be made.

Legislation is not always needed to establish Conservation Areas for the prevention of unacceptable species or habitat loss.

Human Activity in Conservation Reserves – Conflicts

Historically reserve creation without consideration of the local people has caused conflict for the following reasons

- Protected Reserve animals 'escaping' to raid crops (e.g. Primates often raid farms for maize, mangoes & sugar cane).
- Continued hunting / poaching of protected animals for food, sport, research.
- Illegal harvesting of timber & other plant products.
- Tourists feeding protected animals, leaving litter, etc.

EX SITU CONSERVATION

- In captive surroundings.
- Conserving an endangered species by activities undertaken outside its normal space .

EXAMPLES

- RARE BREEDS CENTRES.
- ZOOLOGICAL GARDENS.
- WILDLIFE PARKS
- SPERM BANKS
- CELLS IN TISSUE CULTURE.
- FROZEN EMBRYOS.
- CROPS IN CULTIVATION.
- BOTANIC GARDENS.
- SEED BANKS.

ANIMAL CONSERVATION / BREEDING PROGRAMMES.

Advantages

Prevents imminent extinction of endangered species

Can increase the population size quickly

Potential to repopulate areas by reintroduction programmes

Filter out genetic defects and poor genes.

Opportunity for research

Possible to store gametes for the future and use for IVF

Disadvantages

Failure to breed

Lack of space limits number of individuals involved so this reduces genetic diversity leading to less variation

Reintroduction programmes don't always succeed because they fail to adapt or may not be accepted into a wild community

Repopulation

It is possible to rebuild biodiversity through reintroductions.

Examples of successfully recreated wildlife habitats;

- UK reed beds -Bittern & Otter increases.
- Conifer clearance- wildlife habitat recovery.
- Grazing land reversion to traditional meadow grassland.
- Phinda Reserve, South Africa, livestock clearance & natural fauna reintroduction; (1990-1992; 1,000+ wildebeest, zebra, giraffe, other ungulates) (1992; 13 lions, 17 cheetah).
- Yellowstone National Park- Wolves reintroduced (Deer eaten, willow shoots grow, beaver make dams, lakes form, improved irrigation, forests grew).

SPERM BANKS

Modern techniques make the freezing of genetic material in sperm or eggs possible.

Sperm bank to save rare breeds from extinction

A plan to save 100 of Britain's 130 native breeds of farm animal from extinction was announced yesterday. Sperm and egg banks are to be created to save cattle, sheep, horses, goats, poultry and pigs from the growing specialisation of farming in which high-yield breeds dominate the food chain. A database will be established that will list every breed, the number of animals and where they are kept. The move is not only about the historic importance of keeping traditional breeds with their genetic diversity, but also because of the enormous contribution these animals make to the national economy.

Frozen Noah's Ark Singapore Zoological Gardens

- **Zoos are turning to cryogenics in their efforts to stockpile genetic material and preserve a Noah's Ark for future generations.**
- Noah's Ark provides a bank of animal sperm and tissue samples of its captive wildlife.
- **Ultimate aim of cloning exotic animals.**
- Provide a safety net against extinction (i.e. using more common species as surrogate mothers to endangered ones). (E.g. with the common long-tailed macaque, which would be implanted with the embryo of other highly-endangered macaque species).
- Combat infertility in animals.
- Recreate animals which died prematurely.

Techniques that have been used to impregnate Singapore zoo animals.

- Frozen sperm can be used in assisted reproduction techniques, such as artificial insemination, in-vitro fertilisation and intracytoplasmic sperm injection (ICSI).which is when a single sperm is fused with an egg, and the embryo is implanted in the animal.

PLANT CONSERVATION / BREEDING PROGRAMMES

ADVANTAGES

- As part of their life cycle, most plants naturally have a dormant stage - the seed.
- Seeds are produced in large numbers and can be collected from the wild without disturbing the ecosystem or damaging the wild population.
- Seeds can be stored and germinated in protected surroundings.
- Plants can often be bred asexually.
- Botanical gardens can increase individual numbers quickly, providing ample supply for research.
- Captive-bred plants can be replanted in the wild.

PLANT CONSERVATION BREEDING PROGRAMMES / DISADVANTAGES

- Any collection of wild seeds will cause some disturbance.
- Collected samples may not hold a representative selection of genetic diversity.
- Seeds collected from the same species from another area will be genetically different and may not succeed in a different area.
- Seeds stored for a length of time may not be viable.
- Plants bred asexually will be genetically identical - reducing genetic diversity further.
- Conclusions from research on a small sample may not be valid for a whole species.

Seed Banks

The Kew Millennium Seed Bank Project aims to store a representative sample of seeds from every known species of plant, including the rarest, most useful and most threatened species.

Seed banks contain seeds that can remain viable for many years. They are being stored but also being used to provide benefits to humanity:

- food and building materials for rural communities
- disease-resistant crops for agriculture
- habitat reclamation and repopulation

NORWAY'S ARK'-SEED VAULT

- Set up by Global Diversity Trust March,2008.
- Funded From Norway.
- Nations across the globe are contributing seeds of local crops.
- Located In Spitsbergen, Norway.
- Cold storage vault carved into Rock beneath the Arctic Permafrost.
- Store up to 3 million seeds.

Role of Zoo in ex-situ conservation

ZOO

“ Zoo means an establishment whether stationary or mobile where captive animals are kept for exhibition to the public and includes a circus and rescue centers but does not include an establishment of a licensed dealer in captive animals” under sec 2(39) The Wildlife (Protection) Act 1972.

Zoo is a place of *ex situ* conservation where wild animals are kept in captivity for conservation education, conservation breeding, research and studies.

Zoo (Zoological park or Zoological Garden) Objectives:

- Captive Breeding
- Research
- Education and awareness
- Training
- Recreation
- Rescue and rehabilitation

History

- It is not exactly known when the earliest zoos were established ,but it is possible that they were associated with the first attempts at animal domestication.

4500-2500BC

- Pigeons were kept in captivity as early as 4500BC in what is now Iraq and 2,000 years later elephants were semi domesticated in India.
- The earliest known examples of zoo management date back to the ancient Egyptians who began keeping wild animals . Antelopes including Addax, Ibex, Oryx, and Gazella are depicted wearing collars on Egyptians tomb pictures dating from 2500 BC.

Why Zoos for Education?

- Over 620 million people visit zoos across the world every year.
- That is more than one tenth of the human race.
- More than 50 per cent of world zoo visitation takes place in Asia.
- In India alone over 500,00,000 (5 crore) people visit zoos annually.
- People go to zoos during their free time and of their free will.
- They go to the zoo to see living animals, which they would not, in normal circumstances ,get a chance to see.
- Such a wide, diverse, varied and regular audience provides an excellent opportunity for education, and an enormous potential to heighten public perception and awareness of animals and nature conservation.
- Zoos are living institutions, living classrooms ,living landscapes.

What is Zoo Education?

- Zoo education is a holistic discipline targeted at zoo visitors, staff and the wider community aiming to promote an understanding of, and concern and respect for biodiversity, animals and the natural world, and encourage action for a sustainable future.
- If conservation is to succeed, people need to be inspired to care about and understand animals and the threats they face in the wild.
- Everyone should have the opportunity to experience and learn about wildlife at firsthand.
- The World Zoo Conservation Strategy published in 1993 concludes that, given a professional approach, a knowledge of the zoo public and a clear cut education plan, zoo education programmes can be successful in increasing the public's awareness of the irreplaceable value of nature. Education is therefore an essential conservation task of zoos.

National Zoo Policy 1998

Vision, philosophy and purpose

- Supporting the conservation of endangered species by giving species, which have no chance of survival in wild, a last chance of survival through coordinated breeding under ex-situ condition and raise stocks for rehabilitating them in wild as and when it is appropriate and desirable.
- To inspire amongst zoo visitors empathy for wild animals, an understanding and awareness about the need for conservation of natural resources and for maintaining the ecological balance.
- Providing opportunities for scientific studies useful for conservation in general and creation of database for sharing between the agencies involved in in-situ and ex-situ conservation
- Besides the aforesaid objectives, the zoos shall continue to function as rescue centers for orphaned wild animals, subject to the availability of appropriate housing and upkeep infrastructure.

Zoos Strength

- Large visitation
- A real world of wildlife
- Innovative exhibits
- Creative education programs
- Animal health care
- Rescue centres
- Relevant research programmes
- Operate Zoos to highest ethical standards
- Increase inter institutional cooperation

Animal Collection in Indian Zoos

- Cumulative area of zoo's - 9,000 ha(App)
 - Total animal collection about - 50,000 animals
 - Total number of species - 600
- 1 Mammals : 44%
1. Birds : 38%
2. Reptiles : 18%
3. Amphibian : 1 Species
4. Fish : None
- 23 circuses hold 237 animals (mostly exotic) including about 60 elephants
Visitation – 50-60 million in a year
- No. of Recognized zoos - 155 (23 circus)
 - De-recognized zoos - 313
 - Zoo's modernized - 14

Critically Endangered Species In India housed in zoos

- Birds: 13 species
- Mammals : 10 species
- Reptiles: 6 species
- Amphibians: 20 species
- Fish: 5 species
- Spider: 2 species

Conservation status of species of animals held in Indian zoos

•	Critically endangered	-	1%
•	Vulnerable	-	4%
•	Endangered	-	3%
•	Low risk category	-	8%
•	Lowest risk least Concerned	-	84%

Glimpses(Karthik and Subhadra)

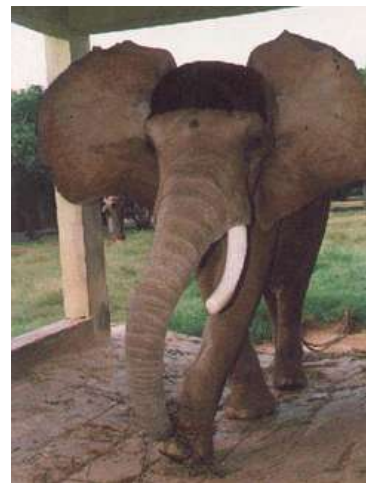


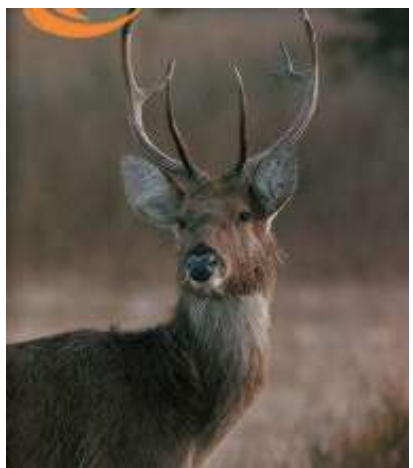
Giraffe





Exotics





Native



Salient Features Pertaining to Zoo in Wildlife Protection Act

- Act amended in 1991 with separate chapter (chapter IVA, Sec 38 A to 38 J) for establishment of CZA.
- Establishment of CZA in February 1992 to oversee management of zoo and provide technical inputs.
- Functions of the Authority : prescribe minimum standards for housing, evaluate functioning of zoos, recognize or derecognize zoos, identify endangered species CBP, co-ordinate the acquisition, exchange and loaning of animals , maintenance of stud books, co-ordinate training , research, provide technical assistance
- Recognition of Zoos-No Zoo can operate /establish without recognition by CZA and obtaining prior approval of the Authority and Supreme Court of India.
- Application for Recognition (509 application received and 196 Zoos recognized after evaluation by experts and 313 derecognized)

- No Zoo shall acquire, sell or transfer any wild animals or captive animals specified in schedule I & II except with the previous permission of the authority (Sec 38 I)
- Circus and rescue centre also included in definition of zoos (2003 amendment)
- Operations in Zoo as per management plan will not attract provisions of FCA provided activities proposed are approved by CZA.
- No person shall tease molest, injure or feed any animals or cause disturbance to animal or litter ground in Zoo. (Sec 38J)
- Punishment-Imprisonment which may extended to six month or fine up to Rs. 2000 or both

The Central Zoo Authority

A statutory body under the Ministry of Environment and Forests, Government of India, established in 1992 through amendment in Wild Life (Protection) Act, 1972

MISSION : To provide better upkeep and veterinary care to the wild animal housed in zoos in India to ensure their conservation through best practices of management and bringing education & awareness among the people.

VISION: To complement and strengthen the national efforts in conservation of the biodiversity of the country, particularly the fauna through the ex-situ conservation linked with in-situ practices.

OBJECTIVE: to enforce minimum standards and norms for upkeep and healthcare of animals in Indian zoos and to control mushrooming of unplanned and ill-conceived ZOOS

Central Zoo Authority

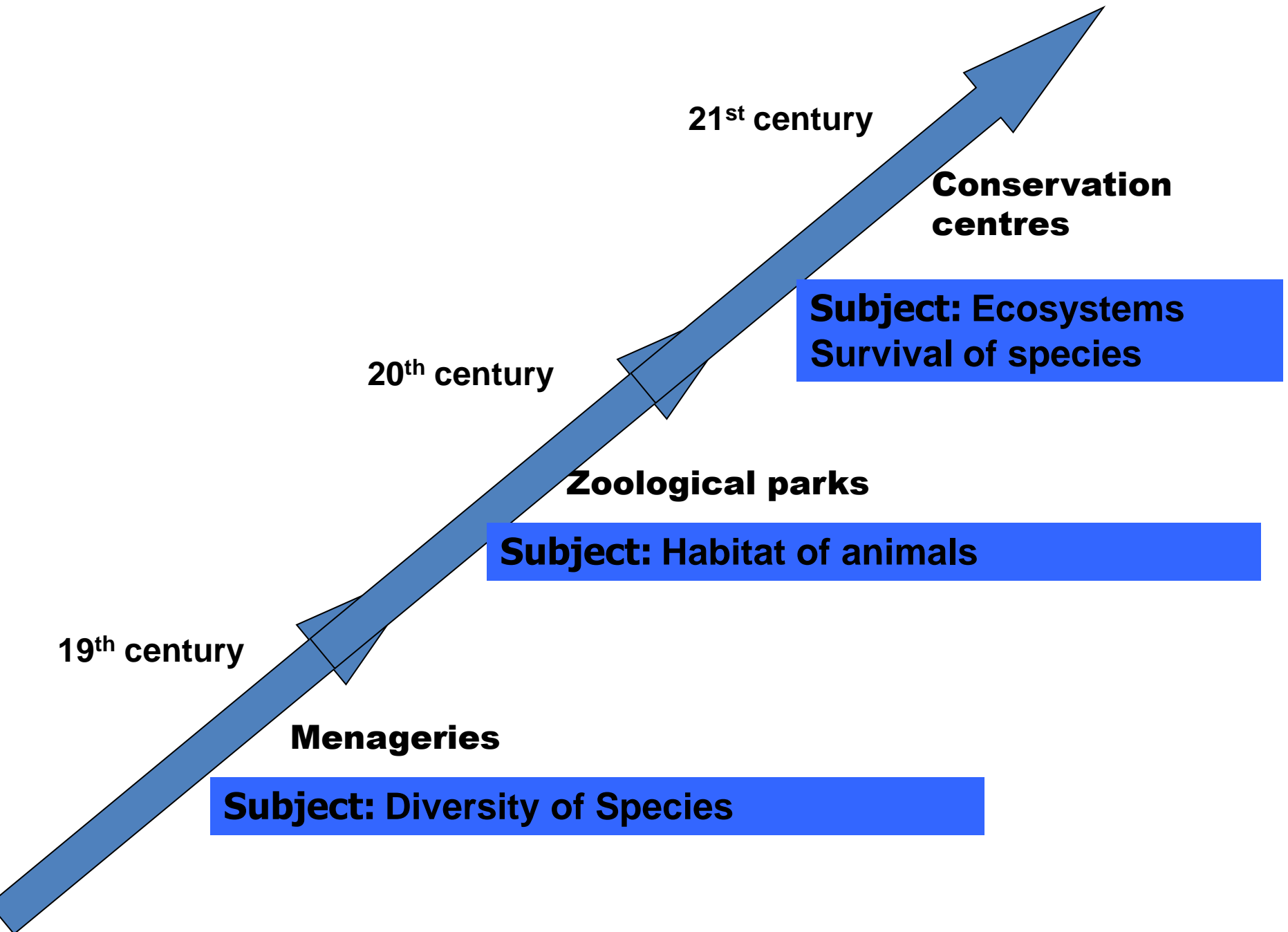
Achievements

- Formulation of guidelines and issue of advisory for species management in zoos
- Initiating conservation breeding programme for 23 identified endangered species of India
- Sensitize the visitors and create amongst them empathy for nature conservation.
- Use of information technology and biotechnology for appropriate genetic management and assisted reproduction including creation of germ-plasm bank.
- Formulation of master plan and lay out plan of zoos for better management
- Rescue and rehabilitation of circus animals and orphaned animals
- Capacity building, human resource development and collaborative research

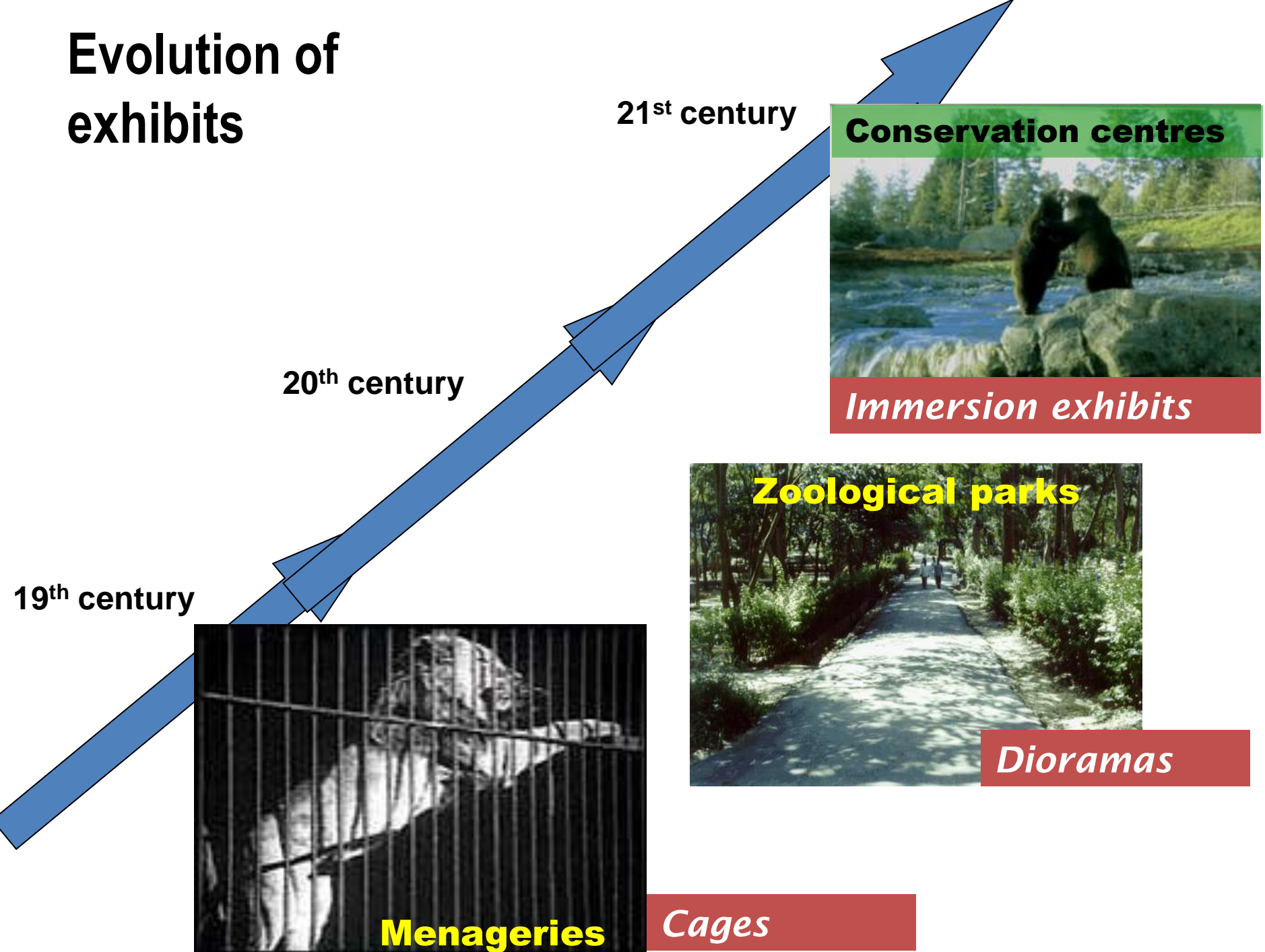
Status of Animal Housed in Zoos

- Single sexed animal
- Low number-skewed sex ratio
- Natural groupings absent
- Sick/injured/Weak animals
- Aberrant/ stereo type behavior
- Inappropriate enclosure
- Lack of enrichment
- Animal information/display boards
- Surplus animals

Evolution of Zoos



Evolution of exhibits





Carl Hagenbeck

1844-1913

- Eminent European animal handler and trainer
- Instrumental in designing open-air enclosures

The “naturalistic” exhibits originated by the Hagenbecks usually placed the viewer on the outside of the romantic panorama. While the animals may be portrayed in the picturesque grottos of some imagined stage set, the public looked over pruned hedges and flower borders of a traditional park. People were separate from and in control of nature

Heini Hediger (1908-1992)



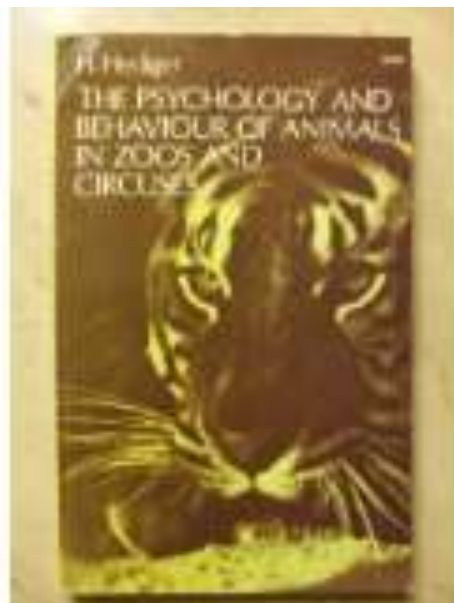
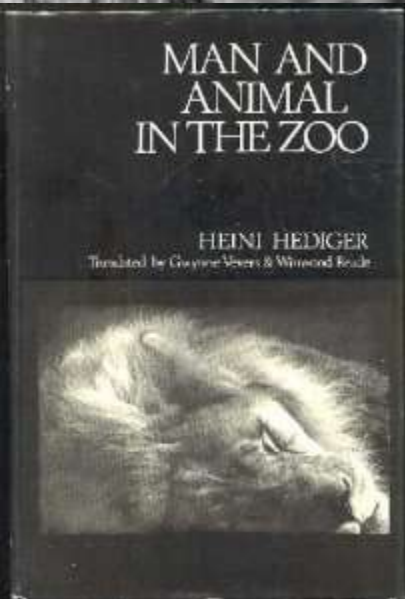
Swiss Zoologist, “Father of zoo biology”

Moved past the facade aesthetics and designed functional enclosures

Studies on proxemics

*flight distance

* Critical distance



Immersive Design- Jon Coe



“One can judge the success of enclosure design by the pulse rate of the zoo-goer”. Coe 1987



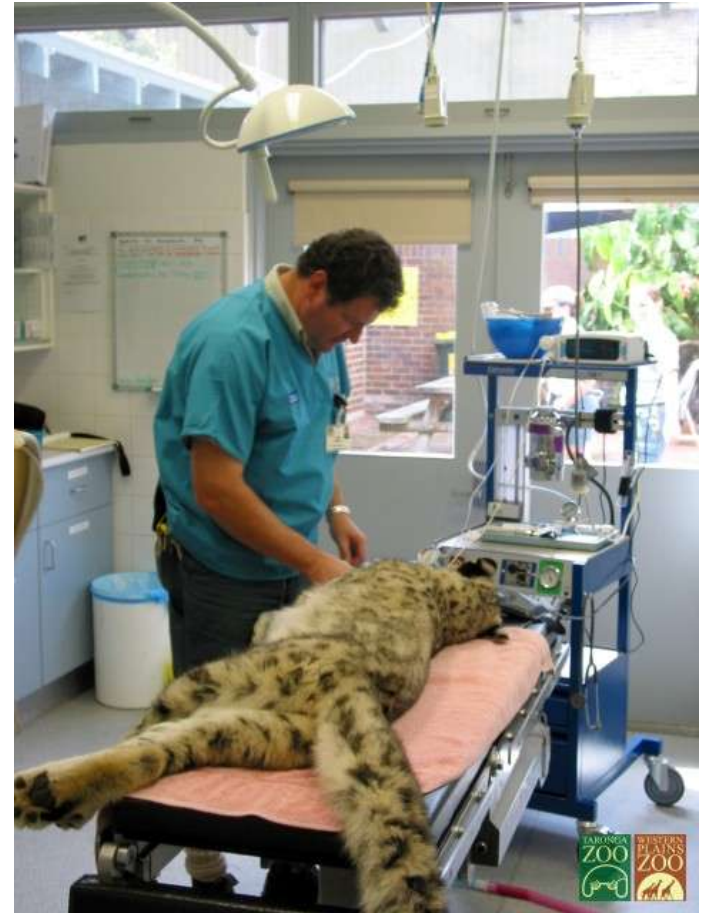
Modern concepts in Zoo designing

- Basic considerations.....

Zoo design (Mistakes can happen)



Hospitalization area



Visitor area



Zoo design (human-animal interaction)



Zoo design (welfare)



Zoo design (visitors friendly)



Zoo design (visitors friendly)



Zoo design (educational)




Zoo design (human-animal interaction)



Natural landscapes of the late 20th century

Immersion exhibits

- 
- * *Landscape Immersion: (Jones et al, 1976)*
 - * *Realistic natural landscapes (habitat replication)*
 - * *Visitors share the wilderness of the animal*
 - * *Barriers and holding areas are concealed*
 - * *Controlled visitor circulation & Restricted viewing*

Landscape Immersion means.....

..... visitors sharing the same landscape with animals (but not the same area)



..... barriers separating the animal from people are not visible

..... trees, grass, termite mounds are all part of the landscape

..... No matter where the visitor turns, the entire landscape is same

Hidden Barriers

Back Fence
Hidden by Planting

Animal Slightly Elevated

Naturalistic
Water Moat



Naturalistic design- no cross-viewing



Naturalistic barrier design



The Hagenbeck Zoo, Hamburg, Germany



Merits

1. Animals moved out of cages
2. First concept of animal welfare
3. Animal-centric design

Open-air moated enclosure

1. People still in control
2. Animals still surrounded by visitors
3. From a prison cell to a prison yard



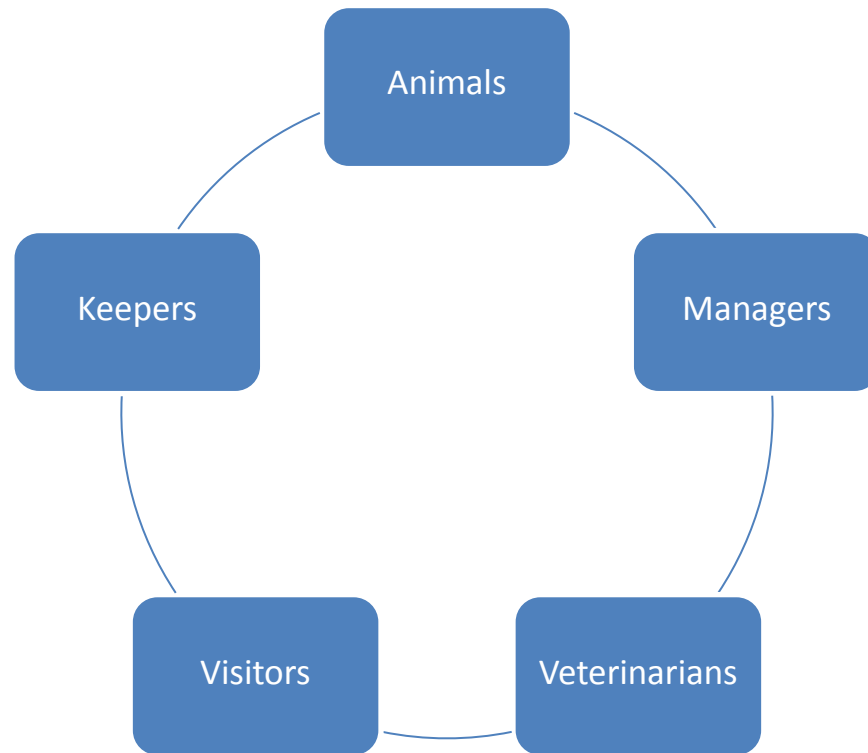




Zoo management

- Structure of Zoo.
- Plans.
- Zoo design

Structures



Collection plans

- Size of zoo.
- Location and weather
- Cost
- Species of interest
 - Critical species
 - Exhibit species
 - Research species

Collection Plan

Collection Plan, is a plan, listing animals and their numbers, which the zoo intend to procure and house in the zoo based on carrying capacity, which will be determined by availability of enclosure space, capability of zoo personnel (keepers) to handle them and ability of the zoo to support the number with ease etc. While doing so, care should be taken to see that smaller number of species in large social groups are planned to be kept.



Collection Plan Contd..

Priority should be given to the locally occurring species and those, which are from similar climatic conditions. This collection plan should keep in mind the space, facility and expertise with the zoo, and species which can be procured from other zoos of the country or abroad without difficulty and can be maintained by the zoo without difficulty.



Animal Collection Plan

Conduct strategic review of the species of animals and their number to be housed in the zoo for preparation of animal collection plan:-

- (a) Space available to each species/ animal and the space actually required for housing all the animals of all the species held in its stock, as per prescribed norms.
- (b) Past and present performance of the zoo in upkeep, healthcare.
- (c) Records of births and deaths of the animals of each species and the survival of the young ones.
- (d) Cost of upkeep and healthcare of each species.
- (e) Adopted theme of the zoo and the relevance of the species in the thematic display.
- (f) Species identified for planned conservation breeding by the zoo.
- (g) Species with surplus number of animals which are available with other zoos.

Breeding plans

- ARKS (Animal Record Keeping System)
 - Data record
 - Inventory record : zoo ID, animal ID, scientific name, sex, origin, time receive, method receive, birth, parents, death, out of stock.
 - Daily record : health, behavior, feed and feeding, management, health care,

Breeding plans

- ARKS (Animal Record Keeping System)
 - Allotment :
 - Enclosure
 - Personal
 - Feed and water



Continued.....

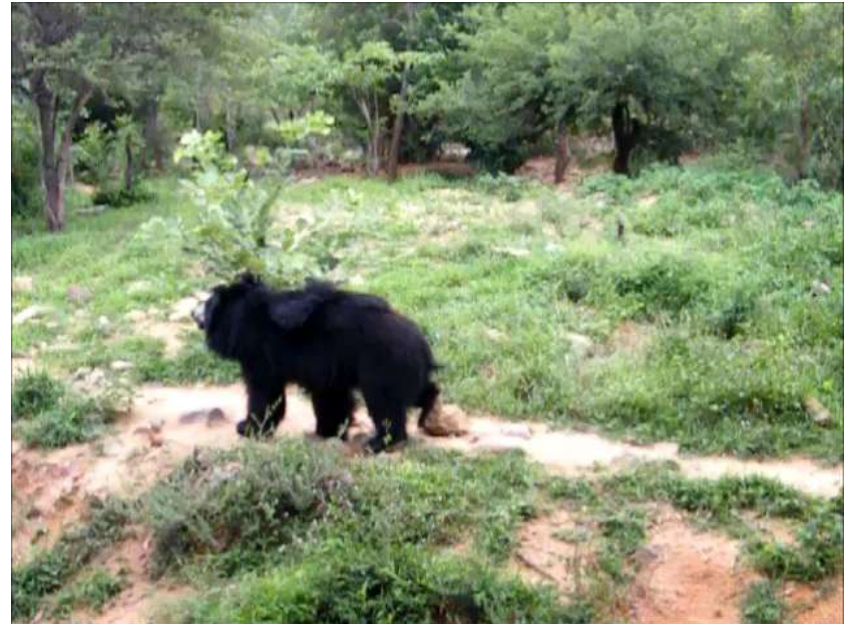
- Basic needs in captivity
 - Food presentation
 - Water presentation
 - Space
 - Shelters
 - Free from stress

Continued.....

- Breeding loan
 - Improve genetics
 - Baby contracts
 - Zoos co-operation

Welfare Concerns in Captivity

Aberrant Repetitive Behaviour: Swaying and pacing



Proximal Zone

Distal Zone

Trail created by the **Pacing** behaviour of Bears



Enrichments

- Stimulate 5 sense
- Encourage natural behavior
- Decrease boredom
- Stimulate breeding
- Exercise

Definition:

- Environmental enrichment is to get animals to interact with their environment and use their natural skills and behaviors.

Types of Enclosure Enrichment

- Manipulable
- Feeding
- Sensory
- Permanent fixtures

Manipulable Enrichments

- Arboreal pathways
- Wobble trees



Arboreal Pathways for
Red Panda, Darjeeling



Setting up Enrichments

Wobble Tree



Elephants with wobble tree



Feeding Enrichment





Asiatic black bear climbing trees



Hanging food items





Coir rope

Hanging food items on manipulanda



Red pandas using enrichments



Sensory Enrichment

- Wallowing areas
- Ice blocks
- Olfactory enrichment
- Auditory enrichment





Ice blocks inside gunny bags



**Olfactory
enrichment**

Sloth Bears Using Honey Feeder



Dietary Interventions

Zoo diet	Location	Enrichment Diet	Location
Cut fruits (Apple, banana)	Retiring cell	Whole apple, guava	paddock area
Bread	Retiring cell	Corn	Paddock area
Milk	Retiring cell	Radish	Paddock area
Boiled rice	Retiring cell	Cucumber	Paddock area
Boiled dal	Retiring cell		
Maize rotis	Retiring cell		

List of Enrichments

Feeding Enrichment	Sensory Enrichment	Manipulation
Pitfall feeders	Coir ropes	Wobble tree
Scatter feed	Ice blocks	Swaying branch
Bamboo feeder	Shade	Log pile
Hanging fruits	Honey Licks	
Fruit filled Hessian Bags		



Waiting for the food

Making Pitfall feeder



Other Manipulations





Pitfall Feeders





Bamboo Feeders



freeloading with Hessian Bags







Enclosure Enrichment





Management Plan

- Document which will detail out the activities indicated in the Master Plan of the zoo for a particular time frame (1year to 5years),
- Prioritizing of the works in phases and financial year wise and provide realistic estimates of the proposed works
- Revenue generated, funding expected from government and other sources.
- Strategy to be adopted for achieving the goals
- Procedure to be adopted and person responsible for carrying out different items of works with their financial and administrative powers.
- Document will guide the managers of the zoo for the management plan period and facilitate the budgeting and focused development.
- New incumbent to carryout development without dislocation.

Planning Process in Zoos

It is mandatory under Recognition of Zoo Rules, 2009 for every zoo to prepare and get the master plan approved by the Central Zoo Authority. The master plan is prepared for long term development of the zoo along with a detailed layout plan prepared on the basis of the theme adopted by the zoos, indicating the locations of green belts, lawns, gardens, animal display area, visitor facilities, support infrastructure for animal upkeep and healthcare, planned breeding of endangered species. Necessary provisions for infrastructural support to achieve the said goal also made in the plan.

So far Master (Layout) Plan of 49 zoos and Master Plan of 18 zoos have been approved and rest are at various stages of scrutiny.



Master Plan and enclosure design are examined by Expert committee and are approved subject to meeting the standards prescribed including provision of natural immersion based enclosure, visitor circulation and amenities.

Master Planning

- Demolish obsolete and cramped exhibits
- Create ecosystem based stimulating habitats that foster physical & psychological needs of animals
- Imaginative signage & graphics to communicate perceivable / implementable conservation message
- Self sustaining populations of genetically & behaviorally sound animals
- Provide zoo visitors insight in to nature

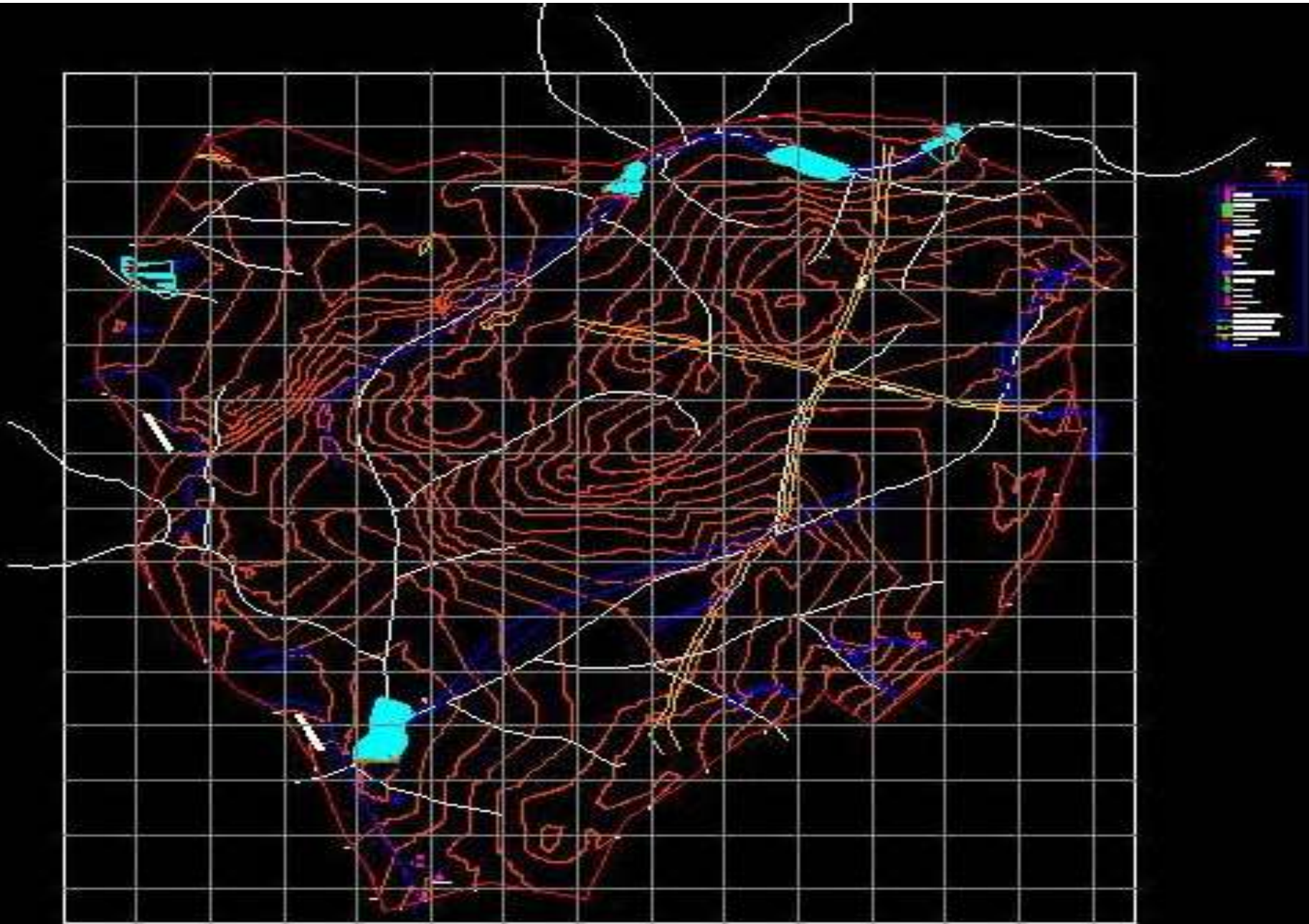
Master Layout Plan

- Master layout plan is a detailed landscape map in a scale of 1:1000 to 1:5000
- Proposed developmental activities in animal display area, conservation breeding area, rescue centre area, visitor circulation routes, animal upkeep and healthcare facilities including animals' quarantine facilities and isolation wards, visitor education facilities and civic amenities, service roads, administrative blocks, entry plaza, car parking should be clearly indicated on the map.
- Allocation of land for each activity should be made available as per "Recognition of Zoo Rules"

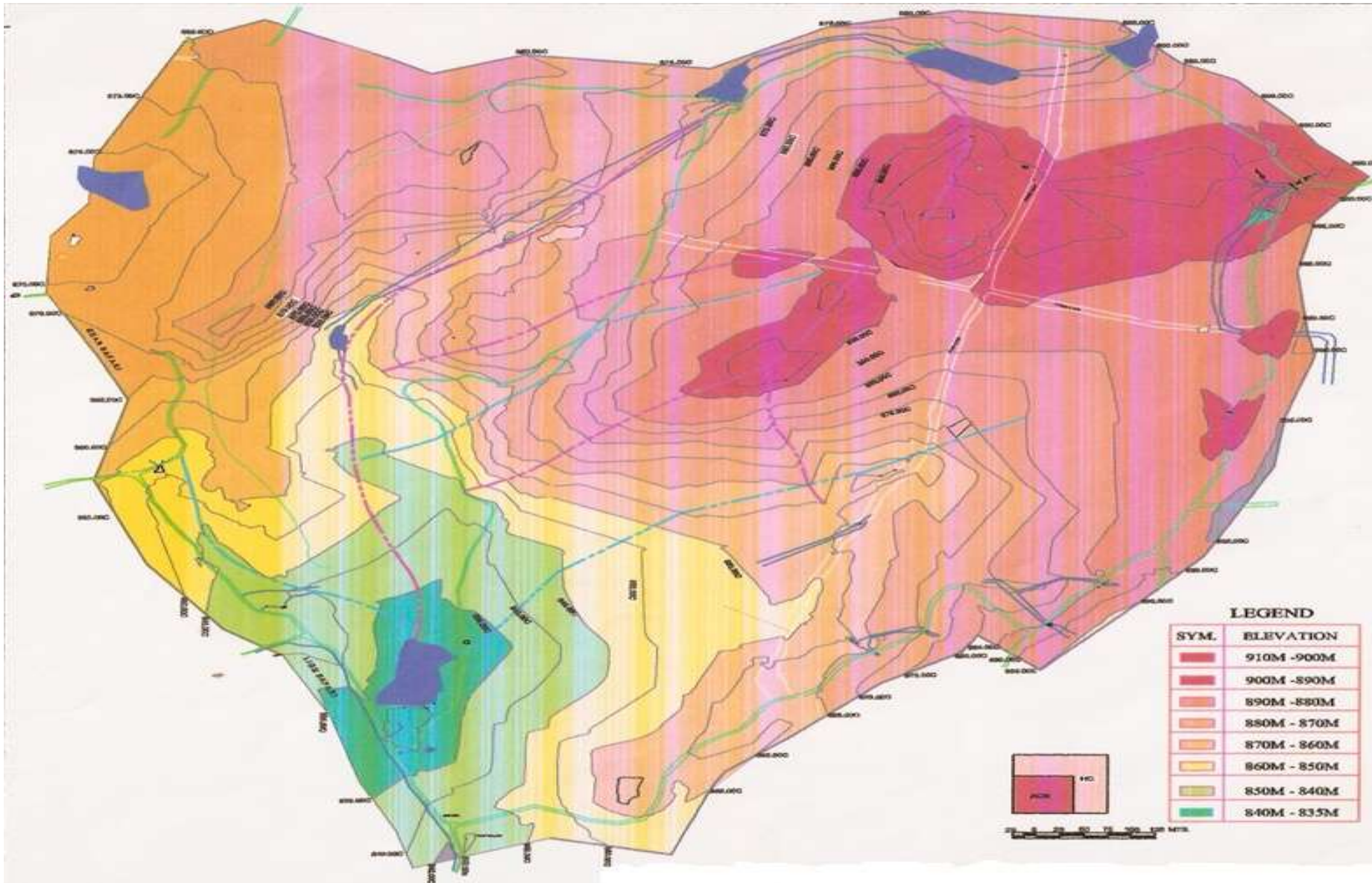
Layout plan should clearly show the following

- Existing enclosures to be retained – Black
- Existing enclosures to be modified – Green
- Existing enclosures to be demolished and redone – Red
- New enclosures to be constructed – Blue
- Structures other than enclosures can also be given similar colours when retained modified demolished or new.
- Power lines, sewerage lines, visitor circulation, service paths and water supply lines should be clearly shown in the layout plan

CONTOUR MAP



Topographic Analysis



Layout plan and location



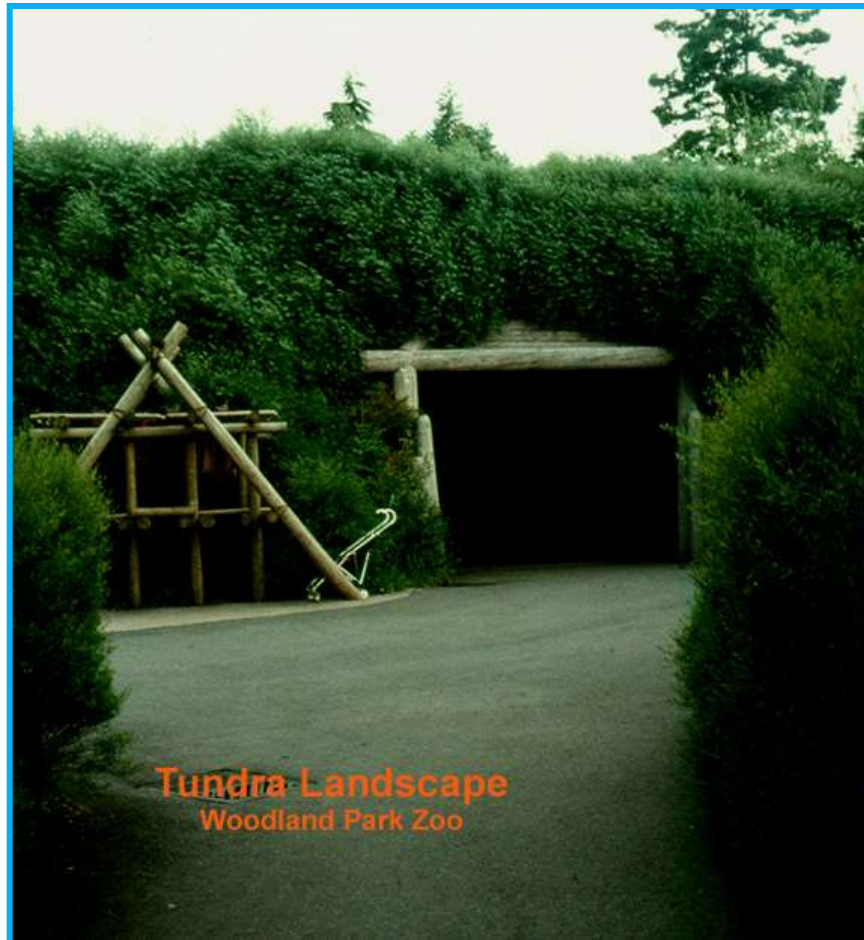
Model Master Layout Plan



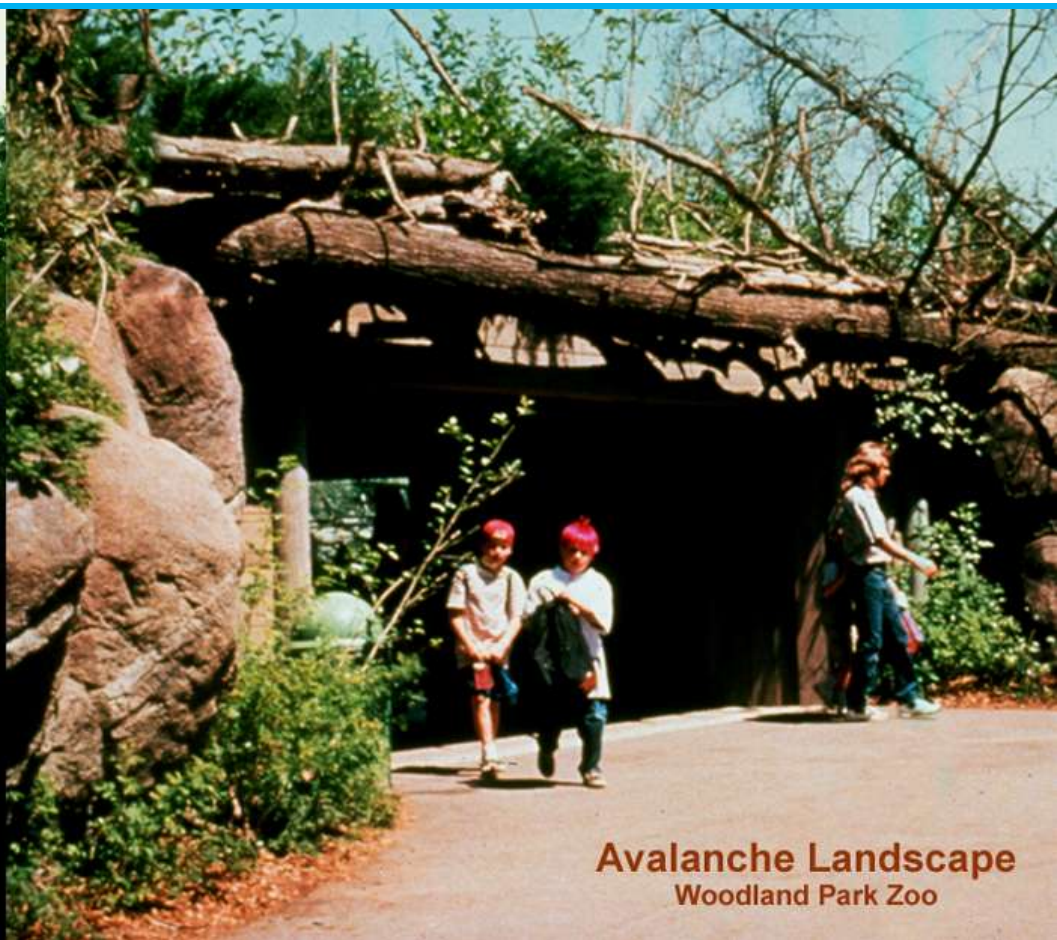
Existing animal enclosures (black colour),
enclosures to be modified (green colour)

Enclosures to be redone after demolishing the old structure (red colour),
Proposed new enclosures may be in blue colour

Entrance Gate



Tundra Landscape
Woodland Park Zoo



Avalanche Landscape
Woodland Park Zoo



Brookfield Zoo

ZSL
ZOOLOGICAL SOCIETY OF LONDON

Welcome to the Zoological Society of London

a non profit-making organisation that operates Whipsnade Wild Animal Park and London Zoo.
The money you spend will go towards saving animals and their habitats around the world.

ZSL
ZOOLOGICAL SOCIETY OF LONDON

← Tickets ↓

Tickets

Animal
Demonstrations

Tickets

Your
ticket
their
future

Your
ticket
their
future

Your
ticket
their
future



The image shows the entrance to the Oakland Zoo. A large wooden sign structure is the central focus. At the top, a horizontal wooden beam holds two taxidermy specimens: a white antelope head with long, thin horns on the left, and a grey elephant head with large ears and tusks on the right. Between these two heads, the words "OAKLAND ZOO" are displayed in large, bold, orange-red capital letters. Below this top beam is a dark grey, corrugated metal roof supported by several vertical wooden posts. Underneath the roof, a white rectangular sign with the word "WELCOME" in black capital letters is mounted. The background is filled with lush greenery, including tall palm trees and dense evergreens, under a clear blue sky. In the foreground, there is a landscaped area with several small, green palm-like plants and a concrete curb.

OAKLAND ZOO

WELCOME

Appropriate infrastructure





Opened in 1958 with large representative collection of eastern Himalayan, extent 27.3 ha, known for planned breeding of Red Panda, Snow Leopards, Tibetan Wolf and Himalayan Newt



Opened in 1960, with large representative collection of eastern ghats, extent 269 ha, 202 enclosures, 2045 animals of 125 species, known for planned breeding of Tiger, Gharial, Salt water crocodile and Indian Pangolin.

Assam State Zoo



Opened in the year 1957 with large representative collection of the north eastern India, extent 175 ha.



Zoo Marketing

Zoo Brand - Logo

Marketing--image





Zoo Marketing – Souvenir Shop



Ticket and Vehicle Parking



- **Pre Visit Zoo Orientation**

Zoo map - signage



2003 1 6

ZOO



PADMAJA NAIDU HIMALAYAN ZOOLOGICAL PARK

Darjeeling, West Bengal, India
GUIDE MAP (Main Display Zone)

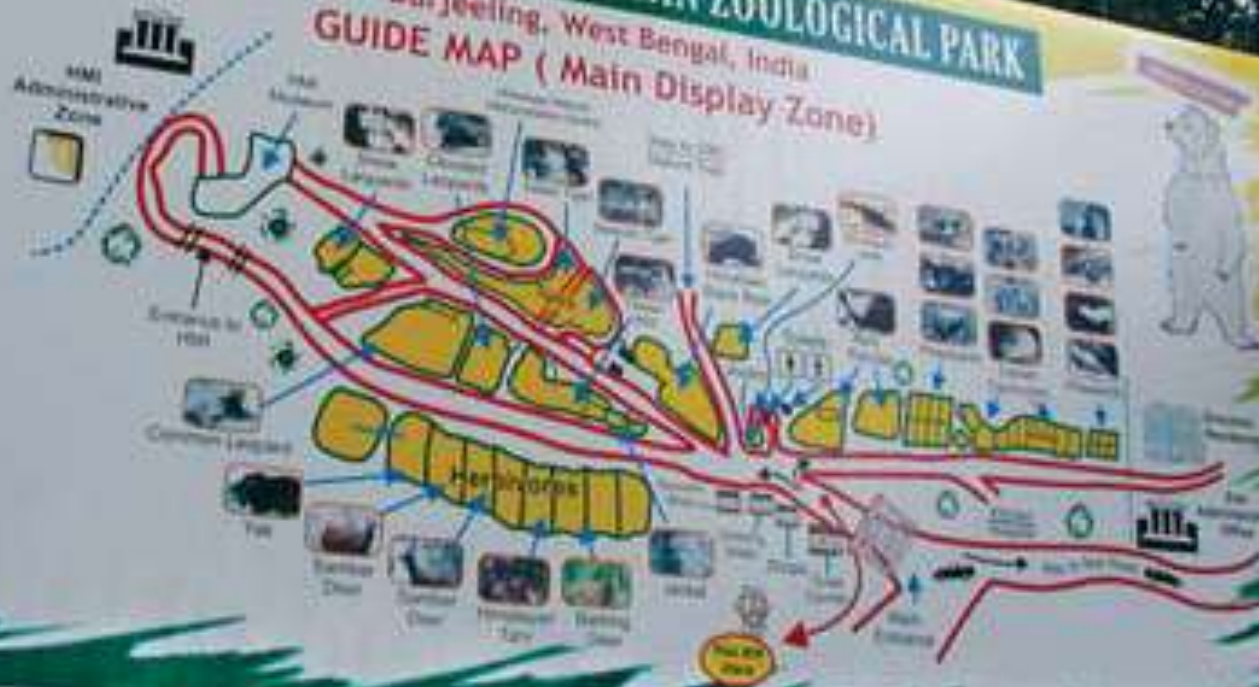
IMPORTANT NOTICES

DO TO DO AT THE ZOO

- Go to The Exhibits in Groups.
- Look at the Animal from Outside. Without touching the fencing.
- If required, Seek Help From Zoo staff.

NOT TO DO AT THE ZOO

- Do not leave Animals.
- Do not throw anything in enclosure.
- Do not feed Animals.
- No smoking, No Polythene.

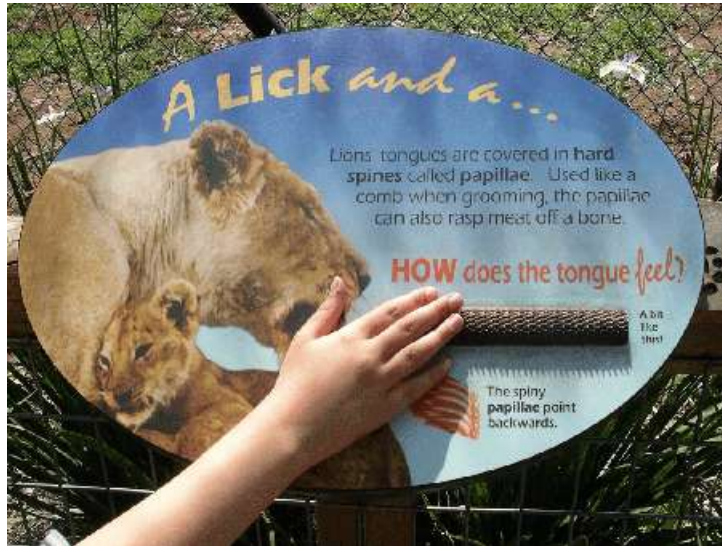


Quite common









Directional Sinages



Informative



Learning with Fun



Endangered Primates of India

SLOW LORIS



SLENDER LORIS



LION-TAILED MACAQUE



CRABEATING MACAQUE



PIGTAILED MACAQUE



STUMP-TAILED MACAQUE



GOLDEN LANGUR



CAPPED LANGUR



NILGIRI LANGUR



HOOLOCK GIBBON

Interesting



Interpretation Signage

Warning Signage

Creating Signage

- Appearance of signs
- Legible sign,
- Sufficient size to be read from a distance
- Avoid cluttering
- 8-10 words in a line and seven line











WARNING
Penguins will bite

Please do not touch, feed or disturb
the penguins. R500 fine

Public Facilities Signage

Glimpses



**GREEN RIDE
BATTERY DRIVEN VEHICLE
BOOKING COUNTER**



ZOO ANIMALS MESSAGE
KEEP THIS ZOO PLASTIC FREE
DON'T FEED US..
DON'T CROSS BARRICADES
DON'T TEASE US
OBSERVE US IN SILENCE



A covered booking counter area with a black metal frame and a green roof. A white battery-driven vehicle is parked inside the counter. A man in a white shirt and blue trousers is standing in the center. To the left, a man in a green shirt is sitting on a bench. The area is surrounded by lush green trees and a paved road. A black fence with yellow and black striped base is visible in the foreground.





canteen area







Guided Tour



Public amenities

- Boating
- Battery operated vehicles
- Children park
- Public conveyances(Toilets, Urinals,Cloak room etc)
- Wheel chairs,Bicycles,Drinkng water etc
- Eateries(restaurant and icecream parlor)



Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Animal housing, display of animals and animal enclosures

- zoo shall ensure that the enclosure is safe and secure for the animals, animal keepers and the visitors - space for free movement, exercise and expression of natural behaviour by the animals, to maintain safe distance from the dominant animals ,efforts to enrich the environment of the enclosure, screening shall be provided between adjacent enclosures



Retiring cell/ Off-display areas

- Provide a place to protect animals from inclement weather
- Provide medical attention
- Feed the animals



Keepers gallery

Used to feed, treat, transport and house the animals





1. Power supply
2. Water supply
3. Area for transport
4. Area for treatment

Day Kraal

Store surplus animals
House sick, gestating
animals



Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Animal housing, display of animals and animal enclosures

- No new enclosures for endangered species shall be constructed without prior approval of the CZA



Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Animal housing, display of animals and animal enclosures

- Every zoo shall provide appropriately designed and effective stand off barriers at every animal display enclosure, display adequate sign boards, with relevant information on the biology, behaviour and the population status of the species in the wild at every display enclosure.



Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Upkeep and healthcare of animals

- zoo shall house the animals in socially and behaviourally viable groups., provide timely supply of quality food, ensure supply of potable water

Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Upkeep and healthcare of animals

- zoo shall house the animals in socially and behaviourally viable groups., provide timely supply of quality food, ensure supply of potable water
- Prevent free ranging wild animals and scavengers sharing the feed of the zoo animals, each animal shall be provided feed in the feeding cells/ kraals



Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Upkeep and healthcare of animals

- left over feed, excreta of animals and all other wastes are removed promptly from the feeding cells and kraals, kraals are washed and disinfected



Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Upkeep and healthcare of animals

- keep a close watch on the general behaviour and health parameters of the zoo animals. Any animal that shows any sign of dullness, loss of appetite, injury or abnormal behaviour shall be thoroughly assessed

Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Upkeep and healthcare of animals

- Every zoo animals shall be screened for parasitic load All staff shall be screened against zoonotic diseases once every year,
- Every zoo shall maintain detailed records of observations of biological and social behaviour and health status of the animals including feed intake, medication and treatment provided in the keeper's diary,

Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Veterinary and infrastructure facilities

- Every zoo shall, -----
- (a) have veterinary facilities
- (b) have a full fledged veterinary unit with all basic diagnostic facilities, comprehensive range of drugs, operation theatre and in-patient wards.
- (c) Provided that a mini zoo shall have at least facilities of a treatment room.
- Every zoo, except mini zoo, shall have a postmortem room, isolation ward, quarantine ward, animal restraining and tranquilizing equipments and a veterinary care reference library.

Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Veterinary and infrastructure facilities

- Every zoo shall, -----
- Every zoo shall have linkages with the eminent institutions and organizations working in the field of wild animal healthcare ,to provide assistance in scientific diagnosis of diseases ,training and upgrading technical skills ,development of protocols for preventive medicines and vaccination

Recognition of Zoo Rules 1992/2009-

Standard and norms for Recognition

- **Post-mortem and disposal of carcasses of animals**

Every animal died in the zoo shall be subjected to a detailed postmortem examination

- **Euthanasia of the animals**

No animal in the zoo shall be euthanized unless doing so is essential for the health of other animals or relieving the animal from suffering or agony

Incinerators for the Disposal of Bones and Animal Carcasses



11:48 AM

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, (participating zoo) whereas off-display conservation breeding facilities are created only in one or two Zoos of the region.

Conservation Breeding Programme

- Flagship programme
- Identified 73 endangered wild animal species.
- Launched 23 species (CZA and states). e.g : Red Panda, Snow Leopard, Pangolin, LTM etc.
- Identified 26 priority species for future CBP
- Identified – coordinating zoos
- participating zoos

List of the Priority Species under CBP

1	Pygmy hog	14	Great Indian bustard
2	Vultures (white-backed, long-billed, slender-billed)	15	Wild ass
3	Hangul	16	Nilgiri langur
4	Golden langur	17	Musk deer
5	Wild buffalo	18	Hoolock gibbon
6	Brow-antlered deer	19	Swamp deer (Hard surface)
7	Lion tailed macaque	20	Nilgiri tahr
8	Red panda	21	Floricans (Bengal & Lesser)
9	Blyth's tragopan	22	Cheer pheasant
10	Asiatic lion	23	Clouded leopard
11	Rhinoceros	24	Painted roof turtle
12	Western tragopan	25	Snow leopard
13	Phayre's leaf macaque	26	Shaheen falcons

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

Salient Features of the SRCBP formulated during the Workshop in Hyderabad and Bhubneshwar

Name of the Species Red Panda

Coordinating Zoo : Darjeeling

- **Found in the eastern Himalayas, Sikkim and Arunachal Pradesh population 5000-6000**
- **Wild population in West Bengal is in Singlila National Park and Neora Valley**
- **Fragmentation and degradation of habitats and occasional poaching are threats**
- **Captive population 17 (9:5:3) and 45 birth recorded**



Salient Features of the SRCBP formulated during the Workshop in Hyderabad and Bhubneshwar

Name of the Species Lion-Tailed Macaque

Coordinating Zoo : Chennai



- Found in Karnataka, Tamilnadu and Kerala, extents up to Goa.
- Population is 3500 individuals, distributed in nearly 50 sub-populations each ranging from single group to 35 groups
- Habitat fragmentation, degradation, poaching , isolated populaitons, inbreeding, demographic stochasticity disease and genetic drift are threats
- Vandalur zoo is coordinating zoo, has four groups of southern genotype with a total number of 23 animals (11 females, 10 males and two infants).
- Population has grown from mere 20 individuals in 1971 to 86 in 2010, need to increase the reproductive rate of the captive population and sex representation to be balanced for all age classes. Genetic analysis show that 89% genetic diversity is being retained by the Lion tailed macaque population
- Required number of the founder population can be determined only after analysis involving PVA

Salient Features of the SRCBP formulated during the Workshop in Hyderabad and Bhubneshwar

Name of the Species Mouse Deer

Coordinating Zoo : Hyderabad

- Poorly- known population size and distribution
- Habitat loss and fragmentation, disturbance, poaching and predators are threats
- Captive population – 52 (18:22:12), 45 births recorded since 2010
- Genetic analysis required for determining inbreeding
- Another CBC to be setup at Vishakhapattanam



CONSERVATION BREEDING

- Captive Breeding of Greater one Horned Rhinoceros in SGBP has helped it to acquire global recognition.
- Park houses the highest number of individuals of the species in captivity after San Diego Zoo, California ,U.S.A.
- For the first time on 28.05.1979 this park received one pair of Rhino named 'Kancha' and 'Kanchi' from State of Assam.
- Almost after 3 years, in the year 1982 one rescued Rhino (named Raju) from Bettiah Forest (at present Valmiki Tiger Reserve) came to this zoo, which led to start breeding of rhino in this park.



RICH HERITAGE





BRIEF HISTORY

- In the year 1988 one female Rhino (Hartali) took birth from successful conjugation of Raju and Kanchi.
- Hartali the first Rhino calf of this park produced eight calves till date and she considered to be one of the most successful breeding female as far as captive breeding in Rhino is concerned

SUPER MOM (HARTALI)

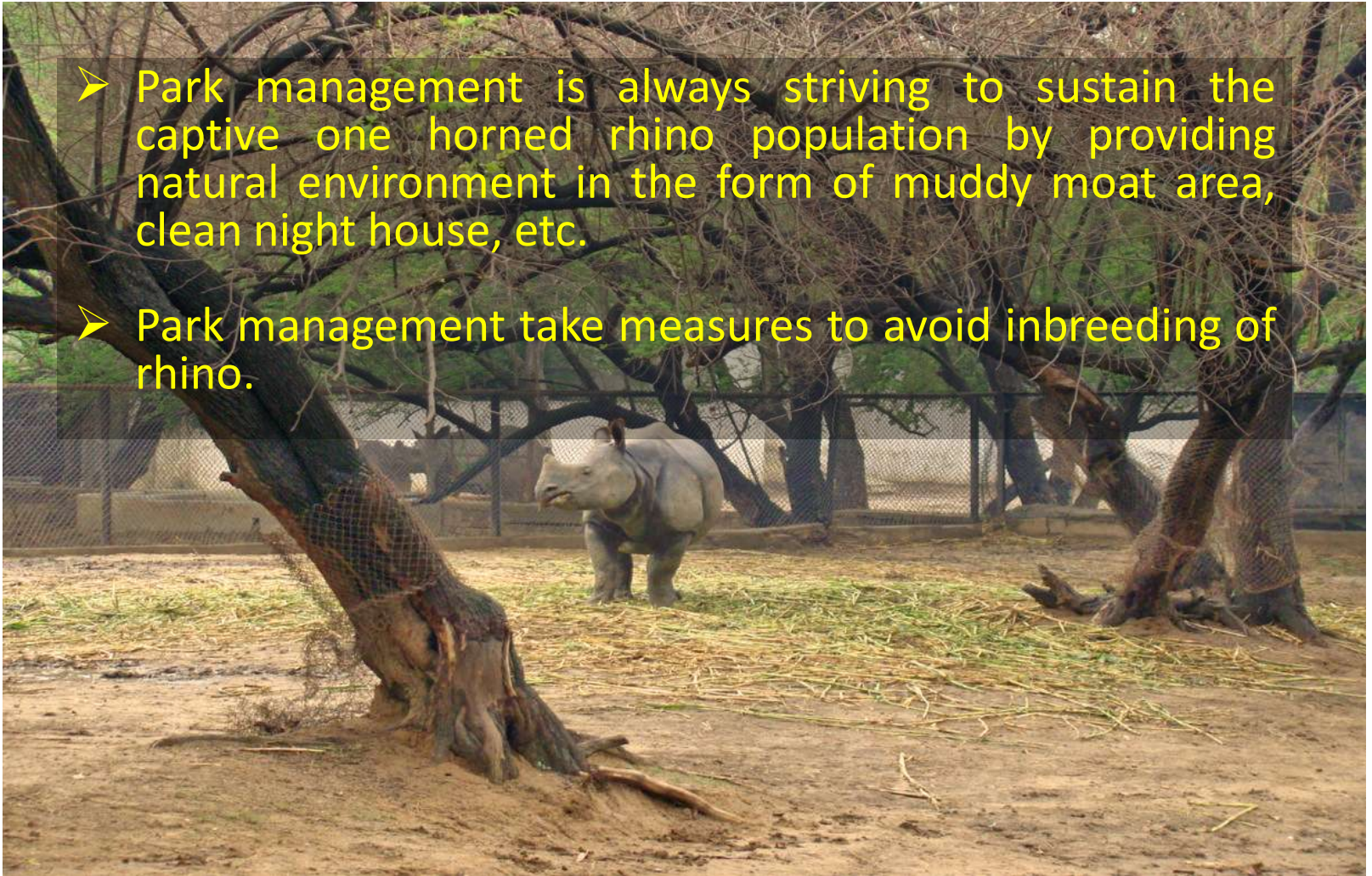








- Park management is always striving to sustain the captive one horned rhino population by providing natural environment in the form of muddy moat area, clean night house, etc.
- Park management take measures to avoid inbreeding of rhino.



NATURALISTIC ENCLOSURE



- So, to improve genetic diversity one male rhino 'Ayodhya' and one female rhino 'Gari' were brought to this Park under animal exchange programme from Delhi Zoo and San diago Zoo, U.S.A. respectively.
- Sanjay Gandhi Biological Park, Patna has provided rhino to Delhi, Kanpur, Ranchi, Hyderabad zoo and country like U.S.A.

SCIENTIFIC RECORD KEEPING

One Horned Rhinoceros (*Rhinoceros unicornis*)

Location - Patna Zoo

Local ID	National stud book No	Sex	Date of Birth	Sire	Dam	Location	Date	Event	House name	Old Stud book No	international S.T.B No
R- Pat1	36	F	1974	wild	Wild	India	1974	Capture	Chitralekha or Kanchi	NR011	0115
						Assam	21.07.1974	Transfer			
						Patna	28.05.1979	Transfer			
						Ranchi	14.12.1996	Transfer			
R- Pat2	49	M	1977	Wild	Wild	India	1977	Capture	Kancha	NR016	0156
						Assam	19.08.1977	Transfer			
						Patna	28.05.1979	Transfer			
						Death	15.12.2011	Death			
R- Pat-3	62	M	1981	Wild	Wild	India	1982	Capture	Raju	NR022	0157
						Patna	28.03.1982	Transfer			
							02.04.1995	Death			
R- Pat-4	80	F	08.07.1988	0157(Raju)	0115 (Kanchi)	Patna	08.07.1988	Birth	Hartali	NR032	0362
R- Pat-5	92	F	06.07.1991	0157(Raju)	0115 (Kanchi)	Patna	06.07.1991	Birth	Rani	NR041	0386
R- Pat-6		M	19.12.1993	0156(Kancha)	0115 (Kanchi)	Patna	19.12.1993	Birth	Raja	0107	0347
						Delhi	21.03.2005	Transfer			
R- Pat-7		F	26.06.1994	0157(Raju)	159(Hartali)	Patna	26.04.1994	Birth	Rani II		
						Kanpur	06.10.1997	Transfer			
R- Pat-8		M	23.10.1997	0156(Kancha)	159(Hartali)	Patna	23.10.1997	Birth	Bajrangi		
							17.07.1999	Death			
R- Pat-9		M	29.09.2000	0156(Kancha)	159(Hartali)	Patna	29.09.2000	Birth	Bhopu	0111	0351
						SDWAP	09.05.2007	Transfer			
R- Pat-10		F	08.08.2002	0156(Kancha)	159(Hartali)	Patna	08.08.2002	Birth	Akancha Or Gouri		0353
R- Pat-11		M	31.05.2003	0156(Kancha)	0203(Rani)	Patna	31.05.2003	Birth	Rustum		0364
						SDWAP	09.05.2007	Transfer			
R- Pat 12		M	19.09.2004	O347(Raja)	159(Hartali)	Patna	19.09.2004	Birth	Ganesh		0365
R- Pat 13		M	27.12.1992	151(Dabbu)	194(Mohani)	Delhi	27.12.1992	Birth	Ayodhya		202
						Patna	21.10.2005	Transfer			
R- Pat 14		M	06.11.2005	0156(Kancha)	0203(Rani)	Patna	06.11.2005	Blith	Suraj		0387
								Transfer to Hyderabad Zoo			

Continued...

Local ID	National stud book No	Sex	Date of Birth	Sire	Dam	Location	Date	Event	House name	Old Stud book No	international S.T.B No
R- Pat 15		F	24.01.2007	0156(Kancha)	0159(Hartali)	Patna	24.01.2007	Birth	Sarswati		202
								Transfer to Hyderabad Zoo			
R- Pat 16		F	23.07.2001	0106(Rabha)	0209(Godawari)	SDWAP	23.07.2001	Birth	Gairi		0278
						Patna	09.05.2007	Transfer			
							09.12.2014	Death due to Anthrax			
R- Pat 17		F	03.12.2005	0190(Arun)	0278(Gari)	SDWAP	03.12.2005	Birth	Lali		158
						Patna	09.05.2007	Transfer			
R- Pat 18		M	30.10.2007	0190(Arun)	0278(Gari)	Patna	30.10.2007	Birth	Shaktiraj		0390
R- Pat 19		F	06.04.2009	156(Kancha)	159(Hartali)	Patna	06.04.2009	Birth	Election		
R- Pat 20		M	25.05.2011	156(Kancha)	159(Hartali)	Patna	25.05.2011	Birth	Virat		
						Mysore	16.07.2014	Transfer			
R-PAT 21		F	10.06.2011	202(Ayodhya)	O353(Gouri)	Patna	10.06.2011	Birth	Unnamed		
						Patna	10.06.2011	Death			
R-PAT 22		M	11.11.2011	202(Ayodhya)	0203(Rani)	Patna	11.11.2011	Birth	Jumbo		
R-PAT 23		F	11.05.2013	202(Ayodhya)	O353(Gouri)	Patna	11.05.2013	Birth	Dolly		
						Mysore	16.07.2014	Transfer			
R-PAT24		M	06.09.2013	202(Ayodhya)	278(Gairi)	Patna	06.09.2013	Birth	Vidhut		
R-PAT25		F	16.09.2013	202(Ayodhya)	159(Hartali)	Patna	16.09.2013	Birth	Babli		
							09.08.2015	Death due to T.B			
R-PAT26		M	16.09.2014	202(Ayodhya)	158(Lali)	Patna	16.02.2014	Birth	Unnamed		
							16.02.2014	Death due to shock associated with respiratory failure			
R-PAT27		M	08.07.2017	202(Ayodhya)	Election	Patna	08.07.2017	Birth	Shakti		
R-PAT28		F	26.07.2017	O365 (Ganesh)	158 (Lali)	Patna	26.07.2017	Birth	Rhine		
						Vandalur Zoo, Chennai	01.09.2019	Transfer			
R-PAT29		F	03.11.2017	202(Ayodhya)	159(Hartali)	Patna	03.11.2017	Birth	Mother rejection		
							05.11.2017	Death			

Continued...

Local ID	National stud book No	Sex	Date of Birth	Sire	Dam	Location	Date	Event	House name	Old Stud book No	international S.T.B No
R-PAT30		M	Adult	wild	Wild	Guwahati Zoo	Unknown	Wild	Nagshankar		
						Patna Zoo	06.12.2019	Exchange			
							13.01.2020	Death			

RHINO BREEDING AND CONSERVATION CENTRE

- ✓ Considering the suitable climate and environment for successful breeding of Rhinos in this zoo, the Central Zoo Authority, New Delhi has selected this zoo for breeding of Rhinos and approved a scheme for construction of **Rhino Breeding & Conservation Centre** at a cost of **Rs. 387.790 lakh** on 60:40 grants basis.





HABITAT DEVELOPMENT

GHARIYAL BREEDING AT PATNA ZOO



GHARIYAL RELEASE IN GANDAK RIVER



Variety of literature



ZOO Education Master Plan



Zoo Education for a Sustainable Future

Networking and Partnerships

Training and Capacity Building

Education and Outreach

Interpretation

Understanding Visitors to Zoos in India

Zoo Education - Why, What, Whom?

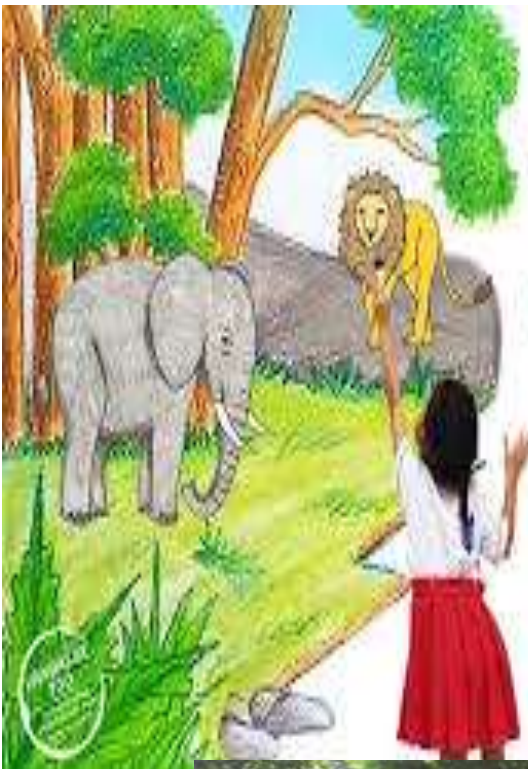
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केन्द्रीय पशुविद्यालय प्राधिकरण
Central Zoo Authority

CEE

Centre for Environment Education



PAINT YOUR THOUGHT

TOPIC

LION & ELEPHANT

(3rd to 5th Standard Students)

TOPIC

FOREST & WILDLIFE

(6th to 9th Standard Students)

8th August 9:30 TO 10:30 AM

Zoo Interpretation Centre
Ariyaratna Zoological Park



Education and Eco awareness – Zoo school programme



Education and Eco awareness – Zoo School programme





Summer Camp



General Requirements

- **Maintenance of Records and submission of Inventory**
- keeper's diary, daily reports, animal history cards and treatment cards, as per standards specified by the Central Zoo Authority
- Every zoo shall maintain record of the births, acquisitions, deaths and disposals of animals of each species in its collection in the format of CZA and the inventory of the animals in the collection , for each financial year shall be submitted to the Central Zoo Authority by 30th day of April of the ensuing year in Form II.
- Provided that for the species included in Schedule I and Schedule II to the Act, detailed reasons of death identified on the basis of the post-mortem examination reports shall be submitted to the Central Zoo Authority every quarter, within a period of fifteen days of the end of that quarter.
- (2) Every zoo shall submit an annual report of its activities and compliance of the conditions stipulated by CZA for each financial year to the Central Zoo Authority by the 30th day of June of the year.

Record Keeping in Zoos

- **The Central Zoo Authority has signed Memorandum of Understanding (MoU) with International Species Information System (ISIS) for providing ISIS membership to 57 Indian ZOOs and 4 related organization viz CZA,WII, IVRI and LACONES**
- **Technical Services-Providing animal Records Management Software Tool ARKS, SPARKS, ZIMS, Med ARKS and Training to all the selected Zoos**

Record Keeping

**Animal Record Keeping In Zoos –
Inventorization: ARKS**

**Pedigree Record Keeping and
Analysis: SPARKS,, POPLINK, PM
2000**

Veterinary Records: MEDARKS

**Maintaining Zoo Records (Husbandry,
Healthcare, Inventorization, Breeding
Strategies): ZIMS**



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. (14 studies)

Scope of Research

- **Research that is aimed at new knowledge institution eg** husbandry, visitor preferences, educational and interpretation methods, conservation approaches etc.,
- **Research that is undertaken in a zoo by others to achieve their own goals eg** assisting researchers from universities and research organizations by providing access to and or material from non-domesticated species for comparative analyses.
- Research in pure and applied biological science (including small population biology, animal welfare, wildlife medicine, physiology, nutrition, behaviour, reproductive biology, genetics, evolution, and taxonomy);
- *in situ* conservation research e.g. field-based ecological and habitat research
- research aimed at identifying and improving zoo operations eg research on visitor learning, the effectiveness of exhibits and programmes, marketing and messaging, membership, and development and fund-raising

Research

- IVRI Barriely – National Referral Center
- **LaCONES (CCMB)**-Sponsored by CZA for development of techniques for assisted reproduction, Frozen Bank, analysis of genetic homozygosity / heterozygosity for endangered species.
- Research Programme – in collaboration with universities, colleges
- National Studbook – WII , Dehradun (14 species)
- SPA- Guidelines and Principles of Designing Zoos
- IVRI-Standard, guidelines & protocols on disease diagnosis & cure of wild animals
- CEE – National Zoo Education Master Plan
- WII – Housing and enclosure enrichment

LACONES, CCMB, Hyderabad



Animals Studied at LACONES



Semen Collection from Tiger



Lion Semen Collection



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)



Providing access to better veterinary facilities and services

- Health Advisory Committees (Prof' Vet College/ Eminent wildlifer/Zoo Vet-Chairperson & senior Zoo vet-Co-ordinator)
- Mechanism with local Veterinary Colleges at the State/Regional level.
- National Referral Centre at Indian Veterinary Research Institute Bareilly (UP)-Getting Baseline data on health parameters/analysis of sample/treating sick animals on request

Research: National level studies

- The Central Zoo Authority has signed Memorandum of Understanding (MoU) with organisation;
SPA-develop Guidelines and Principles of Designing Zoos
IVRI-Standard, guidelines & protocols on disease diagnosis & cure of wild animals
CEE – National Zoo Education Master Plan
WII-Housing and Enclosure Enrichment
CCMB/LaCONES –Bio-technology interventions for conservation of Endangered species
IVRI - to initiate studies in some areas of Zoo Management.

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.

Recognition of Zoo Rules 1992/2009- Standard and norms for Recognition

Development and Planning

- No zoo shall accept any rescued animal unless it has appropriately designed enclosure and upkeep facilities for the animal

Rescue and Rehabilitation

- Increasing man-animal conflict
- National zoo policy, 1998 – zoos to act as RC
- Established 7 nos. Rescue Centers for rehabilitation of ***lions, tigers, leopards, bears and monkeys*** rescued from circuses and housed in Vishkapatnam, Tirupati, Bannerghatta, Vandalur, Nahargarh, South Khairbari, Bhopal.
- Funding- 100% for their maintenance including diet for the animals.
- 202 lions and 42 tigers still living in these rescue centres (Original 464 animals).



Rescue and rehabilitation centre



2002 12 25

Releasing Zoo Surplus Animals

- **Likely to increase disease risks**
- **Lead to behavioural and environmental problems with resident animals and vegetation,**
- **Releases should be based on adequate research and precautions to prevent adverse impact on existing wild populations or ecosystems.**

Disaster Management in Ex-situ Conservation Facility

Identify the Most Likely Disasters in Your Facility

- **Earthquake,**
- **Fire,**
- **Flood,**
- **Landslide,**
- **Oil spill, toxic spill,**
- **Disease outbreak**
- **Riot, act of terrorism, bomb, plane crash, explosion,**
- **Extreme heat or cold, drought, heavy snowfall, avalanche, high wind, tornado, hurricane, volcanic eruption**



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An Enclosure Under Deluge



Preparedness





Case Study- Trypanosomiasis in Nandankanan Zoological Park

- Deaths of 12 Royal Bengal tigers, seven of which were the captive-bred white variety-first mortality on June 23
- On July 16, Calcutta Pathological Laboratory -animals had died from "consumption of decomposed and contaminated cow meat"
- an earlier finding, that post mortem examinations on the animals showed they had died of trypanosomiasis, a protozoan disease affecting the central nervous system
- Disease that could have been generated by consumption of meat contaminated by insect faeces containing trypanosomiasis.



Most people believe it was gross negligence on the part of the zoo authorities that led to the death of the tigers.

None of the senior zoo officials lives on the zoo premises



THANKS