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# Zoo management in Bangladesh and considering variables

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**Abstract**
The purpose of the paper is to discuss the management issues of zoo and its variables. The research is based on some primary data, which are collected from a structured questionnaire survey, interview, Observation and also on some secondary data which are collected from different sources. It is found that different zoo has different kinds of animals among the zoos of Bangladesh. Among the management of zoo reproduction for growth, preventive measures form diseases, quarantine of living and transport elements, vaccination and necropsy are important. In case of medical treatment animal have different sets of diagnostics techniques and anesthesia. A zoo has some basic function like, feeding, breeding, housing and health management. To run visiting task smoothly there are special exhibition technique and visitor management system. Besides, to operate a zoo functionally there are record keeping, transportation, management of new species, enrichment facilities are some of the many variables needs to consider by a zoo authority.

**Keywords:** Zoo, Management, Captive breeding, Bangladeshi zoo

## 1. Introduction

A zoo (short for zoological park or zoological garden) is a facility in which animals are confined within enclosures, displayed to the public, and in which they may also be bred.

London Zoo, which opened in 1828, first called itself a Menagerie or "Zoological Garden," which is short for "Gardens and Menagerie of the Zoological Society of London" [1]. The term "Zoological Park" was used for more expansive facilities in Washington, D.C., and the Bronx in New York, which opened in 1891 and 1899 respectively [2].

The term "bio park" was first coined and developed by the National Zoo in Washington D.C. in the late 1980s. In 1993, the *New York Zoological Society* changed its name to the Wildlife Conservation Society and rebranded the zoos under its jurisdiction as "wildlife conservation parks" [3].

In 1907, the German entrepreneur Carl Hagen beck founded the Tier park Hagen beck in Stalling, now a quarter of Hamburg. It is known for being the first zoo to use open enclosures surrounded by moats, rather than barred cages, to better approximate animals' natural environments [4].

When ecology emerged as a matter of public interest in the 1970s, a few zoos began to consider making conservation their central role, with Gerald Durrell of the Jersey Zoo, George Rabb of Brookfield Zoo, and William Conway of the Bronx Zoo (Wildlife Conservation Society) leading the discussion. From then on, zoo professionals became increasingly aware of the need to engage themselves in conservation programs, and the American Zoo Association soon said that conservation was its highest priority [5]. Because they wanted to stress conservation issues, many large zoos stopped the practice of having animals perform tricks for visitors. The Detroit Zoo, for example, stopped its elephant show in 1969, and its chimpanzee show in 1983, acknowledging that the trainers had probably abused the animals to get them to perform [5].

Roadside zoos are found throughout North America, particularly in remote locations. They are small, unregulated, for-profit zoos, often intended to attract visitors to some other facility, such as a gas station. The animals may be trained to perform tricks, and visitors are able to get closer to them than in larger zoos [6]. Since they are sometimes less regulated, roadside zoos are often subject to accusations of neglect and cruelty [7].

A petting zoo, also called children's farms or children's zoos, features a combination of domestic animals and wild species that are docile enough to touch and feed. To ensure the animals' health, the food is supplied by the zoo, either from vending machines or a kiosk nearby [8].

When they arrive at the zoo, the animals are placed in quarantine, and slowly acclimatized to enclosures which seek to mimic their natural environment. For example, some species of penguins may require refrigerated enclosures. Guidelines on necessary care for such animals is published in the *International Zoo Yearbook* (Encyclopaedia Britannica, 2008) [9].

The position of most modern zoos in Australasia, Europe and North America, particularly those with scientific societies, is that they display wild animals primarily for the conservation of endangered species, as well as for research purposes and education, and secondarily for the entertainment of visitors an argument disputed by critics [10].

To reduce the need for animals from the wild, the breeding of animals within zoos is encouraged. Eric Baratay and Elisabeth Hardouin-Fugier of the Université Jean-Moulin, Lyon, say that the overall "stock turnover" of animals is one-fifth to one-fourth over the course of a year—with three-quarters of wild caught apes dying in captivity within the first twenty months. They say that before successful breeding programs, the high mortality rate is the reason for the "massive scale of importations" [11].

The condition of the animals varies widely, especially in zoos in countries with little or no regulations. The majority of zoos continue to work to improve their animal enclosures, although constraints like size and expense make it difficult to create ideal captive environments for some species, such as dolphins and whales [12, 13].

Zoo Research Guidelines: Monitoring Stress in Zoo Animals [14]. BIAZA, A protected animal is any living vertebrate, other than man. This includes mammals, bird and reptiles from halfway through gestation or incubation periods and fish and amphibians from the time at which they become capable of independent feeding. Trivedi P.R. and Raj Gurdeep, 1997, Some species have become extinct due to natural causes, but the greatest danger to wildlife results from human activities. Thus, we ourselves have created this need for wildlife conservation.

Conservation biology matured in the mid-20th century as ecologists, naturalists, and other scientists began to research and address issues pertaining to global biodiversity declines [15-17].

The conservation ethic advocates management of natural resources for the purpose of sustaining biodiversity in species, ecosystems, the evolutionary process, and human culture and society [18, 19].

Many nations have government agencies dedicated to wildlife conservation, which help to implement policies designed to protect wildlife. Numerous independent non-profit organizations also promote various wildlife conservation causes (Wildlife Conservation, 2012) [20].

The study aim to understand the condition of zoo and also to see the management scenario of zoo in Bangladesh.

## 2. Materials and Methods

During the research work, the procedures were followed stated below:

### Selection of study area

There are seven Zoo's and two Safari Parks in Bangladesh considered well reputed. These are Dhaka Zoo, Rajshahi Zoo, Rangpur Zoo, Chittagong Zoo, Khulna Zoo, Comilla Zoo, Savar Cantonment Zoo, Gazipur Bangabandhu Safari Park and Dulahazra Safari Park. Among them Dhaka Zoo, Rajshahi Zoo, Rangpur Zoo and Dulahazra Safari Park were considered as research subject.

### Data collection procedure

We both use primary and secondary data during data collection. Primary data consist of questionnaire survey, observation, photography etc. Through questionnaire survey we collect various information on zoo. Such as, number of exhibited zoo animals and their health, hygiene, food, disease, treatment, management and breeding condition of zoo animals etc. Observation helps us to understand the infrastructures, enclosures and different sections of zoos and safari park. Photographs were taken from all the zoos and safari park about their infrastructure, cages, enclosure and the habitat of the captive zoo animals. Secondary data collected from register and record books of zoos and safari park, different Journals, books related to zoo management and wild life conservation, newspapers and through internet.

### Data analysis and tools used

Data were analyzed by SPSS and Excel.

## 3. Results and Discussion

### 3.1 Management of Zoo

#### 3.1.1 Reproduction

It is important to understand the biology and social behavior of animals to promote reproduction. Species should be maintained alone, in pairs, or in groups, depending on their established social systems. For example, in mixed species groups of Artiodactyls, it is possible to establish species estrous cycles through a variety of techniques, including monitoring hormone levels in the urine and feces. Monitoring reproductive cycles may be used to determine when to introduce and remove breeding males, with males of other species rotated to coincide with the estrous periods of the females of each species. This may also reduce injuries from interaction between breeding males. At parturition, the males of some species should be removed for several weeks to prevent attacks on the postpartum females or their offspring. In colder climates, males should be introduced at a time that will allow births to occur during warm weather.

Artificial reproductive technologies such as artificial insemination, in vitro fertilization, and embryo transfer have been successfully employed in diverse zoo species. These efforts have made a significant difference in some endangered species breeding programs (e.g., black-footed ferret). However, success requires substantial financial, personnel, and resource investments to determine basic parameters of reproductive cycles and responses to pharmacologic manipulation.

An emerging management priority in maintenance of zoological collections is the need for selective reproduction. Indiscriminate reproduction is unethical and carries with it the potential for overproduction that exceeds the capacity of the exhibit, the zoo, or other zoos to appropriately house the progeny. Overly successful breeding programs carry a risk of limiting resources that could compromise other captive propagation programs. Regional cooperative breeding programs such as Species Survival Plans should be followed. Contraceptive efforts in zoos are multifaceted and include permanent techniques (castration, vasectomy, ovariohysterectomy, tubal ligation), as well as reversible ones

such as separation of the sexes, administration of birth control pills, hormonal implants, gonadotropin releasing hormone agonists, and oral or injectable progestin's. Reversible contraception can also be used to control timing of reproductive cycles. There is ongoing work with immune contraception through administration of porcine zona pellucid vaccines. The Association of Zoos and Aquaria Wildlife Contraception Center is a good source of up-to-date information on contraception techniques.

### 3.1.2 Preventive Medicine of Zoo Animal

The foundation of a medical program for zoo animals is preventive medicine. Preventive medical programs should be adaptive and include attention to individual specimens as well as the herd, troop, or flock. Components of the program include quarantine of new arrivals, periodic fecal examinations and treatments for parasites, booster vaccinations, health screening procedures, nutrition evaluation, necropsy examination of deceased specimens, and a comprehensive pest control program. Animals should be evaluated to ensure their health complies with local, state, and federal health requirements before shipment to other zoos or before release in managed reintroduction programs. Pre-shipment evaluations can also be used as an opportunity to assess the overall health status of the group in which the animal has been living.

### 3.1.3 Quarantine

Animals entering a collection must undergo quarantine. Quarantine facilities should be designed to allow handling of animals and proper cleaning and sanitizing of enclosures. Shipping crates should be cleaned and disinfected before they leave the quarantine area, and the crates' contents disposed of appropriately. Quarantine facilities require barriers against ingress of potential vectors and vermin. Separate keepers who are skilled at recognizing signs of stress and disease and who will carefully monitor feed intake and fecal characteristics should care for quarantined animals.

Quarantine entry should be strictly controlled. Only essential personnel should be allowed into the quarantine facility. Individuals leaving the quarantine facility should not return to other animal areas without showering and changing clothing. The duration of quarantine should be appropriate to ensure that infectious diseases are not introduced into the permanent collection when the quarantined animals are released to exhibits. Quarantine facilities should follow the "all-in/all-out" principle, i.e., if additional animals are added to an ongoing quarantine, the quarantine period should be restarted.

During quarantine, animals should receive appropriate vaccinations and diagnostic testing (e.g., tuberculosis, heartworm). They should be examined and treated for ecto- and end opera sites and screened for enteric bacterial pathogens. Before release, animals should receive physical and laboratory examinations, which may include radiographs, serology, hematology, and clinical chemistries. Serum should be frozen for future reference and possible epidemiologic studies. All procedures and results should be recorded in each individual animal's medical record, which is an essential component of the medical program. Each animal should also be identified by some permanent method (e.g., tattoo, tag, band, ear tag, transponder) to ensure future identification.

When new animals are introduced to enclosures, caution and forethought are necessary to prevent self-induced trauma. Visual barriers, e.g., suspending canvasses from fences or enclosure walls or obscuring glass with soap to provide a visual cue, are standard management steps to protect newly introduced specimens from accidents during acclimation to a new exhibit.

### 3.1.4 Vaccination

Vaccination programs for carnivores, nonhuman primates, equids, artiodactylids, and birds should be developed. Vaccination of zoo carnivores is essential because of their susceptibility to various diseases such as feline panleukopenia, feline rhinotracheitis, feline calicivirus, rabies, canine distemper, and canine parvovirus. (Also see Vaccination of Exotic Mammals). Previously, only killed virus vaccines were recommended, but recent studies have shown that some modified live vaccines are safe for use in select species. Further studies are required because some modified live vaccines (especially canine distemper) produce fatal disease in certain species. A canary pox-vectored recombinant canine distemper vaccine has proven safe for use in those species susceptible to modified live virus vaccine-induced disease. Appropriateness of rabies vaccination depends on the circumstances of each collection. If indicated in rabies-endemic areas for the protection of individual animals, only a killed rabies vaccine should be used. The decision to vaccinate zoo animals for less common diseases for which a vaccine is available should be made on an individual basis. Newer recombinant and subunit vaccines are being developed for a variety of infectious diseases for domestic animals and humans. These vaccines should be used with caution until safety and efficacy studies have been completed for zoological species.

### 3.1.5 Necropsy

All dead animals should be necropsied. This should include gross and his to pathologic evaluation of tissue and viral, bacterial, or fungal cultures when appropriate. Tissues should also be saved for potential future examinations. A thorough pathology examination allows evaluation of medical, management, and nutritional programs. It is also valuable in identifying problems requiring immediate action to safeguard the health of the collection. Variations in anatomy should be recorded because such observations may aid in future diagnostic procedures or therapy in the species.

### 3.2 Clinical Care Program for Zoo Animal

The mainstay of the zoo medical program is a qualified and dedicated keeper staff. The keepers know the individuals under their care and observe them daily. They are the first to recognize abnormalities such as anorexia, inactivity, abnormal feces, or changes in behavior that may reflect early medical problems. Overzealous reporting of observations is preferable to indifference. Because many zoo animals, especially prey species, instinctively conceal overt signs of illness until the disease process is well advanced, it is necessary to make keepers aware of the significance of what may seem to be trivial changes. Past associations with the veterinarian may arouse some animals' responses to the veterinarian's presence, which will mask subtle changes noticeable to keepers.

Once a diagnosis is made, the treatment of zoo animals is similar to that of domestic species except in the method of drug administration and restraint. A comparative medical approach is generally most successful and productive and utilizes application of medical or surgical information about diseases affecting free-ranging animals, related domestic animals, or humans. Frequently, other veterinary experts or human medical or dental specialists are consulted for advice

or assistance with complicated medical or surgical cases. Knowledge of comparative anatomy, physiology, behavior, nutrition, pathology, and taxonomy is useful. Attention must be paid to both individual and population health.

Unless medical conditions dictate otherwise, it is often preferable to leave an animal under treatment at its home exhibit where it can maintain contact with its conspecifics and keepers. This can also prevent disruptions in social hierarchies, which may cause difficulties with reintroductions to an established group.

### 3.2.1 Diagnostic Techniques

The fundamental diagnostic technique is a good history and thorough visual and physical examination (often requiring anesthesia). Ease of sample collection for laboratory testing (CBC, biochemical profile, serology, cytology); fecal examination for parasites; urine for urinalysis; and aerobic, anaerobic, fungal, and viral culture is dependent on species anatomic differences compared with other more commonly treated species. Radiography and ultrasonography are commonly employed. Endoscopy, laparoscopy, and minimally invasive surgery are utilized when indicated. CT and MRI are less commonly utilized but also have a role in specific cases. Virtually any technique used for other species can be modified for use in zoo species.

### 3.2.2 Anesthesia

Safe anesthesia of zoo animals is of special concern. Many procedures routinely accomplished on domestic animals with minimal restraint require anesthesia of zoological species for the welfare and safety of both zoo animals and personnel. Prior to initiation of anesthesia in a zoo animal, the veterinarian should be familiar with the species and choice of anesthetic agent. Anesthesia records for the individual, other specimens of the same species in the collection, or published references for the species should be reviewed. Consultation with someone knowledgeable in the field is advised, as there are great differences in effective drugs and dosages in the diversity of species in a zoological practice.

Many factors influence an animal's response to anesthetic drugs, including age, sex, stage of reproductive cycle, general nutritional status, and most especially mental state before drug administration. Variations may be marked between species as well as individuals and between different collections of the same species. An excited animal usually requires more drug and, once anesthetized, has a greater tendency to develop capture myopathy secondary to hyperthermia, respiratory depression, and acidosis. Capture myopathy can also occur in manually restrained animals and is more common in ungulates or long-legged birds (see Myopathies in Horses). Monitoring of anesthetized animals may include heart and respiratory rates, temperature, ECG, oxygenation (measured by blood gas determination or pulse oximetry), ventilation (measured by blood gas determination or end-tidal $CO_2$), and blood pressure (measured directly or by oscillometric techniques). Attention must be paid at all times to appropriate positioning and padding of anesthetized animals and extremes of environmental conditions to prevent secondary complications.

### 3.3 Considered Variables for Proper Management

There are numerous variables must be controlled in captive condition to maintain the animal, for its life is happy and productive. Feeding, breeding, housing, health management, record keeping, transportation, exhibition technique management, visitor management, management for new species, enrichment facilities and other management are some of the variables should be considered for zoo management.

### 3.3.1 Feeding

Feeding is essential to all animals. It is the process by which edible materials are ingested, digested, absorbed and utilized. Such materials, food, contain energy necessary to maintain life processes, promote growth and allow reproduction.

Some Scientist classified mammalian diets on the basis-of the proportion of the different items consumed by species The classification recognized that the diets of most species are not restricted to single food types (e.g. fruits) but usually combine different types (e.g. fruits and animal material).

**Table 1:** Main dietary categories for mammals

| Diet Category | Relative proportion of different foods |
|---|---|
| Herbivore-grazer, | >50% grasses |
| Herbivore-browser | Herbivore-browser |
| Frugivore-herbivore | >50% fruits remain: mostly plant material Mostly fruits and seeds |
| Frugivore-granivore | >50% fruits, remainder mostly invertebrates and vertebrates |
| Frugivore-omnivore | >50% invertebrates |
| Insectivore-omnivore | >75% ants and termites |

Formulation and Delivery of Zoo Diets very often the diet of captive "species is based on that given to the species in other institutions, or to a close relative 01 a species apparently filling the same ecological niche, already being kept successfully I captivity. While this is acceptable as a base diet every effort should be made to improve upon it following feeding trials and research. The-nutritional requirements of an animal might have to be estimated for an appropriate diet to be formulated.

A major problem in feeding animals in captivity is that artificial diets are restricted in variety and natural choice Attempts to create the perfect diet for captive animals go back to as early as 1930-1935 when Herbert L. Ratcliffe formulated prepared diets for a number of species at Philadelphia Zoo. But the use of prepared diets alone is now generally regarded unsatisfactory, but when combined with more natural feeds they can contribute to a useful and nutritionally adequate diet.

The diet given to a captive animal should be palatable, nutritionally balanced, uncontaminated, toxin-free and easy to obtainable.

Food Presentation: Food must be recognizable and acceptable to the animal otherwise, and regardless of its nutritional value, it may not be consumed. A recurrent problem with wild-caught animals maintained on a limited diet for a long time is the need to introduce new food items. Different species have specific food manipulation methods so that the shape and size of food items are important. Food acceptance is another problem for some species (e.g. reptiles). Most of these problems can be overcome by training and perseverance to wean the animals onto simpler diets.

How Much to Feed: The quantitative aspects of feeding are of enormous importance and must be considered carefully. All animals have a basic minimum requirement of maintenance is a resting non-breeding animal, known as the basal metabolic rate, where weight and body composition rem.

Elevated Physical Activity or Living Colder Environments: more food with high energy contents are required in line with high metabolic costs.

Growth or Reproduction: Growth, egg laying, gestation or lactation require both high energy and high protein content foods.

**3.3.2 Breeding**

Considerable time and energy are invested by a species in the preparation (courtship), execution (mating) and realization (gestation or incubation) of breeding. Any institution maintaining populations of wild species; in captivity mush understand these variables in order to increase their numbers. It is imperative that any captive population be self-sustaining.

**3.3.2.1 Necessary Activities for Breeding of Captive Animals**

Necessary to provide species with appropriate accommodation.

Breeding stock must be selected with the use of carefully kept records to avoid inbreeding. Unsuitable specimens should be excluded from breeding programs or culled from populations.

Individuals must be selected carefully for pairing or grouping. It is vital to recognize secondary sexual characters, to sex monomorphic species and to understand the importance to pair compatibility

Seasonality and artificial control of cycles must be considered.

The best possible diet must be provided for breeding females and young for development and growth to follow me correct patterns.

The frequency of infertility, the development of abnormalities and any birth or hatching problems must be monitored closely in order to take appropriate action.

Stress often plays a major part in breeding failure in captivity a compromise must be struck between adequate management, hygiene and levels of disturbance. Species characteristics must be taken into consideration as some are far more susceptible than others.

**3.3.3 Housing**

**3.3.3.1 Physical Environment**

Lighting: Both quality and quantity are of paramount importance both for psychological (e.g. nocturnal) and physiological (e.g. UV for vitamin D synthesis, heliothermic) needs. Photoperiod has an important impact on the major hormone-mediated systems of the body. (E.g. seasonal reproduction, reproductive condition)

Humidity: Largely of physiological relevance variation to mimic seasonality (e.g. cue for aestivation).

Temperature: Provision of adequate temperatures for even the largess of species during inclement or extreme seasons. Where possible a temperature gradient should be provided as this will give the animal choice (e.g., provision of shade and shelter).

**3.3.3.2 Spatial Confinement**

Boundary type: The minimum flight distance of a species must be considered to ensure that an appropriate distance from the public and other specimens is possible. Suitability of the barrier for an animas safety e.g. glass for birds and water for apes may lead to injury or even death if net property managed.

Dimensions: Other regarded most important however quality is more so. Some species require large are is but to others this type of habitat is alien and inappropriate.

Furnishings: Cage or enclosures must facilitate natural behaviors e.g. climbing, swimming, running etc. and make provision for refuge areas so that animals can evade both each other and the public.

**3.3.4 Health Management**

In nature animals clean their body by themselves and also resist from many diseases. But at zoo they need some extra care. Such as, cleaning of animal's bed, feeder, waterer etc. regularly, bedding material should be removed when it gets dirty, otherwise parasite will affect the animal, disinfecting of floor and wail. after disinfecting, the disinfectant should keep far away from the animal, after disinfection the floor and wall should be cleaned with fresh water, otherwise the animal will lick the disinfectant and will cause many disorder and diseases, dead carcass should be removed immediately, regular vaccination and deworming, immediate treatment for diseased animal and for introducing new species before entering the zoo they must be quarantined.

**3.3.5 Record Keeping**

Keeping daily animal records should be a priority in any modem zoo keeping records on the animals in a collection is a means to an end, not an aimless activity undertaken solely to justify the holding of wild animals in captivity. At the end of the day, the information we spend valuable time recording in the diaries, and transcribing into permanent records, should have practical value from the point of view of both day to 'day in house animals management, inter-institutional animal management and future investigation as well.

However, some events must be recorded. Such as births/hatchings, deaths, imports, exports, transfers within the zoo, animal identification, animal management procedures changes, reproductive details/observations, medical treatments/observations, behavioral observations etc.

**3.3.6 Transportation**

Successful shipment of live animals requires careful planning and management. The following guidelines are necessary for shipment of animal. Such as, animals should have priority over merchandise, though mainly good health animal is transported, animal should be accompanied by qualified veterinarian, pregnant animal or animals that are still dependent on their mother should not be transported, violent movement of ship, aircraft, lorry should discouraged because the ' animal become lethargic and get dangerous injury, animals of different species should not be housed in same container, depending on the species of animals involved and the duration of the journey, -feed and water should arranged, to avoid cross-infection and for health and hygiene-reasons, human contact! with animals should be avoided, no animal should be transported with radioactive material or other substances dangerous to health and containers should be secured the aircraft, rail wagon lorry or ship.

**3.3.7 Exhibition Technique Management**

Zoo should consider what impressions zoo visitors perceive from exhibits, bearing in mind subconscious as well as conscious messages whether we are aware of it or not, we are constantly receiving and sorting messages from the surrounding environment. Is it safe? Is it friend? Is it advantageous? In context of the environment is the necessary questions for managing exhibition technique.

**3.3.8 Visitor Management**

Throughout the world, 605 million people visit zoos each year, this represents 605 million opportunities to

communicate with people. In zoo sometimes simple things like broken benches, overflowing rubbish bins/dirty toilets can communicate not only a couldn't -care- less attitude but perhaps even hostility towards the public.

So for good communication with the public creating clean calm and beautiful environment is another important management work in a zoo.

### 3.3.9 Management for New Species

A variety of criteria" is used to determine which to keep in zoo often played an important part in guiding curators and directors choice of animals. No. of species and acquisition of rare animals for a collection is restricted by the following, space availability within the zoo, environmental requirements of the species in relation to prevalent conditions of the zoo and staff numbers and expertise required to keep the species. Before introducing new species, a zoo will have to take other considerations into account such as:

Will the animal attract public interest?

What education potential does the species offer?

### 3.3.10 Enrichment Facilities

Species require enrichment. However, it is important to identify the arm, species in collection which will benefit most from a program of enrichment, type of enrichment is called environmental enrichment. It is for the animals. Beside this, there are another three types of enrichment facilities should be maintained in zoo. They are recreational enrichment, research enrichment and educational enrichment.

### 3.3.11 Other Management

Besides all the management there are some more management issues we can take care of. They are

### 4. Regular electricity, water supply

Coordination and collaboration of different types of groups, society like IUCN (International Union for Conservation of Nature and Natural Resources), CITES (Convention for International Trade of Endangered Species), CBSG (Captive Breeding Specialist Group), WCMC (World Conservation Monitoring Center) etc.

Maintaining animal law

Distribution of leaflet, folder, for the awareness of people about wildlife and its conservation

Good administration

## 5. Conclusion

Modern zoos have an important role to play in conservation of biodiversity. By displaying animals in simulated natural environment and through public education, visitors have a better appreciation for wildlife and conservation issues. Breeding of endangered animals is an important role of all zoos. While for many reasons, it may not be possible to reintroduce most captive-bred endangered animals into the wild. They have played a vital role in the preservation and protection of wildlife by serving as refuge for threatened species. A number of animals nurtured in zoos have been reintroduced into the wilderness.

One very important tool in ensuring the conservation of endangered species is 'captive breeding.' Many species have been bred successfully inside zoos and a number of them are now being reintroduced in their respective habitats. A complete cognizance of the species involved is required to achieve a high degree of success in captive breeding. Additionally, zoos afford an opportunity for scientists to make further researches, particularly about the conditions in which diverse species will flourish.

Most of today's non-profit and serious zoological gardens display wild animals, not just for the amusement and the entertainment of their visitors, but primarily for conservation of endangered species, for education and biological research.

The concern of these institutions is to help save the diversity of life on Earth through applied conservation activities such as breeding endangered species and proper zoo management.

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