

Ex-Situ Conservation and Breeding of Exotic Species: A Case Study Zoological Garden Alipore, Kolkata

Rupak Bhattacharya, AUK

Keywords

Conservation, breeding cycle, ex situ conservation, zoological garden, Asiatic Lion

Abstract

This work tried to do a descriptive study of the process involved in ex-situ conservation, especially the role played by the zoological garden. The study of the habitat and breeding cycle of different species are very important in the conservation work of species. The protection of endangered species is a very important part to protect the great biodiversity of the earth. This work tried to analyse some rare species of animals and their conservation and breeding, with the help of secondary data from the study area which is the zoological garden Alipore, Kolkata. The major area of this work includes captivity breeding, the habitat and ecology of different species, and their breeding cycle. This work also tries to shed light on the importance of subjects like Biogeography, Wildlife Biology, Ecology, and Environmental Science. The major outcome and result of this work include the recent breeding and conservation results of Alipore zoo and some important literature review of some previous work done by other researchers and authors on this particular topic. The study of different conservation and breeding of different species in zoological parks and wildlife sanctuaries all over the world.

Introduction

Conserving wildlife refers to managing wildlife wisely by first knowing the carrying capacity of a particular area. Carrying capacity is a term used to define the ability of an area to support wildlife or the number of people, animals, or crops that a region can support without environmental degradation by over-exploitation (Mathur, 2019). As time passes by and man keeps on developing their lifestyle grows and by the effects of modernization and urbanization, many detrimental effects are occurring on nature. Biodiversity or biological diversity refers to the variation and variability of life on earth. Planets' biodiversity is completely under a threat and the main culprit is we the human being. In situ and ex situ

conservation focuses on the maintenance of species diversity within or away from their natural habitats, respectively.

Ex-Situ Conservation

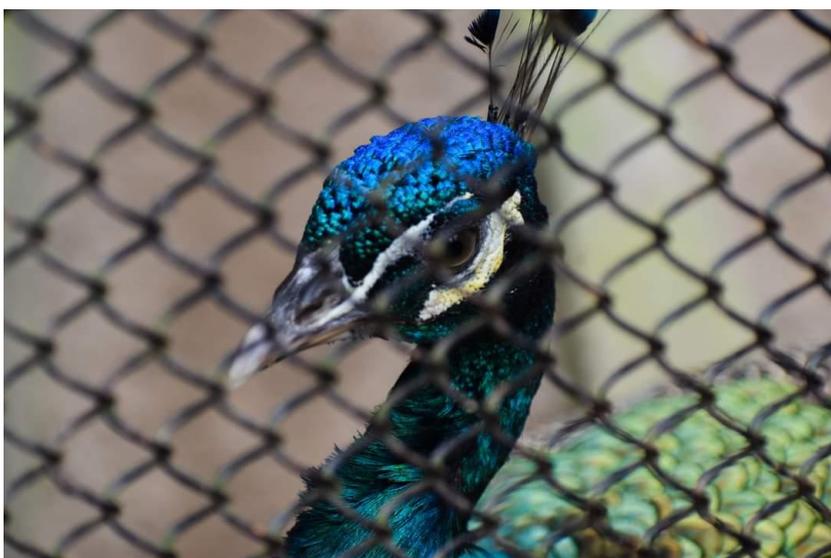
Ex-situ conservation involves the maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in a specific area including zoos, gardens, nurseries, etc. That is, the conservation of selected plants and animals in selected areas outside their natural habitat is known as ex-situ conservation. The stresses on living organisms due to competition for food, water, space, etc. can be avoided by ex-situ conservation thereby providing conditions necessary for a secure life and breeding. For ex situ conservations the species to be conserved should be identified followed by the adoption of different ex-situ methods such as long-term captive breeding and propagation for the species which have lost their habitats permanently, short-term propagation and release of the animals in their natural habitat, animal translocation, and reintroduction and advanced technology in the service of endangered species (<https://www.sciencedirect.com/topics/agriculturalandbiological-sciences/ex-situ-conservation>).



(Clicked by Author on the study area)

Captivity Breeding

Captive breeding is the process of breeding wild animals in places such as zoos or wildlife parks, especially to help preserve endangered species that are threatened by extinction in the wild. The process also includes the release of individual species to the wild, when there is a sufficient natural habitat to support new individuals or when the threat to the species in the wild is minimized. Conservation biologists aim to prevent species extinction in the wild, usually by removing probable threats such as invasive species, habitat loss or poaching. In certain cases, however, in situ conservation efforts may be insufficient, not all species can be efficiently preserved in their natural habitats and more extreme involvement such as captive breeding may be advocated to enhance the probability of species perseverance, though it is very expensive. The techniques from genetics and genomics can be useful for preventing, the process of extinction. Modern methods for sequencing and genotyping make it possible to directly assess the genetic diversity of a species and identify its population structure, sequencing a small sample of geographically distinct individuals can identify a number of the available genetic variants and genotyping methods can then efficiently determine the genetic make-up of a large number of individuals in the population. Captive breeding programs bring about biodiversity and may save species from extinction. Conservation genetics has received increasing attention in recent years. In conservation genetics, information on the relatedness between individuals is particularly important in captive breeding programs that reduce mating between closely related individuals to minimize inbreeding and the loss of genetic variation. Inbreeding and the loss of diversity have been recognized as major problems in ex situ conservation since the 1970s, which has led to the implementation of captive breeding schemes (Wakchaure &Ganguly,2016)



(Image credits- Author on the study Area)

Study-Area

Zoological Garden, Alipore Kolkata (22.5370°N,88.3317°E) is India's oldest formally stated zoological park (as opposed to royal and British menageries) and a big tourist attraction in Kolkata, West Bengal. It has been open as a zoo since 1876 and covers 18.811 ha (46.48 acres). It is probably best known as the home of the Aldabra giant tortoise Adwaita, who was reputed to have been over 250 years old when he died in 2006. It is also home to one of the few captive breeding projects involving the Manipur brow-antlered deer. The zoo had its roots in a private menagerie established by Governor General of India, Richard Wellesley, established around 1800 in his summer home at Barrackpore near Kolkata, as part of the Indian Natural History Project. The first superintendent of the menagerie was the famous Scottish physician zoologist Francis Buchanan-Hamilton. The zoo was formally opened in Alipore - a posh Kolkata suburb and inaugurated on 1 January 1876 by Edward VII, then Prince of Wales. The initial collection consisted of the following animals: African buffalo, Zanzibar ram, domestic sheep, four-horned sheep, hybrid Kashmiri goat, Indian antelope, Indian gazelle, sambar deer, spotted deer, and hog deer. (<https://kolkatazoo.in/alipore/>)



(Image source- <https://kolkatazoo.in/alipore/>)

Background

The Convention of Biological Diversity (CBD) and the International Union for the Conservation of Nature (IUCN) recognize that it will take more than field conservation efforts to conserve species in dire situations and that management of natural habitats will need to be combined with ex-situ approaches (Conway 1995, McGowan et al. 2017). Ex situ approaches consist of management strategies under which individuals are maintained in artificial conditions under different selection regimes than those in natural conditions and include activities such as captive breeding, translocation and reintroduction programs, or head-starting efforts (a technique that involves raising early-stage animals in captivity before releasing them to the wild) (McGowan et al. 2017). These activities can take place within or outside of the species' geographical range, but in a controlled or modified environment (IUCN/SSC 2014). Ex situ activities are absent or play a minor role in most classic conservation organizations, therefore a lot of these activities have been spearheaded by zoos (Conde et al. 2011).

In North America, the Association of Zoos, and Aquariums (AZA) uses the Species Survival Plan (SSP) to maintain healthy, self-sustaining, genetically diverse and viable, as well as demographically stable populations of each species in human care, and to organise zoo and aquarium-based efforts to preserve the species in situ.

In Europe, the EAZA Ex situ Programme (EEP) is the population management tool for species kept in European Association of Zoos and Aquaria (EAZA) institutions.

Other regional associations also manage breeding programs, such as the Australasian Species Management Program (ASMP) of the Zoo and Aquarium Association (ZAA) Australasia.

In 2003 WAZA adopted the Global Species Management Plans (GSMPs), a procedure for establishing inter-regional programs that may include several species for which international studbooks have already been established. (<https://www.waza.org/priorities/conservation/conservation-breeding-programmes/>)

A study of previous work showed that there is still now no proper structure work done on Alipore zoo. The location and size of Alipore zoo make it quite an important zoological park in India. The study area has quite a variety of different mammal and bird species, which also includes some endangered species like the Royal Bengal Tiger, Asiatic Lion, Black Buck deer, etc. A proper study of the behavioural pattern of these animals is essential to keep up with their number and to provide an option for the reintroduction of those species in the natural environment if necessary.

Objectives:

The main objectives of this study are-

1. To Study the Importance of Zoological Garden in ex-situ conservation.
2. To Study the captivity breeding of species.
3. To Study different habitats and biomes of some of the exotic species.
4. To Know the breeding cycle of those species.
5. To Analysis on the recent breeding and conservation results in Alipore zoo.

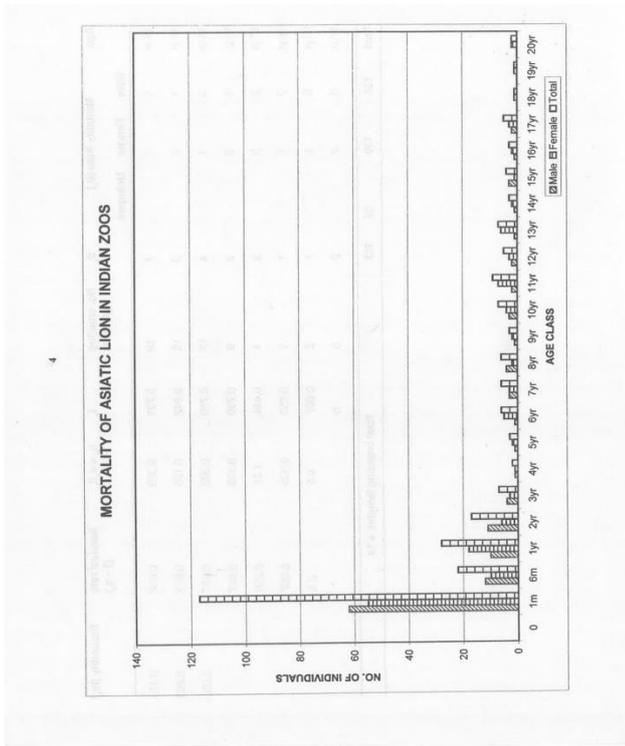
Methodology

The work has been completed mostly based on secondary sources of data collected through different official websites of Alipore zoological garden Kolkata, Central Zoo Authority, and World Zoo authority. Data has also been taken from some verified wildlife organisation like Nat Geo wild, and Discovery World. I have also referred to some books which were very helpful in completing my research.

I have done some field work by visiting my study area once every month during this period of this ntec work. The major work done in this fieldwork includes observation of the behavioural pattern of the animals, studying their enclosure structure, and collecting pictures for the paper.

Result and Findings**1. Asiatic Lion (Panthera Leo Leo)**

It is a subspecies of Panthera Leo Leo that survives today in the wild only in India. They are slightly smaller in size compared to the African lions. The average weight of a male varies from 160-190kg whereas a female weighs between 110-120kg. Their special characteristic feature includes a longitudinal fold of skin running along their belly. Both sexes are polygamous and breed throughout the year, but females are usually restricted to the one or two adult males of their pride. In captivity lions often breed every year, but in the wild, they usually breed no more than once in two years. Females are receptive to mating for three or four days within a widely variable reproductive cycle. During this time a pair generally mates every 20–30 minutes, with up to 50 copulations per 24 hours. Such extended copulation not only stimulates ovulation in the female but also secures paternity for the male by excluding other males. The gestation period is about 108 days, and the litter size varies from one to six cubs, two to four being usual. (<https://www.wvfindia.org/>)



(Source- Asiatic Lion Studbook, Central Zoo Authority)

On June 28, 2019, three lions' cubs were born at Alipore zoo to a six-year-old Asiatic Lion named Shruti, who was brought from Hyderabad Zoo in October 2017. The father of the cubs is another Asiatic Lion named Viswas a 12-year-old Asiatic Lion brought from the same zoo. This is considered to be a remarkable example of a conservation breeding program since it was for the first time a lion cub was born in Alipore zoo, since 1992. (Times of India)



(Source- <https://www.telegraphindia.com/>)

2. Zebra (Equus Zebra)

Zebras are equids, members of the horse family. They have excellent hearing and eyesight and can run at speeds of up to 35 miles per hour (56 kilometres per hour). They also have a powerful kick that can cause serious injury to a predator, like a lion, a hyena, or an African wild dog. Usually, the lead male of the herd, called a stallion, sounds the alarm if danger is spotted and stays at the back of the group to defend against predators, if necessary, while the mares (females) and foals (youngsters) run away. The Zebra is a relatively slow-developing mammal with females not being able to first breed until they are at least a few years old. After a gestation period that can last for between 10 months and a year, the female gives birth to a single foal that is born with its stripes, and mane and also has a little patch of hair in the middle of its tummy. Zebra foals can stand within minutes of birth which is vital to ensure that they can run away to escape from predators. They can begin eating grass after a week and are weaned by the time they are 11 months old. Young Zebras remain with their mother until they are mature at around three years old when the males leave their natal herd to join an all-male bachelor group, while females stay with their mother. These bachelor groups begin to challenge the dominant stallions to try and take over the harem during the mating season. (<https://a-z-animals.com/>)



(Source- Telegraph India)

On March 26, 2022, a zebra gave birth to a female foal around 8.30 am. It weighed 25kg and was separated from the herd with her mother for a few days. Later it was let out in the open for visitors to see. (<https://www.telegraphindia.com/>)

A zebra cub was born on 14th February 2021, on the occasion of valentines day, and was named “Valentina”. (Daily hunt)

3. Grey Kangaroo (Macropus Giganteus)

The eastern grey kangaroo is the second largest and heaviest living marsupial and native land mammal in Australia. An adult male will commonly weigh around 50 to 66 kg (110 to 146 lb) whereas females commonly weigh around 17 to 40 kg (37 to 88 lb). They have a powerful tail that is over 1 m long in adult males. Large males of this species are more heavily built and muscled than the lankier red kangaroo and can occasionally exceed normal dimensions. One of these, shot in eastern Tasmania weighed 82 kg (181 lb), with a 2.64 m (8.7 ft) total length from nose to tail (possibly along the curves). The largest known specimen, examined by Lydekker, weighed 91 kg (201 lb) and measured 2.92 m (9.6 ft) along the curves. When the skin of this specimen was measured it had a "flat" length of 2.49 m (8.2 ft). (Animal Encyclopaedia)

In the breeding season, usually spring and early summer, rival male kangaroos rear up on their hind legs and box to compete for a female. The joey (baby) is born after a gestation of 29 - 38 days. The grey kangaroo is a marsupial mammal, which means that the baby does not develop attached to a placenta inside the mother's uterus, but is born early and spends most of its development inside a pouch. When ready to give birth, the female leaves her mob finds somewhere quiet, and licks her pouch and birth canal clean. The tiny joey, pink and naked, measuring only 2.5cm in length and weighing 1g, is born headfirst and grasps its mother's fur with the claws on its forefeet. The mother offers no help at all. In about 3 minutes, it dragged itself up to the pouch, entered it, and clamped tightly to one of the four teats, which swells in the mouth. (<https://ypte.org.uk/>)



(Source- The Hindu)

In 2015, four red kangaroos were brought from the Czech Republic but none of them survived. In October 2017, four kangaroos arrived at the Alipore zoological gardens from Kanazawa Zoo of Japan. A baby kangaroo emerged from its mother's pouch as observed by the keeper on August 2018. It was a remarkable example of conservation and also a successful breeding program. It was not expected that the kangaroo will breed so early within a year. "The mother named Punca is doing well, and the baby will be able to adapt to the climate and environment well. (The Hindu)

4. Giraffe (Giraffa)

Giraffes are the tallest land animals. A giraffe could look into a second-story window without even having to stand on its tiptoes! A giraffe's 6-foot (1.8-meter) neck weighs about 600 pounds (272 kilograms). The legs of a giraffe are also 6 feet (1.8 meters) long. The back legs look shorter than the front legs, but they are about the same length. A giraffe's heart is 2 feet (0.6 meters) long and weighs about 25 pounds (11 kilograms), and its lungs can hold 12 gallons (55 liters) of air! Its closest relative is the okapi. (<https://animals.sandiegozoo.org/>)

The sexual maturity of the female is at 48-60 months, the male is at 42 months. The giraffe mate at any time of the year with the gestation period being between 453 - 464 days. There is usually only one calf, very rarely twins. A giraffe cow in season attracts males from all around but is soon won by a dominant bull. He drives off the subordinate bulls by threatening them; fighting is rarely necessary at this stage. A giraffe's pregnancy lasts fifteen months, after which the cow will go to a traditional calving ground used by females time and time again to have her single calf. Giraffe calves are born with horns, which is unusual. The horns lie flat against the baby's skull when it is born, but pop up during the first week of life. The calving ground ensures that the young calf is always left in a group of young giraffes of about the same age when its mother goes off to feed in the middle of the day. Even so the calves are heavily predated by hyenas, leopards, and wild dogs, and only about half of them will survive their first six months. (<https://ypte.org.uk/>)



(Picture Source- Self Click, by the Author)

The latest born giraffe calf was born in November 2021 to a mother named “Lakshmi”. It was a male calf and the addition of it made the number of giraffes 11. Alipore zoological garden has shown remarkably good results, especially in the breeding of giraffes. Almost every year a calf is born and also Alipore zoo is exchanging its giraffe with another zoo in India. (Telegraph India)

As per the data received, I can say as a whole the breeding and conservation work among the species studied above. Alipore zoo has shown extremely good progress in the conservation breeding program of Zebra and Giraffe, but still some more endangered species like Bengal Tiger, Leopard, etc. Although in recent years with the dedicated work of many officials it has been able to contribute more to the breeding program of some endangered and rare species like the Asiatic Lion and Grey Kangaroo.

To ensure good conservation and breeding of this species involvement of some good researchers from different fields are very much essential for this to run successfully. As per the definition given by Wikipedia “A wildlife biologist studies animals and their behaviours along with the role each animal plays in its natural habitat. The duties of a wildlife biologist can include: developing and conducting experiments/studies on animals in their natural habitats, studying the characteristics of animals such as their interaction with different species, their reproductive and movement patterns, the dynamic within a population, and the transmission of diseases.” Hence study in this subject is a must for ensuring proper study and conservation programme of the species. Environmental Scientists also need to come up with this matter studying the natural habitat of those people to ensure the proper environment required for the

keeping of different species in an artificial environment. Bio-Geography as a subject studies the distribution of animals, plants, and also biomes all over the world. Bio-Geographers can also play an important role in this conservation program with their analysis of the relation of the species with nature.

Conclusion

This work tried to study the behavioural pattern of some species and also their breeding cycle. This knowledge is very essential for proper conservation and ex-situ conservation. Standing today where modernisation is taking its peak involving methods of artificial conservation is very essential. Through this work, I also tried to show the initiative and progress done by Alipore zoological garden in this conservation program. India and its zoo are still quite lacking behind in this captivity breeding program whereas some international zoos like Chester Zoo and London Zoo have already done remarkable work in this field. Alipore zoo has lots of potential having a quite large area with a variety of species and some endangered ones as well. The enclosure and other requirements like proper food and medication are also been taken care of by trained people to ensure better progress.

This short work showed some data regarding some specific species: - 1. Asiatic Lion 2. Zebra 3. Giraffe 4. Grey Kangaroo

An analysis of their recent breeding progress and also their behavioural patterns and breeding cycle as well.

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