PROCEEDINGS OF

THE COORDINATING MEETING OF EXPERT GROUP ON CONSERVATION BREEDING FOR VULTURE CONSERVATION BREEDING PROGRAMME OF CENTRAL ZOO AUTHORITY

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CONSERVATION BREEDING OF VULTURES

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Long-billed Vultures at VCBC, Pinjore, Haryana

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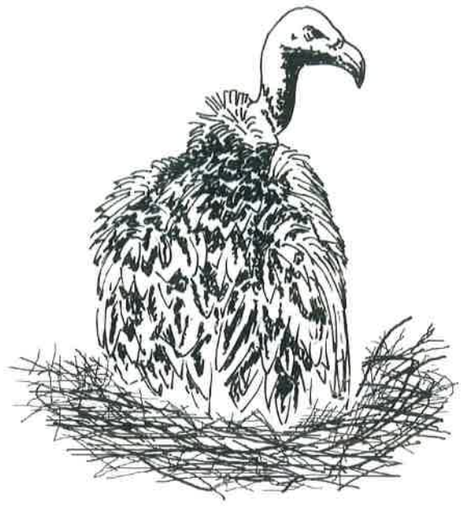

A Long-billed Vulture on nest at VCBC, Pinjore

CONTENTS

Coordinating Meeting of Expert Group on Vulture Conservation Breeding Programme

Executive Summary

The meeting was attended by the following:

Amarinder Kaur, IFS
APCCF and Chief Wildlife Warden, Haryana

B. R. Sharma, IFS
Member, Expert Group on Conservation Breeding

P. C. Tyagi, IFS
Member, Expert Group on Conservation Breeding

Goutam Narayan
Member, Expert Group on Conservation Breeding

Vibhu Prakash
Member, Expert Group on Conservation Breeding

S. Panda, IFS
Director, Nandankanan Zoological Park, Odisha

B.P.S. Parihar, IFS
Director, Van Vihar National Park, Bhopal, MP

B.N.N. Murthy, IFS
Curator, Nehru Zoological Park, Hyderabad, AP

P.R. Sinha, IFS
Country Representative, IUCN, India

B.K. Gupta
Central Zoo Authority, New Delhi

Devendra Kumar
Scientific Officer,
Central Zoo Authority, New Delhi

Mandar D. Kulkarni
Centre Manager, VCBC, Pinjore, BNHS

Rohan Shringarpure
Centre Manager, VCBC, Bhopal, BNHS

M. Sandeep, Biologist
Nehru Zoological Park, Hyderabad

Ravi Chauhan, Biologist
Sakkarbaug Zoo, Junagarh, Gujarat

Nikita Prakash
Scientist, VCBC, Pinjore, BNHS

Rinkita Gurav
Vulture Advocacy, Pinjore, BNHS

A coordinating meeting of the Expert group of Conservation Breeding of Central Zoo Authority on the Vulture Conservation Breeding Programme was held on the 28th January 2014 at the conference room at Institute of Indian Council of Agricultural Research, Pusa Road, New Delhi under the chairmanship of Mr. B. S. Bonal, IFS, Member Secretary, Central Zoo Authority.

The meeting was attended by the members of the Conservation Breeding Programme Expert Committee of Central Zoo Authority, Chief Wildlife Warden of Haryana, Directors of Zoos which have vulture conservation breeding facilities, biologists from Vulture Conservation Breeding Centres and invited experts. The meeting was called to review the progress made at all the eight Vulture Conservation Breeding Centres in the country and also to decide on the possibility of shifting birds between centres keeping in mind the genetic management of the captive populations.

Mr. Bonal said that the agenda of the meeting was to review the status of each of the conservation breeding centres with respect to the infrastructure, capacity of appointed staff and manpower, number of birds, capturing of birds from the wild for establishing the founder stock and shifting of individuals between the centres. The Vulture Conservation Breeding is a coordinated programme of Central Zoo Authority (CZA) and it will support the shifting of the birds. The following guidelines should be followed for shifting the birds:

- The shifting of birds between the centres should be identified by the expert group.
- Once the expert group has identified the birds to be shifted then it would be recommended to the technical committee of CZA.
- The CZA will take the final decision.
- The Conservation Breeding Centre at Pinjore as coordinating zoo should help provide technical support to all the centres including in recruitment of biologists for various centres.

The Technical Support will include:

- Looking for breeding stocks/founder population

- Age, sexing, genetic profiling of birds, compatible pairing, laying of eggs and double clutching.
- Send the team to different centres for evaluation.
- Prepare inventory of birds.
- Breeding plans for different centres
- Develop a coordinated annual plan with CZA
- Develop a MoU between BNHS and other zoo's (centres) like the one signed between BNHS and Bhopal Zoo (centre).
- Suggest the requirement of setting up a basic Laboratory.
- Advice and help to set up the incubation facility.
- Develop Training programmes in consultation with all the centres and CZA.
- Coordinated action plan along with a time frame.
- Need to make a plan to improve the hatching rate at Sakkarbaug Zoo, Junagarh.

Mr. Bonal informed the meeting that apart from the eight Vulture Conservation Breeding Centres, there were seven other zoos in the country where vultures were housed and all of these vultures were unidentified. He also suggested that these vultures could be identified and sent to one of the Conservation Breeding Centres. Vibhu Prakash was requested to help in the identification of the vultures based on photographs provided by the zoos. After some more deliberations by the members of expert group on conservation breeding, it was decided to shift only healthy, genetically viable birds of known sex to the Conservation Breeding Centres. It was also decided to send all the Himalayan Griffons and Cinereous Vultures to the zoos within their distribution range and attempt should be made to breed them after establishing appropriate housing based on the Vulture Conservation Breeding Manual of the CZA.

Dr Amarinder Kaur, IFS, Chief Wildlife Warden, Haryana was of the opinion that the vulture release programme should also be a coordinated programme of CZA and it would require a dedicated and well trained team. She said that there is a need to immediately identify the release site.

Dr. Goutam Narayan, Member, Conservation Breeding Expert Committee was of the opinion that there should be a short-term and long-term plan for vulture conservation and there is a need for a vulture task force which should be headed by the CZA. The prerogative of shifting the birds between centres should be with the CZA. He was of the view that the non-breeding birds should not be sent to Conservation Breeding Centres and could be utilized for display to create awareness in the zoos itself.

Mr. P R Sinha of International Union for Conservation of Nature and Natural Resources as an invited expert said that the national agenda of vulture conservation is in place since 2004 and it needs to be re-looked and revised. The frame work of recovery plan for endangered species has been developed by Government of India. There is a need to coordinate with the Regional Steering Committee for developing the programme.

Dr. Nita Shah, Expert, wanted that the timing of the initiation of the release programme should be decided and should work towards the goal. The MoUs should be signed between the states so that there is no problem during the time of release. There is a need to increase awareness amongst the locals about the harmful effect of diclofenac before the vultures are released in the wild.

Dr Vibhu Prakash emphasized in his presentation that all the centres should follow the standardized protocols for housing, husbandry and care of the vultures as has been mentioned in working manual developed by CZA. He gave a review of the best practice in husbandry and care of vultures and emphasized the need of shifting birds between the centres to optimize the breeding success and maintain genetic diversity and prevent in-breeding.

Mr. Mandar Kulkarni, Centre Manager, Vulture Conservation Breeding Centre (VCBC), Pinjore, Haryana spoke on the molecular sexing and genetic diversity in captive vultures. He said that a good molecular laboratory is developed at the centre at Pinjore and can cater to the needs of all the eight vulture centres in the country. He said that the molecular sexing could be done with the help of either blood or feather samples. At Pinjore centre, the population of birds was found to have good heterozygosity and the population appeared to be diverse. Sex ratio of the birds in Pinjore appeared to be equal.

Mr. Rohan Shringarpure, Centre Manager, Vulture Conservation Breeding Centre, Bhopal spoke on the study of microorganisms found in the three endangered species of vultures. Normal bacteria flora is important for the normal health of any species. Slight variation in these bacteria compositions can lead to the ill health of an individual of any species. This makes it necessary to study their microflora and having birds in captivity gives us this opportunity to obtain the samples easily. He said that the laboratory at Pinjore can cater to all the eight centres in the country. The samples from 10% of the population of each centre could be taken and could be analysed at the centre.

Ms. Nikita Prakash, Scientist, VCBC, Pinjore, spoke on the artificial incubation of the Gyps vulture and said that it is an important tool to increase the production in slow breeding birds. She emphasized on conducting training workshops on artificial incubation at the Pinjore centre for all other conservation breeding centres.

Dr. Brij Raj Sharma, IFS, Member Secretary, West Bengal Zoo Authority said the training should be imparted to all the centres in vulture egg incubation and Dr. B.K Gupta said that it is important that Pinjore centre should organize incubation workshop for the benefit of other centres. Mr. P. C. Tyagi, IFS, Senior Scientist, WII, Dehradun, said that artificial incubation and double clutching is an important tool to increase the productivity in these slow breeding birds and it should be pursued by all the centres.

Dr. S. Panda, IFS, Director, Nandankanan Zoological Park, Bhubaneshwar, Odisha, gave a progress report on the Vulture Conservation Breeding Centre, Nandankanan, Odisha. He requested urgent help in getting founder stock for the centre. He said that one colony aviary and two nursery aviaries are ready with enrichments such as nest ledges, water troughs. The rest of the facilities could be developed soon.

Mr. B.P.S. Parihar, IFS, Director, Van Vihar, National Park, Bhopal, Madhya Pradesh, gave an update on the Bhopal centre and said that the MoU has been signed between BNHS and Van Vihar Zoological Park for running the centre and money has been transferred to BNHS. He said that the centre has a colony aviary and four holding aviaries. The centre hopes to get the birds by the middle of February 2014.

Mr. Murthy, IFS, Curator, Nehru Zoological Park, Hyderabad, gave an update on the VCBC in the zoo. He said there were five birds at the centre and one pair laid an egg which hatched but failed to survive beyond 18 days. He requested help for getting more birds for the founder population. The centre has a colony aviary, one holding and one quarantine aviary.

Mr. Ravi Chauhan, Biologist, Sakkarbaugh Zoo said that there were 54 White-backed and 5 Long-billed Vultures at the centre. Two nestlings of White-backed's successfully fledged last year. The centre has a breeding aviary, hospital aviaries and a holding aviary and has developed incubation cum brooder facility also.

There was no representative from the Vulture Centre at Muta, Ranchi but it was reported that they have finished the construction of their centre including a colony, four hospital, four nursery and one holding aviary.

Dr. Vibhu Prakash, Deputy Director, BNHS, gave a presentation on VCBC, Pinjore. He said that centre was established in 2001. There were a total of 200 vultures of four species including 76 White-backed Vulture, 96 Long-billed Vulture, 26 Slender-billed Vulture and two Himalayan Griffons. A total of 20 nestlings were reared during 2012-13 including 9 Long-billed Vultures, 8 White-backed Vultures and 3 Slender-billed Vultures. There are four colony, eight breeding, two display, eight nursery, three hospital, and three holding aviaries. The centre has a good laboratoty for haematology, molecular biology and microbiology. There are also hospital facilities for birds.

A new dimension was added to the Vulture Programme when a chick exchange trial was carried out at VCBC, Pinjore. This was done to improve the success of second clutch of eggs. By returning the chicks of the first clutch hatched in incubators back to their parents on nests, the second clutch of eggs were removed and incubated artificially to improve their hatching success. All the nestlings that were returned to their nests fledged successfully.

Microflora studies in the three Gyps species of vultures were carried out at the centre. Documentation of normal microflora of the Gyps vultures in captivity was undertaken to generate valuable reference to ensure the fitness of the birds to be reintroduced in the wild which would eventually contribute to the success of the Conservation Breeding Programme.

Molecular sexing of 99 vultures was carried out at the centre during the past 3 years. 40 samples were of White-backed Vultures, 40 of Long-billed Vultures and 19 of Slender-billed Vultures. 25 of the White-backed Vultures were found to be males and 15 were females, 14 were found to be males among the Long-billed Vultures and the rest were females and 9 Slender-billed Vultures were found to be males and 10 were females.

Mr. Mandar Kulkarni presented the progress reports of the BNHS run Rajabhatkhawa and Rani centres in West Bengal and Assam respectively.

Mr. Soumya Chakraborty is the Centre Manager at Rajbhatkhawa. The centre was established in 2005 and there were 92 birds of all the three species including 17 Long-billed Vultures, 60 White-backed Vultures and 15 Slender-billed Vultures. All the three species housed at the centre have bred successfully in captivity. Till date, 13 nestlings of the three species have fledged at the centre of which 11 are White-backed Vultures and 2 Slender-billed Vultures. All the three species of vultures bred during 2013-14. Two Long-billed Vulture eggs hatched for the first time at the centre. A total of 10 nestlings, 7 White-backed Vultures, 1 Slender-billed Vulture and 2 Long-billed Vultures, have hatched this year. There are two colony one display, one hospital and seven holding/breeding aviaries. The centre also has a well equipped laboratory and the incubation facility is under construction.

Mr. Sachin Ranade is the Centre Manager at Rani, Assam. There were 65 vultures of two species including 36 White-backed Vultures and 29 Slender-billed Vultures at the centre. 3 White-backed Vultures and 2 Slender-billed Vultures had hatched this year and were being reared by

the parents. A total of 6 White-backed Vultures and 4 Slender-billed Vultures had fledged successfully during the last 3 years. There was no artificial incubation facility at the centre. There were one Colony, two holding and three temporary nursery aviaries. The centre has a good laboratory and is surrounded by an electric fence to keep elephants and other wild animals away.

Coordinating Meeting of Expert Group on Vulture Conservation Breeding Programme

The Coordinating Meeting of Expert Group on Conservation Breeding for Vulture Conservation Breeding Programme of Central Zoo Authority: An Introduction

B.S. Bonal, IFS
Member Secretary,
Central Zoo Authority
New Delhi

The main objective of the zoos in the country is to complement the national efforts in conservation of rich biodiversity of the country particularly the wild fauna and this objective could be achieved by supporting the Conservation Breeding Programme of endangered species to raise their stocks by rehabilitating them in wild. The Central Zoo Authority was rightly placed to make this happen as it was established in the year 1992 to monitor the functioning of the zoos in the country and to enforce the minimum standards of upkeep and care of animals. The National Wildlife Action Plan (2002-2016) also laid emphasis on the role of zoos for ex-situ breeding of endangered species of wild fauna and their rehabilitation in the wild based on the International Union for Conservation of Nature & Natural Resources (IUCN) guidelines for reintroduction. The planned Conservation Breeding Programme of critically endangered species is the flagship programme of the Authority. The Authority has tried to help various zoos to take up the Conservation Breeding Programmes by organizing workshops for the zoo personnel in various aspects of establishing such programmes including appropriate housing, husbandry and care of captive animals and birds.

An expert group on Conservation Breeding constituted by the CZA, identified 73 endangered species for the Conservation Breeding Programme in July 2007. A zoo in the natural distribution of the animal or bird which was listed for Conservation Breeding Programme was identified as the Coordinating Zoo for the species. The zoos were advised to create off-display area in the zoo for setting up Conservation Breeding Programme. The zoos which had some animals of the species in collection were identified as Participating zoos and were also advised to establish off-display facilities. The CZA funded the setting up of off-display facilities in Coordinating Zoo.

Expert Group on the Conservation Breeding Programme

The CZA, with the objective of effective steering of Conservation Breeding Programmes, formed a group of experts in conservation breeding. The group identified 73 species for the Conservation Breeding Programme in Indian Zoos, of which 26 species were identified as priority species. The CZA also gave a proposal to make a priority list of species for Conservation Breeding Programme based on compiled data and scientific information to Wildlife Institute of India (WII) based on the recommendation of the expert group. The three species of Gyps vultures, White-backed Vulture, Long-billed Vulture and Slender-billed Vulture which are now on the verge of extinction, figured prominently in both the lists.

The Review Meeting

The Central Zoo Authority supported the establishment of five Vulture Conservation Breeding Centres in different zoos namely Van Vihar Zoo, Bhopal, Madhya Pradesh; Nandankanan Zoological Park, Bhubaneshwar, Odisha; Sakkarbaug Zoo, Junagadh, Gujarat; Nehru Zoological Park, Hyderabad, Andhra Pradesh and Muta Zoo, Ranchi, Jharkhand. All the five centres however are still in the process of setting up. Only Sakkarbaug Zoo, Junagadh, Gujarat, has 47 White-backed Vultures and 3 Long-billed Vultures while Nehru Zoological Park, Hyderabad, Andhra Pradesh has 5 White-backed Vultures. The rest of the zoos are in the process of acquiring the founder stock. The Bombay Natural History Society and Haryana Forest Department took the lead and established the first scientifically managed Vulture Conservation Breeding Programme at Pinjore in 2004. The centre has now over ten years of experience in captive management and care. The Vulture Conservation Breeding Centre has been identified as the Coordinating Zoo for the Vulture Conservation Breeding Programme.

This Coordination meeting on the Vulture Conservation Breeding Programme was organized on the 28th January 2014 by the CZA to review the progress made at all the eight Vulture Conservation Breeding Centres in the country and also to decide on the possibility of shifting birds between centres keeping in mind the genetic management of the captive populations.

The agenda of the meeting was to review the status of each of the Conservation Breeding Centres with respect to the infrastructure, capacity of appointed staff and manpower, number of birds, capturing of birds from the wild for establishing the founder stock and shifting of individuals between the centres. The Vulture Conservation Breeding is a coordinated programme of Central Zoo Authority and it will support the shifting of the birds. The following guidelines should be followed for shifting the birds:

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The Technical Support will include:

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- Send the team to different centres for evaluation.
- Prepare inventory of birds.
- Breeding plans for different centres.
- Develop a coordinated annual plan with CZA.

- Develop a MoU between BNHS and other zoo's (centres) like the one signed between BNHS and Bhopal Zoo (centre).
- Suggest the requirement of setting up a basic Laboratory.
- Advice and help to set up the incubation facility.
- Develop Training programmes in consultation with all the centres and CZA
- Coordinated action plan along with a time frame.
- Need to make a plan to improve the hatching rate at Sakkarbaug Zoo, Junagarh.

Apart from the eight Vulture Conservation Breeding Centres, there were seven other zoos in the country where vultures were housed and all of these vultures were unidentified. These vultures could be identified and sent to one of the Conservation Breeding Centres.

Vulture Conservation Breeding Programme of Central Zoo Authority

Vibhu Prakash
Principal Scientist/Dy. Directory
Bombay Natural History Society

I. Introduction

A. Crash in resident Gyps Vultures

Vultures were very common in our country till a couple of decades ago and were estimated to be close to 40 million (4 crores) during 1980s. Their population crashed in mid nineties and by the year 2000, we had already lost 95% of the population of vultures in the country. Based on Nation-wide surveys we could demonstrate that the population of all the three vultures declined by 99% by the year 2007 and all the three species were on the verge of extinction. The crash in population of the resident Gyps vultures, White-backed Vulture Gyps bengalensis, Long-billed Vulture Gyps indicus and Slender-billed Vulture Gyps tenuirostris was documented in mid nineties by Bombay Natural History Society (BNHS). The studies carried out in India revealed that most of the vultures died of visceral gout, which happened due to kidney failure. The visceral gout in vultures was caused by the use of the non-steroidal anti-inflammatory drug (NSAID), diclofenac, which is given to cattle in inflammation and pain. The vultures get exposed to diclofenac when they feed on the carcass of an animal, which had died within 72 hours of being treated with diclofenac.

B. Vulture Action Plan 2006

The Vulture Recovery Plan was prepared in the year 2004 which was incorporated in the Vulture Action Plan of Government of India 2006. The main recommendation of the action plan was to ban the veterinary use of diclofenac, identification of safe alternative drug and establishment of Conservation Breeding Programme. The drug diclofenac for veterinary use was banned in the year 2006 by Government of India. The safety testing carried out of the drug meloxicam, which is also a non-steroidal anti-inflammatory drug, on vultures at the Vulture Conservation Breeding Centre (VCBC) at Pinjore, Haryana in collaboration with the Indian Veterinary Research Institute (IVRI), Bareilly, Uttar Pradesh, was found to be safe for vultures thereby offering a viable alternative. The cattle carcass sampling studies showed us that over 10% of the cattle carcasses available to vultures had diclofenac, before the ban on veterinary use of diclofenac in

2005 but the prevalence reduced to 6% in 2011. The human formulation of the drug diclofenac was being misused for treating animals after the ban on its veterinary use. Efforts are being made to get the multi-dose vials of human use banned to prevent its misuse in treating cattle.

II. Conservation Breeding Progamme

The vultures continue to die and under the given circumstances Conservation Breeding Programme appears to be the only hope for saving the vultures from extinction. The conservation breeding of vultures became a major objective of the vulture project after the release of the Vulture Recovery Plan in February 2004. The major recommendation of the plan was to set up at least three conservation breeding facilities in India, immediately and ultimately six across south Asia.

The three resident Gyps species of vultures are on the priority list of Conservation Breeding of Central Zoo Authority

i. Manual of Vulture Conservation Breeding Programme

The CZA is very keen that only the best practice in housing, husbandry and care, sanitation and veterinary care is followed at all the Vulture Conservation Breeding Centres. So a working manual was produced by CZA which systematically gives details of establishing and running the Conservation Breeding Centre. It gives details of site selection, aviary design, collection techniques of vultures, routine husbandry and care, cleaning schedule, veterinary care, double clutching and artificial incubation, dealing with emergencies. The molecular sexing of vultures and studying the microflora of vultures was also explained.

a. Number of vultures for the founder stock for a Conservation Breeding Centre

A simple deterministic model of a captive vulture population and the wild population eventually derived from it indicated that a breeding centre with 25 pairs would be capable of producing a derived wild population of 100 pairs about 10 years after the beginning of releases. A minimum of 60 founder birds of each species would be required to establish 25 breeding pairs of each species at each breeding centre. To allow for mortality in captivity and any sex imbalance in the founder birds, 60 birds of each species are required from the wild to initiate a centre. This captive population would eventually lead to the restoration of a single wild population of 100 pairs, 16 or more years later. Six such centres should be established to get a derived population of 600 pairs of each of the three species which based on the simple deterministic model would form a self sustaining genetically viable population.

b. Suggested Age Structure of Birds for Conservation Breeding Programme

The suggested age-structure of the founder population is 70-85% of known-age nestlings, 10-15% sub-adults, and rest adults so that most of the captive population is of known-age and are most likely to breed.

c. Number of Vulture Conservation Breeding Centres

So far, there are eight Vulture Conservation Breeding Centres in the country. The Central Zoo Authority has funded 5 Vulture Conservation Breeding Centres in 5 different Zoos of the country. The centres at Van Vihar Zoo, Bhopal, Nandankanan

Zoo, Odisha, Nehru Zoological Park, Hyderabad and Sakkarbaug Zoo, Junagadh, were sanctioned in 2007 whereas the centre at Muta, Ranchi, Jharkhand was sanctioned in 2009. The CZA provided with an amount of Rs. 41 Lakh for the initial capital cost of the centre. Earlier, the Wildlife Institute of India, had organized a workshop in 2006 at Pinjore to develop project proposal for setting up Vulture Conservation Breeding Centres. Three State Governments, Haryana, West Bengal and Assam have set up Vulture Conservation Breeding Centre's in their states in collaboration with BNHS.

d. Location of the Centres

The Conservation Breeding Centre should be located within the distribution range of the species so that they are exposed to pathogens in the environment and have developed an immunity against them. It is important that vulture centres are located at least 5 km from a zoo or any animal collection to prevent possible disease transmission. Centres within the zoo premises will have to take strict bio-security measures like having dedicated team of biologist and veterinarian, vulture keepers and watchmen which will have no interaction with the zoo staff.

The species should be kept in the centres which occur within their distribution range.

The following species are suggested for various centres according to their distribution range:

- Pinjore: White-backed Vulture, Long-billed Vulture and Slender-billed Vulture
- Rajabhatkhawa: White-backed Vulture and Slender-billed Vulture
- Rani: Slender-billed Vulture
- Bhopal: White-backed Vulture and Long-billed Vulture
- Nandankanan: White-backed Vulture and Long-billed Vulture
- Junagarh: White-backed Vulture and Long-billed Vulture
- Nehru Zoological Park: White-backed Vulture
- Muta Zoo: White-backed Vulture and Long-billed Vulture

e. Minimum Facilities required for one Species at a centre

One complete colony aviary of dimension 100x40x20' with provision of construction of a second colony aviary within a year, four holding cum hospital aviaries of dimensions 20x20x20', two quarantine aviaries at least five km from the centre, a laboratory for basic hematology with microscope, centrifuge, hemacue and related equipment for estimation of hemoglobin, blood sampling, a trained biologist and four vulture keepers.

ii. Genetic Management of population in a centre

Genetic Diversity of the founder population should be determined. Birds should be shifted between centres to prevent inbreeding, specially the siblings, and they should be shifted to centres within the known distribution range of the species. 25 pairs of parent stock and 25 pairs of F1 generation should be kept at the centre. Progenies of F1 generation could be released in the wild once the reintroduction programme begins. To avoid overcrowding only 12 pairs should be

kept in a colony aviary. It is very important to mark all the birds with leg ring, patagial tag and micro-chip. Birds of only one species should be kept in an aviary.

iii. Basic laboratory is needed for monitoring the health of the birds

Basic laboratory should be developed at all the centres but facilities for molecular sexing and microbiology need not be developed at all the centres as one facility at the coordinating zoo will be enough to cater to the requirements of all the center.

iv. Artificial incubation and Double Clutching

It is important in this programme and every centre should have an artificial incubation facility as described in the working manual and the chapter on Artificial Incubation and double clutching.

Role of Genetics in Vulture Conservation Breeding Programme

Mandar Kulkarni
Centre Manager
Vulture Conservation Breeding Centre, Bombay Natural History Society, Pinjore, Haryana

Introduction

Genetic management of the populations acquired at the Conservation Breeding Centres is essential, as a limited number of individuals are bred in captivity for releasing back in the wild. Acquiring and maintaining best possible gene pool is important. One of the first steps in genetic management is to study the genetic diversity of the founder stock captured from the wild. All the three species of vultures are not sexually dimorphic and determination of sexes based on the morphological characters is not possible. Molecular method of sex determination was used for management of captive populations.

The Molecular sexing of Gyps vultures and Study of genetic diversity of the founder stock of the Gyps vultures have been initiated at the Vulture Conservation Breeding Centre, Pinjore.

I. Molecular sexing

It is not possible to identify vulture sexes based on their morphology and hence a Polymerase Chain Reaction (PCR) based method is being used for sex determination in the three Gyps species (White-backed vulture, Long-billed vulture and Slender-billed vulture) housed at VCBC, Pinjore. The PCR method is based on intronic length variation in Chromo-helicase DNA binding protein gene (CHD) gene present on the Z and W sex chromosomes of the vultures. The females are heterogametic with sex chromosomes as ZW while the males are homogametic with sex chromosomes as ZZ. The PCR based method employs two parallel PCRs, one (i.e. ZW-common PCR) being common for CHD gene present on Z and W chromosome on the other hand the second PCR (i.e. W-specific PCR) is specific for CHD-W gene present only on W chromosome. These 2 parallel PCR are used simultaneously on each sample; and presence or absence of positive PCR product in the W-specific PCR concludes presence or absence of W-chromosome, eventually confirming sex as female and vice versa.

The PCR based method for sex determination is validated using samples from known sex individuals from either postmortem findings or from established vulture pairs at the centre.

Sex determination of 39 White-backed Vultures, 51 Long-billed Vultures and 20 Slender-billed Vultures was carried out. From the sex determination results, the male:female sex ratio for White-backed, Long-billed and Slender-billed Vultures was found to be 1.16:1, 0.76:1 and 0.82:1 respectively.

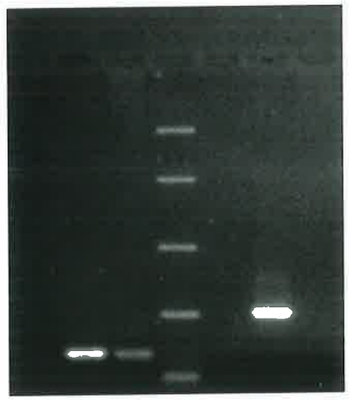
II. Study of genetic diversity

Genetic diversity studies of the founder stock are essential for gathering information on the gene pool of the acquired population at Conservation Breeding Centers, and further management. At Vulture Conservation Breeding Centre, Pinjore, genetic diversity studies are being carried out using the microsatellite loci as molecular markers. In total, 12 microsatellite loci were selected for the study. Each locus was studied by PCR, and the alleles present on each locus were determined by sizing the PCR products. The data obtained was used for calculating allelic frequency on each locus, heterozygosity and tests of Hardy-Weinberg equilibrium (for each locus as well as for complete population).

Using the methodology, 11 individuals from White-backed Vulture population were studied. The results have shown that the White-backed Vulture founder stock population at the Pinjore Centre is very diverse as average observed heterozygosity was found to be more than the average expected heterozygosity. Also, the Global test of Hardy-Weinberg equilibrium has confirmed the presence of heterozygote excess in the population under study.

Future plans

- Study genetic diversity of Long-billed Vulture and Slender-billed Vulture populations at VCBC, Pinjore and subsequently for all the centres.
- Molecular sexing of all vultures at all VCBCs in India.
- Obtaining reproductive data from each VCBC to prepare sibling report and to know breeding history of vultures housed at each VCBC which will eventually aid in exchanging vultures between the centres, for preventing inbreeding and maintaining the gene pools of the vultures housed at all the centres.
- The results of molecular sexing combined with vulture exchange could be helpful in obtaining best possible sex ratio at each centre.



Agarose gel showing PCR products for male & female samples after molecular sexing

Study and profiling of microflora in vulture populations in captivity at Vulture Conservation Breeding Centre, Pinjore, Haryana

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Introduction

In all animals, the microflora plays a vital role in the physiological functions. The communities of microorganisms established in the gut of an individual have been shown to be essential to the metabolic activities of that individual. Any deviation from the normal microflora leads to disease. The resident Gyps species of vultures were rarely kept in captivity in the past and thereby very little information on husbandry, veterinary care and disease risk exists. Nothing much is known about the normal microflora of Gyps vultures, and hence little information is available about their pathogens. Hence this study aims to provide a reference to be looked into in case of sick or diseased vultures, thus facilitating quick and efficient treatment design. Also, by checking whether there are differences between the microflora of the wild caught and captive bred vultures, it aims at ensuring complete fitness of the birds to be reintroduced in the wild.

Methods

The sample collection involved collection of cloacal swabs (to study the gastrointestinal microflora) and choanal swabs (to study the respiratory microflora) from captive, randomly caught Gyps vultures of all the three species. Also, fecal samples were collected from artificially hatched vulture nestlings at various stages of their growth to study the establishment of gastrointestinal microflora. The samples were processed using standard bacteriological culture and identification methods to isolate and identify the bacterial species present.

Results

- In the cloacal samples, Escherichia coli and Enterococcus spp. were found to be commonly occurring bacteria.
- In the choanal samples, Staphylococcus spp. was commonly found across the vultures sampled.
- Escherichia coli was also found from the one week old artificially hatched nestlings, and had a common prevalence throughout their growth. In addition, Plesiomonas shigelloides was also commonly found from

the month old nestlings.

- There were no differences in the microflora patterns across the vulture species.
- Conclusions
- Escherichia coli and Enterococcus spp. are the normal microflora of the gastrointestinal tract, while Staphylococcus spp. are normal microflora of the respiratory tract.
- Escherichia coli colonizes the gut at a very early stage of growth. Similar studies indicate that this organism is common intestinal microflora of meat eating birds and animals, and hence plays a major role in the vulture digestive system. Organisms like Plesiomonas shigelloides also colonize the system, but due to their lack of contribution to the host, are eliminated with passage of time.
- The microflora patterns across the three vulture species are similar because of their genetic relatedness. Also, as the birds exhibit social behavior, they share several bacteria through various routes of transmission.

Future plans

- Study of microflora of vultures in different vulture centres and document the difference in microflora in different climatic zones
- Identify possible pathogens for vultures
- Suggest measures to prevent the spread of bacterial diseases.

Isolated bacterial colonies on a nutrient agar plate

Double Clutching and Artificial Incubation of Gyps Vulture Eggs

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I. Introduction

Artificial incubation and double clutching are certain management techniques that can be used to artificially increase productivity over and above that found in nature. It also saves eggs from parental abandonment. At the Pinjore centre, it was first attempted in 2009-10, when 4 eggs, due to parental abandonment, were put in incubators and were successfully hatched.

Vultures normally lay a single egg every year. The birds lay again within 2-3 weeks if the first clutch is removed or is lost during the initial period of incubation. If the first clutch removed is incubated artificially in incubators and the birds incubate the second clutch, it will be possible to raise two nestlings from one pair instead of one.

Vulture eggs are incubated in octagon incubators, with forced air heating system with efficient temperature and humidity controls. Eggs are incubated at a temperature ranging 36.3° to 36.9°C. Rigorous sanitation protocols like dedicated clothing's for the staff, restricted entry, thorough cleaning and sanitizing incubators and accessories are observed during incubation for successful hatching of eggs.

Incubation parameters like temperature, humidity, turning, candling and weighing eggs are strictly maintained at fixed times recommended for successful hatching.

An average incubation period of 55 days has been recorded for all the three Gyps species eggs. Chicks once hatched are reared in brooder rooms and fed on goat meat. In the brooder boxes they are reared in groups of 2's or 3's to prevent imprinting.

II. Infrastructure

The following infrastructure is required for the artificial incubation centre. This facility will be required at every vulture conservation breeding facility:

a. Incubator room

(12x10x10') is thermo-controlled and a temperature of 19°-21°C is maintained. The incubators are kept on an 'L' shaped marble top which is 3' above the floor.

Nine octagon incubators, with forced air heating and efficient temperature and humidity controls, have been utilized for the purpose. Rigorous sanitation protocol is observed during incubation. Entry into the incubator room is restricted to essential personnel only. The incubators and accessories are thoroughly cleaned and sanitised. A strong disinfectant like F10 is used for this. The staff is required to wear gloves, mask and apron while working.

b. Brooder room

(12x10x10') is thermo-controlled and is utilized for keeping newly hatched nestlings. The nestlings are kept in brooder boxes in the room.

c. Brooder box

(1.5x1.5x2.0') made of wood has heat lamp on one side which enables the nestling to move towards the lamp if it is cold or move away. In this box, the nestling is placed on a long wooden tray (1.5'x 6") conical in shape to prevent splayed legs. The nestlings are kept in groups to avoid imprinting.

Towels to provide a rough substrate are lined at the base of the tray. A day old nestling is reared at 36°C in this box and the temperature is reduced by 1°C every day till it reaches 21°C. The temperature is maintained at 21°C thereafter.

d. Nursery aviaries

A two week old nestling is shifted to nursery aviary. The centre has eight nursery aviaries with a total capacity to rear up to 32 nestlings at a time. Each aviary is provided with four nesting ledges situated 4' above ground. A nest is prepared on these ledges with layers of sticks and twigs and lining of fresh green leaves. The nestlings are kept in groups to avoid imprinting.

e. Holding aviaries

Once the nestling fledges or is more than 16 weeks of age, it is shifted to holding aviaries.

III. Incubation Parameters

a. Turning of eggs

The octagons rest on an automatic egg turning cradle which rocks the whole incubator from side to side thus turning the eggs every hour. The eggs are also turned manually three times a day along the longest axis.

b. Temperature and humidity

The octagons are set in the range of 36.3°C to 36.9°C. Relative humidity is maintained between 55-60%. Temperature and humidity are noted every hour all through the incubation.

c. Weighing of eggs and weight loss management

All eggs are weighed after removing to know their set weight (the weight at the commencement of artificial incubation) and to calculate their fresh weight (the initial egg weight at laying). They are weighed once every three days thereafter. The eggs which lose between 15% to 17% of their weight during incubation usually hatch successfully. Weight loss is manipulated by

increasing or decreasing the humidity during incubation.

d. Candling of eggs

The eggs are placed in front of a source of high intensity beam of light. This lights up the contents inside and is useful in determining the stage of incubation. All eggs are candled once removed from nest and then every sixth day to determine the progress of the air cell formation and its position, to evaluate the egg shell quality, flaws, cracks and yolk quality and mobility.

e. Internal pip

As the time of hatching approaches, the embryo attains its maximum size and occupies all space within the egg except the air cell. The gas exchange capacity becomes insufficient resulting in decrease of oxygen in blood (hypoxia) and increase in carbon dioxide (hypercapnia). Pulmonary respiration is initiated by contraction of hatching muscle causing egg tooth to pierce the inner membrane of the air cell. This becomes audible by vocalisation.

f. External pip

Occurs when the egg tooth pierces the shell leading to a crack in the shell. The egg is shifted to the hatcher set at 36°C with water in the capillaries to limit the drying of shell membrane which could restrict the embryos' movement.

g. Hatching

Occurs as embryo pushes out of shell. The hatchling is wet and exhausted during the process of hatching and then it rests and dries off.

h. Feeding the nestlings

A newly hatched nestling is not fed anything for the first 12 hours as it draws food from its yolk sac. Thereafter, it is fed on 2 grams of minced goat meat dipped in normal saline three times a day. Feeding times are fixed and strictly followed. From the third day onwards, finely chopped ribs and parts of heart, liver, brain, muscles are introduced for a healthy diet and the weight of the nestling is monitored. It is fed according to the weight gain. It is ensured that its daily weight gain is up to 7% till 4 days of age, 9% till 20 days of age, 7% till 30 days of age, 5% till 40 days of age, 3% till 49 days of age and up to 2% till it is 75 days of age. Thereafter, the birds are fed to a full crop.

IV Achievements

a. First-ever artificial incubation and successful hatching of the White-backed and Long-billed Vulture eggs at the centre took place in the year 2009-10. By 2012, 11 White-backed Vulture eggs and 19 Long-billed Vulture eggs have hatched successfully.

b. First-ever artificial incubation and hatching of the critically endangered Slender-billed Vulture eggs took place in 2011-2012, when 3 eggs of the species hatched successfully.

c. Double clutching and artificial incubation is being successfully practiced at the centre to enhance the productivity of the 3 critically endangered Gyps species of vultures.

d. An average incubation period of 55 days was recorded for the first time ever for the eggs of all the three species hatched by artificial incubation.

e. Chick exchange trial: During the current breeding season of 2013-14, a total of 23 vulture nestlings hatched. A new dimension was added to the Vulture Programme when a chick exchange trial was carried out at VCBC, Pinjore. This trial was carried out to see how viable the second clutches of eggs were as hatchability by parental incubation had been somewhat low. By returning the chicks of the first clutch hatched in incubators back to their parents on nests, we were able to take charge of the second clutch of eggs, and tried to improve their success rate to hatching. The second clutch was then artificially incubated and the nestlings were hand reared in groups as have been done previously with the first clutch of eggs. By doing this we hoped to increase the hatchability of the second clutch.

Long-billed Vulture nestling exchanged for second clutch egg

Progress Report of Vulture Conservation Breeding Centre, Van Vihar National Park and Zoo, Bhopal, Madhya Pradesh

B.P.S. Parihar, IFS
Project Leader
Vulture Conservation Breeding Programme Van Vihar National Park,Bhopal, Madhya Pradesh

a. Chronology

In 2005 a project was submitted to Central Zoo Authority regarding involvement of Government of Madhya Pradesh in the conservation breeding of vultures. During the vulture conservation workshop held at Pinjore, Central Zoo Authority asked Government of Madhya Pradesh to submit a project for conservation breeding of three species of vultures viz: White- backed Vulture, Long-billed Vulture and Slender-billed Vulture vide letter F.No. 19-29/92-CZA(144)(Vol II) (M) date 8-2.2006 New Delhi. In January 2007, a proposal was submitted to Central Zoo Authority for Conservation Breeding Programme of two native species i.e. White-backed Vulture and Long-billed Vulture. In 2008, an MOU was signed with Bombay Natural History Society (for 15 years) to provide technical support related to conservation breeding of vultures. In September 2008, a 2.240 ha. area was transferred to Van Vihar National Park for setting up the vulture conservation breeding centre on the Keru dam road, 5 km from Van Vihar National Park through Letter no. 8571 dated 15.9.08.

Central Zoo Authority released Rs. 41.00 lacs for construction of the conservation breeding centre and the structures involved. Infrastructure development at the site were taken up from 2008-09 and completed in 2010-11 (Feb. 2009 to Oct. 2010). A total of Rs. 38.29 lakh were spent of Rs. 41.00 lakhs.

b. Relevant Govt. permissions

In 2006, Government of Madhya Pradesh granted permission to implement the vulture conservation programme vide letter no. F/15-8/2006 dated 28.3.2006

In Jan 2009, Government of India granted permission for capturing 100 birds (25 pairs of each of the two species) from the wild vide letter no. F.No.1-4/2007WL-I(Pt2) dated 15.4.2009

c. Location of the centre

The centre is located on the Keru dam road, about 5 km from the Van Vihar National Park, Bhopal. The area allotted for the setting up of the Vulture Conservation Breeding Centre has been developed to make the land suitable for construction.

d. Infrastructure

The following aviaries have been constructed at the centre

- 1 Colony aviary (100'X40'X20')
- 1 Hospital aviary (20'X20'X15')
- 1 Nursery aviary (20'X20'X15')
- 2 Quarantine pen (20'X20'X15')
- 1 Management house (50'X30')

Electricity and water supplies have been brought to the centre.

e. Progress

BNHS has taken over the Vulture Conservation Breeding Centre, Bhopal in Sept. 2013. Mr. Rohan N. Shringarpure, Research Biologist of BNHS has been appointed as Centre Manager of VCBC, Bhopal in September 2013.

Basic works like water supply, spread of sand, fixing of cots, perches, netlon etc. have been done by BNHS from October to December 2013.

Permission to capture birds from Gandhi Sagar (Mandsaur distt.) and Tamia (Chhindwara distt.) has been accorded by PCCF (WL) M.P. vide letter No. 7503 dated 17.12.2013

Budget Allotment

Government of Madhya Pradesh has allotted the budget of Rs. 29.072 lacs to BNHS for recurring expenditure which has been transferred to BNHS's a/c.

Now we are waiting for the birds to arrive at Vulture Conservation Breeding Centre, Bhopal .

Colony aviary of Vulture Conservation Breeding Centre, Van Vihar, Bhopal

Progress Report of Vulture Conservation Breeding Centre, Nehru Zoological Park, Hyderabad, Andhra Pradesh

P. Mallikarjuna Rao IFS
Project Leader
Vulture Conservation Breeding Programme, Nehru Zoological Park, Hyderabad

Location of the centre

The Vulture Conservation Breeding Programme was started at Nehru Zoological Park, Hyderabad in the year 2010-11.

Number of vultures

There are in all 5 White-backed Vultures at the centre, 2 males and 3 females aged between 20-25 years. The birds were acquired from Kanpur. The birds were shifted from "Birds of Prey" enclosure to newly built breeding aviary on 22nd November 2010. The DNA sexing of birds was carried out with the help of Laboratory for Conservation of Endangered Species-LACONES (Centre for Cell and Molecular Biology, Hyderabad).

Identification of individuals

Both the male birds are marked with leg rings with numbers. The female birds are without any identification.

Infrastructure

Aviaries have been constructed for various purposes. There is one breeding or colony aviary, nursery aviary and quarantine aviary.

1. Quarantine aviary

There is one quarantine aviary at the centre which is of 10'x12'x8'. It is open from all sides and is covered with chain link fence. The aviary is built on about 3' raised platform. To provide shade in the aviary, half of the aviary is covered with asbestos sheets. There are a few stumps for perching. A water trough has been provided for drinking and bathing.

2. Nursery aviary

There is one nursery aviary of dimensions 10'x12'x8'. It is located close to the quarantine aviary. It is similar in shape and size to the quarantine aviary. The flooring is of sand. To give double door protection there is a small chamber of wire mesh within the structure.

3. Colony or breeding aviary

There is one colony aviary of 100x40x20'. It has a flooring of sand and is according to the design provided by the Central Zoo Authority. It has some natural trees for perching and nesting. There are 27 perches all wound with coconut rope to provide a rough surface for vultures. There are two kinds of nesting ledges, of which 18 are concrete ledges and 5 are wooden cots with coir netting. The concrete nesting ledges have windows behind each ledge, fitted with glass. There are four water troughs and have the provision of cleaning from outside. There is double door protection as two doors are on each of the 40' wall and they open in a covered gallery. The food hatch also has a cover of wire mesh to prevent accidental escape of vultures. There is a feeding platform- round elevated platform made of cement and concrete, to facilitate feeding in vultures.

The aviary is fitted with 360^{o} rotatable CCTV camera- to monitor the vultures in the aviary without disturbing the birds. The CCTV monitors are kept in the biologist room for monitoring. A long wooden ladder is kept inside the aviary for repairs.

The big windows in the 100 ft wall are lined with bamboo splits: for obstructing the vision of vultures, so that they do not get disturbed by human movement and they do not get hurt by hitting the wire mesh. The aviary is open to sky. It is covered by a layer of chain link mesh and a second layer of netlon to prevent injuries to vulture.

Breeding

Nesting activity was observed for the first time during the breeding season of 2012. Two pairs attempted nesting. An egg was laid on 11.01.2012 in one of the nests but three days later it fell off the nest when the male and female vultures were observed squabbling over it. The other nest did not lay.

Again in the breeding season of 2013, nesting activity was observed in two nests but only one egg was laid on 1.12.2012. The other nest had no egg. The egg hatched on 22.01.2013 recording an incubation period of 53 days.

Both parents were observed on the nest at the time of hatching and the male was observed feeding the chick after 12 hours of hatching. The chick was feeding well and both the parents were observed sharing responsibilities of rearing the chick. But 18 days after hatching i.e. on 9.2.2013 around 8.00 A.M the chick stopped moving in the nest and the parents were trying to revive it. After about three hours the staff (biologist and animal keeper) entered the aviary to have a closer look. The chick was found dead. A Post-mortem was conducted by the Asst. Director (Veterinary), Nehru Zoological Park, Hyderabad and Professor of Pathology from Government Veterinary College, Rajendranagar which revealed death due to "ATTRESIA OF CLOACA" i.e. closure of cloacal aperture.

Once again the birds are incubating an egg laid on 30.11.2013. Both the adults are totally involved in incubation. The other nest had no egg.

Staff

The Director of the Zoo is the project leader. There is a biologist and a vulture keeper dedicated to the centre. The veterinary help is obtained from the main zoo.

Future plans

The Nehru Zoological Park, Hyderabad is presently handicapped with a limited stock of 2:3 vultures and would like to add another 10 breeding pairs to have successful breeding. It is very much encouraged by the hatching of one egg in the second year itself and the survival of the chick for 18 days and hope for more birds and better results in future.

Colony aviary of Vulture Conservation Breeding Centre, Nehru Zoological Park, Hyderabad

Progress Report of Vulture Conservation Breeding Centre, Sakkarbaug Zoo, Junagarh, Gujarat

Ravi Chauhan
Biologist
Sakkarbaug Zoo, Junagarh,
Gujarat

Introduction

Sakkarbaug Zoological Park is nominated as the Co-ordinating zoo by Central Zoo Authority for Conservation Breeding Programmes of Asiatic Lion, Indian Wolf, Indian Wildass, Asiatic Cheetah and Four Horned Antelope and participating zoo for vultures and Indian gazelle. Sakkarbaug zoo is one of the successful Breeding Centres of vultures after Pinjore in Indian zoos. The Zoological Park is one of the five centres for Vulture Conservation Breeding Programme in India established with support from Central Zoo Authority to save the two critically endangered Gyps species of vultures, the White-backed Vultures and Long-billed Vultures from extinction.

Vultures at the Centre

In all, there are 61 vultures at the centre of which 54 are White-backed Vultures, 5 Long-billed Vultures and 2 Eurasian griffons. 30 of the White-backed Vultures are housed in the breeding aviary (colony aviary), inaugurated in April, 2009.

All the vultures housed at the centre have been rescued from various places in Gujarat. Majority of the vultures have however, come from Ahmedabad and were injured during the Uttran festival by kite strings. Some vultures were rescued as nestlings after they had fallen from their nests or were rescued weak and dehydrated.

I. Location of the centre

The centre is located within the Sakkarbaug Zoo in an off display area.

II. Infrastructure at the centre

Breeding or Colony aviary

It is a large aviary of dimensions 30 x 15 x 7.5 m, for housing 30 White-backed Vultures rescued from various parts of Gujarat. The aviary is large enough for the birds to do wing exercises by flying from one end to another and feed on carcasses, exactly as they do in the wild. It is designed to facilitate breeding activities in the captive vultures.

Enrichments like water ponds, wooden perches wound with coconut rope at appropriate sites, feeding platforms, artificial trees have been provided. It is equipped with CCTV monitoring system to continuously monitor the activities of the captive vultures, and to ensure their well being.

Hospital Aviary

This consists of four aviary rooms with Krall, adjoining the breeding aviary. They are enriched with perches and water facilities. Rescued vultures after undergoing a 45 day quarantine period are shifted to hospital aviary and after a thorough examination are shifted to breeding aviary.

Holding Aviary

There is one holding aviary for rescued birds after quarantine to give vultures required space. This aviary size is 12 mt length, 10 mt width and 5 mt height.

Quarantine Aviary

The centre has a quarantine aviary at some distance in the northern end of the zoo to keep rescued vultures for a temporary quarantine period of at least 45 days, before the vultures are deemed fit to be released into the breeding programme.

Incubation Room

Artificial incubation of vulture eggs has shown good results in Vulture Conservation Breeding Centre, Pinjore, Haryana. Sakkarbaug Zoo has also created such infrastructure and acquired incubators for vulture eggs in 2013. This facility has an Incubator room, Hatching cum rearing room and management office. Two incubators, Octagon 40 Advanced EX, Brinsea, UK, are kept with specific control measures for vulture egg incubation.

Management Office

Facility for Monitoring and Maintenance of Breeding centre is also created at the time of establishment of the centre.

CCTV Monitoring System

Monitoring is a major part of management and to understand the needs in all species. Specific in vultures a 360° dome camera with 22X zoom is fixed to monitor each and every corner of the aviary from management office.

Breeding

Only White-backed Vultures have been recorded nesting at the centre.

Thirty White-backed Vultures were released in breeding aviary in April 2009. Two pairs attempted breeding by laying an egg each by December 2009. Both eggs were unfertile and could not be hatched.

In the year 2010, six eggs were laid of which 2 hatched. Unfortunately both the nestlings died, one died at an age of 72 days and the other at 36 days. The cause of mortality for both nestlings was not clear, though a ball of hair about 3 inches in size was found in the crop of the second chick during Post mortem examination.

The centre tasted success in 2012 when one nestling fledged successfully. Again in 2013 one more nestling fledged successfully.

In 2014, a total of 6 eggs were laid out of which 3 were infertile, two are being artificially incubated and one nestling hatched in January 2014 and is being brooded by the parents.

Future Plans

VCBC, Sakkarbaug Zoo, Junagadh needs an additional enclosure to accommodate more than 20 vultures. A proposal was submitted to Central Zoo Authority for financial assistance to construct an aviary of dimensions 40 mt (L) x 25 mt (W) x 16 mt and 21 mt (Height).

Feeding the vultures

The vultures are fed daily on buffalo meat. The Zoo is confident that the buffaloes are not treated with diclofenac before they are slaughtered.

Colony aviary of Vulture Conservation Breeding Centre, Sakkarbaug Zoo, Junagadh

Progress Report of Vulture Conservation Breeding Centre, Nandankanan Zoological Park, Bhubaneshwar, Odisha

S. Panda IFS
Project Leader
Vulture Conservation Breeding Programme, Nandankanan Zoological Park, Bhubaneshwar, Odisha

Conservation Breeding Programme of White-backed Vulture

Nandankanan is among the five participating zoos for the conservation breeding of White-backed Vulture – designated by CZA. With the financial support from Central Zoo Authority, Nandankanan has initiated the planned conservation breeding of White-backed Vultures in an off-exhibit area located in Nandankanan Sanctuary. The CZA sanctioned an amount of Rs 41.00 Lacs vide letter no. F.No. 19-64/92-CZA (Vol.IV)(212)(M) dated 15.02.2008.

Location of the centre

The facility is located at the North-Western corner of the state Botanical Garden which is about one km from the Zoological Park but is separated by Kanjia Lake and a small hillock. The entry to the centre is through the state botanical garden and not through the zoo. About 0.3 acres of enclosed area surrounded by about seven acres of forested area has been used for the purpose.

Infrastructure

There is one colony aviary (100 X 40 X 20 ft.) and two nursery cum holding aviaries (10 X 12 X 8 ft.). Water and electricity supply have been made to the aviaries.

Staff

An ACF, a Ranger, and a vulture keeper are appointed for looking after the facility. They are posted in the State Botanical Garden and also supervise the Vulture Centre.

Colony aviary of Vulture Conservation Breeding Centre, Nandankanan Zoological Park, Bhubaneshwar

Number of vultures at the centre

There is only one juvenile White-backed Vulture at the centre.

Difficulties in conservation breeding

Although the construction of conservation breeding centre has already been completed with all the facilities, the conservation work cannot be progressed due to non-availability of breeding stock. The birds were once very common are now very rarely seen in Orissa. Capturing the adult birds is again a major constraint for the said purpose.

Progress Report of Vulture Conservation Breeding Centre, Muta, Jharkhand

Introduction

The Central Zoo Authority sanctioned a Conservation Breeding Centre in Jharkhand and the site of the breeding centre was identified at Muta, about 35 km from Ranchi. The centre is now fully constructed.

Infrastructure at the centre

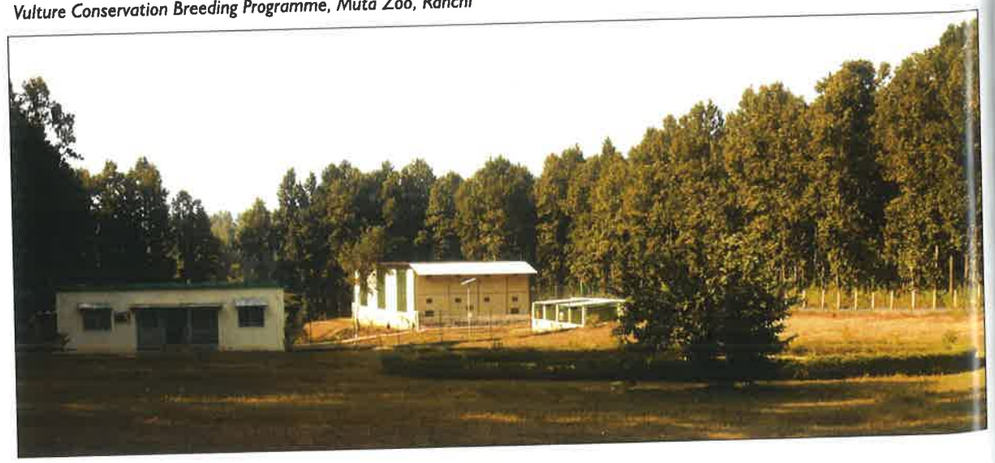
a. Colony Aviary

One colony aviary of dimensions (100 X 40 X 20ft) is ready and is waiting for the birds. The aviaries are open to sky except for the two layers of netting. The upper netting is an iron mesh and the lower netting which is put about 1.6' below is of a tough plastic netting or netlon. All the perches and nest ledges have been put. A speed dome CCTV camera is also installed and the monitor is kept in the management room.

b. Nursery Aviaries

Four nurseries of dimensions (12 X 10 X 8ft) have been constructed. The perches and nest ledges are also placed. The aviaries open into a closed common passage to provide a double door protection to the aviaries.

Vulture Conservation Breeding Programme, Muta Zoo, Ranchi



c. Quarantine Aviaries

Two quarantine aviaries have been constructed of dimension (20 X20X 16ft). The aviaries open into a covered passage to provide double door protection.

d. Hospital Aviaries

Four hospital aviaries have been constructed and are of (10 X 12 X 8ft). The aviaries open into a common passage to provide double door protection.

e. Office Building

The office building has been constructed. It has got three rooms of which two rooms were with attached toilets. One could be utilised as centre manager's room, one as CCTV monitor room and one as laboratory room.

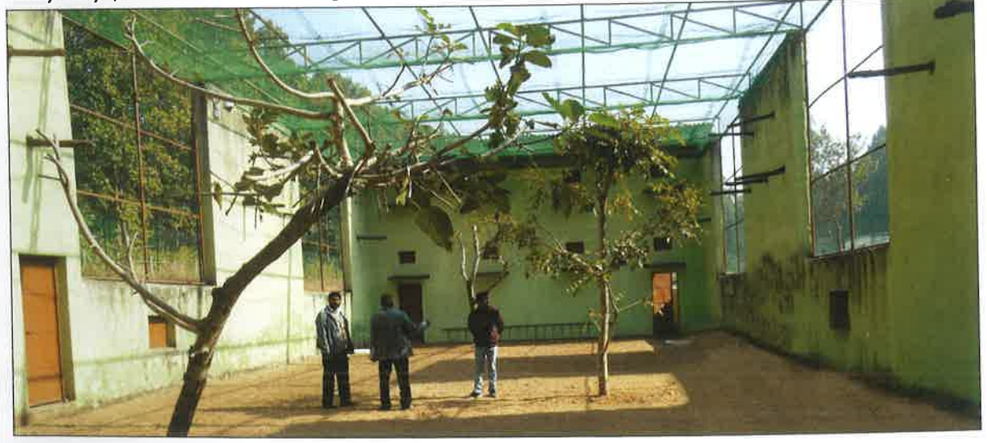
f. Silent Generator

A dedicated silent generator has been purchased for the centre and it will be possible to get uninterrupted power supply for the centre.

g. Perimeter Fencing

The entire area is fenced with 8' high fencing.

Colony aviary of Vulture Conservation Breeding Centre, Muta Zoo, Ranchi



Vulture Conservation Breeding Centre, Rajabhatkhawa, West Bengal

Soumya Sunder Chakraborty
Centre Manager,
Vulture Conservation Breeding Centre, Bombay Natural History Society, Rajabhatkhawa, West Bengal

I. Introduction

The Vulture Conservation Breeding Centre is a collaborative initiative between Bombay Natural History Society and the West Bengal Forest Department, with the goal of saving the three species of vultures, namely the White-backed, Long-billed and Slender-billed, from looming extinction.

Following the release of the South Asia Vulture Recovery Plan in February 2004, the VCBC was established to implement the first of the key recommendations of the Ministry of Environment and Forests' Recovery Plan to set up Conservation Breeding Programme for all three critically endangered gyps species of vultures. Permissive possession of 5 acres of land, for fifteen years, was given by the West Bengal Forest Department in June 2005, to establish the second centre.

II. Location

The centre is situated in Buxa Tiger Reserve on the outskirts of forest village Rajabhatkhawa and is located 15 km from Alipurduar, the nearest district headquarters of West Bengal. It is 8 km off the Kolkata-Guwahati National Highway no. 31 and about 200 km from Bagdogra, the nearest airport.

III. Objectives

- To establish a founder population of 25 pairs each of 3 species of vultures
- To produce a population of at least 200 birds of each species in 15 years to be reintroduced to the wild.

IV. Infrastructure

There are two colony aviaries, one display aviary, one hospital aviary and seven holding/breeding aviaries. The centre also has a well equipped laboratory and the artificial incubation facility is under construction

a. Colony Aviaries

The centre has two colony aviaries (100x40x20') to house adult and sub-adult birds. These aviaries are large enough for the birds to exercise by flying from one end to another and feed socially on carcasses, exactly as they do in the wild. They

are open to sky with a netlon mesh covering the top. An extra iron mesh is also laid above the netlon mesh to prevent monkeys and leopards from getting into the aviary. A number of perches wound with coir ropes are provided at different heights. Breeding ledges are also provided along the 40' wall. There are three (20x15') windows 5' from the ground on the 100' wall. The windows have chain-link mesh bordered by bamboo.

Food hatches are strategically positioned from where food can be passed from outside without disturbing the birds. There are four water troughs for vultures to drink and bathe in. One of the colony aviaries is equipped with remote-controlled CCTV camera. These aviaries have a capacity to hold 40 birds each.

b. Nursery/Holding Aviaries

The centre has 5 nursery/holding aviaries (30x20x14'), with capacity to rear up to 20 nestlings at a time. During the period when the nestlings are brought from the wild, these aviaries are converted into nursery aviaries. A natural nest-like environment is provided for rearing of the nestlings by providing a nest ledge. These aviaries, thereafter, are utilized as holding aviaries once the nestlings fledge by removing the nest ledge and providing perches at different heights.

c. Hospital Aviary

The centre has one hospital aviary (31x15x14') to house injured and sick birds. It has the capacity to hold a total of 2 pairs of vultures. The main feature of this aviary is the position of perches at various heights which makes it easier for the sick or injured birds to sit on.

A few flat ledges (4x3') are also provided as perches. These platforms are made of wood and are bordered on all sides, to facilitate sick birds to rest. At least one ledge is provided under the shaded portion of the aviary.

d. Quarantine Aviaries

There are two quarantine aviaries (30x20x14') and each could house six birds at a time. The aviaries are made up of iron poles and chain-linked fence. The facility is isolated from the centre to minimize the chances of any disease transmission. Any bird brought to the centre is first kept in these aviaries and their health is monitored for 45 days. Blood and fecal samples are analyzed periodically to ensure they are free of diseases.

e. Display Aviary

Birds which are not releasable in wild due to injuries or other reasons will be kept in this aviary for display. This aviary (35x20x14') is located near the main entrance of the centre, with the purpose of displaying vultures in captivity to visitors.

The aviary has perches at various heights, low walls and wider gaps in bamboo lining which allows for better visibility of the birds.

f. Closed-Circuit Television Camera Monitor Room

(12 X 12 X 10ft) is utilized in carrying out observations on the birds. The camera pans up to 355° and tilts up to +/_45°. It can also zoom up to 27X. Every corner of the colony aviary can be monitored with the help of the camera.

g. Walk-in freezer

The meat of the wild animal carcasses and domestic buffaloes are also fed to the vultures. To store the excess meat, a walk-in freezer has been installed. The unit has freezer and ante rooms.

They are constructed of insulated PUF panels. The unit runs on three phase electricity backed by high capacity stabilizers and generator. The freezer can store meat on racks at -16˚C to -20˚C and about 300-350 kg meat could be stored at a time.

h. Perimeter Energized Fence

An energized fence along the periphery has been erected to keep the wild and domestic animals away. It is 6' high and has 8 strands of wire of which 5 are energized and have 11 kv current flowing through. The current does not harm the animal but just gives it a good thud which deters it from coming back. It runs on solar panels which are installed at the centre.

i. Laboratory

A basic laboratory was developed in a building provided by the Forest Department. This has an interpretation room, a sample storage room with a -20°C freezer and a refrigerator, an office room, a meeting cum library room, a haematology room and a post-mortem room.

j. Office and Staff Accommodation

The office of the centre is housed at 'Tiger Lodge', a forest rest house which is about a kilometre from the centre. It is a double-storeyed wooden building, standing on stilts, with four rooms, two on the ground floor and two on the first floor. All the data generated is electronically stored in computer system at the office. The building houses a small library and accommodation for the centre manager and the veterinarian.

V. Routine Vulture Husbandry and Care at VCBC

i Food

Vultures are scavengers; they do not hunt but feed on dead animals to survive. At the VCBC, they are fed twice a week on goat meat. One vulture is fed 3-4 kg of meat in a week which is equivalent to consuming 5% of its body weight every day. The vultures are given freshly slaughtered goat carcasses, with the skin removed. To ensure that there is no diclofenac in the tissues of the goat carcasses, a herd of goats is kept in the care of the centre for at least ten days before slaughter.

ii.Water

All aviaries have water troughs which can be filled and emptied from outside, without entering the aviary. Once a week, troughs are cleaned and fresh water is filled. Water is topped up every day. Care is taken that no algal growth develops in water.

iii. Perches

A very important aspect of aviary design is the position of perches. Most of the perches are above human height and have uneven surfaces. Coir rope is wound around the perches to give them a rough surface. This prevents foot problems in large birds. Perches are monitored and resurfaced regularly.

VI. Observation of birds

Birds are observed through CCTV camera monitors as well as by direct observations from a distance, especially for monitoring the breeding behaviour and looking for any signs of sickness.

VI. Vultures at the centre

There are in all 92 vultures of three species including 60 White-backed Vulture, 17 Long-billed Vulture and 15 Slender-billed Vulture.

VII. Breeding of vultures at the centre

All the three species housed at the centre have bred successfully in captivity. Till date, 15 nestlings of the three species have fledged at the centre of which 11 are White-backed Vultures, 2 Slender-billed Vultures and 2 Long-billed Vultures. The Long-billed Vultures bred for the first time at the centre .

Achievements

Construction of the VCBC started in December 2005 and the first vulture was brought to the centre in March 2006.

1. The centre has the distinction of breeding the Slender-billed vulture for the first time ever in captivity in 2009.
2. The centre has successfully raised nestlings of all the three critically endangered Gyps species of vultures collected from the wild.
3. This is the second centre in the world where Slender-billed Vultures are held in captivity.

Future Plans

1. To breed 20 pairs of each of the three species at the centre every year
2. To do sexing of every individual at the centre
3. To shift siblings of birds to different centres
4. Planning and preparation for reintroduction of vultures in the wild.
5. To educate the public, decision makers and other stake-holders about the role of the toxic drugs, diclofenac, in the vulture population declines and the availability of alternative safe drug.

Colony aviary of Vulture Conservation Breeding Centre, Rajabhatkhawa, West Bengal

Progress Report of Vulture Conservation Breeding Centre, Rani, Assam

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I. Introduction

The Vulture Conservation Breeding Centre (VCBC) is a joint project of the Bombay Natural History Society (BNHS) and the Assam Forest Department to save the two species of vultures, the White-backed and the Slender-billed, from looming extinction.

Subsequent to the release of the South Asia Vulture Recovery Plan in February 2004, the Vulture Conservation Breeding Centre was established to implement the first of the major recommendations of the Recovery Plan – To set up Conservation Breeding Programme for the three endangered species of vultures. Permissive possession of 5 acres of land, for 5 years, was given by the Assam Forest Department in April 2007, to establish the third centre.

II. Location

The centre is located 20 km from the Kolkata-Guwahati National Highway (NH 31) and 6 km from Rani in Kamrup District. It is 25 km away from Guwahati city and 12 km from Guwahati airport. The interstate border with Meghalaya state is about 5km from the centre.

III. Objectives

- To establish a founder population of 25 pairs of each of the species of vultures
- To produce a population of at least 200 birds, in 15 years, of each species, to be reintroduced to the wild.

IV. Infrastructure

There were one colony, two holding and three temporary nursery aviaries. The centre has a good laboratory and is surrounded by an electric fence to keep elephants and other wild animals away. There was no artificial incubation facility at the centre.

a. Temporary Quarantine Aviaries

Two temporary quarantine aviaries (20x20x12') have been established 2 km from the centre on the Forest Department land. The facility has a capacity to hold 12 birds at a time. Any birds brought to the centre are first kept in these aviaries and their health is monitored for 45 days. Blood and fecal samples are analysed periodically to ensure they are free of disease.

The aviaries are made of iron poles and chain-linked fence on all sides. They are open to sky with iron wire mesh covering the top. An extra layer of netlon has been fitted on the inner side to prevent possible injuries to the birds. Wooden perches wound with coir ropes and water troughs are provided within each aviary. The area around the facility has a perimeter bamboo fence to prevent trespassers and wild and domestic animals from entering the facility.

A watchman's hut is also constructed on the facility for round the clock monitoring of the birds.

b. Colony Aviaries

The centre has one colony aviary (100x40x20'), which was completed in February 2010, to house up to 40 adult and sub-adult birds. The aviary is open to sky with a netlon mesh covering the top. There is an extra layer of iron mesh above the netlon mesh to prevent monkeys and leopards from getting into the aviary. A number of perches wound with coir ropes are provided at different heights. Breeding ledges are also provided along the 40' wall. There are three (20x15') windows 5' from the ground on the 100' wall. The windows have chain-link mesh bordered by bamboos.

Food hatches are strategically positioned from where food can be passed from outside without disturbing the birds. There are four water troughs for the vultures to drink and bathe. The colony aviary is equipped with CCTV camera for monitoring and recording vulture behaviour.

c. Holding Aviaries

The centre has two holding aviaries (20x20x16') to house birds that have fledged from the nursery aviaries. Each aviary has a capacity to hold 6 birds at a time. These aviaries are large enough for the birds to do wing exercise and fly from one end to another. A lining of bamboo covers the wire mesh on all sides to prevent injury to the birds. This aviary is open to sky and has an iron wire mesh on the top.

There are a number of high and low perches covered with coir ropes. A food hatch is strategically located in the 100' wall, from where food can be passed. Two water troughs for the birds to drink and bathe in are provided. One trough is alternately kept dry to prevent the growth of algae.

d. Nursery Aviaries

These aviaries are designed to provide a natural nest like environment for the nestlings. The centre has three nursery aviaries of which two are built as twin aviaries with a common wall between them and one as an independent aviary.

i. Twin Nursery Aviaries (20x40x16') have all four sides fitted with chain linked iron netting. A bamboo lining is also provided on the inner side to prevent injury to the nestlings. Both the aviaries have a capacity to rear at least 6 nestlings at a time.

ii. Independent Nursery Aviary (20x20x12') has all the four sides made up of chain link fence lined with bamboo netting. The aviary has a capacity to rear at least 4 nestlings at a time.

flattened bamboo (8 x 6') is placed on the roof to provide shade within the aviaries.
The aviaries have sand flooring and two water troughs for the birds to drink and bathe in. A wooden log wound with coir rope is placed across the aviary and above the nesting ledge for the nestlings to jump on.

e. Interpretation Building

The Assam Forest Department has funded the construction of an Interpretation building at the centre. It consists of a big central hall with four adjoining rooms. The hall will be utilized to sensitize visitors to the rapid crash in vulture populations, the possible consequences of extinction of vultures and to educate them about the role of the project in preventing their extinction. The adjoining rooms are utilised as closed-circuit television camera monitor room and hematology room. Two small rooms are utilized for accommodation of the research staff. There is also provision for a kitchen and a wash room.

f. Perimeter Energised Fence

An energised fence along the periphery of the land has been erected to keep the wild elephants and domestic animals away. It is 6' feet high and has 8 strands of wire of which 5 are energised and have 11 KV current flowing through them.

The current does not harm the animal but gives a gentle thud which deters them from coming back. It runs on solar energy and the panels have been installed at the site. Two solar gates, one at entry and the other at exit have also been installed.

g. Water Supply

Two tube wells were the main source of water for the centre and the staff were manually filling the water troughs in the aviaries till now. Since August 2012, the Assam Public Health Department has initiated a water supply scheme in Rani village. This scheme has facilitated water supply at the centre also. A newly constructed concrete storage tank of 1000 litres and a network of PVC pipelines now water the aviaries, laboratory, kitchen and wash room.

V. Routine Vulture Husbandry and Care at VCBC

1. Food

Vultures are scavengers; they do not hunt but feed on dead animals to survive. At the VCBC, they are fed twice a week on goat meat. One vulture is fed 3-4 kg of meat in a week which is equivalent to consuming 5% of its body weight every day. The nestlings are fed every day with each getting 500 gm of meat. This is continued till they fledge. The vultures are given freshly slaughtered skinned goat carcasses. To ensure that there is no diclofenac in the tissues of the goat carcasses, a herd of goats is kept in the care of the centre for at least ten days before slaughter.

2. Water

All aviaries have water troughs which can be filled and emptied from outside, without entering. The troughs are cleaned and filled with fresh water, once a week. Water is topped up every day. Care is taken that no algal growth develops in water.

3. Perches

A very important aspect of aviary design is the position of perches. Most of the perches are above human height and have uneven surfaces. Coir rope is wound around the perches to give them a rough surface. This prevents the occurrence of foot problems in large birds. Perches are monitored and resurfaced regularly.

VI. Vultures at the Centre

There were 65 vultures of two species including 36 White-backed vulture and 29 Slender-billed vulture at the centre

VII. Breeding at the Centre

3 White-backeds and 2 Slender-billed Vultures had hatched this year and were being reared by the parents. A total of 6 White-backed Vultures and 4 Slender-billed Vultures had fledged successfully during the last 3 years.

VIII. Future Plans

1. Collection of nestlings of the two species of vultures for Conservation Breeding Programme to establish the founder stock.
2. Enhancement of infrastructure and technical capabilities to captive breed 25 pairs each of the two species of vultures.
3. To exchange birds with other centres for genetic management and correcting the sex ratio

Colony aviary of Vulture Conservation Breeding Centre, Rani, Assam

Progress Report of Vulture Conservation Breeding Centre, Pinjore, Haryana

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I. Introduction

The Vulture Conservation Breeding Centre (VCBC), earlier known as Vulture care centre (VCC), was established in September 2001 to investigate the dramatic declines in India's Gyps species of vultures. It is a collaborative initiative between Bombay Natural History Society and the Haryana Forest Department, to save the three species of vultures, the White-backed, Long-billed and Slender-billed, from looming extinction.

Subsequent to the release of the South Asia Vulture Recovery Plan in February 2004, the VCC was upgraded to being the first VCBC in line with a key recommendation of the Ministry of Environment and Forests' Action Plan to set up a Conservation Breeding Programme for the three critically endangered Gyps species of vultures.

The VCBC, lies at the edge of the Bir Shikargah Wildlife Sanctuary in Morni Hills of the Shivalik ranges of the Himalayan foothills. It is 8 km from the city of Pinjore, off the Chandigarh-Shimla highway. The centre covers 5 acres of Haryana Forest Department's land in village Jodhpur.

II. Objectives

1. To establish a founder population of 25 pairs of each of species of vultures
2. To produce a population of at least 200 birds, in 15 years of each species to be reintroduced to the wild.

III. Infrastructure

There are four colony, eight breeding, two display, eight nursery, three hospital, and three holding aviaries and an incubator cum brooder room. The centre has a good lab for haematology, molecular biology and microbiology. There is also a hospital facility for birds.

a. Quarantine Aviaries

(20 X 20 X 12ft) are located 5 km south of the centre on Forest Department land. The facility is isolated from the centre to minimize the chances of any disease transmission. Any bird brought to the centre is first kept in these aviaries and their health is monitored for 45 days. Blood and fecal samples are analysed every fifteen days to ensure they are free of disease. There are three such aviaries with a capacity to hold 20 birds at a time. The aviaries are made up of iron poles and netlon.

b. Nursery Aviaries

(12 X 10 X 8ft) are designed to provide a more natural nest-like environment for rearing of nestlings. The centre has eight nursery aviaries with a total capacity to rear up to 32 nestlings at a time. Each aviary is provided with a nesting ledge situated 4' above ground. A nest is prepared on these ledges with layers of sticks & twigs and a lining of fresh green leaves.

c. Hospital Aviaries (12x10x8) house any bird found injured or sick within the centre for treatment and care. The centre has four hospital aviaries with capacity to hold a bird each.

d. Colony Aviaries

(100 X40 X 20ft) house sub-adult and adult birds. These aviaries are large enough for the birds to exercise by flying from one end to another and feed socially on carcasses, exactly as they do in the wild. There are four such aviaries with capacity to hold 40 birds each. The colony aviaries are equipped with CCTV cameras.

e. Holding Aviaries

House the juveniles after they fledge in nursery aviaries. The centre has three holding aviaries, one of dimensions (60 X 40 X 14ft) and two of dimensions (20 X 20 X 14ft) with capacity to hold 20 birds in the big aviary and 4 birds each in the smaller ones. These aviaries are large enough for the birds to do wing exercises and flap fly from one end to another.

f. Display Aviaries

(25 X 17 X 16 ft) are presently being utilized as additional holding aviaries. They will eventually be used as display aviaries for visitors. Birds which are not releasable in wild due to injuries or other reasons will be kept in this aviary for display.

g. Breeding Aviaries

(20 X 20 X 16ft) house one established breeding pair in each aviary. There are eight such aviaries at the centre. The basic design is similar to that of a holding aviary.

h. Laboratory and Veterinary Care Facilities

The centre has a well-equipped laboratory with the following facilities.

i. The Molecular Room

(15 X 10 X 10ft) has a PCR (Polymerase Chain Reaction) machine with accessories. The equipment is utilised for sexing birds using DNA. There is a fully automated blood biochemistry machine which helps in determining the levels of uric acid, albumin, total protein and creatine kinase in vulture blood serum. The lab is also equipped with a distillation unit to provide distilled water which is a pre-requisite for a laboratory.

ii. The Microbiology Room

(12 X 10 X 10ft) has a modified fume hood which is used as sterile hood for bacterial isolation. The major instruments installed in the room are hot air oven and

bacteriological incubator. With the help of these facilities study of different microscopic fauna found in vultures can be studied.

iii. The Hematology Room

(12 X 12 X 10ft) has all facilities for carrying out routine hematology on vulture blood. The lab has a powerful Leica microscope, centrifuge machine, a Haemacue, a blood mixer and other relevant instruments and accessories to carry out hematology.

iv. The Clinical Room

(12 X 10 X 10ft) is equipped with gas anesthesia machine and other equipment like autoclave required for basic surgery and disease diagnostics. The birds with any sickness or injury are treated here.

v. The Critical Care Room

(12 X 10 X 10ft) is next to the clinical room. It is thermo-controlled and has critical care boxes for keeping birds while recovering from serious illness. The wooden boxes are of dimensions 3x3'.

vi. The Recovery Aviary

(12 X 10 X 8ft) is open to sky and has a layer of netlon on the top. Birds are released in this aviary after recovering in the critical care room. The aviary has a similar design as the hospital aviary. The perching in this aviary is done in accordance to the requirement of the bird.

vii. The Incubator Room

(12 X 10 X 10ft) is thermo-controlled and has latest incubators for achieving optimum success in artificial incubation. The nine hot air octagon incubators are with efficient temperature and humidity controls which are critical for hatching eggs. The octagons with forced (moving) air heating rest on an automatic egg turning cradle which rocks the whole incubator from side to side thus turning the eggs every hour. The eggs are also turned manually three times a day along the longest axis.

viii. The Brooder Room

(12 X 10 X 10ft) is thermo-controlled and is utilized for keeping newly hatched nestlings. The wooden brooder boxes of dimensions (1.5x1.5x2.0') have heat lamp on one side which enables the nestling to move towards the lamp if it is cold or move away. The nestlings are kept in long wooden trays, narrow from the bottom and broad from the top to prevent occurrence of splayed legs. The trays are lined with soft towel material which is changed after every feed. The nestlings are hand reared in groups to make sure that they do not get imprinted on humans. The one day old nestlings are kept at 36°C and the temperature is reduced by 1°C every day till it reaches 21°C. The temperature is maintained at 21°C thereafter till they are shifted to nursery aviaries.

ix. The Freezer Room

(12 X 10 X 10ft) has three -20ºC freezers for storing important tissue samples of vultures.

x. The Closed-Circuit Television Camera Monitor Room

(10 X 10 X 10ft) is utilized in carrying out observations on the birds. All four colony aviaries are equipped with CCTV cameras to study vulture behaviour. The camera pans up to 355º and tilts up to +/_45º. It can also zoom up to 27X. Every corner of the colony aviary can be monitored with these cameras.

IV. Routine Vulture Husbandry and Care at VCBC

a. Observation of birds

Birds are observed through CCTV camera monitors as well as by direct observation from a distance, especially monitoring the breeding behaviour and looking for signs of sickness.

b. Food

The vultures are scavengers. They do not hunt but feed on dead animals to survive. At the VCBC, they are fed twice a week on goat meat. One vulture is fed 3 kilos of meat in a week which is equivalent to 5% of its body weight every day. Vultures are given freshly slaughtered goat carcasses, after removing the skin. To ensure that there is no diclofenac in the tissues of the goat carcasses, a herd of goats is kept in the care of the centre for at least ten days before slaughter.

c. Water

All aviaries have water troughs which can be filled and emptied from outside, without entering the aviary. Once a week, troughs are cleaned and fresh water is filled. Water is topped up every day. Care is taken that no algal growth develops in water.

d. Perches

A very important aspect of aviary design is the position of perches. Most of the perches are above human height and have uneven surfaces. Coconut rope is wound around the perches to give them a rough surface. This prevents foot problems in large birds. Perches are monitored and resurfaced regularly.

V. Vultures at the Centre

There were a total of 200 vultures of four species including 76 White-backed Vulture, 96 Long-billed Vulture and 26 Slender-billed Vulture and two Himalayan Griffon.

VI. Breeding at the Centre

A total of 20 nestlings fledged during 2012-13 including 9 Long-billed Vulture , 8 White-backed Vulture and 3 Slender-billed Vulture.

Future Plans

1. To breed at least 20 pairs of the 3 species of vultures every year.
2. To augment the vulture population by double clutching and artificial incubation.
3. To establish and monitor potential release sites for reintroduction of vultures.
4. To exchange birds with other centres to maintain ideal sex ratio and prevent inbreeding

Recommendations of the Meeting for management of the captive populations at Vulture Conservation Breeding Centres

The following decisions were the important outcomes of the expert committee meeting and panel discussions:

1. Shifting of Birds between Centres

The Committee agreed to shift birds between centres. However it was unanimously decided to form an expert team of three members to evaluate the facilities and submit a report on the existing infrastructure and capacity of the receiving centres with recommendations for necessary improvements.

The team would consist of Dr. Vibhu Prakash or his representative, Dr. Nita Shah, Biologist, and the zoo in-charge of the participating centre.

The team will first visit the Nandankanan and Hyderabad centres and submit the report by the end of February 2014. The report will be sent to Central Zoo Authority and the approval for transferring the birds will be given in accordance with the report.

2. The following will be the tentative plans for shifting of birds to various centres

A. Five pairs of Long-billed Vultures to be sent from Pinjore centre to Bhopal centre.

B. Five pairs of White-backed Vultures to be sent from Pinjore centre, Haryana to Bhubaneshwar centre, Odisha (Subject to evaluation of facility by the expert team)

C. Five pairs of White-backed Vultures to be sent from Rani centre, Assam to Bhubaneshwar centre, Odisha. (Subject to evaluation of facility by the expert team)

D. 3 pairs of White-backed Vultures to be sent from Sakkarbaug Zoo, Junagadh, Gujarat to Hyderabad Centre, Andhra Pradesh.

3. Shifting of vultures from other zoos

Central Zoo Authority will write a letter to all the Chief Wildlife Wardens to send the rescued birds housed in their zoos to the nearest Vulture Conservation Breeding Centre, in future.

4. Role of Coordinating Agencies

The role of Central Zoo Authority, the Chief Wildlife Warden of States where centres are established and Bombay Natural History Society needs to be spelt out clearly.

5. Breeding Plan and MoU between all centres and BNHS

All the Breeding Centers should prepare a Conservation Breeding plan and sign a Memorandum of Understanding with Bombay Natural History Society based on the Madhya Pradesh model as soon as possible.

6. It was decided that species should be kept in the centres which occur within their distribution range

The following species were suggested to be kept in various centres according to their distribution range:

a. Pinjore: White-backed Vulture, Long-billed Vulture and Slender-billed Vulture

b. Rajabhatkhawa: White-backed Vulture and Slender-billed Vulture

c.. Rani: Slender-billed Vulture

d. Bhopal: White-backed Vulture and Long-billed Vulture

e. Nandankanan: White-backed Vulture and Long-billed Vulture

f. Junagarh: White-backed Vulture and Long-billed Vulture

g. Hyderabad: White-backed Vulture

h. Muta: White-backed Vulture and Long-billed Vulture

7. Location of the Centre

It is important that vulture centers are located at least 5 km from a zoo or any animal collection to prevent possible disease transmission. Centres within the zoo premises will have to take strict bio-security measures like having dedicated team of biologist and veterinarian, vulture keepers and watchmen which will have no interaction with the zoo staff.

8. Minimum Facilities required for one Species at a centre

One complete colony aviary of dimension (100 X 40 X 20ft) with provision of construction of a second colony aviary within a year, four holding cum hospital aviaries of dimensions (20 X 20 X 20ft), two quarantine aviaries at least five km from the centre, a laboratory for basic hematology with microscope, centrifuge, hemacue and related equipment for estimation of hemoglobin, blood sampling, a trained biologist and four vulture keepers.

9. Genetic Management of population in a centre

Genetic Diversity of the founder population should be determined. Birds should be shifted, specially the siblings between centres to prevent inbreeding, and they should be shifted to centers within the known distribution range of the species.

10. Number of Founder Stock

25 pairs of parent stock and 25 pairs of F1 generation should be kept at the centre. Progenies of F1 generation could be released in the wild once the reintroduction programme begins. To avoid overcrowding only 12 pairs should be kept in a colony aviary. It is very important to mark all the birds with leg ring, patagial tag and micro-chip for identification. Birds of only one species should be kept in an aviary.

11. Quarantine Facility

It is important to have the quarantine facility 5 km away from the centre. The centre should have all the facilities mentioned in the working manual for Vulture Conservation Breeding Programme.

12. Basic laboratory is needed for monitoring the health of the birds

Basic laboratory should be developed at all the centres but facilities for molecular sexing and hematolgy need not be developed at all the centres as one facility at the coordinating zoo will be enough.

13. Artificial incubation and Double Clutching

It is important in this programme and every centre should have an artificial incubation facility as described in the working manual.

A two months old Slender-billed Vulture nestling at VCBC, Pinjore

The Evaluation of the Vulture Conservation Breeding facility at Nehru Zoological Park, Hyderabad, Andhra Pradesh

The facility at Nehru Zoological Park, Hyderabad, Andhra Pradesh was evaluated by Dr. Nita Shah, and Dr. Vibhu Prakash. Mr. Md. Abdul Hakeem, Assitant Director (Vet), Dr. P. Srinivas, Veterinary Surgeon, Dr. S. Ramesh, Assistant Curator and Mr. Sandeep, Biologist were also present and showed around the facility on the 7th February 2014. The CZA in its meeting of the Conservation Breeding Expert Committee on 28th January 2014 had constituted this committee to evaluate the facilities, staff position and location of the centre which will help in deciding sending of birds to the centre.

Recommendations

1. Based on the location and concern for the conservation breeding programme it had been recommended that a satellite Vulture Conservation Breeding Centre should be established in Narapalli Reserve Forest which was found to be a good site during earlier evaluation. The site is located near Uppal, close to the Hyderabad-Warangal highway and is ~30kms from the Nehru Zoological Park.

   This was discussed with Shri P Malikarjun Rao, IFS, APCCF & Director, Nehru Zoological Park, Mr. Ramalingam, IFS, Curator, Vizag Zoo and Mr. BNN Murthy, IFS, Curator Nehru Zoological Park. All agreed to the recommendation.

Evaluation of Vulture Conservation Breeding Facility, Nehru Zoological Park, Hyderabad by Expert team appointed by CZA

2. The existing vulture aviary within the Nehru Zoological Park premises could be used for captive breeding of vultures and the progenies of these pairs can be sent to other zoos for display.

3. It was further recommended that the vultures housed in seven different zoos which were not participating in the Vulture Conservation Breeding Programme, should be shifted to this captive breeding facility. Some pairs of White-backed Vultures to be procured from Gujarat may also be shifted to this facility.

Location of Existing Captive Breeding Facility

The Vulture Captive Breeding facility is located in an area, at the north-west of the zoo hospital within the zoo premises. The entry to the centre is also through the zoological garden and the nearest animal enclosure is just about 15m away. The human habitation is also 30m away. The facility is not separated by perimeter wall or fence from the rest of the zoo.

A. Existing Infrastructure

There is one colony aviary (100 X 40 X 20ft), one quarantine aviary, one nursery aviary and a CCTV monitor room which is part of the 40 ft gallery of the colony aviary. There is no peripheral wall around the facility and human habitation is in close proximity.

1. Colony Aviary

It houses five White-backed Vultures, two pairs and a single male. The birds need to be microchipped, wing tagged and ringed for record keeping.

The facility is fairly good and will be ready to receive birds once the following is done:

a. The existing layer of netlon below the chain link mesh on the roof should be replaced by a better quality netlon.

b. The existing nesting platforms are too small with iron frame square having very tightly woven jute matting which had accumulated fecal matter. It is advisable to put 5x5'/5x4'wooden cots with jute matting at various heights both along the 40' and 100' walls. The matting on cot should be moderately closely woven.

c. Cement ledges should be replaced with above nest cots. There should be one perch near the nest cot with coconut rope wound around it.

d. All the perches should be natural logs wound with coconut rope and they should be put at various heights as advised.

e. The water troughs need to be a little deep (1') for the vultures to take a dip. 50% of the troughs should be filled at any given time i.e two out of four troughs.

f. Perches must not be directly above the water troughs.

g. It should be made sure there is no metallic piece of wire/nails lying on the floor. A metal detector may be used for this purpose.

h. The sandy floor must be raked regularly and the top layer of sand should be removed and replaced once in 6 months.

i. The bamboos on the windows should be put vertically and there should be a gap of 2 to 2.6 inches between the two bamboo strips. The bamboos should be laid from inside the aviary.

j. The small doors with metallic sheets must be replaced by fine iron-mesh and vertical bamboo strips.

k. All angles and frames must have anti-corrosive lead free paint for long life. Walls must be painted with lime, troughs must be limed after cleaning.

l. For safety reasons electric bulbs along perch walls may be removed and placed in the roof area.

m. CCTV monitor room must be outside the aviary zone as it has been preventing the vultures from using the long end of the aviary.

2. Quarantine and Nursery Aviaries

The aviaries should be redone based on the design given in the working manual on Vulture Conservation Breeding Programme developed by the Central Zoo Authority.

i. The quarantine and nursery aviaries are too close to the colony aviary.

ii. The roof of the aviaries is low (8'). This must be raised and should be at least 14'.

iii. Concrete wall is required on one end; the other three sides must have bamboo on the inner side of the iron-mesh. The roof must have netlon.

iv. Sand on the ground must be raked periodically.

B. Existing Staff

The facility was being looked after by a biologist and a vulture attendant. It was recommended that atleast two more vulture keepers should be hired.

Facilities to be built at the Satellite Conservation Breeding Facility for Vultures

There should be an 8 feet high perimeter fence around about 5 acres of forest land.

I. Aviaries

It is advised to house and breed only White-backed Vultures at the centre. Twenty five pairs of the species should be housed for the conservation breeding programme. However, all 50 birds may not breed hence about 60 birds should be housed.

1. Quarantine Aviary

It is important to have at least one temporary quarantine aviary of (20 X 20 X 14ft) as far as possible from the satellite breeding centre. It should ideally have a physical barrier like a small hillock. It should have similar design as a holding or breeding aviary.

2. Colony Aviary

Only twenty five birds should be kept in one colony aviary. So it is important to have three colony aviaries within the next one year.

II. Laboratory and Veterinary care facilities

The satellite centre should have a well-equipped laboratory with the following facilities.

The Hematology Room

(12 X 12 X 10ft) should have all facilities for carrying out routine hematology on vulture blood. The lab should have a powerful Leica microscope, Centrifuge machine, a Haemacue, a blood mixer and other relevant instruments and accessories to carry out hematology.

The Clinical Room

(12 X 10 X 10ft) could be equipped with gas anesthesia machine and other equipment like autoclave required for basic surgery and disease diagnostics. The birds with any sickness or injury would be treated here.

The Critical Care Room

(12 X 10 X 10ft) should be next to the clinical room. It should be thermo-controlled and should have critical care boxes for keeping birds while recovering from any illness. The wooden boxes should be of dimensions 3x3'.

The Recovery Aviary

(12 X 10 X 8ft) should be open to sky and should have a layer of netlon on the top. Birds should be released in this aviary after recovering in the critical care room. The aviary will have a similar design as the hospital aviary. The perching in this aviary should be done in accordance to the requirement of the bird.

The Incubator Room

(12 X 10 X 10ft) should be thermo-controlled and should have latest incubators for achieving optimum success in artificial incubation. The octagon incubators with forced (moving) air heating system rests on an automatic egg turning cradle, should be ideal for incubating vulture eggs.

The Brooder Room

(12 X 10 X 10ft) should be thermo-controlled and should be utilized for keeping newly hatched nestlings. The wooden brooder boxes of dimensions 1.5x1.5x2' should have a heat lamp on one side which enables the nestling to move towards the lamp if it is cold or move away.

The Closed-Circuit Television Camera Monitor Room

(10 X 10 X 10ft) should be utilized in carrying out observations on the birds. All the aviaries should be equipped with CCTV cameras to study vulture behavior. The cameras should pan and tilt up to 355° and tilt up to +/-45°. It should be able to zoom up to 27X. Every corner of the colony aviary should be monitored with the help of these cameras.

III. Requirement of Staff

The following minimum dedicated staff will be required to run the centre.

1. There should be at least one biologist. The biologist should ideally stay near the centre.
2. Four vulture keepers cum watchman.

The Evaluation of the Vulture Conservation Breeding facility at State Botanical Garden, Nandankanan Zoo, Bhubaneshwar, Odisha

The facility at the State Botanical Garden was evaluated by Dr. Nita Shah, Dr. Vibhu Prakash. and Dr. S. Panda. Mr. D. N. Tripathi ACF and Mr. Prashant Panda, Range Officer were also present and showed around the facility on the 5th February 2014. The CZA in its meeting of the Conservation Breeding Expert Committee held on 28th January 2014 had constituted this committee to evaluate the facilities, staff position and location of the centre which will help in deciding sending of birds to the centre.

Recommendations

1. It was found that the facilities at the centre were good and the birds could be brought in after the suggested changes were done in the existing infrastructure.

2. It was strongly suggested that the Vulture Conservation Breeding Centre should have a dedicated staff of its own. There should be at least one biologist and four vulture keepers cum assistant.

3. The vehicle for the centre should also be its own and should not go to the zoo.

Evaluation of Vulture Conservation Breeding Facility, Nandankanan Zoo, Bhubaneshwar, by Expert team appointed by CZA

2. Four vulture keepers cum watchman.

It should be ensured that no Zoo staff visits the centre nor should vulture staff go to the Zoo.

There should be a separate vehicle for the Vulture Centre and it should not go to Zoo. This is important to avoid any disease transmission.

IV. Provision for Food

It should be made sure that the food is free of diclofenac. Ideally the goats should be kept for seven days with the satellite breeding facility and then should be slaughtered to make sure that the goat meat is free of diclofenac. The animals should not be slaughtered in the zoo slaughter house but should be done near the vulture centre.

The birds should be fed twice a week and each bird should be given 2 kg of meat per feed. The skeletons should be removed only once in fifteen days as birds also feed on bones.

The water troughs should be topped up every day but should be cleaned once a week. Only two alternate troughs should be filled in a week to avoid algal growth.

A White-backed vulture Pair in colony aviary of VCBC, Nehru Zoological Park, Hyderabad

4. The animals should be slaughtered near the centre. Though the centre is away from the zoo but not very far, so it is imperative that all bio-security measures were taken to ensure there were no chances of transmission of diseases.

5. An MoU should be signed with BNHS for technical support.

Location of the centre

The facility is located at the North-Western corner of the state Botanical Garden which is about a km from the Zoological Park but is separated by Kanjai Lake and a small hillock. The entry to the centre is through the state botanical garden and not through the zoo.

A. Existing Infrastructure

There is one colony aviary (100 X 40 X 20ft), two nursery aviaries (20 X 20 X 16ft) and a room. There is a peripheral wall but there is scope for expansion.

1. Colony Aviary

It is quite good and will be ready to receive birds once the following is done:

a. A layer of netlon should be put below the iron mesh of the roof to avoid any accidental injuries to the vultures

b. It is advisable to put 5x5'/5x4'wooden cots with jute matting at various heights both along the 40' and 100 'walls. The matting on cot should be moderately tight netted.

c. All the perches should be natural logs wound with coconut rope and they should be put at various heights as advised.

d. The cement food platforms should be covered with sand.

e. All the water troughs should have a system of filling and emptying the water troughs from outside the aviaries.

f. 50% of the troughs should be filled at any given time i.e two out of four troughs.

g. Perches must not be placed directly above the water troughs.

h. It should be made sure there are no metallic pieces of wire/nails lying on the floor. Metal detectors may be used for this purpose.

i. The sandy floor must be raked regularly and top layer of sand be cleared every 15 days.

j. The bamboos on the windows should be put vertically and there should be a gap of (2 to 2.6") between two bamboo strips.

k. All holes in the walls should be plugged temporarily (as these can be used in the future). A speed dome CCTV camera should be put for observing the birds. It should be ensured that the nesting ledges should be lower than the height of the camera.

l. The small doors with metallic sheets must be replaced by fine iron mesh and vertical bamboo strips.

m. All angles and frames must have anti-corrosive lead free paint for long life. Walls must be painted with lime, troughs must be limed after cleaning.

n. For safety reasons electric bulbs along perch walls may be removed and placed in the roof area.

o. Odisha faces regular storms. Aviaries need to be made storm hardy.

p. Tree branches outside the aviaries need to be pruned.

2. Nursery cum Holding Aviaries

The aviaries were generally good but would require the following improvement:

a. The food hatch should be sealed to stop rodents from entering the aviary

b. The water troughs are very deep and they should be made shallow (1').

c. No perches should be put above the water troughs.

d. The number of perches should be reduced. There should not be more than two perches per wall. There should be only two nest ledges. One below the asbestos shade and one open to sky.

e. The window in the passage should have a netting of fine iron mesh.

f. The water troughs should have the system of emptying and filling from outside to avoid disturbance.

g. Stumps must be placed in the aviary.

B. Existing Staff

At the time of evaluation, an ACF, a Ranger and a vulture keeper were appointed for the facility. They were posted in the State Botanical Garden and also supervised the vulture centre.

Enhancement of Facilities

I. Aviaries:

It was advised to house and breed two species, Long-billed Vultures and White-backed Vultures at the centre. Twenty five pairs of each of the species should be housed for the conservation breeding programme. However, all 50 birds may notbreed hence about 60 birds of each species should be housed.

1. **Quarantine Aviary**

   It is important to have at least one temporary quarantine aviary of 20x20x14' as far as possible from the breeding centre. It should ideally have a physical barrier like a small hillock. It should have similar design as a holding or breeding aviary.

2. **Colony Aviary**

   Only twenty five birds should be kept in one colony aviary. So it is important to have one more colony aviary within the next one year if only one species is kept initially.

II. Laboratory and Veterinary care facilities

The centre should have a well-equipped laboratory with the following facilities.

The Hematology Room

(12 X 12 X 10ft) should have all facilities for carrying out routine hematology on vulture blood. The lab should have a powerful Leica microscope, Centrifuge machine, a Haemacue, a blood mixer and other relevant instruments and accessories to carry out hematology.

The Clinical Room

(12 X 10 X 10ft) could be equipped with gas anesthesia machine and other equipment like autoclave required for basic surgery and disease diagnostics. The birds with any sickness or injury would be treated here.

The Critical Care Room

(12 X 12 X 10ft) should be next to the clinical room. It should be thermo-controlled and should have critical care boxes for keeping birds while recovering from any illness. The wooden boxes could be of dimensions 3x3'.

The Recovery Aviary

(12 X 12 X 8ft) should be open to sky and should have a layer of netlon on the top. Birds should be released in this aviary after recovering in the critical care room. The aviary will have a similar design as the hospital aviary. The perching in this aviary should be done in accordance to the requirement of the bird.

The Incubator Room

(12 X 10 X 10ft) should be thermo-controlled and should have latest incubators for achieving optimum success in artificial incubation. The octagons, with forced (moving) air heating system, rests on an automatic egg turning cradle, should be ideal for incubating vulture eggs.

The Brooder Room

(12 X 10 X 10ft) should be thermo-controlled and should be utilised for keeping newly hatched nestlings. The wooden brooder boxes of dimensions (1.5x1.5x20') should have heat lamp on one side which enables the nestling to move towards the lamp if it is cold or move away.

The Closed-Circuit Television Camera Monitor Room

(10 X 10 X 10 ft) should be utilized in carrying out observations on the birds. All the aviaries should be equipped with CCTV cameras to study vulture behavior. The cameras should pan and tilt up to 355° and tilt up to +/-45°. It should be able to zoom up to 27X. Every corner of the colony aviary should be monitored with the help of these cameras.

III. Requirement of Staff

The following minimum dedicated staff will be required to run the centre

1. There should be at least one biologist. The biologist should ideally stay near the centre.

2. Four vulture keepers cum watchman.

It should be ensured that no zoo staff should visit the centre nor should vulture staff go to the zoo.

There should be a separate vehicle for the Vulture Centre and it should not go to the Zoo. This is important to avoid any disease transmission.

IV. Provision for Food

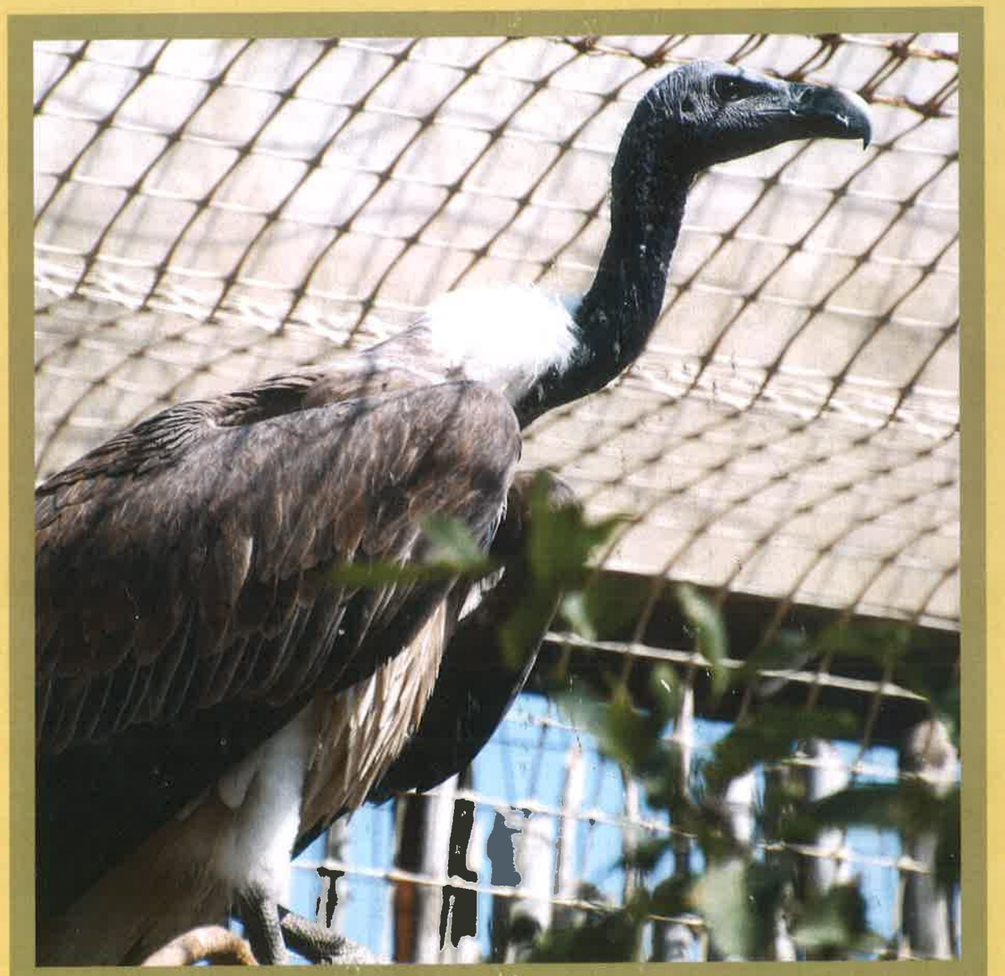
It should be ensured that the food is free of diclofenac. Ideally the goats should be kept for seven days with the zoo and then slaughtered to make sure that the goat meat is free of diclofenac. The animals should be slaughtered near the vulture centre and not in the zoo slaughter house.

The birds should be fed twice a week and each bird should be given 2 kg of meat per feed. The skeletons should be removed only once in fifteen days as birds also feed on bones.

The water troughs should be topped up every day but should be cleaned once a week. Only two alternate troughs should be filled in a week to avoid algal growth.

Holding aviary of Vulture Conservation Breeding Facility, Nandankanan Zoo, Bhubaneshwar

A month old Long-billed Vulture nestling at VCBC, Pinjore



An adult Slender-billed Vulture at VCBC, Pinjore