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VCBC

Vulture Conservation
Breeding Centre
PINJORE

master plan 2011-2021

By
Bombay Natural History Society
Haryana Forest Department
2011

BNHS India CONSERVING NATURE SINCE 1883

Haryana Forest Department

VCBC

Vulture Conservation Breeding Centre

PINJORE, HARYANA

master plan 2011-2021

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2011

BNHS India CONSERVING NATURE SINCE 1883

Haryana Forest Department

जहाँ है हरियाली।
वहाँ है खुशहाली।।

GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT & FORESTS
Central Zoo Authority

THROUGH REGISTERED POST

F. No. 27-1/2006-CZA(509)(M)/235 **DATE: 18.07.2011**

To

Dr. Vibhu Prakash
Principal Scientist,
Vulture Conservation Breeding Centre,
B-3, Forest Complex,
Pinjore – 134 101 (Haryana).

Sub:- Master Plan of the Vulture Conservation Breeding Centre, Pinjore.

Sir,

Reference is invited to your letter No. VCBC-75/2011-MP dated 4th April, 2011.

The revised Master Plan of the Vulture Conservation Breeding Centre, Pinjore was scrutinized by Expert Group on Zoo Designing held on 28th – 29th April, 2011 and the same was placed before 58th Meeting of the Technical Committee held on 8th June, 2011 for its approval. The Technical Committee of the Central Zoo Authority had approved the Master Plan of the Vulture Conservation Breeding Centre, Pinjore subject to the condition that:-

(a) the responsibility of mobilizing the financial resources for implementation of the Master Plan will be the sole responsibility of the State Government or respective Zoo Operator, and
(b) the State Government or respective Zoo Operator should quantify the resources available for the implementation of Master Plan.

In order to send you a copy of the duly signed and approved Master Plan of the Vulture Conservation Breeding Centre, Pinjore, you are requested to submit the soft copy of the digitized and amended Master Plan in any of the format i. e. AUTOCAD/ COREL DRAW/JPEG/TIFF/PDF files on a CD/DVD to this office at the earliest incorporating copy of this letter too.

Yours faithfully,

18/7/11

(B. S. Bonal)
Member Secretary

Copy for favour of information & necessary action to:-

1. The Chief Wildlife Warden, Government of Haryana, Panchkula.
2. The Director, Bombay Natural History Society, Mumbai.

Bikaner House, Annexe VI, Shahjahan Road, New Delhi-110011
Phone : 011-23381585, 23073072, 23070375 (EPABX), Fax : +91-11-23386012
E-mail : cza@nic.in Website : http://www.cza.nic.in

VITAL FACTS

Name of the Rescue Centre	**Vulture Conservation Breeding Centre**
Address	B-3, Forest Complex
City/town	Pinjore
District	Panchkula
State	Haryana
Area of Rescue Centre	5 Acres
Year of Establishment	2001
Controlling Authority	Chief Wildlife Warden, Department of Forests, Government of Haryana
Director/Officer in charge	Dr. Vibhu Prakash, Bombay Natural History Society
Telephone Nos.	+91 92541 34729
Project Manager	Dr. Vibhu Prakash
FAX No.	01733-232924
Email	jatayuprakash@sify.com
Websites	None
Curator	None
Senior Veterinary Officer	None
Junior Veterinary Office	Dr. Parag Deori
Wildlife Biologists	Mrs. Nikita Prakash, Mr. Mandar D. Kulkarni, Mr. Rohan N. Shringarpure
Annual Visitors to Zoo	Does not apply

No. of endangered species at the centre	Three
No. of endangered animals at the rescue centre	135

Visiting Hours

Summer Starts: *Does not apply* Ends: *Does not apply*

Winter Starts: *Does not apply* Ends: *Does not apply*

CONTENTS

FOREWORD

The Vulture Conservation Breeding Centre was established as Vulture Care Centre in the year 2001 to determine the cause of vulture mortality in the wild as the population of vultures was declining at a very rapid pace. The centre is a collaborative project of Haryana Forest Department and Bombay Natural History Society, Mumbai. The centre started functioning as a Conservation Breeding Facility for the three critically endangered *Gyps* species of vultures after the release of the Vulture Recovery Plan in 2004. The facility was recognised as a rescue centre for the *Gyps* vultures by the Central Zoo Authority in 2007. The Recognition of Zoo Rules, 1992, and the National Zoo Policy, 1998 has made it mandatory for the zoos and rescue centres to have a long term Master Plan for the development and functioning of the Zoo. The Master Plan creates a vision that is supported by policies and guidelines. The Master Plan helps in the growth of separate facilities to achieve the specific goal. The guidelines issued by the Central Zoo Authority for preparation of the Master Plan make it simple and straight forward to develop the plan.

The Vulture Conservation Breeding Centre is also the Co-ordinating Zoo of the conservation breeding of vultures in the country as it has developed considerable expertise in housing, husbandry and care and veterinary support for the *Gyps* vultures. It has been successful in the captive breeding of all the three critically endangered resident *Gyps* species of vultures, the White-backed vulture, Long-billed vulture and Slender-billed vulture. The objective of the centre is to release 100 pairs of each of the three species in wild. The first release will start only from 2016 and only if there is no diclofenac, the non-steroidal anti-inflammatory drug, which has been responsible for the near wipe out of the three species, available in the system.

The centre has a number of birds which have been rescued from Gujarat during the past many years which had serious kite string injuries to their wings. Such birds have been given expert veterinary treatment and have been included in the breeding stock. Two female vultures with a wing amputated, have bred successfully during the couple of years.

I am sure with the Master Plan in place, and with support and guidance of Central Zoo Authority, the centre will be able to achieve its objective of conservation breeding of *Gyps* vultures as well as rescuing of injured vultures.

I wish the centre the success that it is striving hard for.

Dr. Amarinder Kaur, IFS
Addl. PCCF cum Chief Wildlife Warden
Haryana

PREFACE

The Bombay Natural History Society and the Haryana Forest Department have experience in holding and managing captive vulture populations for over ten years. The first Conservation Breeding Programme for the three species of vultures was set up in 2004 at Pinjore. The centre has been successful in breeding all the three critically endangered *Gyps* species of vultures, White-backed vulture, Long-billed vulture and Slender-billed vulture.

The Master Plan and the lay out plan of the centre have been prepared based on the guidelines of the Central Zoo Authority (CZA). This ten year plan gives details of the ongoing facilities and facilities which need to be developed. The lay out plan has been made on the contour map which gives a good idea of its topography. The facilities have been marked with different colours according to CZA guidelines. The existing animal enclosures are shown in black colour and the proposed new enclosures in blue colour.

The Master Plan is in three sections. The first section deals with introduction and present arrangements. The second section is the meat of the Master Plan and explains the objectives, action plans for the future, personnel planning, disaster management, contingency plan to address emergencies. It also discusses e-governance and broad budget analysis for implementing the plan.

The *Gyps* vultures are slow breeding and long living species. They breed only when they are 5-6 years old and lay only one egg per year. Hence the conservation breeding of the species will be a long term programme, at least for 15 years. As the ultimate objective of the centre is to release vultures back in the wild to augment the dwindling wild population of vultures, 25 pairs of each of the three species will be housed at the centre for conservation breeding and would release 100 pairs of each of the three species in the wild ten years after the beginning of release programme. The number of founder stock to be kept in captivity is based on a deterministic mathematical model which gave an idea of number of birds to be released in wild which will be genetically viable and would be able to perform their ecological role. The first release is expected to start in 2016 if there is no diclofenac - the veterinary non-steroidal anti-inflammatory drug which has been found responsible for the crash in vulture population, in the system. It is expected that every year 20-25 nestlings will be produced and they will be kept for two years before they would be released in wild. The vultures will be released in flocks of 20-25 birds and in each flock at least 5 birds will be wild caught adults and rest will be captive bred birds. The details of the breeding plans have been incorporated in the Master Plan. The rescued vultures will be treated and would be utilized in the breeding programme if found suitable.

The vultures were once very common in the country but their population crashed within a decade and now they are critically endangered. This happened because of the use of the drug diclofenac. The drug is given to cattle in inflammation and pain but if the cattle dies within 72 hours of administration of this drug and vultures feed on it, then the vultures die of visceral gout. The drug is extremely toxic to vultures and in very low concentration (0.22mg/kg of body weight) could cause mortality. The veterinary use of this drug is banned by Government of India. The human formulations of this drug are still used in veterinary use and the problem continues. So the release programme will depend a lot on removal of the drug from the system. The conservation breeding programme will play a very important role in saving the three vulture species from extinction. The reintroduction and release programme has been described as part of the Master Plan of the centre.

Vibhu Prakash
Project Manager
Vulture Conservation Breeding Centre
Bombay Natural History Society
Pinjore, Haryana

Vulture Conservation Breeding Centre, Pinjore

ACKNOWLEDGMENT

We are grateful to Haryana Forest Department for extending all the support in preparing the Master Plan of the Vulture Conservation Breeding Centre. I am grateful to Dr. R. D. Jakati, the ex-Chief Wildlife Warden and present Director, Indira Gandhi National Forest Academy for meaningful discussions and advice in formulating the Master Plan. I am grateful to Mr. C. R. Jotriwal, IFS, Principal Chief Conservator of Forests for the encouragement in writing and finalizing the plan. Mr. R. K Sapra, IFS, Chief Wildlife Warden, who is also the Project Leader, has been extremely sensitive to the needs of the vulture centre and provided vital input in finalization of the plan.

We are obliged to The Royal Society for the Protection of Birds, U.K. and the Darwin Initiative for the Survival of Species for providing funding support to the Vulture Conservation Breeding Centre, Pinjore. The technical expertise provided by Ms. Jemima Parry-Jones of the International Birds of Prey Centre, U.K is gratefully acknowledged which helped immensely in formulating the Master Plan. Her inputs in the aviary design, husbandry and care, and artificial incubation of vulture eggs are incorporated in the Master Plan. The technical support for veterinary care provided by the Zoological Society of London, U.K. has been very helpful in running the programme. Dr. Andrew Routh, Chief Veterinarian of London Zoo is the veterinary advisor to the centre and his inputs are invaluable in formulating plans for the veterinary care of birds.

We are grateful to the Indian Veterinary Research Institute for providing veterinary support and also for carrying out the safety testing of meloxicam on the vultures. We are especially grateful to Dr. Swarup, ex-incharge and Dr. A. K. Sharma, the present in-charge of the Wildlife Centre at IVRI for helping us draft the veterinary protocol of the centres which are part of the Master Plan.

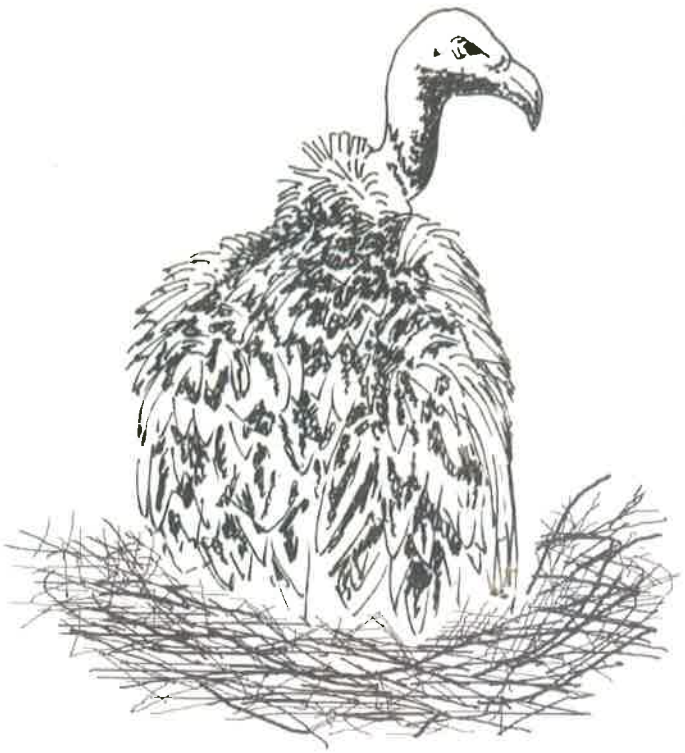
We are grateful to the Central Zoo Authority for providing guidance in formulating the Master Plan. The various workshops conducted by the CZA helped in fine tuning the plan. We would specially like to thank Mr. B. S. Bonal, IFS, Member Secretary for his constant encouragement and support. I would also like to thank Dr. Brij Kishore Gupta, Evaluation Officer for providing guidance at the time of writing the Master Plan as well as the lay out plan.

Last but not the least we are grateful to our parent organization the Bombay Natural History Society for providing all the help in producing the Master Plan especially Dr. A. R. Rahmani, Director, BNHS, for his prompt technical, financial and administrative support.

Vibhu Prakash
Project Manager
Vulture Conservation Breeding Centre
Bombay Natural History Society
Pinjore, Haryana

VCBC

Part 1 The Existing Facilities



CHAPTER 1

Introduction

The Vulture Conservation Breeding Centre was established as a Vulture Care Centre in 2001 with the objective of finding out the cause of vulture mortality

The Vulture Conservation Breeding Centre (VCBC) was established as a Vulture Care Centre in 2001 with the objective of finding out the cause of vulture mortality. The centre was brought under the conservation breeding programme after the release of the South Asia Vulture Recovery Plan in 2004 and was rechristened 'Vulture Conservation Breeding Centre' as the conservation breeding of vultures became the main objective of the centre. The centre was inaugurated in the year 2003 by the British Minister for Nature, Mr. Elliot Morley. The centre was recognized as a rescue centre for vultures in the year 2007 by the Central Zoo Authority.

The centre has a governing council which is chaired by the Principal Secretary, and Commissioner, Department of Forests, Government of Haryana. The Chief Wildlife Warden is the Member Secretary. The VCBC is a joint project of the Bombay Natural History Society (BNHS) and the Haryana Forest Department. It is a successful collaborative initiative of a Government agency and a Non-Governmental Organization (NGO), to save the three species of vultures, the White-backed, Long-billed and Slender-billed, from looming extinction.

I. The need for conservation breeding of vultures

The population of the White-backed, Slender-billed and Long-billed vultures has declined by more than 97% and it continues to decline at the rate of over 50% annually. This is an extremely urgent conservation problem as, in addition to the declines continuing at a very rapid rate, only a handful of White-backed vultures are currently in captivity and no Long-billed or Slender-billed vultures are in captivity anywhere in the world except for the breeding centres at Pinjore, Haryana and Raja Bhat Khawa, West Bengal. The situation is particularly urgent for the Slender-billed vulture, which is now believed to number less than 200 pairs in the world. The Slender-billed vulture is one of the most endangered, large bird of prey in the world, being more likely to go extinct even earlier than the Californian Condor.

As has been the case for the Californian Condor (Snyder, 1986. Wilbur 1978) in the U.S.A., which owes its continuing existence to captive breeding, such a programme is an urgent and necessary tool for the conservation of *Gyps* vultures in India and for Asia. Without a captive breeding programme, it is highly probable that the affected *Gyps* species will become extinct, with the Slender-billed vulture projected to disappear within 10 years. In a similar fashion, other wild populations of old world vultures, such as the Eurasian Griffon vulture (*Gyps fulvus*), Sarrazin (1994) the Cinereous vulture (*Aegypius monachus*) and the Bearded vulture (*Gypaetus barbatus*), have all been either restored or augmented by captive breeding and release programmes, although none of these have had the conservation importance or urgency as *Gyps* vulture in South Asia.

With so much available knowledge from successful vulture conservation breeding programmes, the chances of success for a similar programme for South Asian *Gyps* vultures are good. In general, *Gyps* vultures are relatively easy to house, keep and maintain in captivity, provided adequate facilities are made available and correct management techniques are employed. With the possible exception of the Long-billed and Slender-billed vultures, all species of *Gyps* vultures have been successfully bred in captivity previously. The former two species had not bred in captivity simply because very few, or none, have been held in captivity. These two species have now been bred successfully in the ongoing conservation breeding programme.

Conservation breeding programmes should not be treated as a last ditch option, but should be used as a conservation tool incorporated within a larger program of conservation management. BNHS with the State Forest Departments run such conservation programmes, including monitoring and surveillance of *Gyps* vultures in different range states. Without a captive breeding component to this program, however, the extinction of at least three species of resident *Gyps* vultures in India as well as South Asia seems probable.

The diclofenac is definitely found to be responsible for the mortality of vultures (Oaks et. al. 2004, Shultz et. al. 2004). Diclofenac is very widely used as a veterinary drug in the country and is also very effective and inexpensive. The drug meloxicam appears to be the only alternative to diclofenac at the moment. Though the government has recently imposed a ban on the manufacturing of the drug, it will take at least ten to fifteen years before it is completely removed from the system. This is because it will take time to exhaust all the stock which is widely distributed across the country and also for the fact that this drug being used in humans, gets filtered into veterinary use. Due to the fact that only a very small number of carcasses need to contain lethal dose of diclofenac to cause decline at a very high rate, all the vultures left in the wild are in danger. The only option left to save them is to bring as many vultures in the safety of captivity as soon as possible and initiate captive breeding programme. At the same time efforts should be made to phase out diclofenac from the system. The experience of BNHS at the Vulture Conservation Breeding Facility at Pinjore, Haryana has also been encouraging.

A captive breeding programme is a lengthy commitment; facilities have to be designed and built, breeding stock has to be obtained and placed in the facility and staff needs to be trained to a high standard. It may take some time from set-up to first breeding, but once the birds do start to breed there are certain management techniques that can be used to artificially increase productivity over and above that found in nature. Such techniques, e.g. double clutching, artificial incubation, hand rearing and fostering young are well established and can greatly increase the success of captive breeding and release programs.

II. Diclofenac implicated as the main cause of vulture decline

The centre played an important role in confirming that diclofenac, a non-steroidal anti-inflammatory drug, given to cattle to treat pain and inflammation, is the main cause of vulture mortality and population crash in vultures. The diclofenac was extracted from the tissue samples of vulture carcasses which were collected from different parts of the country and its presence was estimated in collaboration with

Aberdeen University, UK. It was found that 75% of the vulture carcasses collected from various parts of the country had died of "Visceral Gout". This happens when there is kidney failure and the uric acid crystals get deposited on the visceral organs. It was established that all the vultures which had died of visceral gout had diclofenac residues in their tissues. This strong correlation established that at least 75% of the vulture population had died of diclofenac and this was the major cause of decline. The diclofenac as the major cause of vulture mortality was first established in 2003-04 by The Peregrine Fund, a U. S. based NGO, working in Pakistan. Vultures were exposed to diclofenac when they were fed on carcasses of livestock that had died within a few days of treatment and contained residues of the drug. The concentration of diclofenac, as low as 0.22 mg/kg, was found to be lethal to vultures.

III. Ban on the veterinary use of diclofenac in India

The centre played a crucial role in getting the veterinary use of diclofenac banned in the country. The Drug Controller General of India instructed vide letter dated 11 May 2006, to all the state drug controllers to withdraw the licenses granted to manufacture diclofenac formulations for veterinary use. The final gazette notification was issued in August 2008.

Diclofenac ban notice

No.18-1/2007-DC

From:- The Drugs Controller General (India),
Directorate General of Health Services,

FDA Bhawan, Kotla Road,
New Delhi-110002

Dated, the 1st ... 2008

To,

Manufacturer's Associations

Subject:- Prohibition to manufacture, sale and distribution of Diclofenac and its formulations for animal use with immediate effect under GSR 499 (E) dated 04.07.2008 Regarding.

Sir,

Union Ministry of Health and FW New Delhi has published a Gazette Notification vide GSR 499(E) dated 04.07.2008, in exercise of the powers conferred under Section 26A of the Drugs and Cosmetics Act, 1940, prohibiting the manufacture, sale and distribution of Diclofenac and its formulations for animal use with immediate effect.

A copy of the notification is enclosed for your information.

The contents of the notification may be given wide publicity through the journals for the information of the manufacturers of drugs.

Yours faithfully,

(Dr. Surinder Singh)
Drugs Controller General (India)

Various formulations of veterinary diclofenac

IV. Vulture Recovery Plan

The centre organized a South Asia Vulture Recovery Plan Workshop in February 2004. A Vulture Recovery Plan was formulated during the Workshop. The major recommendations of the plan were to ban the use of diclofenac as a veterinary drug and initiate captive breeding programme at least at 6 locations in South Asia to save the vultures from imminent extinction. The Plan was prepared based on the information available on causes of vulture mortality and declines and was released by Mr. S. C. Dhesi, IAS, Principal Secretary and Finance Commissioner, Forests, Government of Haryana, in presence of Mr. S. S. Bist, IFS, I.G., Forests, Ministry of Environment and Forests, Government of India on 16th February 2004. The Recovery Plan discussed various aspects of crash in vulture populations in South Asia and suggested measures for the recovery of the vulture populations. The major recommendations of the Plan were prepared and approved by senior forest officers of various states, scientists of the IUCN Species Specialist Group, RSPB, ZSL, The Peregrine Fund, USA, Wildlife Conservation Society, USA, BNHS, Zoological Survey of India, WII, and CZA during the workshop.

V. Vulture Conservation Breeding Programme

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.

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 their release. A minimum of 60 birds would be required to establish 25 pairs of each species at each breeding centre. To allow for mortality in captivity and unequal numbers of the sexes taken from the wild, it would be necessary to take about 60 birds of each species from the wild to initiate a centre which would eventually lead to the restoration of a single wild population of 100 pairs, 16 or more years later. Releases would not begin until a minimum of 6 years had elapsed since the capture of the founder stocks (assuming that most of the founders are taken as nestlings or juveniles).

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 is most likely to breed.

Release of Vulture Recovery Plan

VI. Objectives

1. To establish a founder population of 25 pairs each of 3 *Gyps* species viz. White-backed vulture, Long- billed vulture and Slender-billed vulture
2. To produce a population of at least 200 birds, in 15 years, of each species, to be reintroduced in the wild
3. To rescue injured wild resident *Gyps* vultures and include them in the ongoing conservation breeding programme after recovery

VII. Location of the centre

Situated at the base of the Shivalik ranges of Himalayan foot hills, the Vulture Conservation Breeding Centre, lies at the edge of Bir Shikargaha Wildlife Sanctuary in Haryana, 8 km from the city of Pinjore, off the Chandigarh-Shimla highway. The centre is spread over 5 acres of Haryana Forest Department's land in village Jodhpur about 200 m off the road.

The area falls under the Punjab plain's biogeographic province, 4A of the Semi-arid biogeographical zone (Rodgers and Panwar, 1988). It falls in the Northern Shivalik Hills and has a dry deciduous forest cover. The forest is dry deciduous scrub of "Northern Tropical Dry Deciduous Forests" (Champion and Seth, 1968). These forests represent a degradation stage of the dry deciduous forests and have been relegated to this stage by adverse biotic factors like heavy grazing, lopping, felling of trees and repeated fires. Constant soil erosion has exposed the poor underlying gravel and boulder base. In spite of good rainfall, moisture retention is very poor and the type has now become a stable edaphic climate. The main tree species found in the area are *Diospyros tomentosa, Acacia catechu, Acacia leucophloea, Butea monosperma, Cassia fistula, Lannea grandis, Anoegeissus latifolia, Aegle marmelos* and *Ziziphus mauritiana*. Undergrowth consists of *Adhatoda vasica, Carissa carandas, Dodonaea viscosa,. Nyctanthus arbor tristis, Ziziphus nummularia, Capparis zeylanica* and *Cassia tora.*

There is plantation of Eucalyptus in the Bir Shikargarh Wildlife Sanctuary which adjoins the centre. The *Acacia catechu, Cassia fistula, Butea monosperma, Diospyros tomentosa, Aegle marmelos* and *Murraya koenigii* are the dominant tree species. There are three very old Banyan trees (*Ficus bengalensis*) within the centre and many around the centre. The *Lantana camara* is the most dominant shrub followed by *Adhatoda vasica*. The *Parthenium* spp. is the most common herb all over the centre. It dominates over the native vegetation. The grass species found are mainly *Aristida depressa, Chrysopogon montanus, Dichanthium annulatum, Heteropogon contortus* and *Erianthus munja.*

On the north of the centre is a 20 years old teak plantation, on the south and south west are the fields of village Jodhpur.

A seasonal rivulet flows on the north eastern side of the centre which ultimately joins the river Ghaggar. As no mining of boulders is permitted according to the Forest Conservation Act, the bed of the rivulet has become higher than the centre which causes flooding in the centre during the years of heavy rains in the catchments.

i. Major crops

There are two major crops grown in the surrounding area. Maize, rice, and ginger are grown during summer (Kharif) and wheat, gram, potato and lentils during winter (Rabi crop). Small holdings and undulating terrain do not permit mechanized farming. Conventional agricultural tools and implements are used. Chemical fertilizers are seldom used. Crops are mainly rain-fed. The water retention of the soil is very poor and all the rainwater goes down very quickly.

ii. Climate

The climate of the region is sub-tropical. It is very cold in winter to almost freezing and very hot in summer. The rainfall is also fairly high.

iii. Rainfall

The region receives most of its rainfall during the monsoon months from July to September. Winter rains are occasional and mainly due to western disturbances. The average rainfall is around 1000 mm. Although the rainfall is good for germination and establishment of forest, the water flows down as the water holding capacity of the soil is very poor.

iv. Soil type

The sub-Himalayan area exposes a part of pre-tertiary and tertiary rocks. The tertiary rocks are dominant and belong to the Dagshai, Kasauli and Sabathu formations and the Shivalik group. These occur along the northern side of the Haryana state bordering H.P. The area consists of variegated clays interbedded with sandstone. The clays are red, yellow, purple, grey and dark grayish in colour. The sequence of clay and sandstone shows rhythmic deposition and lateral changes in the lithology. Sandstone at several places grades into gravel beds.

v. Temperature

The hottest months are May and June and the coldest are December and January. The year 2009 and 2010 recorded the highest maximum temperature nearing 50°C in May (Fig. 1) whereas the lowest minimum was recorded in January 2009 when the temperature fell below zero (Fig.2).

Fig. 1 - Average maximum temperature in °C recorded during various years

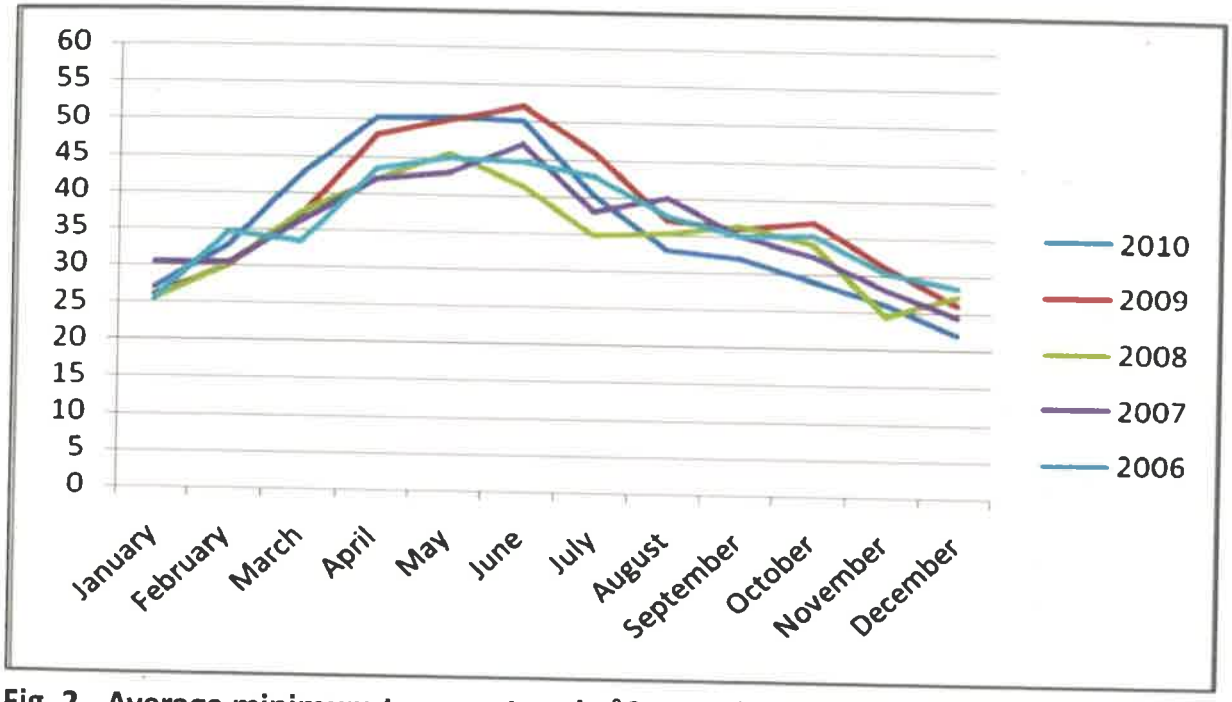
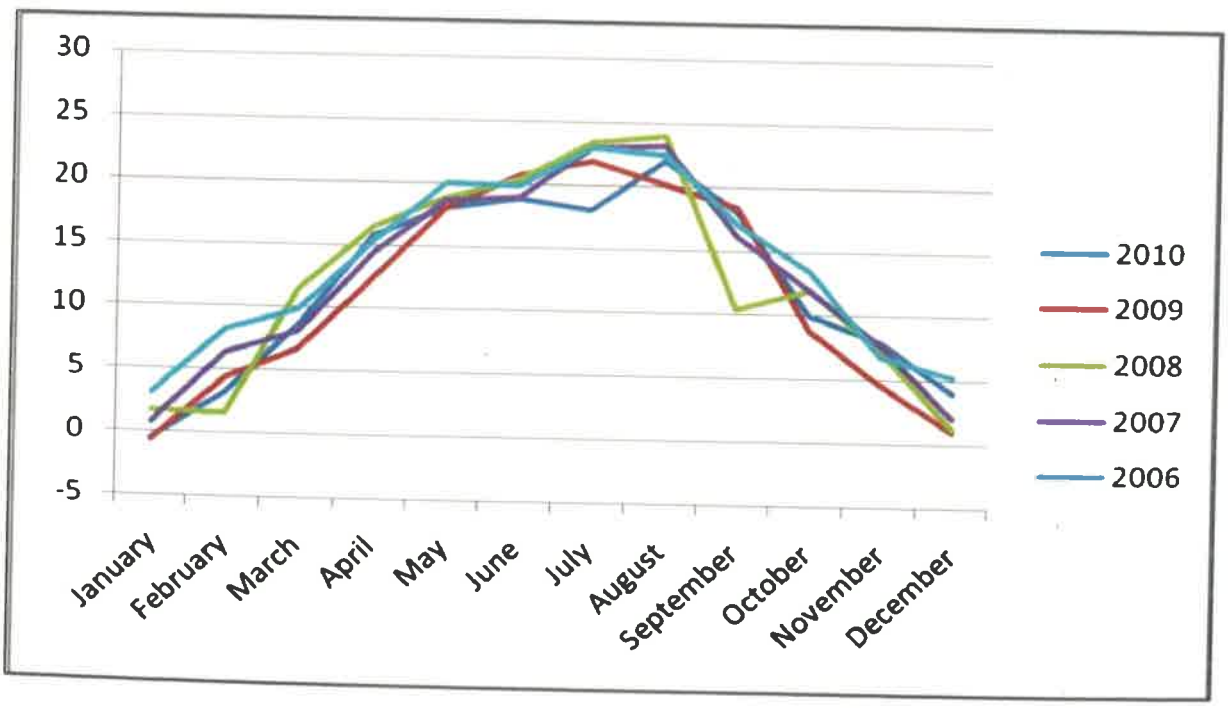


Fig. 2 - Average minimum temperature in °C recorded during various years



CHAPTER 2

Appraisal of the present arrangement and constraints

A . Bird section

I. Housing

There are various types of aviaries for housing vultures of different age and health conditions. The following are the salient features of the different aviaries for housing the vultures.

i. Quarantine Aviaries

The quarantine aviaries are located 5 km south of the centre on Forest Department land. There are three temporary aviaries of dimensions 20x20x12' with a capacity to hold 20 birds at a time. The facility provides total isolation to birds to recover from any stress or diseases. 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 every fifteen days to make sure they are free of diseases.

The aviaries are made up of iron poles and netlon. Wooden perches wound with coir ropes and water troughs are provided within. The area around the facility is fenced to prevent trespassers, wild and domestic animals from entering into the aviaries.

ii. Colony Aviaries

These aviaries house sub-adults and adults of a single species after they have spent about two years in holding aviaries.

These aviaries are large enough for the birds to perform wing exercises by flying from one end to another and feed communally on carcasses, exactly as they do in the wild. There are three such aviaries, each with capacity to hold 40 birds. These aviaries of dimensions 100x40x20' are open to sky except for a welded iron mesh which prevents monkeys from getting in. An additional netlon netting is provided at 1' underneath to prevent injury to the birds if they try to dash against it. There are 25 high and low 3-5' long perches wound by coconut rope. Breeding ledges are also provided along the 40' wall. There are nine concrete ledges of 2.5x1.5' on each of the 40' wall. Each of this concrete ledge has a window of 1.5x1.5', a couple of feet above it. There are twelve

Quarantine Aviary

Outside view of the Colony Aviary

Inside of the Colony Aviary

A Long-billed vulture nestling on the nest in the Nursery Aviary

rectangular nest ledges made up of wooden frame with jute netting, of 5x4'. They are distributed all over the aviary including the 100' walls. There are strategically placed windows, from where food can be passed inside. There are four concrete water troughs of 2.5' radius for vultures to drink and bathe in. The floor of the aviary is soft, made of mud and sand. The colony aviaries are equipped with CCTV cameras.

There are two doors on each of the 40' long wall which open into a 6' wide covered gallery which opens outside. This provides a double door protection which prevents the birds from escaping. There is also a door in the middle of one of the 100' wall which opens into a 6x6' room which opens outside. The staff use the gallery at the middle of the 100' wall to enter for cleaning the aviaries while for catching birds for examination, the side galleries are utilized.

There are three big windows on each of the 100' wall of 20x20x16' separated from one another by a 10' solid concrete wall. The windows have 2x2" welded iron mesh lined by a layer of bamboo. The bamboos protect the birds if they try to dash against the welded iron mesh.

There is a 6' wide shaded area along both the 40' walls. This area is covered by asbestos sheets.

iii. Nursery Aviaries

These aviaries are designed to provide natural nest like environment to the nestlings. The centre has eight nursery aviaries of dimensions 12x10x8' with a total capacity of rearing at least 32 nestlings at a time. Each aviary is covered on the top and on two sides with iron wire mesh and a layer of netlon underneath. Utmost care is taken to prevent injury to nestlings if they dash against the mesh by providing a lining of bamboo.

Each aviary is provided with a nesting ledge of dimensions 12x2½' at 4' above the ground. A nest is prepared on this ledge with layers of sand, twigs and lining of fresh green leaves of aromatic trees. Flooring in all aviaries is of sand. A wooden log wound with coconut rope is placed across the aviary above the nesting ledge. Logs are also put on the ground for perching. At least two and maximum five nestlings are kept in each aviary, mainly to avoid imprinting. Minced meat with powdered bones (to supplement calcium) is provided to the nestlings when they are brought to the centre.

iv. Holding Aviaries

The centre has three holding aviaries, one of dimensions 60x40x16' and two of dimensions 20x20x16' with capacity to hold 10 pairs of vultures in the big aviary and 2 pairs each in the smaller ones. These aviaries are open to sky and have a welded wire mesh on the top. There are a number of high and low perches covered by coconut rope to provide rough surface for birds to perch on. This prevents bumble foot. Food hatches are strategically located in the walls, from where food is offered to vultures. There are four water troughs of 2.5' radius for vultures to drink and bathe in. Two troughs are alternately kept dry every week. There are two water troughs of 1.5' radius in each of the small holding aviaries. The birds are kept in these aviaries after they fledge in nursery aviaries. These aviaries are large enough for the birds to do wing exercise and flap fly from one end to another. They are provided with lining of bamboo to the wire mesh on all four sides, to prevent injury to birds if they dash against the mesh. A lining of thin jute cloth covers the sides of the aviaries to prevent attack from rock bees. The birds are kept in this

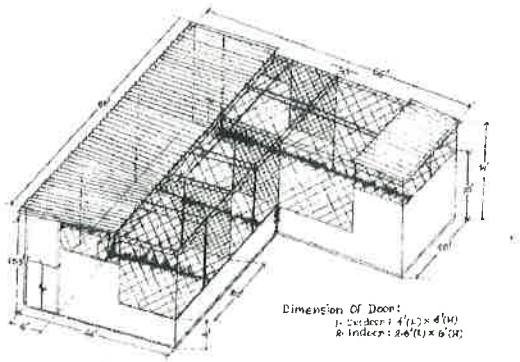


Fig: Holding Aviary © Vibhu Prakash

Design of the Holding Aviaries

aviary till they are three years old and are also provided with nest ledges and nesting material to encourage them to breed.

The aviaries open into a covered gallery which opens outside, to give a double door protection. The smaller aviaries also have a door in the middle of the 20' wall which opens in the gallery. The doors of the two aviaries open into a room of 8x8x6' which opens outside. These doors are used for passing food inside, as well as for the staff to enter the aviaries for cleaning.

The big aviary also has a door in the middle of one of the 60' wall. The doors open into a 8x8x6' room which opens outside. The staff enters to clean the aviary through this door. The aviary also has a food hatch on the opposite 40' wall from where the food is passed inside.

v. Display Aviaries

Located at the far end of the centre are two display aviaries of dimensions 25x17x14'. Presently being used as holding aviaries, they will be eventually used as display aviaries for visitors. Vultures which are not fit for the breeding programme will be kept in these aviaries. The basic design of the aviary is the same as the holding aviaries except for the bamboos which are spaced apart for visibility from outside. There are two water troughs of 1.5' radius and are about a foot deep. One trough is kept dry every alternate week. There is also a square ledge of 4x5' dimensions and made up of wooden frame with jute netting for the birds to rest and roost. Juvenile Himalayan Griffons are housed in one of these aviaries. They were rescued by the locals of this area and brought to the centre. They are not part of the breeding programme.

vi. Breeding Aviaries

There are eight breeding aviaries to house individual or two pairs each. It has been observed that some pairs are not comfortable nesting in a colony aviary. These pairs appear to be of younger birds which are breeding for the first time or are sub-dominant pairs for some reason. Such pairs are disturbed by other birds while nesting. Moreover, in a colony aviary where many pairs nest together, it is more difficult to carry out any intervention if there is a problem with the egg or the nestlings as it will disturb the other breeding pairs. It will be much easier to intervene if only individual or a small number of pairs are in an aviary. Hence, eight breeding aviaries are constructed to keep one or two pairs in one aviary. The aviaries are of dimensions 20x20x16'.

vii. Hospital Aviaries

Any bird found injured or sick while at the centre, is kept in these aviaries for recovery. The centre has four hospital aviaries of dimensions 12x10x8' with capacity to hold a bird each.

The main feature of these aviaries is their small size which

Himalayan Griffons in the Display Aviaries

Hospital Aviaries

helps in catching sick birds, for examination, without much struggle. Perches at various heights make it easier for the bird with injury to perch on. A few flat ledges of dimensions 2½x2½' placed at low height are also provided as perches. These platforms are of wood and are bordered on all sides, to facilitate sick birds to rest. Three sides of the aviaries have two feet solid walls followed by welded iron mesh to the top. One wall is all solid. The solid wall has a door which opens into a covered gallery which is common to all the aviaries in a row. The aviaries are covered at the top with 3' of asbestos sheet to provide shade to the birds. Rest of the roof has welded iron mesh and netlon underneath to prevent any injury to the birds. The aviaries are provided with a water trough with a window nearby which helps in cleaning the trough from outside. A food hatch is provided from where food is passed inside.

II. Incubation and rearing of nestlings

i. Incubator Room

The incubator room is of dimensions 12x10x10'. It is thermo controlled and has two state- of-the-art incubators with the latest contact incubation technology. The incubator works by having a balloon filled with warm air pushing gently down on the eggs, so only the top half of the egg receives the heat - much like a natural bird sitting on eggs. On a programmed timer - with times of our choice, the balloon lifts off the eggs, the eggs are turned on a roller and the balloon returns down on the eggs, thus warming the other side of the eggs.

There are seven forced air incubators (of Brinsea make) also in the room. The temperature is maintained between 36.3-36.9°C in the incubators. The room humidity is maintained but is increased or decreased based on the behaviour of the eggs. The eggs lose 15-17% of the fresh weight by the time they hatch. Humidity is increased if they are losing more weight and decreased if they are losing less weight. The incubators are placed on cradles and are turned automatically once every hour and the eggs are turned manually along the long axis three times a day, always keeping the rounded end on the top.

The eggs are kept in the hatcher just when they start internal pipping. The hatchers are maintained at 36°C but with humidity between 60-70%. The humidity is increased by putting water in the wells at the base of the hatcher. The hatchers are not rolled at all.

ii. Brooder Room

The brooder room is of dimensions 12x10x10'. Newly hatched nestlings from incubators are kept in brooders. The nestlings are hand reared and fed by the staff at the centre. Two or more nestlings are kept together and it is made sure that they do not see the handlers after they are ten days old and start recognizing. This is done to make sure that the nestlings do not get imprinted on humans. The room shares one of its walls with an aviary where handicapped adult birds are kept. The intervening wall has a one way glass which makes sure that the adult vultures are always in sight of the nestlings. The brooder room is also thermo-controlled and is maintained at 23°C. The temperature of the brooder is kept at 36°C initially but is reduced by a degree every day till it reaches 21°C. The nestlings are shifted to the nursery aviaries after they are a month old. The brooder box is of the dimensions 3x3x2'.

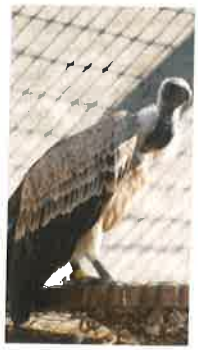
Octagon incubators at the centre

A week old White-backed vulture nestling in the Brooder Room

III. Inventory of vultures

There are a total of 135 birds at the centre of which 57 are White-backed vultures, 58 Long-billed vultures, 18 Slender-billed vultures and 2 Himalayan Griffons.

White-backed vulture



Long-billed vulture

Slender-billed vulture

Of the 57 White-backed vultures, 8 are juveniles which hatched at the centre; of the 58 Long-billed vultures, 3 are juveniles which hatched at the centre and of the 18 Slender-billed vultures, 4 hatched at the centre.

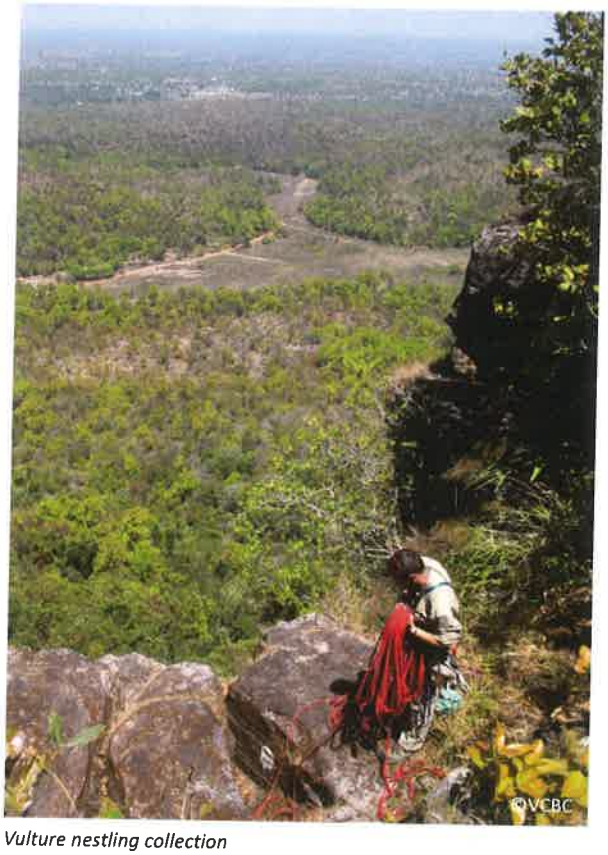
Vultures have been brought to the centre from various states. The maximum number of birds (N=35) have been brought from Gujarat followed by Rajasthan (N=22), Maharashtra (N=21), Haryana (N=20), Madhya Pradesh (N=17), Assam (N=14) and Delhi (N=1). The two Himalayan Griffons are rescued birds from Haryana and are not part of the breeding programme.

IV. Collection method

i. Nestling collection

Nestlings are collected from the wild after they are 45 days old because by then their thermoregulation is well developed and they do not require beak to beak feeding. A very high percentage of mortalities in the wild occur at the nestling stage, hence, bringing nestlings into captivity saves individuals.

The White-backed vultures and the Slender-billed vultures are tree nesters and nest on tall trees, sometimes as tall as 80 meters. The Long-billed vultures are cliff nesters and generally nest on inaccessible cliffs and rocky outcrops. Quite often, they nest in deep caves on a vertical face of the cliff.



Vulture nestling collection

Nestling collection has been possible only due to the help from expert climbers trained in handling vultures. Nestlings are collected in specially designed duffel bags and lowered with the help of a rope to the team waiting on the ground. Once the nestlings are brought down, they are transported in specially designed wooden boxes.

A total of 7 White-backed vulture nestlings and 35 Long-billed vulture nestlings have been collected, so far, from the wild.

A Long-billed vulture nestling being transported

ii. Trapping of vultures

The sub-adult and adult vultures have been successfully trapped from the wild with the help of the snake trap method. This method is very effective, inexpensive, totally non-invasive and quick. A fresh cattle or goat carcass is used as bait and the trapper sits in a grass hide some 10-15m from the carcass, waiting for vultures to feed. He uses a long bamboo pole which is about 60' long and collapsible. The terminal end of the bamboo, approx. 3' long, is very supple, thin and bifid. It is coated with very sticky glue, which is a mixture of the latex of 'peepal' tree *Ficus religiosa* and mustard oil. When the vultures start feeding on the carcass, the bamboo pole is gradually slithered on the ground towards the foraging vultures by the trapper, sitting in the grass hide. When the bamboo is approx. 5' away, the trapper swiftly thrusts it on the body of the feeding vulture. The vulture is then unable to fly. The trapper then rushes and grabs the bird. The glue does not damage the plumage and comes off easily with any vegetable oil.

A total of 14 White-backed and 14, most endangered, Slender-billed vultures have been trapped with the help of this method.

iii. Rescued vultures

In all, 38 White-backed vultures have been rescued and brought to the centre. Of these, 33 birds have been rescued during kite flying, which is part of the festival "Uttrayan" in Gujarat. A good number of birds get serious injuries due to kite strings. Grounded glass is used to coat the string so that in a duel with other flying kites, the ground glass coated string cuts through the strings of other kites. The flying birds get entangled in these strings and suffer serious injuries. Many birds suffer serious wing damage and are maimed for life, while many die of excessive bleeding. Vulture relief camps organized by the Gujarat Forest Department, Animal Help Foundation, Bird Conservation Society of Gujarat and VCBC, Pinjore, have provided first aid care and surgery, as necessary, to these birds. The birds were then transported to Pinjore and are part of the breeding programme.

A total of 4 White-backed vultures and 2 Long-billed vultures have been rescued by individuals, NGO's and Forest Departments of various states and sent to the centre.

iv. Mortality in vultures

Almost half of the mortalities in White-backed vulture took place in 2005, when four vultures were stung by wild rock bees. The bees attacked the vultures when a Crested Honey Buzzard flew over the vulture aviary after plucking a bee hive. All the bees which were following the Honey Buzzard attacked the vultures and four birds died.

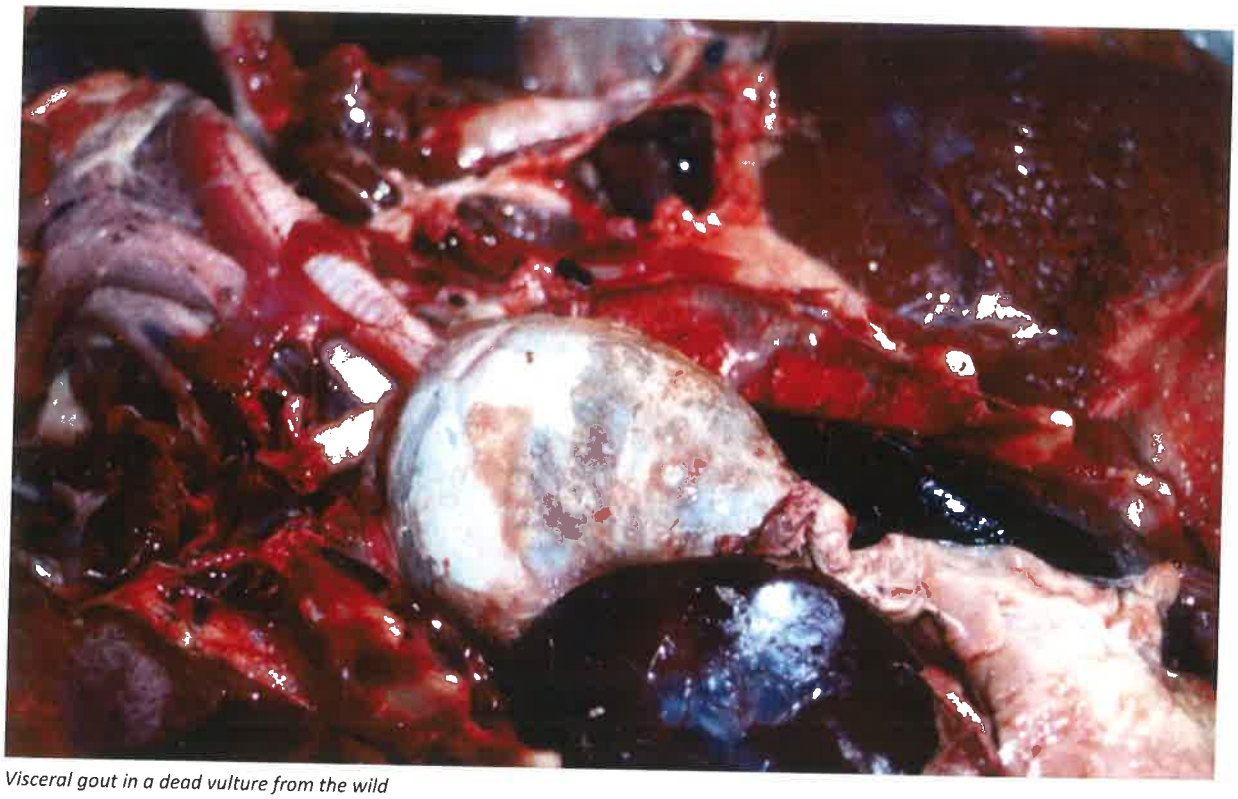
The other mortalities in vultures were mostly in the birds which were injured by the kite string in Gujarat. They developed complications in the injuries and died. In order to find out whether diclofenac is still causing mortality in vultures in wild, post mortems are carried on the vulture carcasses received from various states and their tissue samples are analyzed for the presence of diclofenac.

The centre receives vulture carcasses sent by volunteers from different states for post mortem. These carcasses are sent after receiving due permission from the respective Forest Departments.

Removal of bee stings from attacked vultures

Dead rock bees and stings removed from attacked vultures

A post mortem in progress



Visceral gout in a dead vulture from the wild

B. Veterinary section

a. Laboratory and veterinary care facilities

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

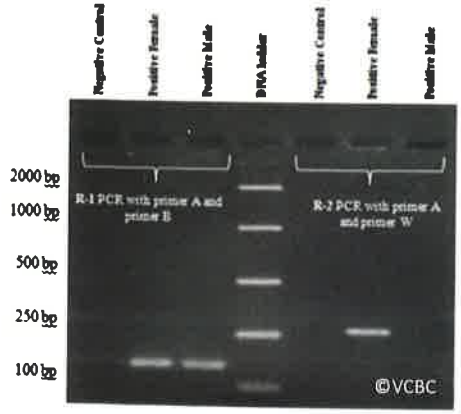
i. Haematology Room

The haematology room is of dimensions 12x12x10'. It has all facilities for carrying out routine haematology. The lab has a powerful Leica microscope, centrifuge machine, a Haemacue (automated haemoglobin measurement device) and a blood mixer.

Microscopic analysis of vulture blood

ii. Molecular Room

The molecular room is of dimensions 15x10x10'. It has a PCR machine with accessories. The equipment is utilized for sexing birds by 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 blood serum. The presence of diclofenac in the vulture tissues as well as cattle carcass tissue is detected with the help of ELISA reader also present in the lab.



Gel electrophoresis for analysis of PCR products

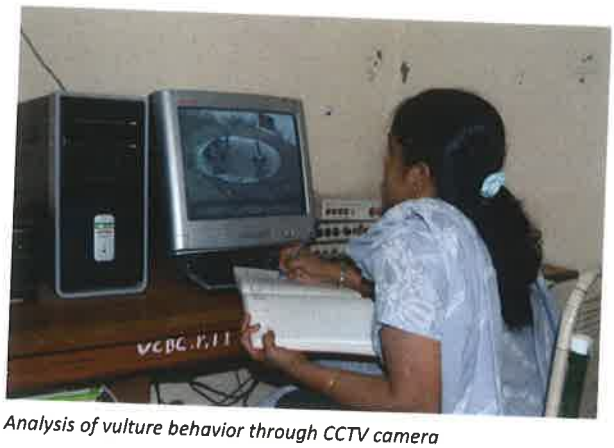
iii. Microbiology Laboratory

The microbiology laboratory is of dimensions 10x10x12'. It has a microbiological incubator, a hot air oven and a fume chamber modified to carry out microbiological procedures in a sterile and isolated environment. The laboratory is currently being used for study of vulture microflora using swabs from vultures collected during the annual health check.

Modified fume chamber for bacteriological testing

iv. Closed-Circuit Television Camera (CCTV) monitor Room

Birds are observed on the monitors of the CCTV cameras which are placed in a room of dimensions of 10x10x10'. Most of the observations on the birds are carried out through



Analysis of vulture behavior through CCTV camera

season i.e. pair formation; birds sitting close to each other, preening each other and making attempts to build nest are carefully looked for. Neck drooping symptoms are also closely monitored. All birds are visually examined by the veterinarians every day.

v. Freezer Room

The centre has three -20ºC freezers for storing important tissue samples of vultures. The freezers are kept in a room of dimensions 12x10x10'.

Deep freezers in freezer room

vi. Clinical Room

There is a clinical room of dimensions 12x10x10' at the centre. The oom is equipped with gas anesthesia machine and other equipment required for basic surgery and disease diagnostics.

Clinical room with gas anesthesia machine.

vii. Critical Care Room

The critical care room of dimensions 12x10x10' is next to the clinical room. It is thermo-controlled and has critical care boxes for keeping birds after surgery or when they are recovering form serious illness. The wooden boxes are of dimensions 3x3'. Three sides of the box are made of wood whereas the front has netlon mesh which allows better visibility of the bird. Such boxes prevent the bird from moving around or flapping wings and helps in a faster recovery. The bird is monitored from the clinical room through a one way glass on the wall between these rooms.

A veterinarian preparing the critical care box

viii. Recovery Aviary

The recovery aviary is of dimensions 12x10x8'. The birds, after recovery in the critical care room, are shifted to this aviary. The aviary is open to sky and has a layer of netlon on the top. The aviary has a similar shape and construction as the hospital aviary. The perching in this aviary is done in accordance to the requirement of the bird.

A bird in the Recovery Aviary

b. Husbandry and care

Husbandry and care is possibly the most important component of any conservation breeding programme. The correct procedures followed ensure a healthy population in captivity.

The protocols for husbandry and care observed at the centre have been developed in consultation with international organizations with expertise in captive management of birds. A number of modifications have been made based on our experience and local circumstances. The following parameters are covered in routine husbandry and care of vultures.

i. Identification

When a vulture is brought to the centre, a strong plastic ring etched with a number is put on one of the legs and a microchip is implanted in its breast muscle for identification.

Application of microchip

Metatarsal ring

ii. Health check

Different examinations are carried out for providing veterinary care to vultures.

A physical examination of vultures in quarantine is carried out three times during the quarantine period of 45 days. An initial check up is carried out for any signs of injury or fracture. Once out of quarantine period, vultures at the centre are physically examined once a year. Daily visual examination is carried out four times in a day. The examination is done from a distance usually through binoculars or through CCTV monitors. It includes the evaluation of the general appearance, attitude and activity of every individual bird. These are the main parameters that are likely to change in response to a disease condition.

Wing tag

Collection of blood sample

Biochemical analysis of vulture blood

Laboratory examination involves haematology, parasitology, basic microbiology and necropsy of vultures which gives a clue of the health condition of the vultures. The centre has a lab which is equipped to carry out all this. Post mortem examination is carried out using a standard protocol, which includes systematic visual examination of external and internal organs.

iii. Food provision for the vultures

Vultures are fed on freshly slaughtered skinned goats. Each vulture is provided with 3-4 kg of meat per week depending on the body weight; spread over two days, to maintain its daily food requirement of 5% of its body weight. 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

iv. Water

Water is provided in cemented troughs inside the aviaries. Four water troughs are provided. The troughs are cleaned from outside once a week and water is topped up every day. Two troughs are filled every week and are kept dry the next week to prevent algal growth.

Maintenance of water trough

Provision of food through the food hatch

C. Stores and feed section

The vultures are fed on the freshly slaughtered goat meat. The goats are kept at a place 10km from the centre. They are quarantined for 10 days before they are slaughtered to make sure there is no diclofenac in their system. The freshly slaughtered skinned goat carcass is brought to the centre after removing the gut contents. The entire carcasses are then fed to the vultures. One vulture is fed 4 kg of meat/week. They are fed twice a week, so on one feeding day they are given 2 kg meat/vulture. The meat for the nestlings is kept in the refrigerator which is kept in the kitchen outside the brooder room. Meat for sick vultures is kept in the refrigerator in the veterinary section.

D. Power supply

The centre has a three phase power connection. It also has an 8 KV generator and two invertors for backup power. The power break downs are frequent but the backup support is enough to tide over the situation.

The generator is housed in a small 8x8x8' room little away from the laboratory building. The room also helps in reduction of noise.

E. Water supply

There are two water tanks constructed in the ground. One water tank is at the northern end of the centre and is of 10x10x12'. The water is filled by water tankers every second day. The tank is cleaned and painted with lime every month. This tank is at an elevation because the land slopes down towards south. There is a gradient of 60' from north to south end. So the water from this tank is supplied to all the aviaries through a system of pipelines and the water goes all over by gravity. The overhead tank on the clinical room is also filled from this tank.

The other tank also of 10x10x12' supplies water to the overhead tank on the laboratory building with the help of a tullu pump. The water is then supplied to the entire building by the overhead tank.

F. Solid and liquid waste-sewerage

a. Solid waste

The major solid waste is the left over bones of the goat carcasses provided to the vultures. The bones are collected and are put in a 10x10x10' deep pit outside the boundary of the centre. The local bone contractor collects the bones every week.

b. Liquid waste

The water from the aviaries goes into soak away pits located just outside the aviaries. The water from the laboratory and the toilets goes into the septic tank.

G. Security section

The entire 5 acres of land is surrounded by 8' high chain link fence to keep trespassers, domestic animals and stray dogs away.

There are day and night watchmen who patrol the area and check all security locks and status of the fence. The watch men have access to the phone and mobile numbers and they remain in touch with the Centre Manager. No instance of vandalism or theft has been reported so far. Two persons stay at the centre during the night.

Chain link perimeter fence bordering the centre

H. Visitor amenities, gardens and landscaping

The Vulture Conservation Breeding Centre is an off display facility and no visitors are allowed. Only officers, biologists and scientists who are associated with the centre visit the centre. There is a reverse osmosis water filter for providing safe drinking water and there is also provision for tea and snacks. There are wash rooms for the staff and visiting scientists and biologists.

I. Construction and maintenance section

No construction is being undertaken at the moment. The construction is done under the supervision of the Centre Manager in consultation with the Project Leader who is the Chief Wildlife Warden of the Haryana State Forest Department.

The routine maintenance of the aviaries and the buildings are carried out immediately after the vulture breeding season or just before the beginning of the breeding season.

a. Maintenance of the aviaries

Aviary maintenance is critically important for ensuring the good health of the captive vultures. Routine and annual maintenance of aviaries is regularly carried out at the centre.

The maintenance of aviaries has two components:

i. Routine maintenance

ii. Bi-annual maintenance

i. Routine maintenance

Three times a day the veterinarians or the biologists check the aviaries. They look at the perches, the ground substrate, water troughs, wire mesh and netlon and the bamboos. If the perch or the nest ledge is broken or the rope has come off from the perch or the bamboo has broken then it is reported to the Centre Manager. All the broken perches and ledges are repaired every Tuesday outside the breeding season but once a month during breeding season. Repairs of urgent nature are done the same week. Any broken netting or netlon is also fixed. The water troughs are thoroughly cleaned and are painted with lime. All the remains of the goat carcasses are removed. The sand is raked especially where the food is dropped.

Repair of perches

ii. Bi-annual maintenance

It is done once before the onset of vulture breeding season and again after the breeding season. It involves thorough washing of the walls by scrubbing off all the droppings. The cemented ledges are cleaned by removing the sand and replacing it with fresh sand only after the ledge is thoroughly washed and disinfected. The wooden ledges are removed and replaced by freshly netted ones. All the perches are wound with fresh coconut rope.

All the ground vegetation is cleared and all the sand on the floor is removed and fresh sand is spread to prevent any build up of pathogens. The water troughs are thoroughly cleaned and painted with lime.

Bi-annual cleaning in the aviaries

All the netting is physically checked for any breakage and anti-rust paint is applied. All bamboos are also checked for any breakage and are replaced accordingly.

The maintenance of CCTV camera is also carried out and its external cover is thoroughly cleaned.

b. Maintenance of laboratory and veterinary section

The inner walls of veterinary section are painted every year and all the instruments are cleaned and rearranged.

The stock of medicines is checked and all expired medicines are discarded. The list of instruments and equipment are checked and replenished when required. All the major instruments have annual maintenance contracts which are periodically renewed.

J. Collection plans

The centre's objective is to house 25 pairs of each of the three species namely, White-backed vulture, Long-billed vulture and Slender-billed vulture at the centre. To get 25 breeding pairs, we need at least 60 birds of each of the species to take care of mortality in birds and those which may fail to form pairs. The centre will aim to keep at the most 180 birds. It however has space for 70 birds of each of the three species.

a. White-backed vulture

The centre has a total of 57 White-backed vultures, of which eight are hatched at the centre. We can still accept 13 birds if the rescued birds are sent to the centre. The centre will however not do any active collection of White-backed vultures.

b. Long-billed vulture

The centre has a total of 58 Long-billed vultures, of which three are hatched at the centre. The centre can accept 12 rescued birds of this species. The centre will however not do any active collection of Long-billed vulture.

c. Slender-billed vulture

The centre has a total of 18 Slender-billed vultures, of which 4 were hatched at the centre. The centre can accept 52 Slender-billed vultures. The centre has permission to collect 26 birds from Assam from the wild. It will try to catch juveniles and collect nestlings from Assam. The centre will actively rescue Slender-billed vultures and bring them to the centre if it gets report of any sick or injured birds. The collection will be attempted in the next couple of breeding seasons.

d. Himalayan Griffon

The centre has two Himalayan Griffons which have been rescued from the wild. These birds were not released in the wild after they recovered as initially a viral disease was suspected to be involved in killing vultures and the Himalayan Griffons were kept at the centre with other birds. They are not part of the breeding programme.

These birds will now be utilized in the release programme as a surrogate species. The Himalayan Griffon is not an endangered species and is still seen in fairly good numbers. They are of the same genus as the resident *Gyps* species whose conservation breeding is the main objective of the centre. They are also ecologically very similar and are susceptible to diclofenac, hence could be used as a surrogate species. The two captive Himalayan Griffons will be released in the areas where the captive bred birds of resident *Gyps* species are proposed to be released. The released Himalayan Griffons will be studied for a year or so before the resident *Gyps* which are critically endangered, are released. It is expected that any abnormal behaviour problem shown by these birds will be rectified in the endangered resident *Gyps* vultures before they are released.

No attempt will be made to actively bring the rescued birds at the centre.

K. Administrative section

I. Office and staff

i. Office

The administrative section of the centre is located on the first floor of the office of DFO Morni, at Forest Complex, Pinjore, about 9 km from the centre. The office space has been provided by the Forest Department, Government of Haryana. It has two 20x20x16' rooms.

The Vulture Conservation Breeding Centre is a collaborative project of the Haryana Forest Department and Bombay Natural History Society.

ii. Staff at the centre

Project Leader	:	The Chief Wildlife Warden, Haryana
Project Manager	:	Dr. Vibhu Prakash, Principal Scientist, BNHS
Centre Manager	:	Mr. Mandar D. Kulkarni

Technical Assistant	:	Ms. Nikita Prakash
Biologist	:	Mr. Rohan Shringarpure
Veterinarian	:	Dr. Parag Deori
Adm. Assistant	:	Mr. Niranjan Dalei
Supervisor	:	Mr. Jaikishan Sharma
Vulture Keeper	:	Mr. Sugan Chand, Mr. Rajesh Kumar
Day Watchman	:	Mr. Timan Singh
Night Watchman	:	Mr. Prakash Chand

The Bombay Natural History Society looks after the day to day management of the centre through its Centre Manager. The entire expenses are being met by BNHS. The Haryana Forest Department provides the administrative support in terms of obtaining permission to bring the birds to the centre and also permission from various other agencies.

II. Memorandum of Understanding between Haryana Forest Department and Bombay Natural History Society

A Memorandum of Understanding (MOU) was signed between the Haryana Forest Department and the BNHS for long term collaboration in Vulture Conservation Breeding Programme on 2nd May 2006. The MOU was signed by Dr. R.D. Jakati, IFS, CWLW, on behalf of Forest Department and by Dr. A. R. Rahmani, Director, BNHS after it was duly approved by the Government of Haryana.

III. Governing Council for the centre

The centre has a governing council which has a purely advisory role. It has the following structure:

Chairman	:	Principal Secretary, Environment and Forests, Government of Haryana.
Member Secretary	:	Chief Wildlife Warden, Haryana

Members

1. Central Zoo Authority (CZA)
2. Wildlife Institute of India (WII)
3. Hisar Veterinary College
4. Ministry of Environment and Forests (MOEF)
5. Director, BNHS
6. Zoological Society of London (ZSL), UK
7. Royal Society for the Protection of Birds (RSPB), UK
8. National Birds of Prey Trust (NBPT), UK
9. Principal Scientist, Bombay Natural History Society
10. Centre Manager, Vulture Conservation Breeding Centre

L. Research and training

The centre is engaged in research on various aspects of vulture conservation. Regular information is collected on their breeding biology which includes pair formation, nest distribution, incubation, nestling and fledgling periods. Information is also collected on the food and feeding habits. The observations are done through CCTV monitors without disturbing the birds.

Besides the above mentioned research, the following major projects have been undertaken by the centre:

a. Safety testing of the non-steroidal anti-inflammatory drug meloxicam carried out on the White-backed and Long-billed vultures at the centre during 2005.

Meloxicam safety testing

The testing was jointly conducted by BNHS, IVRI and Haryana Forest Department. It was done in three phases: In Phase I, meloxicam was administered to vultures orally; in Phase II, it was administered to other scavenging birds and in Phase III, the vultures were fed on meloxicam treated buffalo meat. Blood samples were collected 48 hours after feeding. There was no adverse reaction to the drug. No significant changes were noticed in the haematological and biochemical

parameters either. This experiment gave strong evidence that meloxicam is totally safe for vultures and other scavenging birds. It is known to be as effective to cattle as diclofenac is and hardly has any side effects.

b. Vulture monitoring and surveillance

One of the main activities of the vulture centre has been nationwide surveillance and monitoring of vulture populations and colonies. Annual nationwide surveys have been an integral part of the project since its inception, as without the data provided by these observations, it is impossible to know the extent or spatio-temporal variations of the declines in India. The annual surveys conducted have provided valuable data on the degree and geographical extent of the declines. The latest survey carried out in 2007 has showed that populations of three species of *Gyps* vultures continue to decline precipitously, with White-backed vulture declining at the catastrophic rate of approximately 42.3% per year and the Long-billed and Slender-billed vultures at the rate of over 17% per year.

c. Best Practice Review Workshop

A workshop on 'Best Practice review of the Vulture Conservation Breeding Programme' was held from 5th to 7th December 2006 with the objective to produce a manual 'Best Practice Guidelines for Indian Vulture Conservation Breeding Programme'. The participants included officials from Forest Departments of Assam, Andhra Pradesh, West Bengal, Haryana and Maharashtra. Organizations like IVRI, WII were also represented. International experts from the RSPB, ZSL, ICBP, The Peregrine Fund and IUCN Reintroduction Specialist Group also attended the workshop. The centre provided all the logistics and support. It was funded by the RSPB and Darwin Initiative for the Survival of Species, a UK Government grant. A manual has been produced with the input from various experts and will form the baseline for running a conservation breeding programme of vultures.

d. Workshop on tissue extraction and ELISA based analysis of diclofenac

The workshop was held at the centre from 28th April to 6th May 2009. The main resource persons were Dr. Mark Anthony Taggart from University of Aberdeen, UK, and Dr. Mohini Saini from IVRI. The participants were researchers from BNHS and IVRI. The main objective of the workshop was to impart training on the ELISA (Enzyme Linked Immuno-Sorbent Assay) based analysis of diclofenac which will help in determining whether an animal carcass has diclofenac in the tissue or not. This will help in making sure that the food offered to vultures is free of diclofenac. The workshop gave attendees a practical, highly interactive, hands-on experience of the laboratory based techniques that could be used to both extract and analyse diclofenac in animal tissues. Such work is relevant to the ongoing long term conservation and protection of critically endangered *Gyps* species of vultures within India.

e. Carcass sampling workshop

To determine the quantity of diclofenac still being used in the cattle, cattle carcass samples are being collected from different parts of the country. A carcass sampling workshop was conducted at the centre in March 2009. Drs. Vibhu Prakash (BNHS) and Richard Cuthbert (RSPB) demonstrated the techniques of collecting liver tissue samples from fresh animal carcasses and storing them in a portable freezer. The samples would finally be transferred to IVRI for further analysis using ELISA technique. The training was imparted to project veterinarians with the objective of ensuring uniformity in sample collection and to avoid contamination between samples. The resource personnel and the participants visited the Panchkula carcass and garbage dump, Haryana, for hands-on training.

Project veterinarian at Panchkula carcass dump for hands on training on collection of carcass samples

Facilities for research at the centre

The centre provides facilities for carrying out research for Master's as well as doctoral degrees. So far, 3 students have done their dissertation at the centre.

- Mr. Pradeep Sarkar and Mr. Debasish Bhakta from North-East Regional Institute of Science and Technology (NERIST), on a summer training course, visited the centre from June 1 to July 20, 2007. They took part in

the day to day activities of the centre. The students submitted their dissertation on captive management of vultures.

- Mr. Dipankar Lahkar, a student of second year Master's degree in Wildlife and Conservation Biology, North Orissa University, carried out four months dissertation on 'Captive management of vultures with special reference to their feeding ecology at VCBC, Pinjore'.

M. Breeding

The centre is carrying out conservation breeding programme for the three resident *Gyps* species of vultures namely White-backed vulture, Long-billed vulture and Slender-billed vulture. So far, 8 nestlings of White-backed, 3 of Long-billed and 4 of Slender-billed have successfully fledged at the centre. The breeding of all the three species has happened for the first time ever in the world.

N. Education and awareness

The education and awareness programmes are frequently carried out by the centre. The centre's Technical Assistant visits schools around the centre and gives slide shows and shows a documentary on the centre. The students are explained the role of vultures in the ecosystem and the causes of vulture decline. The role of a conservation breeding centre of vultures in saving the species is explained in great details. Vulture awareness programmes are also carried out in the neighbouring villages.

Illustrated talks are also given to the staff of local Forest Departments, trainees of various forest schools including Forests Research Institute, Indira Gandhi Forest Academy and various state forest institutes.

O. Capacity building of staff

a. Training of Dr. Vibhu Prakash

Dr. Vibhu Prakash, Principal Scientist at the Centre, visited the International Centre for Birds of Prey, UK, for three months during 2001 to understand the working of a raptor breeding facility. He worked with Ms. Jemima Parry-Jones, Director, NBPT, who is an international expert on the captive care, husbandry and breeding of birds of prey. He also visited The Hawk Conservancy, Andover, UK, where White-backed vultures were held in captivity and were part of a breeding programme. He did hands-on work on vulture captive management and care along with the Director Mr. Ashley Smith.

b. Training of Dr. Devojit Das

Dr. Das, Project Veterinarian, was sent to UK in 2004 for two weeks advanced training in vulture care and management at the Institute of Zoology, ZSL and worked with pathologists and microbiologists to learn the latest techniques in disease diagnostics. He visited the National Birds of Prey Centre for training in captive care and management of birds. At the Greendale Laboratory, he was trained in avian clinical pathology. He also visited the Strud Veterinary Laboratory and undertook training related to anesthesia, X-ray and management of fracture wound in birds.

c. Training of Dr. Puja Basu in ARKS

Dr. Basu, Project Veterinarian, attended workshop on Animal Record Keeping System (ARKS) software, a product of International Species Information System (ISIS), organized by CZA and MC Zoological Park, Chhatbir (Punjab) at Chandigarh from 10th to 15th February 2009. The workshop dealt with navigation through ARKS, maintenance routines, addition of specimens into a collection, setting up of enclosures, entering animal transactions, addition of animal identifiers etc.

d. Training of Mr. Mandar Dilip Kulkarni

Training in general molecular biology practices.

Mr. Mandar D. Kulkarni attended two training programs on the 'general practices in molecular biology' at School of Science, NMIMS University, Vile Parle, Mumbai in July and December 2010.

Training in Molecular sexing of vultures

Mr. Mandar D. Kulkarni, Centre Manager, attended training on the 'new tools in molecular sexing of vultures' at Indian Veterinary Research Institute, Izzatnagar, Bareilly, Uttar Pradesh from date 16th to 20th November 2010. The training included application of new PCR method for identifying gender of vultures which are otherwise very difficult to sex visually.

Training in SPARKS

Mr Mandar D. Kulkarni attended workshop on SPARKS software, a product of International Species Information System (ISIS), organized by CZA and Assam State Zoo, Guwahati (Assam) from 30th November to 4th December 2010. The workshop dealt with navigation through SPARKS, maintenance of data by creating a STUDBOOK, addition of specimens into a studbook, setting up of enclosures, entering animal transactions, addition of animal identifiers and various other topics.

e. Training of Mr. Rohan N. Shringarpure

Mr. Rohan N. Shringarpure attended training on the general microbiological techniques for isolation and identification of bacteria, at the School of Science, NMIMS University, Mumbai, for getting hands-on experience which could be applied to the study of microbial profile in vultures. He was also trained in isolating bacterial DNA from cultures and performing PCR to amplify specific bacterial sequences.

f. Training of Ms. Nikita Prakash in avian egg incubation

Ms. Nikita Prakash attended an avian egg incubation workshop at International Centre for Birds of Prey, at Newent, Gloucestershire, U.K from 24 to 26th November 2010. The course was conducted by experts from San Diego Zoo and Los Angeles Zoo, USA. It was an intensive hands on workshop where the participants were given training in all aspects of raptor egg incubation.

g. Workshop for establishment of ex-situ conservation centres for vultures in Indian zoos

The Wildlife Institute of India organized a three day workshop for 'Establishment of Ex-situ Conservation Centres for Vultures in Indian Zoos' at Pinjore from 1-3 November 2006 in collaboration with the BNHS and the Haryana Forest Department. The CZA, the apex regulatory body of Government of India for keeping animals and birds in captivity, sponsored this workshop. The major objective of the workshop was to train the participants in developing a project proposal for the proposed conservation breeding centres in the four zoos identified by Government of India.

These zoos are:

1. Van Vihar, Bhopal, Madhya Pradesh
2. Nehru Zoological Garden, Hyderabad, Andhra Pradesh
3. Nandan Kanan Zoo, Bhubaneshwar, Orissa,

Dr. Vibhu Prakash, resource person, addressing the participants at the workshop.

4. Sakkarbaug Zoo, Junagadh, Gujarat.

The main resource persons for the workshop were drawn from Haryana Forest Department, VCBC, Pinjore, WII and IVRI.

h. Vulture veterinary workshop

Very little information on the veterinary care of captive birds is available and very few people in our country are trained in veterinary care of captive birds. A Vulture veterinary workshop was conducted at the centre during October 2005. Dr. Andrew Routh, Senior Veterinary Officer, ZSL, Drs. Vibhu Prakash, Devojit Das and Percy Avari, all from BNHS, were the resource persons. Five Indian veterinarians and a veterinarian from Nepal attended the course. These veterinarians are potential employees for the Vulture Conservation Breeding Centres being planned in India and Nepal. The areas focused during the workshop were avian anatomy and physiology, pharmacology, avian anesthesiology, surgery and orthopedic care, principles of rescue and rehabilitation, housing and release techniques, post-release monitoring of wild animals and sampling techniques. There were both classroom and practical sessions.

i. Training in captive care and management of vultures imparted by the centre

The centre now has gained more than 8 years experience in the captive management and care of resident *Gyps* species of vultures; it is recognized by the CZA as the coordinating institution for the conservation breeding of vultures in the country. It has been imparting training to various stakeholders in conservation breeding programme.

A team of six staff of Vulture Conservation Breeding Centre, Nepal, including the Project Manager, vulture keepers and an Assistant Wildlife Conservation Officer, Chitwan National Park, visited the centre in August 2008 for training. They were shown the centre and were explained the functioning of the centre in detail. The birds and aviaries were shown through CCTV monitors and identification of the three species of vultures was explained. Data collection and recording was demonstrated. Catching of birds at the centre was demonstrated and their processing like ringing, microchipping, morphometrics, moulting patterns was explained to them.

Zoo officials from Sakkarbaug Zoo, Gujarat; Van Vihar, Madhya Pradesh; Nandan Kanan, Orissa and Nehru Zoological Park, Andhra Pradesh were imparted training in captive breeding, vulture husbandry care and captive management.

A visit to the centre by In-service Officers and Officer trainees has become part of the various technical courses conducted by the country's premier forest training institutes - Indira Gandhi National Forest Academy, Dehradun, Uttaranchal and forest training school. Batches of officers and field staff regularly visit the centre.

Students of Master's course as well as Forest Officer's refreshers course conducted by the WII, visit the centre as part of their ex-situ training module.

j. Training of volunteers

The centre has been spreading the message of vulture conservation by training youngsters regularly and engaging them as volunteers.

Ms. Ruchi and Drishti Dave provided voluntary service at the centre from 10th to 19th May 2007, when most of the staff was occupied with nation-wide vulture surveys. Both the volunteers participated in all activities at the centre right from cleaning aviaries, providing food to the birds, to observing them through CCTV monitors. A good spin-off of the experience that Ruchi gained from her visit was that the Forest Department, Gujarat, recognized her as a trained person in keeping vultures and made her the honorary Wildlife Warden.

Ms. Supriya K Nair provided voluntary services from 23rd May to 4th June 2008 at the centre during her summer holidays. A second year B.Sc. Zoology student at Delhi University who had keen interest in wildlife, studied vulture behavior through CCTV monitors particularly the nesting, feeding and perch utilization.

Mr. Dave Dick, Mr. Roger Broad and Mr. Duncan Orr-Ewing from RSPB visited the centre during their sabbaticals between February and March 2006. They participated in day-to-day running of the centre, supervising the construction work, releasing birds in the aviaries, handling birds, taking morphometric measurements, feeding and observing birds.

A batch of forest trainees at the centre

A volunteer at the centre

P. Funding

Most of the funding for the centre has been provided by the Royal Society for the Protection of Birds, U.K. with major supporting grant from Darwin Initiative for the Survival of Species, a U.K. government funding and Rufford Foundation, U.K. The Ministry of Environment and Forests, Government of India funded construction of breeding aviaries through Haryana Forest Department. The centre has been fortunate to obtain funding for the vulture programme from several other donors, both in cash and kind.

The Zoological Society of London, UK donated a Leica microscope, Thermal Cycler (to carry out PCR), ELISA Washer and Reader, gas anesthesia machine, vulture rings, microchips and microchip readers.

Synermed Europe Ltd. donated a veterinary biochemistry analyzer to the centre's laboratory for the duration of the project. It is a fully automated machine and mainly used for checking the levels of uric acid, albumin, proteins and creatine kinase in the blood serum of vultures.

The International Centre for Birds of Prey, UK has funded the purchase of a centrifuge machine, two state-of-the-art incubators and a hatch-maker and the construction cost of eight nursery aviaries.

The British High Commission, New Delhi has funded the installation of a three-phase electricity connection to the centre and a satellite-tagging project to investigate the origins of migratory *Gyps fulvus* and *Gyps himalayensis* that over-winter in India.

The Body Shop, UK, a cosmetic company, funded the construction cost of the third colony aviary in which the Slender-billed vultures are presently housed.

The Los Angeles Zoo has donated a high power Lyon candler to the centre.

Q. Other unique activities

i. The centre helps in rescue and rehabilitation of raptors found in Haryana.

ii. Based on the experience gained from breeding *Gyps* vultures, the centre is now an advisor on conservation breeding of other bird species.

iii. The centre's veterinarian helps the local villages in treating their livestock in emergencies. The villagers are also advised not to use diclofenac.

R. Achievements

Breeding of vultures at the centre

The centre has successfully bred 8 nestlings of White-backed vultures, 4 of Slender-billed vultures and 3 of Long-billed vultures, during the breeding seasons of 2007-08, 2008-09 and 2009-10.

Breeding season of vultures at the centre commences from the month of September when established pairs in the colony aviaries begin defending their nest ledges and sit together most of the times. They copulate on the nest ledges, collect nesting material and build nests. This coincides with the onset of breeding season in wild.

The White-backed vultures were the first ones to initiate breeding at the centre in the year 2005-06. The Long-billed and the Slender-billed vultures attempted breeding for the first time in 2006-07.

i. White-backed vulture

The first attempt at nesting at the centre was observed in the breeding season of 2005-06. Two pairs of White-backed vultures attempted breeding in colony aviary. A clutch size of one egg was observed in both the nests. The eggs were laid in December. Both the sexes shared equal responsibilities. The nesting was not successful as one egg broke in the nest and

White-backed vulture with nestling.

Long-billed vulture on its nest

the other egg failed to hatch in spite of an extended incubation.

During the breeding season of 2006-07, two nestlings of the White-backed vultures, hatched at the centre on 1st and 5th January 2007, respectively. This was the first ever hatching of White-backed vulture egg in captivity anywhere in the world. Unfortunately, neither of the nestlings survived but this was not unexpected from first time parents.

The programme finally tasted success in 2007-08 when two out of four eggs hatched and fledged successfully.

During the breeding season of 2008-09, a total of five nestlings hatched of which 3 fledged successfully and two did not survive. An average incubation period of 55 days (N=5) and nestling period of 121 days (N=3) was recorded. Both parents shared equal responsibility in raising the nestling.

During the breeding season of 2009-10, a total of five nestlings hatched of which three survived. One nestling was hatched in the incubator and was successfully raised. This happened first time ever for the species.

ii. Long-billed vultures

The first attempt at nesting by the Long-billed vultures was noticed in 2006-07 when three pairs were formed in the colony aviary. No eggs were, however, laid as the birds were only 2-3 years old. Six pairs were formed in 2007-08 and each laid an egg but none hatched as the birds were 3-4 years old and they gain adulthood between 5-7 years.

Five pairs were formed in 2008-09. Five eggs were laid but they did not hatch. During 2009-10 however, 3 nestlings successfully hatched in artificial incubators and fledged successfully.

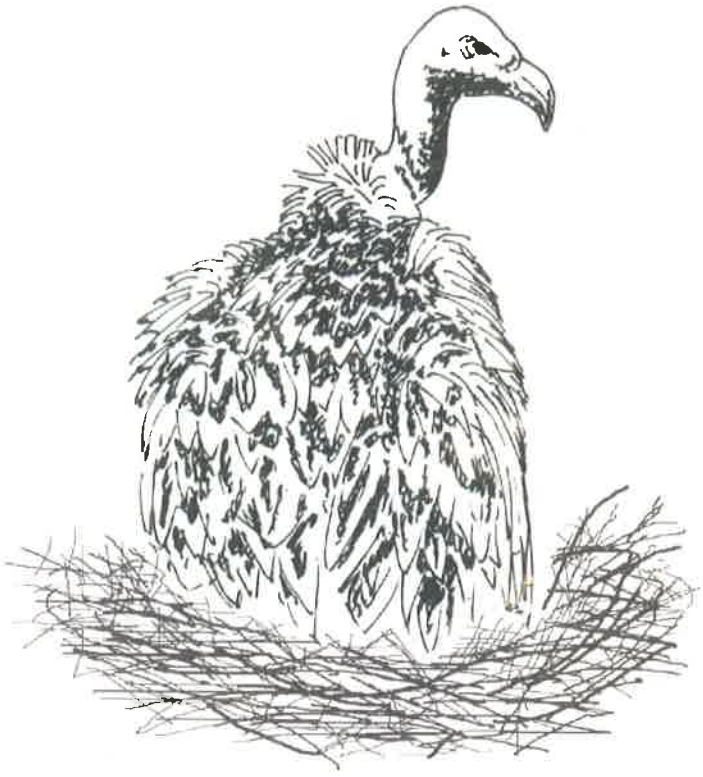
iii. Slender-billed vultures

The first attempt at breeding by the Slender-billed vultures was noticed in 2007-08 when three pairs were formed in the colony aviary. However, no eggs were laid as the birds were sub-adults. In 2008-09, three pairs were formed but only two laid an egg each and only one egg hatched on 2nd March 2009. An incubation period of 57 days was recorded and both the parents shared equal responsibility in bringing up the nestling. The nestling fledged successfully on 8th August 2009 after 156 days of nestling period. This hatching of Slender-billed vulture egg had happened for the first time in captivity. Subsequently three more nestlings successfully fledged during the nesting season of 2009-10.

Slender-billed vulture with nestling

VCBC

Part 2 Future Plans



CHAPTER 1

Future objectives including mission statement/theme

I. Mission

To release 100 pairs each, of the three species of critically endangered resident *Gyps* species of vultures, in the next fifteen years to establish at least one viable population of *Gyps*, in an environment free of diclofenac and other poisons.

II. Vision

To become a living example of saving critically endangered bird species from extinction with ex-situ conservation programme.

III. Conservation message of the centre

The wildlife species are better conserved in nature but could certainly be saved from extinction by ex-situ efforts if there is a problem and rehabilitated in wild once the cause of mortality is removed.

IV. Objectives

1. To establish a founder population of 25 pairs each of 3 species of vultures
2. To produce a population of at least 200 birds of each species in 15 years to be reintroduced to the wild.
3. To rescue injured wild resident *Gyps* vultures and include them in the ongoing conservation breeding programme after recovery.

CHAPTER 2

Proposed changes in the collection plans

A. Collection plans

The centre's objective is to house 25 pairs of each of the three species namely, White-backed vulture, Long-billed vulture and Slender-billed vulture at the centre. To get 25 breeding pairs, we need at least 60 birds of each of the species to take care of mortality or birds which will fail to form pairs. The centre will aim to keep at the most 180 birds. There will not be any change in the current collection plan. The centre has 57 White-backed vultures but has the capacity to house 70 vultures. It will accept 13 more White-backed vultures if they are rescued and brought to the centre. There are 58 Long-billed vultures and the centre has capacity to keep 70 Long-billed vultures. The centre would accept 12 Long-billed vultures if they are rescued and brought to the centre. The centre has 18 Slender-billed vultures but could house 70. It would try to procure 52 birds from the wild or rescued birds

a. Egg manipulation and management to augment the population of vultures

Vultures normally lay a single egg every year but can relay within one month, if the egg is lost during the initial period of incubation. At the centre, we plan to remove eggs from a few nests after they have been incubated for ten days by the birds and put them in incubators at the centre. The birds will relay within a month and this egg will be incubated by them. The nestlings which will hatch in incubators would be hand reared. They would be reared in groups of 2-3 and care would be taken that the nestlings do not see the handlers to avoid imprinting. In this way, it will be possible to raise two nestlings from a pair instead of one. This has also been done in other conservation breeding programmes of vultures like the Californian Condor in USA and Griffon vulture in France and Israel. Monitoring of identified release sites will be taken up to make sure there is enough food and habitat available for the released vultures. It would be ensured that there is no diclofenac used for treating livestock in at least 100 km radius of the release sites, prior to release.

b. Reintroduction plan of the three resident *Gyps* species of vultures

The reintroduction of the three species of resident *Gyps*, White-backed vulture, Long-billed vulture and Slender-billed vulture will begin only after 2015. The birds will be released in flocks of not less than 20 birds. Most of the birds will be captive bred at the centre but few (5%) will also be wild caught adult birds. The wild caught adult birds know the tricks of survival in wild and hopefully will act as guide birds to the captive bred birds.

The areas where the birds will be released will be monitored from at least a year before release and it would be made sure that no diclofenac is used in the radius of 100 km of the release sites. The release site will be close to the centre or to a place where vultures are present in good numbers. This will be achieved by high level advocacy in these areas. The birds will not be released if it is found that diclofenac is still being used in the areas. All released birds will be satellite tagged and will be monitored at least till the time they start breeding in the wild.

The release programme will commence after the year 2015. The birds hatched at the centre will be kept for two years and then will be released in the pre-monitored sites. The birds will be released in flocks of 20 with a few wild caught adults which will act as guide birds. The released birds will be fitted with satellite tags and will be constantly monitored.

B. Lay out plan of the Vulture Conservation Breeding Centre

The centre territory is demarcated by a 6' high chain link fence. It has been proposed to increase the height of the fence to 8', in compliance with CZA standards.

The centre has three holding aviaries towards its south eastern end, four hospital aviaries, seven nursery aviaries and a recovery aviary. There is a laboratory building which houses haematology, molecular, biochemistry, microbiology laboratory, CCTV room, freezer room, store room, watchman's room and restrooms. The clinical room and critical care rooms are in the adjacent building. All these structures are at the south eastern and south western end of the centre. The main entrance gate is on the south western end of the centre. Between the gate and the laboratory building is a water tank in the ground of 10x10x8' dimension. (Appendix-1)

The three colony aviaries are in a row north of the holding aviaries. There is a gap of 30' between each aviary.

Two display aviaries, the breeding aviaries and a water tank are at the northern end of the centre about 10 m from the chain link fence. The water tank is to the northern end and the display aviaries are at the north-eastern end.

C. Proposal for the future

The ultimate aim of the conservation breeding programme is to reintroduce vultures in the wild. The centre, in the coming years, will endeavor to create facilities and breed vultures in good numbers for the success of the release programme. Construction of two new colony aviaries and a CCTV monitor cum Interpretation room is proposed to meet the ultimate aim.

i. Colony Aviary

There are a total of 135 birds at the centre and their number is increasing by the hatching of the nestlings at the centre. On an average 15 nestlings are expected to successfully fledge at the centre. There are three colony aviaries at the centre each holding around 30 birds. Rest of the birds are housed in the holding aviaries. There is an immediate need of constructing two colony aviaries (100x40x20'). The aviaries are good for holding as well as for breeding vultures.

ii. CCTV monitor and Interpretation Room

It is proposed to build a oom which could serve as a CCTV monitor cum Interpretation room (25x30'). The room will be utilized for keeping CCTV monitors and also for displaying material on the vulture conservation breeding programme. This room will be at the entrance of the centre and will be utilized for imparting information to visitors at the centre.

Though the centre is mainly an off display facility, with the growing interest in vulture conservation, number of people show keen interest in visiting the centre. The Interpretation room will be constructed close to the water tank on the northern end of the centre. A new entry gate will also be constructed on the northern end. Important visitors including government officials, media persons, students and teachers will be allowed to come through this gate and into the Interpretation room.

The Interpretation room will have all the monitors of the CCTV cameras. The visitors will be shown the birds on CCTV monitors and live birds in the display aviary. Thus the main Conservation Breeding Centre will remain undisturbed.

iii. Construction of a food processing room

The centre brings skinned goat carcasses from its facility which is located 10 km from the centre. The meat is then weighed and distributed to various aviaries. The meat for the new born nestlings also needs to be prepared by chopping it down into smaller pieces and grinding the pieces in a mixer. The centre does not have a facility to prepare food in one place.

It is proposed to build a kitchen of 20x12x10'. It will have a central platform which will be sloped towards one end. There will be a drain in the middle which will take all the waste in the main drain. The drain will empty in a septic tank.

There will be a slanting platform with cabinets underneath for storage of essential implements. The room will also have a refrigerator to store food for the nestlings. The room will ideally be air conditioned.

iv. Electrification of all the aviaries

All the aviaries need to have electricity connection according to the CZA specifications. None of the aviaries have an electricity connection. It is proposed to give electric connection in each of the aviaries. The centre has three phase connection till the incubation rooms. The electricity will have to be extended upto another 200 m till the display aviaries and the proposed Interpretation Centre.

D. Proposal to address the inadequacies and shortcomings identified in the appraisal report

The centre intends to breed 25 pairs of each of the three species, White-backed vulture, Long-billed vulture and Slender-billed vulture. The centre has an adequate number of White-backed and Long-billed vultures but only 18 Slender-billed vultures. The Slender-billed vulture population has declined over most of its range but is still seen in Assam. Efforts will be made to either collect rescued vultures or collect vultures from the wild with the help of CZA and Assam Forest Department.

i. Construction of food processing room

It is proposed to construct a food processing room as it is a problem to prepare food for vultures in the open, especially during monsoon and winter. The room will be equipped with water and electricity and will be air conditioned. The mixer cum grinder will help in preparing food for the nestlings.

ii. Construction of spurs in the nearby river

Construction of spurs in the river flowing next to the centre by the Forest Department has provided relief from the river water entering the centre during monsoon. Couple of additional spurs will totally stop the flow of water in the centre. The Haryana Forest Department has promised to construct the spurs.

iii. Prevention of bee attack

To prevent the attack of bees, the hives of rock bees are constantly removed. The branches where the hives are constructed are painted with coal tar and jute cloth is hung from the branches. The fluttering of the cloth prevents the bees from building the hive.

A layer of bamboo now lines all the wire mesh netting in the aviaries from the sides which face the tree with bee hives. These bamboos obstruct the movement of bees. A thin curtain of the same jute cloth is also lined on the outside of the wire mesh which faces the bee hive.

A protocol has been developed which is followed during the bee attack. The staff puts netted covering on the head which covers the entire face and head and wear long gloves. The staff is also given a bee repellant. Fire extinguishers are placed in every aviary. The cold jet of the gas drives the bees away.

The birds stung by bees are immediately captured and are put in a box after removing all the stings and are treated with an ammonia salt to neutralize the acidic bee sting. The birds are also given steroids and non- steroidal anti- inflammatory drug, meloxicam and are then allowed to rest in the wooden boxes. The boxes are kept indoors in thermo-controlled room to keep them warm.

Floods at the centre

CHAPTER 3

Personnel planning

a. Present Staff

Project Leader: Chief Wildlife Warden

The Chief Wildlife Warden is the leader of the Project and is responsible to give direction to the programme. All the work is done under his guidance.

Project Manager: Dr. Vibhu Prakash, Principal Scientist, BNHS

The Project Manager is in charge of the Vulture Conservation Breeding Programme and is responsible for the implementation and execution of the programme. He is responsible for bringing in funding and recruitment of various categories of staff in consultation with BNHS headquarters.

Technical Assistant: Ms. Nikita Prakash

The Technical Assistant is responsible for the management of all the data generated including periodically updating it. She is responsible for producing reports and publications of the centre. She is also responsible for the artificial incubation and rearing of nestlings.

Centre Manager : Mr. Mandar D. Kulkarni

The Centre Manager is responsible for the day to day running of the centre. He is responsible for the smooth running of the centre by co-coordinating with other staff members. He is responsible for following the cleaning, husbandry and care and feeding protocols. He reports directly to the Project Manager on a day to day basis. He is also responsible for the DNA sexing of vultures as a special field of interest.

Staff at the centre

Research Biologist: Mr. Rohan Shringarpure

The Research Biologist is responsible for the behavioral observations of vultures in captivity as well as in the wild. He is responsible for monitoring the breeding behavior, nesting of vultures and maintenance of aviaries. He co-ordinates his work with the Centre Manager. He also works on the molecular pathology of vultures.

Veterinarian: Dr. Parag Deori

He is responsible for the veterinary care of vultures. He does daily health monitoring as well as annual health monitoring. The haematology, biochemistry and analysis of fecal samples is routinely carried out. Minor surgeries are also carried out at the centre. He works in co-ordination with the Centre Manager.

Supervisor: Mr. Jaikishan Sharma

He is responsible for the up keep of birds and daily maintenance of the aviaries. He is responsible for changing water, preparing food for the vultures and feeding them. He also supervises the incubation and feeding of nestlings. All the vulture keepers report to him and he in turn reports to the Centre Manager, Veterinarian and Research Biologist.

The two vulture keepers and night watchman assist all the above staff in running the centre

Administrative Assistant: Mr. Niranjan Dalei

The Administrative Assistant assists the Centre Manager in the administration and also looks after the accounts.

b. The proposed recruitment of staff

Two biologists will be recruited to monitor the proposed reintroduction areas. They will assess food and habitat availability, prevalence of diclofenac in a radius of 100 km from the release site, will carry out awareness programmes and interact with the authorities to implement the ban on the veterinary use of diclofenac. They will report to the Project Manager.

Adult Slender-billed vulture

CHAPTER 4

Disaster management

The centre is located within the seismic zone and is also near a seasonal rivulet. So there could be problems with earthquake and flooding. It is close to forest area which has a good number of rock bee hives which makes centre prone to rock bee attack. There has been no incidence of theft or vandalism and there is no immediate reason to think that it could be a problem.

The main worry during a disaster is the safety of birds. All the staff are trained in catching and handling vultures. The centre always has 50 vulture transport boxes to immediately shift the vultures in case of an emergency.

Line of command during calamity

In time of a calamity, the vulture keepers are supposed to immediately inform the Supervisor, who resides close to the centre. They also inform the Centre Manager over the telephone. The Supervisor should immediately reach the centre to assess the damage or problem and inform the Centre Manager. The Centre Manager informs the Project Manager who in turn informs the Project Leader and rushes to the centre.

The Supervisor starts the rescue work according to the protocol. All the vulture keepers are immediately called to the centre. One of the vulture keepers lives on the premises of the centre.

The practice drill is done every three months when all the staff participates in full preparedness.

A. Earthquake

The aviaries have been made earth quake proof by putting iron rods in the foundation. However, in event of damage to the aviaries by earth quake, every aviary is equipped with instruments to cut open the wire and break the brick wall to remove the vultures. Each aviary has a set of wire cutters, spade, hack saws, hammers, pliers of different sizes and screw driver. Ten sets of hand held nets are also kept to catch the vultures. The first aid box is also kept in the aviaries. The electricity connection is immediately disconnected.

There are over fifty vulture boxes to transfer vultures. The wooden boxes are big enough to keep vultures for a day or two if required. In case of damage due to earth quake the vultures will be kept in the boxes till temporary aviaries are erected. The material for temporary aviaries like netlon is cut to the size of the aviary, pipes with hooks and other material required is kept ready. The aviaries would be erected within four to five hours. There is a portable diesel generator which is kept in ready to use condition. Rechargeable torches and battery operated torches are kept ready with the watchmen.

B. Floods

Seven spurs have been erected in the rivulet along the centre to divert the flood water from coming into the centre. We need to put up two more spurs in the river, just before the beginning of the centre's land, to make it a foolproof arrangement. The Haryana Forest Department has promised to build two more spurs in the near future.

Damage to the Colony Aviary caused by floods

If the water does enter the centre, the birds are not affected much. The aviaries get flooded, but as the centre is at a slope, all the water ultimately flows down. Efforts are made to make sure that the water does not stagnate in the centre. When the water recedes lot of debris needs to be cleaned and repairs are needed to the fence and sometimes to the walls.

The birds are kept under observation but no attempt is made to catch them as they remain perched at a height.

C. Attack by Rock Bees

On the 5th January 2005, a swarm of wild rock bees attacking a Crested Honey Buzzard were led by the Buzzard to one of the vulture aviaries. The bees then attacked the vultures. 13 of the vultures were badly stung and out of them four died of anaphylactic shock. This appeared to be a freak incident but could happen again. So various measures have been taken to avoid the attack after consulting the Bee Research Institute at Pune. Details of the measures taken are described in chapter 2.

CHAPTER 5

Contingency plan to address emergencies

A. Dealing with bird escape

If a bird escapes from the centre, the only way to get it back is to catch it. The bird will be located and then will be lured on a carcass. The bird will then be caught by the centre's trapper. Usually the trappers lure the bird on carcasses and then catch it with the help of a bamboo trap. A fresh cattle or goat carcass is used as bait and the trapper sits in a grass hide some 10-15m from the carcass, waiting for vultures to feed. He uses a long bamboo pole which is about 60' long and collapsible. The terminal end of the bamboo, of approx. 3' long, is very supple, thin and bifid. It is coated with very sticky glue, which is a mixture of the latex of 'peepal' tree *Ficus religiosa* and mustard oil. When the vultures start feeding on the carcass, the bamboo pole is gradually slithered on the ground towards the foraging vultures by the trapper, sitting in the grass hide. When the bamboo is approx. 5 feet away, the trapper swiftly thrusts it on the body of the feeding vulture. The vulture is then unable to fly. The trapper then rushes and grabs the bird. The glue does not damage the plumage and comes off easily with any vegetable oil.

The trapper is employed by the project and is always available.

If the bird is in captivity for a long time, it is very likely that it will hang around the vicinity of the centre and would be easy to catch. The bird which has recently been caught will fly away immediately and will be difficult to catch. Wild vultures hang around the aviaries where vultures are kept regularly. The availability and company of vultures attract them to these aviaries. So it is possible that the escaped vulture might also come back and would be easily identified with its ring number and wing tag.

The Chief Wildlife Warden and Central Zoo Authority will be immediately intimated about any escaped birds.

B. Monkey and dog menace

At the moment there is no problem regarding monkeys or stray dogs. The six feet high perimeter fence keeps the dogs away. As not many villages are around the centre, the dog population is low and there has been no problem so far.

There is no food for monkeys at the centre, so they do not visit the centre. No fruiting trees grow at the centre and the staff is strictly advised not to throw food around. The monkeys are regularly seen around the centre going in the agriculture fields but are not attracted to the centre.

All the aviaries are monkey proof as they have a welded iron mesh on the top and a layer of tough plastic netting, a foot below it. The double door protection also makes it impossible for the monkeys to enter the aviaries.

Increase in dog population since vulture decline

C. Snake bites

There are number of snakes seen with the centre. The Bronze Keelback is the most common snake followed by wolf snakes, cat snake, rat snake, Python. There are also poisonous snakes like Cobra and Russel's viper. We keep at least 10 vials of the anti-venom serum prepared by Haffkines Institute, Mumbai, in stock. The vials are kept at a cool and prominent place in the custody of the Veterinarian. The instructions of use are also kept pasted on the board. The doctors in the nearby hospitals have also been informed about the anti-snake venom stored at the centre.

The staff is trained in simple steps to avoid contact with snakes.

D. Food in event of a strike

The vultures are fed on freshly slaughtered goats. The goats are kept with us for ten days before they are slaughtered. So the centre always has with it food supplies for more than a week and sometimes for more than two weeks. So it is unlikely that the centre will ever face a food shortage due to strike.

In an eventuality of food shortage due to a strike, goats could also be purchased locally from the villages around. At least three goat herders are known to the centre staff in the vicinity of the centre.

E. Infighting between animals

Vultures are very social birds and live in big flocks. They do not defend territories and do not have any serious fights. In our ten years of experience in keeping vultures in captivity, we have never come across serious fights among vultures injuring each other.

However, the vultures are constantly under CCTV camera observations and if a serious fight does break out, the keepers will immediately go in and separate the birds. The problem maker will be isolated from the flock.

F. Epidemics

So far, we have lost 10 White-backed vultures and 3 Long-billed vultures at the centre. Almost half of the mortalities in White-backed vulture took place in 2005, when four vultures were stung by wild rock bees. The other mortalities in vultures were mostly in the birds which were injured by the kite string in Gujarat. They developed complications in the injuries and died. No vulture has died of any specific disease.

There was once an outbreak of Avian Pox in the colony aviaries and only the juvenile birds were affected. The birds got over the infection on their own and did not require any treatment.

Most of the vulture mortalities in the wild have occurred because of the non-steroidal anti inflammatory drug diclofenac. The diclofenac causes an increase in the uric acid level in the blood. So blood biochemistry of at least 10% of the birds is routinely checked to see if there is any increase in the uric acid levels. It is always made sure that the food given to vultures is diclofenac free by keeping the goats in the care of the centre for a week before slaughter. Diclofenac is excreted out of the body within 72 hours of administration. In order to find out whether diclofenac is still causing mortality in vultures in the wild, the post mortems are carried on the vulture carcasses received from various states and their tissue samples are analyzed for the presence of diclofenac.

Vultures are susceptible to many avian diseases like Raniket disease, Avian Influenza etc. All the biosecurity measures are taken to prevent the spread of disease. The Blue-rock pigeons are kept away from the aviaries by plugging all the holes in the aviaries. Foot baths are kept at the entrance of the aviaries to prevent the spread of any pathogens.

The birds are visually checked by the veterinarians three times a day. Any bird showing abnormal behavior is immediately isolated and its blood and fecal samples are taken for analysis. Treatment is started immediately. The veterinarian takes advice from IVRI which is a referral centre of Central Zoo Authority in case of any problem.

All the birds are caught once a year and are given a thorough health check. Haematology is carried out on 10% of the birds.

In case of any epidemic the affected birds will be isolated and will be sent to the quarantine facility which is five kilometers from the centre. The resident Veterinarian will supervise the operations.

G. Power breakdown

The centre has a three phase power connection. It also has an 8 KV generator and two invertors for backup power. The power break downs are frequent but the back up support is enough to tide over the situation.

CHAPTER 6

Capacity building of staff

The main thrust areas where the staff will require training are husbandry and veterinary care. The staff will also periodically require training in molecular biology, pathology, artificial incubation and rearing of vulture nestlings.

The centre works in close collaboration with expert international and national organizations. The Royal Society for the Protection of Birds which is a Bird Life International partner of Bombay Natural History Society has committed to provide technical and financial support to the centre. Similarly the Zoological Society of London, U.K. advises on veterinary care and International Centre for Birds of Prey, U.K. advises on veterinary care and husbandry. Experts from these institutions periodically visit the centre and impart training to the staff. The staff from the centre also visits various other captive breeding facilities of birds of prey for training.

The centre has joint projects with the Indian Veterinary Research Institute on DNA sexing of vultures and estimation of diclofenac in the tissues of vultures and cattle. The centre's Veterinarian and Centre Manager will be sent to IVRI for updating the skills and learn advance techniques of sexing and estimation of diclofenac. The centre has a molecular room where sexing of vultures could be done using DNA. Similarly estimation of diclofenac in tissue samples will also be carried out at the centre once the ELISA technique is standardized by IVRI.

Workshop on the SPARKS software

CHAPTER 7

E-governance

The centre utilizes the website of its parent organization. The website www.bnhs.org gives regular updates on the progress made at the centre.

All the data generated is computerized and is analyzed periodically. The images from the CCTV are also saved electronically and are analyzed periodically.

The centre is a member of ISIS (International Species Information System) and provides periodic updates to CZA and ISIS.

All the data is maintained as excel spreadsheets in the computers. All daily observations, feeding details, breeding details, health and post mortem records are kept electronically. A hard copy of all the records is also maintained. The centre has internet connection though not broadband. The information about the centre is updated on BNHS website.

Communication

The communication between the centre and the Society's headquarters is by e-mail. Most of the communication with the Central Zoo Authority, Ministry of Environment and Forest and Haryana Forest Department is by e-mail as well as by surface mail.

The monthly, quarterly, six monthly and yearly reports are prepared and sent to BNHS head office mostly electronically. The relevant reports are sent to the Haryana Forest Department, Ministry of Environment and Forests, Government of India and Central Zoo Authority also.

The accounts are maintained at the centre but are sent to BNHS twice a month. The expenses are reimbursed by the BNHS on receiving the bills.

Maintenance of records in a digitized format

CHAPTER 8

Broad budget analysis for implementing the plan

A. Construction and development

i. Construction

So far, most of the funding for running the centre has come through Darwin Initiative for the Survival of Species, a U.K. government fund and the Royal Society for the Protection of Birds, U.K. The recurring cost of the centre is about Rs. Seventy Lakhs of which about 50% is the vulture food cost. The Royal Society for the Protection of Birds has committed funding for the running cost of the centre for the next five years but the centre will have to organize funding for developmental work. Funds will be requested from the Ministry of Environment and Forests, Government of India and Central Zoo Authority. Other international sources will also be explored. Most of the construction work for the centre is now completed. The construction of two colony aviaries, a food processing room, an interpretation cum CCTV monitor room and electrification of the aviaries are the important construction and development work which need to be taken up by the centre.

ii. Recruitment of additional staff

Additional staff will be required for carrying out monitoring of the areas where the vultures will be reintroduced. Two biologists will carry out the monitoring supported by two field assistants and a driver. These staff will be recruited for at least three years.

iii. Day to day maintenance

The cost of the day to day maintenance has been assured for the next five years by the Royal Society for the Protection of Birds, U.K. Food for the birds is the most important and an expensive aspect of day to day maintenance. Over Rs. 3 lakhs a month is spent on food. The staff cost is the next major cost in the day to day maintenance.

B. Proposal for the future

The ultimate aim of the conservation breeding programme is to reintroduce vultures in the wild. The centre, in the coming years, will endeavor to create facilities and breed vultures in good numbers for the success of the release programme. Construction of two new colony aviaries and a CCTV monitor cum interpretation room is proposed to meet the ultimate aim.

i. Colony Aviary

There are a total of 135 birds at the centre and their number is increasing by the hatching of the nestlings at the centre. On an average 15 nestlings are expected to successfully fledge at the centre every year. There are three colony aviaries at the centre each holding around 30 birds. The rest of the birds are housed in the holding aviaries. There is an immediate need of constructing two colony aviaries (100x40x20'). The aviaries are good for holding as well as for breeding vultures.

ii. CCTV monitor and Interpretation Room

It is proposed to build a room which could serve as a CCTV monitor cum Interpretation room (25x30'). The room will be utilized for keeping CCTV monitors and also for displaying material on the vulture conservation breeding programme. This room will be at the entrance of the centre and will be utilized for imparting information to visitors to the centre.

Though the facility is mainly for off display purpose but with growing interest in vulture conservation, number of people show keen interest in visiting the centre. The Interpretation room with be constructed close to the water tank at the northern end of the centre. A new entry gate will also be constructed on the northern end. Important visitors including government officials, media persons and students and

teachers will be allowed to come through this gate and into the Interpretation room.

The Interpretation room will have all the monitors of the CCTV cameras. The visitors will be shown the birds on CCTV monitors and live birds in the display aviary. So the main Conservation Breeding Centre will remain undisturbed.

iii. Construction of a food processing room

The centre brings skinned goat carcasses from its facility which is located 10 km from the centre. The meat is then weighed and distributed to various aviaries. The meat for the new born nestlings also needs to be prepared by chopping down in smaller pieces and grinding in a mixer. The centre does not have a facility to prepare food at one place.

It is proposed to build a kitchen of 20x12x10'. It will have a central platform which will be sloped towards one end. There will be a drain in the middle which will take all the waste in the main drain. The drain will empty in a septic tank.

There will be a slanting platform with cabinets underneath for storage of essential implements. The room with also have a refrigerator to store food for the nestlings. The room will ideally be air conditioned.

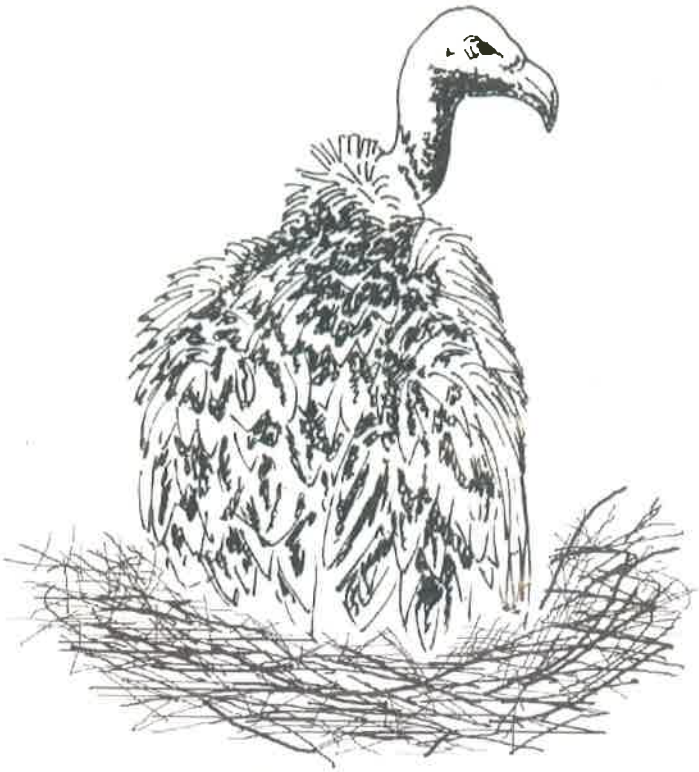
iv. Electrification of all the aviaries

All the aviaries need to have electricity connection according to the CZA specification. None of the aviaries at the centre have electricity connection. It is proposed to give electric connection in each of the aviaries. The centre has three phase connection till the Incubation rooms. The electricity will have to be extended up to another 200 m till the display aviaries and the proposed Interpretation Centre.

First ever hatchling of Slender-billed vulture

VCBC

Part 3 Management Plan 2011-2021



CHAPTER 1

Management plan including projected budget till 2021

The following will be the main thrust areas for the centre during the next five years:

a. Routine husbandry and care
b. Annual health check
c. Bi-annual cleaning
d. Double clutching and artificial incubation
e. Sexing of birds hatched at the centre
f. Study of vulture microflora
g. Collection of Slender-billed vulture
h. Monitoring of proposed reintroduction sites

a. Routine husbandry and care

The centre houses 135 birds of three endangered species of vultures namely, White-backed vulture, Long-billed vulture and Slender-billed vulture. There are two Himalayan Griffons which are not part of the breeding programme. It is a big responsibility to take the day to day care of the birds.

The Centre Manager is responsible for the day to day running of the centre. He makes sure that daily, three times visual check of birds for health monitoring is done by the Veterinarian, the vultures are fed freshly slaughtered diclofenac free goat meat twice a week at the rate of 4 kg per vulture per week, that the water troughs are topped up every day, and are totally drained out every third day and are refilled, the troughs are thoroughly cleaned every week and the goat skeletons are removed every week during non breeding season and every month during breeding season.

During breeding season i.e. from October till April the birds are fed every day with every bird getting 500gm of extra meat per week. Fresh green nest material is put regularly every week throughout the breeding season.

b. Annual health check

All birds will be caught and given a thorough health-check according to the protocols laid. 10% of the birds will be bled and their hematology and blood biochemistry will be carried out. This will be done in the months of August-September after the breeding season gets over. The Centre Veterinarian will be responsible for carrying out the Annual Health Check. The ultimate responsibility will be of the Centre Manager.

c. Bi-annual cleaning

The Centre Manager will be responsible for the bi-annual cleaning. The bi-annual cleaning is carried out once before the onset of the breeding season i.e. in the month of September and once after the breeding season ends i.e. in the month of April. A thorough cleaning will be done when all the perches will be replaced, all the ledges will be cleaned by removing the sand and washing them with disinfectant 'F-10'. The sand will be replaced by fresh river sand. The netting will be removed from the nesting cots and fresh netting will be applied. The top six inches of sand on the ground will be removed and would be disposed off. Fresh sand would be added. The water baths will be cleaned and painted with lime. All the walls will be cleaned and painted with lime. The bamboos on the windows will also be washed and the broken ones will be replaced . The CCTV camera will be serviced and damaged components will be replaced.

The cleaning in aviaries will be done from one side, so the birds could move to other side of the aviary. Sudden movements and sound will be avoided.

d. Double clutching and artificial incubation

The vultures are long-living and slow breeding birds. They normally lay one egg every year and the average nesting success is 50% in the wild. The birds lay again if the egg fails to hatch. So to increase the productivity of vultures at the centre the first clutch is removed and is artificially incubated. The females tend to lay the second egg within one month. The birds then incubate the second egg themselves. In this way two nestlings are produced per year by one pair instead of the usual one.

Double clutching and artificial incubation will be carried out during the next five years.

e. Molecular sexing of birds at the centre

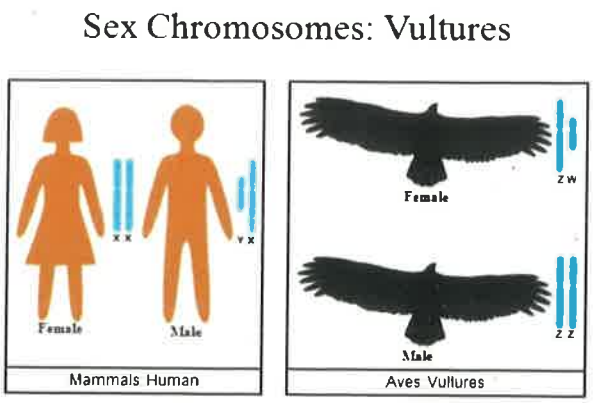
Vultures are not dimorphic birds, hence identifying their gender by visual observations is nearly impossible. In a conservation breeding programme it is important to identify the sex of every individual bird. Hence a Polymerase Chain Reaction (PCR) based method is being used for gender identification of the vultures at VCBC, which is described in brief as follows :

Polymerase Chain Reaction

PCR is the abbreviation of a molecular tool Polymerase Chain Reaction using which a particular segment of the DNA from any organism can be amplified or multiplied 1000 times its original number for further study or analysis. The required DNA can be initially isolated from any tissue like skin (i.e. feathers) or blood of the vulture.

Basic principle

In vultures as for other birds (and opposite to mammals), the females are heterogametic i.e. they have single copy of two different sex chromosomes Z and W (female: ZW); while the males are homogametic i.e. they have two copies of only one sex chromosome Z (male: ZZ). Presence of different sex chromosomes in the male and the female is the basis of the molecular sexing method. The W sex chromosome which varies from the Z chromosome is present in females and absent in males. This variation in the Z and W occurs in some of the specific segments of the DNA on these chromosomes. When the isolated DNA from both the male and the female is subjected to PCR with specific primers (which will only amplify the variable segment of DNA on the W and Z chromosomes) it will generate different PCR products for the male DNA and the female DNA. Hence when the PCR processed samples are loaded onto an agarose gel matrix, male and the female vultures will show different banding patterns, which makes the gender identification possible.



Basic principle of molecular sexing

f. Study of vulture microflora

Very little is known about the micro organisms that exist in the three *Gyps* species of vultures in captivity at the centre. Knowledge about the vulture microflora will create a database of organisms commonly found in the birds. This will have a long term application of finding organisms potentially pathogenic to vultures, and also finding the host-organism relationships.

The methodology involves isolation and identification of bacteria from swabs collected from various sites in vultures during the annual health check, using conventional microbiological and biochemical techniques, followed later by application of PCR and sequencing of the bacterial 16s rRNA gene.

Thus a database of bacteria found in vultures will be prepared, and over a period of time, potential pathogens will be found.

Growth of bacteria as colonies on solid culture media

g. Collection of Slender-billed vulture

The centre plans to keep 25 pairs of each of the three species. It has the capacity to keep 70 birds of each of the three species. We have so far got only 18 Slender-billed vultures of which four are hatched at the centre. The centre has permission to collect forty birds from Assam- their only remaining stronghold. The centre will attempt to collect these birds from Assam with the help of CZA and Assam Forest Department.

h. Monitoring of proposed reintroduction sites

It is proposed to start releasing the captive bred vultures in the wild after 2015. The release will take place only when it is absolutely sure that the area is free of diclofenac. The release sites will be monitored from 2012. The area will be monitored in a radius of 100 km from the point of release. The food availability, habitat availability and absence of diclofenac will be ensured. High level advocacy programmes will be launched and decision makers will be persuaded to take action against anybody using diclofenac drug in cattle. The tissues of cattle carcasses and vulture carcasses will be collected and will be analyzed for the prevalence of diclofenac.

Awareness programmes will be carried out among various stake holders like cattle owners, dairy owners, untrained veterinarians and veterinarians, drug retailer and wholesalers and stockists, drug inspectors and Drug Controller General. The help of Forest and Animal Husbandry officials will also be enlisted.

The biologists will be responsible for the execution of the programme under the supervision of the BNHS Principal Scientist.

Long-billed vulture in flight in the Colony Aviary

CHAPTER 2

Plan of action and budget for implementing the management plan

a. Construction and development

i. **Construction**

So far most of the funding for running the centre has come through Darwin Initiative for the Survival of Species, a U.K. government fund and the Royal Society for the Protection of Birds, U.K. The recurring cost of the centre is about Rs. Seventy Lakhs of which about 50% is the vulture food cost.

The Royal Society for the Protection of Birds has committed funding for the running cost of the centre for the next five years but the centre will have to organize funding for developmental work. The funds will be requested from the Ministry of Environment and Forests, Government of India and Central Zoo Authority. Other international sources will also be explored.

The following construction work needs to be done in the next five years:

Year	Structures to be constructed	Estimated Cost per unit	No. of Units to be constructed	Total Cost (in Rs. Lakhs) per unit	Funding Source
2011-2012	Colony aviary	Rs.20,00,000	1	20.00	MoEF, Haryana State Government
2011-2012	CCTV camera system including optic fiber cable	Rs 100,000	1	01.00	MoEF, Haryana State Government
2011-2012	Interpretation cum CCTV room	Rs. 10,00.000	1	10.00	MoEF and Haryana State Government
2012-2013	Food processing room including equipment	Rs. 10,00.000	1	10.00	RSPB, U.K.
2012-2013	Electrification of aviaries	Rs. 50,000	1	00.50	RSPB, UK.
2012-2013	Vehicle for monitoring vulture colonies	Rs. 700,000	1	07.00	Funding will be sought from RSPB and other agencies
2013-2014	Colony Aviary	Rs. 20,00,000/-	1	20.00	Funding will be sought from MoEF and CZA
2013-2014	CCTV camera with optic fibre	Rs. 100,000/-	1	01.00	Funding will be sought from MoEF and CZA and other agencies
2014-2015	No construction proposed				
2015-2016	Construction of pre-release aviary	Rs. 20,00,000	1	20.00	Funding will be sought from RSPB
			Total	**89.50**	

ii. **Recruitment of additional staff**

Additional staff will be required for carrying out monitoring of the areas where the vultures will be reintroduced. Two biologists will carry out the monitoring supported by two field assistants and a driver. These staff will be recruited for at least three years.

Table : Recruitment of additional staff

Year	Staff to be Recruited	Monthly emoluments	No. of staff	Total annual expenditure (in Rs. Lakhs)	Funding
2011-12	No recruitment				
2012-13	Recruitment of two biologists	Rs. 25000/- per person	2	06.00	Funding will be sought from RSPB, MoEF and CZA
2012-2013	Two field assistants	Rs. 10,000/- per person	2	2.40	"
2012-2013	Driver	Rs. 10,000/	1	1.2	"
2013-2014	No recruitment	10% increase in above emoluments	5 (as above)	10.34	
2014-2015	No recruitment	10% increase in 2013-2014 emoluments		11.37	
			Total	**31.31**	

Projected budget for the breeding centre till 2021

Bombay Natural History Society, Mumbai
Vulture Conservation Breeding Project, Pinjore, Haryana

Summary of budget

Particulars	Rs.(Lakhs)								
	2011	2012	2013	2014	2015	2016	2017	2018	2019
A. Salary and wages	16.52	27.77	30.55	33.60	36.96	40.66	44.73	49.20	54.12
B. Fuel expenses	2.10	2.31	2.54	2.80	3.07	3.38	3.72	4.09	4.50
C. Meat for vultures	57.60	63.36	69.70	76.67	84.33	92.77	102.04	112.25	123.47
D. Material supply and expendibles	7.20	7.92	8.71	9.58	10.54	11.60	12.76	14.03	15.43
E. Report & publications	2.20	2.42	2.66	2.93	3.22	3.54	3.90	4.29	4.72
F. Capital cost									
(I) Cost of land		-	-	-	-	-	-	-	-
(ii) Cost of construction	10.00	17.50	20.00	-	20.00	-	-		
G. Maintenance cost					40.00				
H. BNHS Administrative Fee 15%	13.68	15.05	16.55	18.21	20.03	22.03	24.23	26.66	29.32
I. Total	**109.30**	**136.33**	**150.71**	**143.78**	**198.16**	**193.98**	**191.38**	**210.51**	**231.57**

Summary of budget

Particulars	Rs. (Lakhs)					
	2020	2021	12th Year	13th Year	14th year	15th Year
A. Salary and wages	59.53	65.48	72.03	79.24	87.16	95.88
B. Fuel expenses	4.95	5.45	5.99	6.59	7.25	7.97
C. Meat expense	135.82	149.40	164.34	180.77	198.85	218.74
D. Material supply and expendibles	16.98	18.67	20.54	22.60	24.86	27.34
E. Report and publication	5.19	5.71	6.28	6.90	7.59	8.35
F. Capital cost	-					
(i) Cost of land	-	0.00	0.00	0.00	0.00	0.00
(ii) Cost of construction	-	0.00	0.00	0.00	0.00	0.00
G. Maintenance cost	40.00					
H. BNHS administrative fee 15%	32.26	35.48	39.03	42.93	47.23	51.95
I. Total	**294.72**	**280.19**	**308.21**	**339.04**	**372.94**	**410.23**
J. Grand Total	**3571.06**					

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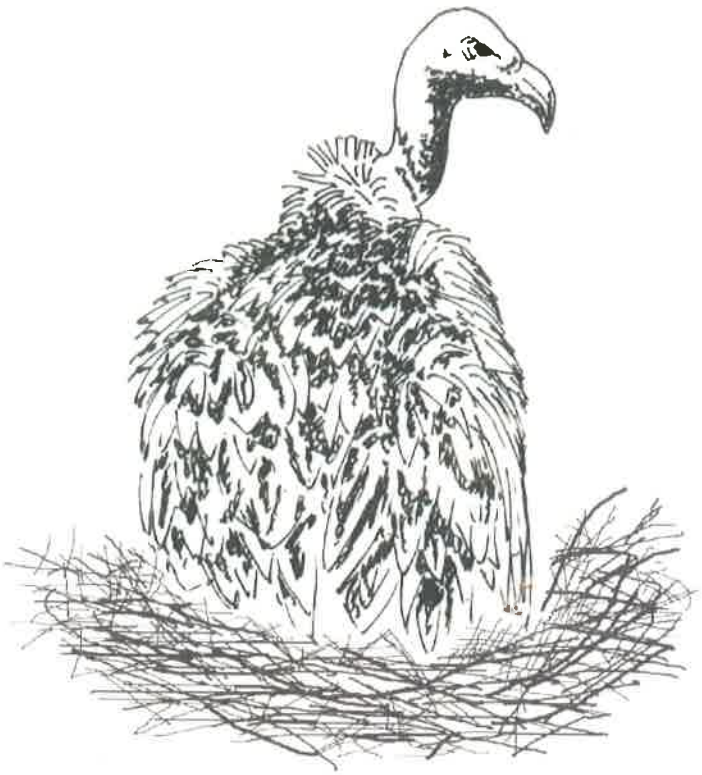
VCBC

Annexures to the Master Plan



Annexure 1
Lay out plan depicting the present and future set up

Annexure 2
Existing animal collection plan/inventory

Annexure 3
Free living species in and around the centre

Annexure 4
Present staffing pattern at the centre

Annexure 5
List of buildings other than animal enclosures

Annexure 6
MOU between Haryana Forest Department and BNHS

Annexure 2

Existing animal collection plan/inventory

SN.	Species	Total Number	Remarks
1.	White-backed vulture	57	8 have hatched at the centre
2.	Long-billed vulture	58	3 have hatched at the centre
3.	Slender-billed vulture	18	4 have hatched at the centre
4.	Himalayan Griffon	02	
	Total	**135**	

White-backed vulture

Long-billed vulture

Slender-billed vulture

Himalayan Griffon

Annexure 3

Free living species in and around the centre

Annexure 3.1 : **Checklist of birds seen in and around the VCBC, Pinjore.**

Sr. No.	Common name	Scientific name
1.	Cattle Egret	*Bubulcus ibis*
2.	Little Egret	*Egretta garzetta*
3.	Black Kite	*Milvus migrans*
4.	Shikra	*Accipiter badius*
5.	Sparrow Hawk	*Accipiter nisus*
6.	Oriental honey Buzzard	*Pernis ptilorhynchus*
7.	Booted Eagle	*Hieraaetus pennatus*
8.	Steppe Eagle	*Aquila nipalensis*
9.	Red-headed vulture	*Sarcogyps calvus*
10.	Cinereous vulture	*Aegypius monachus*
11.	Himalayan griffon vulture	*Gyps himalayensis*
12.	Long-billed vulture	*Gyps indicus*
13.	White-backed vulture	*Gyps bengalensis*
14.	Slender-billed vulture	*Gyps tenuirostris*
15.	Egyptian vulture	*Neophron percnopterus*
16.	Short-toed serpent Eagle	*Circaetus gallicus*
17.	Peregrine Falcon	*Falco peregrinus*
18.	Eurasian Hobby	*Falco subbuteo*
19.	Red-headed Falcon	*Falco chicquera*
20.	Common Kestrel	*Falco tinnunculus*
21.	Black Francolin	*Francolinus francolinus*
22.	Grey Francolin	*Francolinus pondicerianus*
23.	Red Jungle-fowl	*Gallus gallus*
24.	Indian Peafowl	*Pavo cristatus*
25.	White-breasted Waterhen	*Amaurornis phoenicurus*
26.	Red-wattled Lapwing	*Vanellus indicus*
27.	Yellow-footed Green Pigeon	*Treron phoenicoptera*
28.	Blue Rock Pigeon	*Columba livia*
29.	Eurasian collared Dove	*Streptopelia decaocto*
30.	Spotted Dove	*Streptopelia chinensis*
31.	Little brown Dove	*Streptopelia senegalensis*
32.	Alexandrine Parakeet	*Psittacula eupatria*
33.	Rose-ringed Parakeet	*Psittacula krameri*
34.	Plum-headed Parakeet	*Psittacula himalayana*
35.	Slaty-headed Parakeet	*Psittacula cyanocephala*
36.	Common Hawk Cuckoo	*Hierococcyx varius*
37.	Asian Koel	*Eudynamys scolopacea*
38.	Greater Coucal	*Centropus sinensis*

39.	Barn Owl	*Tyto alba*
40.	Scops Owl	*Otus scops*
41.	Collared scops Owl	*Otus bakkamoena*
42.	Great Horned Owl	*Bubo bubo*
43.	Brown Hawk Owl	*Nixon scutulata*
44.	Spotted Owlet	*Athene brama*
45.	White-throated Kingfisher	*Halcyon smyrnensis*
46.	Green Bee-eater	*Merops orientalis*
47.	Blue-bearded Bee-eater	*Nyctyornis athertoni*
48.	Indian Roller	*Coracias garrulus*
49.	Common Hoopoe	*Upupa epops*
50.	Indian Grey Hornbill	*Ocyceros birostris*
51.	Brown-headed Barbet	*Megalaima zeylanica*
52.	Coppersmith Barbet	*Megalaima haemachephala*
53.	Black-rumped Flameback	*Dinopium benghalense*
54.	Fulvous-breasted Woodpecker	*Dendrocopos macei*
55.	Indian Pitta	*Pitta brachyura*
56.	Streak-throated Swallow	*Hirundo fluvicola*
57.	Eurasian golden Oriole	*Oriolus oriolus*
58.	Black Drongo	*Dicrurus macrocercus*
59.	Ashy Drongo	*Dicrurus leucophaeus*
60.	Spangled Drongo	*Dicrurus hottentottus*
61.	Greater racket-tailed Drongo	*Dicrurus paradiseus*
62.	Brahminy Starling	*Sturnus pagodarum*
63.	Common Myna	*Acridotheres tristis*
64.	Bank Myna	*Acridotherus ginginianus*
65.	Rufous Tree-pie	*Dendrocitta vagabunda*
66.	House Crow	*Corvus splendens*
67.	Long-billed Crow	*Corvus macrorhynchus*
68.	Scarlet Minivet	*Pericrocotus brevirostris*
69.	Long-tailed Minivet	*Pericrocotus ethologus*
70.	Small Minivet	*Pericrocotus cinnamomeus*
71.	Himalayan Bulbul	*Pycnonotus leucogenys*
72.	Red-vented Bulbul	*Pycnonotus cafer*
73.	Black Bulbul	*Hypsipetes leucocephalus*
74.	Common Babbler	*Turdoitus caudatus*
75.	Jungle Babbler	*Turdoides striatus*
76.	Red-throated Flycatcher	*Ficedula parva*
77.	Small Niltava	*Niltava macgriroriae*

78.	White-browed Fantail	*Rhipidura aureola*
79.	Asian paradise Flycatcher	*Terpsiphone paradisi*
80.	Grey-breasted Prinia	*Prinia hodgsonii*
81.	Plain Prinia	*Prinia inornata*
82.	Common Tailor bird	*Orthotomus sutorius*
83.	Blyth's reed Warbler	*Acrocephalus dumetorum*
84.	Lesser Whitethroat	*Sylvia curruca*
85.	Common Chiffchaff	*Phylloscopus collybita*
86.	Siberian Rubythroat	*Luscinia calliope*
87.	Himalayan Rubythroat	*Luscinia pectoralis*
88.	Oriental Magpie Robin	*Copsychus saularis*
89.	White-rumped Shama	*Copsychus malabaricus*
90.	Brown Rock-Chat	*Cercomela fusca*
91.	Indian Robin	*Saxicoloides fulicata*
92.	Blue Whistling Thrush	*Myophonus caeruleus*
93.	Great Tit	*Parus major*
94.	Green-backed Tit	*Parus monticolus*
95.	Tree Pipit	*Anthus trivialis*
96.	White Wagtail	*Motacilla alba*
97.	Purple Sunbird	*Nectarinia asiatica*
98.	Crimson Sunbird	*Aethopyga siparaja*
99.	Oriental White-eye	*Zosterops palpebrosus*
100.	House Sparrow	*Passer domesticus*
101.	Scaly-breasted Munia	*Lonchura punctulata*
102.	Black-headed Munia	*Lonchura Malacca*
103.	Chestnut-shouldered Petronia	*Petronia xanthocollis*
104.	Common Rosefinch	*Carpodacus erythrinus*
105.	Rock Bunting	*Emberiza cia*

Annexure-3.2

List of plants at VCBC, Pinjore.

Sr. No.	Common name	Scientific name
1	Sacred Barna	*Crateva magna*
2	Simal	*Bombax ceiba*
3	Bael	*Aegel marmelos*
4	Neem	*Azadirachta indica*
5	Toon	*Cedrela toona*
6	Indian Jujube	*Zizipus mauritiana*
7	Siris	*Albizzia lebbeck*
8	Mango	*Magnifera indica*
9	Indian Laburnum	*Cassia fistula*
10	Flame of the forest	*Buteo monosperma*
11	Harar	*Terminalia chebula*
12	Sain	*Terminalia tornentosa*
13	Bahera	*Terminalia belerica*
14	Sagwan	*Tectona grandis*
15	Amla	*Emblica officinalis*
16	Banyan	*Ficus benghalensis*
17	Pipal	*Ficus religiosa*
18	*Solid Bamboo*	*Dendrocalamus strictus*
19	Khair	*Acacia catechu*
20	Karaunda	*Carissa congesta*
21	Lantana	*Lantana camara*
22	Karee patta	*Murraya koenigii*
23	Karela	*Momordica charantia*
24	Adulsa	*Adhatoda vasica*
25	Safeda or Nilgiri	*Eucalyptus*
26	*Ber*	*Ziziphus mauritiana*
27	*Kendu*	*Diaspyros cordifolia*

Annexure 3.3

List of mammals at VCBC, Pinjore.

Sr. No.	Common name	Scientific name
1.	Rhesus Macaque	*Macaca mulatta*
2.	Leopard or Panther	*Panthera pardus*
3.	Jungle Cat	*Felis chaus*
4.	Common Mongoose	*Herpestes edwardsi*
5.	Jackal	*Canis aureus indicus*
6.	Yellow-throated Marten	*Martes flavigula*
7.	Flying Fox	*Pteropus giganteus*
8.	Indian false Vampire	*Megaerma lyra*
9.	Striped Squirrels	*Funambulus pennanti*
10.	Indian bush Rat	*Golunda ellioti*
11.	Common house Rat	*Rattus rattus*
12.	Indian Porcupine	*Hystrix indica*
13.	Rufous-tailed Hare	*Lepus nigricollis ruficaudatus*
14.	Nilgai or Blue bull	*Boselaphus tragocamelus*
15.	Sambar	*Cervus unicolor*
16.	Chital or spotted Deer	*Axis axis*
17.	Barking Deer	*Muntiacus muntjak*
18.	Indian wild Boar	*Sus scrofa*

Annexure-3.4

List of reptiles seen in and around VCBC, Pinjore.

Sr. No.	Common name	Scientific name
1.	Northern house Gecko	*Hemedactylus flaviviridis*
2.	Common Skink	*Mabuya carinata*
3.	Common Indian Monitor	*Varanus bengalensis*
4.	Blind Snake	*Typhlina bramina*
5.	Indian Python	*Python moluras*
6.	Common Rat Snake	*Ptyas mucosus*
7.	Wolf Snake	*Lycodon aulicus*
8.	Common Indian Krait	*Bungarus caeruleus*
9.	Indian Cobra	*Naja naja*
10.	Russel's Viper	*Daboia russelii*

Annexure 4

Present staffing pattern at the centre

Project Leader	:	Chief Wildlife Warden, Haryana
Project Manager	:	Dr. Vibhu Prakash, Principal Scientist, BNHS
Technical Assistant	:	Ms. Nikita Prakash
Centre Manager	:	Mr. Mandar D. Kulkarni
Research Biologist	:	Mr. Rohan Shringarpure
Veterinarian	:	Dr. Parag Deori
Supervisor	:	Mr. Jaikishan Sharma
Vulture Keepers	:	Mr. Sugan Chand, Mr. Rajesh Kumar
Watchmen	:	Mr. Timan Singh, Mr. Prakash Chand
Adm. Assistant	:	Mr. Niranjan Dalei

Nestling of a White-backed vulture

Annexure 5

List of buildings other than animal enclosures

Laboratory building

Veterinary section

Incubation room / Brooder room

Store room

Ground water tank

Generator room

For further information, please contac

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